Money, Banking, and International Finance

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Preface

I taught Money & Banking and International Finance many times. Over time, I transformed my lecture notes into a textbook. Instructors can use this textbook for individual courses in Money and Banking or International Finance, or a hybrid of the two. Financial analysts, economists, and policy analysts can refer to this book as a valuable study guide, as it is concise, informative, and aligned with current events. We explain how governments and central banks influence exchange rates, interest rates, financial markets, and currency flows.

The events unfolding in 2025 underscore why understanding global finance is crucial. Recent events have shaken the confidence of international investors in the current financial system. After Russia invaded Ukraine in February 2022, the United States and its allies froze about $300 billion in Russian currency exchange reserves. The interest of these funds was diverted to Ukraine to help finance its war effort. This event, while strategic, caused many nations to question the safety of holding U.S. dollar reserves. In response, Brazil, Russia, India, China, and South Africa, known as BRICS, have banded together to discuss forming an alternative financial system free from U.S. dominance. Many nations are interested in joining this new financial system.

The Trump Administration further accelerated this move away from the U.S. dollar and the U.S. financial system. His new policies and proposals have induced new shocks to the financial system, which raise questions about the stability of the U.S. dollar and the U.S. financial system. One factor that all financial systems need is trust. Investors must have trust in the financial system, which is being tested in 2025.

The following recent developments steer us in the direction of a severe financial crisis:

- ❖ Inverted yield curve: The yield curve inverted in October 2023 when the Federal Reserve raised interest rates to combat inflation. It remained inverted until December 2024, the longest inversion on record. Historically, inversions occur about a year before recessions.

- ❖ Aggressive tariffs: The Trump Administration directed aggressive tariff policies at U.S. trading partners. The policies have disrupted supply chains and generated uncertainty in the financial markets, which is also fueling inflation. The higher prices already stress many households as they have depleted their savings and credit.

- ❖ Rising public debt: The U.S. federal debt reached $37 trillion in 2025. Roughly $8 trillion of this debt is due in 2025, with another $8 trillion due in 2026. These numbers exclude new borrowings from the government. The U.S. government faces challenges in financing and rolling over this debt as investors begin to lose confidence. France, Germany, Japan, and the UK are also struggling to finance their debts.

- ❖ Foreign-investment tax: The U.S. Treasury has a new policy to assess taxes on interest on Treasuries that are held by countries deemed to have “unfair tax advantages.” Foreign investors are further discouraged from investing in U.S. debt.

- Weak-dollar policy: Officials propose the weakening of the U.S. dollar. Governments, businesses, and people hold the world's reserve currency because it is widely accepted and retains its value. Foreign investors lose their appeal to hold a reserve currency if they believe it will become weaker. It also weakens the demand for U.S. Treasuries since they are denominated in dollars.

- Immigration enforcement: Mass deportations in 2025 have ensnared international students and tourists. Foreign tourists contributed about $165.5 billion to the economy in 2022, while international students contributed about $43.8 billion. The contraction of these industries would also amplify a downturn in the economy.

- Debt tokenization: The U.S. Treasury is exploring the tokenization of the U.S. debt in 2025. It raises questions about a government controlling digital financial infrastructure. The tokens could serve a function as money, which would compete with the Federal Reserve. The government will likely control all aspects of transactions, which directly contradicts Bitcoin's philosophy. Bitcoin was designed as a decentralized network, where users have complete control over their crypto wallets.

- Backdoor to the Money Supply: The actions of the U.S. Department of the Treasury may influence the money supply even though economic theory disagrees. Money market mutual funds and money market deposit accounts purchase T-bills and allow investors limited check-writing privileges. Consequently, the Treasury Department may influence the M2 money via these money market funds.

We examine these issues in this textbook and how they affect financial markets, exchange rates, and currency flows. This book equips readers and students with knowledge that they can understand, apply, and protect themselves from the complexities we face ahead during a time of extreme global financial turbulence.

1. Money and the Financial System

This chapter introduces the financial system. We will learn the purpose of financial markets and their relationship to financial institutions. Financial institutions connect the savers to the borrowers through financial intermediation. At the heart of every financial system lies a central bank. It controls a nation's money, and the money supply is a vital component of the economy. Unfortunately, economists struggle to define money because people can easily convert many financial instruments into cash. Thus, central banks use several definitions to measure the money supply. Furthermore, if an economy did not use money, people would resort to an inefficient barter system. Unfortunately, this society would produce a limited number of goods and services. Cash overcomes the inherent problems with a barter system and allows specialization to occur at many levels.

Financial Markets

Money and the financial system are not just related; they are deeply intertwined. Their influence permeates the entire economy, impacting the inflation rate, business cycles, and interest rates. This interconnectedness highlights the importance of understanding how financial markets and the money supply impact the economy. By understanding this relationship, consumers, investors, savers, and government officials can make more informed decisions, recognizing their impact and the choices they make on the economy.

Financial markets play a pivotal role in our economy, bringing buyers and sellers together to facilitate the buying and selling of bonds, stocks, and other financial instruments. Whether it's the face-to-face transactions on the New York Stock Exchange or the virtual connections on NASDAQ, these markets are the hallmarks of our financial system, making it easier for buyers to invest their savings and for sellers to borrow funds.

A ***financial institution*** links savers and borrowers, with commercial banks being the most common. For example, if we deposit $100 into our savings account, the bank could subsequently lend this $100 to a borrower. Then the borrower pays interest to the bank. In turn, the bank would pay us interest for using our funds. A bank's profits reflect the difference between the interest rate charged to borrowers and the interest rate the bank pays us for our savings account.

Why would someone deposit money at a bank instead of directly buying securities through the financial markets? As a financial institution, a bank offers three benefits to its depositors. First, a bank collects ***information*** about borrowers. It lends to borrowers with a low chance of defaulting on their loans. Thus, a bank's specialty is to rate its borrowers. Second, the bank reduces investment ***risk***. Banks lend to various borrowers through home mortgages, business loans, and credit cards. Suppose one business is bankrupt, or several customers do not pay their credit cards. In that case, the default does not financially harm the bank. The bank would earn interest on other investments that offset the bad loans. Ultimately, a bank deposit is considered a liquid asset. Suppose people have an emergency and need money from their bank deposits. In that case, they can quickly convert the bank deposit into cash.

Economists use liquidity to define money. ***Liquidity*** refers to the ability of an asset to be easily converted into cash with minimal transaction costs. For example, if we list all our assets in terms of liquidity, liquidity forms a scale, as shown in Figure 1. Cash is the most liquid asset because a person already has money and does not need to convert it to money. Subsequently, a savings account is almost as good as cash because customers can quickly withdraw their deposits from a bank or ATM and convert them into cash with minimal transaction costs. Nevertheless, cars and houses are the least liquid assets because owners require time and high transaction costs to convert these assets into cash.

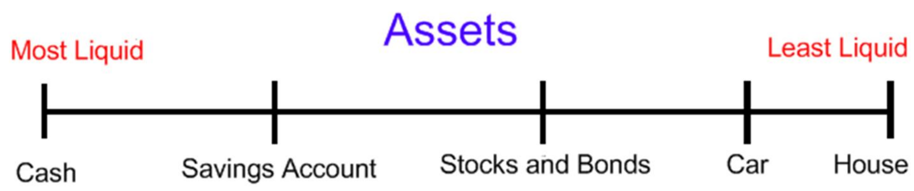


Figure 1. Assets ranked by liquidity

Central Banks

Every country uses ***money***. Therefore, every country has an institution that measures and influences the ***money supply***. This institution is the ***central bank***. For example, the central bank of the United States is the ***Federal Reserve System***, commonly referred to as the "***Fed***." The Federal Reserve regulates banks, grants emergency loans to banks, and influences the money supply. Since the money supply and financial markets are closely intertwined, the Fed can indirectly influence financial markets by adjusting the money supply. Therefore, the Fed can indirectly affect the interest rates, exchange rates, inflation, and the output growth rate of the U.S. economy. Economists refer to this as ***monetary policy***, which involves the central bank managing the money supply to influence the economy. Consequently, this book explains how a central bank can affect the economy and financial markets. Lastly, readers can apply this analysis to any central bank worldwide.

Central bank influences three critical variables in the economy, which include the following:

Inflation is a sustained rise in an economy's average prices for goods and services. When a central bank increases the money supply, it can create inflation. For example, if we place $100 in a shoebox and bury it in our yard for one year. That $100 loses value over time because, on average, all the prices for goods and services in an economy continually rise every year. If the inflation rate increases by 2% per year, then after one year, $100 would buy, on average, 2% fewer goods and services. Although inflation erodes the value of money, a low positive inflation rate is not necessarily alarming, as it may be a sign of economic growth.

A ***business cycle*** refers to the economy's cycles of strong and weak economic growth. The economy becomes larger for economic growth and smaller for weak growth. Economists measure the size of the economy by the ***Gross Domestic Product (GDP)***. GDP reflects the total value of goods and services produced within an economy for one year. When businesses boost production, they create more goods and services within the economy. If GDP skyrockets, then the economy experiences a business cycle. Thus, consumers' incomes are rising; businesses experience strong sales and increasing profits, and workers can easily find new jobs, which decreases the unemployment rate. However, inflation can strike an economy with rapidly rising prices if the money supply grows too quickly.

Interest rates reflect the cost of borrowing money. People borrow money to buy cars, houses, appliances, and computers. In contrast, businesses borrow to build factories and invest in machines and equipment that increase the quantity of goods and services they produce. Moreover, governments borrow money when they spend more than they collect in taxes. Since economies with complex financial markets offer a wide range of loans, these loans have varying interest rates. Typically, economists refer to "the interest rate" because interest rates tend to move in tandem. As a central bank expands the money supply, interest rates fall, and vice versa, as we will demonstrate later in this book. Thus, an increasing money supply causes interest rates to fall in the short run.

A critical function of monetary policy is to create economic growth. Unfortunately, the GDP can grow slowly or decrease as businesses produce fewer goods and services within the economy. At the same time, consumers' incomes fall or stagnate. As an economy produces fewer goods and services, unemployed workers experience greater difficulties finding jobs. Subsequently, the unemployment rate increases and the economy enters a recession. Unfortunately, if the money supply grows too slowly or even contracts, it could cause the economy to enter a recession.

Economists calculate both the nominal GDP and real GDP. ***Nominal GDP*** includes the impact of inflation. For example, if the economy experiences inflation or firms produce more goods and services during a year, the nominal GDP rises. On the other hand, economists remove the effects of inflation by calculating ***real GDP***. When real GDP increases, it means that companies in society have produced more goods and services, with the impact of inflation removed from the calculation. That way, if real GDP is rising, then the public and economists know the economy has expanded, while a decreasing real GDP indicates a society's economy is contracting. Finally, economists define many variables in either real or nominal terms, such as interest rates and wages, which we explain in more detail later in this book.

Barter and Functions of Money

What would an economy look like without money? Without money, buyers would exchange goods with sellers by exchanging one good for another, a practice known as ***barter***. Unfortunately, barter has four problems.

Problem 1: Barter suffers from a ***double coincidence of wants***. For example, if we make shoes and want to drink Coca-Cola, we search for a person who produces Coca-Cola and needs shoes. Thus, we need to search for someone who wants the opposite of what we want, which could take a long time.

Problem 2: Many goods, such as fruits and vegetables, deteriorate and spoil over time. Growers of perishable goods cannot store their purchasing power. If they wanted to save, they would need to exchange their products for goods that would not perish quickly.

Problem 3: Products and services have different price measurements. For instance, if a store stocked 1,000 products and money circulated in this economy, it would subsequently have 1,000 price tags. Then customers can compare products easily. With barter and no money, this same store would have 499,500 price exchange ratios, as calculated in Equation 1. The Variable E indicates the number of price ratios, while n is the number of products produced in a barter system.

$$E = \frac{n(n-1)}{2} = \frac{1{,}000 \cdot 999}{2} = 499{,}500 \qquad (1)$$

A price ratio shows the amount of one good that buyers and sellers exchange for another good, and we show examples of price ratios in Figure 2. For example, a person could exchange one apple for three bananas or two Coca-Colas.

1 apple = 3 bananas
2 Coca-Colas = 1 apple
.
.
1 cup of coffee = 1 Coca-Cola

Figure 2. Examples of price ratios

Problem 4: Under a barter system, businesspeople would struggle to write contracts for future payments of goods and services. Consequently, a barter society would produce a limited range of goods and services.

Money eliminates the problems with barter and has four functions. First, money functions as a ***medium of exchange*** because people use money to pay for goods and services and repay debts. The function of the medium of exchange is to promote efficiency and specialization. For example, the author teaches economics and finance. Under a barter system, the author would extensively search the market to find a person who would exchange goods and services that the author needs. In the author's case, he could incur considerable search costs for individuals seeking economic instruction. With money, the author does what he does best and teaches for cash. Then he takes this money to the market and buys goods and services that he wants. This function of money allows the ***specialization of labor*** to occur and eliminates the problem of double coincidence of wants under a barter system.

The second function of money is a ***unit of account***. Money conveniently allows people to place specific values on goods and services. For example, a two-liter of Coca-Cola costs $0.89, while a two-liter of Pepsi costs $0.99. Thus, customers can easily compare the prices of products. This function is essential for businesses because businesspeople place value on buildings, machines, computers, and other assets. Then they record this information in financial statements. Subsequently, investors read the financial statements and gauge which companies are profitable. Finally, this function of money eliminates the massive number of price exchange ratios that would occur under a barter system.

The third function of money is the ***store of value***. Money must retain its value. For example, if a two-liter of Coca-Cola costs $0.99 today, then it should cost $0.99 tomorrow. Unfortunately, inflation erodes the "store of value" of money. As the price level increases, the value of money decreases because each unit of money buys fewer goods and services. Inflation erodes consumers' ***purchasing power*** over time. If the inflation rate becomes too high, then money as a "medium of exchange" breaks down too. In countries with high inflation rates, people resort to barter and immediately exchange their local money for stable money, such as euros or U.S. dollars. However, people must use money as a medium of exchange because government laws legally require them to accept money as a means of repaying debts or paying taxes. This legal requirement is "***legal tender.***" On the other hand, bank checks are not considered legal tender, and individuals and businesses can refuse to accept checks as payment.

The fourth and final function of money is serving as a ***standard of deferred payment***. This function combines the "medium of exchange" and "unit of account" of money because contracts state debts in terms of a "unit of account," and borrowers repay using the "medium of exchange." Hence, this function of money is essential for future business transactions. Businesses and individuals can borrow or lend money based on future transactions, which create financial markets.

Money needs six desirable properties for people and businesses to use money, which include the following:

1. ***Acceptable:*** Businesses and the public accept money as payment for goods and services. People must trust money before they receive payment. Unfortunately, inflation erodes the trust in money.
2. ***Standardized quality:*** The same units of money must have identical size, quality, and color so people know what they are getting. If a government issues money in different sizes and colors, how would people determine whether bills are legitimate or counterfeit?
3. ***Durable:*** Money must be physically sturdy, or it might lose its value quickly as it degrades and falls apart. In some countries, people do not accept torn, ripped, or faded money.
4. ***Valuable relative to its weight:*** People can conveniently carry large amounts of money around and use it in transactions.
5. ***Divisible:*** The public can divide money into smaller units to purchase inexpensive goods and services.

All modern countries use coins and paper bills as money, which possess the five desirable properties. The total value of paper bills and coins is ***currency***. Furthermore, people become psychologically dependent on a currency because they have been using it for a considerable amount of time. For example, U.S. citizens have used the U.S. dollar as their currency for two centuries. If the U.S. government were to introduce a new currency with a different name, the public could reject it.

Forms of Money

Since the dawn of civilization, people have created payment systems. Thus, money facilitates business transactions, and the payment system serves as the mechanism to settle these transactions. The first and oldest form of payment is ***commodity money***. Commodity money occurs when a government selects a commodity from society to serve as a medium of exchange, such as gold or silver. If society did not use gold or silver as money, people could still use this commodity for other purposes. For instance, people use gold in jewelry, teeth fillings, electrical wires, or microprocessor pins. Commodity money could be anything. For example, prisoners used cigarettes as money in U.S. prisons. Meanwhile, people accepted vodka and bullets as payment in remote parts of Russia during the 1990s.

Commodity money could be full-bodied money. Its value as a good for non-money purposes equals its value as a medium of exchange. For instance, if the market value of one ounce of gold is $1,000, and the government made one-ounce gold coins, then the face value of the coin would equal $1,000. Thus, this coin represents ***full-bodied commodity money*** because its inherent value equals its market value.

Governments discovered a trick about commodity money. What would happen if a government made one-ounce gold coins with a face value equal to $2,000 while the coin contained $1,000 of gold? Subsequently, the government had created $1,000 out of thin air! The government can create value by “printing money,” which we call ***seigniorage***, and thereby receive significant revenue through money creation.

The government can debase its currency by relying on seigniorage. For example, the Ancient Roman government “printed money” by recalling gold and silver coins two thousand years ago. By mixing in cheap metals, the Roman government made more coins containing less gold and silver. At the beginning of the ancient Roman Empire, coins were almost entirely made of gold and silver. Nevertheless, towards the end of the empire, Roman coins contained specks of gold and silver. For example, the government can debase coins. If the government issued one-ounce gold coins worth $1,000, and the coins were 98% pure gold, then the government could print money by collecting the old coins and minting two new coins with a value of $1,000 that contained only 49% gold. The government fills the remaining 51% of the coin with cheap metals. Unfortunately, the government could create extremely high inflation rates by over-depending on seigniorage.

The second form of commodity money is ***representative full-bodied money***. This money has little inherent value, such as paper bills. However, people can convert it into a valuable commodity, such as gold and silver. For example, if we had U.S. dollar bills before 1933, we could exchange them for gold at the U.S. government’s exchange rate of $ 20.67 per ounce. Most of humanity used commodity money before the 20th century, until government and central banks replaced it with fiat money.

Governments and central banks created the second payment system, ***fiat money***, in the 20th century. Most central banks worldwide use fiat money. The Federal Reserve System has the authority to issue U.S. dollars in the United States, and the public cannot use this money for anything else. Furthermore, the people cannot exchange U.S. dollars for another commodity from the government. For example, if people do not want to use U.S. dollar bills as money, they have no function other than being fancy paper.

No authority can limit the amount of money the Federal Reserve System can issue. If the Fed wants to inject an additional $1 trillion into the economy, it could do so quickly and effectively. However, a rapid expansion in the money supply would harm an economy. For instance, countries with high inflation rates or ***hyperinflation*** have rapidly growing money supplies. Hyperinflation causes a country's inflation rate to become extremely high, rendering prices largely meaningless. Subsequently, people stop using money as they resort to barter. We show a 100-trillion Zimbabwe note in Figure 3. A Nobel Prize laureate in economics, Milton Friedman, stated, "Inflation is always and everywhere a monetary phenomenon."

Figure 3. One-hundred-trillion Zimbabwe note

The third payment system, a ***check***, is a form of credit money tied to a person's checking account. Banks, credit unions, and other financial institutions offer checking accounts to people and businesses. Then people use checks as a medium of exchange, allowing them to purchase goods and services. Once sellers accept a check, they present it to their bank for payment.

Checks have three benefits. First, people and businesses do not carry cash. Second, the check provides proof of a business transaction. Finally, checks have become convenient for large transactions, such as buying a house or car. The buyer does not need to carry a suitcase of cash for this transaction. However, the financial institution charges fees for using checks, or the check writers abuse their accounts and write fraudulent checks for amounts that exceed their account balances. Some businesses and people do not accept checks because they cannot verify if a person has sufficient funds in their account.

Checks evolved into the last payment system – electronic funds. The most common form is debit cards. A ***debit card*** improves the payment system's efficiency and extends the function of checks. Many retail and grocery stores allow consumers to pay for goods and services using a debit card. When customers purchase their goods and services, they use a plastic card that contains either a chip or a magnetic strip. Next, the store has machines that read the chip or magnetic strip, allowing the store to transfer funds electronically from the customer's checking account to the store's bank account. Consequently, the debit card reduces the uncertainty for customers of having sufficient funds in their accounts for business transactions. Although many businesses do not accept checks, they do accept debit cards.

Debit cards expanded electronic funds transfer, leading to the development of the ***automated teller machine (ATM)*** and the rise of online commerce. An ATM allows people to withdraw cash from machines located at banks, grocery stores, shopping malls, and gas stations. ATMs are connected through computer networks; Visa Debit is one of the largest networks. The Visa network enables customers to access their checking and savings accounts at financial institutions 24 hours a day, 7 days a week, from almost anywhere in the world. Ultimately, people can purchase products and services, transfer funds between bank accounts, or pay utility bills from the comfort of their own homes, all without leaving their computer screens. They only need a computer connection to the Internet to transfer money or pay bills.

Smartphones and ***QR codes*** are replacing debit cards. People making purchases can scan the seller’s or vendor’s QR code with their smartphones. Then this person uses their smartphone's banking app to transfer funds from their bank account to the seller’s or vendor’s bank account. Thus, technology is reducing the need for people to carry money while their smartphones tie people to online commerce.

Bitcoin and Cryptocurrencies

The Internet created a new currency that exists only in cyberspace. We call this money ***Bitcoin***, where “bit” refers to the computer term—a piece of information, either a one or a zero. This currency has other names, including virtual money or cryptocurrency.

No central bank or government issues Bitcoins, and approximately 20 million Bitcoins were in circulation worldwide in 2024. The supply is expected to continue growing to 21 million Bitcoins by 2140. Furthermore, cryptography plays a key role in Bitcoin. Every Bitcoin has a unique, encrypted number that only a Bitcoin operator can decrypt. A person opens an account or wallet and can buy Bitcoins from online vendors. People can store their Bitcoins on their computer, cellphone, or online in a wallet.

People do not have to reveal their identity. They settle transactions by sending the other party their Bitcoin information. As a buyer completes a transaction, the software encrypts the buyer’s private key into the transaction, along with the Bitcoin address and the buyer’s wallet address. A private key allows only the wallet holder to conduct transactions, while the wallet number is similar to a bank account number. The transactions are entered into a block, a collection of transactions. Then miners complete the transaction by solving a computationally difficult puzzle. The miner who solves this puzzle earns 6.25 Bitcoins in 2024 and transaction fees. Miners often join pools where they work together to solve this puzzle collectively and divide the earned Bitcoins among all members of the pool. Lastly, transactions are recorded in a public ledger known as the ***blockchain***.

Hackers and fraudsters cannot alter transactions on the blockchain once they are recorded. Changing a single transaction or adding a character, such as a space, to the transactional record (or the block) alters the hash. A hash is a unique number computed from the block. If one item changes, even adding an extra space causes an entirely different hash to be generated. Thus, everyone would know that the blockchain was altered. Other miners would ignore this blockchain with the false record. Lastly, the computational power to rebuild a blockchain with a false record is immense. However, it is easy for someone to verify the blockchain because the miners have already solved the complicated puzzle.

Miner is not the proper terminology. A miner functions as a clearinghouse. A ***clearinghouse*** is a large bank that facilitates the transfer of funds between member banks. Then member banks have accounts at the clearinghouse. For example, we purchase $500 worth of clothes from an online store and send a check to the seller. Next, the seller deposits the check into their bank account. The seller's bank sends information about the check to the clearinghouse, and the clearinghouse verifies the details with our bank. Our bank checks our balance to ensure we have sufficient funds in the account to cover the check. Once our bank approves the transaction, the clearinghouse deducts $500 from our bank's account and credits $500 to the seller's bank account. Then our bank reduces our account by $500 while the seller's bank adds $500 to their account, thus clearing the transaction.

Bitcoins have four drawbacks that would prevent wide-scale adoption.

1. People who deposit their savings into banks are protected by deposit insurance. If their bank fails, the deposit insurance guarantees that the depositors will not lose their money. The Federal Deposit Insurance Corporation insures bank deposits up to $250,000 for U.S. banks and their depositors. However, no government agency insures Bitcoin or protects people from losses.
2. Hackers can break into online wallets and steal the Bitcoins. Since all transactions are electronic, victims may not be able to recover their stolen Bitcoins.
3. The price of Bitcoin fluctuates wildly, as shown in Figure 4. For people to use and accept money, they must know its value. Some investors purchase Bitcoins, hoping to buy them at a low price and sell them for a higher price.

Source: coinmaketcap.com

Figure 4. Bitcoin's Price

4. Few sellers accept Bitcoins as payment. Miners cleared approximately 700,000 Bitcoins in December 2023, which is significantly smaller than the million transactions that Visa and Mastercard process daily.

Bitcoins provide three benefits. First, buyers and sellers do not have to reveal their identities to each other. They can remain secret. Nevertheless, the crypto wallet has a unique number. Once a person's wallet number is identified, individuals can search the entire blockchain and view all of this person's transactions. Second, people can use Bitcoin to launder or smuggle currency across international borders. A buyer would purchase Bitcoins in one country and withdraw them in another, thereby circumventing currency controls. Finally, buyers and sellers use Bitcoins to settle transactions in the underground economy that is hidden within the Internet. We refer to this as the deep Internet, which most users will never encounter. The deep Internet enables buyers and sellers to communicate with each other without revealing their location, identities, or conducting anonymous transactions.

Bitcoin is evolving into the currency of the black markets on the Internet. Buyers and sellers use Bitcoin like numbered Swiss bank accounts. For example, they open a numbered account at a Swiss bank that contains no personal information. Then they can use the account to settle transactions secretly. For example, a person pays for an illegal service. This person contacts the Swiss bank and requests that the bank transfer the bribe amount from his account to the seller's account. This person gives the banker a code (or private key for Bitcoin) to approve the transfer. Consequently, the transaction remains secret because no one has revealed their identities.

The U.S. federal government is cracking down on the internet black market and is closing down Bitcoin operators. Agents believe that if they can shut down the money, they can eliminate the black markets operating on the deep Internet or prevent the funding of terrorists. For example, the U.S. Department of Homeland Security shut down Mt. Gox, the largest Bitcoin operator in the United States, in May 2014. However, Mt. Gox did not participate in any illegal activities. U.S. law requires all money exchangers to register with the Financial Crimes Enforcement Network. Unfortunately, the federal government will fail because people can use Bitcoins anywhere in the world.

Bitcoin continues to flourish despite its drawbacks and the U.S. government crackdown. Bitcoin ATMs are cropping up in Las Vegas, Hong Kong, New York City, and Vancouver, with more stores and vendors accepting Bitcoin for payment. Lastly, the rapid appreciation of Bitcoin and cryptocurrencies in 2018 created a class of crypto millionaires, which caught the attention of investors and the get-rich-quick scammers.

Money Supply Definitions

Economists use two approaches to defining the money supply: transaction and liquidity. If they use the ***transaction approach***, they emphasize the function of money as a medium of exchange. Only a few assets possess this property. As the central bank increases the money supply, people raise their spending, which in turn promotes national output, increases income, reduces unemployment, and potentially creates inflation.

If economists use the ***liquidity approach***, they rank all assets by liquidity and include only liquid assets in the money supply, as people can quickly sell these assets at a known price with minimal costs in the future. This approach emphasizes money's function as a "store of value" because if highly liquid assets retain their value, people can easily use them to purchase goods and services directly or indirectly. Why does this approach work? When the central bank increases the money supply, people adjust their portfolios of assets, which in turn affects consumer spending, national output, income, and employment.

The Federal Reserve System defines money supply as M1, M2, M3, and L. Many central banks worldwide measure their money supply similarly to the United States. However, they differ in which financial instruments they include in their measures. Every country uses different financial instruments because countries differ in their legal systems, financial market regulations, and customs.

Economists define the ***M1*** as the narrowest definition of money supply because they use the transaction approach to determine which financial instruments to include. M1 adds the following three items together:

❖ Currency held by the public and in bank vaults. It excludes currency held by the government.

❖ All forms of checking accounts.

❖ Traveler's Checks are held by people and not by banks.

Economists define ***M2*** as broader than M1 because they use the liquidity approach to determine the money supply. Economists add the following together for M2:

❖ Include everything in M1.

❖ Include all small denomination savings deposits and time accounts at all financial institutions. A small denomination in the U.S. refers to a bank account with a balance of less than $100,000. Examples include Certificates of Deposit or savings accounts at banks.

Economists define ***M3*** broadly than M2. This definition includes the following items summed together:

❖ Include everything from M2.

❖ Include large-denomination savings, time accounts, and liquid securities with longer investment times than the financial instruments included in M2. For example, a corporation holds a $1 million Certificate of Deposit.

Economists define liquidity as the broadest measure of the money supply, encompassing all liquid assets. The Federal Reserve does control this measure. ***L*** sums the following items together.

- Include everything from M3.
- Include all short-term securities, such as Treasury Bills issued by the U.S. Federal government. (Refer to Chapter 2 for examples of short-term securities.)

The Fed stopped publishing the M3 definition of the money supply on March 23, 2006. It stated that M3 does not provide any useful purpose, and the Fed does not use M3 in formulating monetary policy. Some international investors believe the Fed stopped publishing M3 because they fear a collapse of the U.S. dollar in global markets. After all, the United States suffers from large trade deficits and massive national government debt. (We discuss these issues in Chapter 5). The M3 definition contains the U.S. dollars held outside the United States, and it is growing alarmingly.

Which definition of the money supply is the best? The four monetary aggregates grow at different rates, times, and directions. Before 1981, a stable relationship existed between M1 and GDP, but the government began deregulating the financial markets during the 1970s and early 1980s, obscuring this relationship. Many economists use the M2 definition of the money supply to explain changes in GDP, inflation, and employment. Accordingly, the Fed does not formulate M1 targets and instead concentrates on M2.

Key Terms

financial market
financial institution
information
risk
liquidity
money
money supply
central bank
Federal Reserve System
Fed
monetary policy
Inflation
business cycle
Gross Domestic Product (GDP)
interest rates
nominal GDP
real GDP
barter
double coincidence of wants
medium of exchange
specialization of labor
unit of account
purchasing power
legal tender
standard of deferred payment
currency
commodity money
full-bodied commodity money
seigniorage
representative full-bodied money
fiat money
hyperinflation
check
debit card
automated teller machine (ATM)
QR code
Bitcoin
blockchain
clearinghouse
transaction approach
liquidity approach
M1
M2
M3

store of value	L

Chapter Questions

1. Identify the purpose of financial markets and financial institutions.
2. What advantages do financial institutions provide compared to the financial markets?
3. Why is liquidity necessary in defining the money supply for a country with sophisticated financial markets?
4. Define monetary policy.
5. Which three variables of the economy can central banks influence?
6. Please define the following terms: inflation, gross domestic product, and interest rates.
7. Identify the difference between real and nominal.
8. Which problems does a barter economy suffer from?
9. How do the functions of money overcome the problems associated with barter?
10. What is seigniorage?
11. Distinguish between the different payment systems.
12. Distinguish between the transaction and liquidity approaches to defining the money supply.
13. Identify the differences between M1, M2, M3, and L.
14. Judge whether credit cards should be a form of money.

2. Overview of the U.S. Financial System

This chapter explains how financial markets connect savers to borrowers. Savers use two separate channels to lend to borrowers. First, the savers could deposit their funds into a financial institution that, in turn, lends to the borrowers. Second, savers could lend directly to the borrowers by investing in financial securities. Thus, these two channels create a variety of financial markets, including spot and derivative markets, as well as primary and secondary markets. Furthermore, we examine the impact of financial innovation and government regulation of the financial markets. Finally, we define the standard financial instruments at the end of the chapter, which we use for the remainder of the book.

The U.S. banking system evolved into a complex system. As the United States formed, the public and the government distrusted large, powerful banks. The government passed laws that heavily regulated the banking system, thereby increasing the number of U.S. banks and reducing the size of their assets. Moreover, the United States created two layers of commercial banks: national and state banks. Several federal and state government agencies regulate these banks. Consequently, banks have used ingenious methods and innovations to circumvent governments' regulations.

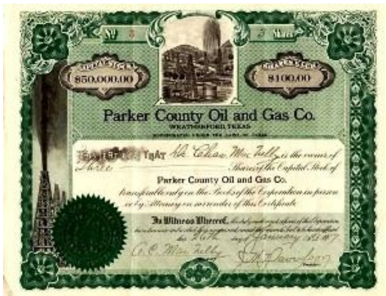
Financial Intermediation

A ***financial system*** transfers funds from ***savers*** to ***borrowers***. Savers and borrowers can be anyone. Some households, businesses, and governments are net savers because they spend less than their income, and they become the source of loans. In contrast, other households, businesses, and governments are net borrowers. They spend more than their incomes. For example, many college students are net borrowers. Students' incomes are usually lower than their yearly expenses, and they use student loans to cover the difference. After graduation, students enter the workforce and begin repaying their student loans. As their incomes continually rise over time, the former students repay their loans and become net savers, saving funds for retirement. Using another example, many local and state governments have laws requiring them to balance their budgets. This fiscal responsibility forces many local and state governments in the United States to be net savers. In contrast, the U.S. federal government has been a net borrower for the last 60 years.

Transfer of funds from savers to borrowers is vital to an economy. If borrowers invest the funds by purchasing machines and equipment, they can produce more goods and services. When businesses produce more goods and services, the economy expands, and a growing economy generates jobs and increased incomes. As consumers experience rising incomes, they buy more goods and services, improving their living standards. The beauty of the U.S. financial system is that financial institutions can collect and consolidate the meager savings of many people and then lend to large companies. For instance, 10,000 savers with $200 in their savings accounts could allow a financial institution to pool and loan $2 million to a business. Subsequently, the company can invest in new machines and equipment, boosting production and economic growth.

Savers link the borrowers through two routes: financial intermediaries and direct finance. The standard ***financial intermediaries*** include banks, mutual funds, and insurance companies. For example, we purchased fire insurance for our home. When we pay our premium, the insurance company invests our payment in the ***financial markets*** by purchasing ***financial securities***. Financial intermediaries provide this function primarily to earn profits. For instance, banks transfer our funds to borrowers to gain profits. Banks earn profits from the difference between the interest borrowers pay to the bank and the interest the bank pays to its account holders.

The second route links savers to borrowers through ***direct finance***. Net savers, like households, can lend directly to businesses through the financial markets. Two broadly defined financial instruments are common stock and bonds. If we buy ***common stock***, we own shares of a corporation, which we refer to as ***equity***. We show an example of a stock certificate in Figure 1. Moreover, stockholders have the right to vote on specific corporate policies and elect the members of the Board of Directors. Each share of stock entitles the owner to one vote. For example, if we owned 100 shares of stock, and this corporation issued a million shares, our vote would have a negligible impact on corporate policy. Finally, the stockholders earn a share of the profits, which we refer to as ***dividends***.



Source: www.oldstockresearch.com/faq.htm

Figure 1. An example of a stock certificate

The second financial instrument is a bond. A ***bond*** consists of a standardized loan to a corporation. It is a fancy document that gives bondholders legal rights. The corporation promises to repay a long-term loan plus interest to the bondholders. Suppose a corporation goes bankrupt and is liquidated. In that case, bondholders have a higher priority and claim on the corporation's assets, while the common stockholders come last.

Bonds and stocks have two markets: the primary market and the secondary market. A corporation or government issues brand-new securities in the ***primary market*** by selling them directly to securities dealers. Thus, they sell new securities in the primary market, while investors sell and buy existing securities in the ***secondary market***. The most famous secondary market for stock is the New York Stock Exchange. This exchange enables investors to buy and sell shares of existing stock from the largest corporations in the United States. Furthermore, secondary markets are important because these markets increase the liquidity of financial instruments. Investors can quickly sell or buy financial securities on secondary markets. As the government or corporations issue new securities, the prices from the secondary market set the prices for the new securities in the primary market.

Why would savers deposit their money into banks instead of investing directly in the financial markets? Financial intermediaries provide three functions:

- ❖ Our bank accounts have ***liquidity***. In the event of an emergency, we can easily withdraw funds from our accounts. However, if we purchase stock and bonds from the financial markets, we may experience time delays and incur transaction costs when withdrawing our money.

- ❖ Financial intermediaries have specialists who collect ***information*** about borrowers. They lend to borrowers who are unlikely to ***default*** on their loans.

- ❖ The financial intermediaries reduce the ***risk***. They lend to various borrowers through a process called ***diversification***. For example, banks will issue credit cards, grant mortgages, lend to various businesses, and buy U.S. government securities. If several credit card holders default, a couple of households stop paying their mortgages, or a company goes bankrupt and defaults on a bank loan, the banks could still earn profits because most bank customers are repaying their loans. On the other hand, if we directly invested in a company that went bankrupt, then we could lose all of our investment.

Savers could withdraw their money from the financial intermediaries and invest directly in the financial markets. We refer to this process as ***financial disintermediation***. Savers have two reasons for investing directly in the government. First, a government may pay a higher interest rate than a bank. For example, our savings account earns 2% interest, while a U.S. Treasury bill pays 4% interest. Thus, the investors want to earn a greater interest rate. Second, the U.S. government has a low risk of default because the government has the power to tax and “print” money. If the government experiences financial trouble, it can raise taxes, issue more government securities, or print money.

Governments cause a problem by accumulating a large debt. The government usually gets money for loans first, while businesses come second. If investors have limited funds, businesses may not have access to the necessary capital to invest in machines and equipment. Consequently, large government debt can impact the financial markets and hinder business investment, as it crowds out private investment. For example, the U.S. government debt exceeded $37 trillion in 2025. If investors did not invest in U.S. government debt, they could invest their funds in the private markets.

Financial markets have two methods to complete a transaction. Up to this point, we have assumed that when a buyer and seller complete a financial transaction, they immediately exchange money for the financial instrument. We refer to this as the ***cash market*** or ***spot market***. However, buyers and sellers have another option to complete a transaction. Buyers and sellers of a financial instrument can negotiate a price and quantity today, but they exchange the financial instrument for money on a specific future date. These transactions occur in the ***derivatives market***. For example, we negotiated a price today to buy 10 Treasury bills from a seller for $9,000 each in six months. We have entered into a contract with the seller for a future transaction. If these contracts are standardized, investors can buy and sell these contracts on secondary markets. We study the derivatives market in Chapter 19.

Financial Instruments

Every financial instrument, except for stock, has a principal, interest, and maturity date. The ***principal*** is the amount of the loan that the borrower received from the lender. Then the borrower pays ***interest*** as a periodic payment to the lender for using the funds. Interest is a cost to the borrower but income to the lender. Finally, ***maturity*** is when the security expires or the final date when the borrower pays the last payment for the principal plus interest.

Analysts and economists categorize financial instruments into two broadly defined classes: the money market and the capital market. The ***money market*** comprises short-term securities with a maturity of less than one year. Money market securities are popular and involve lending funds from one party to another. Money market securities are highly liquid and almost as liquid as cash, hence the name "money market." The second category, the ***capital market***, encompasses long-term securities with a maturity of more than one year. The capital market includes common stock because it has no expiration date, and the corporation, in theory, could live forever. Thus, stock is a long-term security.

We should memorize the following securities because we will continually refer to these financial instruments throughout this book. For students to understand these securities, it is essential to remember who issues them and whether they are classified as a money market or capital market security. All these securities have one purpose: One party owes another party money plus interest, except stocks. Stocks represent ownership in a corporation and are not loans.

Money market securities have maturities of less than one year, and we list the common ones:

- ***U.S. Treasury bills***, or ***T-bills***, are loans to the U.S. government. Maturities range from 15 days to one year. The smallest denomination starts at $10,000. T-bills do not have an interest rate stamped on them. Suppose an investor buys a T-bill for $19,000; the T-bill has a face value of $20,000 with a maturity of six months. Then, six months later, the government will pay $20,000. The $1,000 reflects the interest.

- ***Commercial paper*** is a loan to a well-known bank or corporation for a short time. Corporations use commercial paper to raise funds without issuing new stocks or bonds. Commercial paper is a form of direct finance, and the loan has no collateral.

- ***Banker's Acceptances*** are used in international trade. For example, a firm wants to buy from a foreign exporter. However, the exporter does not know the firm's creditworthiness. The firm deposits money at a bank, and the bank guarantees payment by issuing a banker's acceptance. That way, the exporters accept the banker's acceptance and ship the goods to the firm. If the firm does not deposit money at the bank and the bank guarantees payment, then the bank must pay the foreign exporter, even if the firm is bankrupt. These securities are liquid because holders can sell them on a secondary market.

- ***Negotiable Bank Certificates of Deposit (CDs)*** are loans to banks that banks sell directly to depositors. CDs have a fixed time. If a depositor withdraws a CD early, they forfeit the interest. Consequently, CDs typically pay a higher interest rate than savings accounts.

- ***Repurchase Agreements (Repos)*** are short-term loans. For example, a bank sells T-bills to a customer. It promises to repurchase these T-bills the next day for a higher price, which reflects interest. Banks used repos to circumvent the law, allowing them to pay businesses interest on their checking accounts. Before the 1980s, U.S. banks were prohibited from paying interest on checking accounts. For example, IBM has excess funds in its checking account. A bank sells IBM T-bills and uses IBM's funds. The next day, the bank returns IBM's funds with interest and takes back the T-bills. Consequently, the bank paid interest on a checking account.

- ***Federal Funds*** are overnight loans between banks. For example, a bank with excess funds deposited at the Federal Reserve can lend these funds to another bank. Market analysts and the Fed closely scrutinize this interest rate because monetary policy has an immediate impact on the federal funds interest rate.

- ***Eurodollars*** are U.S. dollars that people deposit in foreign commercial banks outside the United States and in foreign branches of U.S. banks. Eurodollars are an essential source of funds in the international market. Furthermore, the euro has become a popular currency for investors, with bank accounts denominated in euros outside the Eurozone. The Eurozone comprises the 28 countries within the European Union that use the euro as their currency. If people and investors have euro-denominated accounts outside the Eurozone, they are still referred to as Eurodollars.

Capital market securities have maturities longer than a year, and we list the common ones:

- U.S. Treasury securities are loans to the U.S. government. The U.S. government issues ***Treasury Notes***, also known as ***T-notes***, with terms ranging from one to 10 years. In comparison, ***Treasury Bonds*** or ***T-bonds*** have maturities greater than 10 years. These Treasury securities have a stated interest rate, and the government typically pays interest semiannually. The United States also issues Treasury Inflation-Protected Securities that raise the principal in proportion to the inflation rate, protecting bondholders from inflation. Other countries issue similar inflation-protected bonds.

- State and local governments issue municipal bonds. The U.S. federal government encourages investors to buy these bonds by exempting investors from U.S. income taxes. Furthermore, municipal bonds are categorized into two types: general obligation and revenue bonds. A state or local government guarantees the bond payment with its taxing power for ***general-obligation bonds***. For instance, a city government builds a new firehouse. Then the city government guarantees payment of the bonds with its power to tax. For ***revenue bonds***, the local or state government secures the bonds' payment using the project's revenues. For example, a college builds a new dormitory using revenue bonds. When students pay to live there, the university repays some of the bondholders' revenue.

- We already discussed stocks and corporate bonds earlier in this chapter.

- A ***mortgage*** is a loan secured by a house or property that typically lasts from 15 to 30 years. Usually, the property becomes the collateral. For instance, if homeowners lose their jobs and are unable to repay the mortgage, the bank takes possession of the house. We refer to this process as foreclosure, where a bank takes ownership of the property and evicts the homeowners. Various savings institutions and banks grant mortgages, making mortgages the largest debt market.

- Commercial bank loans are financial instruments that banks provide to businesses. These loans lack well-developed secondary markets.

- The government agencies can issue securities. For example, Sallie Mae[1] is a private company and lends to college students. Sallie Mae pools student loans into a fund and issues bonds, allowing investors to purchase shares in the fund. Subsequently, the investors indirectly earn interest from the students' monthly payments. Thus, Sallie Mae increases the liquidity of student loans, making them more attractive to investors.

Sallie Mae may experience financial hardship. The U.S. economy has been plagued by weak economic growth since 2024, and many college graduates struggle to find jobs, even Ivy League graduates. They may default on their student loan payments. Many call this the College Bubble. As college tuition soars into the stratosphere, many college students accumulate large amounts of debt to pay for their education, and some of these students have slim chances of finding good-paying jobs after graduation. Consequently, high school graduates may opt not to attend college to avoid accumulating debt, which could spark a financial crisis for U.S. colleges and universities. Then U.S. colleges and universities could experience financial hardships and contract similarly to the housing market in 2024.

The United States Banking System

The United States banking system differs from other industrialized countries. For instance, the United States has more banks per capita, but these banks possess fewer assets because the U.S. government has imposed strict regulations on them. Early in U.S. history, the public and government feared big banks, so state and federal governments passed laws that forced banks to be smaller and encouraged numerous banks to form.

[1] Sallie Mae split into Navient and Sallie Mae in 2014. Navient manages federal student loans for the U.S. Department of Education but was banned from student loans in 2024. At the same time, Sallie Mae offers credit cards, private student loans, and savings accounts.

The United States has a ***dual banking system***. A bank chooses a charter from a state government or the U.S. federal government. A charter is a document that legally establishes a corporation and allows a financial institution to participate in banking activities. A ***national bank*** receives a charter from the federal government, while a ***state bank*** receives a charter from a state government.

If a bank receives a charter from the federal government, then this bank is regulated by three government agencies:

- ❖ The ***Office of the Comptroller of the Currency***, an office in the U.S. Treasury Department, regulates national banks. This office also grants charters on behalf of the U.S. federal government and requires national banks to be members of the Federal Reserve and the Federal Deposit Insurance Corporation. As of 2023, the United States had roughly 1,062 national banks. The top four largest national banks possess 43% of the total assets of the U.S. banking system.

- ❖ The ***Federal Deposit Insurance Corporation (FDIC)*** insures deposits at member banks. If this agency insures, then it also regulates. As of 2024, the FDIC had 4,539 member banks.

- ❖ The ***Federal Reserve System (Fed)*** is the central bank of the United States and the ***lender of the last resort***. When a bank encounters financial difficulties and cannot obtain a loan from other financial institutions, it can then request a loan from the Fed. Moreover, the Fed regulates banks.

A state-chartered bank could have fewer regulations. A state government agency regulates its state banks, and many states require their banks to join the Fed and FDIC. Therefore, a state bank could have one or more regulatory agencies to contend with.

The U.S. government imposed another restriction upon the U.S. banking industry—the McFadden Act. The ***McFadden Act*** prohibited commercial banks from opening branches in another state. This law put national and state banks on equal footing, thereby fostering competition. However, this law allowed small, inefficient banks to remain in business, resulting in the United States having the largest number of banks in the world. The United States had 14,217 banks in 1986, which decreased to 9,459 by 2010 and further declined to 4,577 in 2024.

Some states imposed more restrictions on their banks than other states. For example, some states have implemented unit banking, which restricts banks to operating within a single geographic location. ***Unit banking*** restricts a bank to a single geographical area, such as a city, and prevents the bank from branching into other cities. Currently, no states enforce unit banking. Furthermore, ***branch banking*** enables a bank to operate two or more banking offices owned by a single banking corporation within a specific geographical area. A geographic location can be a city, county, or state. Currently, most states allow statewide branch banking.

Different institutions have evolved in the United States, differing from commercial banks. They include savings institutions and credit unions, which are not commercial banks. Thus, they have their regulatory agencies. These institutions either have a charter from the federal government or a state government. The Federal Home Loan Bank System (FHLBS) is a U.S.

government agency similar to the Federal Reserve. The FHLBS regulates nearly 6,500 savings and loan banks in 2024. Moreover, the FDIC insures deposits at savings institutions. Most credit unions have charters issued by the National Credit Union Administration, which acts on behalf of the federal government. This agency also insures the deposits at credit unions, while the FDIC does not.

Why did the U.S. and state governments propagate such a complex system? The financial sector is vital to the economy, and every country worldwide regulates its financial markets. The government uses six reasons to regulate a banking system and its financial markets, which include the following:

- **Reason 1:** Governments want the financial system to be stable. Banks contribute to a nation's money supply. A wave of bank failures could trigger a significant contraction in the money supply, leading to an economic decline and potentially triggering a severe recession. Many economists believe the Great Depression would have been less severe if a wave of bank failures had not swept across the country.

- **Reason 2:** The money supply and financial markets are intertwined. Suppose the central bank uses the money supply to influence inflation, the business cycle, or interest rates. In that case, the central bank also affects the financial markets. Consequently, central banks require government regulations to effectively manage monetary policy and help achieve low inflation and unemployment rates.

- **Reason 3:** The U. S. government wants to promote efficiency in the financial intermediation process.

- **Reason 4:** The U.S. government wants to provide low-cost financing for homebuyers. This desire led to the U.S. Housing Bubble that occurred between 1997 and 2007. The 2020 COVID-19 pandemic also created another housing bubble that started to burst in 2024.

- **Reason 5:** Financial markets depend on accurate information. Governments ensure borrowers provide accurate information to investors. In the United States, the ***Securities and Exchange Commission (SEC)*** requires publicly traded companies (i.e., companies that sell stock to the public) to disclose financial information based on acceptable accounting standards.

- **Reason 6:** The U.S. government wants to protect consumers. A financial system, such as a bank, can be very complicated. Many depositors do not understand the financial instruments. Therefore, they are not able to gauge the soundness of the institution or make rational decisions. Consumers can easily evaluate and compare different products in a competitive market, such as computers, smartphones, tablets, and TVs.

The Glass-Steagall Banking Act

Before the Great Depression, banks could provide various services, including investment banking. However, politicians and the public believed that commercial banks should not underwrite new stock and bonds for corporations because they thought banks were underwriting "risky" securities. Furthermore, the banks possess enormous power to create monopolies. Thus, the United States government passed the ***Glass-Steagall Banking*** Act in 1933. This law divided the functions of investment banking and commercial banking. A commercial bank is a regular bank, while an investment banker markets and sells brand-new stocks and bonds. In practice, the Glass-Steagall Banking Act insulated investment banking from the competition. Consequently, companies may pay more for issuing new securities than if commercial banks were allowed to underwrite them.

The Glass-Steagall Act created the Federal Deposit Insurance Corporation (FDIC). The FDIC, a public corporation, insures the deposits of each depositor in commercial banks up to $250,000. For example, if we have $150,000 in our checking account and $150,000 in certificates of deposit, the FDIC would insure a total of $250,000. If our bank fails, we are guaranteed to receive at least $250,000 from the FDIC, potentially losing up to $50,000. In some cases, the FDIC insured all deposits that exceeded $250,000 per person, while it did not for other bank failures. It depends on how the FDIC handles the bank failure.

The FDIC receives its funding from insurance premiums. Every commercial bank member is required to pay approximately $100,000 per year. The FDIC became very successful because bank failures averaged 10 per year between 1934 and 1981. On the other hand, bank failures averaged 2,000 annually during the Great Depression before the U.S. government created the FDIC.

The FDIC uses the following two methods to deal with bank failures:

- **Method 1:** The FDIC closes the bank and seizes the bank's assets. The FDIC sells the bank's assets and returns the money to the depositors. Suppose the FDIC does not receive enough money to pay all depositors for selling the bank's assets. In that case, the FDIC pays the difference from its funds. Thus, the FDIC rarely uses the first method because the FDIC could pay out millions or billions in claims.

- **Method 2:** The FDIC purchases and assumes control of the failed bank. The FDIC keeps the bank open and searches for another bank to buy the failed one. If the FDIC cannot find a buyer, it can grant extra incentives, such as low-interest-rate loans from the FDIC, or purchase the problem loans from the failed bank's portfolio. The FDIC also allows a bank to cross state lines to acquire a failed bank. Although federal law prohibited banks from crossing state lines and opening branches in another state, the federal government did not hesitate to violate its own rules when necessary.

The U.S. government established the FDIC to reduce the bank failure rate by preventing bank runs and ensuring the stability of the banking system. A ***bank run*** occurs when depositors become aware that their bank is experiencing financial difficulties, prompting them to rush to the bank to withdraw their deposits. Unfortunately, a bank holds only a fraction of the total deposits because it uses these deposits to grant loans. Thus, a bank will close its doors after exhausting all the cash from the vault. Furthermore, if the bank granted many illiquid loans, it must sell these loans at a discount to raise more reserves. Selling illiquid loans at a discount can cause the bank to become insolvent. ***Insolvency*** occurs when a bank's total liabilities exceed its total assets. Consequently, any bank on the verge of failing cannot return money to its depositors. Even a financially healthy bank could fail if people spread rumors that the bank has financial troubles. Then the rumor triggers a bank run.

Bank runs can lead to contagion. ***Contagion*** is that a bank run on one bank leads to bank runs on others. For example, depositors line up at one bank to withdraw their accounts; subsequently, many depositors do not get their money back. Then the depositors tell friends and family, and they begin questioning the financial health of their banks. Many people struggle to assess the financial health of banks. Friends and family run to their banks to withdraw funds from their accounts, triggering more bank runs. As the contagion spreads, it triggers a wave of severe bank runs known as financial panics. ***Financial panics*** can push the economy into a severe recession.

The FDIC charges insurance premiums based on the total amount of deposits at the bank and the risk level that the depository institutions pose to the FDIC. Many banks are experiencing financial difficulties resulting from the 2008 Financial Crisis, as they had approved mortgages to individuals with poor credit. As the U.S. entered a recession in 2007, some homeowners started defaulting on their mortgages. Unfortunately, housing values have been falling since 2007. If a bank foreclosed on a person’s house, then the bank possesses a home that is losing value. Thus, the financial crisis led to 140 banks failing in 2009, resulting in financial difficulties for the FDIC. Then the FDIC requires banks to prepay their deposit insurance for 2010, 2011, and 2012. The FDIC wants banks to prepay $45 billion in deposit insurance, despite having already doubled the insurance premiums for 2009. Unfortunately, the 2020 COVID-19 pandemic led to another housing bubble that is set to burst in 2025. Thus, we should expect another wave of bank failures.

Financial Innovation

Financial markets and institutions continually evolve, driven by ***financial innovation***. Investors are attracted to the latest security if a new financial instrument reduces risk, increases liquidity, or enhances transparency. For example, ***mutual funds*** are one financial innovation. A mutual fund pools money from many individuals into a single fund, and a fund manager invests the fund in various stocks. Consequently, this method lowers investors’ risk through the diversification of stocks. For example, we created a mutual fund and bought 30 different corporate stocks. Our Coca-Cola stock rises one day while the value of our IBM stock declines. Overall, the average of the fund’s 30 stocks could earn a return for the fund investors, i.e., us. If we had bought only Kodak corporate stock, we would have lost our investment when Kodak filed for bankruptcy.

Mutual funds provide four benefits to investors. First, small investors can invest in the fund and earn returns from various stocks that they would not have otherwise had access to. Second, the fund provides management and record-keeping. Third, the fund hires professionals to invest and study the markets. Lastly, the fund can lower transaction costs by buying large blocks of securities and achieving significant discounts through bulk purchases. Thus, mutual funds have become popular with investors.

Regulations can spur innovation. The U.S. and state governments have always heavily regulated their financial institutions. Consequently, these institutions ingeniously circumvented these regulations by creating new financial instruments or new financial institutions. The first method to circumvent banking regulations was for bank leaders and owners to develop bank holding companies. A ***bank holding company*** is one corporation that obtains ownership or control of two or more independent banks. A bank holding company can do three things.

- Bank holding companies can branch within states or across state lines. For example, a corporation buys enough common stock of two banks to become the majority shareholder. The majority shareholder elects the Board of Directors and votes on corporate policy. Therefore, the holding company can control several banks across multiple states, thereby circumventing the McFadden Act.

- Bank holding companies can buy other nonbank companies and enter other spheres of economic activity, such as data processing, investment advice, and insurance. Allowing banks to participate in non-financial activities is known as ***universal banking***.

- Bank holding companies can raise non-deposit funds. For example, a bank holding company controls one bank that needs more funding. Holding companies issue commercial paper to themselves and divert these funds to the bank, circumventing the interest rate restrictions on bank deposits.

The second innovation, ***nonbank banks***, allows banks to circumvent federal and state regulations. The legal definition of a bank is an institution that accepts deposits and makes loans. What would happen if a bank stopped accepting deposits? Legally, the bank is no longer a bank and becomes exempt from the extensive U.S. bank regulations. Thus, the nonbank bank is simply a finance company.

The third innovation was the creation of ***money market mutual funds (MMMFs)***. MMMFs are pools of liquid money-market assets managed by investment companies. The MMMF is identical to a mutual fund. Investment companies sell shares to the public in small denominations, and the fund managers invest in money market instruments. Consequently, MMMF became very successful and grew from \$186.9 billion in 1981 to \$3.3 billion in 1997 and \$959.8 billion in 2010. Lastly, MMMF totaled \$6.59 trillion in 2024.

The MMMFs hurt the banks financially as people started withdrawing money from their bank accounts and investing it in MMMFs. MMMFs offer higher interest rates and provide check-writing privileges. Accordingly, banks began losing customers, putting pressure on the regulatory agencies, which in turn pressured Congress and the President to change the laws. Since 1982, banks have started offering ***money market deposit accounts (MMDAs)***, similar to MMMFs, with one key difference. The FDIC considers an MMDA a bank account; therefore, it is covered by FDIC insurance, whereas MMMFs are not. Finally, MMDAs have no reserve requirements and have grown rapidly as people started to invest in them.

The next innovation, the ***automated teller machine (ATM)***, allowed banks to circumvent regulations. Modern computer technology will enable customers to receive banking services through computer terminals at banks, stores, and shopping malls. Customers can make deposits, withdrawals, and credit card transactions. Technically, ATMs are not considered bank branches and are therefore not subject to branch banking restrictions. Thus, ATMs are located some distance away from the main bank. Furthermore, many banks established networks that allowed customers to access their accounts from anywhere in the world. Moreover, banks offer debit cards. For example, a customer uses a ***debit card*** to pay for goods and services by electronically transferring funds from his checking account to a store's bank account. Thus, debit cards have replaced checks. Some businesses do not accept checks but take debit cards because the merchants know they will receive money from the customer's bank. Lastly, consumers are gradually replacing debit cards with ***QR codes***, where they scan a business's QR code with their smartphones, which automatically transfers the money between the consumer's and merchant's bank accounts.

The political climate in the United States was shifting before the 2008 Financial Crisis. Innovation, rising interest rates, and deregulation were eroding the regulatory structure set up in the 1930s. Banks can cross state lines, open branches in other states, and offer investment advice and brokerage services. Thus, the banking industry experienced two trends. First, banks can acquire other banks, reducing the number of banks in the United States. Second, as banks merge, they become bigger as their assets grow. U.S. banks were approaching the size of Japanese and German banks, which had traditionally been larger in terms of asset size.

The 2008 Financial Crisis struck the U.S. economy, causing many commercial and investment banks to teeter on the brink of bankruptcy. The U.S. federal government stepped in and purchased stock in many financial corporations. Taxpayers indirectly helped the corporations. Subsequently, the U.S. government helped and approved many bank mergers, including mergers between commercial and investment banks. Consequently, the U.S. government bailed out these banks because they were too big to fail. A wave of large bank failures would likely cause the entire U.S. financial system to implode. Consequently, U.S. banks will become larger with partial government ownership (or interference, depending on one's viewpoint).

Many critics of financial deregulation advocate for the U.S. government to reenact the Glass–Steagall Act, which separated commercial and investment banking activities. Many leaders around the world are debating whether to pass new laws to separate commercial and investment banking in their countries because the 2008 Financial Crisis forced governments to spend billions bailing out their large banks. For example, investment banks teetered on the brink of bankruptcy due to billion-dollar losses in 2008. Lehman Brothers went bankrupt; Goldman Sachs became a bank holding company, and Bank of America bought Merrill Lynch. Thus, the 2008 Global Financial Crisis ended the separation between investment and commercial banking.

Blockchains and Cryptocurrencies

Technology has advanced to create a new field called ***Fintech***, which leverages technology to enhance the financial markets. Technology such as cryptocurrencies has eliminated intermediaries like banks. Consumers and merchants can transfer funds peer-to-peer by using a cryptocurrency. We can view ***cryptocurrency*** as if we are buying stock in a company. The coin is similar to a corporation's stock. However, the coin holders usually do not vote at the annual shareholders' meeting or receive the payout if the crypto company goes bankrupt and the assets are liquidated. Some crypto coins allow coin holders to vote on the company's policies. These coins also serve as a form of currency, taking over the functions of checks, credit cards, and debit cards. As of 2025, there are over 9,000 cryptocurrencies.

Bitcoin started the blockchain technology. Satoshi Nakamoto conceived the idea of ***Bitcoin*** in response to his dissatisfaction of the 2008 Global Financial Crisis. Of course, no one knows the identity of Satoshi Nakamoto. It started as an alternative payment system that does not require an intermediary, such as a bank. One person can clear a transaction with another person, peer-to-peer. Transactions are recorded on a block that consists of 1 megabyte. The blockchain is a chain of blocks of information linked together. Multiple users, i.e., miners, have a copy of the whole blockchain. They are connected in such a way that any alteration to any block, regardless of its severity, causes the other users in the system to reject these changes.

Other cryptocurrencies and blockchains evolved with better features. For example, Bitcoin is slow and takes time to make a transfer. The average transaction speed is 7 transactions per second. Founders invented other coins with faster transaction speeds. Another feature is smart contracts. The Ethereum network is the first cryptocurrency to utilize ***smart contracts*** written in the Solidity programming language. Smart contracts automatically execute instructions when certain conditions are met. Ethereum has created a new area of ***decentralized finance (DeFi)***. For example, LendingClub supports a platform where investors can directly loan to borrowers. The Fair Trade Commission sued LendingClub in 2018 for promising no-fee loans, but LendingClub assessed thousands of dollars in fees. Another innovation is the ***non-fungible token (NFT)***. Artists can place their digital artwork, music, or video on a website and create tokens. The artwork is similar to a pool, where investors can buy tokens and become owners of the artwork (i.e., pool). Then investors can buy or sell these tokens as needed.

Cryptocurrencies experience extreme price fluctuations, making it a challenge for them to serve as a store of value. For example, Bitcoin fluctuated between \$40,000 and \$100,000 per coin in 2024. Figure 2 shows the Bitcoin price in U.S. dollars. The extreme volatility led to the creation of ***stablecoins***, which are designed to maintain a stable value. Many of them established a \$1 par to the U.S. dollar. The common stablecoins include Tether, USD Coin, Dai, and Binance USD. One stablecoin, EURC, is pegged to the euro. Lastly, one token, PAX Gold, on the Ethereum chain pegs the token's value to the price of gold per troy ounce. Unfortunately, these coins are subject to "runs" similar to those on banks, where many investors attempt to cash in their coins simultaneously, causing a collapse in coin value.

The SEC believes that coins are a form of financial security subject to the SEC's regulations. The coins are similar to owning a corporation's stock. Crypto companies create coins and sell them to investors through an Initial Coin Offering (ICO), similar to a company issuing new stock through an Initial Public Offering (IPO). Some countries, such as China and South Korea, have banned ICOs. Several reasons include people conducting transactions anonymously to avoid taxes, circumventing a country's currency controls, transferring more than $10,000 across a border, and buying illegal items.

Figure 2. The Bitcoin Price in USD

Several central banks and governments are examining cryptocurrencies and developing their digital currencies. For example, China and the Federal Reserve began studying the feasibility of digital currency in 2021, which they call ***central bank digital currency (CBDC)***. Cryptocurrencies are evolving to become an integral part of the financial landscape.

Websites

Office of the Comptroller of the Currency	http://www.occ.treas.gov/
Federal Deposit Insurance Corporation	http://www.fdic.gov/
Federal Home Loan Bank System	http://www.fhlbanks.com/
Federal Reserve System	http://www.federalreserve.gov/
National Credit Union Administration	http://www.ncua.gov/

Key Terms

financial system	Office of the Comptroller of the Currency
savers	Federal Deposit Insurance Corporation (FDIC)
borrower	Federal Reserve System (Fed)
financial intermediaries	lender of the last resort

financial markets
financial securities
direct finance
equity
dividends
primary market
secondary market
liquidity
information
default
risk
diversification
financial disintermediation
cash market
spot market
derivatives market
principal
interest
maturity
money market
capital market
dual banking system
national bank
state bank
McFadden Act
Unit banking
branch banking
Securities and Exchange Commission (SEC)
Glass-Steagall Banking
bank run
Insolvency
Contagion
financial panics
financial innovation
bank holding companies
universal banking
nonbank banks
automated teller machine (ATM)
debit cards
QR codes
Fintech
cryptocurrency
Bitcoin
smart contracts
decentralized finance (DeFi)
non-fungible token (NFT)
stablecoins
central bank digital currency (CBDC)

The Common Financial Instruments

banker's acceptance
bond
commercial paper
common stock
Eurodollars
Federal Funds
general-obligation bond
money market deposit account (MMDA)
money-market mutual fund (MMMF)
mortgage
mutual fund
negotiable bank certificate of deposit
repurchase agreement
revenue bond
Treasury Bond (T-bond)
Treasury Note (T-note)
U.S. Treasury bill (T-bill)

Chapter Questions

1. Why would people deposit their savings into financial intermediaries, instead of directly investing in the financial markets?

2. Distinguish between stocks and bonds.
3. Distinguish between the primary and secondary markets.
4. Assess the significance of secondary markets.
5. Define financial disintermediation and why it occurs.
6. Identify the money market instruments and capital market instruments.
7. Distinguish between a money market and a capital market.
8. Do common stocks have a maturity date?
9. Appraise the difference between a state bank and a national bank.
10. Which government agencies regulate commercial banks?
11. Explain why the government regulates the banking sector.
12. Explain the role of the Federal Deposit Insurance Corporation (FDIC).
13. Identify the two methods the FDIC uses to handle a bank failure.
14. Please define bank runs, contagion, and financial panics.
15. Why did the financial markets in the modern world become international?
16. Why do governments regulate the financial markets?
17. Identify the methods a bank holding company uses to circumvent government regulations.
18. How do nonbank banks and automated teller machines circumvent bank regulations?
19. Distinguish between a money-market mutual fund and a money-market deposit account.

3. Multinational Enterprises

This chapter defines and distinguishes the three business forms: proprietorships, partnerships, and corporations. We study corporations extensively because they offer many advantages over proprietorships, partnerships, and other management structures. Although corporations comprise 20% of U.S. businesses, they dominate the business and financial markets. Unfortunately, the corporate structure has several disadvantages, the main one being that it is susceptible to corporate fraud. Thus, we examine the disadvantages and explore ways to mitigate them. Finally, corporations dominate international trade and finance, which is why we study them in this book. Toward the end of the chapter, we explain the Law of Comparative Advantage and why businesses engage and profit from free trade.

Forms of Business Organizations

The goal of a business is to earn profits. Alfred P. Sloan stated it best: "General Motors is not in the business of making automobiles. General Motors is in the business of making money." All business owners seek to generate a profit, and they are typically classified into three main types: sole proprietorships, partnerships, and corporations. A single person owns a ***sole proprietorship***. That one person becomes liable for all the business's debts, and the business is dissolved legally upon the owner's death. Sole proprietors are the most numerous form of business in the United States, and they typically own farms, grocery stores, hotels, and restaurants.

A ***partnership*** is a business owned and managed by two or more people. A partnership is defined as general or limited liability. Under a general partnership, all partners become liable for the partnership's debts and obligations. If one partner applies for a bank loan, steals the money, and flees the country, the remaining partners become liable for that bank loan. A limited liability partnership restricts liability and helps protect the partners' assets that they do not use directly in the business. Thus, a partner can only lose assets invested in the partnership while the other assets are protected from creditors. On the other hand, general partnerships do not have this protection. If a general partnership goes bankrupt, creditors can pursue a partner's assets, such as the partner's home, car, and personal bank accounts. Accounting and law firms are usually partnerships.

A ***corporation*** becomes the last form and the focus of this chapter. Although corporations comprise approximately 20% of businesses in the United States, they dominate both domestic and international markets because they are involved in all spheres of business activity. Unfortunately, corporations can become so complex that management loses sight of their goals of earning profits. For instance, ***shareholders*** represent the corporation's owners and should benefit accordingly. Sometimes, corporate managers lose sight of this. Unfortunately, the managers fail to maximize the shareholders' wealth, share price, or a firm's value. However, suppose a corporation continually earns losses year after year. That business will fail in that case, similar to a proprietorship or partnership.

Corporations

Corporations typically begin as private companies that evolve into corporations. They have an ***Initial Public Offering (IPO)***, the day the corporation begins selling stock to the public. Typically, the corporation's founder holds a significant stake in the company's stock and becomes a millionaire or billionaire overnight due to the rapid appreciation of their stock holdings.

A ***charter*** is a legal document issued by the government that establishes a corporation. By law, the corporation becomes a separate and distinct legal entity with rights and obligations similar to those of a natural person. A state government approves corporate charters in the United States. For example, several corporations choose the State of Delaware because the state charges the lowest incorporation fees.

A corporation consists of three primary parties: stockholders, the board of directors, and the executive officers. Stockholders own the corporation and typically meet once a year to vote for the board of directors; one share equals one vote. Consequently, the majority shareholder dominates the board of directors and exercises control over the corporation. Of course, a majority shareholder could be another corporation. Next, the board of directors sets corporate policy, declares dividends, and selects the president and executive officers. Executive officers operate the corporation's daily business.

In Figure 1, we show two corporate forms. In both forms, the stockholders are the owners and elect the board of directors. They differ in who becomes the president of the corporation. In the first form, the board chairman serves as both the chief executive officer and president of the corporation. In the second form, the board appoints a chief operating officer to be president of the corporation.

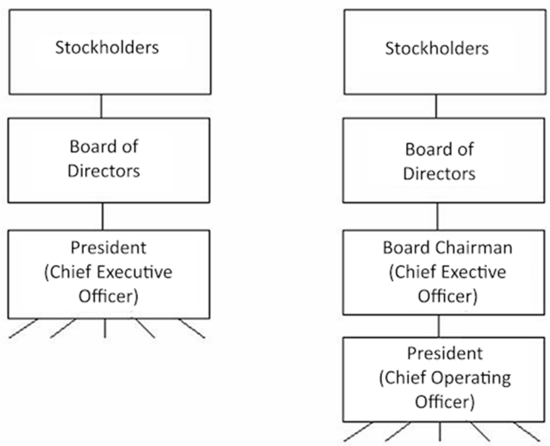


Figure 1. The two forms of corporate management

Corporations are large organizations that can raise a substantial amount of financial capital. Consequently, a corporation has the financial resources to enter foreign countries and dominate international trade. Furthermore, it establishes specialized departments that employ experts in law, taxation, finance, and accounting to manage operations for foreign countries. Advantages of the corporate form include the following:

- A corporation has limited liability. Stockholders own the corporation, and they are not liable for its debt. If a corporation fails, the stockholders only lose their investment, the amount of common stock that they had purchased.

- Stockholders can quickly transfer corporate ownership. ***Stocks*** are certificates that represent ownership in a corporation, and stockholders can freely buy or sell stock to other investors through the stock market.

- Corporations have continuity of life. Theoretically, a corporation could live forever.

- Stockholders do not have a ***mutual agency relationship,*** where the stockholders cannot bind a corporation to contracts. Stockholders have no say in the daily operations of the corporation, despite owning it.

Corporations have two disadvantages. First, the government heavily regulates corporations. Corporations file numerous reports with the government because they can expand into multiple countries, markets, and industries. Corporations may encourage regulations because bureaucratic red tape creates barriers to entry. Thus, new companies often struggle to enter the market due to the complexity and arduousness of regulations. Second, the government imposes taxes on corporations twice. Corporations pay taxes on their profits. Then stockholders receive earnings from the corporation as ***dividends***, and these dividends become income to the stockholders, which the government also taxes.

Corporations could issue two classes of stock: common and preferred. ***Common stock*** allows stockholders to vote at stockholder meetings, while preferred stock does not have any voting rights. The stockholders gave up their voting rights, but they will receive their dividends before the common stockholders. Consequently, a corporation could issue preferred stock to expand operations without sharing control of the corporation with the new preferred stockholders. Lastly, corporations can pay different dividends, with a higher dividend paid to common shareholders.

We define preferred stock by the following categories:

- ***Cumulative Preferred Stock*** – a corporation must pay past-due dividends to cumulative preferred stockholders before it pays dividends to common stockholders. Stockholders only receive dividends when the board of directors declares them.

- ***Protected Preferred Stock*** – a corporation must deposit part of its profits into a fund, and, thus, the corporation can guarantee dividend payments to preferred stockholders.

- ***Redeemable Stock*** – a corporation has the right to repurchase the preferred stock in the future.

- ***Convertible Stock*** – a stockholder can convert preferred stock into common stock on a specific date in the future.

The issuing of stock allows corporations to garner large amounts of financial capital. For example, a corporation can raise capital by issuing bonds. A bond is a loan. However, a bond is standardized, allowing investors to buy or sell bonds on the financial markets. The bondholder has two rights. First, a corporation pays interest on the bond, regardless of its financial position. Second, a corporation pays the face value of the bond on a specific future date. If a corporation goes bankrupt or is dissolved, the corporate debts are paid first, including bonds, bank loans, and taxes. If any assets remain, the preferred stockholders are paid first, while the common stockholders are paid last.

Corporations can buy other corporations. For instance, a parent corporation can have many subsidiaries, and the parent company does not fully integrate these subsidiaries into its operations. Corporations develop these complex structures because of lawsuits, taxes, and regulations. Unfortunately, lawsuits are common and excessive in the U.S. If a successful lawsuit bankrupts a subsidiary, only that subsidiary is impacted. For example, a judge sued a dry cleaner for $65 million because the dry cleaner lost the judge's pants. Although the dry cleaner found the judge's pants a week later, the lawsuit bankrupted the dry cleaner. In another example, a corporation owns 10 different apartment complexes. A corporation establishes each apartment complex as a separate legal entity. Suppose a tenant is injured on one property. In that case, they can sue that complex, which limits the lawsuit to one subsidiary.

Stockholders, of course, want a good return on their investment. A ***return*** reflects an investor's profit stated in annual percentage terms, and it has two sources: Dividend yield and capital gains. A ***dividend yield*** converts the dividend into a percentage of the stock's price. For example, we received $1 per share on our Facebook stock, which was valued at $20 per share. The dividend equals D; the stock price is P; and t indicates the current day. We calculate our dividend yield as 5% in Equation 1.

$$dividend\ yield = 100 \cdot \frac{D_t}{P_t} = 100 \cdot \frac{\$1}{\$20} = 5\% \tag{1}$$

Investors could earn a ***capital gain***, meaning they can sell their stock for a price greater than the amount they originally paid. For example, we bought our Facebook stock for $18 per share last year and sold it this year for $20. We compute a capital gain of 11.1% in Equation 2. Notice the subscripts; t represents today, while t-1 represents last year. If the investment period does not equal one year, we must adjust the capital gain accordingly. For instance, if our investment lasted for two years, subsequently, we would divide the capital gain by 2, converting it into an annual return.

$$capital\ gain = 100 \cdot \frac{P_t - P_{t-1}}{P_{t-1}} = 100 \cdot \frac{\$20 - \$18}{\$18} = 11.1\% \tag{2}$$

Our return from our Facebook investment is the dividend yield plus the capital gain, or 16.1%. Corporate managers can influence the dividend yield by approximately 2% per year. At the same time, they have little influence on capital gains, which could range as high as 12% per year. Unfortunately, investors may face significant losses if the stock market declines during an economic downturn. For example, many internet stocks became worthless in 2000 as the stocks from internet companies plummeted. Subsequently, the U.S. stock markets dropped in value by half during 2008. Consequently, investors may incur capital losses if they sell their stock as its value declines or the corporation becomes bankrupt.

Corporations can use subsidiaries to avoid regulations or taxes. For instance, a parent corporation could relocate to the Bahamas or the Cayman Islands. These countries are tax havens characterized by low taxes, minimal regulations, and strict confidentiality laws. Consequently, corporations can shift assets and liabilities among subsidiaries to decrease their overall tax burden. At this point, we clarify some tax terminology. ***Tax evasion*** occurs when a person or corporation owes taxes to a government but refuses to pay it. Some activities create tax liability, and the law requires them to pay taxes. Otherwise, the government can assess fines or send the tax evaders to prison. However, corporations can use ***tax avoidance*** because they can afford to hire specialists. Tax avoidance occurs when managers carefully plan corporate activities to prevent the creation of tax liabilities. Thus, they are not liable for taxes.

The dividing line between tax evasion and avoidance can be a thin one. Since the 2007 Great Recession, which impacted the world economy for a decade, some tax authorities penalized and fined companies that utilize tax avoidance. Unfortunately, tax collections are down, and many governments are becoming aggressive in tax collections. For example, Italian tax inspectors boarded yachts as they docked in Italian ports in 2012. Italian yacht owners registered their yachts in the Cayman Islands, avoiding registration fees and VAT fuel taxes. Consequently, the Italian ports reported a 40% decline in yacht docking as the yacht owners avoided Italy's ports. Unfortunately, the economies around the ports suffer from fewer customers, who shop and eat in the local communities, which could further depress tax revenues.

Corporate Fraud

The Enron Corporation declared bankruptcy in 2001 and became the universal symbol of corporate fraud. Enron managers created ***Special Purpose Entities (SPEs)*** to wipe debt and liabilities from Enron's financial statements. A SPE consists of a company or a subsidiary of the corporation. An SPE could be a shell company, where the company does not physically exist except on paper. The sole purpose of the SPEs was to hide debt from investors.

Enron managers invested in numerous power plants worldwide, and some of their investments ultimately soured and failed. Then they created off-balance sheet companies and sold their bad investments to their SPEs. Afterward, their balance sheet appeared financially strong, and Enron applied for additional bank loans, thereby increasing its cash reserves. Next, Enron management acquired additional companies and repeated the process. Ultimately, Enron concealed $25 billion in debt from its investors.

Enron's managers invested Enron stock in the SPEs. As Enron's stock price soared, the SPE's finances remained healthy until Enron's stock price peaked at $90 per share. Once Enron's stock price began plummeting, it fell below $1 per share in 2000, and the SPEs incurred substantial losses. Enron hid its losses and requested additional loans from banks to keep the company afloat, but it was unable to secure new loans. The U.S. economy entered a recession in 2001, following the bankruptcy of many internet companies in 2000. A recession continually exposes an organization's weaknesses. Unfortunately, Enron employees' pension funds were invested in Enron stock, and many employees lost their pension funds and became unemployed.

Almost everyone in the financial world overlooked the SPEs, including Enron's auditor, Arthur Anderson, Enron's law firm, and the regulators from the Securities and Exchange Commission (SEC). Then the U.S. government passed the Sarbanes-Oxley Act in 2002, which required CFOs and CEOs to sign their company's financial statements. The law's goal was to increase transparency. ***Transparency*** means outsiders can examine an organization, understand the rules, and accurately assess a firm's actual financial situation. Unfortunately, Enron was "a black box," and only a few insiders knew Enron's genuine financial picture. On the other hand, a non-transparent government tends to be corrupt. For example, if government officials fail to document laws and regulations, or if these laws and regulations are unclear, bureaucrats have broad discretion in determining whether to approve a business license or activity, thereby fueling corruption.

The U.S. economy rebounded after a strong, overly optimistic real estate market took off in 2000. Everyone forgot about Enron's misdeeds until the 2007 Great Recession, when the scale of the fraud became much larger. For example, Lehman Brothers utilized exotic securities, such as credit default swaps and collateralized debt obligations, to purchase real estate (Discussed in Chapter 19). After the recession had struck, unemployment doubled, and many households started defaulting on their mortgages. Commercial and investment banks stopped lending overnight, and real estate prices tumbled. Unfortunately, Lehman Brothers went on a spending spree, buying real estate at the peak of the housing bubble. It held $768 billion in bank and bond debt, while it had $639 billion in assets that dropped rapidly as real estate prices fell. Lehman Brothers filed for bankruptcy in 2008 and closed its doors after 158 years of business.

U.S. corporations often prioritize short-term profits, which can lead to issues with corporate fraud. Countries differ in corporate structure and planning. For instance, the Japanese plan long term, and they form a ***Keiretsu***, a conglomerate of many companies with a bank member. Consequently, the bank could grant low-interest loans to its partner companies, and the Keiretsu usually focuses on long-term profits and market shares. Lastly, corporations in South Korea, Germany, and Russia have also established conglomerates similar to the Keiretsu.

Some governments become shareholders in companies, which are often used by former communist countries. The government retains control over the company and attracts partners who bring technology and efficient management practices. Unfortunately, the government, as a shareholder, becomes susceptible to corruption because it can use its authority to protect the company and isolate it from competition.

Some corporations suffer from the ***principal-agent problem***, when two related parties have different incentives, creating conflicts and odds with each other. For example, the corporate structure separates the managers from the owners (i.e., stockholders). Stockholders select managers who maximize profits, maximize the return to the shareholders, and increase shareholder value. However, managers may not act in the best interest of the owners. They want high salaries, generous benefits, luxurious offices, and access to private planes and Limousines, which reduces the return to stockholders. Furthermore, some companies tie the upper management's salary to the company's financial performance, such as stock options. However, upper management has manipulated stock prices to make their company's financial performance appear strong. Then they cash in their stock options at the higher stock price.

The U.S. investment banks, for example, were partnerships before the 1990s, and the managers handled money carefully. They were both the principal and agent. Then, during the 1990s, the managers converted the investment banks into corporations, and they gambled and took high risks, even though the shareholders owned the corporations. Investment banks became involved in the mortgage market in the early 2000s and were caught in the mania of the U.S. housing bubble. When the bubble deflated, the shareholders lost their stock value during the 2008 Financial Crisis. Finally, GM is the last, perverse example, as it canceled its stock, and the shareholders lost everything in 2008. Remember, the corporate managers represent the shareholders and run the corporation on their behalf, while the shareholders are the owners. It is interesting how a corporation can dump its owners.

A family that dominates a corporation could reduce the principal-agent problem. For example, the Walton family is the majority shareholder in the Wal-Mart Corporation. Microsoft was similar when Bill Gates was both the CEO and majority shareholder. Consequently, they became both the agent and principal, having a unified interest in earning profits. Thus, these companies earned high returns. Then the managers had better vision and oversight over their corporations.

Expanding into Foreign Countries

A ***multinational corporation*** is a company that incorporates itself in one country and operates in one or more foreign countries. For example, British Petroleum, General Electric, Toshiba, and Walmart are multinational corporations with extensive business activities worldwide. Sometimes, financial analysts use the term "***multinational enterprise***" because a government could form a joint venture with a corporation, and the definition of an enterprise implies a broader scope.

A multinational enterprise's goal is to earn profits. Therefore, it enters international markets and foreign countries in pursuit of profits. Every global enterprise has a choice. It could export to another country or relocate production outside its home country. For instance, many U.S. corporations relocated manufacturing outside the United States, despite the country's high unemployment rate since the onset of the 2007 Great Recession.

Financial analysts and economists divide the world's markets into mature economies and emerging markets. ***Mature economies*** are competitive, and a company entering this market would face narrow profit margins. Some examples include the United States and the European Union. On the other hand, ***emerging-market economies*** are countries that recently opened their markets to international trade and finance. They can be very profitable but entail greater risk. For example, China, India, and Mexico are removing their government controls on their markets, allowing international investors and corporations to invest in their economies.

A government that attracts foreign investment must modify its laws to meet three key requirements. First, a government establishes an ***open marketplace***, allowing free markets and the free movement of capital, labor, and technology. Thus, a government relaxes its control over its market. Second, a government allows ***strategic management.*** Therefore, companies can develop new products and services, enabling them to compete with other companies. Furthermore, a multinational enterprise could tailor its goods and services to accommodate different cultures and tastes. Walmart had to change its store layouts and product offerings for its Chinese stores as compared to its American stores. Ultimately, multinational corporations require access to capital because their international activities necessitate financing. Hence, a country must allow the free movement of money, and corporations are free to issue more stock and bonds or receive bank loans without government interference.

A firm has the following twelve reasons to relocate production to another country rather than to export.

- **Reason 1:** A foreign government offers subsidies and tax breaks to a company. Some countries, such as the United Arab Emirates (specifically Dubai) and China, have free-trade zones, where companies pay little or no taxes, experience few regulations, and can freely export their products and services to international markets. Consequently, some governments offer incentives to companies to create jobs and reduce unemployment and poverty rates.

- **Reason 2:** A company gains access to technology from another country. For example, India has talented computer programmers and engineers who work for relatively lower wages than their counterparts in the United States and Europe. Consequently, a company could relocate to India to tap into its skilled workforce.

- **Reason 3:** An enterprise that moves its factories to a foreign country automatically avoids trade restrictions, like tariffs and import quotas. The government does not apply trade restrictions to products and services produced within a country.

- **Reason 4:** A company relocates its manufacturing facilities to reduce transportation costs. For example, sugarcane is bulky and expensive to transport. Consequently, sugar producers locate the sugar mills close to the sugarcane fields. Then they extract and purify the sugar and ship it to distant markets.

- **Reason 5:** A business gains access to new markets and more consumers. For instance, the Coca-Cola Corporation produces and sells its carbonated soda products in most countries worldwide, thereby expanding its consumer base.

- **Reason 6:** A company could diversify its business and manufacturing by expanding into foreign markets. Some foreign markets experience rapid growth, while others exhibit weak growth. Consequently, the business could earn a return on its investments.

- **Reason 7:** A company needs an essential raw material for production. For example, battery manufacturers need lithium to produce laptop and electric vehicle batteries. They established mining and refining facilities in Bolivia because the country holds half of the world's lithium reserves.

- **Reason 8:** Businesses and companies reduce their production costs. Consequently, many U.S. manufacturing companies relocated to China and Mexico to capitalize on lower wages and comparable productivity levels.

- **Reason 9:** A company outsources its production to another company outside the country. For example, Microsoft outsourced its production of Xbox consoles to Flextronics, a Singaporean company. Then Flextronics outsourced the production to a Chinese manufacturing company. Consequently, ***outsourcing*** can lower a company's cost, granting it a cost advantage over its competitors.

- **Reason 10:** A company investing in a foreign market today may lead to future investments. For example, a company opens a subsidiary in Moscow, Russia. After establishing the subsidiary, the company can open branches in other Russian cities or enter other Russian-speaking countries.

- **Reason 11:** A company that produces in a foreign market reduces economic exposure. ***Economic exposure*** refers to changes in economic factors, such as inflation, interest rates, and exchange rates, that affect a company's profits. One crucial factor is fluctuating exchange rates. A company may experience significant fluctuations in earnings if it produces in one country and exports to another. However, if the company manufactures and sells within the same country, fluctuating exchange rates would have less impact because the company's revenues and costs are denominated in the same currency. Thus, a company's profit could remain stable in a foreign market.

- **Reason 12:** Many companies relocate subsidiaries to politically safe and business-friendly countries, such as the Bahamas, Dubai, and Singapore. These countries have low taxes and few regulations.

Multinational enterprises are more complicated than businesses that remain in their home country. First, enterprises transfer resources between countries, such as machines, equipment, and labor. Next, they ship products and services to other countries. Consequently, companies require excellent logistics management and specialists who are knowledgeable about a country's various laws and regulations. Second, international enterprises are exposed to exchange rate risks and credit risks. Thus, a company's profit can change rapidly due to fluctuations in currency exchange rates, or it may be unable to obtain credit to finance operations in a specific country. Finally, enterprises have other exposures, such as country risk. For example, the Venezuelan government nationalized the oil companies in 1976 to form Petróleos de Venezuela, S.A. (PDVSA).

International enterprises in Venezuela experienced the seizure of their assets without compensation.

Country risk refers to the risk associated with investing in a particular country when its political conditions undergo rapid changes. For example, the Republic of Kazakhstan was a former Soviet Union state that became an independent country in 1991. The country's president, Nursultan Nazarbayev, opened the country's economy to free markets in the early 1990s. Consequently, Kazakhstan made significant strides towards a market economy. It attracted billions in international investment because the country contains vast petroleum and mineral wealth. Following the 2008 Financial Crisis, the Kazakh government gradually reinstated Soviet-era rules, practices, and regulations. Unfortunately, the Soviet legal system is characterized by bureaucracy, slowness, and arbitrariness, and it suffers from corruption and political favoritism. Moreover, the Kazakh government nationalized several foreign-owned companies, and international investment began plummeting in 2012.

The Law of Comparative Advantage

The ***Law of Comparative Advantage*** forms the basis of free trade. David Ricardo, a British political economist, formulated the law in the 19th century. It states that two countries can benefit from trade by specializing in the production of goods where a country has a relatively cheaper cost. Thus, governments that instituted free trade between themselves helped fuel the rapid growth of globalization and the rise of multinational enterprises. Political leaders reduced their tariffs and trade barriers to facilitate the free flow of goods, services, and capital across borders. Finally, the Law of Comparative Advantage still works for a large country that can produce everything.

Economists use a ***production possibilities frontier (PPF)*** to illustrate how two countries can benefit from free trade. A PPC represents graphically a country's maximum production level for two goods given its endowment of resources. Resources include labor, machines, equipment, land, and entrepreneurs. The PPC has three assumptions:

- Both countries produce at full employment, which means they manufacture on the boundary of the production possibilities curve. Thus, society employs its entire labor force, and entrepreneurs use all their machines, equipment, and land to produce goods and services.

- The PPCs are straight lines. Consequently, an industry experiences no losses when entrepreneurs move resources from one sector to another. Although this analysis works with curved PPCs, the straight-line PPCs simplify the analysis.

- Two countries, the United States and Mexico, produce only tomatoes and cars.

We begin the analysis with no trade between Mexico and the United States. The United States produces 50 units of tomatoes, while Mexico produces 60 if it shifts the entire country's resources to grow tomatoes. If entrepreneurs shift all their resources into car manufacturing, the United States will produce 100 cars, while Mexico will manufacture 30. The intercepts indicate the maximum production levels for the PPC curves, as shown in Figure 2.

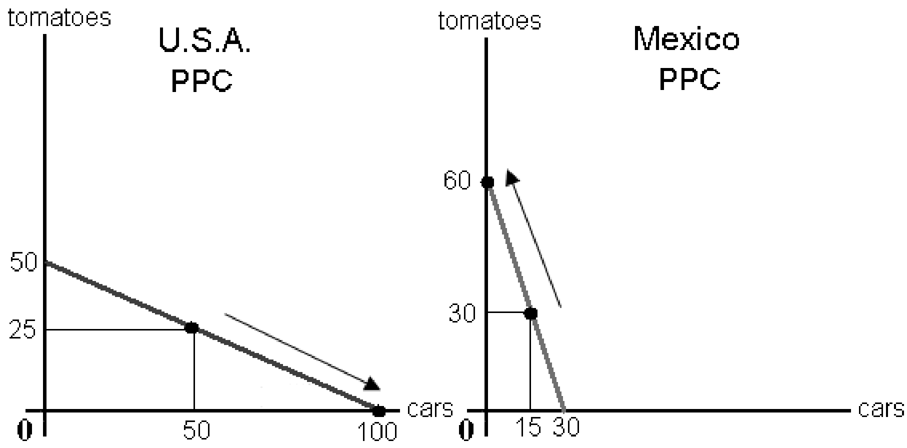


Figure 2. The Production Possibilities Curves for Mexico and the United States

We set each country's production level at the halfway point. We do not have to put it at the halfway point, but it makes the analysis simpler. Thus, the United States produces 25 tomatoes and 50 cars, while Mexico produces 30 tomatoes and 15 vehicles. Consequently, the total production for both countries equals 55 tomatoes and 65 cars.

Suppose Mexico and the United States engage in free trade. In that case, the countries will specialize in producing products where they have low opportunity costs. Opportunity costs reflect the slopes of the PPCs. The slope for the United States equals 0.5, which means the U.S. must give up the production of one car to produce 0.5 tomatoes. On the other hand, Mexico has a slope of 2. It can make two tomatoes by giving up one car. Consequently, the United States specializes in car manufacturing, while Mexico specializes in growing tomatoes.

Straight-line PPCs lead to ***complete specialization***, whereas curved PPCs have partial specialization because curved PPCs experience increasing opportunity costs as an industry expands. With complete specialization, the United States produces all cars, while Mexico produces all tomatoes, because the opportunity costs remain unchanged. U.S. entrepreneurs continually shift resources from the tomato industry into the car industry until they reach the maximum car production. On the other hand, Mexico's entrepreneurs do the exact opposite. Consequently, the United States produces 100 cars and grows zero tomatoes, while Mexico grows 60 tomatoes and produces zero cars. The gain in world production equals 35 cars and 5 tomatoes. Unfortunately, we need more trade theory to predict how the countries would divide this extra production.

This simple analysis of free trade has limitations. First, it does not include the role of technology or the flow of resources from one country to another. Second, it does not include outsourcing. Outsourcing occurs when a firm contracts part of its production to another firm in another country, a practice commonly employed by many international companies. Finally, communication and transportation costs are decreasing, which strengthens outsourcing and the flow of resources.

Key Terms

- sole proprietorship
- partnership
- corporation
- shareholders
- initial public offer (IPO)
- charter
- stocks
- mutual agency relationship
- dividends
- common stock
- cumulative preferred stock
- protected preferred stock
- redeemable stock
- convertible stock
- return
- dividend yield
- capital gain
- tax evasion
- tax avoidance
- special purpose entities (SPE)
- transparency
- keiretsu
- principal-agent problem
- multinational corporation
- multinational enterprise
- mature economies
- emerging-market economies
- open marketplace
- strategic management
- outsourcing
- economic exposure
- country risk
- Law of Comparative Advantage
- production possibilities curve (PPC)
- complete specialization

Chapter Questions

1. Explain why sole proprietorships are usually small businesses.

2. Identify the benefits of incorporating a business.

3. The board of directors of a corporation needs more funding to invest in a new factory. However, they do not want to issue more common stock because it would weaken the majority shareholders' position. Identify the board's options.

4. Could a corporation use a subsidiary to hide debt or manipulate its financial statements?

5. We bought stock for a new internet company for $25 per share last year and paid a $0.50 dividend per share. Unfortunately, the company is facing bankruptcy, and we have to sell our shares quickly for $15. Calculate our rate of return for this investment.

6. Did the U.S. federal government fix corporate fraud after passing the Sarbanes-Oxley Act in 2002?

7. Could a bank that becomes a member of a Keiretsu create problems for the entire company?

8. Does the principal-agent problem exist if a university pays a commission to an enrollment counselor who enrolls students in the university?

9. Distinguish between a third-world country and an emerging economy.

10. Could a country produce within the interior of a production possibilities curve?

11. Identify the benefits for a business to expand into a growing country like China.

12. Is outsourcing a form of free trade?

13. We have two countries: Bosnia and Herzegovina and Colombia. Both countries grow tobacco and coffee. Two countries can produce the maximum with their resources in the table.

Production	Tobacco	Coffee
Bosnia and Herzegovina	1,000	500
Colombia	500	1,000

Please draw the two PPCs with production set at the halfway point. Identify the gain in output if the two countries engage in free trade.

4. International Banks

Over the last 40 years, savers and borrowers have become increasingly linked through international financial markets. For example, a Japanese bank transfers funds from savers in Japan to lend to a company that builds a new factory in China. Thus, ***globalization*** influences and permeates the financial markets as funds move between countries and investors have access to financial markets that span the globe.

Globalization has significantly impacted the financial markets, as products, services, and capital flow across national borders. Globalization has increased rapidly since World War II, with three primary causes. First, many government leaders repealed laws restricting the free flow of investment between countries. Second, countries are growing economically. Thus, the savers can channel their funds into the international financial markets, pursuing greater returns abroad. Ultimately, international corporations manufacture products in one country and then ship them to another. Corporations require financing to conduct business in foreign countries; they collaborate with international banks. A global bank operates in two or more countries. Therefore, corporations move products, services, and resources across international borders, while banks facilitate the movement of money and financial transactions.

After this chapter, we will understand why banks enter international markets and the methods banks use to enter foreign markets. Banks can circumvent government regulations by crossing borders and inventing new financial instruments. Unfortunately, international banks pose many problems for government regulators.

Functions of International Banks

International banks transcend the functions of a domestic bank because they link savers and borrowers across different countries. A global bank helps people and businesses engage in international trade and finance. Furthermore, an international bank facilitates foreign currency exchange rates and maintains inventories of foreign currencies. For example, HP Corporation contracts with a firm in Hong Kong to buy memory chips. HP goes to an international bank, which grants a short-term loan for the memory chip purchase. The bank helps HP pay for the memory chips and can help HP with the currency exchange rates.

International banks provide three benefits. First, international banks accept deposits from savers and lend to borrowers. The savers and borrowers could be located in different countries. Second, international banks lower transaction costs by reducing information asymmetry, mitigating investment risk, and enhancing the liquidity of financial markets. Liquidity refers to the ease with which assets can be converted into currency. Currencies and bank accounts are the most liquid assets, while houses and cars are the least liquid. Finally, international banks stimulate financial innovation by creating new financial instruments.

International banks link savers and borrowers from different countries worldwide, crossing international borders. They are concentrated in financial centers worldwide, such as New York City, Tokyo, and London, and they operate 24 hours a day, seven days a week. Consequently, a government in one country faces difficulties in regulating its banks' activities in other countries. For example, Citibank has branches and subsidiaries in many countries worldwide. The U.S. government and the Federal Reserve System struggle to regulate and monitor all the banks' activities.

International banks are located in offshore markets. An ***offshore market*** has few regulations, low tax rates, and strict banker-customer confidentiality laws. Leading offshore markets include the Bahamas, Cayman Islands, Dubai, Hong Kong, and Singapore. Suppose the regulatory agency believes a bank is participating in risky investments. In that case, the regulatory agency has difficulty examining bank records for subsidiaries located in offshore markets. Consequently, some wealthy individuals, businesspeople, and criminals hide their money in offshore accounts to evade taxes, protect their wealth from countries with aggressive tax policies, or conceal their profits from illicit business activities.

Becoming an International Bank

Banks in the United States use four methods to become an international bank, which include the following:

- **Method 1:** The U.S. bank opens a ***bank branch*** in a foreign country. These branches accept deposits and make loans. U.S. banks open branches in financial centers worldwide, typically in locations where U.S. firms and corporations conduct business. Bank branches facilitate the transfer of money across national borders.

- **Method 2:** The U.S. bank becomes a ***holding company***. The U.S. bank buys and becomes a majority shareholder of a foreign bank. The Federal Reserve System restricts U.S. banks from investing in foreign firms that are "closely related to banking."

- **Method 3:** The U.S. bank becomes an ***Edge Act Corporation***. The U.S. bank establishes a subsidiary. Subsidiaries can accept deposits from U.S. residents and foreigners, but can only grant loans for international business activity. These international banks assist with global trade and foreign currency exchange. Furthermore, the Federal Reserve System has the authority to approve the Edge Act Corporation and exempts the subsidiary from some U.S. banking regulations.

- **Method 4:** The U.S. bank creates an ***international banking facility (IBF)***. A global banking facility, similar to an Edge Act corporation, accepts deposits from foreign investors and lends to them. The IBFs cannot conduct business within the United States except with their parent company or other IBFs. The government exempts IBFs from many regulations, and they are exempt from paying local and state taxes. The Fed encourages U.S. banks to use an IBF to engage in the international markets.

Foreign banks can enter the U.S. banking market using three methods.

- **Method 1:** A foreign bank opens an agency office. The ***agency office*** cannot accept deposits from U.S. residents, but it can lend to them. Moreover, the agency office is not subject to U.S. banking laws and does not carry FDIC deposit insurance. The agency office receives its funding from foreign depositors and investors. An agency office is similar to a non-bank bank, as it circumvents numerous U.S. banking regulations. The legal definition of a bank is an institution that accepts deposits and grants loans. If the institution ceases to grant loans or accept deposits, it is no longer considered a bank, legally.

- **Method 2:** A foreign bank does business in the U.S. through a ***foreign bank branch***. This is a full-fledged bank that accepts deposits and makes loans. Consequently, the foreign bank branch must follow the U.S. banking regulations.

- **Method 3:** A foreign bank enters the U.S. market through a ***subsidiary U.S. bank***. Foreign banks buy U.S. bank stock and become the majority shareholder. Thus, the foreign bank controls the U.S. bank, converting it into a subsidiary. Many foreign banks use subsidiaries to enter the U.S. banking market because the U.S. has a highly complex legal system. Hence, the U.S. bank employs staff and experts who are familiar with the laws, rules, and regulations. Suppose a foreign bank opens a new branch. In that case, the managers and staff will spend time learning and complying with numerous rules and regulations.

Exchange Rate Risk

An ***exchange rate*** is the ratio of one currency to another. We usually write an exchange rate as Equation 1. For example, one U.S. dollar is equivalent to 1.5 euros.

$$\$1 = 1.5 \text{ euros} \tag{1}$$

For instance, we plan a trip to the United States and want to convert 1,500 euros into U.S. dollars. How many U.S. dollars would we have? We use a trick with exchange rates – retain the currency units in the calculation. If we computed correctly, then only one currency unit would remain after the calculation. We can form two ratios with the currency by dividing both sides of the equation by one of the units of currency. We show the two ratios in Equation 2:

$$\frac{\$1}{1.5\ euros} = 1 \quad or\ 1 = \frac{1.5\ euros}{\$1} \tag{2}$$

Now multiply the ratios by 1,500 euros. The first ratio in Equation 3 is correct because one currency unit remains after the calculation. The ratio for Equation 4 is wrong because the euro currency units become squared.

$$1{,}500\ euros \frac{\$1}{1.5\ euros} = \$1{,}000 \tag{3}$$

$$1{,}500\ euros \frac{1.5\ euros}{\$1} = \frac{2.25\ (euros)^2}{\$1} \qquad (4)$$

Exchange rates can fluctuate over time. If the exchange rate changes to Equation 5, the U.S. dollar buys more euros. Thus, the U.S. dollar appreciated. If the U.S. dollar appreciated, the euro would automatically depreciate. Consequently, ***appreciation*** means a currency becomes worth more than another currency, while ***depreciation*** implies that the other currency falls in value. Appreciation and depreciation are relative concepts applied to one exchange rate. The trick is to examine the currency that has a unit of one. When we know what happens to that currency, we automatically know what happened to the other currency.

$1 = 2 euros (5)

The exchange rate can also move in the other direction. If the exchange rate changes to Equation 6, the U.S. dollar buys fewer euros. Thus, the U.S. dollar depreciates while the euro appreciates.

$1 = 1 euro (6)

Financial analysts use the terms strong and weak to refer to a currency, which differs from appreciation and depreciation. For instance, a weak U.S. dollar implies we compare the dollar to a "basket" of currencies. Overall, the dollar fell in value relative to the currencies in the basket, which includes other industrialized countries, such as the United Kingdom, Canada, the Eurozone, and Japan.

Fluctuating exchange rates lead to ***exchange rate risk***, which can financially harm international banks, investors, and businessmen. Thus, they must analyze and examine the exchange rate trends when accepting deposits and granting loans. For example, an international bank receives $1 million from depositors in the United States and then lends $1 million to a business in Russia. Many countries enforce laws requiring business activity to be denominated in their currency. Hence, the bank converts U.S. dollars into Russian rubles because companies in Russia use the ruble. If the exchange rate equals $1 for 25 rubles, we compute the bank's loan at 25 million rubles in Equation 7.

$$Bank\ Loan = \$1{,}000{,}000 \cdot \frac{25\ rubles}{\$1} = 25\ million\ rubles \qquad (7)$$

What would happen if the exchange rate varies? The international bank could gain or lose from fluctuations in the exchange rate. If the currency exchange rate changes to $1 for 50 rubles, the U.S. dollar will appreciate while the Russian ruble will depreciate. When the Russian business repays its 25 billion-ruble loan, we calculate that the bank receives $0.5 million, as shown in Equation 8. Therefore, the bank experienced a significant loss.

$$Bank\ Loan = 25{,}000{,}000\ rubles \cdot \frac{\$1}{50\ rubles} = \$500{,}000 \quad (8)$$

If the exchange rate changes so $1 equals 10 rubles, then the Russian ruble appreciates while the U.S. dollar depreciates. According to Equation 9, the Russian business repays a total of $2.5 million. Consequently, the international bank benefits in this case.

$$Bank\ Loan = 25{,}000{,}000\ rubles \cdot \frac{\$1}{10\ rubles} = \$2{,}500{,}000 \quad (9)$$

Banks, businesses, and investors can experience significant gains or losses when transacting and investing in foreign countries.

International Financial Securities

International banks created several financial securities to hedge against foreign exchange rate risk. Some financial securities also allow global banks to circumvent government regulations and facilitate international trade.

A bank, business, or investor can use derivatives as a first line of defense against exchange rate risk. A ***derivative*** is a contract for the future delivery of a commodity at a specified price on a particular date. Typical commodities include foreign currencies, petroleum, coffee, corn, wheat, Eurodollars, stocks, and bonds. For example, a buyer and seller agree to a future price of coffee today. On the day the contract expires, the buyer must buy the coffee at the price and quantity specified in the contract. A derivative contract protects a bank, company, or investor from price fluctuations, allowing them to buy and sell the contracts on secondary markets before the contract matures. For exchange rate risk, investors can buy derivatives contracts that will enable them to purchase a quantity of foreign currencies on a future date at a fixed exchange rate. On the other hand, in the spot market, the buyer and seller exchange a commodity for money immediately, which does not protect against future price fluctuations.

A derivative contract has many different forms. The first form is a ***forward contract***. For example, an international bank granted a loan to a business in Malaysia. As the business repays the bank in Malaysian ringgits, the global bank can use a forward contract to exchange ringgits for U.S. dollars at a future fixed exchange rate. Thus, the international bank protects itself from the foreign exchange rate risk. A forward contract contains the commodity's quantity, a fixed price, and the future transaction date. Furthermore, a forward contract is tailor-made, and international banks usually write forwards for foreign currencies. Another derivative, similar to a forward, is a futures contract. ***Futures*** contracts are standardized, and investors can buy or sell them quickly on the futures markets. Forwards and futures have maturities of 1, 2, 3, 6, or 12 months.

International banks and investors utilize ***currency swaps*** to mitigate exchange rate risk and minimize transaction costs. A currency swap is the exchange of debt instruments denominated in different currencies. For instance, a forward-forward swap refers to a situation in which a firm and a bank exchange two forward contracts with each other. A bank sells a forward contract for a specific currency to a firm, and the firm simultaneously sells a contract to the dealer for the opposite currency with the same maturity. Thus, a currency swap is similar to a loan with collateral from the bank, and it has grown into a $64.1 trillion market as of 2023.

Intel, for example, wants to build a factory in Germany. In contrast, Volkswagen wants to build a new factory in the United States. Intel needs euros, while Volkswagen needs U.S. dollars for these investments. These companies are well-known within their own countries and can borrow on favorable terms from their banks. A U.S. bank lends to Intel, while a German bank lends to Volkswagen. Now, Intel and Volkswagen can exchange their loans using currency swaps. Intel has euros to build a factory in Germany. In contrast, Volkswagen has U.S. dollars to build a factory in the United States. The key to understanding a forward-forward swap is that the exchange involves two cash flows, and a forward contract protects each of these cash flows.

A popular currency swap is a ***spot against a forward***, comprising 57% of trades in 2004. Investors or businesspeople can protect themselves from exchange rate risk by purchasing currency on the spot market from a bank today. Then they use a forward to transfer the same currency back on a future date for a fixed exchange rate. For example, an investor invests $10 million in Malaysia. He buys ringgit currency from an international bank today and invests his money for one year in Malaysia. Afterward, the investor cashes out his ringgits and exchanges them for U.S. dollars with the original bank using a forward contract. Thus, an investor protects himself from fluctuations in the exchange rate because he exchanges his currency in the future for a known price.

International banks and investors created another financial instrument, ***Eurodollars***, that reduces the foreign exchange rate risk. Banks create Eurodollars when customers transfer deposits from the United States to a foreign bank. Then the bank does not convert the account to the local currency but keeps the account denominated in U.S. dollars. The Soviet Union created Eurodollars because it accumulated U.S. dollars from selling petroleum to foreign countries. The Soviet leaders wanted to hold U.S. dollars but not in U.S. banks. They feared that the U.S. government could seize their assets and convinced European banks to keep their accounts in U.S. dollars.

Eurodollars allow banks to circumvent laws and regulations. In the United States, banks initially did not pay interest on checking accounts. During the 1970s, depositors withdrew their funds from their checking accounts as interest rates soared. In Britain, banks initially could not grant loans outside Britain. Nevertheless, Eurodollars allowed these banks to circumvent these laws. U.S. banks could borrow Eurodollars from the United Kingdom instead of relying on domestic deposits. U.S. banks paid market interest rates on Eurodollars. In contrast, British banks could lend outside of Britain by using Eurodollars. Eurodollars were so successful that many governments repealed regulations, and the U.S. dollar remains the dominant currency in the Eurodollar market.

Eurodollars are not limited to Europe. During the 1970s, the Organization of the Petroleum Exporting Countries (OPEC) reduced its petroleum production, leading to a surge in oil prices. High oil prices led to a significant influx of U.S. dollars into the OPEC nations, making OPEC the largest source of Eurodollars. Currently, Japan and South Korea also have sizeable deposits in

U.S. dollars. Nevertheless, many countries are alarmed by the large U.S. debt and massive trade deficits, which cause an outflow of U.S. dollars into international markets. Many believe the U.S. dollar will depreciate. Accordingly, the Federal Reserve stopped publishing the M3 definition of the money supply in 2006, which measured the quantity of Eurodollars.

Eurodollars gave rise to two offshoots: Euroloans and Eurobonds. Consequently, the principal and interest payments for Euroloans and Eurobonds are denominated in U.S. dollars. For example, a European bank lends to a Russian company using a ***Euroloan***. All terms of the loan are denominated in dollars, and Russia must repay the loan in the same currency. Thus, the bank protects itself from ruble-dollar exchange rate changes by passing the exchange rate risk on to the Russian business. ***Eurobonds*** are bonds where all bond payments and receipts are denominated in one currency. However, Euroloans and Eurobonds are not entirely free from exchange rate risk. Suppose the Russian business earns profits from sales denominated in rubles. A severe ruble depreciation can cause the Russian company to default and go bankrupt. Subsequently, the business cannot afford to convert a depreciating currency into an appreciating one, as it defaults on the Euro loan.

The banks cannot grant Euroloans in billions of dollars. Therefore, several international banks cooperate to grant a sizable loan. We refer to this cooperation as a ***loan syndication***. A syndicate grants a large loan by collecting funds from several banks, with one bank managing the loan and earning a management fee. Most international banking businesses are conducted through the ***Euromarkets***. These markets remain unregulated and include all financial markets denominated in U.S. dollars and located outside of the United States.

The last financial instrument, a ***banker's acceptance***, facilitates international trade. If a U.S. store wants to import coffee from Costa Rica, the exporter in Costa Rica has little information about the U.S. store's creditworthiness. Furthermore, if the exchange of coffee for money occurs in the future, the U.S. store does not know what the future exchange rate will be. Thus, this becomes an information problem, and an international bank can use a banker's acceptance. The U.S. store deposits money at its international bank. The bank guarantees payment by issuing a banker's acceptance and sending a credit letter to the Costa Rica exporter. If the U.S. store goes bankrupt, the exporter in Costa Rica still gets his money. If the firm does not deposit money at the bank and guarantees payment, the bank must pay the exporter in Costa Rica. When the exporter in Costa Rica exports coffee to the U.S., they deposit their letter of credit at their bank. The exporter's bank would contact the U.S. store's bank and arrange payment. Consequently, bankers' acceptances lower transaction costs and are liquid assets because banks and holders can sell or buy them on secondary markets.

Regulatory Oversight

After World War II, the U.S. dollar became the ***international reserve currency***. Traders prefer to negotiate transactions in global financial markets in an international transaction currency. For example, traders in the petroleum market negotiate all transactions in U.S. dollars. Thus, traders are protected from the exchange rate risk.

During the 1980s, several developing countries threatened to default on their Euroloans. Loan default would trigger a global banking crisis in industrialized countries. Consequently, twelve countries, including the United States, met in Switzerland to discuss capital requirements. They named the meeting after the City of Basel. The Basel Committee aimed to ensure that banks had sufficient capital to withstand a financial crisis and avoid substantial losses in profits. Unfortunately, countries face difficulties in implementing the Basel Agreement because each country has its distinctive regulations and different accounting standards. Nevertheless, the Basal Agreement set common capital standards for banks engaged in currency swaps, financial futures, and options.

The 1980s debt crisis forced central banks to meet and discuss their role as lenders of last resort during a banking crisis. Central banks concluded they should concentrate on the financial stability of their domestic banks. However, many banks are linked internationally to other banks abroad. Consequently, a banking crisis in one country can spread and trigger a banking crisis in another. Thus, no single central bank can contain a financial crisis.

Leaders of central banks and government finance ministries push for coordination and restrictions on deposit insurance. For instance, deposit insurance in the United States insures up to $250,000 for each person. Other countries do not have generous deposit insurance. Currently, U.S. banks pay modest premiums only on domestic deposits. If the Federal Deposit Insurance Corporation (FDIC) requires U.S. banks to pay deposit insurance on all accounts, including those of foreign banks, their premiums would likely increase. Furthermore, governments have two problems coordinating international deposit insurance. First, many regulatory agencies in other countries lack the FDIC’s monitoring power. Second, the European Union requires all member countries to formulate a Deposit Guarantee Scheme to fund deposit insurance up to €100,000. The member countries determine how they will insure deposits. Some members have laws requiring the government to step in and fund the deposit insurance if the insurance premiums cannot cover all accounts during a bank failure.

Many governments in the United States and other countries were deregulating their financial markets when the 2008 financial crisis struck the world economy. The United States, Ireland, Spain, and others experienced a strong real estate bubble that deflated in 2007. As the unemployment rate soared, businesses laid off many people, and the unemployed could not find jobs. Subsequently, some people stopped paying their mortgages, harming the banks financially. Banks stopped granting new mortgages, and construction of brand-new housing came to a halt. Afterward, housing prices began to fall as banks foreclosed on houses that were losing value.

The U.S. government responded quickly, using the identical response many other countries had used.

- ❖ The U.S. government purchased preferred stock in the largest banks in the United States, infusing the banks with funds. This was the first time the U.S. government had directly owned a business.

- ❖ The Federal Reserve purchased many of the toxic mortgage loans from the banks, thereby removing the bad debt from their balance sheets. A ***toxic loan*** is a bank granting a mortgage to a family or person with no credit history or poor credit. Toxic loans became the first loans to sour as the world's economy entered the 2007 Great Recession. Before the financial crisis, toxic loans were referred to as subprime loans because banks earned substantial profits from them.

- The Fed rapidly expanded the money supply to offset the decline of the U.S. economy. The Fed also granted trillions of dollars in emergency loans to the U.S. banks.

- The Federal Reserve became the lender of the last resort for the developed world. Central banks from Britain, the European Union, and Japan could borrow U.S. dollars from the Federal Reserve through the ***U.S. dollar liquidity swap***. A U.S. dollar liquidity swap refers to a central bank's ability to borrow U.S. currency from the Federal Reserve by providing its currency as collateral. Then on the maturity date, the central bank repays its loan in U.S. dollars, and the Fed returns the currency. This is similar to a forward-forward transaction.

- The U.S. government plans to implement the Basel III requirements that increase banks' capital requirements and force banks to boost their holdings of liquid securities. Many banks increased their leverage ratio during the housing bubble to unsustainable levels. Unfortunately, the term "leverage" has multiple meanings depending on its context. In our case, ***leverage*** equals the ratio of debt a business uses to acquire assets. Many banks accumulated debt to acquire properties at the peak of the housing bubble. Once the bubble deflated, the properties' values fell, and the banks could not sell them without incurring enormous losses. Banks had high leverage ratios as they accumulated debt for assets with dropping market values. If banks hold more capital or liquid assets, they would have more capital to deal with a financial crisis.

The world took a while to recover from the 2008 Financial Crisis. Once the global economy had recovered, many countries closed their borders and shut down businesses during the COVID-19 pandemic of 2020. People were prohibited from coming into physical contact with others. Unfortunately, the world is still reeling from the aftermath of the pandemic. The U.S. government ramped up its spending spree as the U.S. national debt surpassed $37 trillion in 2025. Many countries, including Australia, Canada, Finland, France, Greece, Italy, Portugal, Spain, Sweden, the United Kingdom, and the United States, are experiencing challenging labor markets. We are, unfortunately, repeating a similar scenario as 2008. As unemployment rises, loan defaults increase, including those on car loans, credit cards, mortgages, and student loans. High loan defaults harm the banking system's finances, while the world appears to be entering another global financial crisis.

Key Terms

globalization
international banks
offshore market
forward contract
futures
currency swap

bank branch
holding company
Edge Act Corporation.
international banking facility (IBF)
agency office
foreign bank branch
subsidiary U.S. bank
exchange rate
appreciation
depreciation
exchange rate risk
derivative
forward-forward swap
spot against a forward
Eurodollars
Euroloans
Eurobonds
loan syndication
Euromarkets
banker's acceptance
international reserve currency
toxic loan
U.S. dollar liquidity swap
leverage

Chapter Questions

1. Identify the benefits of being an international bank.

2. Explain an offshore market.

3. Identify how a U.S. bank becomes an international bank.

4. Identify how foreign banks enter the United States banking industry.

5. Identify an exchange rate risk.

6. We loaned a Mexican business $100,000. However, the company is repaying the loan in Mexican pesos. The exchange rate was $1 = 10 pesos on the day of the loan but had changed to $1 = 15 pesos; what happened to the value of our investment?

7. Distinguish between a spot market and a derivatives market.

8. Identify a forward transaction.

9. Define a currency swap with a "spot against a forward."

10. Identify the purpose of a currency swap.

11. Explain how a banker's acceptance facilitates trade.

12. Define Eurodollars, Euroloans, and Eurobonds, and explain why these financial instruments are popular.

13. Identify the problems that governments experience as they regulate international banks.

5. Financial Institutions

Financial analysts and economists classify the financial markets and institutions into five categories: securities market institutions, investment institutions, contractual savings institutions, depository institutions, and government financial institutions. Thus, we will examine the prominent characteristics of each category and understand how a financial institution from one category differs from those in another category. Unfortunately, these categories are not set in stone, as a financial company may be classified under two or more categories. Since the 1980s, the U.S. federal government has started deregulating the financial markets, allowing financial institutions to expand into new activities as they cross into other categories. Consequently, financial institutions began competing fiercely, and those in one sector often compete with those in others. For instance, a company could expand across three categories by offering banking services, selling insurance, and acting as a broker for financial securities.

Securities Market Institutions

Securities market institutions include investment bankers, brokers, dealers, and organized exchanges. These institutions enhance the liquidity of the secondary markets. However, they are not financial intermediaries because they do not connect savers to borrowers. Instead, they help the savers locate the borrowers.

A prominent securities market institution is the investment bank. An ***investment bank*** assists corporations in issuing new stock and bonds or helps local or state governments issue new bonds. Furthermore, an investment bank could facilitate a takeover of one corporation by another. Consequently, the investment bank has a significant influence on the primary market. In the United States, an investment bank is not a regular bank. It serves as a marketing agent for new securities. For example, the Ford Corporation wanted to build a new factory and decided to issue new stock. The new stock will provide the funds that Ford can use to construct the factory. Ford will go to an investment bank, which will assist Ford in creating these new securities. Then the investment bank sells the new Ford stock to its customers. If these customers want to sell their stock, they sell it on secondary markets or organized exchanges. Prestigious investment banks include the following: Merrill Lynch, Goldman Sachs, and Credit Suisse.

The U.S. government passed the Glass–Steagall Act of 1933 to separate the functions of commercial and investment banking. A commercial bank is a standard bank that accepts deposits and makes loans. Many countries, such as the European Union, the United Kingdom, and South Korea, do not have a legal separation between commercial and investment banking. Then, in 1999, the U.S. government repealed parts of the Glass-Steagall Act, allowing U.S. investment banks to branch into commercial banking and insurance, thereby enabling them to compete internationally. Unfortunately, the world’s largest commercial and investment banks teetered on the brink of bankruptcy during the 2008 Financial Crisis. Consequently, many government leaders around the world are debating the enactment of similar laws to the Glass-Steagall Act.

The process of issuing new stock is called underwriting. ***Underwriting*** lowers information costs. An investment bank guarantees a stock or bond price to the corporation. Then the investment bank sells the new stock or bond for a higher price, reflecting the investment banker's profit. Furthermore, investment banks may collaborate to form a ***syndicate***. One investment bank becomes the manager and earns management fees, while other investment banks assist in selling the new securities.

The U.S. government requires investment bankers to disclose information to investors, helping to prevent risk and fraud. Unfortunately, investment bankers have access to inside information about corporate mergers. When a corporation acquires another corporation, the merger often causes the target company's stock price to surge. Thus, investment bankers can secretly buy stock or share information with friends and family who buy that particular stock. Insiders can earn a substantial profit, which is illegal in the United States. The Securities and Exchange Commission has the authority to investigate and prosecute these cases.

Parties directly related to a company are prohibited from acting on ***insider information*** because they are part of the company. In some instances, outside parties may be privy to information about a company. For example, a car company plans to introduce a new model of an electric car using lithium-ion batteries. Before the announcement, the company had entered negotiations to purchase batteries to power these cars. However, the battery company can infer that the car company plans to introduce an electric car because lithium-ion batteries are typically used in electric vehicles. The battery company can act on this information and purchase the car company's stock before the stock price rises following the car company's announcement. Consequently, the battery company is not an insider, but it can act on information before it becomes public and earn an abnormal return.

Investors can buy or sell corporate stock through ***organized exchanges***. Exchanges are secondary markets that increase the liquidity of securities. We define organized exchanges as either an exchange or an over-the-counter market. An ***exchange*** has a physical location, and buyers and sellers of securities meet face-to-face. Only members, known as ***specialists***, are eligible to participate in these exchanges. For example, if we want to buy Coca-Cola stock, we must contact a broker who, in turn, contacts a specialist at the New York Stock Exchange. The specialist matches prices and stock quantity for buyers and sellers. Consequently, the broker and specialist earn a commission from each transaction. The oldest and largest U.S. corporations are listed on the New York Stock Exchange, while unknown corporations are listed on the American Stock Exchange.

The over-the-counter (OTC) market does not have a physical location. Telephones and computers connect the dealers and brokers. Both new and small firms are traded in the over-the-counter market. The OTC market in the United States is related to the ***National Association of Securities Dealers Automated Quotation (NASDAQ)***, commonly referred to as NASDAQ. New high-tech firms, such as Texas Instruments, were initially listed on NASDAQ but eventually switched their listing to a major exchange. Europe has its equivalent of NASDAQ, which they call EASDAQ.

Many countries removed the barriers to their financial markets, allowing international companies to sell or buy stock in their countries. For example, a German investor can purchase

U.S. corporate stocks, such as GE and IBM, on the Frankfurt Stock Exchange. In contrast, an American investor can buy Japanese stocks, including those of Honda Motors and Sony, on the New York Stock Exchange. Consequently, the financial markets are truly global, linking savers and investors together worldwide.

Financial analysts compile market indices that measure broad movements in a financial market. Today's most popular and oldest stock market index is the ***Dow Jones Industrial Average***, otherwise known simply as the "Dow" or "the industrials." The Wall Street Journal introduced the Dow in 1882, calculating it as a weighted average of 30 representative stocks from the New York Stock Exchange. The Dow Jones Industrial Average includes companies such as Coca-Cola, IBM, Procter & Gamble, and ExxonMobil. Analysts at the Wall Street Journal adjust the Dow for corporate mergers, bankruptcies, and stock splits. Another popular market index is the Standard and Poor's 500 (S&P 500). It includes 500 stocks listed on the New York Stock Exchange and NASDAQ. We list the major stock exchanges in the world in Table 1, along with their standard market indices.

Table 1. The Major Global Stock Exchanges

Country	Name	Major Market Index	City
Australia	Australian Securities Exchange	S&P/ASX 200	Sydney
Canada	Toronto Stock Exchange	S&P/TSX 100	Toronto
China	Hong Kong Stock Exchange	Hang Seng Index	Hong Kong
China	Shanghai Stock Exchange (SSE)	SSE Composite Index	Shanghai
China	Shenzhen Stock Exchange	SZSE Component Index (500)	Shenzhen
England	London Stock Exchange	Financial Times Stock Exchange (FTSE100)	London
France	Euronext Paris	Cotation Assistée en Continu (CAC) 40	Paris
Germany	Frankfurt Stock Exchange	Deutsche Aktien Xchange (DAX) 30	Frankfurt
Italy	Borsa Italiana	Milano Italia Borsa Index (FTSE MIB)	Milan
Japan	Tokyo Stock Exchange	Nikkei 225	Tokyo
Malaysia	Bursa Malaysia	FTSE Bursa Malaysia KLCI Index	Kuala Lumpur
Mexico	Bolsa Mexicana de Valores	Indice de Precios y Cotizaciones (IPC)	Mexico City
Netherlands	Euronext Stock Exchange	Euronext 100	Amsterdam
United States	New York Stock Exchange	Dow Jones Industrial Average	New York
United States	NASDAQ	NASDAQ 100	New York
Thailand	The Stock Exchange of Thailand	Bangkok SET50 Index	Bangkok

Note: Numbers in the market indices indicate the number of stocks included in the calculation
Note: The Amsterdam Stock Exchange, Brussels Stock Exchange, and Paris Stock Exchange merged to form Euronext.

Market indices provide four benefits. First, the market indices provide broad movements in a stock market. That way, investors know the direction the overall market is heading – up or down. Second, they provide fast information. Financial analysts calculate a market index in seconds and distribute it to investors instantly. Third, private companies calculate the market indices. Thus, the government does not influence the numbers. Lastly, investors can invest in securities that mirror a market index.

The stock market exchanges introduced a new financial instrument, known as ***exchange-traded funds (ETFs)***, in the 1990s. They are similar to open-end mutual funds. Investors can buy into an ETF by purchasing the ETF shares from a broker, similar to buying shares of stock. Initially, the EFTs were designed to track a specific stock market index, such as the S&P 500. Thus, small investors could earn the return of the stock market index without buying all 500 stocks in the S&P 500. EFTs grew significantly and were worth approximately $ 9.7 trillion in 2024.

A stock market occasionally experiences a rapid drop in stock prices, precipitating a stock market crash. A ***stock market crash*** refers to a sudden and dramatic decline in stock prices over a short period. Unfortunately, a stock market crash can lead to the bankruptcy of investment companies, insurance companies, pension funds, and commercial banks. Although commercial banks are not directly involved in the stock market, they may have extended loans to investors who are unable to repay them. Finally, a stock market crash in one market can trigger another stock market crash, even in a foreign country.

The stock market crash served as a precursor to the Great Depression. In 1929, the stock market crashed on October 24 and October 29. Afterward, the unemployment rate peaked at 26% in the United States. Subsequently, the New York Stock Exchange crashed on October 19, 1987. The Dow Jones fell by 508 points (or 27.8%) in a single day, marking the largest one-day loss in U.S. history. However, the United States did not enter a recession because the Federal Reserve intervened, providing emergency loans to financial institutions. Then the United States experienced a stock market crash in March 2000, which triggered the 2001 Recession. Many people refer to this as the dot-com crash because the stock values of many internet companies plummeted to zero overnight. Finally, the U.S. experienced the 2007 Great Recession, the most severe recession since the Great Depression of the 1930s. The recession led to the 2008 Financial Crisis, when pandemonium struck the financial world. Ultimately, many anticipate a stock market crash in 2025, as businesses and consumers have reached their credit limits, bankruptcies are on the rise, and the unemployed struggle to find new employment in a challenging economy.

A stock market crash typically occurs as a result of a financial bubble. A ***bubble*** is a dramatic, rapid rise in asset prices. As asset prices reach a peak, they rapidly fall, bankrupting financial institutions that become caught in the market. The United States and other industrial countries experienced a strong real estate bubble that deflated in 2007. The collapsing housing bubble triggered the 2007 Great Recession and the 2008 Financial Crisis. Unfortunately, real estate prices fell while foreclosures and unemployment soared. Consequently, the investment and commercial banks incurred substantial losses in the mortgage market as homeowners defaulted on their mortgage payments. Banks refused to lend to anyone, causing a credit crunch. A ***credit crunch*** means financial institutions stop lending to themselves and the public, disrupting business activities such as construction and manufacturing. Many anticipate another asset bubble for stocks and real estate in 2025 as the U.S. economy heads into recession.

Investment banks became involved in mortgages because they packaged mortgages into new exotic securities, which were tremendously profitable before 2007. Then stock prices began plummeting in 2008, losing half their value. Some banks, such as Citigroup and Bank of America, were particularly hard hit, as their stocks traded below $1 per share, representing a significant decline in value. The investment bank, Lehman Brothers, declared bankruptcy and closed its doors to the financial world. Unfortunately, many Americans nearing retirement experienced a 50% or more decline in their pension funds, causing them to delay retirement. (We detail the 2008 Financial Crisis in Chapter 18 after students learn derivatives.)

Asset bubbles share similar characteristics and have the following five stages.

1. **Displacement:** A trigger or innovation changes the fundamentals in the economy. Investors observe a promising new trend, technological breakthrough, deregulation, or low interest rates. This displacement attracts the early adopters and “smart money.” For example, the first recorded bubble occurred in the 17th century in the Netherlands. The Dutch elites were introduced to rare tulip bulbs. The dot-com bubble started in the 1990s as the internet revolutionized commerce. In the early 2000s, low interest rates, coupled with subprime mortgages, ignited the U.S. housing bubble.

2. **Boom:** The displacement gains momentum. Prices rise as more participants enter the market. Optimism strengthens. Media attention intensifies. Retail investors enter the market to profit from rising prices and easy credit. Speculation overtakes rational investment. For example, the Tulip Mania took off as tulips became fashionable. The market values of dot-com companies soared, even if the companies lacked sustainable profits. Similarly, U.S. housing prices soared rapidly as home flipping became popular between 2001 and 2007.

3. **Euphoria:** Confidence soars as everyone believes prices will continue going up. The fear of missing out, or FOMO, drives new investors to the market; they ignore risk. The ***bulls*** dominate the market. (A bull is an investor who thinks the financial markets will keep increasing because bulls attack with horns down and then thrust upward.) Valuations lose connections with the fundamentals. Leverage increases as investors rely on loans and margins to finance acquisitions. Alan Greenspan, a former chairman of the Federal Reserve, coined the term “irrational exuberance” in 1996. Investors call this phenomenon ***herding behavior***, similar to a flock of sheep running together to escape a common threat. For instance, a tulip bulb sold for the same price as a house. Mortgage loan originators relaxed lending standards and eliminated income verification and asset requirements between 2000 and 2007. Many low-income households accepted mortgage loans that they could not afford to repay.

4. **Profit-Taking and Crisis:** Prices reach a peak and then begin to decline. Some investors cash out, especially smart money. Negative news surfaces, weakening confidence. Volatility rises from fluctuating prices. For instance, tulip buyers started defaulting on contracts. The earnings of dot-com companies disappoint the investors, prompting analysts to downgrade stocks in 2001. The U.S. economy entered a recession in 2007. Rising unemployment and bankruptcies led to mortgage defaults. The large number of defaults and foreclosures destabilized the U.S. banking system in 2008.

5. **Panic and Bust:** Selling becomes frantic while prices crash. Confidence evaporates. Investors begin exiting the market in large numbers. The ***bears***[2] take over the market. (A bear is an investor who thinks the financial markets are going down because bears attack from above and push downward.) Government scrutiny and economic fallout follow. For example, the tulip market collapsed overnight in 1637. The NASDAQ lost approximately 78% of its value during the bursting of the dot-com bubble in 2001. Rising foreclosures placed enormous strains on the U.S. banking system in 2007, which led to the collapse of Lehman Brothers in 2008 and triggered the 2008 Global Financial Crisis. The crisis spreads across the globe.

What is surreal is that the same scenario is unfolding in 2025. During the 2020 COVID-19 Pandemic, the Federal Reserve and the U.S. government injected massive liquidity into the banking system and economy. Families moved into larger homes, while many office workers began working from home. The U.S. housing market experienced another rapid appreciation in housing prices between 2020 and 2022, coinciding with a spike in inflation. Unfortunately, housing prices began to drop in 2025. Corporate layoffs and business bankruptcies are also increasing as the U.S. economy teeters on the brink of another financial crisis.

Investment Institutions

Investment institutions include mutual funds and finance companies. A mutual fund manager gathers funds from multiple investors and invests the money in a diversified portfolio of stocks. Consequently, a ***mutual fund*** diversifies stocks while lowering investors' risk. For example, we launch our mutual fund and offer investors the opportunity to invest in it. We take their money and buy 30 different corporate stocks. The Coca-Cola stock rises one day while the value of IBM stock falls. The average of the fund's 30 stocks should earn a return for our fund and investors. If we had bought only Kmart corporate stock, we would have lost our investment since the company went bankrupt.

Mutual fund companies have different strategies and characteristics, and well-known mutual fund companies include Fidelity, Vanguard, and Dreyfus. Mutual fund companies develop strategies that only invest in stocks of specific industries, large companies, or foreign companies. Furthermore, the mutual fund company may issue a fixed number of shares to the fund, which we refer to as ***closed-end mutual funds***. Then investors may buy and sell these shares in over-the-counter markets, just like stock. Thus, the mutual fund company does not repurchase its shares for closed-end mutual funds. A mutual fund company may offer another alternative called ***open-ended mutual funds***. Mutual fund companies can repurchase shares in the fund, and the price of the shares becomes tied to the value of the underlying stock in the fund. Ultimately, mutual fund managers employ two primary methods to generate profits. First, fund managers charge management fees for ***no-load funds,*** usually 0.5% of asset value. For the second method, the fund managers charge a commission for selling or purchasing shares for ***load funds***. The load reflects the commission that lowers the fund's value.

[2] Now, we understand why the author used a bull and a bear fighting on the book cover.

Money-market mutual funds are similar to mutual funds. However, the fund manager buys only money market securities, and the fund excludes corporate stock. The theory behind money market mutual funds is straightforward. If we have five friends with $2,000 each and they want to buy a Treasury bill with a minimum face value of $10,000, then our friends can pool their money together and buy one T-bill. Once the T-bill matures, our friends split the interest among themselves.

Money-market mutual funds are very popular. They offer check-writing privileges, and some investors want to avoid tying up their funds for an extended period. Moreover, the fund's value remains relatively stable when interest rates fluctuate, as money market securities typically have a maturity of less than one year. In 2024, money-market mutual funds had assets of $6.6 trillion.

Commercial banks offer ***money market deposit accounts*** that are similar to money market mutual funds. However, the two funds differ because the Federal Deposit Insurance Corporation (FDIC) insures the money market deposit accounts, while it does not insure money market mutual funds. If our bank goes bankrupt and we have invested in money market deposit accounts, we are insured up to the maximum insured amount, which is $250,000 as of 2024.

Finance companies are another type of investment institution that raises money by selling stocks, bonds, and commercial paper. Commercial paper is a short-term loan with a maximum maturity of 270 days, typically issued by a well-known bank or corporation. Commercial paper is a form of direct finance and has no collateral. In addition, finance companies lend to consumers for furniture, appliances, cars, and home-improvement loans, or they lend to small businesses. Some corporations created their own finance companies to help consumers buy their products. For example, General Motors Acceptance Corporation (GMAC) lends money to people so they can buy cars from General Motors (GM). However, GM sold its 51% stake in GMAC to Cerberus Capital Management in 2006. Then GMAC expanded into the mortgage market and was caught in the 2008 financial storm when the housing bubble deflated. GMAC was renamed Ally Bank in 2010 and became part of the bank holding company Ally Financial, Inc.

Contractual Saving

Contractual saving institutions are insurance companies and pension funds. ***Insurance companies*** protect people who buy insurance policies. An insurance policy prevents financial hardship, such as a medical emergency, a car accident, or the death of a family member. Insurance companies serve as financial intermediaries, connecting the funds of policyholders to the financial markets. Policyholders make periodic payments to the insurance company, known as ***premiums***. The insurance companies will invest the premiums in the financial markets. For the insurance company to earn a profit, the interest earned in the financial markets plus the premiums must exceed the amount paid for claims. The largest insurance companies include Allstate, Aetna, and Prudential. Most states established commissions that regulate insurance companies. Commissions may limit premiums, minimize fraud, and prevent insurance companies from investing in risky securities.

Insurance companies use the ***law of large numbers*** as they insure many people. On average, statisticians can predict an insurance company's payout in claims because they can accurately predict the rates of death, illness, injury, and property damage for an entire country. Statisticians do not know which individuals will experience hardship, but they can predict how often it occurs for a large population. Unfortunately, insurance companies face two significant challenges when selling insurance policies: adverse selection and moral hazard. ***Adverse selection*** refers to a situation where a person buying insurance has more information than the insurance company. For example, a person knows he has a heart problem and decides to buy an extensive life insurance policy. Then he hides this information from the insurance company. ***Moral hazard*** refers to the phenomenon where people who purchase insurance become more careless than they would be without insurance. For instance, a person buys theft insurance for their home, but then stops locking their windows and doors when they leave, increasing the risk that a burglar will break into their house.

Insurance companies use two strategies to combat moral hazard and adverse selection. First, insurance companies gather information about policyholders, including their driving records, medical records, and credit histories. Consequently, the insurance company charges a higher premium to individuals likely to file a claim, which is referred to as a ***risk-based premium***. Second, insurance companies use a ***deductible***. When a person makes a claim, they must pay the initial portion. For example, a person buys health insurance with a $500 deductible. After this person has paid the first $500 for medical expenses, the insurance company pays the remainder of the claim. This passes some of the responsibility to the person holding the insurance policy. Finally, a person could buy insurance with smaller premiums but a greater deductible.

The first type of insurance company is a ***life insurance company***. These companies purchase long-term corporate bonds and commercial mortgages because they can accurately predict future payments. Furthermore, insurance companies are organized in two ways: Mutual or stock. Insurance policyholders own a ***mutual company*** because the insurance policy functions as corporate stock, whereas a ***stock company*** is a corporation that issues shares of stock. Thus, the shareholders own the company, while the insurance policyholders do not. A stock company is more common because it has more funding sources. They receive funding by selling stock to shareholders and revenue by selling insurance policies. Most policies issued are called ***term life policies***. The person buying the life insurance must pay the premium for the rest of their life. These policies are popular because the policyholder can borrow against the policy's value upon retirement. Borrowing against insurance is an annuity. An ***annuity*** pays a retired person a specific amount of money each year.

The second type of insurance is property and casualty insurance. They are organized as either a stock company or a mutual company, and they insure against theft, floods, illness, fire, earthquakes, and car accidents. These companies tend to purchase liquid, short-term assets because they cannot accurately predict the number of future claims that will arise. Insurance companies charge premiums that correspond to the chance of the event occurring. For example, a homeowner in California would pay a higher premium for earthquake insurance than a homeowner in the Midwest of the United States because California experiences more earthquakes.

Pension funds are another contractual savings institution. Many people save money for retirement, and ***pension funds*** become a vital form of saving. Some employers sponsor pension funds as a job benefit, or workers can voluntarily pay into personal retirement accounts. Then the financial companies manage the pension funds and invest them in the financial markets. Pension fund managers can accurately predict when people will retire and usually invest in long-term securities, such as stocks, bonds, and mortgages. A person can only receive benefits from the pension fund after they become vested. ***Vested*** means that employees must work for their employer for a minimum amount of time before they can receive benefits from the pension plan. The period varies for the pension funds. For example, some city governments require an employee to be employed by the city for 10 years before they become 100% vested in the city's pension plan.

Employers have three reasons for offering pension plans to employees. First, the pension fund managers can more efficiently manage the fund, lowering the pension fund's transaction costs. Second, the pension funds may offer benefits such as life annuities. A life annuity is a type of annuity that retired people receive monthly payments from the annuity until their death. Life annuities could be expensive if a worker buys them individually. However, a large employer with many employees can request discounts from pension companies. Finally, the government does not tax the pension fund as workers invest funds into it, allowing it to grow faster. Nevertheless, the government usually imposes taxes on withdrawals from a pension fund. Suppose the employer offered higher wages and no pension plans to the employees. In that case, the government taxes the greater income, reducing the amount an employee could invest in a retirement plan.

Employers have two options for owning a pension plan. First, employees own the value of the funds in the pension plan, which is referred to as a ***defined contribution plan***. Retired employees will receive a higher pension income if the pension fund is profitable. The retired employees will receive a low pension income if the pension fund is not profitable. Companies with a defined contribution plan are likely to invest pension funds in their employers' stock. That way, employees have an incentive to be more productive because the value of their pension plan depends on their company's profitability. However, this pension fund becomes a liability if the company goes bankrupt. Then the employees own worthless stock. One infamous case was the Enron collapse in 2001. Some employees were paper millionaires until their stock portfolios suddenly lost value as the Enron stock price collapsed from $70 per share to less than a dollar. Second, the most common type of plan is the ***defined-benefit plan***. An employer promises a worker specific benefits based on the employee's earnings and years of service to the company. If this pension fund is profitable, the company pays the promised benefits and retains the remaining funds not paid to the retired employees. If the pension fund is unprofitable, the company pays the promised benefits out of its pocket.

Federal and state governments regulate the pension funds. Regulations require pension fund managers to disclose all investments. That way, employees know which securities the pension fund managers have invested in. Regulations help prevent fraud and mismanagement. Unfortunately, a pension fund will go bankrupt when the company where the employees work goes bankrupt. Consequently, Congress created the Pension Benefit Guaranty Corporation, which insures pension fund benefits up to a specific limit if the company is unable to meet its obligations. Some economists believe a pension fund disaster is likely to occur for state and local government retirees after 2022. Many state and local governments offer generous defined-benefit plans to public employees, and they have not raised enough money to fund these pension plans.

A recent trend in pension funds allows employees to manage their 401(k) plans, also known as pension plans. The 401(k) refers to a section of law in the Internal Revenue Service's regulations, and the benefit of this pension plan is that the employee can take their pension plan with them when they switch employers. However, the 401(k) has one risk. The amount of money a person has accumulated at retirement depends on how much money they invested in the plan and how well the investments have performed.

Depository Institutions

Depository institutions are intermediaries that connect savers to borrowers, accepting deposits and making loans. ***Commercial banks*** are the largest and most dominant among depository institutions. Many borrowers seek bank loans for mortgages, car loans, or credit cards. Savers have three reasons to deposit their savings in a bank rather than invest directly in the financial markets. First, the bank deposits are liquid. A depositor can quickly exchange their bank deposit for cash or use a smartphone app to transfer funds quickly and easily. People scanning QR codes with their smartphones have become a popular payment method. Second, banks gather information about their borrowers, thereby reducing the risk of loan default. Banks hire a financial specialist who monitors investments. On the other hand, an investor would spend a significant amount of time and effort monitoring their investments in the financial markets. Finally, banks mitigate risk by lending to a diverse range of borrowers. Consequently, commercial banks are essential to a community because they accept deposits and lend money.

Savings institutions are another depository institution. Initially, these institutions accepted deposits and granted low-cost mortgages for homebuyers. During the early 1980s, many savings institutions faced a financial crisis due to the rise in interest rates. For example, if we borrowed $10,000 at a 5% interest rate and loaned it out at 10%, we earn a profit. However, if we borrowed $10,000 at a 10% interest rate and loaned it out at 5%, we would subsequently incur a loss. Unfortunately, this happened to the savings institutions. Interest rates rose during the 1980s as savings institutions paid a greater interest rate to depositors than the amount these institutions earned on mortgages. Mortgages are usually 30-year loans, and savings institutions were locked into low interest rates from the 1960s. Currently, savings institutions are similar to banks, except that different government agencies regulate them.

Credit unions are another depository institution. Credit unions are similar to commercial banks, except they restrict membership. Credit unions extend membership to people who share a common interest. Usually, people work for a particular company or industry. For example, many states have credit unions for schoolteachers. These institutions only allow schoolteachers to open accounts. Initially, credit unions offered savings accounts and made consumer loans for cars and boats. However, credit unions have evolved similarly to banks, offering the same services, including checking accounts and mortgage loans. Some credit unions have lessened their member restrictions as they compete directly with banks. Consequently, commercial banks want credit unions to be treated on equal grounds with commercial banks because a credit union does not pay income taxes on its profits.

Government Financial Institutions

Federal, state, and local governments in the United States create ***government financial institutions*** that lend funds to the public. This is a type of direct financing in which a government establishes a public corporation that sells bonds and commercial paper to investors in the financial markets. Then the public company uses the investors' money to lend directly to borrowers. For example, the Farm Credit System, a U.S. government agency, lends to farmers. Farmers use loans to finance the growth of crops, equipment, or mortgage loans. Additionally, the U.S. government provides financial aid to students pursuing a college education. For example, the Student Loan Market Association, known as Sallie Mae, lends directly to students or buys student loans from banks. Finally, the Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation (Freddie Mac) grant mortgages to low-income households. They also buy and sell mortgages to boost the liquidity of the mortgage loan market. They both became giants in the mortgage market by buying or backing over half of all mortgages granted in the United States.

The government can utilize a second method to lend to the public via loan guarantees, similar to insurance. For example, a commercial bank lends to a student to cover the costs of education, and the U.S. Department of Education guarantees the loan. If the student defaults, the U.S. Department of Education repays the loan to the bank, and then the U.S. government uses its authority and resources to collect from the student.

Some people question a government's role in financing. When a government directly lends, it squeezes financial institutions out of the loan market. Furthermore, the federal government loan guarantees can exacerbate moral hazard. Financial institutions that receive loan guarantees may not screen borrowers as thoroughly, lending to those with a higher default risk. For example, the effects of the 2007 Great Recession continue to linger in the U.S. economy. Then the COVID-19 pandemic struck the world in 2020, and the U.S. economy appeared to be in a recession in 2025. Economic slowdowns lead to mass layoffs and increase the unemployment rate. Housing values also plummet during economic downturns, while foreclosures soar. Consequently, the U.S. government might be liable for trillions of dollars in loan guarantees and bailouts of public corporations. We explain several examples below:

- ❖ The U.S. Department of Education, Sallie Mae, and commercial banks granted college student loans that exceeded $1.8 trillion in 2025. Unfortunately, college graduates enter a dismal job market with substantial debt. The student-loan default rate hovers below 10% but spikes during economic downturns. By April 2025, 31% of student loans are 90+ days past due. College students, on average, owe approximately $39,000, while law school graduates accumulate loans exceeding $130,000. Unfortunately, a stagnant economy could force the U.S. government to pay billions in loan guarantees.

- ❖ Fannie Mae and Freddie Mac hold roughly $7.25 trillion in mortgages in 2025, which comprise half of the mortgages in the United States. The U.S. government seized these two institutions in 2008 and has spent billions of dollars to bail them out. They appear financially sound in 2025. However, another economic downturn could lead to substantial bailout costs. One of these companies' missions is to grant mortgages to low-income households who are vulnerable during economic downturns.

Key Terms

investment bank
underwriting
syndicate
insider information
organized exchanges
exchange
specialists
National Association of Securities Dealers Automated Quotation (NASDAQ)
Dow Jones Industrial Average
exchange-traded funds (EFTs)
stock market crash
bubble
credit crunch
bull
herding behavior
bear
investment institutions
mutual fund
closed-end mutual funds
open-ended mutual funds
no-load funds
load funds
money-market mutual funds
money market deposit accounts
finance companies
contractual saving institutions
insurance companies
premiums
law of large numbers
adverse selection
moral hazard
risk-based premium
deductible
life insurance company
mutual company
stock company
term life policies
annuity
pension funds
vested
defined contribution plan
defined-benefit plan
depository institutions
commercial banks
savings institutions
credit unions
government financial institutions
vested

Chapter Questions

1. Which institutions are defined as securities market institutions?

2. Please explain the Dow Jones Industrial Average's purpose and usefulness.

3. What are stock market crashes, and why are they bad for an economy?

4. Which institutions are classified as investment institutions?

5. Identify examples of moral hazard and adverse selection for a person buying car insurance.

6. Which institutions are defined as contractual saving institutions?

7. Which institutions are classified as depository institutions?

8. Which institutions are defined as government financial institutions?

9. Could France suffer from a college bubble where students do not pay tuition or take out student loans?

6. Cryptocurrencies

We give an overview of cryptocurrencies and how investors can exploit them. Cryptocurrencies are a marvel in technology. Nick Szabo coined the term “smart contracts” in the 1990s. A decade before Bitcoin was founded, Szabo suggested that miners could mine cryptocurrency using their home computers. The miners solve a problem that allows a block of transactions to be added to the blockchain. Then the miners are paid in newly minted coins. Satoshi Nakamoto authored the seminal white paper that established the theory behind Bitcoin, the world’s first cryptocurrency. No one knows the identity of Satoshi Nakamoto, but some claim that Nick Szabo is Satoshi Nakamoto, a claim he denies.

Cryptocurrencies have appreciated rapidly in a short period. For example, Bitcoin’s value increased by 1,318 percent in 2017, gaining investors’ attention and creating the first wave of Bitcoin millionaires. Some investors aim to capitalize on Bitcoin’s rapid appreciation and incorporate cryptocurrencies into their investment portfolios. However, Bitcoin crashed in 2018. Alas, cryptocurrencies are one of the most volatile markets created so far.

The Winklevoss Twins, Tyler and Cameron, are among Bitcoin’s advocates and original investors. They were Olympian rowers who finished sixth in the 2008 Beijing Olympics. They claimed they devised the idea for Facebook at Harvard University and hired Mark Zuckerberg as the programmer. Mark settled a lawsuit with the Winklevoss Twins. Furthermore, the twins used their wealth to buy Bitcoin when it was $10 per coin and became Bitcoin billionaires in 2017. They advocate that the Securities and Exchange Commission allow investors to include Bitcoin in exchange-traded funds. The SEC allowed EFT fund managers to add Bitcoin in 2024.

The Blockchain

Crypto in cryptocurrency comes from the word ***cryptography***, which means “secret” or “anonymous.” The military uses cryptography to encrypt or conceal messages passed between parties, so that if a third party intercepts the message, it cannot be read. Symmetric encryption cryptography is the simplest method, as both the sender and receiver use the same secret key to encrypt and decrypt the message. A spy or hacker intercepting the message cannot decrypt it unless they possess the key.

Cryptocurrencies use ***asymmetric encryption cryptography***. We encrypt a message using the receiver’s public key, while the receiver decrypts it with their private key. Anyone can decrypt the message using the sender’s public key. Consequently, how do we know the receiver is the one who sent the message and not an impostor? First, the sender encrypts their message with their private key. Second, the sender encrypts the message with the receiver’s public key. Third, the receiver receives the message and decrypts it using their private key. Lastly, the receiver decodes the message with the sender’s public key. That way, these two parties can communicate with each other while spies and hackers cannot decrypt the intercepted message.

A ***crypto wallet*** can handle the asymmetric encryption. It is an application that can be used on a smartphone or computer. Technically, it does not store our cryptocurrencies. It reads the blockchain, displays the number of coins we have, and recent transactions for our wallet address. Each wallet has an address similar to a bank account number, which allows us to send or receive funds with other parties. However, the wallet stores our private and public keys. We use our private key to conduct and approve transactions. If hackers obtain our private key, they gain access to our wallet and can perform transactions on our behalf. Some hackers send fake coins or tokens, attempting to trick users into engaging in transactions with these counterfeit assets. Then they can get access to our private key. The private key confirms ownership over a particular crypto wallet.

The crypto wallet reads a blockchain for a particular cryptocurrency. The ***blockchain*** is a database or digital ledger. Although Bitcoin primarily holds transactions, the blockchain can also store transactions, medical records, land titles, supply chain information, identity verification, or legal ownership records. The blockchain is transparent because anyone can scan it and view the records.

We show a simplified blockchain in Figure 1. The information or transactions, in this case, are stored in a block. The average size of a Bitcoin block is approximately 1 megabyte, which contains around 500 transactions. For example, Kenneth R. receives 10 Bitcoins while Jessica and Fred send 5 and 2 Bitcoins, respectively, in Block 1. Once a block is full of transactions, it is sent to the miners, who solve a computer problem by adding a nonce to the block. A nonce is similar to a random number that solves this computer problem. Then miners calculate a unique signature for this block and record it in the next block. Suppose hackers modify one of the blocks. When miners calculate the unique signature with that nonce, the resulting signature will not match the one recorded in the next block. Thus, the miners know this block was modified and will ignore it.

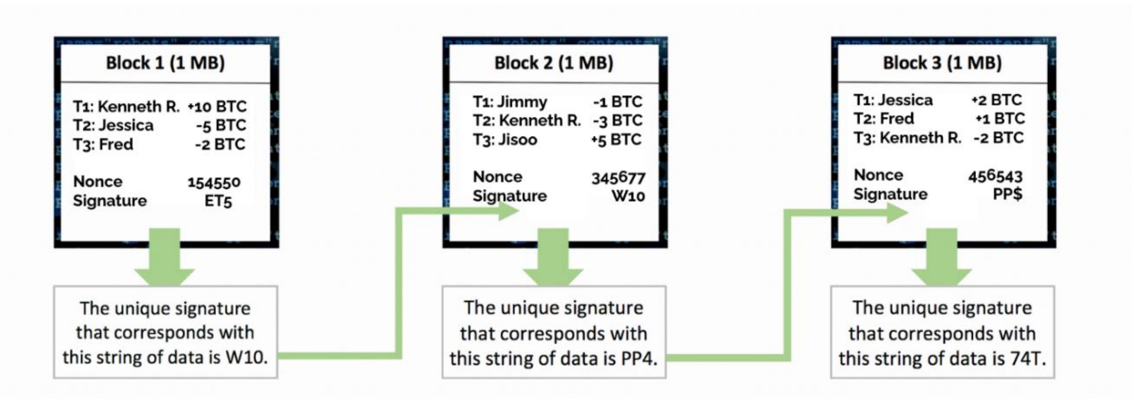


Figure 1. An example of a blockchain

A block cannot be changed once it has been completed and added to the blockchain. Thus, the records are not changeable. Furthermore, if hackers steal coins or we send cryptocurrency to the wrong wallet, we lose those coins. Blockchains do not allow chargebacks. In contrast, banks and financial intermediaries can perform chargebacks to reverse transactions. Blockchains have no central authority, and blockchains do not allow modifications. This is both the power and danger of cryptocurrencies. All miners have a complete copy of the blockchain, which decentralizes it and distributes it across multiple miners. However, the blocks cannot be modified to correct accounts for hacks, thefts, or mistakes.

Bitcoin and other coins use ***proof of work***. That means these coins allow independent miners to solve a problem, enabling another block to be added to the blockchain. These networks are entirely decentralized, and the miners earn newly minted coins and transaction fees. In 2010, users at home could mine Bitcoin on their home computers and laptops; however, large mining farms now dominate the industry. Other minable coins include Litecoin, Dogecoin, Monero, and Ravencoin.

Bitcoin employs a ***halving cycle*** that gradually reduces the reward over time. When Bitcoin was first created in 2009, miners could earn 50 Bitcoins for adding a block to the blockchain. After 210,000 blocks are added to the blockchain, the reward for Bitcoin is halved, which occurs approximately every four years. Newly minted Bitcoins dropped to 25 coins on November 28, 2012. This halved to 12.5 Bitcoins in 2016, 6.25 coins in 2020, and 3.125 coins in 2024. In addition, a bull and bear cycle typically follows the Bitcoin halving cycle, where cryptocurrencies experience an extreme bull market followed by a cold crypto winter.

Mining cryptocurrencies requires many computers and electricity. Large Bitcoin farms require massive amounts of electricity, with a farm using between 86,000 and 286,000 kWh per year. For example, Bitcoin's network consumes approximately 128 GWh per day to produce 900 Bitcoins. Some environmentalists and political leaders complain about the massive electricity requirements because fossil fuels, such as coal and natural gas, are burned to generate electricity, which contributes to greenhouse gas emissions. In summary, cryptocurrencies may not be environmentally friendly.

Some cryptocurrencies use ***proof of stake***, where a company manages the computers in their coin's blockchain. Many cryptocurrencies with proof-of-stake allow coin holders to deposit coins on a company's blockchain computer system, similar to a bank's time deposit. Users stake their coins. Thus, they cannot spend them. As the company's blockchain adds new blocks and mints new coins, these coins are distributed to stakeholders as interest. Staking encourages investors to purchase specific coins and hold them to earn additional rewards. Some coins offer reasonable interest rates, such as Tron (TRX), which pays an annual interest rate of 5%. Lastly, investors earned up to 55% on Pancake Swap with their CAKE token in 2022.

Bitcoin and the Rise of Cryptocurrencies

Satoshi Nakamoto invented the first cryptocurrency, ***Bitcoin***, in 2008. Satoshi Nakamoto is a pseudonym, and nobody knows his real identity. A Satoshi Nakamoto is living in California. He is a physicist, of Japanese descent, and a libertarian, but he claims he did not invent Bitcoin. However, Satoshi Nakamoto, the Bitcoin creator, holds approximately 980,000 Bitcoins because he created one of the first wallets on the blockchain. One of the oldest Bitcoin wallets, which had been inactive for 9 years, became active in 2021 and moved 616 Bitcoins. Consequently, he would be a billionaire, worth about $58.8 billion. He wrote the first ***white paper*** that launched the industry (https://bitcoin.org/bitcoin.pdf). The writing style indicates the writer is British. The white paper explains why the coin was created, its objectives and goals, and its key features. Many cryptocurrency creators follow this process and write a white paper, similar to a corporation's stock prospectus. Nevertheless, Bitcoin remains the number one cryptocurrency in market capitalization, with a market capitalization of $2.2 trillion as of 2025.

Satoshi Nakamoto wrote a ***peer-to-peer payment system*** in response to the 2008 Global Financial Crisis. The theory behind Bitcoin was to challenge the immense power of banks. The banking system earns fees from individuals who make transactions, such as those using debit cards and checking accounts. Additionally, the banking system earns fees for converting one currency into another or conducting international transfers. Satoshi Nakamoto developed a new payment system that could settle transactions between individuals without intermediaries or geographical boundaries.

The financial system requires trust. Cryptocurrencies eliminate intermediaries, such as banks, because people can directly transact with each other, regardless of their lack of trust in traditional financial institutions. When we use a debit card at the store, the store owner trusts that the bank will credit the customer's account with the customer's funds. The blockchain does not require trust. The system determines whether the payer has the balance in their wallet. Then the system moves the coin from their wallet to the merchant via the blockchain. Bitcoin solves the ***double-spending problem*** when a user attempts to spend the same Bitcoin twice. The blockchain is transparent and open to anyone. Outsiders can verify that there is no double spending.

Cryptocurrency can simplify international transactions. For example, we pay for a product in Japan. We buy Bitcoin and send it to the seller. The seller cashes out this Bitcoin in Yen. Thus, we can see that cryptocurrencies are popular. We do not have to worry about a foreign government seizing funds or bank accounts. This is one of the reasons the U.S. government opposes cryptocurrencies. Cryptos can become the new international transaction currency. Table 1 shows the Bitcoin Market Capitalization for the top countries. China comes first, followed by the United States, and then the Eurozone. The cryptocurrency market capitalization was $3.35 trillion in 2024. Meanwhile, the New York Stock Exchange had a market capitalization of $28.4 trillion in 2024, while the U.S. federal government debt totaled $36 trillion.

Table 1. The Top Countries for Bitcoin Market Capitalization in 2024

Rank	Country	Market Cap	Circulating Supply
1	China	446,974,397 BTC	309,480,000,000,000 CNY
2	United States	222,972,054 BTC	21,311,000,000,000 USD
3	Euro Area	182,767,036 BTC	16,548,705,000,000 EUR
4	Japan	110,592,861 BTC	1,601,217,000,000,000 JPY
5	United Kingdom	46,971,901 BTC	3,545,530,000,000 GBP
6	Germany	43,624,549 BTC	3,950,000,000,000 EUR
7	South Korea	41,654,802 BTC	5,557,494,000,000,000 KRW
8	France	39,589,168 BTC	3,584,615,000,000 EUR
9	India	32,806,594 BTC	264,769,000,000,000 INR
10	Canada	27,860,274 BTC	3,731,317,000,000 CAD
11	Hong Kong	24,538,886 BTC	18,251,104,000,000 HKD
15	Taiwan	20,378,508 BTC	63,385,514,000,000 TWD
23	Thailand	7,842,827 BTC	25,804,000,000,000 THB
30	Malaysia	5,692,718 BTC	2,417,132,000,000 MYR

Source: FiatMarketCap

Cryptocurrency as Money

Cryptocurrencies use a blockchain to store transactions. Anyone can view transactions on the blockchain. Refer to Blockchain.com. No central authority creates the cryptocurrency or manages the asset. For example, central banks establish a fiat currency. The government defines fiat currency as a legal tender, which means that people can use it to settle payments and repay debts. Then central banks increase their money supply over time, which leads to inflation. However, cryptos are decentralized. Many cryptocurrencies impose a maximum coin supply. For example, Bitcoin is designed to have a maximum supply of 21 million coins. Bitcoin miners can earn newly minted coins by solving the blockchain puzzle first. However, miners would only earn transaction fees once the maximum number of Bitcoins is in circulation.

The primary function of money is to serve as a ***medium of exchange***, enabling two parties to enter into a transaction. The buyer exchanges money with a seller for a product or service. Then they exchange products and services for money. For cryptocurrencies to be accepted, buyers and sellers have to use them to settle transactions. However, Bitcoin transactions are slow, and transaction fees are high when the Bitcoin network is congested. The high fees can prevent society from adopting them.

Money's second function is a ***store of value***; the asset must be stable and retain its value. We already know that inflation erodes the value of money. Similar to currency, companies can increase the supply of crypto coins, which leads to inflation. In addition, a severe problem with cryptocurrencies like Bitcoin is their high volatility, which causes prices to rise and drop quickly. Figure 1 shows the Bitcoin price since its inception. In 2024, the Bitcoin price bottomed out at $40,000 per coin and then reached $100,000, representing a significant swing. This extreme volatility led to the creation of ***stablecoins***, whose value is pegged to the U.S. dollar or euro. The U.S. government is also against stablecoins. Perhaps they could evolve into an alternative international transaction currency. The common stablecoins include Tether, USDC, Dai, First Digital USD, and BUSD. Lastly, some cryptocurrencies have tied the value of their coins to the price of gold per troy ounce. Tether Gold (XAUt) and PAX Gold offer coins tied to the gold market value. Supposedly, both companies hold the equivalent of gold in their vaults.

Money's third function is a ***unit of account***. This function enables us to assign a value to an asset. Cryptocurrencies allow a unit of account. However, cryptocurrencies can appreciate quite quickly. For example, Bitcoin Pizza Day is celebrated on May 22, when Laszlo Hanyecz used 10,000 Bitcoins to purchase two Papa John's pizzas on May 22, 2010. At that time, few people accepted Bitcoin. Using a current value of $90,000 per Bitcoin, those two pizzas are valued at $900 million in 2024. Now, we can see the allure of cryptocurrencies and how the rapid appreciation created Bitcoin millionaires overnight.

Cryptocurrencies are a mixture of stock and money. When buying a cryptocurrency, we buy into a company's ecosystem. Cryptocurrencies require three key attributes to be accepted as a form of payment. First, people must possess cryptocurrencies. Second, merchants and businesses must accept crypto as a form of payment. Ultimately, society must trust that cryptocurrencies are valuable and will continue to be so. As cryptocurrencies gain popularity, crypto ATMs are emerging in the United States and around the world.

Figure 1. The Daily Bitcoin Price

We can add layers to a cryptocurrency. For example, Bitcoin is a coin on the Bitcoin blockchain, while Ether is a coin on the Ethereum network. However, Ethereum uses smart contracts, which add functionality beyond the functions of a currency. A ***smart contract*** is a computer program that automatically executes an agreement when certain conditions are met. For example, anyone can create a ***token*** on the Ethereum blockchain. For example, Shiba Inu and PAX Gold are tokens on the Ethereum Blockchain, while Dogecoin is a token on the Binance Smart Chain (BEP20). A token is similar to a coin in that it facilitates payments. Furthermore, Matic is the token used on the Polygon Network, which sits on top of Ethereum as a Layer 2. Matic has cheaper transaction fees than Ethereum. (Matic has its blockchain at https://polygonscan.com/). Thus, anyone can create their tokens that sit on top of another ecosystem. They can make an ***Initial Coin Offering (ICO)*** to raise funds for a crypto company, which is similar to an Initial Public Offering (IPO). Investors must exercise caution when investing in new coins and tokens. Many scams exist in the crypto world.

Smart contracts allow the creation of ***nonfungible tokens (NFTs)***. Fungible tokens mean that each token does not differ from other tokens. If we exchange one Bitcoin for another, these Bitcoins are identical. However, NFTs mean that these tokens differ from one another. For example, we digitally create a masterpiece like Edward Munch's The Scream. We place our masterpiece online. Then a smart contract enables us to create nonfungible tokens for this masterpiece, allowing us to sell them to investors. Thus, investors own a piece of the artwork by purchasing our NFTs for that specific piece. When investors buy or sell NFTs, the artist earns a commission from the trade. As a side note, investors can use NFTs to purchase land in games and virtual worlds. Just think of an NFT as a token that allows investors to buy specific digital assets.

Cryptocurrency Benefits and Misconceptions

Cryptocurrencies offer numerous benefits but also come with several misconceptions. The benefits include the following:

- Cryptocurrencies cut out the middlemen. The blockchain serves as the intermediary, recording all transactions. Banks and financial intermediaries facilitate transactions between businesses and individuals, charging fees for these transactions. The cryptocurrency ecosystem also charges transaction fees, which can be cheaper. However, cryptocurrency transaction fees surge during periods of network congestion.

- Corruption requires a concentration of power, where power brokers can wheel and deal with themselves. Large banks and central banks wield enormous power. However, cryptocurrencies decentralize power and challenge the authority of banks and central banks. Thus, decentralization disperses power and authority.

- After the 2008 Global Financial Crisis, central banks rapidly expanded the money supply, a policy known as quantitative easing. We had the same fears after many governments closed their countries' borders and shut down commerce during the 2020 Coronavirus Pandemic. Central banks are rapidly increasing the money supply to maintain economic growth. Many fear that the rapid increase in the money supply will lead to inflation and a depreciation of currencies. However, Bitcoin and many other coins have an upper limit to the number of coins that can be minted.

- Private companies and individuals can mine and maintain cryptocurrencies, thereby removing government control. This is another reason why governments are hesitant to adopt cryptocurrencies, as they cannot regulate and control them. In some countries, people lack trust in their government or banks and instead utilize alternative systems to settle payments. For example, a government can prevent people from opening bank accounts and seize money from bank accounts. For example, the Indian government banned banknotes in 2016. The government claimed it needed to fight against corruption, tax evasion, and wealthy individuals hoarding banknotes. It created many problems since everyone had to wait in line to exchange their old currency for the new one. Nevertheless, cryptocurrencies give people control over their own money.

- Many people in the world do not own bank accounts. However, they are likely to own a smartphone. The saying is that many of the world's poor have access to smartphones but not toilets. Many smartphones allow the installation of crypto wallets, which enable users to access cryptocurrencies. Thus, cryptocurrencies allow the world's poor to access digital accounts and electronic payment systems.

- Bitcoin and cryptos have become status symbols. Some people show that they do not need the government or the central bank. They can enter into transactions using modern computer technology.

Bitcoin and cryptocurrencies are often associated with numerous misconceptions. Refer to the following:

- The first misconception is that criminals are the only ones who use cryptocurrencies. That is why the U.S. government is cracking down and trying to regulate cryptocurrencies. The famous criminal, Ross Ulbricht, a physics student, founded the Silk Road in 2011. The Silk Road became a black market on the dark web. The dark web is a part of the internet where websites operate without traditional IP addresses. Governments and internet providers can track users via their IP addresses but not the dark web. Ross sold various drugs through the Silk Road and required payment in Bitcoin. The FBI arrested Ross in 2013 and shut down his operation. The agents seized more than $1 billion in Bitcoin. During legal proceedings, Ross tried to hire hitmen to silence witnesses against him, but was not successful. The judge made Ross Ulbricht an example by imposing a life sentence without the possibility of parole. Accordingly, Bitcoin still has this reputation of being used by criminals. Some hackers and hitmen advertise their services on the dark web, but anyone can use cryptocurrencies, not just criminals.

- Users, including criminals, assume their transactions are anonymous. However, this is not entirely true. All transactions are recorded on the blockchain, using the wallet address as the equivalent of a bank account number. For example, we can view the cryptocurrency wallet as similar to a web browser to view emails, whereas all emails are viewable on the blockchain. If someone connects our identity to our wallet address, that person can view all of our transactions. If the government or tax authority figures out our wallet address, agents can scan the entire blockchain for all transactions associated with this wallet address. Furthermore, when a hacker steals funds from someone, it is easy to track where the money goes. That is the idea behind Monero, a cryptocurrency that hides the wallet addresses. Some refer to Monero as a cryptocurrency used by criminals. (Refer to https://www.getmonero.org/).

Alternative Coins

Bitcoin has a scalability problem. It adds a new block to the blockchain every 10 minutes, which averages about 7 transactions per second. ***Alternative coins*** (or ***altcoins***) utilize shorter blocks that process transactions more quickly, thereby enhancing the user's experience. For example, Ethereum adds a block every 15 seconds. Ethereum calls these blocks Uncles. Shorter blocks and faster transactions increase the likelihood that a given node will process transactions incorrectly. The node may not have been aware of some transactions originating from distant locations or may have become aware of them late. Lastly, alternative coins differ in transaction fees, known as ***gas fees***, which can be high, especially when the network is congested. Before 2023, Ethereum users incurred expensive gas fees during congested periods, whereas the Binance Chain typically has low gas fees.

The computer code is not perfect. Software engineers and programmers have changed the code for Bitcoin. However, the community must stand behind the changes. Sometimes, some computer miners disagree with the changes and will split from the original coin. At other times, computer programmers will take the computer code for a cryptocurrency, such as Bitcoin, and modify it to create a new alternative coin, known as an altcoin. Altcoins offer improved speed, security, anonymity, and additional benefits. For example, Litecoin, Bitcoin Cash, Bitcoin SV, and DogeCoin use Bitcoin's source code. DogeCoin started as a joke in 2013 but has grown into the seventh-largest cryptocurrency by market capitalization. Their tagline is "open source peer-to-peer digital currency, favored by Shiba Inus worldwide." Shiba Inu is a popular Japanese dog breed. DogeCoin is a token on the Binance Smart Chain with a market capitalization of USD 61.49 billion as of 2024. Lastly, Dogecoin inspired the token Shiba Inu, another cute meme coin based on the Japanese dog breed.

Ethereum is the second-largest coin in market capitalization. Ethereum refers to both a coin and a foundation. The coin is sometimes called ether. Ether is a substance that fills space and allows light waves to pass through. Ether is also a class of organic compounds that induces sleep. Ethereum uses the ***Ethereum Virtual Machine (EVM)*** to view transactions as smart contracts. Smart contracts written in Solidity extend beyond the fundamental role of Bitcoin transactions, offering a more comprehensive approach to digital transactions. Smart contracts enable multiple parties to enter into a contract, while the EVM enforces the contract's conditions. No third party, such as a judge, magistrate, or government agency, is required to enforce contracts. When certain conditions are met, the contract executes orders and triggers actions.

Smart contracts have many applications in the business world. Smart contracts enable ***DeFi***, or short for ***decentralized finance***. Investors can join farms or liquidity pools (LPs) by depositing their coins on a decentralized finance (DeFi) platform to earn interest and dividends from their investments. Smart contracts allow the creation of nonfungible tokens (NFTs). The blockchain establishes ownership rights for electronic media, including images, art, music, and videos. Users can buy or sell NFTs, while the original artists collect a royalty fee from every transaction. (Some investors buy NFTs to buy real estate in virtual worlds.) Some people discuss using blockchain technology to help businesses comply with regulations. For instance, U.S. small businesses incur approximately $83,000 in compliance costs during their first year of operation. Smart contracts and blockchains can handle and record accounting and government rules.

Vitalik Buterin is one of the founders of Ethereum. He was born in Moscow, Russia, but his parents migrated to Canada when he was six. His father, a programmer, taught him about cryptocurrencies and Bitcoin when he was 17 years old. Valetik wrote blog posts so he could be paid in Bitcoin. It was not his math or programming skills that made him great. He founded Bitcoin Magazine and was head writer at 17. He dropped out of college and traveled to study how to create a startup. Now, Valetik is a billionaire. In June 2017, a rumor circulated that Valetik died in a car crash, and the Ether price dropped 30%.

Charlie Lee founded ***Litecoin*** in 2011. Lee's parents are Chinese, and he was born in the Ivory Coast. Then they emigrated to the United States. Lee attended MIT and worked at Microsoft, Google, and Coinbase, a U.S. crypto exchange. Lee modified the Bitcoin computer code, believing it would help overcome Bitcoin's shortcomings. The Bitcoin code is open-source, allowing anyone to download and change it. He altered the Bitcoin code to enable the processing of transactions four times faster. Litecoin has a maximum supply of 84 million coins (4 times 21 million), whereas Bitcoin has a maximum supply of 21 million coins. Consequently, Bitcoin is often likened to gold, while Litecoin is likened to silver. Bitcoin also has higher transaction fees, which may deter users from using it for small transactions. However, the larger supply of Litecoin makes this coin cheaper. Litecoin was valued at $128 in 2024, with a market capitalization of $6.96 billion, making it the 20th most used cryptocurrency in the world. Lastly, Lee sold most of these coins in 2017 before the crypto winter in 2018. Litecoin's price dropped 71% after the peak in 2017.

Chris Larsen and Jeb McCaleb founded Ripple Labs with their coin, ***XRP***. Chris has a business background rather than a technical background. He founded two startups in Silicon Valley. Forbes estimated Chris Larson's wealth at $8 billion, one of the wealthiest people in the world. Jeb McCaleb started Mt Gox and later sold it long before the collapse. Some criticize XRP because its crypto-network is private, and the top management has minted all 100 million XRP coins. The founders hold some of these coins, and investors have received about 20 billion coins. The large number of coins keeps the XRP price low. Thus, XRP operates similarly to a bank rather than a cryptocurrency.

Ripple Labs is one of the few cryptocurrency companies with a solid business model and a clear plan for generating profits from cryptocurrencies. Ripple focuses on blockchain technology to enhance business payments by collaborating with international commercial banks to facilitate cross-border fund transfers. Thus, Ripple competes with the ***SWIFT network***, which banks use to communicate with each other and conduct international wire transfers. Additionally, Ripple enhances the speed of transaction completion and facilitates the tracking of payments. Several banks are testing Ripple's system, including Santander (USA), Canadian Imperial Bank of Commerce (Canada), Kotak Mahindra Bank (India), Itaú Unibanco (Brazil), IndusInd (India), InstaReM (Singapore), BeeTech (Brazil), and Zip Remit (Canada). The Malaysian bank CIMB allows its customers to transfer money via the Ripple network. Ripple is the third-largest cryptocurrency by market capitalization in 2024, with a market capitalization of approximately $143.69 billion.

The U.S. Department of the Treasury is exploring the tokenization of the U.S. debt in 2025. We call this ***Central Bank Digital Currency (CBDC)***. It raises questions about a government controlling digital financial infrastructure. These tokens could serve a function as money, which would compete with the Federal Reserve. The government will likely control all aspects of transactions, which directly contradicts Bitcoin's philosophy. Bitcoin was designed as a decentralized network, where users have complete control over their crypto wallets. Meanwhile, many independent miners support the Bitcoin infrastructure, preventing any person from exerting any control over the network. Ripple Labs also exerts complete control over its network, but a profit motive drives it and not politics.

Key Terms

cryptography	unit of account
asymmetric encryption cryptography	smart contracts
crypto wallet	token
blockchain	Initial Coin Offering (ICO)
proof of work	nonfungible tokens (NFTs)
halving cycle	alternative coins (altcoins)
proof of stake	gas fees
Bitcoin	Ethereum
white paper	Ethereum Virtual Machine (EVM)
peer-to-peer payment system	decentralized finance (defi)
double spending problem	Litecoin
medium of exchange	XRP
store of value	SWIFT network
stablecoins	Central Bank Digital Currency

Chapter Questions

1. What are several reasons why governments do not like cryptocurrencies?

2. Why are investors interested in adding cryptocurrencies to their investment portfolios?

3. What is the difference between proof of work and proof of stake?

4. Are cryptocurrencies similar to a corporation's common stock?

5. Why must users keep their crypto wallets secure?

6. Are cryptocurrencies and the blockchain the same thing? Please explain.

7. Bitcoin, Bitcoin Cash, and Bitcoin SV use the SHA256 algorithm to calculate the hash, or digital signature. The hash is calculated on a block of the blockchain with the nonce. The nonce means a number calculated once.

   Please go to https://codebeautify.org/sha256-hash-generator for a hash

Type in the text below to calculate the hash. Just change one thing, even add a space. Please observe how the hash completely changes.

Hello world!
Nonce:

Bitcoin requires a hash with 19 leading zeros on a 64-character hash. Refer to the example below:

0000000000000000000 3c78f599f1512f8ce7bd32f07e29b69cb8c5e5b90707\

Please add a number or characters to the Nonce and see with trial and error how many leading zeros we can get.

7. Financial Statements and the Value of Money

This chapter provides an overview of financial statements and the value of money. Business people and financial analysts use and examine four financial statements: the income statement, balance sheet, statement of changes to stockholders' equity, and statement of cash flows. Since all accountants record financial statements in a currency, they must discount future payments and receipts of money using the present value formula. Consequently, we will learn how to use the present value formula to compute the present value of future withdrawals, payments, and investments. Furthermore, we will learn to use the present value formula to calculate the amortization table for a mortgage, annuity payments, the value of savings accounts, and investments. Then we expand the present value formula to handle foreign currencies.

The Financial Statements

Accountants use and create four financial statements. The income statement is the first and most important financial statement because investors must know whether a business has earned a profit or a loss. We also call the net income a profit, and every income statement has two items:

- ***Revenues*** are inflows of assets received in exchange for goods and services that the business produces. Businesses earn revenue by selling products or services.

- ***Expenses*** are outflows of assets because a business pays costs to operate. A company must pay workers' salaries, materials, taxes, and utilities.

We show an example of an income statement in Table 1. PEMEX is Mexico's Petroleum Company, and the "p" refers to the Mexican currency, the peso. The Mexican government owns PEMEX after it established PEMEX as a monopoly over all Mexican petroleum production, refining, and distribution. We omitted some categories to simplify the income statement. In 2005, PEMEX's net sales were 505,109,185 pesos for domestic sales and 423,533,791 pesos for exports. Thus, PEMEX sold 505 million pesos' worth of products within Mexico and exported 423 million pesos of petroleum to the United States.

The next category is PEMEX's operating costs, and they are separated into three categories. First, PEMEX incurred a cost of sales of 361,177,339 pesos for petroleum production, refining, and distribution. Cost of sales is the cost PEMEX pays to supply its customers with petroleum and petroleum products. Second, PEMEX paid 21,910,789 pesos to transport its products between its facilities and retail markets. Furthermore, the corporation paid 46,800,391 pesos to administer the corporation. Finally, we add all costs and write negative numbers as a red number in a parenthesis.

Exchange gain (or loss) influences the company financially because a country's exchange rate has changed. The international petroleum market is denominated in U.S. dollars, and PEMEX sold petroleum to the United States for U.S. dollars and exchanged dollars for pesos. Thus, PEMEX experienced a gain of 17,627,605 pesos from currency exchange. Therefore, the U.S. dollar must have appreciated against the Mexican peso during 2005.

Table 1. The 2005 Income Statement for PEMEX

Net Sales		
Domestic	505,109,185 p	
Export	423,533,791	
Total Revenues		928,642,976 p
Costs and Operating Expenses		
Cost of sales	361,177,339 p	
Transportation expenses	21,910,789	
Administrative expenses	46,800,391	
Total cost and operating expenses		(429,888,519) p
Exchange gain (loss)		17,627,605 p
Taxes and duties		(580,629,293) p
Net income		(64,247,231) p

Source: PEMEX (2006)

The Mexican national government relies on PEMEX to pay taxes because the company paid 580,629,293 pesos in taxes and duties. Consequently, PEMEX incurred a 64,265,231 peso loss due to paying a large amount of taxes to the Mexican government. To find the approximate U.S. dollar value, divide all numbers in Table 1 by 11, as the peso-dollar exchange rate was roughly \$1 = 11 pesos in 2005.

The ***balance sheet*** is the second financial statement and shows the financial position of a business on a specific date. The balance sheet itemizes a business's assets, liabilities, and equity. ***Assets*** are economic resources owned by a business, while ***liabilities*** are debts and financial obligations of the business. Finally, ***equity*** equals total assets minus total liabilities, which we also call net assets. We express equity in Equation 1. Moreover, creditors want businesses to have positive equity. If a business cannot repay its debts, the creditors can legally force the business to sell its assets to repay debts. We list several assets and liabilities in Table 2.

$$\text{Equity} = \text{Total Assets} - \text{Total Liabilities} \tag{1}$$

A corporation divides its equity into two capital accounts: Contributed Capital and Retained Earnings. ***Contributed Capital*** is the amount of capital that a corporation has sold. In other words, the amount of stock that circulates between investors outside of the corporation. Table 3 shows stockholders' equity for preferred stock and common stock. We list the amounts of authorized and outstanding shares for both stock types. When a corporation earns profits, it records the profits in the ***Retained Earnings*** account. Subsequently, a corporation can use retained earnings to finance expansions or pay dividends to investors.

Table 2. A Listing of Assets and Liabilities

Assets	Liabilities
Accounts Receivable – Customers owe money to the business for goods and services sold on credit	***Accounts Payable*** – Business owes money to creditors for goods and services bought on credit.
Buildings and Land	Interest payable
Equipment	Salaries owed to workers
Cash	Taxes payable
Patents and copyrights	

Table 3. Stockholders' Equity

Preferred stock, 2,000 shares authorized, 1,000 shares issued and Outstanding	$250,000	
Common stock, 12,000 shares authorized, 10,000 shares issued and outstanding	$350,000	
Total capital contributed by common stockholders		$600,000
Retained earnings		$80,000
Total stockholders' equity		$680,000

Accountants divide a company's assets into current and fixed assets. We show an example in Table 4 for Stores USA. ***Current assets*** include cash, accounts receivable, merchandise inventory, and prepaid expenses. They are important because a business needs these assets to operate its daily business. On the other hand, ***fixed assets*** include buildings, plants, and equipment with long life spans. Stores USA has a store and office equipment valued at $25,000 and $4,000, respectively. Accountants subtract the accumulated depreciation from the equipment because the equipment becomes old and deteriorates. Depreciation equals $5,500 for the store equipment and $1,500 for the office equipment.

Accountants divide the Stores USA's liabilities into current liabilities and long-term debt. ***Current liabilities*** are debts and obligations that are less than a year and include accounts payable, notes payable, and income taxes. ***Long-term debt*** consists of all debt with maturities greater than a year, such as corporate bonds. Stores USA has no long-term liabilities. Furthermore, the corporation issued 10,000 shares for $50 per share and earned income of $6,500 under retained earnings listed under Stockholders' Equity. The board of directors can pay dividends from this account or finance an expansion of the business. Finally, the total assets equal the total liabilities plus shareholders' equity, conforming to Equation 1.

Table 4. A Balance Sheet for Stores U.S.A.

Current assets:		
Cash	$8,000	
Accounts receivables	10,000	
Merchandise inventory	20,000	
Prepaid expenses	1,000	
Total current assets		$39,000
Plant and equipment:		
Store equipment	$25,000	
Less accumulated depreciation	5,500	
Office equipment	4,000	
Less accumulated depreciation	1,500	
Total plant and equipment		22,000
Total Assets		$61,000
Current liabilities:		
Accounts payable	$3,500	
Income taxes payable	1,000	
Total liabilities		$4,500
Stockholders' Equity		
Common stock, $5 par value, 10,000 shares authorized and outstanding		$50,000
Retained earnings		6,500
Total stockholders' equity		56,500
Total liabilities and stockholders' equity		$61,000

The Statement of Changes in the Owner's Equity is the third financial statement and shows the changes in the owner's equity. For all business organizations, profits or net income always increase equity because the organization has more resources flowing into it. However, proprietors and partners could invest and/or withdraw from the business. Thus, investment increases the equity, while withdrawals reduce it. For corporations, the Statement of Changes in the Owner's Equity is called the Statement of Retained Earnings. We show an example in Table 5 for XYZ Corporation. Profits or net income increase retained earnings, while dividends declared decrease it. Dividends are similar to a proprietor's or partner's withdrawals. If the corporation issues more stock, it increases its investment and records this transaction under Stockholders' Equity.

The ***statement of cash flows*** is the last financial statement and shows the money inflows and outflows of a business. This statement is essential because a company needs adequate cash to operate, such as paying workers, taxes, rent, and interest payments. A corporation could have a strong balance sheet and excellent income growth, but it fails due to poor cash flows. Table 6 lists the activities that cause cash inflows and outflows. Financial analysts view the cash flow statement as necessary because future business expansion impacts the cash flows over time. Furthermore, a company could be financially healthy, but poor cash flows impose hardship on the business. For example, if an employer cannot pay workers' wages, then some workers quit and leave the employer.

Table 5. The Statement of Retained Earnings for Corporation XYZ

Net income	$50,00
Add retained earnings, December 31, 2022	$10,000
Total	$60,000
Deduct dividends declared	20,000
Retained earnings, December 31, 2023	$40,000

Table 6. Activities that Affect a Business's Cash Flow

Cash Inflows	Cash Outflows
Operating Activities	
Customers pay for sales in cash	Pay salaries
Customers pay accounts receivables	Pay expenses (in cash)
Merchandise inventory decreases	
Accounts payable increases	
Investing Activities	
Received cash from investments	Purchased securities
Sold property or equipment	Purchased land
Financing Activities	
Company issues more stock	Company pays dividends
Company issues bonds	Company retires its bonds or stocks

We show a Statement of Cash Flows in Table 7. If cash enters a business, then the cash flow is positive. As cash leaves a business, the cash flow is negative. Furthermore, the cash flow statement has three sections: operating, investing, and financing activities. For example, the business received $100,000 from customers and paid $20,000 in taxes for the operating activities. The $100,000 represents net cash received from customers, calculated as total cash sales minus merchandise returns. The business then invested in itself by purchasing $20,000 in new equipment for its investment activities. Finally, the business issued $50,000 in brand-new stock to expand the business and paid $30,000 in dividends for financing activities. Consequently, the business has $110,000 in total cash at the end of the year. We can calculate this amount by starting with the cash on hand at the beginning of the year and adding the net cash flow that the business received during the year.

Table 7. The Statement of Cash Flows

Cash flow from operating activities		
Cash Received from customers	$100,000	
Payments for taxes	(20,000)	
Cash flow from investing activities		
Cash paid for equipment purchase	(20,000)	
Cash flows from financing activities		
Cash received from issuing stock	50,000	
Cash paid for dividends	(30,000)	
Net increase in cash		$80,000
Cash balance at beginning 2023		$30,000
Cash balance at end of 2023		$110,000

Single Investment

Financial analysts use the present value formula to price financial securities or calculate mortgage payments. The present value formula places a value on future cash flows in terms of money today. Therefore, the present value emphasizes the present because people prefer to receive their money now rather than wait for a future payment. Consequently, an interest rate rewards savers for delaying payment. For example, if we deposit $100 into a bank at 5% interest rate, we earn interest:

- After one year, we earn 0.05 x $100 = $5 in interest. Our ending balance becomes $105.00.
- After two years, we earn 0.05 x $105.00 = $5.25. Our ending balance grows to $110.25.

We can use interest compounding to compute the ending balance in Equation 2.

$$\$100(1+0.05)(1+0.05) = \$100(1+0.05)^2 = \$110.25 \qquad (2)$$

If we let the money earn interest after T years, then we build the sequence in Equation 3. In this case, we multiply the beginning balance by the interest repeatedly. Moreover, the one inside the parentheses indicates the principal as $1 while the 0.05 reflects the interest.

$$\$100(1+0.05)(1+0.05)\cdots(1+0.05) = \$100(1+0.05)^T \qquad (3)$$

For example, our $100 grows into $13,150.13 at 5% interest in one hundred years. We write the mathematical notation as:

- The future Value (FV) in dollars at Time T.
- The present Value (PV) in dollars at Time 0.

- The interest rate (i) is the discount rate.
- Subscripts reflect the time with the final period being T.

We write the formula in Equation 4.

$$FV_{100} = PV_0(1 + i)^T = \$100(1 + 0.05)^{100} = \$13{,}150.13 \quad (4)$$

We want our money today because a hundred years is a long time away. The present value of \$13,150.13 in one hundred years is worth \$100 today because we can take that \$100 today, invest it in a savings account at 5% interest, and let it grow into \$13,150.13. If we receive a payment in the future, then we compute the present value in Equation 5.

$$PV_0 = \frac{FV_T}{(1 + i)^T} = \frac{\$13{,}150.13}{(1 + 0.05)^{100}} = \$100 \quad (5)$$

We use algebra to solve for unknown variables. For example, we have \$10,000 to invest and want the final balance to grow into \$15,000 in four years. We can calculate the minimum interest we must earn to achieve this goal. We show all steps of algebra in Equation 6, and the minimum interest rate equals 10.66% annually.

$$FV_0 = PV_T(1 + i)^T \quad (6)$$

$$\$15{,}000 = \$10{,}000(1 + i)^4$$

$$\frac{\$15{,}000}{\$10{,}000} = (1 + i)^4$$

$$\sqrt[4]{1.5} = \sqrt[4]{(1 + i)^4}$$

$$1.1066 = 1 + i$$

$$i = 0.1066$$

We have an easy formula to calculate how long something doubles in size, known as the ***Rule of 72***. The interest rate, i, as a percentage, and the time indicate the number of years. Accordingly, the product of the interest rate and time equals 72 in Equation 7.

$$i \cdot t = growth \cdot time = 72 \quad (7)$$

For example, if our bank deposit earns 4% interest per year, how long will it take for our deposit to double in size? Just divide 72 by 4, and our bank account doubles in 18 years. What would happen if our interest rate climbed to 7% per year? Then our bank deposit would double in 10.3 years, or 72 ÷ 7.

Of course, we could solve for the interest rate using the Rule of 72. For example, what interest rate do we need for our savings account to double in 5 years? Our interest rate must be 14.4% annually, or 72 ÷ 5.

We could apply the Rule of 72 to economic variables other than financial securities. For example, the Chinese economy grows 10% per year. How many years does the Chinese economy need to double in size? The Chinese economy doubles every 7.2 years, or 72 ÷ 10. On the other hand, the U.S. economy grows slowly at 1% per year after the 2020 COVID-19 Pandemic. How many years does it take for the U.S. economy to double in size? The U.S. economy doubles in size every 72 years, or 72 ÷ 1. What would happen if the U.S. economy began contracting in size by 1% per year? We cannot use the Rule of 72 for negative growth rates. It is impossible for something to double in size with negative growth.

Multiple Investments

We can adjust the analysis to allow people to receive or pay multiple future payments. For instance, we deposit $500 into the bank account every year at 6% interest.

- After the first year, we earn $500 × 0.06 = $30 in interest. Our balance grows to $1,030 ($500 + $30 + $500) because we initially deposit $500 and then add another $500 at the end of the year.

- After the second year, we earn $1,030 × 0.06 = $61.80 in interest. Our balance grows into $1,030 + $61.80 + $500 = $1,591.80. We added another $500 to our account at the end of the year.

- After the third year, we earn $1,591.80 × 0.06 = $95.508 in interest. Our balance becomes $1,591.80 + $95.508 + $500 = $2,187.31. We added the last $500, which did not earn interest.

We calculate the future value of our bank deposits in Equation 8.

$$FV_3 = \$500(1+0.06)^3 + \$500(1+0.06)^2 + \$500(1+0.06)^1 + \$500(1+0.06)^0 \quad (8)$$

$$FV_3 = \$2{,}187.31$$

The last term, in Equation 8, is the final deposit. Although we multiply this term by an interest rate, the exponent equals zero, setting the term inside the parentheses to one. Consequently, the exponent indicates how many years of interest that specific $500 earned over the course of three years.

We can reverse our logic and calculate the value of these cash flows today if we receive \$500 now, \$500 in one year, \$500 in two years, and \$500 in three years. We calculate the present value of \$1,836.51 in Equation 9.

$$PV_0 = \frac{\$500}{(1+0.06)^0} + \frac{\$500}{(1+0.06)^1} + \frac{\$500}{(1+0.06)^2} + \frac{\$500}{(1+0.06)^3} = \$1{,}836.51 \qquad (9)$$

If we received \$1,836.51 as a lump sum today, we could invest this money into a savings account and earn \$2,187.31 in three years at 6% interest. We converted a multiple-stream investment into a single deposit investment.

The present value formula is flexible because it can handle uneven withdrawals and investments. For example, we do the following activities with our bank account in Table 8.

Table 8. Withdrawals and Deposits for a Bank Account

Year	Activity	Amount	Interest + Balance
0	Deposit	\$100	\$148.15
1	Deposit	\$300	\$389.88
2	Withdrawal	\$50	-\$57
2	Deposit	\$100	\$114.00
3	Withdrawal	\$75	-\$75
		Total	\$520.03

Withdrawal or deposit determines the sign. A withdrawal is negative, while a deposit is positive. Furthermore, the interest plus balance column in Table 8 includes the interest rate that the deposit would earn if held until the end of the third year. For example, we deposited \$100 into our account at Time 0, which grew into \$148.15 in 3 years at 14% interest. Moreover, we withdrew \$50 in Time 2, which would earn \$57 for the next two years. However, we withdrew it, making it negative. The value of our withdrawals and deposits equals \$520.03 at the end of Year 3.

We use the present value formula to calculate today's value of these cash flows. We would be indifferent about receiving a lump-sum payment of \$351.01 today or \$520.03 in three years with a \$50 and \$75 withdrawals. We calculated the present value in Equation 10.

$$PV_0 = \frac{\$100}{(1+0.14)^0} + \frac{\$300}{(1+0.14)^1} + \frac{\$100 - \$50}{(1+0.14)^2} + \frac{-\$75}{(1+0.14)^3} = \$351.01 \qquad (10)$$

If we invested \$351.01 today at 14% interest, then in 3 years, we would have \$520.04, the final balance of our bank account after the two withdrawals.

Compounding Frequency

Financial analysts always define an interest rate as an annual term, called the ***Annual Percentage Rate (APR)***. The APR comes from the Federal Reserve's regulation that helps prevent fraud. For example, do we consider a 1% interest rate a reasonable interest rate to charge a borrower? Unfortunately, we do not know the period this interest rate applies to because the period was omitted. If the 1% is annual, then it is an excellent interest rate for a loan. However, if it is daily, this rate is terrible. The borrower took money from a loan shark. For this book, we define all interest rates in annual terms, unless otherwise stated.

Banks and finance companies usually calculate interest payments and deposits monthly. Thus, we adjust the present value formula for different time units. If we refer to Equation 11, we add a new variable, m, the ***compounding frequency***, while APR is the interest rate in annual terms. In the monthly case, m equals 12 because a year has 12 months.

$$FV_T = PV_0 \left(1 + \frac{APR}{m}\right)^{m \cdot T} \tag{11}$$

For example, we deposit \$10 in our bank account for 20 years that earns 8% interest (APR), compounded monthly. Consequently, we calculate our savings grow into \$49.27 in Equation 12: If our bank compounded our account annually, then we would have \$46.61.

$$FV_T = PV_0 \left(1 + \frac{APR}{m}\right)^{m \cdot T} = \$10 \left(1 + \frac{0.08}{12}\right)^{12 \cdot 20} = \$49.27 \tag{12}$$

Although the compounding frequency is usually 12 months, we could use semi-annually (two payments per year, or m equals 2), or quarterly (four payments per year, or m equals 4).

We can convert any compounding frequency into an APR equivalent interest rate, called the ***effective annual rate (EAR)***. From the previous example, we convert the 8% APR interest rate, compounded monthly, into a yearly rate without compounding, yielding 8.3%. We show the calculation in Equation 13. The EAR is the standard compounding formula, removing the years and the present value terms.

$$EAR = \left(1 + \frac{APR}{m}\right)^{m} - 1 = \left(1 + \frac{0.08}{12}\right)^{12} - 1 = 0.083 \tag{13}$$

If we deposit \$10 in our bank account for 20 years, earning 8.3% APR with no compounding (or m equals 1), then our savings would grow to \$49.27, which is the same as an interest rate of 8% that is compounded monthly. We calculate this in Equation 14.

$$FV_T = PV_0 \left(1 + \frac{APR}{m}\right)^{m \cdot T} = \$10 \left(1 + \frac{0.083}{1}\right)^{1 \cdot 20} = \$49.27 \tag{14}$$

We can adapt the present value formula for frequency compounding. For example, what is the present value if we receive \$50 in a month, \$100 in six months, and \$75 in 13 months at 10% APR? We must adjust our time units to months, as this is the smallest time unit.

- We expressed the interest rate in APR, so divide it by 12 to obtain the monthly interest rate, yielding 0.8333% in our case.
- All time subscripts are monthly.

We calculated a present value of \$212.06 in Equation 15.

$$PV_0 = \frac{\$50}{(1+0.0083\overline{3})^1} + \frac{\$100}{(1+0.0083\overline{3})^6} + \frac{\$75}{(1+0.0083\overline{3})^{13}} = \$212.06 \tag{15}$$

Compounding frequency has a special case. As m approaches infinity, the compounding equation transforms into Equation 16, called continuous compounding. ***Continuous compounding*** means that for every fraction of a second, our balance earns interest. The abbreviation, lim, refers to the limit and defines how the function behaves when m becomes very large. Thus, the number e is a constant and equals approximately 2.1828. The number e is similar to pi (or π≈3.14), and its digits do not repeat any patterns.

$$FV_T = \lim_{m\to\infty} PV_0 \left(1+\frac{APR}{m}\right)^{T\cdot m} = PV_0 \cdot e^{APR\cdot T} \tag{16}$$

For example, we deposit \$50 into our bank and leave it alone for 70 years. If the bank uses continuous compounding, then our savings grow into \$9,528.31, calculated in Equation 17. Every fraction of a second, we earn interest on our account over 70 years. On the other hand, if our bank uses monthly compounding, subsequently, our savings would grow into \$9,373.90, yielding \$154.41 less than the continuous compounding.

$$FV_T = PV_0 \cdot e^{APR\cdot T} = \$50 \cdot e^{0.075\cdot 70} = \$9{,}528.31 \tag{17}$$

Banks and financial institutions rarely use continuous compounding to calculate the market values of financial securities. Financial analysts and mathematicians use continuous compounding to simplify complex calculations of financial formulas and mathematical models.

Annuities and Mortgages

Financial analysts use the present value formula to calculate an annuity. An ***annuity*** is an investment for people who plan for retirement. An annuity has two parts. As people work, they make periodic deposits into an annuity account. Subsequently, once they retire, they receive periodic payments until death.

We define annuities as an ordinary annuity or an annuity due. If a person pays into an annuity at the end of the period, then it is an ***ordinary annuity***. However, if people pay into an annuity at the beginning of the period, they receive one extra payment that earns interest over the life of the annuity, called an ***annuity due***. Consequently, they only differ when the payment is applied to the annuity account and when payments begin earning interest.

For this chapter, we stick to ordinary annuities. For example, we invest in an annuity that earns 9% APR interest with annual compounding. Calculate the value of our annuity in five years if we pay $20,000 into the pension. We computed the annuity growth as $119,694.21 in Equation 18.

$$FV_5 = \$20{,}000(1+0.09)^4 + \$20{,}000(1+0.09)^3 + \cdots + \$20{,}000(1+0.09)^0 \qquad (18)$$

$$FV_5 = \$20{,}000[1.09^4 + 1.09^3 + 1.09^2 + 1.09^1 + 1.09^0]$$

$$FV_5 = \$119{,}694.21$$

Did we notice anything strange about the exponents? We raise the first term in Equation 18 to the fourth power because our initial payment occurred at the end of period 1, and has earned four years of interest. Finally, the last term has a zero exponent because the final $20,000 does not earn interest. Moreover, mathematicians derived a formula to calculate an annuity without calculating a long series of numbers. They derived a formula in Equation 19, and c is the periodic payment into an annuity. Using the previous example, the value of the annuity still equals $119,694.21.

$$FV_T = C\left[\frac{(1+i)^T - 1}{i}\right] = \$20{,}000\left[\frac{(1+0.09)^5 - 1}{0.09}\right] = \$119{,}694.21 \qquad (19)$$

We also have the other side of an ordinary annuity. For example, we saved a $60,000 annuity that earns 4% APR. We plan to withdraw equal annual payments over 10 years. How much do we receive annually? Remember, we receive our first payment at the end of the first period, which is the beginning of the second period. That $60,000 earns interest for the first period. We compute an annual withdrawal payment of $7,397.46 in Equation 20.

$$FV = \frac{i \cdot PV}{1-(1+i)^{-T}} = \frac{0.04 \cdot \$60{,}000}{1-(1+0.04)^{-10}} = \$7{,}397.46 \qquad (20)$$

Financial analysts use the present value formula to calculate mortgage payments, which is vital to building an amortization table. An ***amortization table*** itemizes every payment for a mortgage loan and decomposes every payment into interest and the amount that reduces the principal. A mortgage is a bank loan for a property, and the property becomes the collateral. For instance, if a person has a mortgage for a house and defaults on the loan, the bank can legally take possession of the house. We use the present value formula to build an amortization table.

The mathematical notation for a mortgage is the following:

- All future mortgage payments (FV) are equal and are usually monthly.
- The interest rate (i) is the loan rate, which is fixed throughout the life of the loan.
- A bank loan is an amount recorded for PV_0 because the bank lent us money at time 0.

We show a mortgage as a stream of cash flows to the bank in Equation 21.

$$PV_0 = \frac{FV_1}{(1+i)^1} + \frac{FV_2}{(1+i)^2} + \frac{FV_3}{(1+i)^3} + \cdots + \frac{FV_T}{(1+i)^T} \tag{21}$$

All loan payments are equal, so we set FV = FV_1 = FV_2 = FV_3 = ... = FV_T. Thus, we can factor the FV terms from all interest terms in Equation 22.

$$PV_0 = FV\left[\frac{1}{(1+i)^1} + \frac{1}{(1+i)^2} + \frac{1}{(1+i)^3} + \cdots + \frac{1}{(1+i)^T}\right] \tag{22}$$

We solve for FV, which becomes the loan payment, yielding Equation 23.

$$FV = \frac{PV_0}{\left[\frac{1}{(1+i)^1} + \frac{1}{(1+i)^2} + \frac{1}{(1+i)^3} + \cdots + \frac{1}{(1+i)^T}\right]} \tag{23}$$

For example, a bank granted a mortgage for \$60,000 at an interest rate of 12% APR. The mortgage is a six-year loan paid annually. We solve for FV and calculate our annual payment of \$14,594 in Equation 24.

$$FV = \frac{\$60{,}000}{\left[\frac{1}{(1+0.12)^1} + \frac{1}{(1+0.12)^2} + \frac{1}{(1+0.12)^3} + \cdots + \frac{1}{(1+0.12)^6}\right]} \tag{24}$$

$$FV = \$14{,}594$$

We can use the mortgage loan information to build an amortization table. We show an amortization table in Table 9. For Year 0, we have \$60,000 outstanding because we have not made a payment yet. Then we make our first payment in Year 1. Our interest is 12% multiplied by \$60,000, equaling \$7,200. If our payment is \$14,594, then \$7,200 is the interest while the remainder reduces the principal. Thus, we subtract \$7,394 from the loan balance. For Year 2 and beyond, we repeat the sequence until we pay the loan in full in Year 6.

Table 9. The Amortization Table

	Payment	Interest	Principal Paid	Loan Balance
Year 0	-	-	-	\$60,000
Year 1	\$14,594	\$7,200	\$7,394	\$52,606
Year 2	\$14,594	\$6,313	\$8,281	\$44,325
Year 3	\$14,594	\$5,319	\$9,275	\$35,050
Year 4	\$14,594	\$4,206	\$10,388	\$24,662
Year 5	\$14,594	\$2,959	\$11,635	\$13,027
Year 6	\$14,594	\$1,563	\$13,027	\$0

All amortization tables have one feature. The first payment has the highest interest, while the lowest principal is applied to the loan balance. Then the interest amount declines over the life of the loan until it becomes the smallest for the last payment.

If a mortgage is monthly, then we divide the interest rate by 12 and multiply the number of years by 12. For instance, a 20-year mortgage will have 240 payments, 12 × 20. As we can see, Equation 24 would have 240 terms. Consequently, mathematicians devised a formula to calculate a mortgage with many payments.

For example, we compute our monthly payment if we bought a \$150,000 home at 6% APR with a 30-year mortgage. We calculated our monthly fee of \$899.33 in Equation 25. If we notice, Equation 25 is the same formula for an annuity payout with compounding frequency included. The interest rate, i, is the APR interest rate divided by 12.

$$FV = \frac{i \cdot PV}{1 - (1 + i)^{-T \cdot m}} = \frac{0.005 \cdot \$150{,}000}{1 - (1 + 0.005)^{-30 \cdot 12}} = \$899.33 \tag{25}$$

An amortization table can also handle balloon payments and variable interest rate mortgages. However, these topics go beyond this textbook's scope. A balloon payment is a type of payment where a person pays a low monthly payment every month. For the last payment, the person would pay the remaining balance, which could be quite large. Lastly, a variable-interest rate loan allows the bank to adjust the loan's interest rate as market interest rates change.

Foreign Investments

We can use the ***net present value (NPV)*** to calculate the monetary return to an investment in Equation 26. This equation is almost identical to the present value formula, except that PV_0 is negative and located on the right-hand side, while we add a new variable, NPV. If the net present value (NPV) equals zero, then this equation reduces to the present value formula. Using the NPV formula, we can invest the present value (PV_0) today to generate future cash flows (FV_i) that end at Time T. The market interest rate (i) allows us to compare our investment to the market rate.

$$NPV = -PV_0 + \frac{FV_1}{(1+i)^1} + \frac{FV_2}{(1+i)^2} + \cdots + \frac{FV_T}{(1+i)^T} \tag{26}$$

If we calculate a positive, net present value, then our investment is paying off. Consequently, the investment is increasing the investor's wealth because more money flows in than out. Furthermore, investors would use the net present value formula to evaluate several investment projects. Then they select the project with the highest NPV, provided it is positive. An investor would never choose a project with a negative NPV because the project's return would be negative. Over time, more money flows out than in, creating a net loss.

For example, our brother wants us to invest $10,000 into his business. He promises to repay us $12,000 in two years. If we invested our money into financial securities, we would earn an annual 10% APR. Thus, we want to know if it is profitable to invest in our brother's business? We calculated a net present value of -$82.64 in Equation 27. Unfortunately, we could earn more on the financial securities than our brother's business because the NPV is negative.

$$NPV = -\$10{,}000 + \frac{\$12{,}000}{(1+0.1)^2} = -\$82.64 \tag{27}$$

Investors can use the net present value formula in Equation 28 to calculate the return of a foreign investment. We add a new variable, the exchange rate, E_i, to the formula. The exchange rate converts the value of the foreign investment into the equivalent of our home currency. Unfortunately, the exchange rates change continually, and we assume we know the exchange rate at every point in time. The subscript indicates the specific exchange rate for that year.

$$NPV = -PV_0E_0 + \frac{FV_1E_1}{(1+i)^1} + \frac{FV_2E_2}{(1+i)^2} + \cdots + \frac{FV_TE_T}{(1+i)^T} \tag{28}$$

For example, we invested 20,000 euros into Greece, and we expect to earn $8,000 each year for Year 1, Year 2, and Year 3. Nevertheless, we could invest our money in our country's financial markets that earn a 5% APR. Is our investment profitable? We forecasted the exchange rates below, and our home country is the United States:

Time 0: The exchange rate equals $1.50 per 1 euro.
Time 1: The exchange rate equals $1.75 per 1 euro.
Time 2: The exchange rate equals $2.00 per 1 euro.
Time 3: The exchange rate equals $2.10 per 1 euro.

We calculate the net present value of our investment of $12,358.27 in Equation 29. The NPV is positive, and the investment increases our wealth. However, we must forecast the future exchange rates. Of course, we know today's exchange rate, E_0. Unfortunately, exchange rates could fluctuate in any direction. An appreciating euro (depreciating dollar) raises NPV, while a depreciating (appreciating dollar) euro would lower it.

$$NPV = -20{,}000€ \cdot 1.50\,{}^{\$}/_{€} + \frac{8{,}000€ \cdot 1.75\,{}^{\$}/_{€}}{(1+0.05)^1} + \frac{8{,}000€ \cdot 2.00\,{}^{\$}/_{€}}{(1+0.05)^2} + \frac{8{,}000€ \cdot 2.10\,{}^{\$}/_{€}}{(1+0.05)^3} \quad (29)$$

$$NPV = -\$30{,}000 + \$13{,}333.33 + \$14{,}512.47 + \$14{,}512.47 = \$12{,}358.27$$

We continue our example, and we see Europe experiences a financial crisis. Thus, the euro begins plunging against the U.S. dollar, causing the exchange rates to change to below:

Time 0: The exchange rate equals $1.50 per 1 euro.
Time 1: The exchange rate equals $1.25 per 1 euro.
Time 2: The exchange rate equals $1.00 per 1 euro.
Time 3: The exchange rate equals $0.50 per 1 euro.

The euro depreciates while the dollar appreciates. We can think that we are earning a currency that is losing value while converting it to a currency that strengthens in value. We calculate the net present value of -$9,764.60 in Equation 30. Our investment turned out to be a disaster, resulting in a negative return due to the euro's depreciation.

$$NPV = -20{,}000€ \cdot 1.50\,{}^{\$}/_{€} + \frac{8{,}000€ \cdot 1.25\,{}^{\$}/_{€}}{(1+0.05)^1} + \frac{8{,}000€ \cdot 1.00\,{}^{\$}/_{€}}{(1+0.05)^2} + \frac{8{,}000€ \cdot 0.50\,{}^{\$}/_{€}}{(1+0.05)^3} \quad (30)$$

$$NPV = -\$30{,}000 + \$9{,}523.81 + \$7{,}256.24 + \$3{,}455.35 = -\$9{,}764.60$$

Key Terms

revenue
expense
balance sheet
asset
liability
equity
contributed capital
retained earnings
accounts receivable
accounts payable
current assets
fixed assets
current liabilities
long-term debt
statement of cash flows
Rule of 72
Annual Percentage Rate (APR)
compounding frequency
effective annual rate (EAR)
continuous compounding
annuity
ordinary annuity
annuity due
amortization table
net present value

Chapter Questions

1. Compute the net income if a company sold $50,000 of goods in cash, sold $60,000 of goods on accounts receivable, paid $100,000 in costs and operating expenses, paid taxes of $30,000, and paid $30,000 in administrative expenses.

2. Calculate the retained earnings of a corporation at the end of the year if retained earnings were $20,000 at the beginning of the year, net income was $50,000, declared $60,000 in dividends, and sold $50,000 in additional stock.

3. Compute a business's cash balance at the end of the year if the company starts with a cash balance of $10,000, paid salaries of $70,000, received $100,000 in cash sales from customers, and $30,000 for accounts receivable, and paid taxes of $10,000.

4. We will receive $1,000,000 in exactly one hundred years. How much is this worth to us today if the market interest rate equals 5% APR?

5. We deposit $5,000 into a bank that earns 10% APR. How much will our balance grow in 50 years?

6. We deposit $1,000 in a bank for two years. What interest rate in APR must we earn for our ending balance to be $1,200?

7. We deposit our savings into a money market that earns 3% APR. How many years would it take to double?

8. If the U.S. economy grows 5% per year, how many years does the U.S. economy need to double?

9. We will receive $1,000 each year for two years. Our first payment starts in Year 0. Calculate the cash flow value to us today if the market interest rate equals 7% APR.

10. Every year, we save $700. How much would this money grow into after 3 years if the market interest rate equals 3% APR?

11. Compute the present value if a friend repays a loan over 3 months with an annual interest rate of 12% and a monthly payment of $100. The first payment begins at the end of the first month.

12. If we deposit $500 into a savings account that earns 5% APR for 30 years, calculate the ending balance for the following compounding frequencies: annual, monthly, and continuous.

13. If we are earning 12% APR on our investment that is compounded quarterly, compute the effective annual rate (EAR).

14. We are saving for retirement, and plan to invest $2,000 every year into an ordinary annuity that earns 7% APR. Compute the value of our annuity in 20 years.

15. We have saved an ordinary annuity with a balance of $50,000. Calculate our annual withdrawal payments if the annuity earns a 5% APR, which we withdraw over 15 years.

16. Compute the monthly payment for a $500,000 mortgage for 30 years with a 7% APR.

17. We reside in Malaysia and have an overseas bank account in Europe. We expect the following annual payments and exchange rates. Malaysia uses the ringgit (RM) currency while the Eurozone uses the euro, €.

Time	Payments	Exchange rate
0	2,000 €	4.00 RM / €
1	3,000 €	4.25 RM / €
2	4,000 €	4.50 RM / €
3	5,000 €	5.00 RM / €

Calculate the present value of our cash flows for a market interest rate of 4%.

8. Valuation of Stocks and Bonds

This chapter provides an overview of stocks and bonds, and the methods financial analysts use to calculate the market price using the present value formula. Furthermore, corporations issue various bonds and stocks, and use them to expand business operations. Corporations sell their bonds and stock to investors who buy them for investment. They either hold the bonds until maturity or sell the bonds and stock for a capital gain or loss. Consequently, investors must know the difference between yield to maturity and the rate of return. This chapter expands on Chapter 7 as we expand the present value formula to value various bonds and stocks.

Overview of Bonds

Corporations often borrow money by issuing bonds. A ***bond*** is similar to notes payable because it is a written promise to pay interest and principal. We show a picture of a bond in Figure 1. The face value of this bond equals \$1,000, and this bond matures on February 1, 2030. Consequently, whoever holds this bond will receive \$1,000 on this date, and the bondholder also earns \$100 (0.1 × \$1,000) per year in interest. Most bonds pay interest twice annually or \$50 every six months for this example.

Bond

\$1,000

10%

February 1, 2030

Figure 1. A picture of a bond

Bonds, however, differ from notes payable. A ***note payable*** is a loan from a single creditor, such as a bank, while a bond is a loan that corporations issue in denominations of \$1,000, \$2,000, etc. Finally, bonds are standardized, and thus, investors can easily buy or sell them on the financial markets before the bonds mature.

Bonds differ from corporate stock. A share of ***stock*** represents ownership in a corporation. For instance, if a shareholder owns 1,000 shares out of 10,000, then they own 10% of the corporation’s equity. Moreover, the shareholder also receives 10% of the corporation’s earnings when the board of directors declares ***dividends***. On the other hand, a bond represents a debt or a liability to the corporation. For example, if a person owns a bond with a face value of \$1,000 with an 11% coupon interest rate and a 20-year maturity, then the bondholder has two legal rights. A bondholder has a legal right to receive 11% or $110 interest each year while the bond is outstanding. At last, the bondholder has a legal right to receive $1,000 when the bond matures in 20 years.

A corporation needing long-term funds may consider issuing additional shares of stock or issuing new bonds. However, if the corporation issues new stock, the existing stockholders' share control is diluted by the new stockholders. Consequently, the stockholders lose part of their control of the corporation. On the other hand, the bondholders do not share in the management or earnings of the corporation. Although the corporation must pay the bond interest, whether it earns profits or losses, bonds reduce net income, thus lowering a corporation's taxes. U.S. corporations pay between 15 and 35% of their net income in taxes. Nevertheless, bond interest payments are an expense that lowers the corporation's net income. If a corporation issues new bonds, then the common stockholders could increase their dividend earnings.

We show an example of a corporation expanding operations in Table 1. This corporation had sold 300,000 shares of outstanding common stock to investors, and it needs $2 million to expand its operations. After the expansion, the management estimates the company can earn $1,000,000 annually. Consequently, the corporation has two plans. For Plan A, the corporation issues 200,000 new shares of the corporation's stock at $10 per share. For Plan B, the corporation issues $2 million of bonds with a 10% interest rate. Hence, the interest expense equals $200,000 per year.

Table 1. A Corporation Finance an Expansion through Bonds or Stocks

	Plan A	Plan B
Earnings before bond interest and income taxes	$1,000,000	$1,000,000
Deduct interest expense		(200,000)
Income before corporation income taxes	$1,000,000	$800,000
Deduct income taxes (assumed 40% rate)	(400,000)	(320,000)
Net income	$600,000	$480,000
Plan A income per share (500,000 shares)	$1.20	
Plan B income per share (300,000 shares)		$1.60

Examining these two plans, Plan B results in a greater income per share for the shareholders because the bond's interest lowered the tax burden by $60,000. Thus, the stockholders retained control of the corporation, and they potentially earn higher dividends per share by using bond financing.

The Valuation of Bonds

Governments and corporations issue a variety of bonds with different characteristics and cash flows. Consequently, we explain the main bonds and the methods investors and analysts use to value them. We show a ***discount bond*** in Figure 2, and it is the simplest to calculate. This discount bond is a Treasury Bill issued by the U.S. government. For this example, the Treasury Bill has a face value of $10,000, which we call T-bills for short. Discount bonds do not have an interest rate listed on them. Thus, the U.S. government sells T-bills at a discount or lower price. The lower price reflects the market interest rate.

Figure 2. A picture of a Treasury Bill

For example, if the U.S. federal government sold this T-bill to us for $9,500, the present value, PV_0, becomes the market price. Subsequently, the federal government will repay us $10,000 for this instrument on August 10, 2027. The $500 difference reflects the interest on this loan.

Investors and analysts calculate the yield to maturity (YTM), the return to an investment. The yield to maturity reflects an investor's profit from a security that is similar to an interest rate or return. We state both interest rates and yield to maturity in annual percentage terms. For our example, we calculated the yield to maturity of 5.26% in Equation 1 if the bond's face value equals $10,000, while the market value is $9,500 with a maturity of one year.

$$\begin{aligned}
PV_0 &= \frac{FV_1}{(1+YTM)} \\
\$9{,}500 &= \frac{\$10{,}000}{(1+YTM)} \\
1+YTM &= \frac{\$10{,}000}{\$9{,}500} \\
YTM &= 0.0526
\end{aligned} \tag{1}$$

If a discount bond has a maturity of less than one year, then the time subscript remains one year. However, we adjust the yield to maturity to annual terms. For example, if the T-bill in the previous example matured in 180 days, then we calculate it in the same way. Nevertheless, we multiply the rate of return by two because 365 days divided by 180 is approximately two. In our case, the return would equal 10.52%.

Discount bonds usually have a maturity of one year or less. However, we can adjust the present value formula to calculate bonds with longer maturities. For example, we purchased a discount bond for $15,000 that has a face value of $20,000 with a three-year maturity. We calculate our annual rate of return of 10.1% in Equation 2. Did we notice the time subscript is a three?

$$
\begin{aligned}
PV_0 &= \frac{FV_3}{(1+YTM)^3} \\
\$15{,}000 &= \frac{\$20{,}000}{(1+YTM)^3} \\
(1+YTM)^3 &= \frac{\$20{,}000}{\$15{,}000} \\
YTM &= \sqrt[3]{1.33333\bar{3}} - 1 \\
YTM &= 0.101
\end{aligned} \tag{2}
$$

A ***coupon bond*** differs from a discount bond because its interest rate is stated on the certificate. In the past, an investor would detach a coupon from the bond and mail it to the corporation or government for an interest payment. Then the corporation or government would send a check to the bondholder. We show a coupon bond in Figure 3 with dated coupons at the bottom of the certificate.

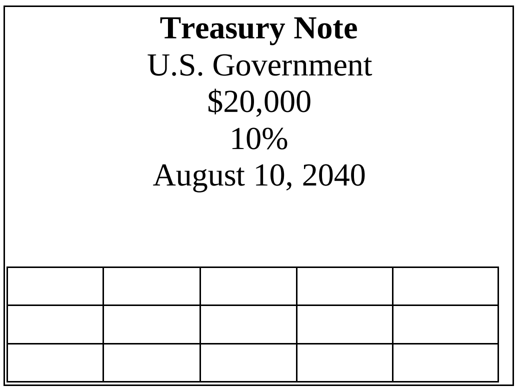


Figure 3. An example of a coupon bond

This coupon bond is a U.S. Treasury note with a face value of $20,000, or a T-note for short. The U.S. government pays 10% interest every six months; consequently, the person who possesses this instrument would clip off one coupon and send it to the U.S. federal government for payment. Hence, the interest payment equals 0.1 × $20,000 × 0.5 = $1,000 for every six months. When the T-note matures on August 10, 2040, the bondholder receives $20,000 and the last coupon payment.

Market interest rate rarely equals the bond's stated interest rate. If the market interest rate is lower than the coupon interest rate, then a corporation or government would never sell the bond for the face value because it would pay a higher interest rate than the market. However, the government or corporation could sell the bond for a greater market price, reducing the investor's return. A higher market price means the bond issuer sold the bond for a ***premium***.

A corporation, for example, has a $1,000 bond that pays interest twice a year. The interest rate on the bond is 8%, which equals $80 a year or $40 every six months. If the bond matures in two years, then the present value formula has 4 periods. The current market interest rate is 4% a year, or 2% for a payment period. The corporation would not sell this bond at face value because the corporation would pay a higher interest rate than the market. Consequently, the corporation can sell this bond for a greater price, reflecting the market interest rate. We calculate the bond market price in Equation 3, and it, PV_0, equals $1,076.15. Therefore, a corporation pays 4% interest on bonds with an 8% interest coupon rate.

$$PV_0 = \frac{\$40}{(1+0.02)^1} + \frac{\$40}{(1+0.02)^2} + \frac{\$40}{(1+0.02)^3} + \frac{\$40 + \$1{,}000}{(1+0.02)^4} \tag{3}$$
$$PV_0 = \$1{,}076.15$$

The market interest rate could swing in the opposite direction. The corporations and governments could sell bonds at a ***discount*** if the market interest rate exceeds the bond's interest rate. For example, a corporation sells a $1,000 bond that pays 8% interest rate, which is paid twice a year. Thus, the corporation pays $80 a year in interest, or $40 every six months. Furthermore, the bond matures in two years, or 4 periods in the present value formula. If the market interest rate rises to 12% a year (or 6% for a payment period), an investor would never buy this bond at face value. They would earn 8% interest per year. However, the corporation could sell this bond for a lower price, compensating the investors for a greater market interest rate. We calculate the bond market price in Equation 4, and the bond's market price, PV_0, equals $930.70. Consequently, investors would earn a 12% return on their 8% interest bonds.

$$PV_0 = \frac{\$40}{(1+0.06)^1} + \frac{\$40}{(1+0.06)^2} + \frac{\$40}{(1+0.06)^3} + \frac{\$40 + \$1{,}000}{(1+0.06)^4} \tag{4}$$
$$PV_0 = \$930.70$$

A government or corporation could issue a bond that never matures, which we call a consol or ***perpetuity***. Consequently, the bond has no maturity date, but the bondholder receives interest payments forever. A government or corporation rarely issues these bonds because most people and governments like end dates for loans. However, this bond possesses nice mathematical properties.

A government, for example, sold a consol that pays $50 interest per year, and the bond never matures. If the market interest rate equals 8%, then we calculate the market price, PV_0, of this coupon. Since all interest payments are equal, all future values, FV, are the same in the present value formula. Thus, the present value becomes an infinite series, which reduces to FV ÷ i. Consequently, we calculate the market price of this console as $625 in Equation 5.

$$PV_0 = \frac{FV}{(1+i)} + \frac{FV}{(1+i)^2} + \frac{FV}{(1+i)^3} + \cdots = \frac{FV}{i}$$
$$PV_0 = \frac{\$50}{0.08} = \$625 \tag{5}$$

We list several bonds with different characteristics below:

- ***Registered Bonds:*** The corporation registers the names and addresses of the bondholders. Most corporations register bonds because the registration protects the investors from loss or theft of the bonds.

- ***Bearer Bonds:*** Those who possess these bonds receive the interest payment. Coupon bonds are usually bearer bonds.

- ***Debenture Bonds*** are unsecured bonds. Thus, the corporation does not pledge assets for the bond issues. A corporation must be financially strong to issue these bonds because these bonds rely on the corporation's credit standing.

- ***Convertible Bonds:*** Bondholders have the right to exchange the corporate bonds into corporate stock on a specified date.

- ***Municipal Bonds:*** City and county governments issue municipal bonds to finance local projects. These bonds are popular with investors because the U.S. government does not tax their interest earnings. Consequently, municipal bonds usually pay lower interest rates than other bonds.

The Yield to Maturity and the Rate of Return

Investors who purchase a financial security are familiar with its face value, maturity date, number of interest payments per year, and total interest payments. However, investors do not know the discount rate. They can substitute the information into the present value formula and solve for the discount rate. Then investors can calculate the discount rate for several different bonds and select the bond that has the highest discount rate.

If investors hold the bond until maturity, then we call the ***discount rate*** the yield to maturity. Economists consider the ***yield to maturity*** the most accurate measure of interest rates because the yield to maturity allows investors to compare different bonds. For example, we want to buy a coupon bond today for a market price of $1,600. The bond pays $400 interest per year and matures in three years. Finally, the bond pays $1,000 on the maturity date. Consequently, we calculate our yield to maturity of 14.11% in Equation 6. We can compare this yield to other investments and choose the investment with the greatest yield.

$$\$1{,}600 = \frac{\$400}{(1+YTM)^1} + \frac{\$400}{(1+YTM)^2} + \frac{\$400 + \$1{,}000}{(1+YTM)^3} \tag{6}$$
$$YTM = 0.1411$$

As we can see, this calculation becomes very complicated. If we calculate the discount rate manually, then we must calculate the PV_0 by selecting various discount rates, such as 0%, 5%, 10%, and 20%. Next, we insert our particular discount rate, r, into Equation 7, and select the discount rate that has a present value, PV_0, close to $1,600. Mathematicians wrote programs that can solve for the discount rate. If we visit the author's website, szulczyk.net, we can find a JavaScript program that can solve for the discount rate.

$$PV_0 = \frac{\$400}{(1+r)^1} + \frac{\$400}{(1+r)^2} + \frac{\$400 + \$1{,}000}{(1+r)^3} \tag{7}$$

The yield to maturity generates two critical rules on bonds, which include the following:

- The market interest rate (or yield to maturity) and the market price (or present value) of the securities are inversely related. For example, if we examine the present value formula, the interest rate, or yield to maturity, is located in the denominators of the fractions. Thus, the market price falls as the interest rate rises, and vice versa.

- If a bond has a shorter maturity, subsequently, its price will fluctuate less for a change in the market interest rate. We show this by an example.

For example, we have two bonds with a face value of $5,000 and a coupon interest rate of 10%, paid annually. In our case, both bonds pay $500 once a year. The first bond matures in one year, while the other bond matures in 10 years. If the market interest rate rises to 16%, then the one-year bond has a market price of $4,741.38 while the 10-year bond has a market value of $3,550. Consequently, the interest rate change affected the 10-year bond more than the one-year bond. We calculated the market value of the one-year bond in Equation 8 and the ten-year bond in Equation 9. As this example illustrates, investors prefer money market securities because they fluctuate less when the interest rate changes.

$$PV_0 = \frac{\$500 + \$5{,}000}{(1+0.16)^1} = \$4{,}741.38 \tag{8}$$

$$PV_0 = \frac{\$500}{(1+0.16)^1} + \frac{\$500}{(1+0.16)^2} + \cdots + \frac{\$500 + \$5{,}000}{(1+0.16)^{10}} = \$3{,}550.03 \tag{9}$$

We can become confused by the terms used throughout this book. We use yield to maturity, discount rate, and interest rate interchangeably, and we can interpret these terms to mean an interest rate. However, the rate of return differs because investors could sell their securities before they mature. Thus, the rate of return includes the interest rate and capital gains or losses. A ***capital gain*** occurs when an investor sells a financial security for a higher price. In comparison, a ***capital loss*** occurs when an investor sells a financial security for a lower price. Investors do not want capital losses, but they can occur. For instance, an investor must sell an asset whose market price has dropped because they need cash quickly. Thus, the present value still works for capital gains and losses. Finally, if the investor holds onto the security until the maturity date, then the rate of return equals the yield to maturity.

A bond, for example, has a face value of $2,000 with a coupon interest rate of 5% and a 10-year maturity. We bought this bond for $2,000 and then resold it two years later for $2,400. Thus, we collected two years of interest. Consequently, our rate of return equals the two years of interest plus the capital gain. We calculated the capital gain in Equation 10, and r equals the rate of return of 14.33%. The author used a computer program to solve for r.

$$\begin{aligned} PV_0 &= \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} \\ \$2{,}000 &= \frac{\$100}{(1+r)} + \frac{\$100 + \$2{,}400}{(1+r)^2} \\ r &= 0.1433 \end{aligned} \tag{10}$$

A capital loss is similar. As an illustration, we bought a financial security for $2,000 with a coupon interest rate of 5% and held it for two years. Although we earned two years of interest, this company reported financial trouble, and the bond price dropped to $1,000. Unfortunately, we calculated our return from the investment as a huge loss of -23.3% in Equation 11.

$$\begin{aligned} \$2{,}000 &= \frac{\$100}{(1+r)} + \frac{\$100 + \$1{,}000}{(1+r)^2} \\ r &= -0.233 \end{aligned} \tag{11}$$

The Valuation of Stocks

The value of a stock equals the present value of an asset's future cash flows. Thus, the present value of all future cash flows is the asset's market price in Equation 12. The market price of stock per share equals P_0. The market price in period 1 is P_1, while D_1 indicates the dividends. Finally, the rate of return is r, and the subscripts denote the period.

$$P_0 = \frac{D_1}{(1+r)} + \frac{P_1}{(1+r)} \tag{12}$$

An investor values his stock, P_0, at time 0, which equals the discounted dividend he receives next year and the market price he would receive if he sells the stock. Furthermore, if the investor is in the first period, then the investor faces the same choice for Period 2 in Equation 13. Thus, we moved the time subscripts ahead by one period.

$$P_1 = \frac{D_2}{(1+r)} + \frac{P_2}{(1+r)} \tag{13}$$

We obtain Equation 14 by substituting Equation 13 into Equation 12.

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{P_2}{(1+r)^2} \tag{14}$$

Then we build our sequence by examining an investor's decision for Period 3, and substitute that equation into Equation 14 for variable P_2. We continue to expand an investor's future decision for each period until we derive an infinite sequence in Equation 15.

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots \tag{15}$$

If the corporation pays the same dividends, then $D = D_1 = D_2 = \cdots$. Subsequently, the market price becomes a perpetuity, where we simplify a stock's value to Equation 16.

$$P_0 = \frac{D}{r} \tag{16}$$

As an illustration, we purchase stock as a long-term investment. Our annual rate of return is 5%, and we expect the corporation to pay \$2 per share indefinitely. Consequently, we compute the market value of this stock of \$40 per share in Equation 17.

$$P_0 = \frac{D}{r} = \frac{\$2}{0.05} = \$40.00 \tag{17}$$

If we want to know the market value of this stock for one year, then this becomes a trick question. Since we expect to earn the same dividend year after year, the market price is still \$40.00. Thus, the investor does not experience any capital gains or losses.

Many investors want their dividends to grow over time, and Equation 16 can include a dividend growth rate. If the dividend grows at g percent per year, then we update the present value formula to include a dividend growth rate in Equation 18. Consequently, we can simplify this infinite sequence into something similar to a perpetuity.

$$P_0 = \frac{D(1+g)}{(1+r)} + \frac{D(1+g)^2}{(1+r)^2} + \frac{D(1+g)^3}{(1+r)^3} + \cdots = \frac{D}{r-g} \tag{18}$$

For instance, we purchase stock as a long-term investment. Our rate of return equals 10%, and we expect the corporation to pay \$2 dividend that grows 5% per year. Thus, we compute a market value of the stock of \$40 per share in Equation 19.

$$P_0 = \frac{D}{r-g} = \frac{\$2}{0.10-0.05} = \$40.00 \tag{19}$$

Using the same numbers, what would happen if dividends grow at a slower rate, such as 2% per year? We calculate a market value of \$25 per share because the dividend grows slowly in Equation 20.

$$P_0 = \frac{D}{r-g} = \frac{\$2}{0.10-0.02} = \$25.00 \tag{20}$$

Two forces reduce future cash flows. First, a greater discount rate lowers the future value of cash flows. Second, a larger dividend growth rate increases the value of future cash flows, causing the dividends to grow faster than the rate of return. Nevertheless, the dividend growth rate must be lower than the discount rate, or g > r. Otherwise, the future cash flows become more valuable over time, making the present value negative.

For example, we purchase stock as a long-term investment. Our rate of return is 12%, and we expect the corporation to pay \$5 at Time 1 with dividends growing at 5% per year. Thus, we calculated a market value of this stock of \$71.43 per share in Equation 21.

$$P_0 = \frac{D}{r-g} = \frac{\$5}{0.12-0.05} = \$71.43 \tag{21}$$

The market value of stock for the second period does not equal \$71.43 because the stock price has grown 5% per year. Instead, we calculate the market value of \$75 in Equation 22.

$$P_1 = P_0(1+g) = \$71.43(1+0.05) = \$75.00 \tag{22}$$

Using Equation 18, we can solve for different variables, depending on what we know. For example, the stock price equals \$100 per share while dividends are \$3 per share that grow 5% per year. We can compute the rate of return on this investment. We calculate a rate of return of 8% per year in Equation 23.

$$\begin{aligned} \$100 &= \frac{\$3}{r-0.05} \\ r &= 0.08 \end{aligned} \tag{23}$$

Some corporations, especially in high-tech industries, pay low dividends in the beginning. Subsequently, the corporation grows rapidly over time, and it begins paying higher dividends. We can modify the present value formula to handle this situation. The present value formula has two components:

- Non-steady state – we use the present value to write out all cash flows when the dividend growth rate is not constant. Non-steady state occurs for a new corporation.

- Steady state – the corporation begins paying dividends over time that increase at a constant rate. This occurs after the corporation becomes mature. Consequently, we calculate the cash flows as a perpetuity.

As an illustration, we set the rate of return to 10%. A corporation pays a dividend of $6 at time 1. The corporation expects to increase the dividend by 2% for the first year, 4% for the second year, and 6% for the third year. After Year 3, the dividend grows at a constant rate of 6% per year. In this case, we solve for the dollar value of the dividend for each year with no fixed growth rate. We calculate the following:

- Year 1: D_1 = \$6(1+0.02) = \$6.12

- Year 2: D_2 = \$6.12(1+0.04) = \$6.3648

- Year 3: D_3 = \$6.3648(1+0.06) = \$6.746688

The third year becomes the perpetuity because the corporation begins increasing the dividend at a constant rate. For this example, we must observe the time subscripts. Remember, we calculate the stock price, P, one period before the dividend payment, D, in Equation 24.

$$P_2 = \frac{D_3}{r - g} = \frac{\$6.746688}{0.10 - 0.06} = \$168.67 \qquad (24)$$

Finally, we can calculate the market value of the stock share in the period 0 by discounting the future cash flows of the stock in Equation 25.

$$P_0 = \frac{\$6.12}{(1 + 0.1)} + \frac{\$6.3648}{(1 + 0.1)^2} + \frac{\$168.67}{(1 + 0.1)^2} = \$150.22 \qquad (25)$$

A new startup internet company does not pay dividends for the first three years. In year 4, the company begins paying a dividend of $10 per share that grows 5% per year. If the rate of return is 8%, then we calculate the market value of the stock.

- First, we set the dividends to zero for the initial three years, which means $D_1 = D_2 = D_3 = 0$

- Second, we set the dividend to \$10 for the fourth period, or D_4 = \$10. Next, we calculate the perpetuity that begins in Period 3 in Equation 26.

$$P_3 = \frac{D_4}{r - g} = \frac{\$10}{0.08 - 0.05} = \$333.33 \quad (26)$$

Unfortunately, Equation 26 yields the market value of stock for Period 3. If we are in Year 0 for the cash flow, then we use the present value formula to calculate the stock price in Time 0 in Equation 27. Consequently, the market value of the stock equals $264.61 per share.

$$P_0 = \frac{\$333.33}{(1 + 0.08)^3} = \$264.61 \quad (27)$$

Key Terms

bond
notes payable
stock
dividends
discount bond
coupon bond
premium
discount
consul
perpetuity
registered bond
bearer bond
debenture bond
convertible bond
municipal bond
discount rate
yield to maturity
capital gain
capital loss

Chapter Questions

1. Explain the similarities and differences between notes payable and a corporate bond.

2. Identify the advantages of issuing more bonds instead of stock.

3. A T-bill has a face value of $20,000 with a yield to maturity of 3%, and this bill matures in 270 days. Calculate the market value of this T-bill.

4. If a consol pays $100 of interest every year and the market interest rate equals 6%, compute the market value of this consol.

5. A bond has a face value of $2,000, an interest rate of 10%, and pays interest twice a year. If the yield to maturity is 5% and the bond matures in three years, calculate the market value of this bond.

6. A bond has a face value of $2,000, an interest rate of 10% and pays interest twice a year. If the yield to maturity is 20% and the bond matures in three years, compute the market value of this bond.

7. Explain why money market securities make better investments than capital market securities.

8. If we expect the central bank to lower interest rates, define a good investment strategy.

9. We bought a discount bond for $4,500. If the bond matures in 3 years with a face value of $5,000, calculate our yield-to-maturity (YTM).

10. If a corporation expects to pay $1 dividend every year that grows 3% per year while the market interest rate is 4%, compute the market value of this stock.

11. A new internet company does not pay dividends for the first two years. However, in Year 3, the company will pay a $1 dividend that grows at 5% per year. Calculate the market price of this stock if the interest rate is 10%.

9. Determining the Market Interest Rates

We explain in this chapter which factors determine interest rates by using the market forces of supply and demand for bonds. Several factors shift the supply and demand functions, which alter the bond's market quantity, market price, and market interest rate. These shifts allow analysts and economists to predict changes in interest rates and bond prices. We also use demand and supply functions to explain interest rate behavior during business cycles and recessions and explain the Fisher Effect. Finally, we introduce a loanable funds market for a small country. Then we expand the supply and demand for bonds to include the world's real interest rate. The world's interest rate either causes loanable funds to enter or leave a small country.

The Supply and Demand for Bonds

Interest rates have fluctuated substantially in the United States during the second half of the 20th century. For example, interest rates on 3-month T-bills were 1% in the early 1950s. Then the interest rates on T-bills soared to over 15% in 1981 and subsequently, plummeted to below 6% in the mid-1980s and 1990s. Currently, T-bill rates have fallen below 1% after the 2008 Financial Crisis while rising to around 4% in 2025.

Everyone closely watches the interest rates. They determine whether consumers should save or buy, whether families should buy a house or purchase bonds. Furthermore, the interest rates influence business decisions to invest in new equipment or invest their money in financial securities. From Chapter 2, we have learned the major financial instruments. All these instruments represent credit market instruments. All these instruments are loans, where one party lends funds to another party, except corporate stock. Stock conveys ownership in a corporation and is not a loan.

Companies and governments issue various credit instruments with different maturities. Therefore, each credit instrument has an interest rate associated with it. Financial markets have hundreds of financial instruments, which create hundreds of interest rates. The good news is that all interest rates usually move together. If one interest rate increases, then the other interest rates rise too. For our analysis, we assume a market has one interest rate.

The bond supply and demand determine the interest rate in the ***bond market***, and a bond becomes a tradable commodity. Investors buy bonds, while businesses and governments supply them. Consequently, the intersection of supply and demand functions in the bond market determines the bond's market price and quantity.

The ***demand function*** reflects the relationship between the quantity demanded and the market price of bonds, when we hold all other economic variables constant. We show a demand function in Figure 1. The demand function has a negative slope because as we move from point A to point B, the price of bonds becomes lower, so investors buy more bonds for a cheaper price. Just imagine bonds are similar to a product. For example, if the price of a soda becomes cheaper, then consumers buy more sodas. Please note that as we move from point A to point B, the price of bonds decreases, so using the present value formula, the market interest rate rises. Hence, the investors are attracted to the higher interest rate.

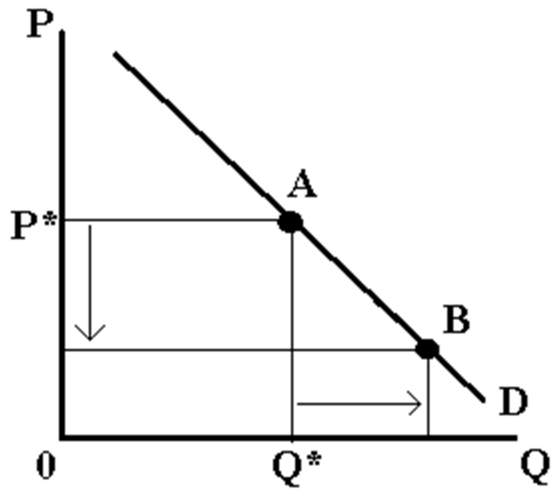


Figure 1. The demand function for bonds

The ***supply function*** shows the relationship between the quantity supplied and the market price, when we hold all other economic variables constant. We draw a supply function in Figure 2. The supply function has a positive slope because, as we move from point A to point B, the price increases (while the market interest rate falls). Consequently, businesses and firms borrow more funds because the interest rates are cheaper. Remember that a bond's interest rate moves in the opposite direction of a bond's price.

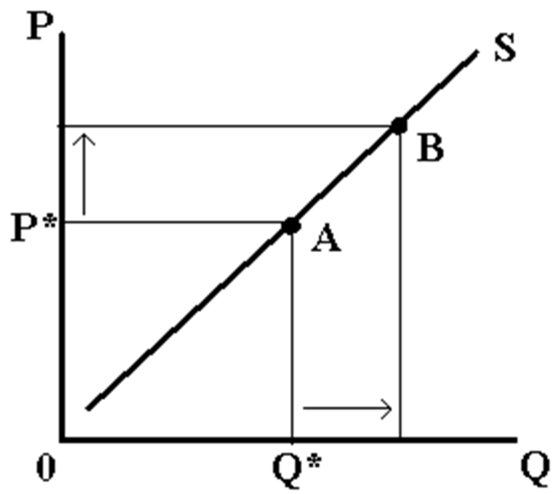


Figure 2. The supply function for bonds

Demand and supply functions intersect at one point, the equilibrium. The ***equilibrium*** reflects a state of rest. As long as the supply or demand function does not change, then the price and quantity remain where they are. We show supply and demand functions in Figure 3. At this point, the quantity demanded equals the quantity supplied for bonds. The Q* and P* represent the equilibrium quantity and price. Using the present value formula, we can deduce what happens to the market interest rate.

What would happen to the bond market if the bond's price exceeds the equilibrium price? Consequently, the quantity supplied is greater than the quantity demanded, creating a ***surplus***. Businesses and governments sell more bonds because the price of bonds is high, and interest rates are low. However, investors do not buy these bonds due to their high price and low interest rates. Thus, the bond's price falls until it restores equilibrium at P* again.

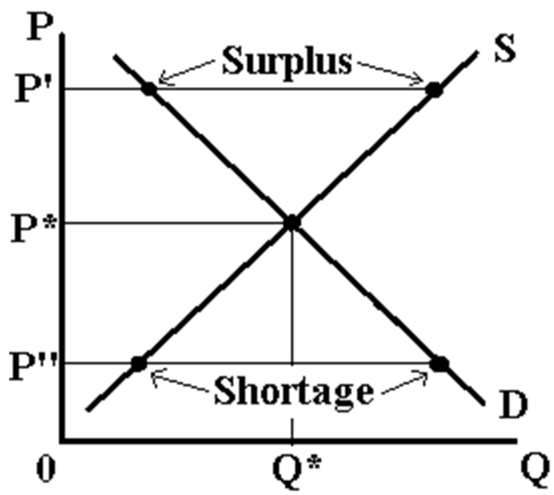


Figure 3. The supply and demand for bonds

What would happen in the market if the price of bonds were lower than the equilibrium price? The quantity supplied becomes less than the quantity demanded, creating a ***shortage***. Bond prices are low, and interest rates are high. Consequently, investors have a large demand for bonds because they offer a good investment. However, businesses and governments do not sell bonds at a low price and a high interest rate. Thus, the bond's price must increase until equilibrium is restored at P* again, decreasing the market interest rates. Therefore, the market always gravitates to equilibrium and consistently eliminates shortages and surpluses as long as a government does not interfere in the market.

Please know the difference between a movement along a demand curve and a demand function shift. We show a decrease in quantity demanded in Figure 4. Investors demanded more bonds as we move from point A to point B. Economists call this a change in "***quantity demanded***." Investors increase the quantity demanded because the price of bonds becomes cheaper. Consequently, a factor has changed the supply function and not the demand function. If an outside factor affects the demand function, then the demand function would shift. Economists call a rightward shift an "increase in demand," while a shift to the left is a "***decrease in demand***." We show a demand function shifting in Figure 5.

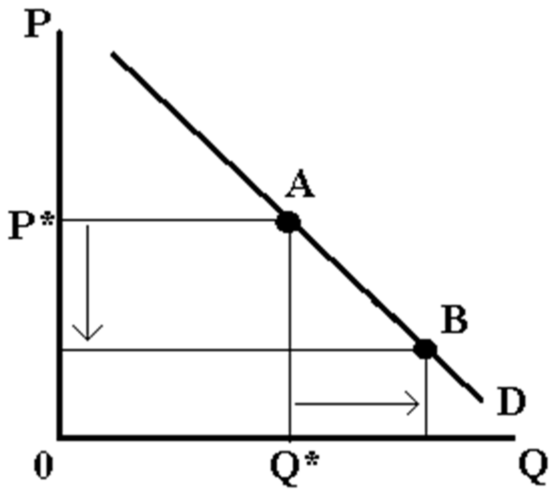


Figure 4. A movement along a demand function

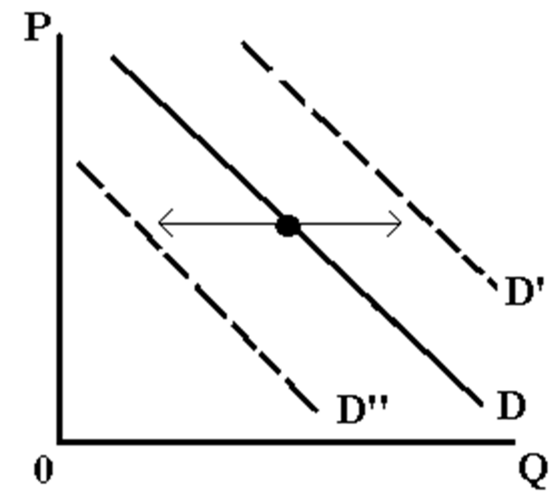


Figure 5. A demand function shifts

We listed six factors to show an increase in the demand function, shifting it to the right. We show the increase in the demand function in Figure 6. When the investors increase their demand for bonds, the demand function shifts to the right because investors buy more bonds. Thus, both the equilibrium quantity, Q*, and the bond's market price, P*, rise. When we discount the bonds using the present value formula, the market interest rate for the bonds falls.

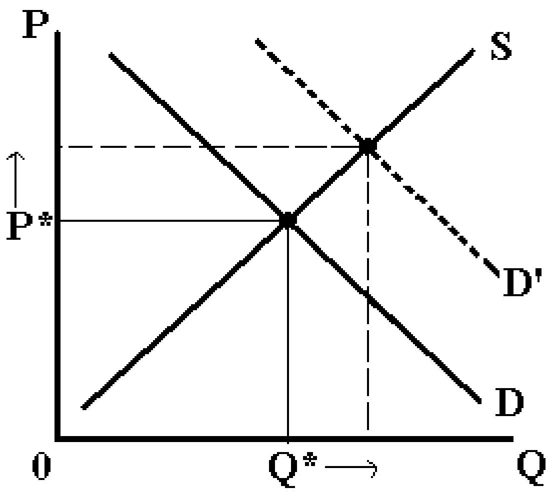


Figure 6. A demand function increases

We list the following six factors that increase the demand function:

- An ***increase in wealth*** increases the bond’s demand function, shifting it to the right. A growing economy creates wealth. Thus, the demand for bonds increases too because investors and the people have more wealth and invest more in the bond market.

- A ***decrease in the expected returns*** on investment increases the bond’s demand function, shifting it to the right. If investors believe interest rates will decrease, they would buy more bonds now. For example, if we believe interest rates will fall, the bond prices would increase. Consequently, we buy bonds now because they offer a low price with a high interest rate, and we can resell them in the future at a higher price as the market interest rate falls.

- A ***decrease in expected inflation*** increases the bond’s demand function, shifting it to the right. Inflation erodes the purchasing power of households, businesses, and governments. Inflation also erodes the value of investments, such as stocks and bonds. Thus, the investors would buy fewer bonds if they believe the inflation rate will rise in the future, especially long-term bonds. If investors expect inflation to decrease in the future, they tend to buy more bonds for investment.

- A ***decrease in the risk*** of bonds increases the bond’s demand function, shifting it to the right – investors loan funds to borrowers, who will not default on their loans. Investors are usually risk-averse. If investors believe the bond market becomes more stable and “safer," then they buy more bonds.

- An ***increase in the liquidity*** of the bond market increases the bond’s demand function, shifting it to the right. Investors are attracted to highly liquid bonds. The future is uncertain, and investors can sell an asset fast for little transaction cost. If the bond market becomes more liquid, such as U.S. government securities, then investors boost their demand for U.S. government bonds.

- A ***decrease in information costs*** increases the bond's demand function, shifting it to the right. Investors continually need information so they can evaluate their investments. For example, firms like Standard & Poor's assess the financial strength of large corporations and the corporations' ability to repay their debts. Investors have low information costs for large corporations, increasing their demand for large corporate bonds.

Please note that the demand function can shift leftward by the same six factors. We reverse the logic for the six factors. For example, an increase in expected inflation causes the demand function to decrease and shift to the left. Consequently, the bond price falls while the interest rate rises.

Four factors cause the supply function to shift. We listed them in a way that causes the supply function to increase and shift to the right in Figure 7. When businesses and governments issue more bonds, the supply function shifts rightward, causing the equilibrium quantity (Q*) to increase while the bond's market price (P*) falls. When we discount the bond's price using the present value formula, the bond's market interest rate rises.

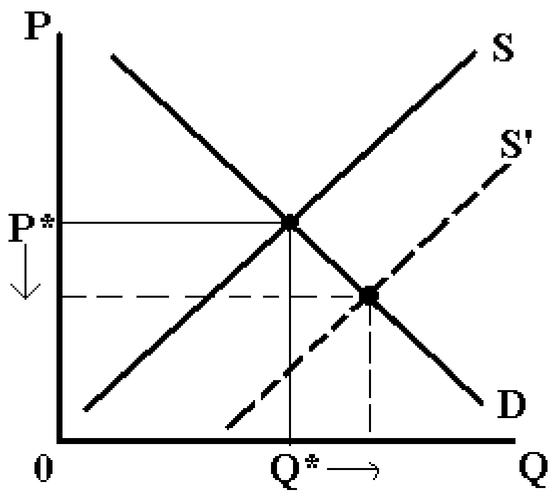


Figure 7. A supply function increases

The following four factors shift the supply function:

- A ***rise in expected profits*** increases the bond's supply function, shifting it to the right. A business would borrow and increase its debt to acquire assets like machines and equipment if it expects to generate larger profits. Usually, businesses issue bonds for machines and equipment during a business cycle because of profit expectations, while the opposite occurs during a recession.

- A ***decrease in business taxes*** increases the bond's supply function, shifting it to the right. If a government subjects a business to high taxes, then the business has a low incentive to invest in machines and equipment or expand its production. More investment, such as borrowing funds through the bond market, enlarges the firm, increasing its tax burden. If a government lowers the tax burden on businesses, businesses could invest more by using bonds, thereby increasing the bond supply, which would shift the supply curve to the right.

- A ***rise in expected inflation*** increases the bond's supply function, shifting it to the right. Inflation erodes the value of the dollar. Consequently, the value of debt decreases over time. If businesses and the government anticipate rising inflation, they borrow more funds by issuing bonds. Then they repay their loans with "cheaper" dollars.

- A ***rise in government borrowing*** increases the bond's supply function, shifting it to the right. When the government spends more than what it collects in taxes, the government can borrow by issuing government bonds. The United States federal government has operated with budget deficits for the last 50 years. Every year, the U.S. government issues more debt via bonds, and the supply of bonds keeps increasing, which raises interest rates and reduces bond prices.

Please note that the supply function can shift to the left by the same four factors. We reverse the logic for the four factors. For example, a drop in expected inflation causes the supply function to decrease and shift leftward. Consequently, the bond price rises while the interest rate falls.

We have an excellent example that comes from a policy shift in the Trump Administration in 2025. The new policy allows the U.S. Department of the Treasury to impose a 20% tax on interest earned by foreigners on their U.S. investments if the government believes the foreigners' country imposes unfair taxes on Americans. Some claim this tax is arbitrary because what determines an unfair tax advantage? Nevertheless, what is the potential impact on the U.S. Treasury bond market? To foreigners, U.S. Treasury bonds are less attractive because the U.S. government can raise taxes on the returns foreigners earn on their bonds. Thus, the quantity of bonds decreases, the market price decreases, while the interest rate or yield increases. Unfortunately, the tax that some dubbed the "revenge tax" can raise the U.S. government's borrowing costs.

Interest Rates and the Business Cycle

The empirical evidence indicates that market interest rates rise during a business cycle and fall during recessions. During a business cycle, the amount of goods and services produced in the economy increases because businesses become optimistic about future profits and invest in machines and equipment by issuing more bonds; consequently, the supply of bonds increases. If an economy produces more goods and services, it creates more wealth. Investors save more and invest in the financial markets. Thus, the bond's demand increases and the demand function shifts rightward in Figure 9.

The U.S. Treasury Bond

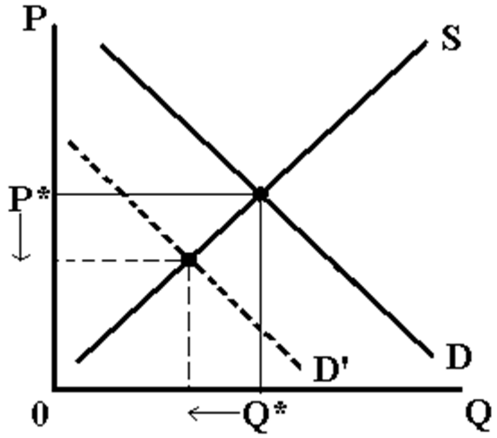


Figure 8. The demand function decreases for the "revenge tax"

When both the supply and demand functions shift, we know either the price or quantity while the other variable becomes indeterminate. In this case, both functions increase, causing the amount of bonds to increase, but bond prices and interest rates become unknown. We can do an experiment with the supply and demand functions. First, we increase the demand function significantly, and increase the supply function slightly. Second, we increase the demand function slightly and increase the supply function substantially. Consequently, the market price is greater in the first case and lower in the second case. Therefore, changes in bond prices and interest rates become ambiguous. Unfortunately, we cannot prove that interest rates rise during economic expansions and fall during recessions.

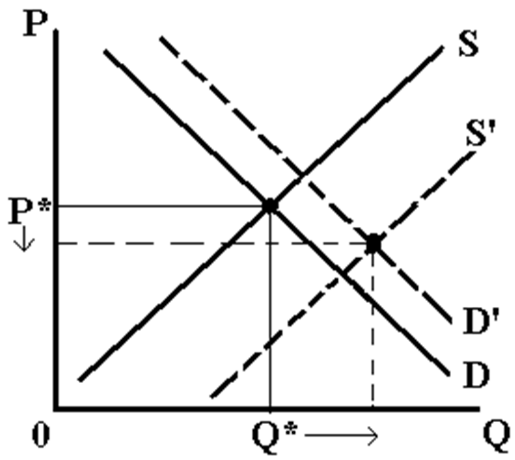


Figure 9. Both supply and demand functions increase

The Fisher Effect

We have discussed nominal interest rates. We did not adjust the nominal interest rates for inflation. Unfortunately, inflation can have a significant influence on the financial markets. Investors and savers are concerned about the real interest rate because the real interest rate reflects the actual cost of borrowing. The ***Fisher Effect*** relates nominal and real interest rates, and we define the notation as:

- i is the nominal interest rate.
- r equals the real interest rate.
- π^e is the expected inflation rate.

We show the Fisher Effect Equation in Equation 1. It equals a geometric average of the expected inflation rate and real interest rate.

$$(i+1) = (1+r)(1+\pi^e) \qquad (1)$$

For low inflation and low interest rates, we can use the approximation that we had derived in Equation 2. We multiply the two right terms and then set the cross term to zero because it becomes a tiny number. However, if the inflation rate or interest rate becomes high, then the approximation loses accuracy as the cross term becomes large.

$$\begin{aligned} (i+1) &= (1+r)(1+\pi^e) \\ i+1 &= 1 + r\pi^e + r + \pi^e \\ i &\approx r + \pi^e \end{aligned} \qquad (2)$$

For example, we expect the inflation rate to be zero ($\pi^e = 0$), and we grant a loan for 5% for one year. At the end of Year 1, we have 5% more money in real terms because we can purchase 5% more in goods and services. We calculated the real interest rate in Equation 3.

$$r \approx i - \pi^e \approx 5 - 0 = 5 \qquad (3)$$

What would happen if we expect inflation to increase to 5% ($\pi^e = 5\%$), and we grant a loan for one year at 5%? At the end of year 1, we would have 5% more money, but prices, unfortunately, became 5% higher too. Consequently, our purchasing power would not change in real terms because what we earned and what we could buy increase by the same percentage. We calculated the real interest rate in Equation 4.

$$r \approx i - \pi^e \approx 5 - 5 = 0 \qquad (4)$$

The real interest rate, therefore, reflects the actual cost of borrowing and becomes a better indicator of incentives to lend and borrow. Many financial analysts use nominal interest rates because inflation is low in the United States, averaging 3% per year or less. Since the 2020 COVID-19 pandemic, inflation has struck the United States in 2022. Inflation, unfortunately, is picking up again in 2025 from the U.S. aggressive tariff policies.

We can use the bond market to show the Fisher Effect. If investors anticipate higher inflation in the future, they buy fewer bonds. Investors know that inflation will erode the value of their investment. Thus, the demand for bonds shifts to the left. However, businesses and governments want to sell more bonds because they can repay the bonds with inflated dollars. The supply for bonds shifts rightward. We show the impact on the bond market in Figure 10. Accordingly, the price of bonds decreases and the interest rates increase. In this case, the amount of bonds (Q*) in the market is ambiguous. We prove this by shifting the demand and supply curves enough so that the quantity does not change. Then we shift either function a little more, and the equilibrium quantity changes direction. Thus, greater inflationary expectations lead to higher bond prices and lower bond interest rates, as we use the present value formula.

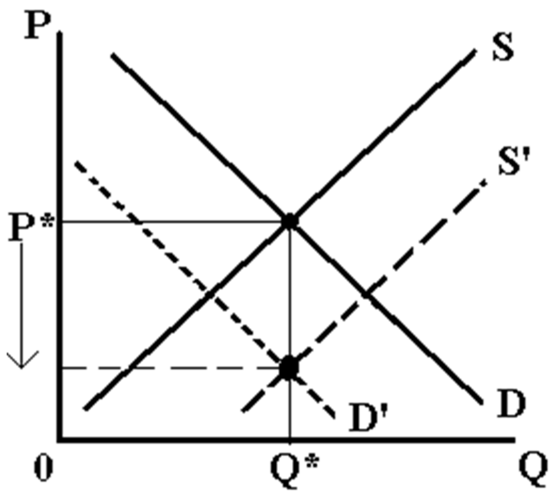


Figure 10. The supply and demand functions explain the Fisher Effect

Financial analysts always write interest rates for financial instruments in nominal terms. If investors and the public have higher expectations of inflation (π^e), then nominal interest rates (i) become greater. If the government wants low nominal interest rates, then the public and investors must believe the inflation rate will be low.

Bond Prices in an Open Economy

In the previous supply-demand graphs, the bond was the good for the market. However, we could switch the analysis, where the money exchanged for the bond becomes the commodity. Then money becomes the ***loanable funds***. Consequently, the bond and loanable funds markets yield identical results because we examine the same picture from a different perspective. Nevertheless, loanable funds switch the roles of supply and demand. If investors buy bonds, it indicates a demand for them. Investors become a source of loanable funds because they trade money for bonds. Thus, the investors represent the supply function in the loanable funds market. If a business or government sells bonds, then it demands loanable funds. Therefore, they represent the demand function for loanable funds. The equilibrium price in the loanable funds market is the interest rate, while the equilibrium quantity is the amount of loanable funds.

Previous supply-demand examples viewed the bond market as a closed economy. A ***closed economy*** has no financial transactions with other countries because the country does not allow money and goods to flow across its borders. However, we could modify the analysis to facilitate international investors' entry into the market. An ***open economy*** is a country that allows goods, services, and financial securities to flow freely in or out of a country. Consequently, the analysis uses the loanable funds approach. The quantity represents the amount of loanable funds, while the price is the real interest rate. We use the real interest rate because investors are concerned about their investment return after accounting for inflation. Thus, we deduct a country's inflation rate from the nominal interest rate, yielding the real interest rate.

If a country were a closed, small economy, the loanable funds market would be at equilibrium. Domestic investors represent the supply of loanable funds, while businesses and governments demand them. Furthermore, we assumed the country is small because the investors, government, and companies cannot influence the international interest rate. Consequently, the real interest rate equals 5% in Figure 11 while the amount of funds in the market is L*.

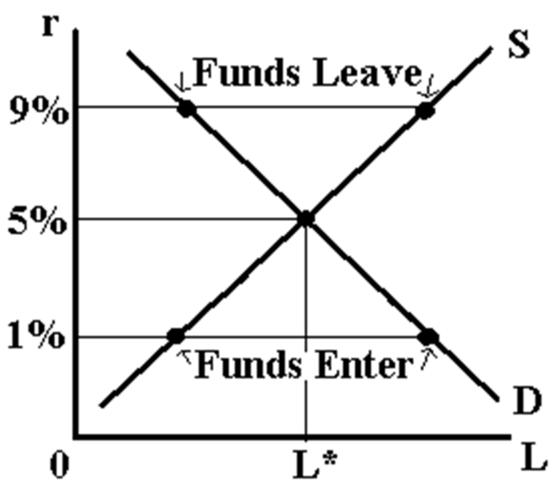


Figure 11. Loanable funds in an open economy

If the world's real interest rate were 9%, domestic investors would invest their funds in the international market, earning a higher interest rate, as shown in Figure 11. However, businesses and governments would not borrow funds at this interest rate because it is too high. Consequently, the difference between quantity supplied and quantity demanded reflects the amount of funds leaving the country at 9% real interest rate. If this country were a closed economy, subsequently, the market would have a surplus, and market forces would lower the real interest rate to 5%.

If the world's real interest rate were 1%, then firms and the government would borrow at the cheap rates in Figure 11. However, the domestic investors would not lend at that rate. Consequently, the difference between quantity demanded and quantity supplied reflects the amount of funds entering the country. If this country were closed, then the loanable funds market would cause a shortage, and market forces would raise the real interest rate while restoring equilibrium.

We assumed the country is a ***small open economy*** because it is too small to influence the world's real interest rate. Many countries, such as the Netherlands and Belgium, would fall within this category. However, a large country like the United States, Germany, or Japan would affect the world's real interest rate.

Key Terms

bond market	increase in demand
demand function	decrease in demand
supply function	Fisher Effect
equilibrium	loanable funds
surplus	closed economy
shortage	open economy
quantity demanded	small open economy

Chapter Questions

1. Which six factors shift the demand for bonds, and in which direction?

2. Which four factors shift the supply for bonds, and in which direction?

3. Draw a bond market with a supply and demand function. What would happen in the market if the 2008 Financial Crisis caused wealth to drop?

4. Draw a bond market with a supply and demand function. What would happen in the market if a government imposes higher taxes on businesses?

5. Draw a bond market with a supply and demand function. What would happen in the market if investors expect greater returns from their investment?

6. How would the demand and supply functions for a bond market shift during a business cycle and a recession?

7. Calculate the real interest rate if the nominal interest rate equals 90% while the inflation rate is 100%. Please calculate both the exact and the approximate values.

8. How would the demand and supply functions shift in the bond market if investors, governments, and businessmen expect greater inflation? We will prove the Fisher Equation and the impact of expected inflation on the market interest rate and the bond's price.

9. Distinguish between the loanable funds market and the bond market.

10. Draw a loanable funds market for a small country with an equilibrium interest rate of 7%. What would happen if the world's interest rate were 9%?

11. Draw a loanable funds market for a small country with an equilibrium interest rate of 7%. What would happen if the world's interest rate were 5%?

10. Risk and Term Structure of Interest Rates

Businesses and governments offer a variety of bonds that differ in default risk, liquidity, information costs, and taxes. Thus, these differences cause interest rates and bond prices to vary among these different securities. Furthermore, the U.S. government offers Treasury Bills, Treasury Notes, and Treasury Bonds that range in maturity from 15 days to 30 years. Consequently, economists study these interest rates from these securities that they call the term structure of interest rates. Then economists can plot the term structure, called the yield curve. A yield curve usually slopes upward, indicating that long-term U.S. government securities pay a higher interest rate than short-term ones. Economists use three theories to explain the characteristics of the yield curve and how to utilize the yield curve to predict recessions.

Default Risk and Bond Prices

Default risk is the possibility that a borrower will not repay the principal and/or interest on a loan. For instance, the U.S. government has little risk of default[3], and investors call U.S. securities ***default-risk-free instruments***. The U.S. government can raise taxes, print money, or issue new debt when it experiences financial trouble. On the other hand, a business has some risk of default. A company can go bankrupt and fail to repay its debt. Economists call the difference between the interest rate on U.S. government bonds and corporate bonds the default risk premium. Investors add a ***default risk premium*** to a risk-free investment, so they can invest in "risky" bonds because they earn a greater return. Risk premium is always positive. Rating companies such as Standard & Poor's Corporation and Moody's Investor Service assess the default risk for corporations. These companies calculate a single statistic, called the ***bond rating***, based on a corporation's net worth, cash flow, and ability to meet its debt obligations.

The supply and demand functions that we learned in the last chapter can help explain the impact of market risk. We illustrate the supply and demand curves for two markets: the government bond market and the corporate bond market. We set the same equilibrium price and quantity for both markets in Figure 1, which means both markets have identical risks. Unfortunately, a corporation could have financial trouble, which leads investors to believe it could default. Some investors demand fewer corporate bonds and invest more in government bonds. Thus, the demand for corporate bonds falls while the demand for government bonds rises because the investors consider the government bonds default-free.

The government bonds have a higher bond price, while corporate bonds had a lower bond price. Thus, the market interest rate always moves in the opposite direction of bond prices because of the present value formula. Consequently, corporations pay greater interest rates for their bonds while the U.S. government pays a lower interest rate. Taking the difference between the government bond and corporate bond interest rates, we can calculate the risk premium. As the

[3] Moody's downgraded the U.S. debt on May 16, 2025, as the U.S. public debt has soared beyond $37 trillion. The era of U.S. debt being risk-free is coming to an end.

default risk increases, the risk premium increases too. During recessions, when some businesses go bankrupt, the default risk increases, increasing the risk premium. Hence, the difference between government and corporate interest rates would widen.

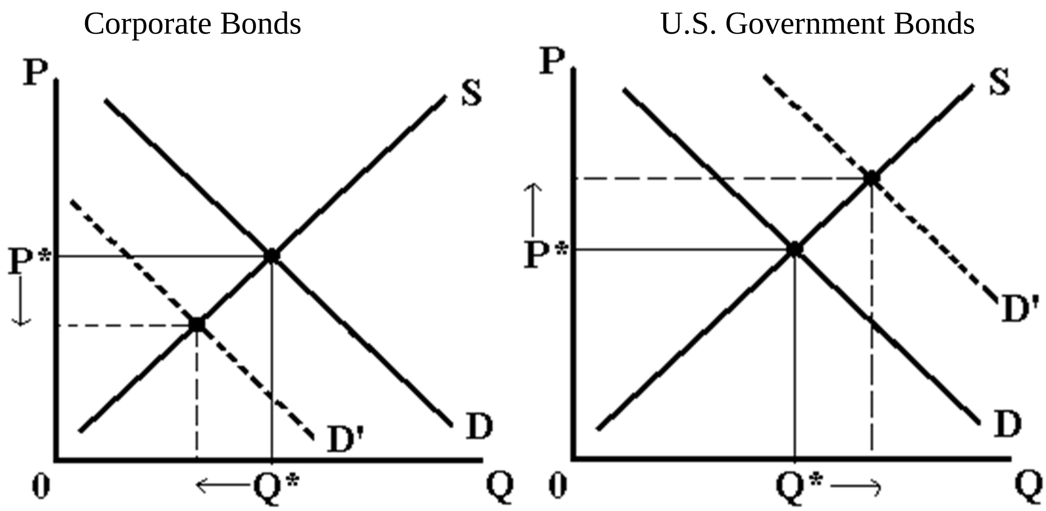


Figure 1. The impact of a risk premium on the bond markets

Liquidity and Bond Prices

Liquidity causes bond prices and interest rates to differ. For instance, U.S. government securities are widely traded and are the most liquid. Hence, investors can easily buy and sell them. On the other hand, corporate bonds are less liquid and less widely traded, making it more difficult for investors to buy and sell them. Consequently, we use a similar analysis to default risk, which we have explained in the previous section. We start the analysis with the same liquidity in both the government bond and corporate bond markets in Figure 2. Thus, both bond markets have the identical equilibrium bond price, P*, and hence, the same liquidity.

Investors are drawn to government bonds due to their higher liquidity. The secondary markets expand for government bonds, boosting the liquidity for these securities. The demand function increases and shifts rightward for government bonds. However, investors reduce their purchases of corporate bonds because they are less liquid, decreasing the demand function and moving it to the left. Thus, the government bond prices rise, which reduces the interest rate for government bonds. On the other hand, the decrease in corporate bond prices raises the market interest rate for corporate bonds. Taking the difference between the two interest rates, we measure the degree of liquidity. Nevertheless, economists refer to the difference in interest rates as a risk premium.

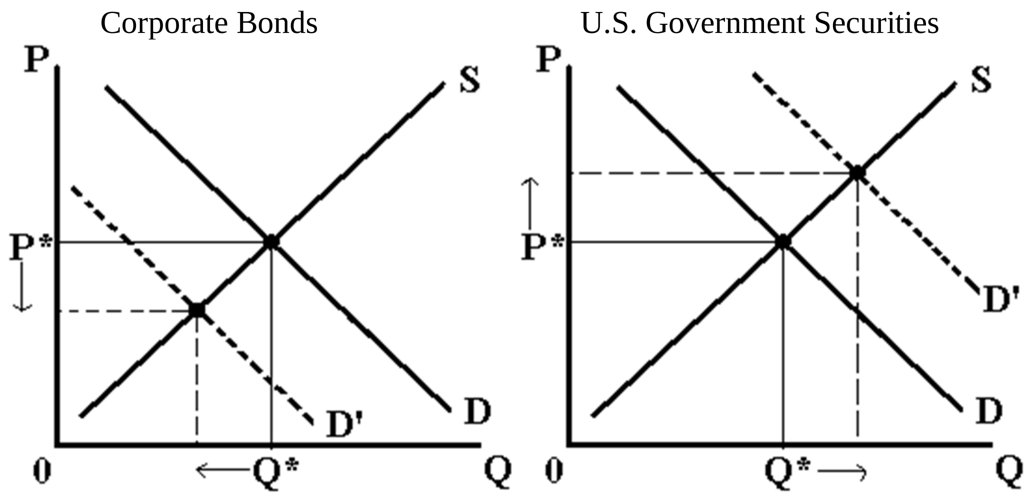


Figure 2. The impact of liquidity on the bond markets

Information Costs and Bond Prices

Information costs influence the bond prices and interest rates. If investors need time and money to acquire information on securities, then they pay a greater information cost. We include these costs in the bond's market price and interest rate, and they raise the cost of borrowing. For example, investors are well-versed in both U.S. government securities and corporate bonds from large corporations, and these securities have the lowest information costs. On the other hand, the information costs for new and small companies are high, and therefore, these companies pay greater interest rates when they borrow funds.

We can use the demand and supply analysis to create two markets for the high and low-information-cost bond markets. Both markets start with the same level of information, and consequently, the bond prices and interest rates are identical. We depict the bond markets in Figure 3. The equilibrium bond prices are similar for both markets and equal P*, and the interest rates would be equal.

Investors pay a greater cost to acquire information for the high information-cost bonds. Thus, investors are attracted to low information-cost bonds, which boosts their demand, increases the market price, and decreases the market interest rate. High information-cost bonds are not as attractive as an investment, so investors buy fewer bonds, reducing bond prices and raising interest rates. Therefore, low information-cost bonds pay a lower interest rate.

Taxes and Bond Prices

Taxes can cause bond prices and interest rates to differ. For example, U.S. government bonds have a lower risk of default and higher liquidity than ***municipal bonds***, which are state and local government bonds. However, the interest rates of municipal bonds have been consistently lower than those of U.S. government bonds for the last 50 years because investors do not pay U.S. taxes on the interest they earn on municipal bonds, but they pay U.S. government taxes on U.S. government securities. If we bought municipal bonds, we would subsequently earn a lower interest rate than U.S. government securities. Nevertheless, we pay no taxes, compensating us for the greater risk and lower liquidity.

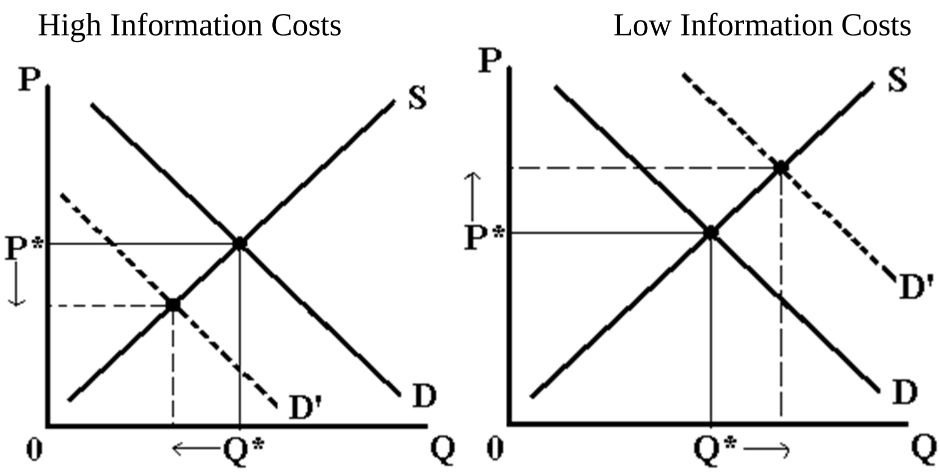


Figure 3. The impact of information costs on the bond markets

The demand and supply analysis shows the impact of taxes on the bond markets in Figure 4. The government taxes both the municipal and non-municipal bonds, while the default risk, liquidity, and information costs are equivalent for both markets. Consequently, bond market prices have the same market price, P*, and pay identical interest rates.

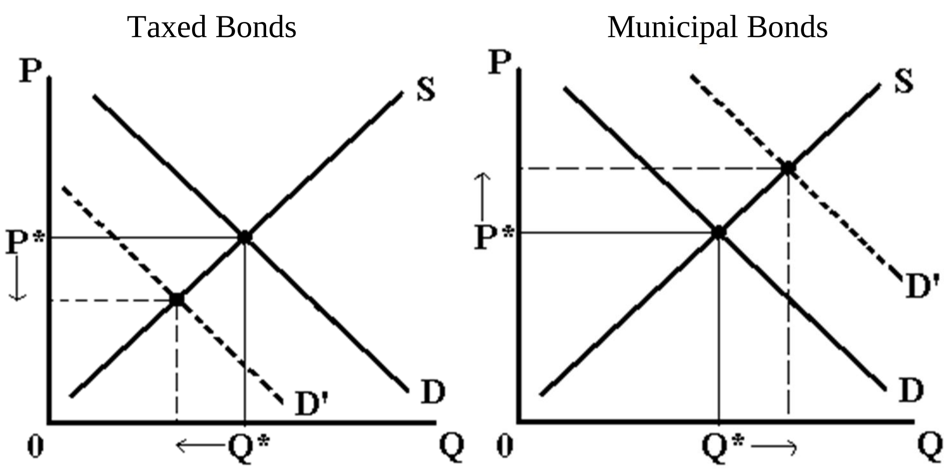


Figure 4. The impact of taxes on the bond markets

The U.S. Government has exempted municipal bonds from federal taxes. Thus, investors are attracted to municipal bonds, which boosts their demand, increases the market price, and decreases the market interest rate. On the other hand, the taxed bonds are not as attractive as an investment, so investors buy fewer bonds, causing bond prices to fall and interest rates to rise. Therefore, municipal bonds have a lower interest rate than U.S. government bonds.

The Role of the U.S. Dollar as a Reserve Currency

The events unfolding in 2025 indicate that countries and international investors question the role of the U.S. dollar as an international reserve currency. After Russia invaded Ukraine in February 2022, the United States and its allies froze about $300 billion in Russian currency exchange reserves. The interest of these funds was diverted to Ukraine to help finance its war effort. This event, while strategic, caused many nations to question the safety of holding U.S. dollar reserves. In response, Brazil, Russia, India, China, and South Africa, known as BRICS, have banded together to discuss forming an alternative financial system free from U.S. dominance. Many nations are interested in joining this new financial system. A second factor is that U.S. officials propose the weakening of the U.S. dollar. The problem is that foreigners hold U.S. dollars because the U.S. dollar is strong and retains its value. If foreigners believe their dollar holdings will weaken, they are not likely to hold them. Thus, these two factors challenge the role of the U.S. dollar as a reserve currency.

We illustrate this example in Figure 5. We start with the same government bond prices for the U.S. Treasury bonds and Chinese government bonds. As foreign investors lose confidence in the U.S. dollar as an international reserve currency, investors' demand for U.S. bonds decreases, while their demand for Chinese bonds increases. Thus, foreigners invest in fewer U.S. Treasuries as the quantity falls while investors buy more Chinese government bonds. Chinese bond prices have increased, while U.S. Treasuries have decreased. After applying the present value formula, the interest or yields on U.S. bonds rise while the yields fall for Chinese bonds. In 2025, the yields on Chinese bonds were below 2% while bond yields on U.S. Treasuries were above 4%.

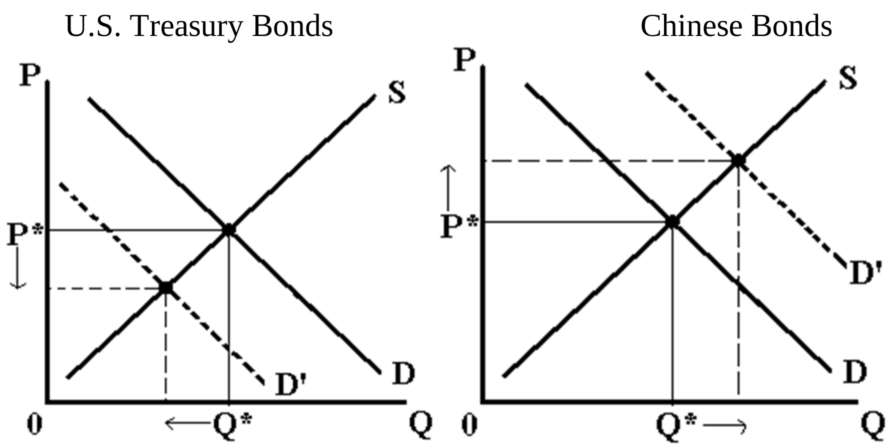


Figure 5. The impact of foreigners' confidence of the U.S. dollar

The Term Structure of Interest Rates

The ***term structure of interest rates*** refers to the fact that interest rates differ by maturity, assuming securities have identical risk, the same liquidity, similar information costs, and the same taxes. Economists define the term structure of interest rates for U.S. securities because the U.S. government issues a variety of securities with maturities ranging from 15 days to 30 years. No other finance company or business issues a broader range of securities that differ by maturity than the U.S. government. We show the interest rates for U.S. government securities in Table 1 for four specific dates: July 28, 1999, July 31, 2000, July 17, 2006, and March 31, 2023. The year 1999 was a good year for the U.S. economy, marked by rapid growth and a low unemployment rate. Thus, this year shows a normal upward-sloping term structure. We plot these interest rates to show the yield curve for these same years. The years 2000, 2006, and 2023 show an inverted term structure. This inversion preceded the recessions in 2001 and 2007. The 2023 term structure is unsettling since it remained inverted for two years from October 2022 to December 2024. Some claim the long inversion means the recession was avoided. However, many are predicting a severe recession in the latter part of 2025.

Table 1. The Term Structure of Interest Rates for U.S. Government Securities

Maturity	7/28/1999	7/31/2000	7/17/2006	03/31/2023
1-month	N/A	N/A	4.91	4.74
3-month	4.71	6.27	5.11	4.85
6-month	4.79	6.42	5.30	4.94
1-year	5.04	6.07	5.24	4.64
2-year	5.54	6.30	5.12	4.06
3-year	5.59	6.24	5.07	3.81
5-year	5.70	6.16	5.04	3.60
7-year	5.97	6.19	5.04	3.55
10-year	5.81	6.04	5.07	3.48
20-year	6.30	6.13	5.23	3.81
30-year	6.01	5.79	5.10	3.67

Economists plot U.S. government securities by the market interest rates and maturity, which we call a ***yield curve***. The yield curve can display a positive, negative, or flat slope and has two key characteristics. First, the yield curve usually slopes upward because the long-term securities have higher interest rates than short-term securities. Consequently, T-bonds usually have a greater interest rate than T-bills. Second, interest rates move together, so the yield curve shifts typically upward or downward as the interest rates change.

Economists use three theories to explain why the yield curve has these two characteristics.

The ***segmented markets theory*** is that supply and demand in each bond market determine the interest rate. For example, U.S. government securities are classified into specific and separate markets based on maturities. One group of investors only invests in T-bonds, while another group invests in T-bills. Consequently, the yield curve usually slopes upward because people prefer to hold short-term bonds rather than long-term bonds. Unfortunately, this theory cannot explain why interest rates move together in different markets, shifting the whole yield curve. If the markets of different maturities are separated and independent, a change in one bond market would not affect another market.

The ***expectations theory*** states investors view all securities with the same liquidity, risk, information costs, and taxes as perfect substitutes. Consequently, the interest rate on a long-term bond must equal the average of short-term interest rates that people expect to occur over the life of the security. For example, the current market interest rate on a one-year bond equals 9%. We expect the interest rate to rise to 11% next year, so when we buy another one-year bond for the following year, the average interest rate we expect to earn is 11%. If we decide to hold a two-year bond, the interest rate must be 10% because the interest rate will be 9% for the first year, and we believe interest rates will increase to 11% for the second year. After we average the two years, our return would equal 10%. If investors expect that short-term interest rates will rise, then the yield curve has a positive slope. If investors expect that short-term interest rates will drop, subsequently, the yield curve will have a negative slope. If investors expect short-term interest rates not to change, then the yield curve becomes flat. Although expectations theory explains why short-term and long-term interest rates move together, the theory cannot explain why the yield curve usually has a positive slope. This implies investors would think short-term interest rates will increase most of the time, but the short-term interest rate could fall or rise.

The ***preferred habitat theory*** is the most widely accepted theory, combining expectations theory and segment markets theory. Investors prefer to hold short-term bonds with a low expected return because investors prefer that type of habitat. Money market securities fluctuate less than capital market securities as interest rates change. However, the investors will invest in long-term bonds if they earn a ***term premium***, a higher interest rate. Consequently, the yield curve slopes upward because investors add the term premium to long-maturity bonds.

The preferred habitat theory explains why the long-term and short-term interest rates move together. Interest rate on a long-term bond equals the average of the short-term interest rates expected to occur over the life of the long-term bond. If investors expect short-term interest rates to increase, the yield curve will have a positive slope. If investors expect that short-term interest rates will decrease, subsequently, the yield curve will have a negative slope. However, investors add a term premium, so the yield curve has a positive slope because the term premium is high enough to cancel the effect of changing interest rates.

Most of the time, the yield curve has an upward slope, where long-term interest rates exceed short-term interest rates. We illustrate a standard, upward-sloping yield curve in Figure 5 for July 28, 1999, when the U.S. economy experienced rapid growth with a low unemployment rate. Lastly, many economists utilize the 10-year bond yield minus the 2-year note as the yield curve because of its ease of calculation. The 10-year rate reflects the long-term rate, while the 2-year rate reflects the short-term rate.

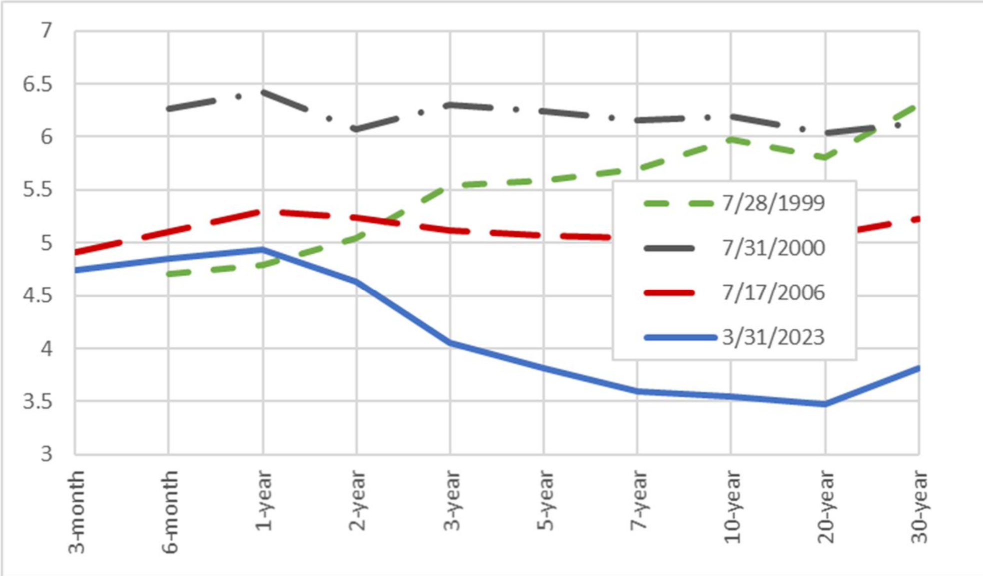


Figure 5. The yield curve for U.S. government securities for four specific dates

Economists use the yield curve to predict economic activity. When a yield curve is downward sloping, such as when a three-month T-bill interest rate exceeds the 10-year T-bond, a recession usually occurs one year later. Investors become pessimistic about the future and reflect their pessimism in the term structure of interest rates. It also reflects that the Federal Reserve has induced contractionary monetary policy or quantitative tightening, which removes reserves from the banking system and contracts the money supply. The monetary policy raises short-term interest rates first, while gradually trickling to long-term rates over time.

The yield curve inverted before the recessions of 2007, 2000, 1991, and 1981. For example, the yield curve inverted on July 31, 2000, and the United States entered a recession in March 2001. Furthermore, the yield curve flipped upside down on July 17, 2006, and inverted several times through the year. Subsequently, the U.S. economy entered the Great Recession in December 2007, becoming the worst recession since the 1930s Great Depression (Haubrich & Millington, 2014). Unfortunately, the world's economy took about 10 years to recover from this recession. Nevertheless, the yield curve inverted and stayed inverted between October 2022 and December 2024. We have yet to experience a recession in 2025, but this year has shown the classic signs of a recession. Companies are laying off workers; bankruptcies and foreclosures are rising quickly; a ***stagflation*** has gripped the U.S. economy, i.e., the U.S. economy is experiencing high inflation and low GDP growth at the same time. Lastly, many investors are losing trust in U.S. Treasury securities and the U.S. dollar. A financial collapse may be imminent at the end of 2025 or the start of 2026.

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2007, becoming the worst recession since the 1930s Great Depression (Haubrich & Millington, 2014). Unfortunately, the world's economy took about 10 years to recover from this recession. However, the yield curve inverted and stayed inverted between October 2022 and December 2024. We have yet to experience a recession in 2025, but this year has shown the classic signs of a recession. Companies are laying off workers; bankruptcies and foreclosures are rising quickly; a stagflation has gripped the U.S. economy, i.e., the U.S. economy is experiencing high inflation and low GDP growth at the same time. Lastly, many investors are losing trust in U.S. Treasury securities and the U.S. dollar. A financial collapse may be imminent at the end of 2025 or the start of 2026.

Although many economists and analysts use the yield curve to forecast recessions, the yield curve is not a perfect predictor. It predicted two recessions in 1966 and 1998 that never occurred (Haubrich & Millington, 2014). Some claim the two-year inversion of the yield in 2023 meant that the United States has averted the recession. However, others claim a severe recession is coming. The Trump Administration in 2025 also has strengthened the chances that the United States experiences a recession. Mass deportations in 2025 have ensnared international students and tourists. Consequently, international students may head to other countries to study while foreign tourists avoid the United States. International students contributed about $43.8 billion to the U.S. economy, while foreign tourists contributed about $165.5 billion in 2022. The contraction of these industries would amplify a downturn in the economy.

Key Terms

default risk
default-risk-free instruments
default risk premium
bond rating
municipal bonds
term structure of interest rates
yield curve
segmented markets theory
expectations theory
preferred habitat theory
term premium
stagflation

Chapter Questions

1. If one bond market has a high risk while the other is low risk, how does risk impact the bond markets? Please use demand and supply analysis to answer this question.

2. If one bond market were highly liquid while the other market had low liquidity, how would liquidity impact the bond markets? Please use demand and supply analysis to answer this question.

3. If one market has high information costs while the other does not, how would information costs affect the bond markets? Please use demand and supply analysis to answer this question.

4. If a government taxes one bond market but not another, how would taxes affect the bond markets? Please use demand and supply analysis to answer this question.

5. Explain both the term structure of interest rates and the yield curve.

6. Which three theories explain the characteristics of the yield curve? Which theory is plausible?

7. If we saw a yield curve with a negative slope, which economic phenomenon would we predict to occur in a year?

11. The Banking Business

We study the business of banking by examining a bank's assets, liabilities, and capital. Then we examine several bank scenarios to show how outside factors influence a bank's balance sheet. We record these changes by using a reduced balance sheet called T-accounts. For example, we illustrate how a bank could become insolvent, while another scenario includes the impact of interest-rate risk upon a bank's balance sheet. We then discuss how banks use securitization to convert loans into marketable securities, which ultimately led to the 2008 Financial Crisis. Lastly, we must understand Chapter 11 to understand the next chapter because Chapter 12 examines the Federal Reserve's balance sheet and the public and banking system's influence over the money supply.

A Bank's Balance Sheet

Checking and savings accounts are very popular in the United States. U.S. households invest nearly 1/4 of their wealth in banks. They make payments by using checks that transfer money from one bank to another. One reason behind the popularity of bank accounts is the ***federal deposit insurance***. If a bank goes bankrupt and customers cannot withdraw cash from their bank accounts, the federal government will step in and pay the depositors from their accounts. Deposit insurance guarantees each customer will not lose a maximum of $250,000 if his or her bank fails.

A ***balance sheet*** is a financial statement that lists all the bank's assets and liabilities. Assets are things a bank owns, while liabilities are things a bank owes to other people. Accountants list assets on the left and liabilities on the right. Accounting transactions conform to Equation 1.

$$\text{Total Assets} = \text{Total Liabilities} + \text{Capital} \qquad (1)$$

Capital equals total assets minus total liabilities. Capital has many names, such as net equity, net worth, or net assets. If the business is a corporation, then we call this capital stockholders' equity.

Liabilities are the first item on a bank's balance sheet. They are the source of funds for a bank, with the most important being deposit accounts. Referring to Table 1, people and businesses held $8.1 trillion in deposits. Then checking accounts become one of the most important deposit accounts. For example, if we needed money and went into a bank, the bank must allow us to withdraw money from our checking account immediately on demand. Consequently, checking accounts become a liability to the bank because the bank owes us this money. At last, checking accounts earn the lowest interest rate and are usually the cheapest source of funds for a bank.

Non-transaction deposits are the second liability. These deposits include the various types of savings accounts. These accounts earn interest and do not allow check-writing privileges. Consequently, these deposits require fewer bank services and earn higher interest rates than checking accounts. Non-transaction deposits include the following:

- A ***savings account*** is the most common type and pays a higher interest rate than a checking account. However, savings accounts have fewer services than checking accounts.

- ***Small-denomination time deposits*** (also called Certificates of Deposit) have maturities ranging from several months to over 5 years. Although they are less liquid than a savings account, they pay higher interest.

- ***Large-denomination time deposits*** are accounts that exceed $100,000. Corporations and banks invest in these securities. Investors can sell these time deposits in a secondary market before maturity. Therefore, they are liquid and an alternative to T-bills. As Table 1 shows, investors held $2,342 billion in large time deposits in December 2024.

Table 1. Commercial Banks Assets and Liabilities on December 2024

Assets in billions of dollars		Liabilities in billions of dollars	
Securities in bank credit	5,376.10	Deposits	
Loans			
Commercial and industrial loans	2,788.30	Large time deposits	2,342.00
Real estate loans	5,628.10	Other deposits	15,658.20
Consumer loans	1,964.00	Borrowings	2,110.30
All other loans and leases	12,672.30	Trading liabilities	116.7
Allowance for loan and lease losses	(202.5)	Net due to related foreign offices	378.1
Fed funds	677.2	Other liabilities	873.4
Loans to commercial banks	6.3		
Cash assets	3,198.20		
Trading assets	1,947.00		
Other assets	1,060.0	Capital	2,312.50
Total assets	23,674.50	Total Liabilities plus capital	23,674.50

Source: Board of Governors of the Federal Reserve System. August 8, 2025. Assets and Liabilities of Commercial Banks in the United States (Weekly) - H.8. Available at http://www.federalreserve.gov/releases/h8/current/default.htm (access date: 08/12/25).

Borrowings become the last liability. A bank borrows funds if it can lend the funds to a borrower for a higher interest rate than the interest rate paid on the borrowings. Borrowings are not deposit accounts. Banks can borrow from the Federal Reserve or other banks. We call a Federal Reserve loan a ***discount loan***. We show the banks' borrowings in Table 1. U.S. banks borrowed $2,110.3 billion from U.S. banks and nonbanks.

A bank has ***assets*** on the other side of a bank's balance sheet. The bank takes funds from depositors and loans these funds to borrowers who pay interest. Thus, banks earn interest from the loans, becoming a vital source of banks' income. Reserves are the first and most liquid asset. They include three items. First, a bank holds ***vault cash***, which is cash the bank holds in its safe. A bank has money, so a bank can pay depositors cash when they come to the bank to withdraw funds. According to Table 1, U.S. banks held $3,198.20 billion in December 2024. Second, a bank holds deposits at another bank because these deposits can aid in check clearing and foreign exchange transactions. Finally, the bank holds deposits at the Federal Reserve, a central bank that requires banks to hold a percentage of their checkable deposits as reserves as ***required reserves***. The Federal Reserve wants to ensure that banks have enough reserves to meet depositors' withdrawals.

Marketable securities are the second asset. Banks hold U.S. government securities, such as T-bills, T-notes, T-bonds, and municipal bonds. (Banks can hold mortgage-backed securities, which we discuss under Securitization). These securities are very liquid, and we sometimes call them secondary reserves. If banks need cash reserves quickly, they can sell their marketable securities. U.S. banks held roughly $4,418.10 billion in December 2024. Table 1 excludes the government marketable securities but it is included in securities in bank credit..

Loans are the third asset and the most important source of income. In December 2024, loans represented roughly 54% of total assets. Unfortunately, loans have lower liquidity, higher information costs, and greater probability of default than other assets. However, banks are compensated for this risk by earning higher interest rates. Loans earn higher interest rates than marketable securities. According to Table 1, U.S. banks lent $2,788.30 billion as commercial and industrial loans, $5,628.10 billion for real estate, and $1,964.00 billion for consumer loans. Fifty-seven percent of consumer loans comprise credit cards.

The ***federal funds market*** can be a bank asset or a liability. Each bank must hold reserves in the form of vault cash plus deposits at the Federal Reserve. The Federal Reserve sets the percentage of reserves a bank must hold because reserves help ensure banks have cash to meet depositors' withdrawals. In the federal funds market, a bank with excess reserves at the Fed can lend these reserves to another bank that is short in reserves. These loans are usually overnight, where banks transfer electronically the funds. Consequently, federal funds become an asset for the lending banks and a liability to the borrowing banks. Referring to Table 1, banks lent $677.2 billion to other banks in the federal funds in December 2024. The ***federal funds rate*** reflects the interest rate for this market.

Table 1 contains two items that are not self-explanatory. U.S. banks estimated $202.5 billion in bad debt and losses during December 2024. We labeled this loss Allowance for loan and lease losses. Furthermore, U.S. banks held $1,947.00 billion in trading assets that banks use in derivatives trading. Finally, the remaining bank's assets earn no interest and include physical capital, such as the bank's buildings, computers, and other equipment, which totaled roughly $1 trillion.

The bank's ***net worth*** or capital becomes the last item on the bank's balance sheet. Capital equals total assets minus total liabilities. All banks organize themselves into corporations. A corporate bank's capital is the stock sold to the investors plus the bank's profit. Creditors consider capital important because it provides a financial cushion for loans and obligations. If a company goes bankrupt and cannot repay a loan, the creditors have the priority on the company's assets, while the shareholders have the last priority. A positive capital ensures the bank can repay its loan obligations. A bank's net worth averaged roughly 10.0% in December 2024. After the 2008

Financial Crisis, we would expect banks to start accumulating more capital to deal with future financial crises. However, it went down by 2% from 2013.

A Bank Failure

A ***bank failure*** occurs when a bank develops financial problems and fails. Unfortunately, the bank cannot return the depositors' money. A government imposes regulations to encourage banks to hold a large amount of reserves, marketable securities, and equity capital, reducing the chance of bank failure.

In this analysis, we use T-accounts. A ***T-account*** represents a simplified balance sheet listing only changes for assets, liabilities, and net worth. For example, we open a checking account at our bank and deposit $100 in cash. We record the transaction below:

Our Bank

Assets	*Liabilities*
+$100 Reserves	+$100 Checking account

A central bank, for example, requires commercial banks to hold 10% of deposits in the form of vault cash and/or reserves at the central bank. Therefore, $10 of our checking account becomes required reserves while the remaining becomes excess reserves. Banks can lend their ***excess reserves*** to borrowers, and we record the transaction below:

Our Bank

Assets	*Liabilities*
+$10 Required reserves + 90 Excess reserves	+$100 Checking account

The bank earns no interest on reserves, so the bank grants a loan to a borrower for $90. The loan becomes the bank's source of income, and we record the transaction below:

Our Bank

Assets	*Liabilities*
+$10 Required reserves + 90 Loans	+$100 Checking account

For the bank to earn a profit, it must earn a higher interest rate on the loan than the interest it pays on the checking account. If a borrower defaults and fails to repay the loan, the bank must subsequently return our $100 upon our demand. The bank would pay $90 from the bank's net worth and $10 from required reserves.

Banks face another complication, ***liquidity risk*** – the depositors withdraw more money from their accounts than the amount of cash held in a bank's vault. Consequently, banks developed asset and liability management to prevent liquidity risk. Asset management involves banks lending to borrowers who pay high interest rates and are unlikely to default on their loans. Then banks purchase securities that have high returns, are liquid, and have low default risk. If depositors begin withdrawing funds, the banks can sell the liquid securities and pay the depositors' withdrawals. Liability management is that banks cannot force customers to open checking and savings accounts. Thus, banks are limited in these funding sources. However, banks use financial instruments, such as certificates of deposits, Eurodollars, the federal funds market, and repurchase agreements. Currently, banks have few restrictions on raising funds.

Illustrating liquidity risk for our bank, we show our bank's balance sheet below. The Federal Reserve requires our bank to hold 10% of deposits as required reserves. Thus, our bank has enough funds to meet depositors' withdrawals.

Our Bank

Assets		*Liabilities*	
Required reserves	$10 million		
Excess reserves	10 million	Deposits	$100 million
Loans	80 million	Bank Capital	10 million
Securities	10 million		

Depositors withdraw $10 million, which decreases deposits by $10 million. The bank pays the funds from excess reserves, equaling $10 million. Consequently, this bank has met withdrawal demands. Both bank deposits and excess reserves decrease by $10 million, shown in the T-account below:

Our Bank

Assets		*Liabilities*	
Required reserves	$10 million		
Excess reserves	0 million	Deposits	$90 million
Loans	80 million	Bank Capital	10 million
Securities	10 million		

Depositors withdraw another $10 million, and the bank pays the withdrawals from required reserves. Both deposits and required reserves decrease by $10 million, shown in the T-account below.

Our Bank

Assets		*Liabilities*	
Required reserves	$0 million		
Excess reserves	0 million	Deposits	$80 million
Loans	80 million	Bank Capital	10 million
Securities	10 million		

The bank must hold 10% of deposits as reserves, which requires finding $8 million. Our bank has the following options:

- ❖ The Bank could sell $8 million of securities to raise funds.
- ❖ The bank asks several borrowers to repay $8 million in loans. The bank could sell loans to other banks.
- ❖ The bank borrows the funds from the central bank or another commercial bank.

Our bank borrows the $8 million from the Federal Reserve as a loan. Our bank managed the liquidity risk well. We show our bank's balance sheet below:

Our Bank

Assets			*Liabilities*
Required reserves	$8 million	Deposits	$80 million
Excess reserves	0 million	Bank Capital	10 million
Loans	80 million		
Securities	10 million	Fed loan	8 million

How does a bank prevent a bank failure? A bank holds excess reserves and short-term, highly liquid securities to prevent a bank failure. In the following example, our bank has the following balance sheet below, and our bank will fail.

Our Bank

Assets			*Liabilities*
Required reserves	$10 million		
Excess reserves	0 million	Deposits	$100 million
Loans	90 million	Bank Capital	10 million
Securities	10 million		

A rumor circulated that the bank president had lost millions in the derivatives market and had disappeared to the Bahamas. Consequently, we and the other depositors are afraid our bank will fail, so we and the other depositors withdraw $20 million from our bank. Our bank sells $10 million in securities and uses $10 million in required reserves to meet depositors' withdrawals, shown in the T-account on the next page.

Now our bank needs $8 million in required reserves. If our bank sold the loans, it would sell the loans for a lower value than the bank's book value. Since the other banks are unfamiliar with our bank's borrowers, they will purchase the loans at a fraction of their value, resulting in a substantial loss. Our bank could ask other banks for a loan, but other banks may decline if they believe our bank will fail. Our bank could ask the Federal Reserve for a loan, but the Fed may not grant the loan.

Our Bank

Assets		*Liabilities*	
Required reserves	$0 million		
Excess reserves	0 million	Deposits	$80 million
Loans	90 million	Bank Capital	10 million
Securities	0 million		

Our bank sells $40 million of loans, but the other banks will pay $25 million for them. Now our bank has become insolvent because its total liabilities exceed its total assets. Unfortunately, our bank could fail. When a bank becomes insolvent, the U.S. federal government can legally take control of the bank. The bank could have prevented its failure if it had had more reserves or more highly liquid securities. We display our insolvent bank's balance sheet below.

Our Bank

Assets		*Liabilities*	
Required reserves	$25 million	Deposits	$80 million
Loans	50 million	Bank Capital	10 million

As we can see from the previous example, a bank could fail if too many loans go bad. A bank is concerned about credit risk. ***Credit risk*** is the risk that borrowers will default on their loans. One method banks use to lower credit risk is to diversify their loan portfolios. Banks spread their loans across different industries, different regions, and different loan borrowers. For example, a bank grants loans for credit cards, mortgages for homes spread across the state, and commercial loans for hotels, restaurants, retail stores, and factories. If a factory goes bankrupt and defaults on its commercial loan, the loan default does not harm the bank severely because the bank is earning income on the other loans. Of course, we can see the problem of recessions and financial crises since they hit a large variety of borrowers at the same time, harming the banking sector.

Adverse selection becomes a problem for banks. Some borrowers apply for bank loans, even when they know they will default. Banks implement seven procedures to reduce adverse selection, which include:

- Banks perform ***credit-risk analysis***. The bank collects information about the borrowers' employment, income, and net worth. From this information, the bank assesses the borrowers' ability to repay their loans.

- A bank prevents adverse selection by requiring ***collateral***. Borrowers pledge assets to the bank. If a borrower defaults on the loan, the bank will seize the asset. For example, the house becomes the collateral for a mortgage. If the homeowner defaults on the mortgage, then the bank takes possession of the house.

- Bank minimizes adverse selection by ***credit rationing***. Banks establish a maximum loan amount for a borrower. For example, banks grant a maximum credit of $1,000 to college students. If a bank granted a credit limit of $10,000, some students would borrow the full amount and be unable to repay the credit-card balance.

- Banks use ***restrictive covenants*** to minimize adverse selection. Banks specify conditions or restrictive covenants in the loan agreement that prevent the borrowers from engaging in certain activities. For example, a person applies for a home-improvement loan and plans to use the loan to speculate in the derivatives market. The bank places a restrictive covenant in the loan agreement. The borrower can only use the loan for home improvement.

- Banks may ask the borrower to have another relative with a good credit history co-sign the loan. If the borrower defaults, then the bank can demand payment from the borrower or co-signer.

- Banks minimize adverse selection by fostering a long-term relationship with the borrowers. When the banks know their customers well, they can accurately assess the customers' risk of default.

- Banks monitor borrowers' credit history via the credit bureaus like Experian, Equifax, and TransUnion. If a borrower misses a payment or two to a creditor, a bank may freeze credit because some borrowers will start defaulting on a series of loans.

The Interest Rate Risk

Interest rates became volatile during the 1980s, forcing banks to become more concerned with interest-rate risk. Banks experience an ***interest-rate risk*** when changes in interest rates cause their profit to fluctuate. We show an example of a bank's balance sheet below:

Our Bank

Assets		*Liabilities*	
Interest-rate sensitive assets:	$20 million	Interest-rate sensitive liabilities:	$50 million
❖ Variable-rate loans		❖ Certificates of deposit	
❖ Short-term securities		❖ Money market deposit accounts	
Fixed-rate assets:	$80 million	Fixed-rate liabilities:	$50 million
❖ Long-term bonds		❖ Checkable deposits	
❖ Long-term securities		❖ Savings accounts	

Interest-rate sensitive items are short-term securities, variable interest-rate loans, and short-term deposits. When the interest rate varies, these items change almost immediately. On the other hand, the fixed-rate assets and liabilities are not sensitive to interest rate changes. These loans and securities are locked into one interest rate for an extended period. Banks consider checking and savings accounts fixed-rate liabilities because these accounts pay little or no interest.

If the interest rate increases from 10% to 15%, which equals a 5% interest increase, the income from interest-rate sensitive assets increases by \$1 million (0.05 × \$20 million = \$1 million). Moreover, the cost of funds increases by \$2.5 million (0.05 × \$50 million = \$2.5 million). Consequently, the bank's profits decline by \$1.5 million (\$1 M - \$2.5 M = -\$1.5 million). Unfortunately, changes in interest rates significantly impact a bank's profits.

Three conditions occur as the interest rates fluctuate:

- If the interest-rate sensitive liabilities **exceed** the interest-rate sensitive assets, then rising interest rates cause banks' profits to plummet, while falling interest rates cause banks' profits to increase.

- If the interest-rate sensitive liabilities **are less than** interest-rate sensitive assets, subsequently, increasing interest rates cause banks' profits to soar, while declining interest rates cause banks' profits to plummet.

- If the interest-rate sensitive liabilities **equal** the interest-rate sensitive assets, then fluctuating interest rates do not affect bank profits.

For example, if the bank manager knows the interest-rate sensitive liabilities exceed the interest-rate sensitive assets, and the manager believes interest rates will fall, he or she will do nothing. The bank manager expects the bank's profit to rise. If a bank manager anticipates an increase in interest rates, they would likely boost interest-rate-sensitive assets and decrease interest-rate-sensitive liabilities by adjusting balance sheet items. This is why many financial analysts closely watch the Fed for clues on monetary policy since Fed's policy influences interest rates..

Over the last 20 years, four key factors have transformed how banks manage their balance sheets. First, the U.S. federal government deregulated the financial markets, granting banks more flexibility in acquiring assets and liabilities. Second, financial innovation created new, liquid financial instruments, such as repurchase agreements, the federal funds market, and securitization. Banks securitized their bank loans and transformed them into liquid securities. Third, the high volatility of interest rates during the 1980s contributed to the creation of new financial instruments, such as the ***floating-rate debt***. Some banks grant loans to borrowers with variable interest rates. If the interest rate rises, the banks increase the interest rate on the loans. For example, a variable interest rate mortgage is an ***adjustable-rate mortgage (ARM)***. Finally, the derivatives market expanded during the 1980s. Banks could buy futures and options to protect themselves from changing interest rates and exchange rates. Therefore, banks learned to protect themselves from interest rate fluctuations.

Securitization and the 2008 Financial Crisis

Securitization is similar to a mutual fund. We define ***securitization*** as the process of transforming illiquid financial assets into marketable securities. Banks and financial institutions package similar loans together, such as mortgages, place them into a fund, and issue securities that are tied to the fund's assets. Then investors buy the securities to earn a return on the fund's assets. On average, the pool of funds has a predictable cash flow as people pay their loans. Then investors receive these payments as an investment. Banks used securitization because computers simplified the record-keeping process. Banks securitized car loans, credit card loans, home equity loans, student loans, and private firm debt.

Securitization is more complex because a fund could issue different bonds called tranches. A ***tranche*** is a French term meaning a portion or slice. Each tranche has a bond associated with a risk level and a different credit rating. Credit-rating agencies could rate some bonds as AAA, which pay the lowest return to investors, but investors are first in line if the fund goes bust. Furthermore, the fund issues risky bonds, known as speculative-grade bonds, which offer higher returns, but investors risk losing their investments if the fund goes bankrupt.

Banks did not use securitization on a large scale before 2000 because the banks could not price the different tranches in the fund until a statistician, David Li, devised a method in 2000. Li's method allows easy and quick pricing of these tranches. Consequently, the bankers and financiers applied securitization to various assets. They securitized mortgages, car loans, third-world debt, credit cards, and student loans. Securitization of mortgages has its name, ***mortgage asset-backed securities (ABS)***. Unfortunately, the securitization of mortgages led to the U.S. housing bubble between 2000 and 2007. Even in 2024, commercial banks held $11 trillion in asset-backed securities, while the Federal Reserve held about $2.5 trillion. Lastly, Fannie Mae and Freddie Mac are large contributors to mortgage asset-backed securities.

A problem with the U.S. housing bubble was that the banks relaxed their loan requirements. Before 2000, banks would grant home loans only to borrowers with a stable work history and good credit history. Furthermore, the borrowers documented their incomes thoroughly. During the housing bubble, several large U.S. banks relaxed their lending standards. Homebuyers could state their incomes without verifying them. Subsequently, banks granted mortgages to people with poor credit or poor work history, called ***subprime loans***. After the U.S. economy had entered the 2007 Great Recession, the subprime loans turned into toxic loans as the subprime borrowers began defaulting on their loans in record numbers.

Banks relaxed their loan standards because they would not suffer from a mortgage default. Banks used securitization to "cash out" the mortgages and push the default risk onto the investors. Cashing out of the mortgages gave banks funds to grant new mortgages and continue the process. Consequently, the banks relaxed their loan standards, maintaining a strong demand for mortgage loans. This credit flow rapidly appreciated housing prices in the United States between 2000 and 2007. If a borrower had defaulted on the mortgage, homes kept appreciating over time, so foreclosures did not harm banks and investors. Banks and investors foreclosed on homes that soared in value.

Banks earn short-term profits from mortgage closing cost fees and the management of funds. In addition, attorneys earn legal fees from the fund's setup. Of course, the banks do not earn the cash flow from a mortgage because the fund investors do. For example, if a family bought a $100,000 home at 7% interest rate, as a 30-year mortgage, then their monthly payment equals $665 per month. This payment does not include property taxes, homeowner's insurance, and other fees. However, the homeowner pays a total of $139,509 in interest to the investors' fund over the life of the loan.

Banks persuaded homeowners to accept adjustable-rate mortgages (ARMs). Thus, a mortgage payment changes as the interest rate changes. Initially, homeowners made low mortgage payments, but these payments would increase significantly as interest rates rose. Using the same example with a $100,000 mortgage with no principal paid, and the interest rate climbs to 10%, then the homeowner's monthly payment climbs to $878 per month, increasing by $213. Thus, they pay a total interest of $215,925 to the investor fund. With home prices in California averaging $500,000, these numbers become extreme. Some of the most prominent players in securitization included Countrywide Financial, Lehman Brothers, and Wells Fargo.

Investment banks profited from the U.S. housing market, contributing to the housing bubble. Investment banks packaged the bonds from mortgage asset-backed securities into ***Collateralized Debt Obligations (CDOs)***. They used re-securitization, where the investment banks took securitized bonds and placed them into a fund, and issued new securities that they sold to investors. The bankers created CDOs with tranches to offer different returns and risk levels to investors. Then the investment bankers sold CDOs to investors around the world, avoiding U.S. regulations. Consequently, the investment banks earned fees from the fund's setup and the fund's management.

Credit-rating agencies, such as Standard & Poor's and Moody's, conspired with the investment banks. Credit agencies consistently rated CDOs with an AAA credit rating, even though some CDOs' funds contained subprime mortgages. Credit-rating agencies were either incompetent or perpetuating fraud. Many investors and pension fund managers only invest in AAA-rated securities. Without the AAA rating, the investment bankers could not sell the CDOs. For example, many state governments require pension fund managers to invest in AAA-rated investments. Thus, the Wall Street Bankers sold their CDOs to pension funds for police, teachers, and government workers. Lastly, the CDOs were not transparent, and many investors did not understand how they worked. The AAA credit rating became vital for bankers to sell the CDOs.

A company can use a collateralized debt obligation to artificially enhance its financial statements. For example, a company transfers its debt into CDOs. They remove liabilities from their balance sheet, which improves their financial situation. (The company must follow the accounting rules if the rules allow.) It is similar to Enron, as it utilizes special-purpose entities to conceal corporate debt. Financial analysts are uncertain about the number of companies that use CDOs to improve their financial statements. The CDO market was valued at approximately $500 billion in 2006 and declined to around $30.5 billion by 2024.

Mortgage asset-backed securities and collateralized debt obligations attracted large sums of money to the U.S. housing market, causing the rapid appreciation of housing prices. Commercial banks kept lowering their lending standards to grant more people mortgages. Real estate agents in Houston repeated a joke: if home buyers have a heartbeat and a paycheck stub in their pocket, a bank would grant them a mortgage loan. Subsequently, the 2007 Great Recession struck the U.S. economy. Unemployment rate soared to 10%, and households, especially the subprime market, defaulted on their mortgages in record numbers. The housing construction industry had collapsed when homeowners stopped buying houses. Then the U.S. housing bubble deflated as housing prices began plummeting.

A surge in mortgage defaults led investors to question ABS and CDOs, causing them to stop investing in securitized debt. Subsequently, both the commercial and investment banks became stuck with billions in unsold CDOs. Furthermore, the banks and investors of CDOs and ABS foreclosed on homes that lost value. Unfortunately, if the banks accumulate too many bad mortgages, then they become insolvent. Finally, the 2008 Financial Crisis caused fear, panic, and paranoia to sweep across the financial world. Banks and financial institutions had frozen all credit and loans overnight.

The mortgage market began showing signs of another correction in 2025. The U.S. government and Federal Reserve injected massive reserves into the banking system and economy during the 2020 COVID-19 pandemic. The stimulus contributed to a new housing bubble between 2020 and 2022. By 2025, corporate layoffs, bankruptcies, and unemployment rates are rising, while housing prices are falling. Another correction and recession appear to be forming.

Key Terms

federal deposit insurance
balance sheet
capital
liabilities
non-transaction deposit
savings account
small-denomination time deposit
large-denomination time deposit
borrowings
discount loan
assets
vault cash
required reserves
marketable securities
loans
Federal funds market
Federal funds rate
net worth
bank failure
T-account
excess reserves
liquidity risk
credit risk
credit-risk analysis
collateral
credit rationing
restrictive covenants
interest rate risk
floating-rate debt
adjustable-rate mortgage
securitization
tranche
mortgage asset-back securities
collateralized debt obligations

Chapter Questions

1. Identify a bank’s assets, liabilities, and capital.

2. Explain a bank’s net worth and its importance.
3. Explain liquidity risk.
4. How does a bank become insolvent?
5. Identify methods banks can use to reduce adverse selection.
6. How did the 2007 Housing Bubble cause banks to become insolvent?
7. Identify methods a bank can use to protect itself from interest rate risk.
8. Explain floating-rate debt.
9. Define and explain securitization.
10. Could the Federal Reserve have prevented the 2008 Financial Crisis?

12. The Money Supply Process

We examine the Federal Reserve's balance sheet in this chapter and explain how fluctuations in the Fed's assets and liabilities affect the money supply. The money supply greatly influences the interest rates, exchange rates, inflation, and a country's production of goods and services. Furthermore, fluctuations in the money supply impact the financial markets, such as bond and stock prices, and the economic well-being of society. Unfortunately, the Fed can only influence the money supply because the public and banks also influence it. For this chapter, we use the definitions of money, M1, and M2, to explain how the banking system expands the money supply through the process of multiple deposit expansion.

The Fed's Balance Sheet

The ***monetary base*** equals the currency in circulation plus reserves held by commercial banks. ***Currency in circulation*** refers to the Federal Reserve Notes held by the public, i.e., U.S. money, excluding ***vault cash*** at banks, as it has already been accounted for as bank reserves. Moreover, the Fed can directly influence the monetary base, and in turn, the monetary base influences the money supply. Before understanding how the money supply process works, we introduce the Fed's balance sheet. Consequently, the currency in circulation and ***bank reserves*** are liabilities to the Federal Reserve.

Using a simple example, the Fed sets ***the required reserve ratio*** to 10%, which is the percentage of total reserves that banks must hold as reserves at the Fed or as vault cash. If we open a bank account by depositing $100, then the bank must hold 10% of our deposit, which equals $10. Thus, the $10 is the ***required reserves***. A bank could hold more than $10, which is ***excess reserves***. Consequently, the bank holds reserves to meet depositors' withdrawals. We could return to our bank and withdraw our $100 deposit. Subsequently, the bank returns our money from its reserves. The bank either holds $10 in its vault or deposits the $10 with the Fed. Did we notice that bank reserves are assets to the bank, but liabilities to the Fed? On the other hand, the public holding money is an asset, but money is a liability to the Fed.

The Fed has two important assets: government securities and discount loans. When the Fed increases its assets, the monetary base rises. When the Fed decreases its assets, the monetary base declines. The Fed can change the monetary base through open-market operations. An ***open-market operation*** is the Fed buying and selling financial securities. Usually, the Fed buys and sells U.S. government securities. When the Fed buys U.S. government securities, we call it an ***open-market purchase*** because the Fed's assets increase, expanding the monetary base. The Fed can sell U.S. government securities, called an ***open-market sale***. The Fed's assets decrease, contracting the monetary base. For example, the Fed buys a $10,000 T-bill from our bank. We list the transaction on the next page in the T-account:

The Fed buys the T-bill by using a Fed check. When the bank sends the check to the Fed, the Fed increases the reserves at our bank. A Fed check is not backed by money per se. As the Fed clears its check, it adds numbers to a bank's accounting books. Afterwards, the bank's reserves increase, allowing it to lend to someone and earn interest. Consequently, the Fed's assets increase while both the monetary base and money supply expand.

Our Bank

Assets	*Liabilities*
-$10,000 T-bill	
+$10,000 Deposit at the Fed	

The Fed

Assets	*Liabilities*
+$10,000 T-bill	+$10,000 Bank reserves

For the second example, the Fed buys one T-bill from us for $10,000, using a Fed check. Subsequently, we deposited the Fed check at our local bank, and our net assets did not change; The bank's reserves increased by $10,000, as well as the demand deposit. Finally, the Fed's T-account becomes identical to the last example.

We

Assets	*Liabilities*
-$10,000 Treasury Bill	
+$10,000 Demand Deposit (Checking)	

Our Bank

Assets	*Liabilities*
+$10,000 Fed Reserve Deposit	+$10,000 Demand Deposit

The Fed

Assets	*Liabilities*
+$10,000 T-bill	+$10,000 Bank reserves

The money supply has risen because we traded the T-bill for a demand deposit. It makes no difference if the Fed purchased U.S. securities from the public or a bank. Consequently, the Fed's assets increase, expanding the monetary base. Our bank's reserves increase, allowing our bank to lend and earn interest. Then the money supply increases. If the Fed sells U.S. government securities, the opposite occurs subsequently.

The Fed loans are the second most important asset. The Fed lends to banks, helping the banks survive liquidity problems. The Fed loans are called ***discount loans***. Furthermore, we call the interest rate the Fed charges for these loans the ***discount rate***. The Fed does not use loans to influence the monetary base. Instead, the Fed relies on open-market operations because it has complete control over the number of securities it buys and sells. With discount loans, the banks determine whether they want to borrow from the Fed. The Fed cannot force a bank to accept a loan. However, if the Fed makes more discount loans, subsequently, the Fed's assets increase, expanding both the monetary base and money supply. For example, a bank asks the Fed for a loan of $1 million.

The Bank

Assets		*Liabilities*	
Reserves at Fed	+$1 million	Loan from Fed	+$1 million

The Fed

Assets		*Liabilities*	
Loan to institution	+ $1 million	Bank reserves	+$1 million

The bank's reserves increased by $1 million, and the bank can grant more loans, expanding the money supply. When the bank repays the Fed loan, subsequently, the Fed's assets become smaller. Subsequently, both the monetary base and the money supply decrease. We show the transaction below in the T-accounts:

The Bank

Assets		*Liabilities*	
Reserves at Fed	-$1 million	Loan from Fed	-$1 million

The Fed

Assets		*Liabilities*	
Loan to institution	-$1 million	Bank deposit at Fed	-$1 million

Multiple Deposit Expansion and Contraction

The banking system creates the money supply through ***multiple deposit expansion***. This means if the Fed increases the monetary base by $1, then the amount of checkable deposits in the banking system will increase by more than $1. Checkable deposits are a component of the M1 definition of money; consequently, the money supply increases by more than $1. We show the multiple deposit expansion by using an example.

The Federal Reserve increases the money supply by buying a $10,000 U.S. T-bill from us. We take the Fed check and deposit the whole $10,000 at our bank into our checking account. We record the transaction in the T-account below.

Our Bank

Assets		*Liabilities*	
Required Reserves	$1,000	Deposits	$10,000
Excess Reserves	9,000		

The money supply immediately expands by $10,000. A bank must hold 10% of its deposits as required reserves. Thus, the bank holds $1,000 of reserves against our account as a deposit at the Fed or as vault cash. However, the bank has $9,000 in excess reserves. These reserves earn no interest, and consequently, the bank loans them out. For instance, our bank grants a $9,000 car loan to our friend. We display the transaction below:

Our Bank

Assets		*Liabilities*	
Required Reserves	$1,000	Deposits	$10,000
Excess Reserves	0		
Loans	9,000		

The bank sends our friend a check for $9,000. Our friend takes this check to a car dealership and buys a car. The car dealer deposits this check at his bank, and we record this transaction below:

The Car Dealer's Bank

Assets		*Liabilities*	
Required Reserves	$900	Deposits	$9,000
Excess Reserves	8,100		
Loans	0		

Did we notice the change in the money supply? The money supply expanded by $19,000 because we have $10,000 sitting in our account, and the car dealership has $9,000 in its account. The car dealer's bank must hold 10% of the deposit, equaling $900. The remaining funds, $8,100, earn no interest. Consequently, the car dealer's bank lends this out. A car dealer's bank grants an $8,100 business loan. We record this transaction below:

The Car Dealer's Bank

Assets		*Liabilities*	
Required Reserves	$900	Deposits	$9,000
Excess Reserves	0		
Loans	8,100		

The small business contracts with a construction company to renovate its premises. A construction company receives a check for $8,100 and deposits it into its bank account. We record the transaction on the next page:

Construction Company's Bank

Assets		*Liabilities*	
Required Reserves	\$810	Deposits	\$8,100
Excess Reserves	7,290		
Loans	0		

The construction company's bank must hold 10% of this deposit, equaling \$810. With remaining reserves of \$7,290 earning no interest, the bank consequently grants a loan. Did we notice the change in the money supply? The money supply has expanded by \$27,100, which includes the \$10,000 in our account, \$9,000 in the car dealer's account, and \$8,100 in the construction company's account. When the construction company's bank grants a loan, the money supply increases again, leading to multiple deposit expansions that occur infinitely.

We can derive the maximum change in the money supply when the monetary base changes. First, we start with the formula for total reserves in Equation 1.

$$\text{Total Reserves} = \text{Required Reserves} + \text{Excess Reserves} \tag{1}$$

In this case, excess reserves equal zero because banks earn no interest. Banks grant loans using their excess reserves. The second equation calculates required reserves. When a bank accepts a new checking account, it must hold a percentage of the deposit, as outlined in Equation 2.

$$\text{Required Reserves} = \text{Deposits} \times \text{Required Reserve Ratio } (r_r) \tag{2}$$

We substitute Equation 2 into Equation 1 and set the excess reserves equal to zero, which yields Equation 3.

$$\text{Total Reserves} = \text{Deposits} \times r_r \tag{3}$$

Did we notice the money supply changes when the Federal Reserve changes the bank reserves? We show reserve changes in Equation 4 and deposit changes in Equation 5. The Δ symbol means change, and we take the difference between two adjacent periods. The first period is t, while the future period is t+1.

$$\Delta\text{Reserves} = \text{Total Reserves}_{t+1} - \text{Total Reserves}_t \tag{4}$$

$$\Delta\text{Deposits} = \text{Deposits}_{t+1} - \text{Deposits}_t \tag{5}$$

Suppose we write Equation 3 for two adjacent periods: t and t+1. Equations become Total $\text{Reserves}_{t+1} = \text{Deposits}_{t+1} \times r_r$ and Total $\text{Reserves}_t = \text{Deposits}_t \times r_r$. Then we subtract the equation for the period t+1 from the equation for the period t, yielding Equation 6.

$$\Delta \text{Reserves} = \Delta \text{Deposits} \times r_r \tag{6}$$

We solve Equation 6 for the change in deposits, yielding the money supply equation in Equation 7.

$$\Delta \text{Deposits} = \Delta \text{Reserves} \times \frac{1}{r_r} \tag{7}$$

If the Federal Reserve increases the monetary base by buying $10,000 of T-bills, the bank reserves increase by $10,000. If the required reserve ratio equals 10%, then we substitute this into Equation 7. Consequently, checkable deposits would rise by $100,000. We call this formula the ***simple deposit multiplier***, which equals ($1 \div r_r$). A simple deposit multiplier shows the maximum increase in the money supply for a change in bank reserves.

The simple deposit multiplier assumes the banks lend all their excess reserves. Banks continue to lend until the Fed's entire increase in reserves becomes required reserves held by the banking system. If the required reserve ratio equaled zero, then a one-dollar increase in reserves would expand the money supply infinitely because the banks do not hold any reserves.

Leakages cause the money multiplier to be smaller in the real world. Some people withdraw cash when they deposit checks at the bank, while some banks do not lend all their excess reserves. For example, banks refused to grant loans during financial panics, such as the 2008 Financial Crisis. Instead, banks invested in safe investments, like U.S. government securities. Some economists argue the Federal Reserve could inject trillions of dollars into the banking system without creating inflation by purchasing bad loans and government debt. However, these economists are wrong. If banks held onto the entire excess reserves, the money multiplier would equal one. Thus, if the Fed increased the monetary base by $1 trillion, then it would expand the money supply by $1 trillion as it buys assets from the public. A rapid, expanding money supply creates inflation. If the banks lent their excess reserves, then the money supply would increase more than $1 trillion, creating greater inflation.

The Fed decreased the monetary base by selling its assets, contracting both bank reserves and the money supply. We call the Fed selling securities the ***multiple deposit contraction***. A transaction is similar to multiple deposit expansion, except that the numbers become negative.

Consequently, the Fed can control the monetary base easily but has less control over the money supply. For instance, people can change their behavior, which primarily impacts bank reserves. For example, we went to our bank to withdraw $200. We record the transaction in the T-account below:

Our Bank

Assets		*Liabilities*	
Required Reserves	$1,000 – 200	Deposits	$10,000 – 200
Excess Reserves	0		
Loan	9,000		

The bank pays out \$200 from the required reserves. The bank does not have any excess reserves because it has loaned them out. Consequently, our deposit becomes \$9,800, and the bank must hold \$980 in required reserves. However, it only has \$800, so the bank is short \$180. The bank calls in loans, causing other banks to lose deposits. Thus, the money supply contracts by Equation 8.

$$\Delta\text{Deposits} = \Delta\text{Reserves} \times \frac{1}{r_r} = -\$180 \times \frac{1}{0.10} = -\$1{,}800 \qquad (8)$$

We do not include our \$200 because we converted \$200 from a checkable deposit into currency. Remember the M1 definition of money, as defined by Equation 9. We started at \$180 because we converted the first \$200 from a checkable deposit into currency, and unfortunately, we cannot count the same money twice.

M1 = checkable deposits + currency (9)

The Money Supply Multipliers

People who hold more currency and fewer deposits can cause bank reserves to fall, contracting the money supply. Thus, the public determines the level of currency to hold relative to the bank deposits. Economists examine the proportion of cash (C) to checkable deposits (D) as the ***currency-deposit ratio*** (C/D). Consequently, four factors influence this ratio over time, which include the following:

- ❖ Greater wealth reduces the currency-deposit ratio. When a country becomes wealthier, people have greater income. Thus, people would deposit their money into banks because holding large amounts of currency is risky.

- ❖ Higher interest rates lower the currency-deposit ratio. Banks pay interest rates on deposits, while currency does not. When interest rates rise, people begin depositing money into banks to earn a higher interest rate.

- ❖ Risk could raise the currency-deposit ratio. During a financial panic, people convert their deposits into currency, harming the economy. When depositors convert deposits into currency, banks' reserves decrease, shrinking the money supply. Unfortunately, a contracting money supply could trigger a recession.

- ❖ Underground activities raise the currency-deposit ratio. People who participate in illegal activities do not want the government to know about them, so they deal exclusively with currency. Bank accounts leave transaction records. The currency-deposit ratio would increase if people evaded taxes or participated in illegal activities.

What would happen if the Fed bought a T-bill from us for $10,000? Subsequently, we take the Fed check to a bank and ask the bank to pay in cash. In this case, the total bank reserves would not change, but currency in circulation and monetary base rise by $10,000. The effect of an open-market purchase on the monetary base is always the same, whether the proceeds from the sale are in deposits or currency. When the Fed sells U.S. government securities, it decreases the monetary base by the amount of government securities it has sold. Consequently, the Fed has complete control over the monetary base.

We derive the ***money multiplier***, which equals the ratio between the money supply and the monetary base. We define the notation as:

- We define the money supply (M1) as the currency in circulation (C) plus checkable deposits (D), written as M1 = C + D.
- The monetary base (B) equals banks' reserves (R) plus currency in circulation (C), written as B = C + R.
- The money multiplier (m) equals the ratio between the money supply (M1) and the monetary base (B) or as $M1 = m \times B$.

We use a clever substitution. First, we start with the equation M1 = M1 and on the right-hand side, we multiply and divide by the monetary base, shown as Equation 10. The B's would cancel, and M1 still would equal M1.

$$M1 = \left[\frac{M1}{B}\right] \times B \tag{10}$$

Then we substitute M1 = C + D and B = C + R into Equation 10 for the variables within the brackets, yielding Equation 11.

$$M1 = \left[\frac{C + D}{C + R}\right] \times B \tag{11}$$

The money multiplier becomes the term within the brackets. We divide both the numerator and denominator in the fraction by D, shown in Equation 12.

$$M1 = \left[\frac{{}^{C}/_{D} + 1}{{}^{C}/_{D} + {}^{R}/_{D}}\right] \times B \tag{12}$$

The currency-deposit ratio equals C / D, while the reserves-deposit ratio is R / D. Both ratios are fixed.

For example, the currency in circulation equals $240 billion; checkable deposits equal $600 billion, and total bank reserves equal $60 billion. We substitute these numbers into the currency-deposit ratio and total reserves-deposit ratio in Equations 13 and 14.

$$C/_D = \frac{\$240B}{\$600B} = 0.40 \tag{13}$$

$$R/_D = \frac{\$60B}{\$600b} = 0.10 \tag{14}$$

We substitute the currency-deposit and reserve-deposit ratios into the money supply equation, yielding Equation 15.

$$\begin{aligned} M1 &= \left[\frac{0.4 + 1.0}{0.4 + 0.1}\right] \times B \\ M1 &= 2.8 \times B \end{aligned} \tag{15}$$

The money multiplier equals 2.8. Although the money multiplier relates the total monetary base to the money supply, it also works for changes in the monetary base. For example, if the Fed buys $100,000 in T-bills, then the monetary base increases by $100,000, expanding the M1 money supply by $280,000. However, we must remember that the multiplier assumes the banks lend their entire excess reserves.

Banks can weaken the ratio between the monetary base and the money supply. For example, if the Fed increased the monetary base by buying $100,000 in T-bills and the banks hold the entire excess reserves, subsequently, the money supply expands only by $100,000. Banks do not lend any reserves, causing the money supply multiplier to equal one. We can prove this because R = D.

We derive the money supply multiplier for M2 similarly. The M2 definition includes time deposits, denoted by T. We define the M2 definition as M2 = C + D + T.

Similarly to the M1, we start with Equation 16. The monetary base (B) would cancel, leaving M2 = M2.

$$M2 = \left[\frac{M2}{B}\right] \times B \tag{16}$$

We substitute the M2 and monetary base definitions for the variables in the brackets, yielding Equation 17.

$$M2 = \left[\frac{C + D + T}{C + R}\right] \times B \tag{17}$$

We divide the numerator and denominator by D, yielding Equation 18.

$$M2 = \left[\frac{C/_D + T/_D + 1}{C/_D + R/_D}\right] \times B \tag{18}$$

We add a new variable - the time deposit to the checkable deposit ratio. The public determines this ratio by depositing their funds between time deposits, checkable deposits, and currency.

For example, the currency in circulation equals \$240 billion; checkable deposits equal \$600 billion; total bank reserves equal \$60 billion, and total time deposits equal \$800 billion. Subsequently, we calculate the ratios for currency-deposit, reserves-deposit, and time-checkable-deposit in Equations 19, 20, and 21.

$$C/_D = \frac{\$240B}{\$600B} = 0.40 \tag{19}$$

$$R/_D = \frac{\$60B}{\$600B} = 0.10 \tag{20}$$

$$T/_D = \frac{\$800B}{\$600B} = 1.333 \tag{21}$$

We substitute these ratios into Equation 18, yielding Equation 22.

$$\begin{aligned} M2 &= \left[\frac{0.4 + 1.333 + 1.0}{0.4 + 0.1}\right] \times B \\ M2 &= 5.47B \end{aligned} \tag{22}$$

The M2 money multiplier always exceeds the M1 money multiplier. Furthermore, we can derive the money multipliers for M3 and L similarly. Of course, these multipliers would be larger than M2 and M1. Consequently, economists can measure the sophistication of a country's financial system by comparing the definitions of money and their money multipliers. If a country's money multipliers are close together, it indicates that the country has small, undeveloped financial markets. If these multipliers diverge significantly, this country possesses sophisticated financial markets.

The Fed faces challenges in implementing monetary policy when money multipliers are unstable. Although the Fed can control the monetary base precisely (B), it only influences the money supply. The Fed sets the required reserve ratio, but the public determines the currency-deposit ratio, and the banks decide the level of excess reserves to hold. Hence, we conclude the Fed cannot control the money supply precisely.

Key Terms

monetary base
currency in circulation
vault cash
bank reserves
required reserve ratio
required reserves
excess reserves
open-market operation
open-market purchase
open-market sale
discount loan
discount rate
multiple deposit expansion
simple deposit multiplier
multiple deposit contraction
currency-deposit ratio
money multiplier

Chapter Questions

1. Identify the assets and liabilities on the Fed's balance sheet.

2. Defines the money multiplier and identifies the parties who influence the money multiplier.

3. The required reserve ratio equals 5%; the banks hold zero excess reserves, and the public does not withdraw money from their bank accounts. Calculate the change in the M1 definition of the money supply if the Fed purchases $50,000 in U.S. government securities.

4. The required reserve ratio equals 20%; the banks hold zero excess reserves, and the public does not withdraw money from their bank accounts. Compute the change in the M1 definition of the money supply if the Fed sells $10,000 in U.S. government securities.

5. The required reserve ratio equals 10%, and the banks hold zero excess reserves. Calculate the change in the M1 definition of the money supply if a person deposits $1,000 in cash into his checking account.

6. The required reserve ratio equals 10%, and the banks hold zero excess reserves. Compute the change in the M1 definition of the money supply if a person withdraws $5,000 in cash from his checking account.

7. Identify the currency-deposit ratio, and explain why it changes over time.

8. Why do excess reserves present a problem for the Fed?

9. Why does the Fed have trouble controlling the money supply?

10. Currency in circulation equals $500 billion; checkable deposits equal $900 billion; total bank reserves are $700 billion, and total time deposits equal $1,200 billion. Calculate the M1 and M2 money multipliers.

13. The Fed's Balance Sheet

This chapter explains the items on the Federal Reserve's balance sheet and uses more T-account transactions. For instance, we will learn how the Fed clears a check between two banks. Then we derive an equation that relates changes in the Fed's assets and liabilities to the monetary base and money supply. Then we learn whether a government issuing securities to cover a budget deficit impacts its central bank's balance sheet, monetary base, and money supply. Finally, a central bank can intervene in its currency exchange markets to strengthen or weaken its currency.

The Fed's Balance Sheet

Similar to any corporation or business, the Federal Reserve has a balance sheet. The Fed's assets are anything of value that the Fed owns. The Fed also has liabilities, which are obligations and debts the Fed owes to other parties. After we subtract the Fed's total assets from total liabilities, the remainder becomes the Fed's net worth. The Fed publishes its balance sheet in the Federal Reserve Bulletin, and the public has free access to it. The Federal Reserve Bulletin is a monthly publication of the Board of Governors that includes money supply numbers, interest rates, and other economic data. Each Federal Reserve's asset, liability, and net worth are itemized in Table 1 for September 26, 2012 and August 13, 2025. The two dates reflects how the Fed's balance sheet has changed over 13 years. The term "consolidated" refers to the total of all assets, liabilities, and capital across all 12 Federal Reserve district banks.

The Fed's Assets

- ***Securities*** are the largest holdings of the Fed's assets, and they consist of U.S. government T-bills, T-notes, and T-bonds. When the Fed uses open-market operations, it buys and sells securities. The Federal Reserve held $1.7 trillion in securities in 2012 and $6.3 trillion in 2025.

- ***Mortgage-Backed Securities***: The Federal Reserve purchased mortgage securities from the commercial banks and public corporations during the 2008 Financial Crisis. These mortgages are considered bad loans because the borrowers defaulted. Thus, the Fed helped banks clean up their balance sheets while shoring up banks' finances. The Fed bought $835 billion in mortgage-backed securities in 2012 and $2,121 billion in 2025.

- ***Discount Loans*** are Federal Reserve loan funds to banks, helping the banks overcome short-term liquidity problems. The Fed controls the interest rate on these loans, which influences the amount of loans that banks need. We call the interest rate the discount rate. The Fed loaned $1.7 billion to the commercial banks in 2012 and $6.1 billion in 2025.

❖ ***Items in the Process of Collection (CIPC)*** are assets that arise from the Fed's check clearing process, and they equaled $138 million in 2012 and $54 million in 2025. We show the check clearing process in this chapter.

Table 1. Federal Reserve's Consolidated Balance Sheet for 2012 and 2025

Assets	2012 $ millions	Assets	2025 $ millions
Securities held outright	1,731,808	Securities held outright	6,327,776
Mortgage-backed securities	834,979	Mortgage-backed securities	2,120,606
Loans	1,732	Loans	6,090
Items in process of collection	138	Items in process of collection	54
Gold certificates	11,037	Gold certificates	11,037
Special Drawing Rights	5,200	Special Drawing Rights	15,200
Coins	2,183	Coins	1,468
Central bank liquidity swaps	14,693	Central bank liquidity swaps	46
Bank premises	2,350	Bank premises	564
Other assets	202,067	Other assets	47,069
Total assets	2,806,187	Total assets	6,643,615
Liabilities and Capital		Liabilities and Capital	
Federal Reserve notes	1,085,808	Federal Reserve notes	2,352,354
Depository institution deposits	1,473,576	Depository institution deposits	3,328,346
U.S. Treasury deposits	65,665	U.S. Treasury deposits	515,469
Foreign official deposits	24,220	Foreign official deposits	9,434
Deferred availability cash items	779	Deferred availability cash items	429
Other liabilities	101,421	Other liabilities	-231,649
Capital accounts	54,718	Capital accounts	45,743
Total liabilities and capital	2,806,187	Total liabilities and capital	6,597,872

Source: Federal Reserve. September 27, 2012 and August 13, 2025. Federal Reserve Statistical Release-Factors Affecting Reserve Balances. Available from http://www.federalreserve.gov/releases/h41/current/h41.htm#h41tab9

❖ ***Gold Certificates*** are gold claims held by the U.S. Treasury. When the U.S. Treasury buys gold, it sells the certificates to the Federal Reserve. In turn, the Fed credits the U.S. Treasury account at the Fed. The Fed held $11 billion in gold certificates in 2012 and 2025. The gold is priced at $42.22 per troy ounce. Public officials are discussing the revaluation of these certificates, which would give the U.S. Department of the Treasury more funds, as long-term U.S. Treasuries are not selling well in 2025. Unfortunately, as the Treasury spends these new funds, the gold re-evaluation could cause inflation.

❖ ***Special Drawing Rights (SDRs)***: The International Monetary Fund (IMF) issues Special Drawing Rights that are credit securities. The IMF allocates SDRs to various countries around the world, and the Fed holds approximately $5.2 billion in 2012 and $15.2 billion in 2025. We discuss SDRs in Chapter 15.

- ***Coins:*** The U.S. Mint designs and produces all coins for the United States. The U.S. Mint is a department under the U.S. Treasury. Usually, the Federal Reserve prints the U.S. paper money, the Fed's liability. Nevertheless, the Fed buys the coins from the U.S. Mint, making it an asset. The Fed had $2.2 billion in coins in 2012 and $1.5 billion in 2025.

- ***Central Bank Liquidity Swaps*** are Federal Reserve loans made to other countries' central banks of developed countries. For example, the European Central Bank needs a loan from the Fed. The Fed can lend dollars to the European Central Bank and accept euros as collateral. The Federal Reserve created the central bank liquidity swaps during the 2008 Financial Crisis. The Fed granted $14.7 billion in central bank liquidity swaps in 2012.

- The ***bank premises*** are the buildings and equipment owned by the Federal Reserve, which were valued at $2.4 billion in 2012 and $46 million in 2025.

- ***Other assets***: The Fed owns other assets, including foreign-exchange reserves, deposits, and bonds denominated in foreign currencies. Moreover, the Federal Reserve created companies, such as Maiden Lane Transactions, to facilitate transactions with investment banks and insurance companies during the 2008 Financial Crisis. The Fed held $202 billion in 2012 and $47.1 billion in 2025 for other assets.

The Fed's Liabilities and Capital Accounts

- ***Federal Reserve notes*** are U.S. paper money that the Federal Reserve issues. Currency outstanding only includes cash held in bank vaults or cash circulating within the economy. The U.S. currency circulated outside the Federal Reserve was $1.1 trillion in 2012 and grew to $2.4 trillion in 2025.

- ***Deposits by depository institutions***: Banks hold reserves in vault cash and deposits at the Fed. Deposits are assets to the financial institutions, but liabilities to the Fed. The Federal Reserve held $1.5 trillion in bank deposits in 2012 and $3.3 trillion in 2025.

- ***U.S. Treasury deposits***: The U.S. Treasury deposits its money into commercial banks that it collects from tax payments, fees, and U.S. government securities. When the U.S. Treasury pays expenditures, it transfers funds from its commercial bank accounts to its accounts at the Fed. Then the Treasury Department writes checks on its Fed account. Consequently, the U.S. Treasury Deposits are an asset to the U.S. government but a liability to the Federal Reserve. The U.S. Treasury deposited $65.7 billion at the Fed in 2012, which grew to $515.5 billion in 2025.

- ***Foreign and other deposits***: The Fed holds deposits from foreign governments, the IMF, the World Bank, the United Nations, and U.S. government agencies such as the FDIC. The Fed held $24.2 billion in 2012 and $9.4 billion in 2025.

- ***Deferred Availability Cash Items (DACI)*** are liabilities that arise from the Fed's role in the check-clearing process, which was $779 million in 2012 and $429 million in 2025. We explain the check clearing process in the next section.

- ***Other liabilities*** include reverse repurchase agreements and dividends the Fed owes to the national commercial banks. Other liabilities were $101.4 billion in 2012 and a negative $231.6 billion in 2025.

- The ***capital account*** equals the Federal Reserve's total assets minus total liabilities. This category was substantial, equating to $54.7 billion in 2012, and fell to $45.7 billion in 2025. The Federal Reserve is a public corporation, and every U.S. commercial bank with a charter from the U.S. government must buy stock in its Federal Reserve district bank. Subsequently, the Fed pays the commercial banks 6% annual dividend on their Fed stock.

The 2012 and 2025 Fed's consolidated balance sheets have witnessed significant changes in 13 years.

The Check Clearing Process

The Fed has the authority to clear checks, and the check clearing process can cause bank reserves and the money supply to fluctuate through the ***Federal Reserve float***. The Federal Reserve float is the difference between ***cash items in the process of collection (CIPC)*** and ***deferred availability cash items (DACI)***, and it is always positive. As a float increases, it expands both the bank reserves and the money supply.

For example, we live in California, and we sent a $1,000 check to a firm in New York City to buy a computer. The computer firm deposits the check into its bank account. Subsequently, the bank sends the check to the Fed, which can then clear it between our bank and the computer firm's bank. Accordingly, the Fed credits the computer firm's bank a $1,000 asset, the DACI. Next, the Fed must collect $1,000 from our bank, the CIPC. We record the computer firm's bank and Fed's T-accounts below:

The Computer Firm's Bank

Assets	*Liabilities*
+$1,000 DACI	+$1,000 Deposits

The Federal Reserve

Assets	*Liabilities*
+$1,000 CIPC	+$1,000 DACI

The bank of the computer firm cannot touch the asset, DACI. The Fed acknowledges the asset and is in the process of collecting money for the computer firm's bank. After two days, the Fed converts the DACI into bank reserves. Consequently, the bank can lend these reserves.

The Federal Reserve

Assets	*Liabilities*
	–$1,000 DACI +$1,000 Reserves for computer firm’s bank

The Computer Firm’s Bank

Assets	*Liabilities*
–$1,000 DACI +$1,000 Reserves at the Fed	

If the Fed does not collect $1,000 from our bank within two days, the Fed subsequently extends credit to the computer firm’s bank. Thus, the total reserves of the banking system increase because banks did not lose reserves. The $1,000 check we wrote now exists as $1,000 in both our bank account and the computer firm’s bank account. We calculated the float from our check in Equation 1, and it equals $1,000.

$$\text{Float} = \text{CIPC} - \text{DACI} = \$1,000 - 0 = \$1,000 \quad (1)$$

The Fed collects the $1,000 from our bank. Accordingly, the float returns to zero, and our checking account decreases by $1,000. Our check for $1,000 no longer exists in two places. The check clearing process is a long-drawn-out process because if we write a check for $100 and have only $10 in our checking account, then this check does not clear. That is why the Fed needs permission to lower the bank’s reserves to clear the check, rather than doing so automatically. We display the final transaction below:

The Federal Reserve

Assets	*Liabilities*
– $1,000 CIPC	–$1,000 Reserves at our bank

Our Bank

Assets	*Liabilities*
–$1,000 Reserves at the Fed	–$1,000 Our checking account

Usually, the float changes predictably during the mid-month because people pay their bills. Furthermore, the float changes in December because people write checks to buy Christmas presents, or in April when people pay their taxes. Moreover, bad weather and transportation strikes can cause the float to soar unexpectedly as the Fed experiences delays in check collections. Consequently, an increase in the float expands both the bank reserves and the money supply. Then the Fed must nullify the float by selling U.S. government securities that reduce the money supply.

Many banks join a clearinghouse that can clear checks and wire transfers without using a central bank. For example, a large bank in New York is the clearinghouse between two small banks. One bank is Maybank in Malaysia, while the other is First National Bank in Indiana. Both banks have accounts at the clearinghouse. If a person transfers money from Malaysia to Indiana electronically, the clearinghouse reduces the Malaysian bank's account and adds the wire transfer amount to Indiana's bank account. Consequently, banks and central banks clear checks and wire transfers similarly.

Changes in the Monetary Base

If the Fed's balance sheet changes, both the monetary base and money supply change. At first, this process seems complex, but economists use a trick. First, we list the Fed's total assets in Equation 2 and total liabilities in Equation 3.

Total Assets = U.S. gov. securities + discount loans + gold certificates + SDRs + CIPC (2)

Total Liabilities = Currency outstanding (C) + deposits by depository institutions (D) +

U.S. Treasury deposits + Foreign and other deposits + DACI (3)

Next, we substitute the monetary base formula into Equation 3 because the monetary base equals deposits held by depository institutions plus currency in circulation, or B = D + C. After substituting the monetary base into Equation 3, we yield Equation 4.

Total Liabilities = Monetary base (B) + U.S. Treasury deposits + Foreign and other deposits +

DACI + Capital (4)

Subsequently, we use the accounting identity as defined by Equation 5 to relate the Fed's assets, liabilities, and capital.

Total Assets = Total Liabilities + Capital (5)

Finally, we substitute the total assets and total liabilities into the accounting identity, and we solve for the monetary base, which becomes Equation 6:

Monetary base (B) = U.S. gov. securities + discount loans + gold certificates + SDRs +

(CIPC – DACI) – U.S. Treasury deposits – Foreign and other deposits – Capital (6)

Equation 6 shows how a change in the Fed's balance sheet affects the monetary base. For instance, if the Fed purchases an asset, then the monetary base increases and expands the bank reserves. When banks have more reserves, they grant more loans, potentially increasing the money supply. Of course, the opposite could occur. If the Fed sells an asset, subsequently, both the monetary base and bank reserves drop, and the money supply potentially shrinks. If the Fed acquires a liability in Equation 6, then the monetary base, bank reserves, and the money supply all fall. On the other hand, if the Fed reduces a liability, subsequently, both the monetary base and bank reserves rise, and the money supply potentially increases.

Many things alter the Fed's balance sheet. Unfortunately, the Fed cannot control many items on its balance sheet. For example, the Fed has no control over the Treasury deposits, the float (CIPC – DACI), gold certificates, SDRs, and foreign government deposits. As these items can change, the Fed must use open-market operations to maintain a stable monetary base.

Does the U.S. Treasury Affect the Monetary Base?

The U.S. federal government has experienced persistent budget deficits for the last 50 years because it spends more than what it collects in taxes. The government finances budget deficits in three ways. First, the U.S. government can decrease its spending, which is not politically popular. People demand benefits and social programs from their government. Second, the U.S. government can raise taxes, which could anger the taxpayers. Finally, the U.S. can sell U.S. government securities. Thus, the U.S. government chose to finance budget deficits by selling more U.S. government securities. However, investors started questioning the financial stability of the United States because the U.S. national debt surpassed $37 trillion in 2025 with a widening deficit of $2 trillion per year. (That means the U.S. government adds another trillion to the debt every six months.)

Could the U.S. federal government affect the monetary base by financing budget deficits? For example, the U.S. government increases taxes; we pay a total of $2,000 in taxes, and we send the U.S. government a check for $2,000. We record the T-account transactions below for us, our bank, the Fed, and the U.S. Treasury Department.

Our Balance Sheet

Assets	*Liabilities*
–$2,000 Deposit	–$2,000 Taxes due

Our Bank

Assets	*Liabilities*
–$2,000 Reserves	–$2,000 Deposits

The Federal Reserve

Assets	*Liabilities*
	–$2,000 Reserves +$2,000 U.S. Treasury deposits

The U.S. Treasury subsequently spends $2,000 to buy more paper for a government agency. A company receives $2,000 and deposits the funds into the company's bank account. Although we paid higher taxes, the U.S. government returns our money to the economy. Thus, when a government raises taxes and immediately spends the taxes, the taxes have no impact on the monetary base and money supply. Nevertheless, the government has transferred funds from one party to another.

The U.S. Treasury Department

Assets	*Liabilities*
–$2,000 Taxes due +$2,000 Deposits at the Fed	

For the following example, the U.S. Treasury finances a budget deficit by selling T-bills. We buy a $20,000 T-bill. We record the T-account transactions below for us, our bank, the Fed, and the U.S. Treasury.

Our Balance Sheet

Assets	*Liabilities*
– $20,000 Deposit + $20,000 T-bill	

Our Bank

Assets	*Liabilities*
–$20,000 Reserves	–$20,000 Deposits

The Federal Reserve

Assets	*Liabilities*
	– $20,000 Reserves +$20,000 U.S. Treasury deposits

The U.S. Treasury Department

Assets	*Liabilities*
+$20,000 Deposits at the Fed	+ $20,000 U.S. T-bill

The U.S. Treasury collects our $20,000 and uses it to purchase something. When the Treasury pays for a product or service from the public, the U.S. government pays $20,000 to a company, which then deposits the funds into its bank account. Consequently, the U.S. government returns $20,000 to the economy, causing zero changes in bank reserves. Thus, when the U.S. Treasury issues new securities, the new securities do not affect the monetary base and money supply.

If the U.S. Treasury sold government securities directly to the Fed, the Fed would subsequently finance budget deficits, a process known as ***monetizing the debt***. The media refers to this as printing money. For example, the Fed directly buys $100,000 in T-bills from the U.S. government. Consequently, we show the impact on the Fed's and U.S. Treasury T-accounts below:

The Federal Reserve

Assets	*Liabilities*
+$100,000 T-bills	+$100,000 U.S. Treasury deposits

The U.S. Treasury Department

Assets	*Liabilities*
+$100,000 Deposits at the Fed	+ $100,000 T-bills

The Fed's purchasing securities directly from the U.S. Treasury does not increase the monetary base as long as the money remains in the account. However, once the U.S. Treasury spends the money in its account, then the Fed's assets increase, expanding both the monetary base and money supply.

The Federal Reserve is not required to buy U.S. government securities or help the U.S. Treasury finance budget deficits. The Fed and U.S. Treasury are independent. However, the Fed can finance budget deficits indirectly. For instance, if the Fed stabilizes interest rates, then the Fed could monetize the debt indirectly. For example, the U.S. Treasury issues new securities, decreasing the securities' market price and raising the interest rate. If the Fed maintains the original interest rate, it must subsequently buy U.S. government securities to return interest rates to the same level.

Central banks are not independent from their finance ministries in developing countries. The finance ministry could force the central bank to finance budget deficits. When a central bank monetizes the debt, it increases the money supply, creating inflation. Consequently, many developing countries suffer from high inflation rates.

A Central Bank Intervenes with its Currency Exchange Rate

The United States' financial system is linked to the international financial markets. Investors, savers, households, businesses, and governments in foreign countries can influence the financial markets in the United States, while the U.S. financial markets similarly affect foreign financial markets. Consequently, governments intervene in the international markets to affect their financial markets.

The Federal Reserve tries to manage the value of the U.S. dollar in the international markets. However, governments and central banks have difficulties in influencing the exchange rate of their currency because over $7.5 trillion in transactions occur daily in the foreign-exchange market. The foreign exchange market is the largest international market in the world. As countries engage in global trade, goods move in one direction while money moves in the opposite direction. When a central bank tries to manipulate the foreign-exchange rate of its currency, economists call this ***foreign-exchange market intervention***.

The Federal Reserve and U.S. Treasury Department intervene in the foreign-exchange markets, manipulating the U.S. dollar exchange rate. Usually, the Federal Reserve and Treasury coordinate their policies together. For example, the Federal Reserve holds foreign currencies, such as British pounds, European euros, and Japanese yen. Foreign currencies are an asset to the

Federal Reserve, known as ***international reserves***. The Federal Reserve can sell or purchase U.S. dollars on the global markets that impact the U.S. exchange rates and U.S. money supply. Table 2 summarizes the impact of a strong or weak U.S. dollar on the U.S. economy.

Table 2. Impact of a Strong or Weak Dollar on the U.S. Economy

Strong U.S. Dollar	Weak U.S. Dollar
Foreign-produced goods are cheaper.	Foreign-produced goods are more expensive.
U.S. customers benefit.	U.S. customers are hurt.
U.S. produced goods become more expensive.	U.S. produced goods are cheaper in foreign markets.
U.S. export businesses are hurt in foreign markets.	U.S. export businesses benefit in international markets.
Trade deficit worsens.	Trade deficit becomes smaller, or becomes a trade surplus

The Fed believes the dollar is too weak and therefore strengthens it. The Fed will sell foreign currencies and buy U.S. dollars. The Fed sells $10,000 in foreign currency, and we record the transaction in the T-account below.

The Federal Reserve

Assets	*Liabilities*
–$10,000 Foreign currencies	–$10,000 Currency in circulation

This transaction removed $10,000 of U.S. currency from the international market, as the Fed holds the U.S. dollars. Consequently, the monetary base decreases by $10,000 while the money supply contracts. Unfortunately, the Fed's international reserves decreased by $10,000. The Fed does not buy U.S. currency. Instead, the Fed could accept a check for the foreign-currency sales. When the Fed cashes a check, it decreases the bank's reserves by removing money from the banking system. We record the transaction below:

The Federal Reserve

Assets	*Liabilities*
–$10,000 Foreign currencies	–$10,000 Bank reserves

In this case, the monetary base still decreases by $10,000 while the money supply contracts. It makes no difference whether the Federal Reserve accepts a check or cash denominated in U.S. dollars. Both transactions impact the monetary base in the same way. If the Federal Reserve believes the U.S. dollar is too strong, then the Fed can weaken or depreciate the dollar by selling U.S. currency and buying foreign currencies. For example, the Fed buys $30,000 of foreign currency. We record this transaction in the T-account below.

The Federal Reserve

Assets	*Liabilities*
+$30,000 Foreign currencies	+$30,000 Currency in circulation

The Federal Reserve's assets increase by $30,000, increasing the monetary base by $30,000 and expanding the money supply. The world's economy has $30,000 more U.S. dollars in circulation. If the Fed lets these foreign exchange transactions change the monetary base, then we call this ***unsterilized foreign-exchange interven***tion.

The Federal Reserve can prevent changes to the monetary base when it influences the U.S. dollar exchange rates, called ***sterilized foreign-exchange intervention***. For example, the Fed believes the dollar is too strong and wants to weaken it. The Fed buys $30,000 in foreign currencies and sells $30,000 in U.S. currency, boosting the monetary base. However, the Fed performs an open-market operation by selling $30,000 in T-bills for cash. These two transactions cancel changes to the monetary base. Consequently, the change in the Fed's assets and liabilities is zero, and we record the transaction in the T-account below.

The Federal Reserve

Assets	*Liabilities*
+$30,000 Foreign currencies	+$30,000 Currency in circulation
–$30,000 T-bills	–$30,000 Currency in circulation

A Backdoor to the Money Supply

The U.S. Treasuries may have a back door to the money supply. We start with the M1 definition of money, as shown in Figure 1. M1 consists of currency in circulation and checking deposits. We observe a sharp surge in M1 during the 2020 COVID-19 pandemic, reflecting the large monetary and fiscal stimulus programs. After 2022, M1 began to decline as the Federal Reserve implemented a contractionary monetary policy. However, most economists prefer to use the M2 definition, since it tends to correlate better with economic activity.

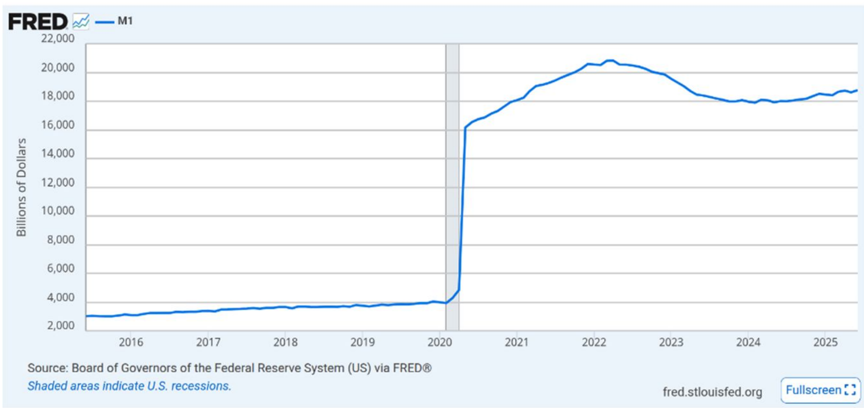

Figure 1. The M1 Money Supply

The M2 definition includes everything in M1 plus savings deposits, small certificates of deposit, money market deposit accounts (MMDAs), and retail money market mutual funds (MMMFs). Both MMDAs and MMMFs often allow limited check-writing privileges. Businesses and people can easily convert the other components into cash. In Figure 2, we see that M2 also rose sharply during the pandemic. Unlike M1, however, M2 started decreasing and reversed direction. It is continuing to increase even after the Federal Reserve began its quantitative tightening in 2022. That is a troubling sign.

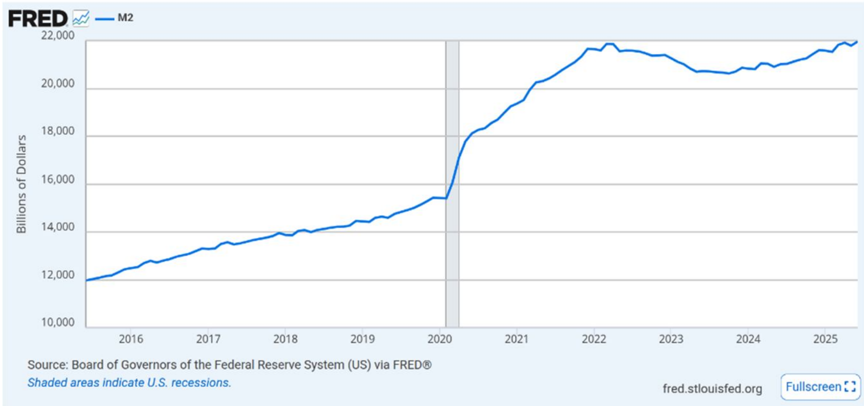

Figure 2. The M2 Money Supply

We raise an important point. M2 continues to expand even as the Fed has imposed quantitative tightening. Increasing the money supply can cause inflation, especially if it grows faster than the economy's output. One reason for the continued growth of M2 is the role of Treasury securities. Fund managers of MMDAs and MMMFs frequently invest in Treasury bills because they are considered safe short-term assets. As investors shift away from longer-term government bonds in 2025, the demand for short-term Treasury bills surges. We also see this trend not only in the United States but also in France, Germany, Japan, and the United Kingdom.

Money market managers take investors' funds to invest in T-bills. The Department of the Treasury receives these funds, which are then spent on budget expenses. However, these money market accounts and funds hold these T-bills and are counted in M2. As investors use their checking writing privileges, this money is spent again, becoming a kind of "back door" through which Treasury financing can influence the measured money supply, even though the Treasury itself is not supposed to influence money creation. Money creation is the role of the Federal Reserve.

We observe the same phenomenon with Tether, the stablecoin. Tether is the fourth-largest cryptocurrency with a market capitalization of $167 billion. ***Market capitalization*** equals the crypto market price times the number of coins in circulation. It determines how large the market is. Furthermore, Tether pegs the price to $1 and backs the coin with liquid assets. In 2024, Tether held $113 billion in T-bills. The logic is still the same. For Tether to issue a new coin, it usually buys T-bills. Thus, both Tether holders and the Department of the Treasury double-spend this funding. Nevertheless, Tether is excluded from the M2 definition, which would not account for the continued growth in M2.

The danger is that interest on the public debt, borrowing needs, and inflation can reinforce each other in a feedback loop. Higher inflation leads investors to demand higher interest rates.

Higher interest payments raise the government's debt burden, which in turn requires more borrowing. Beyond a certain point, these forces can feed on each other, which weakens the dollar and increases financial instability. We do not know exactly where the tipping point is. However, once we pass it, the adjustment can be sudden and severe.

Key Terms

securities	U.S. Treasury deposits
mortgage-backed securities	Foreign and other deposits
discount loans	Deferred Availability Cash Items (DACI)
Items in the Process of Collection (CIPC)	capital account
gold certificates	Federal Reserve float
Special Drawing Rights (SDRs)	monetizing the debt
coins	foreign-exchange market intervention
Central Bank Liquidity Swap	international reserve
bank premises	unsterilized foreign-exchange intervention
Federal Reserve notes	sterilized foreign-exchange intervention
deposits by depository institutions	market capitalization

Chapter Questions

1. Identify the Fed's assets, liabilities, and capital.

2. Explain how the Federal Reserve clears a check between two banks.

3. Which factors influence the reserve float?

4. Identify the changes to the monetary base and money supply if bad weather causes the float to increase.

5. Identify the changes to the monetary base and money supply if the U.S. Treasury increases its deposits at the Federal Reserve.

6. Identify the changes to the monetary base and money supply if the commercial banks reduce the amount of discount loans from the Fed.

7. Which assets and liabilities can the Fed not control?

8. Identify the changes to the monetary base and money supply if the U.S. Treasury changes the taxes or changes its borrowing behavior.

9. Explain how the Federal Reserve can monetize the U.S. debt if the Fed and the U.S. Treasury Department are independent.

10. Why do central banks and governments intervene in the foreign-exchange markets?

11. Distinguish between a “weak” dollar and a “strong” dollar. How would a strong U.S. dollar affect the U.S. economy?

12. Distinguish between unsterilized and sterilized foreign-exchange intervention.

14. The Central Banks of Europe and the United States

We explain the structure of the world's two largest and most powerful central banks in this chapter: The Federal Reserve System (Fed) and the European Central Bank (ECB). The Fed has an unusual structure because Congress and the President decentralized the power of its central bank, where each central bank branch can tailor services for its unique region of the United States. Moreover, the Board of Governors manages the Fed, while the Federal Open Market Committee handles the purchase and sale of the U.S. government securities and other assets. Keeping it straight, the Board of Governors devises monetary policy, while the Open Market Committee puts monetary policy into action. Then we shift focus to the structure of the European Central Bank, whose structure mirrors the United States. The Executive Board devises monetary policy while the Governing Council implements it. Finally, a central bank should remain independent of its government because a self-governing central bank can focus on price stability and low inflation.

Why the U.S. Government Created the Federal Reserve System

The United States was a latecomer to the world when it created its central bank. The U.S. government permanently established a central bank in 1913 and named it the ***Federal Reserve System***. Congress, government officials, and the public did not want to create a powerful financial institution, so the U.S. government created the Federal Reserve System to have many checks and balances. Most European countries formed their central banks in the 17th, 18th, and 19th centuries. They converted a large private bank into a central bank. For example, Great Britain established the Bank of England in 1694, and France founded the Bank of France in 1800.

The Federal Reserve System comprises 12 Federal Reserve banks. The United States is divided into 12 regions, and each area has a Federal Reserve Bank as shown in Figure 1. The Board of Governors is located in Washington, D.C., while the dots show the headquarters for each Federal Reserve bank within its region. The Fed is spread across 12 banks because each section of the country is economically different. For example, Michigan originally manufactured U.S. cars while Texas and Oklahoma supplied oil and natural gas. Therefore, a Federal Reserve Bank can provide services to its unique region. Initially, each Federal Reserve Bank provided the following functions:

- ❖ A Fed bank clears checks between banks.
- ❖ A Fed bank regulates member commercial banks.
- ❖ A Fed bank manages the currency by issuing new currency and removing old, worn-out currency.

- ❖ A Fed bank prevents financial panics by being a source of liquidity or emergency loans for banks during an economic crisis. Each Fed Bank had the power to set the discount rate, or the interest rate on the loan.

- ❖ A Fed bank collects and publishes data for the public. Each Fed bank employs staff of economists, researchers, and PhDs, who conduct research for the public interest.

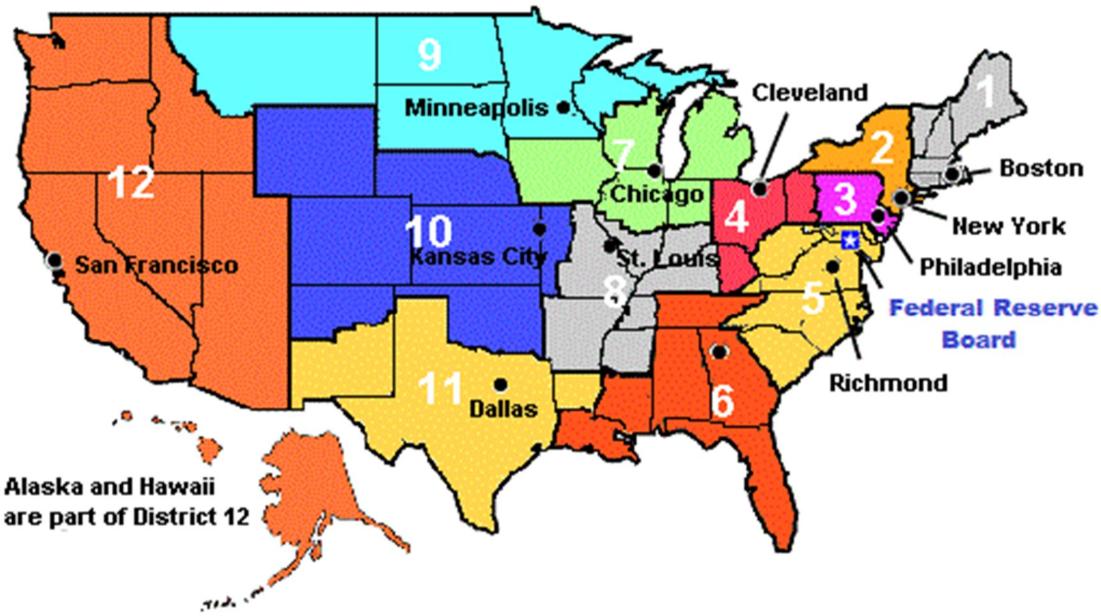

Figure 1. The Map of the Federal Reserve Banks

The President and Congress created the Federal Reserve System to prevent financial panics, such as the Panic of 1907. The New York Stock Exchange plummeted nearly 50% while many banks teetered on bankruptcy as people began bank runs. Consequently, a Federal Reserve Bank is a “lender of the last resort.” It provides emergency loans to banks and helps restore confidence in the banking system. Moreover, the Fed loans were originally discount loans. For example, a bank needs $9,500, and it asks the Fed for a loan. If the Fed agrees, the bank gives collateral to the Fed, such as a $10,000 T-bill. Then the Fed increases the bank’s reserves by $9,500, i.e., the loan. The difference between the loan and T-bill is the discount, which reflects the interest rate the Fed charges for the loan. Economists call this interest rate the ***discount rate***. Furthermore, the government did not create the Fed to alter the money supply, manipulate interest and currency exchange rates, or manipulate the financial markets to achieve economic goals. Nevertheless, the Fed learned to do this during the 1920s.

The Federal Reserve System's Structure

A unique feature of a Federal Reserve Bank is that each bank is a federally chartered corporation. Each bank has its stockholders, directors, and a president. Furthermore, every national commercial bank is required to purchase stock of the Federal Reserve Bank in its district, equaling 6% of the commercial bank's net equity (capital). National commercial banks are banks whose charter comes from the U.S. government. These national banks are also called member banks, and they earn a fixed 6% dividend on their shares of Federal Reserve stock.

Each Federal Reserve Bank has nine directors. Member commercial banks elect six directors: three bankers and three representatives from the business community. The ***Board of Governors***, which holds the power at the Fed, appoints the last three directors. In turn, the nine directors elect the president of each Federal Reserve District Bank. Of course, this is not a free election because the Board of Governors must approve the bank president.

Commercial banks have no control over their Fed district banks, although they privately own them. A Fed bank does not operate like a corporation where the stockholders can freely elect the board of directors, who vote on the significant corporate policies. Congress created this odd structure because it did not want the Fed to be part of the government or controlled by the banks, but somewhere between them. Nevertheless, the Fed is part of the government or a quasi-government. When Congress created the Fed in 1913, it dispersed the Fed's power over the 12 Federal Reserve Banks. Over time, the Board of Governors consolidated the central bank's power.

The Board of Governors is the entity that controls the Federal Reserve System. It determines monetary policy, reserve requirements, and discount policy. The board consists of seven members, who serve a 14-year term. Most board members will not finish their term because they resign to work for financial firms on Wall Street, where they earn five times their Federal salary. The Fed chairman earns $250,600 annually while other governors earn $225,700 annually. A U.S. president, with Senate approval, appoints the members, the chairperson, and vice-chairperson of the board. The chairperson and vice-chairperson serve a four-year term. The Comptroller of the Currency and Secretary of the Treasury cannot be members of the board because the Federal Reserve must remain independent of the U.S. federal government. If the U.S. government is accumulating a massive debt, and the Treasury cannot increase taxes or borrow, then the Treasury could resort to printing money to cover deficits by forcing the Fed to buy its securities. Unfortunately, printing money always leads to inflation.

The Board of Governors is independent of the U.S. federal government in three ways. First, the Board of Governors earns its revenue from the 12 district banks. The Fed does not ask Congress for money. Whoever controls the money is directly or indirectly in command. Second, the terms of the board members are staggered. Every two years, the U.S. President appoints one member to the Board of Governors for a term of 14 years, divided among seven members. This prevents a newly elected President from appointing all members at once, who become loyal to the President. Third, the government cannot thoroughly audit the Fed. The less the government knows, the less it can tamper with things. Please do not think the Fed is entirely independent! If the Federal Reserve angers Congress too much, Congress could rewrite the laws that created the Fed.

The ***Federal Open Market Committee (FOMC)*** is a special committee within the Fed that makes decisions about open-market operations. Although the Board of Governors determines monetary policy, the Federal Open Market Committee puts the policy into action. After the FOMC makes a decision, the committee sends a ***directive*** to the manager at the New York City Federal Reserve Bank to buy and sell U.S. government securities.

The FOMC consists of the Board of Governors, plus five Federal Reserve district bank presidents. The President of the Federal Reserve Bank of New York City is a permanent member of the FOMC and is always the FOMC vice-chairperson because New York City is the financial center of the United States. The Fed buys and sells government securities through the New York Fed. The remaining four positions for the FOMC are rotated among the other 11 Federal Reserve district bank presidents. Moreover, the Fed buys securities from the secondary markets. If the Fed bought securities directly from the primary market, then it would be buying directly from the U.S. Treasury. Thus, the Fed would not be independent from the U.S. Treasury if it buys new securities in the primary market.

The chairperson of the Board of Governors is also the chairperson of the FOMC. This person is an influential figure because they can advise the President, inform Congress of the Fed's actions, and serve as the spokesperson for the entire Federal Reserve System. When he speaks, everyone in the financial world listens. The current chairperson is Jerome Powell, and many consider him the second most powerful person in the United States after the U.S. President.

The European Central Bank

The European Union (EU) created a common market among European countries. Many countries eliminated customs between EU countries as they erected common customs with the outside world. Thus, capital, goods, labor, and services can move anywhere within the EU freely. Furthermore, the EU has improved efficiency in other areas. Many EU countries reduced or eliminated their purity and labeling laws that stopped imports from other EU members. For example, the Greek government removed regulations for ice cream while Belgium removed its chocolate laws. Even Germany removed its beer purity law, which was passed in 1516. That law required all German beer producers to make beer from only four ingredients: barley, hops, water, and yeast.

The EU allows new countries to join, but they must overcome many obstacles to membership. Turkey wants to join the EU, but the EU membership requires a member country to be a democracy, where the citizens elect the government officials. Furthermore, governments must respect human rights and have a functioning market economy. As of 2025, the EU has 27 members.

The European Union had created new institutions, such as the European Parliament and European Court of Justice. These institutions are not concentrated in one country but spread across EU members. Most institutions are located in Brussels, Luxembourg, and Strasbourg. One drawback to the European Union was that it created new bureaucracies at the top level of government. The EU employed approximately 60,000 government officials and bureaucrats in 2025, which increased from 33,000 officials in 2012.

Twenty EU members use the common currency, the euro, which we refer to as the ***Eurozone***. The Eurozone replicates the United States by forming the world's largest market with a single currency. As a large number of countries share one currency, it creates four benefits. First, a single currency has no exchange rate risk. Citizens from different countries can sell and buy goods from one another, and they do not worry about changes in the exchange rate. Second, a single currency reduces transaction costs since parties do not need to convert one currency into another. Third, a single currency helps align political interests. The Eurozone members work and cooperate as they strive for peace and stability. Finally, a single currency promotes competition, and regions within the Eurozone begin to specialize.

Specialization can occur across many industries and countries. For instance, the financial institutions within the Eurozone can specialize and reduce their lending costs. Furthermore, countries can specialize. Germany specializes in automobile and machinery production, while France specializes in pharmaceuticals, chemicals, and aerospace. As countries within the Eurozone specialize, the producers experience higher efficiency and greater productivity, and they have access to more consumers. Consequently, the zone helps integrate European countries, spurring economic growth and unleashing the competitive market forces. Over time, the Europeans should see their living standard rise and their unemployment rate fall.

The ***European Central Bank (ECB)*** manages the euro and is located in Frankfurt, Germany. The ECB was modeled after the Bundesbank, which was Germany's central bank. The primary goal of the ECB is to achieve price stability, keeping the euro stable with a low inflation rate. The euro is successful, and the Eurozone rivals the United States in terms of GDP. Furthermore, the euro was appreciating against the U.S. dollar as it strove to become the new international currency because Europe's financial markets and global trade rival those of the U.S.

The euro did well until the 2008 Financial Crisis struck the world's economy. The euro began losing ground against the U.S. dollar. Subsequently, several EU member countries, such as Greece, Ireland, Portugal, and Spain, were plagued with severe budget problems that led to the European Debt Crisis in 2012. We discuss the crisis at the end of the chapter.

The structure of the European Central Bank is similar to the structure of the Federal Reserve System. The ***Governing Council*** decides and formulates monetary policy for the European Central Bank and is identical to the Board of Governors of the Federal Reserve System. The council is composed of the Executive Board and 27 Governors[4]. The Governors are the heads of their country's central bank who are members of the Eurozone.

The ***Executive Board*** implements monetary policy and manages the day-to-day operation of the ECB, similar to the Federal Open Market Committee (FOMC). The board has a president, a vice president, and four additional members, whom the ***European Council*** selects. The European Council consists of the heads of state of the EU member countries. The European Council appoints members to the Executive Board for an eight-year term that is not renewable. Furthermore, the board members' terms are staggered. Consequently, the European Council cannot change the board members all at once. The President of the Executive Council also becomes the President of

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[4] The number of governors should be 28 since Croatia was admitted to the Eurozone in 2013.

the Governing Council. The ECB president is selected from a central bank whose country is a member of the Eurozone. Winn Duisenberg, from the Netherlands, was the first ECB president.

EU countries retained their central banks, even countries that have adopted the euro. Countries' central banks remain independent of the EU, and the top official of a central bank in the Eurozone is a governor and a member of the Governing Council. Currently, 20 EU countries have adopted the euro, which means the Governing Council has 25 Governors (19 central bank Governors plus the six members of the Executive Board). The country's government selects the governor who serves at least a five-year term. Furthermore, the governors have more influence on monetary policy within the European Central Bank than the presidents of the twelve Federal Reserve banks have over the Board of Governors. Consequently, the Board of Governors centralizes and controls the power within the Federal Reserve.

All central banks of the European Union buy stock into the European Central Bank, even countries that are not members of the Eurozone. Thus, the EU central banks own the European Central Bank. Similarly, the national commercial banks buy the Federal Reserve's stock in their district within the United States. The amount of stock a central bank buys depends on a country's population and GDP. Germany owned 21.8% of the ECB's stock in 2025, while France owned 16.4%, and Italy had 13.1%. The ECB returns 80% of its profits to the stockholders, which are the central banks of member countries.

The European Central Bank is the most independent central bank in the world. No EU country or EU institution can hold it accountable. Even the European Parliament, the highest representative body of the EU, cannot audit or dictate policy to the ECB. Moreover, the ECB does not receive funding from any EU body or government, and the terms are staggered for the Executive Board. Thus, the European Council cannot manipulate the ECB by appointing the whole Executive Board at once. Consequently, the ECB concentrates on price stability, which they define as a 2% or less inflation rate per year. Other countries, such as the United States, can pressure the central bank to pursue several goals, such as lowering the unemployment rate or manipulating interest and currency exchange rates.

The Eurozone created three problems among its EU members. First, the countries surrendered control of their monetary policy. If a country experiences financial difficulties, it cannot use its central bank to help finance the government's deficit. For instance, a central bank could devalue its currency to stimulate economic growth because a devalued currency boosts exports and reduces imports, creating jobs in the export industries. Second, prices soared in Southern Europe while wages fell behind, impoverishing many people. Finally, the ECB cannot legally buy bonds from EU governments. However, the Europeans were worried about the 2009 Greek Debt Crisis, and they bought Greek government bonds to keep the Greek government operating. We discuss the Greek debt crisis in the next section.

Is the Federal Reserve Independent of the U.S. Government?

Two viewpoints describe whether the Fed serves the public interest or acts in its self-interest. The ***public interest view*** states that the Fed serves the public by implementing a monetary policy that causes stable prices, low unemployment, and strong economic growth. Many economists argue that the Fed does not serve the public interest because it does not emphasize price stability and economic development. Furthermore, many experts criticized the Fed's role in the 2008 Financial Crisis and 2020 COVID-19 pandemic. Unfortunately, the Fed kept interest rates low artificially. Low interest rates encourage people and speculators to buy houses, inflating both the housing bubble and housing prices. The Fed has not unwound the massive liquidity that was injected into the banking system in 2020.

The ***principal-agent view*** holds that government bureaucracies often fail to serve the purposes for which political leaders created them. Bureaucrats become concerned about maximizing their power, influence, and prestige. For example, a new computer corporation is founded, and it creates new computers at a low price. If consumers buy this computer, then the corporation earns profits. However, if the corporation builds computers that nobody wants, the corporation will go bankrupt. Profits ensure businesses will produce goods and services that consumers want. On the other hand, profits do not guide government agencies, and no mechanism keeps them in check. Every year, government agencies receive more funding, regardless of the agencies' performance. Over time, bureaucrats become more concerned with funding, job security, and prestige, instead of following their original function. This explains why the public highly rates its dissatisfaction with government agencies. The principal-agent view of the Fed suggests that the chairman prioritizes his or her self-interest and protects their friends, such as large commercial and investment banks.

The Fed is independent of the U.S. Treasury Office, even though some Presidents tried to influence it. However, a government budget deficit could lead to money creation. If the Fed maintains a constant interest rate and the U.S. government operates a budget deficit, the U.S. Treasury Department can finance the deficit by issuing T-bills. Nevertheless, the T-bill supply rises, causing the market price of T-bills to fall. Thus, market interest rates rise. If the Fed maintains a fixed interest rate, it must buy these T-bills, expanding both bank reserves and the money supply. Consequently, a government budget deficit leads to inflation if a central bank focuses on the interest rate.

Foreign countries differ in the degree of independence between their government and their central banks. For example, the Eurozone and Switzerland have the most independent central banks in the world. Thus, these countries experience the lowest inflation rates in the world. On the other hand, the central banks in Russia, Kazakhstan, Thailand, and Turkey have less independence from their governments, and these countries experience higher inflation rates.

A national government's financial health determines the level of independence between the government and the central bank. Political leaders boost government spending to win favor with the public, but are hesitant to raise taxes. Consequently, a government would suffer from a budget deficit that its treasury can finance by selling government bonds. As a government's debt continually grows, investors will reach a point when they stop buying bonds. Unfortunately, political leaders refuse to cut government programs and subsidies or raise taxes. The only solution is for the government to force its central bank to buy bonds that investors do not want, even though this creates inflation.

The European Union experienced a similar situation. Greece, Spain, Ireland, and Portugal have reached their debt limits, and investors are no longer willing to purchase their bonds. The

European Central Bank is independent of the member countries' governments, and these countries cannot force the central bank to buy their bonds. Instead, the governments imposed austerity measures, increasing taxes and reducing government programs and subsidies, which sparked massive protests and demonstrations against the governments. Increasing taxes or decreasing government spending hinders economic growth. Consequently, many European countries had entered a recession in 2012.

Many Americans and experts believe the massive $37 trillion U.S. government debt will lead to inflation as the U.S. government forces the Federal Reserve to buy its bonds. Subsequently, the Federal Reserve would lose its independence. For example, the Trump Administration humiliated Jerome Powell in 2025, the Chairman of the Federal Reserve. Powell took a careful stance to maintain the federal funds rate at its current level to weaken inflation and stabilize the financial markets from the massive quantitative easing during the COVID-19 pandemic. The ***federal funds rate*** is the interest that banks lend to each other through their excess reserves. However, the Trump Administration wants the rate lowered. The reason could be to boost the U.S. economy since data suggests an economic slowdown is underway. In addition, the U.S. government has about $8 trillion in bonds coming due this year and another $8 trillion next year. The Trump Administration may be trying to lock in lower rates because the interest on the debt exceeds $1 trillion in 2025[5].

Key Terms

Federal Reserve System
discount rate
Board of Governors
The Federal Open Market Committee (FOMC)
directive
Eurozone
European Central Bank
Governing Council
Executive Board
European Council
public interest view
principal-agent view
federal funds rate

Chapter Questions

1. How many district banks does the Federal Reserve have?

2. Why did Congress and the President create the Federal Reserve System with several independent bank branches?

3. Please describe the structure of the Federal Reserve System. For example, who owns the Fed stock? Who makes the decisions regarding monetary policy?

4. Identify the functions of the Board of Governors, and who appoints members to this board?

[5] A financial disclosure reveals that President Trump purchased $100 million in bonds in 2025. He could earn large capital gains if the Fed lowers interest rates, which raises bond prices.

5. Which factors help the Fed be independent of the U.S. federal government?

6. Identify the functions of the Federal Open Market Committee, and who appoints members to this board?

7. Explain why the chairperson of the Board of Governors is such an influential person.

8. Identify the economic consequences if an EU member of the Eurozone withdraws from the euro and reintroduces its currency.

9. Distinguish between the Executive Board and the Governing Council of the European Central Bank.

10. Identify the benefits and problems for EU countries that are members of the Eurozone.

11. Distinguish between the public interest view and the principal-agent view.

12. Please explain why the degree of independence between the central bank and its government is very important.

15. Monetary Policy Tools

This chapter introduces the Federal Reserve's three significant tools for conducting monetary policy: open-market operations, discount policy, and reserve requirements. The Fed uses monetary policy to influence the important macroeconomic variables in society, including the GDP growth rate and indirectly the unemployment rate, interest rates, currency exchange rates, and asset prices such as stock and bonds. Thus, many people, especially in the financial markets, scrutinize the Fed's actions to determine monetary policy. Accurately predicting the Fed's actions, financial companies can reap enormous profits. Unfortunately, a central bank's use of monetary policy may create more instability for an economy due to time lags, which is why we discuss several problems associated with monetary policy.

Open-Market Operations

The Fed can use expansionary or contractionary monetary policies. ***Expansionary monetary policy*** means the Federal Reserve is expanding the money supply, which indirectly reduces short-term interest rates. The Fed can also employ ***quantitative easing***, a form of expansionary monetary policy that involves directly buying massive amounts of assets on a large scale. For example, the Fed has purchased over $6 trillion in U.S. Treasuries and over $2 trillion in mortgage asset-backed securities. In contrast, ***contractionary monetary policy*** involves the Federal Reserve contracting the money supply, thereby raising short-term interest rates. ***Quantitative tightening*** is similar to contracting the money supply but allows the Fed to sell assets or allow assets to mature "off the books." In addition, the Fed can use Open-Market Operations, Discount Policy, and Reserve Requirements to implement a monetary policy. ***Open-Market Operations*** are the Fed's purchase and sale of U.S. government securities, and it is the Fed's most important tool. Open-market operations have the same effect if the Fed purchases any short-term, liquid securities. However, the Fed usually buys and sells U.S. government securities. We also discuss Discount Policy and Reserve Requirements in their sections in this chapter.

The Fed, for example, wants to expand the money supply by using expansionary monetary policy. In the T-bill market as represented in Figure 1, the original market price and quantity for T-bills are P* and Q*. Then the Fed buys T-bills, creating a greater demand for T-bills, shifting the demand function to the right. The Fed pays for the T-bills using a "Fed check." After the seller deposits the check at their bank, the bank's reserves increase. The banks have more funds to lend to borrowers, which creates money in the banking system while raising the money supply. Consequently, both the market price and quantity of T-bills rise. Then the market interest rate for T-bills falls when we calculate it using the present value formula.

One key observation is that open-market operations influence interest rates, as the T-bill serves as a short-term credit instrument. When the Fed purchases the T-bills, the T-bill's price rises while the T-bill interest rate falls. Consequently, the decrease in the short-term interest rates spreads to other markets, including the federal funds rate, commercial paper, and bankers' acceptances. Therefore, short-term interest rates on all short-term credit instruments will rise and fall together. It takes more time for monetary policy to affect long-term rates.

Contractionary monetary policy works similarly to expansionary monetary policy. Figure 2 depicts the market price and quantity for T-bills as P* and Q*. The Fed sells T-bills, increasing the supply of T-bills and shifting the supply curve for T-bills rightward. Consequently, the market price of T-bills falls while the market interest rate for T-bills rises by using the present value formula. The short-term interest rates for other credit instruments rise. Finally, the banks' reserves fall, and bankers grant fewer loans, which shrink the money supply.

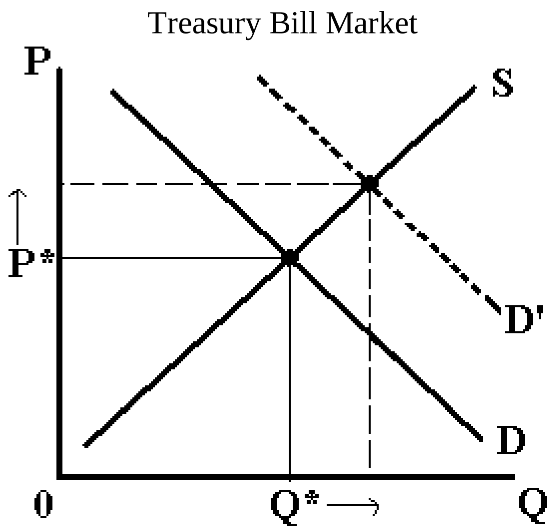

Figure 1. The Federal Reserve increases the money supply by purchasing T-bills

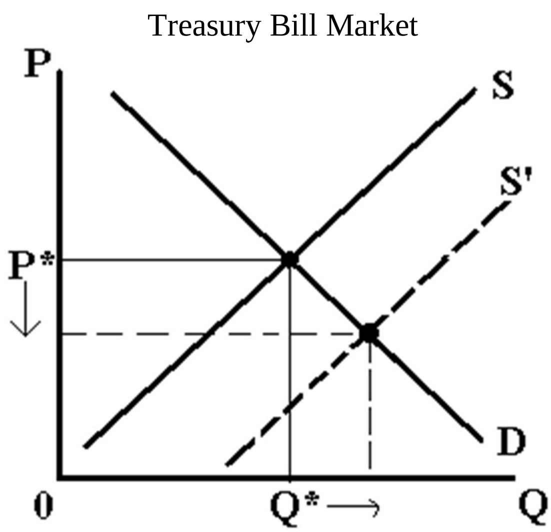

Figure 2. The Federal Reserve decreases the money supply by selling T-bills

The Fed can only control the growth rate of the money supply or short-term interest rates, but not both simultaneously. For example, the Fed increases the M1 money supply by 3%. Consequently, the Fed continues to buy T-bills until the M1 money supply expands by 3%. However, short-term interest rates fall. The Fed cannot prevent falling interest rates because it focuses on the money supply. On the other hand, the Fed wants to reduce the short-term interest rates to 4%. If the current interest rate is 6%, the Federal Reserve subsequently continues to buy T-bills until the interest rate falls to 4%. Nevertheless, as the Fed continually buys T-bills, both banks' reserves and the money supply expand. The Fed has no control over the money supply while it focuses on the interest rates. Thus, the Fed can either affect short-term interest rates or the money supply, but not both simultaneously.

Federal Open Market Committee

The Fed formed the ***Federal Open Market Committee (FOMC)*** to implement monetary policy by buying or selling assets like U.S. government securities. The FOMC meets eight times per year and issues a ***general directive*** that states the objective for the monetary aggregates and interest rates. Furthermore, the Federal Reserve Bank of New York is responsible for carrying out the general directive. The Federal Reserve Bank of New York deals with about 40 dealers who specialize in U.S. government securities (i.e., secondary market). The New York Fed and dealers are connected electronically. When the Fed is ready to buy or sell government securities, the Fed asks these dealers to bid. Then the Fed buys or sells to the dealers with the best offer. The ***Open Market Trading Desk*** is the department within the New York Fed Bank that buys and sells government securities.

When the trading desk at the Fed conducts monetary action, it can use dynamic or defensive transactions. A ***dynamic transaction*** is when the Fed uses a transaction to meet the monetary policy as specified in the general directive. A ***defensive transaction*** is when the Fed uses open-market operations to offset fluctuations in bank reserves. The Fed uses defensive transactions more than dynamic transactions. For example, the banks' reserves fall as people withdraw money from their bank accounts to buy Christmas presents or pay their taxes in April. Consequently, the money supply decreases around Christmas and April. Furthermore, natural disasters and employees' strikes can delay the delivery of the mail. A mail delay slows the Fed's check-clearing process. Thus, the float rises, expanding both banks' reserves and money supply. Accordingly, the Fed uses defensive transactions to offset temporary fluctuations in bank reserves to stabilize the money supply.

The Federal Reserve can use two methods to conduct monetary policy. First, the Fed uses ***outright purchases and sales***, when it buys or sells a security, and the transaction is permanent. The dealer who purchased the security has no obligation in the future to sell the security to the Fed or vice versa. Second, the Fed uses the ***repurchase agreement (repo)*** to buy securities from a dealer, and the dealer agrees to repurchase the securities for a specific price and on a particular date in the future. This is similar to a bank repurchase agreement. The dealer buys back the government security usually within 15 days. Consequently, the repo injects temporary reserves into the banking system. For example, people around Christmas time withdraw enormous amounts of currency from the financial institutions because they buy Christmas presents with cash. Accordingly, the Fed uses a repo to temporarily inject reserves into the banking system to offset the currency drain. After Christmas, the currency returns to the financial institutions. Then the repo expires, and the temporary reserves are removed from the banking system as the dealer repurchases the repo.

The Fed can do the opposite of a repo, called the ***reverse repurchase agreement*** (***reverse repo***). In this case, the Fed sells securities to dealers with an agreement to repurchase them at a specific price on a particular date in the future. Thus, the reserve repo temporarily lowers excess reserves in the banking system. We can visualize this scenario by the Fed filling a swimming pool with water. The Fed's injection of massive reserves into the banking system is like filling a pool. The reserve repo can act like a safety valve to drain some excess water from the pool, so it does not overfill. Thus, excess funds and liquidity are drained from the banking system, which helps lower inflation. Thus, the repo and reserve repo are tools to allow the Fed to fine-tune short-term interest rates and bank liquidity, especially for cyclical or seasonal fluctuations.

The Federal Reserve has actively used the reverse repo since the 2008 Global Financial Crisis. The reverse repo becomes important during times of excess liquidity in the banking system as the Fed temporarily drains reserves. For example, the Fed injected large-scale quantitative easing during the COVID-19 pandemic. It supported the economy during the widespread shutdowns in the entertainment, dining, and retail sectors. By 2022, inflation began rising quickly, prompting the Fed to use the reverse repo to drain excess reserves from the banking system. Thus, the reserve repo became an important tool during and after the pandemic.

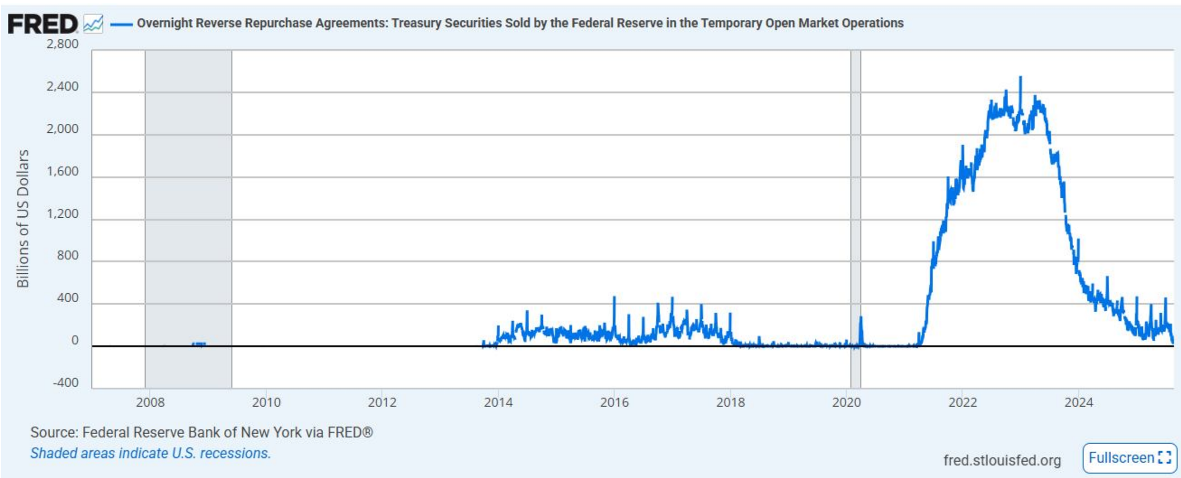

Figure 3. The Fed overnight reserve repo market

The Fed has four reasons why open-market operations are its most popular and essential tool. First, the Fed can completely control how many securities it buys or sells. Second, open-market operations are flexible. The Fed can influence bank reserves by a small amount by purchasing a few U.S. government securities or by a significant amount by buying many securities. Third, if the Fed makes a mistake by buying too many U.S. government securities, then it can turn around and sell them to correct its mistake. Finally, the Fed can implement open-market operations very quickly.

Many people scrutinize the Fed, and they read the Fed's directives for its open-market trading desk. However, these directives are vague and not precise, creating the principal-agent problem. If the directives are unclear, then the outcome does not matter. The Fed can deem any outcome as a success, making the Fed unaccountable for errors.

Many central banks across the world, including the European Central Bank, use open-market operations similarly to the United States. Although some countries have a small market for government securities, central banks can buy and sell any assets. The Fed, for instance, used to buy banker's acceptances but stopped this practice in 1977.

Discount Policy

The Fed's second monetary policy tool is the ***discount policy***. The Fed can grant loans to financial institutions. For example, a bank experiences financial problems and needs reserves. Consequently, the bank sells a $10,000 T-bill to the Fed, and the Fed boosts the bank's reserves by $9,000. The discount is the difference, while the T-bill becomes the collateral of the loan. When the bank repays the Fed loan, the Fed returns the T-bill for $10,000 to the bank. The $1,000 difference reflects the interest rate the Fed charges for the loan, called the ***discount rate***. Traditionally, the Fed only loaned to banks that were members of the Federal Reserve System. Each Federal Reserve district bank provides loans, known as the "***discount window***." Currently, any bank in the U.S. can borrow from the Fed, and the Fed may not require collateral for the loan.

The Fed could use a discount policy to influence the money supply and interest rates. For example, Figure 3 shows the Federal Funds Market, where banks lend their reserves at the Fed to other banks. Consequently, the banks electronically transfer these funds through the Fedwire. The demand function comprises the banks' demand for federal funds. These banks borrow funds to ensure they hold enough reserves to meet depositors' withdrawals or satisfy the Fed's reserve requirements. The demand curve is downward sloping because banks borrow more funds when the interest rate decreases (i.e., the loans are cheaper). The supply function represents the banks' supply of federal funds to the market, as these banks hold excess reserves. These banks temporarily lend out excess reserves so that they can earn interest income. The supply function is upward sloping because banks lend more funds at a higher interest rate (i.e., they earn higher profits). The intersection of the demand and supply curves determines the equilibrium interest rate (i*) and amount of reserves (R*).

The Fed could use the discount rate for expansionary monetary policy. For instance, the Fed decreases the discount rate, depicted in Figure 3. The banks borrow cheaply from the Fed, boosting the reserves in the banking system. Thus, banks have more reserves to lend. The supply function for the federal funds market increases and shifts rightward. Consequently, the interest rate for federal funds falls and both the monetary base and money supply expand.

Contractionary monetary policy works similarly to expansionary monetary policy. Figure 4 shows the Federal Funds Market. The market interest rate is i* while the equilibrium reserves are

R*. For example, the Fed raises the discount rate. Banks borrow less from the Fed because they pay higher interest rates on their loans. Thus, banks have fewer reserves, lowering the reserves in the banking system. Consequently, the banks have fewer reserves to lend, shifting the supply of Federal Funds leftward. The interest rate rises while both the monetary base and money supply shrink.

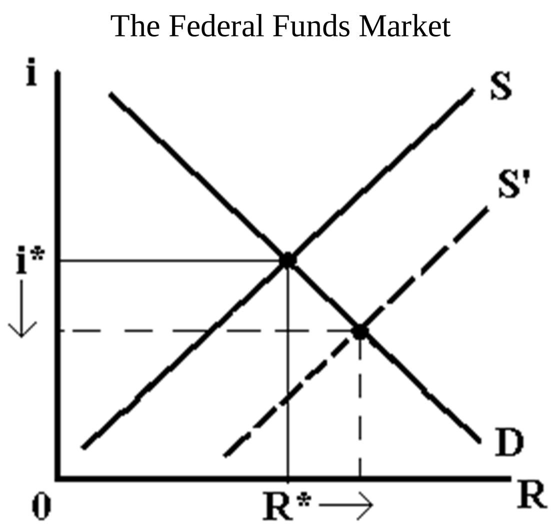

Figure 3. The Federal Reserve uses the discount rate to increase money supply

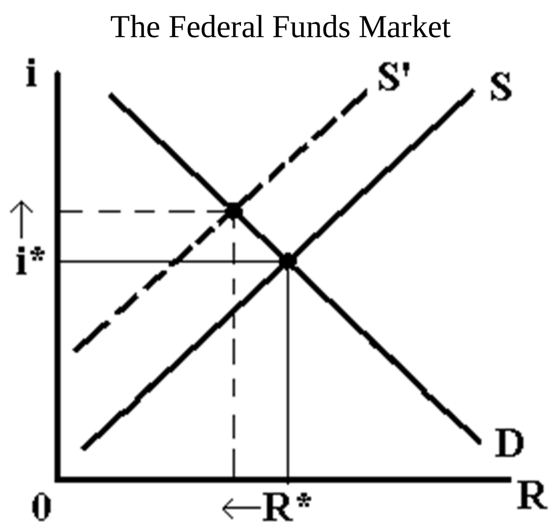

Figure 4. The Federal Reserve uses the discount rate to decrease money supply

The Fed can grant adjustment, seasonal, or extended credits. The ***adjustment credit*** is a short-term loan to help banks experiencing short-term liquidity problems. ***Seasonal credit*** is a loan to help small banks located in agricultural areas or tourist destinations. These areas experience wide fluctuations in income because farmers harvest crops once or twice a year, and tourists visit an area during high season. Finally, the Fed could grant an ***extended credit***. For instance, a large bank is on the verge of bankruptcy and has severe liquidity problems. Thus, the Fed grants a long-term loan to this bank, preventing a bank failure.

The Fed, along with the FDIC, could extend loans to restore the financial health of the bank. For example, Continental Illinois Bank, the 8th largest U.S. bank, failed during the 1970s because it granted too many bad loans. The FDIC purchased 80% of the bank's stock and elected new management. Thus, the U.S. government nationalized the bank because the bank became too big to fail, while the Fed provided $3.5 billion in loans to the FDIC. During the 2008 Financial Crisis, the Fed granted up to $2 trillion in loans to prevent some of the largest banks and financial companies in the United States from failing.

Banks can abuse the discount window. For example, a bank could borrow funds from the Fed at 2% and lend these funds out at 5%, earning 3% interest on the Fed loans. The Fed counters this problem by conducting more thorough investigations and audits of the bank, ensuring it complies with regulations. Moreover, the Fed can impose fines or publicly criticize the bank. A bank borrowing from the Fed indicates financial weakness. Finally, the Fed may stop lending to the bank because borrowing from the Fed is a privilege and not a right! Many economists argue that the Fed should set the discount rate greater than a comparable short-term interest rate. That way, borrowing from the Fed becomes a penalty because a bank borrows at a higher interest rate than the market. For example, the European Central Bank uses the penalty interest rate to prevent its banks from abusing their loans.

The Fed implemented the ***Term Auction Facility (TAF)*** Program after the 2008 Financial Crisis. The Fed specifies the total amount of discount loans that it is willing to provide to the banks, while the banks competitively bid for these funds. Then the Fed uses the bidding process to set the interest rate for loans.

The Fed's discount policy provides four benefits to the banking system. First, the Fed is the "lender of the last resort." If a bank faces liquidity issues or needs reserves and cannot borrow from other banks, the Fed is the last resort for a loan. Second, the Fed creates the ***announcement effect*** when the discount rate unexpectedly changes. The rate change provides information to the financial markets because the Fed conducts monetary policy secretly. For example, the Fed raises the discount rate. Press, politicians, and financial analysts think the Fed is tightening monetary policy, i.e., contracting the money supply. Third, the Fed employs moral suasion, utilizing its power to persuade depository institutions to comply with its directives. A loan from the Fed is a privilege, not a right. If a bank needs a loan from the Fed and fails to comply with the Fed's requirements, the Fed could refuse to lend to the bank. Finally, the Fed uses the discount policy to prevent a financial crisis. The Fed can lend as much as the banks need. Thus, the Fed calms the financial markets by stating its discount policy.

The discount policy is not an effective tool for controlling the money supply. For instance, if the Fed wants to increase the money supply, the Fed must grant more discount loans to banks. However, the Fed cannot force banks to accept its loans. If the Fed pursues a contractionary monetary policy, the Fed must call in loans from the banks, causing hardship. These loans indicate that banks are facing financial difficulties, and the Fed could exacerbate their problems by withdrawing the loans.

The public and financial analysts scrutinize the federal funds market to predict monetary policy. For example, when the public and financial analysts see the federal funds interest rate fall, they infer the Fed is using an expansionary policy. On the other hand, if the federal funds rate rises, the public believes the Fed is using contractionary monetary policy. As we know from this chapter, the Fed cannot control the federal funds rate, but can only influence it. Other factors can raise or lower the Federal Funds rate.

Reserve Requirements

The Fed can use reserve requirements as a monetary tool. ***Reserve requirements*** are the ratio of reserves to deposits that banks must hold to satisfy depositors' withdrawals. Banks store reserves as vault cash or deposits at the Fed. The Fed has the power to set reserve requirements for banks within the limits set by Congress. The Fed rarely changes the reserve requirements because such changes have a significant and disruptive impact on the banking system. Table 1 shows the reserve requirements before 2020. In 2008, the Federal Reserve started paying interest on required and excess reserves to encourage banks to hold onto excess reserves instead of granting loans. In 2020, the Federal Reserve entirely removed any reserve requirements to help banks survive the COVID-19 pandemic, which is still in place today.

Table 1. The Federal Reserve Required Reserve Requirements

Bank liability	Required Reserve Ratio (%)	Effective date
Checking accounts		
$0 to $10.3 million	0	1-09-90
More than $10.3 million to $44.4 million	3	1-09-90
More than $44.4 million	10	1-09-90
Nonpersonal time deposits	0	12-27-90

The Fed can use reserve requirements to alter the money supply. If the Fed believes banks are holding too many excess reserves, then banks would create high inflation in the future as they lend their excess reserves as loans. These loans return as deposits, expanding the money supply and leading to multiple deposit expansions. Consequently, the Fed can increase the reserve requirement ratio, switching some excess reserves to required reserves.

The money multiplier ($1 \div r_r$) increases if the Fed reduces the reserve requirement, and vice versa. For example, if the required reserve ratio equals 10%, and the Fed buys a $10,000 T-bill using a Fed check, subsequently, the money supply could potentially expand by $100,000 (or $10,000 ÷ 0.10). If the Fed lowered the reserve requirement to 5%, and it purchased a $10,000 T-bill, then the money supply can potentially increase to $200,000 (or $10,000 ÷ 0.05). Thus, the Fed rarely changes the reserve requirements because this tool is too powerful. Small changes in the reserve requirement could have an enormous impact on the banking system and the money supply.

Economists and policymakers believe reserve requirements are not an effective monetary policy tool for the following reasons:

- Changing the reserve requirements is too powerful because small changes in reserve requirements have a great impact on the money multiplier and the money supply.

- The required reserves impose a cost to the banks because they cannot lend these reserves to borrowers, and therefore, do not earn interest income on required reserves. These reserves sit in a vault as cash or as deposits at the Fed. However, the Fed started paying interest on required and excess reserves since 2008.

- The purpose of reserve requirements is to make deposits safe and maintain a stable banking system. However, if the majority of the depositors came to their bank to withdraw their deposits, then the bank would still fail. Unfortunately, the banks hold fewer than 10% of the deposits as vault cash and/or deposits at the Fed. Thus, reserve requirements would not prevent bank runs and do not stabilize the banking system. Only deposit insurance can help prevent bank runs.

- Reserve requirement ratios are components of the money multiplier. Thus, the Fed must maintain a constant money multiplier and reserve requirements to control the money supply. No empirical evidence indicates that reserve requirements improve the stability of the money multiplier. Moreover, banks would still hold reserves to meet depositors’ withdrawals if a central bank did not impose reserve requirements.

Milton Friedman, a Nobel laureate, suggested the central bank should impose a 100% reserve requirement on banks. Accordingly, the banks would hold all deposits either at the Fed or in vault cash. The banking system could not create multiple deposit expansions, and the money multiplier would be one. For example, if the Fed purchased a $10,000 T-bill, both the monetary base and the money supply would expand by exactly $10,000. Consequently, the Fed has complete control over the money supply with a 100% reserve requirement. Banks would hold all deposits as reserves so that they could meet depositors’ withdrawals. Moreover, the U.S. government could eliminate federal deposit insurance and substantially reduce bank regulations. However, banks could not lend under this system, causing the financial intermediation process to break down. Banks link savers to investors. Thus, the whole economy would need restructuring, and another financial institution would evolve into something similar to a bank that would lend to businesses and households.

Monetary Policy Goals

The goal of monetary policy is to increase the well-being of society. Economists measure well-being in terms of the quantity and quality of goods and services that people consume. The Fed has six ***monetary policy goals***, which include the following:

Price stability: Product prices communicate information to households and businesses. Households determine how many goods to buy, while businesses determine how many goods to produce. Inflation is a continual increase in the prices of goods and services, and it erodes the value of money. Furthermore, a high inflation rate becomes more variable, thus creating uncertainty for businesses, consumers, and workers. This uncertainty leads to adverse effects on decisions and hinders economic growth. If the inflation rate soars, then money's functions of a "store of value" and "medium of exchange" break down.

High employment: The Federal Reserve and the federal government strive to minimize unemployment, as it causes significant human misery. As workers remain idle, factory space and equipment become underutilized. When a society does not use all its resources, an economy's GDP grows at a slow rate or even decreases. The government cannot reduce the unemployment rate to zero. In some cases, unemployment occurs when workers quit their jobs and look for new ones, or students graduate and enter the labor market. The Fed tries to lower the unemployment rate to the natural rate of unemployment. Currently, economists estimate the natural rate of unemployment to be 6% for the United States. If the Fed strives for an unemployment rate below 6%, then the Fed's policy could create inflation.

Economic growth: A growing economy has an increasing real GDP because society produces more goods and services. A high real GDP growth rate lowers the unemployment rate, while businesses earn profits. Then they raise their investment, producing more goods and services. Furthermore, strong economic growth raises incomes for companies and households. When businesses and families have higher incomes, the local, state, and federal governments collect more tax revenues. Thus, the Fed uses monetary policy to spur strong economic growth.

Financial market and institution stability: Financial panics, bank runs, stock market crashes, or bankruptcies of large financial institutions could trigger a chain reaction that causes other financial institutions to go bankrupt. Unfortunately, a financial panic disrupts the link between savers and investors. As a result, businesses are unable to secure the loans they need for investment, while customers are also denied loans to purchase homes, cars, and other essential assets. If the financial markets and institutions break down, then the economy can enter a severe recession, causing high unemployment and slow or decrease the GDP growth rate. Consequently, the Fed stabilizes the financial system by being a "lender of the last resort," preventing financial panics.

Interest rate stability: The Fed stabilizes interest rates because fluctuating rates create economic uncertainty, making it difficult for businesses and households to plan for the future. Businesses become uncertain about investing in new buildings, machines, and equipment, while consumers are unsure about long-term investments, such as buying a house or car. Interest rate stability is related to the stability of the financial markets. Large swings in interest rates can cause sizeable capital gains and losses in the financial markets. Consequently, some investors earn profits while others earn losses.

Foreign-exchange market stability: The Fed tries to stabilize the U.S. dollar's value against the major currencies, such as the Japanese yen and the European euro. A strong U.S. dollar causes U.S products to become relatively more expensive to foreigners while foreign-made products become cheaper to U.S. citizens. Thus, consumers buy more foreign products, raising imports while U.S. businesses sell fewer products abroad, shrinking exports. If the U.S. dollar weakens, then U.S. imports and exports do the opposite. U.S. products become cheaper to foreigners while foreign-made goods become more expensive. Thus, U.S. exports rise while imports fall.

Some of these goals conflict with each other. For example, if the Fed pursues a monetary policy that expands the money supply, it boosts national output and lowers the unemployment rate. However, expansionary monetary policy can trigger inflation. Then the nominal interest rates begin to increase because of the higher expectations of inflation, via the Fisher Effect.

The European Central Bank, on the other hand, has only one policy goal – price stability. The ECB defines price stability as an inflation rate of 2% or less. Thus, this extremely low inflation rate causes the exchange rate of the euro to strengthen relative to other currencies, which we discuss in Chapter 16.

Time Lags and Targets

The Fed cannot influence the monetary policy goals directly. The Fed uses its tools, open-market operations, discount rates, and reserve requirements, to influence indirectly its policy goals. Unfortunately, three time lags hinder monetary policy. First, the Federal Reserve or government needs data and information before it can take action; however, the ***information lag*** is a significant issue. For instance, the government calculates the unemployment rate monthly and estimates GDP data quarterly. The government requires nine months to determine if the economy has entered a recession, as economists define it as two consecutive quarters of negative real GDP growth. Thus, a government knows the economy is in a recession by the end of the third quarter because of the information lag. Second, the Federal Reserve or government must study the data, and then they devise and approve a policy, which is an ***administrative lag***. Finally, a monetary policy does not impact the economy immediately. It takes time for the Fed's policy to be implemented and reflected in the economy, a process known as the ***impact lag***.

Time lags can amplify the business cycle. For example, the economy entered a recession that lasted only one year. Subsequently, the economy returned to the full-employment level. Unfortunately, the government took three months to collect quarterly GDP data. The GDP needs two consecutive quarters of negative GDP growth before a recession is declared. Thus, the Fed must wait nine months to determine whether the economy has entered a recession. If the administrative lag is one month while the impact lag equals six months, then the Fed's policy takes hold after one year and four months to influence the economy, or 9 + 1 + 6. If the Fed counteracted this recession, it would subsequently make the economy more unstable. After the economy returns to the full-employment level, the Fed's policy kicks in, expanding the economy and creating inflation.

The Fed uses operating targets and intermediate targets to reduce the problems with time lags. The Fed uses its tools to influence the intermediate targets, and the ***intermediate targets*** directly affect the price level, unemployment rate, and economic growth rate. Moreover, the Fed has more control over the intermediate targets, and the time lags are shorter. Intermediate targets include the M1, M2, and M3 definitions of the money supply and short-term interest rates.

The Fed has more control over operating targets than intermediate targets. ***Operating targets*** are the federal funds rate and non-borrowed reserves. The federal funds rate is the interest rate that banks charge for lending their excess reserves to other banks. When the Fed uses open-market operations, changes discount policy, or alters reserve requirements, the Fed's monetary policy has an immediate impact on the federal funds rate and non-borrowed reserves. When the Fed implements monetary policy, such as inducing a higher GDP growth rate, the Fed's policy immediately affects the operating targets, and, in turn, influences the intermediate targets, such as GDP growth rate. Accordingly, the Fed monitors changes in the intermediate and operating targets, determining whether monetary policy is affecting the economy correctly.

The Fed uses three criteria to select an intermediate target. First, the Fed must easily measure the intermediate target to overcome information lags. Second, the Fed must have control over the intermediate target. For example, the Fed can influence the money supply, but not the GDP growth rate. Many factors influence the GDP growth rate, and the Fed cannot influence all of them. Thus, the Fed would never select GDP as an intermediate target. Finally, the Fed selects intermediate targets that influence the policy goals predictably. For example, the Fed influences the M1 definition of the money supply, and M1 sometimes influences the unemployment rate, while at other times, it does not. Therefore, M1 would not be a good intermediate target.

Before the 1990s, the Fed alternated back and forth between interest rate and money supply targets. This strategy was not successful because the Fed's monetary policy caused more instability in the economy. Economists refer to this as ***procyclical monetary policy***, which means the Fed amplifies the business cycle. Monetary policy can either further expand a growing economy, creating inflation, or it can amplify a severe recession. For example, the Fed selected interest rates as its intermediate target. A growing economy causes interest rates to rise. For the Fed to lower the interest rates, it must buy more U.S. government securities. Consequently, the bond's prices increase, lowering the interest rates. Nevertheless, the bank reserves expand the money supply, expanding the economy faster. On the other hand, as an economy enters a recession, interest rates fall. If the Fed wants to boost interest rates, it must subsequently sell U.S. government securities. Thus, the price of the securities decreases, raising the interest rates. However, bank reserves fall, contracting the money supply and worsening a recession. Since the 1990s, the Fed has emphasized a low inflation goal, and this policy has been successful. Europe and Japan also emphasize price stability and low inflation rates.

Economists suggested the Fed use other intermediate targets, such as the following:

- ***Nominal GDP***: If an economy produces more goods and services, then both real and nominal GDP increase. If inflation raises prices, the higher prices increase nominal GDP, but do not affect real GDP. Some economists believe the Fed cannot influence real GDP, but only the inflation rate, which in turn affects the nominal GDP. If the Fed selected nominal GDP as an intermediate target, then the Fed would be focusing on price stability indirectly.

- ***Yield Curve***: Some economists suggested the Fed use the yield curve as an intermediate target. Although the Fed examines the yield curve, the yield curve's shape depends on investors' expectations of inflation and real interest rates over a range of security maturities.

- ***Commodity prices***: Some economists suggested the Fed focus on commodity prices. However, commodity prices do not accurately predict inflation well.

- ***U.S. dollar exchange rate***: Exchange rates can predict inflation and the real GDP growth rate. Nevertheless, the exchange rate could respond to changes in the interest rate between countries. International investors invest in countries with high real interest rates.

Monetary policy can become ineffective in some cases. For instance, Japan entered a perpetual recession, starting in the 1990s. Businesses and consumers became very pessimistic when the Japanese central bank lowered the interest rate, but it had no impact on the economy. After the U.S. housing bubble popped in 2007, the Federal Reserve pursued expansionary monetary policy, also known as quantitative easing. The U.S. recovery has been slow. Then the 2020 COVID-19 pandemic struck the world, and the world is still reeling in the aftereffects, such as the massive amount of funds injected into the U.S. banking system. The next financial crisis started to appear in 2025.

The Japanese and U.S. struggling economies lead to the idea of ***cyclical asymmetry***, where contractionary monetary policy is always effective, while expansionary monetary policy can be impotent at times. Thus, the low interest rates do not change consumers' and investors' behavior, but high interest rates do. Consequently, some experts believe a central bank should focus only on one target - inflation. Thus, a central bank should not concentrate on the economy but maintain low inflation. Central banks in Canada, the Eurozone, New Zealand, Sweden, and the United Kingdom maintain low inflation rates, which appreciate their currencies. Suppose an economy has an inflation rate of over 10%. In that case, the central bank is likely increasing the money supply too quickly while pursuing other targets unrelated to price stability. Finally, a country with an independent central bank from the government could experience low inflation rates because the central bank can focus on price stability and not help the government finance its budget.

Yield curve control (YCC) is being debated to help the U.S. government finance its $37 trillion debt in 2025. The yield curve is usually upward sloping because investors want to be compensated for investing in long-term securities as compared to short-term ones. The United States government has used yield curve control in the past. It forced the Fed to control the yield curve between 1942 and 1951 to help the U.S. government finance World War II. The Fed froze the short-term Treasury yields around 0.375% and long-term yields around 2.5%. If the large debt caused rates to rise, the Fed must enter the government bond market to buy bonds, thereby increasing both the demand and price of bonds. In turn, the Fed's actions decrease the yields or interest rates. Depending on the severity of intervention, yield curve control can become quantitative easing on steroids. It helps the government finance large debt, but can induce high inflation. Japan started using yield curve control in 2016 because quantitative easing was not influencing its economy. They held the 10-year bond yield close to zero until Japan phased it out in 2024. Lastly, Australia used yield curve control during the 2020 COVID-19 pandemic.

Key Terms

expansionary monetary policy
quantitative easing
contractionary monetary policy
quantitative tightening
open-market operation
Federal Open Market Committee
general directive
Open Market Trading Desk
dynamic transaction
defensive transaction
outright purchase and sale
Federal Reserve repurchase agreement
Reverse REPO
discount policy
discount rate
discount window
adjustment credit
seasonal credit
extended credit
Term Auction Facility Program
announcement effect
reserve requirement
monetary policy goal
price stability
high employment
economic growth
financial market and institution stability
interest rate stability
foreign-exchange market stability
information lag
administrative lag
impact lag
intermediate target
operating target
procyclical monetary policy
cyclical asymmetry
yield curve control

Chapter Questions

1. What happens to bank reserves, interest rates, bond prices, and the money supply if the Fed buys U.S. Treasury securities?

2. What happens to bank reserves, interest rates, bond prices, and the money supply if the Fed sells U.S. Treasury securities?

3. Explain why the Fed concentrates on the growth rate of the money supply or short-term interest rates, but not both at the same time.

4. Distinguish between repos and reverse repos, and identify their purpose.

5. Distinguish between dynamic and defensive transactions.

6. Explain why open-market operations are such an essential monetary tool.

7. What happens to the short-term interest rates, bank reserves, and the money supply if the Fed changes the discount rate?

8. Identify the three credit loans that the Fed can grant to banks.

9. Please explain how the Fed prevents banks from abusing their privilege in receiving Fed loans.

10. Identify the problems in using the discount policy as a monetary tool.

11. Why do the financial analysts and the public scrutinize the federal funds market?

12. Explain why reserve requirements are such a powerful monetary tool.

13. Identify the costs and benefits of imposing a 100% reserve requirement for banks.

14. Identify the Fed's six monetary policy goals.

15. What are the time lags, and why do they cause problems for monetary policy?

16. Explain why the Fed uses targets.

17. Distinguish between an operating target and an intermediate target.

18. Identify the criteria for selecting intermediate targets.

19. Explain pro-cyclical monetary policy, and explain why it occurs.

20. Which intermediate targets have economists suggested the Fed use?

16. The International Financial System

Governments and central banks often intervene in the foreign-exchange markets. Developed countries like the United States and Europe tend to maintain strong currencies, while China and the Asian Tigers tend to weaken their currencies. Thus, international investors prefer to hold strong currencies, while the Asian countries weaken their currencies to boost their export industries, creating jobs and wealth. This chapter examines a central bank's intervention in its currency exchange markets and the impact of a country's balance of payments on its exchange rate. Moreover, the world has used three exchange rate regimes: the gold standard, the Bretton Woods System, and flexible exchange rates. We discuss these exchange rate regimes in detail, along with the international institutions: the International Monetary Fund and the World Bank.

Balance of Payments

Balance of payments records all transactions between the households, businesses, and government of one country and the rest of the world. It is a cash flow statement and not a balance sheet. Economists use balance-of-payments accounts to compare the total flow of money between one country and the rest of the world, and economists always measure it in a country's currency. We show the 2011 and 2024 balance of payments for the United States in Table 1.

Table 1. U.S. Balance of Payments for 2011 and 2024

Category	2011 Amount	2024 Amount
	($ trillion)	($ trillion)
Current Account		
Total Exports, Services, and Income	2.84	4.83
Total Imports, Services, and Income	-3.18	-5.96
Unilateral Transfers	-0.13	0.00
Total	-0.47	-1.13
Financial Account		
U.S. Owned Assets Abroad	-0.48	-0.86
Foreign Owned Assets in the U.S.	1.00	2.05
Financial Derivatives	0.04	-0.07
Capital Account	0.00	0.14
Total	0.55	1.27
Statistical Discrepancy	0.09	-0.14

Source: Bureau of Economic Analysis (2012, 2025)

The balance of payments uses the accounting double-entry system, where total debits equal total credits. A payment by a U.S. resident, business, or government to another country represents a deficit item or negative because money is leaving the United States. Several examples of deficit items include a U.S. resident who buys imported goods, sends money to relatives in foreign countries, or travels abroad. A country's residents or government receiving cash for transactions is a surplus item, and the number is positive because money enters the United States. Several examples of surplus items include U.S. firms exporting goods to another country. U.S. residents receive money from foreigners, or foreigners travel to the United States.

The ***current account*** summarizes the purchases and sales of goods and services between the United States and the rest of the world. The first item is the trade balance, which equals total exports minus total imports, and it is usually the largest item. If the trade balance is positive, then more money flows into the country than leaves because cash moves in the opposite direction of goods and services. If the trade balance is negative, subsequently, more money flows out of the country than in as the government buys more products and services from the world. Furthermore, the current account includes the items for shipping, brokerage, and insurance for the ships and airplanes that deliver the cargo. Then economists add investment income to the current account. We must be careful because investments are financial transactions that economists record under the financial account. However, economists record the income from those investments under the current account. Finally, the current account includes unilateral transfers between nations such as foreign aid, private gifts, and money sent to relatives living in another country.

For the United States, the current account balance equaled -$0.47 trillion in 2011 and -1.13 trillion in 2024. The current account is negative because more money left the United States than entered, resulting in a current account deficit. Subsequently, the United States finances this deficit by borrowing from foreigners. The current account deficit is significant because the United States imports more goods than it exports.

The ***financial account*** totaled $0.55 trillion in 2011 and $1.27 trillion, recording all transactions for stocks, bonds, and real estate between the United States and the rest of the world. If the financial account is positive, then more money flowed into the United States than left, called a financial inflow. Consequently, the United States borrows from foreigners because they invested more assets in the United States than the amount the U.S. residents bought foreign assets. If the financial account is negative, then more money is flowing out of the United States than flowing in, called a capital outflow. Thus, a country is lending to foreigners because the value of foreign assets bought by residents exceeds the amount of assets foreigners purchased inside the country.

The U.S. businesses, for instance, bought $0.48 trillion in foreign stocks, bonds, and real estate in 2011 and $0.86 trillion in 2024. Meanwhile, foreigners bought $1.00 trillion of financial and property assets within the United States in 2011 and 2.05 trillion in 2024. Furthermore, approximately $0.04 trillion flowed into the United States for the purchase of financial derivatives in 2011 and an outflow of $0.07 trillion in 2024. Finally, the capital account experienced a net small outflow in 2011 and an $0.14 trillion inflow in 2024. Capital account represents the purchase of assets used in manufacturing and production, and the production has not started yet. For example, a U.S. firm buys a coal mine in a foreign country, and it has not begun to extract coal yet. Then economists record this transaction under the capital account.

If a country has a current account deficit, then a financial surplus finances this deficit. For example, the United States has operated current account deficits for the last 55 years. It imports more goods and services than it exports, causing an outflow of U.S. dollars into the foreign exchange markets. International investors obtain U.S. dollars and use them to buy assets in the United States, creating a financial account surplus. Foreigners invest in government securities, stocks, bonds, and real estate in the United States. The ***balance-of-payments equation*** illustrates this relationship in Equation 1, where the current account plus the financial account equals zero.

$$\text{Balance of Payments (BOP)} = \text{current account} + \text{financial account} = 0 \qquad (1)$$

We use Equation 1 as an equilibrium equation to predict changes in a country's exchange rate. If a country's balance of payments equals zero, then that country's exchange rate may not change. For example, the United States has a current account deficit, causing U.S. dollars to flow into the foreign-exchange markets. Foreign countries collect these U.S. dollars and invest them in the United States. What happens if foreign investors are unwilling to invest in the United States? Consequently, the balance of payments becomes negative, causing the U.S. dollar to weaken or depreciate because the international markets have a surplus of U.S. dollars. Subsequently, a weaker U.S. dollar causes the current account to shrink over time as imports fall while exports rise until restoring equilibrium.

If the Federal Reserve does not want the dollar to weaken, then it can buy these U.S. dollars by using official reserve assets. The Federal Reserve can finance a balance-of-payment deficit or reduce U.S. dollars on the international market by doing one or more of the following:

- The Fed could buy U.S. dollars by selling gold.
- The Fed could buy U.S. dollars by selling foreign currencies.
- The Fed could borrow from foreign central banks.
- The Fed could use its reserves at the International Monetary Fund or ask the IMF for a loan.
- The Fed could use Special Drawing Rights (SDRs). We discuss them further under the Exchange Rate Regimes.

Economists record official reserve assets under the Financial Account as the ***U.S. Official Reserve Assets***. The official settlements balance was a minus $15.9 billion in 2011 and $238.8 billion in 2024. We already included this balance in the financial account in Table 1. The Federal Reserve paid $15.9 billion by selling assets to foreign countries in 2011 and gained $238,801 in 2024, which we itemized in Table 2.

Economists add a non-zero amount called ***statistical discrepancy*** to force the current account plus financial account to equal zero. Discrepancy arises from measurement errors, and some people and businesses do not report revenue from illegal businesses, evade taxes, or hide their money from their government in another country. People hiding money is a form of capital flight that we discuss further in this chapter. Statistical discrepancy was an inflow of $0,09 trillion in 2011 and became an outflow of $0.14 trillion in 2024. We examined the Years 2011 and 2024 to gain insight on how the accounts differ. Thus, the current and capital accounts have become larger in magnitude in 13 years.

Table 2. The U.S. Official Reserve Assets in 2011 and 2024

U.S. official reserve assets	2011 Amount ($ millions)	2024 Amount ($ millions)
Gold	0	11,041
Special drawing rights	1,752	166,890
Reserve position in the International Monetary Fund	-18,079	26,005
Foreign currencies	450	34,865
Total	-15,877	238,801

China and the Asian Tigers weaken their currencies to boost their exports. Consequently, these countries experience trade surpluses, causing more money to flow in than out. The governments can use this money inflow to purchase U.S. government debt, real estate, and stocks and bonds in U.S. corporations. Thus, the U.S. debt and trade deficits go together, and we discuss them under the Hegemony section in this chapter. Furthermore, the Asian countries can use this money inflow to buy machines and equipment from developed countries, boosting their investment and production even further.

The Exchange Rate Regimes

Nations implement a regime or system to settle international payments arising from global trade and finance because nations must use a system to settle payments between themselves. This system is the ***exchange rate regime***.

The first and oldest exchange rate regime is the gold standard, which originated with the Greek and Roman civilizations. Subsequently, the world used the gold standard between 1876 and 1913 before World War I plunged the world into war. A ***gold standard*** occurs when a central bank sets the exchange rate of its currency to gold. Subsequently, the central bank agrees to convert its currency to gold on demand. For example, the United States, Japan, and Britain establish the following exchange rates as Equations 2.

2,000 U.S. dollars = 1 ounce of gold (2)

200,000 Japanese yen = 1 ounce of gold

4,000 British pounds = 1 ounce of gold

If the U.S. central bank wants a money supply of $40 million, it must buy and hold 20,000 ounces of gold, which is $40 million ÷ $2,000 per ounce. For a central bank to boost the money supply or grant emergency loans to banks, it must buy and store more gold.

The gold standard forces fixed exchange rates, which economists call a ***fixed exchange rate system***. Consequently, one U.S. dollar equals 100 yen or 2 pounds. We calculate the exchange rates in Equation 3. First, we set all currencies equal to one ounce of gold. Then we divide by one currency's coefficient, yielding the exchange rates, which in this case, we divide all numbers by 2,000:

1 ounce of gold = \$2,000 = 200,000 yen = 4,000 pounds (3)

$$\frac{\$2{,}000}{2{,}000} = \frac{200{,}000\ yen}{2{,}000} = \frac{4{,}000\ pounds}{2{,}000}$$
$$\$1 = 100\ yen = 2\ pounds$$

A gold standard helps countries maintain a zero balance of payments. For example, the U.S. experiences a payments deficit with Japan, where the current account plus the financial account is negative. Consequently, U.S. dollars are flowing out of the United States and into Japan. On the other hand, Japan accumulates U.S. dollars, and the Japanese central bank exchanges the U.S. dollars for gold from the U.S. central bank. Then gold begins flowing out of the United States and into Japan. Once the U.S. central bank possesses less gold, it must contract the money supply. Remember, the money supply fixes the ratio between the gold the government is holding and the currency in circulation. When the money supply declines, the prices in the economy will decrease, a phenomenon known as ***deflation*** or negative inflation. Thus, U.S. products become cheaper than those from other countries. Then U.S. businesses export more goods abroad, while lower U.S. prices make foreign products more expensive. Hence, the U.S. consumers buy fewer imported goods. U.S. exports increased in size while imports decreased, thereby increasing the current account until it equals zero, and gold stops flowing out of the United States. The exact opposite would occur in Japan. Consequently, a gold standard automatically eliminates trade deficits and surpluses.

The gold standard has the following four benefits:

Benefit 1: High inflation rates were rare under the gold standard because central banks had little control over the money supply. If a central bank wants to increase the money supply, it must buy gold. For example, the inflation rate averaged less than 1% in the U.S. under the gold standard. Consequently, a gold standard constrains a central bank's ability to expand the money supply.

Benefit 2: International investors have a lower risk because exchange rates do not fluctuate. All exchange rates become fixed, which eliminates the exchange rate risk.

Benefit 3: The gold standard significantly constrains a government's power. For instance, central banks have little power to influence the money supply, and hence, they cannot pursue policies to affect their economies. Thus, gold goes hand in hand with free markets, strong property rights, and limited government, but this benefit depends on the reader's viewpoint because this could be a problem (Gold Standard, pp. viii-ix). The Federal Reserve granted \$2 trillion for emergency loans to banks during the 2008 Financial Crisis and about \$3 trillion during the 2020 COVID-19 Pandemic. These massive injections of funds into the banking system would be impossible under a gold standard. The Fed would need to buy gold to support this injection. If the

Fed went ahead with these injections without the gold purchases, the public could run on the Fed and demand their dollars be converted to gold.

Benefit 4: The gold standard restricts commercial banks and the government. If banks create too much credit, the credit expands the money supply, leading to inflation in the long run. People would convert their currency into gold, restricting credit expansion and hence reducing inflation. Moreover, the government could print money to finance budget deficits, but this would cause inflation. Then the public counteracts the inflation by converting cash into gold (Gold Standard, p. xi).

The gold standard, unfortunately, can export a country's recession to other countries. However, all exchange rate regimes share this problem. For example, the United States and Japan engage in trade, and both use the gold standard. We outline the steps for a country to export a recession:

- If the United States enters a recession, U.S. consumers reduce their demand for imports of Japanese products. If the U.S. exports remain the same while imports fall, the U.S. experiences a trade surplus, leading to a gold inflow from Japan to the United States.

- In Japan, exports to the United States fall because lower demand causes the export industries to contract, and they lay off workers. Furthermore, the Japanese central bank must reduce its money supply because it has shipped gold to the United States. Consequently, the unemployed workers buy fewer goods because they earn lower incomes, and deflation causes Japanese products to become cheaper. Furthermore, contractionary monetary policy would raise interest rates, which would reduce investment. Falling investment would contract the economy further.

- All exchange rate regimes allow one country to export a recession to another country. Nevertheless, a flexible exchange rate enables a country to manipulate the exchange rate to reduce the impact of a recession.

After World War II, 44 countries implemented a new international system, the ***Bretton Woods System***, where the delegates met at a vacation resort, Bretton Woods, in New Hampshire. The Bretton Woods System established fixed exchange rates between nations that lasted between 1945 and 1971. All countries except the United States fixed their exchange rates to the U.S. dollar. Then the United States government established the official exchange rate of $35 for 1 ounce of gold because the United States held much of the world's gold supply. The U.S. government accumulated gold from the sale of supplies and weapons to Europe for both World Wars. However, the gold-dollar exchange rate applied to foreign governments because U.S. citizens could not legally own gold between 1933 and 1974. Consequently, the Bretton Woods System transformed the U.S. dollar into the international reserve currency

The Bretton Woods system was more flexible than the gold standard because countries could adjust their currency exchange rates relative to the U.S. dollar. Consequently, countries used a system resembling a gold standard, but a government can intervene with its exchange rate to correct a balance-of-payments deficit. Subsequently, U.S. President Richard Nixon ended the

Bretton Woods System on August 15, 1971, because the United States experienced trade deficits that would lead to a gold outflow.

The Bretton Woods system created two institutions: the International Bank of Reconstruction and Development, or simply the World Bank, and the International Monetary Fund. The ***World Bank*** grants long-term loans to developing countries. They use the loans for economic development and build a country's infrastructure, such as highways, bridges, power plants, and water supply systems. The World Bank sells bonds in the international markets to raise funds for its projects.

Countries created the ***International Monetary Fund (IMF)*** to be the lender of the last resort. The IMF grants loans to countries that experience balance-of-payment deficits. Consequently, the IMF is similar to a central bank because a central bank can grant emergency loans to its banks during a financial panic or crisis. Thus, the IMF should stabilize international payments and promote global trade. Moreover, the IMF collects and standardizes international economic data. The IMF has 190 members and opens membership to any independent nation. If a country wants to join the IMF, it contributes capital based on a formula. A country pays one-fourth of the capital in gold and three-fourths in that country's currency. The IMF has relaxed its gold requirement, allowing countries to pay using strong currencies such as euros, pounds sterling, Special Drawing Rights, U.S. dollars, or yen. Consequently, the IMF gains financial capital because the IMF possesses gold and a pool of foreign currencies that it can lend to countries.

The IMF helps countries that are experiencing balance-of-payments deficits. For example, Britain has a balance-of-payments deficit, and it borrows from the IMF. The British government needs U.S. dollars, so the British government or central bank gives pounds and receives dollars from the IMF to finance its balance-of-payments deficit. Thus, the U.S. dollar decreases while the British pound increases in the IMF's currency pool. When Britain repays the loan with interest, it repays in a currency that is acceptable to the IMF, and then the IMF returns the British pounds.

The IMF created ***Special Drawing Rights (SDRs)*** in 1969 because IMF officials believed a gold and reserve asset shortage would cause an international crisis. Each member country of the IMF receives a proportion of new SDRs. Between 1968 and 1971, the IMF created $10 billion worth of SDRs. By 2010, the IMF had issued 204 billion of SDRs, approximately worth $308 billion. When a country experiences a balance-of-payments deficit, it can use its SDRs as money to obtain foreign currencies from the IMF. Lastly, the IMF's last allocation totaled 660.8 billion in 2021.

Are SDRs money? Initially, the IMF priced an SDR based on gold's weight. Then the IMF officials switched the SDR's value to a basket of strong currencies, containing the euro, British pound, Japanese Yen, and U.S. dollar. Consequently, the IMF defines the SDR as a "unit of account," which comprises one function of money, and it establishes exchange rates with the four currencies. Moreover, countries can use SDRs to obtain foreign currencies from the IMF, which suggests that the SDR is considered money. However, the IMF considers SDRs to be a credit instrument. Many economists and the Cato Institute argue for SDRs to serve as the new global currency. Thus, international trade would not collapse if the United States or Europe were to enter a severe economic depression.

The U.S. Treasury accepts the new SDRs on behalf of the United States. Then it issues certificates that are claims to the SDRs and sells these certificates to the Federal Reserve. Consequently, SDR certificates become assets to the Federal Reserve.

Although the countries abandoned the Bretton Woods system in 1971, the World Bank and the IMF still exist. Subsequently, governments use various controls, measures, and standards for their country's currency. Governments specify the rules and limit how people and businesses can exchange their currency for other currencies. Furthermore, governments impose controls on imports, exports, international investment, and foreign ownership of real estate, indirectly influencing their currency exchange rates.

The government could implement a flexible exchange rate system, allowing the supply and demand in the foreign-exchange markets to determine its currency exchange rate. Investors refer to this as a ***free float*** or ***clean float*** because the government does not interfere with its exchange rates. Although Canada, the Eurozone, Japan, South Korea, and the United States allow their exchange rates to change, these countries occasionally intervene with their exchange rates. Unfortunately, fluctuating exchange rates could hinder international trade and investment by inducing uncertainty in transactions.

Most countries use a ***managed float***, where a government allows supply and demand to determine its currency's exchange rate, but it intervenes to achieve economic policy goals. Of course, if investors are pessimistic about a government's ability to manage its exchange rate, they call this a ***dirty float***. Usually, a government maintains either a too strong or a too weak currency relative to the other currencies. Unfortunately, government intervention could lead to depreciation. For example, if investors believe a country's currency will depreciate, then they either cash out of that currency or buy derivative contracts. Consequently, investors can overwhelm a government, forcing it to devalue its currency. Then investors' expectations turn into a self-fulfilling prophecy.

Some governments use a ***pegged exchange rate***, where the government fixes its currency exchange rate to a strong currency, such as the U.S. dollar or euro. For example, the United Arab Emirates (UAE) set its exchange rate to one U.S. dollar to equal three UAE dirhams before 2008. Following the 2008 Financial Crisis, the UAE devalued its currency to 3.67 dirhams per U.S. dollar. Other countries like the Bahamas, Barbados, and Hong Kong peg their currencies to the U.S. dollar, while Bosnia and Herzegovina and Bulgaria fix their currency to the euro. Unfortunately, a government must intervene in the currency market to maintain its exchange rate. Countries like Uzbekistan and some African countries maintain exchange rates that are too strong, but their central banks rapidly expand the money supply, creating inflation. Inflation can weaken a currency. Consequently, black markets form for their currencies because the black market price reflects the actual market value. Lastly, a government can use a pegged exchange rate to keep inflation in check. However, the central bank must impose strict monetary disciple. A central bank expanding the money supply to cover a government's budget deficit can undermine the peg, leasing to inflation and a currency crisis.

Several countries use ***dollarization***, where a country uses the U.S. dollar or euro as its currency. For instance, East Timor, Ecuador, and El Salvador use the U.S. dollar as their currency, while Panama uses the dollar and Panamanian balboa alongside each other. Furthermore, U.S.

territories, such as Guam, the Marshall Islands, the U.S. Virgin Islands, and Puerto Rico, also use U.S. dollars. A territory is a country that was not admitted as a state to the United States. Other countries, Kosovo and Montenegro, use the euro as their currency even though they are not European Union members. Consequently, dollarization allows a country to integrate its economy with the United States or the Eurozone by tying its inflation rate to that country. Dollarization also removes the exchange rate risk, but that country loses control over monetary policy. Its central bank cannot collect revenue from ***seigniorage***, when a government earns a profit from printing money. For example, the Federal Reserve pays approximately 9.4 cents ($0.094) to manufacture a one-hundred-dollar bill. Thus, the Federal Reserve earns $99.906 when this bill enters circulation. Unfortunately, dollarization severely limits a central bank's power.

Countries using the current exchange rate regimes encourage worldwide inflation. For example, if a country's currency is depreciating due to a rapidly expanding money supply, then another country could counteract its currency appreciation by rapidly expanding its money supply. Consequently, these countries would maintain stable exchange rates, despite being afflicted with high inflation rates (Gold Standard, p. xii).

Financing Balance-of-Payments Deficits and Surpluses

The exchange rate regime determines which strategies a country must undertake to finance a balance-of-payments deficit or surplus. Surpluses are easier to finance than deficits. Some refer to deficits as a "deficit with tears" because a central bank or government must use its resources to fund it. On the other hand, a balance-of-payments surplus allows a government or central bank to accumulate foreign assets.

A fixed rate regime is the most difficult to maintain because a government must hold a balance-of-payments (BOP) deficit or surplus close to zero. Unfortunately, this regime weakens a central bank's power for monetary policy. For instance, if the central bank expands the money supply, then the country's interest rate falls. Next, the international investors cash out of the country because they invest in other countries with higher interest rates. Consequently, the demand for that country's currency weakens and depreciates. For the government or central bank to maintain the fixed exchange rate, it must enter the international market and buy its currency, appreciating its currency. Unfortunately, a central bank must focus on its exchange rate, reducing its focus on other goals.

A country with a fixed exchange rate can use the following two strategies:

Strategy 1: If a country has a balance-of-payments deficit, it has an excess supply of currency on the foreign exchange markets. Thus, a central bank buys its currency using official settlement reserves, such as foreign currencies, gold, SDRs, or a loan from the IMF. As a country removes its currency from the international markets, its balance-of-payments deficit falls. If the central bank has no reserve assets, then it must devalue its currency, or a black market could form.

Strategy 2: If a country experiences a balance-of-payments surplus, subsequently, that country has a shortage of currency on the foreign exchange markets. A central bank can easily finance a surplus by selling its currency to buy foreign currencies, thereby accumulating official reserves.

A floating exchange rate regime is the easiest to maintain because a government does not intervene with its currency exchange rate. The government or central bank allows the exchange rate to correct any surpluses or deficits. If a country experiences a balance-of-payment deficit, then its currency tends to depreciate over time, increasing exports while decreasing imports. On the other hand, a balance-of-payment surplus does the exact opposite.

A country could experience the ***J-curve Effect*** when the trade deficit becomes worse temporarily as its currency depreciates, as shown in Figure 1. For example, a country allows its currency to depreciate starting at period t_1. Unfortunately, the trade deficit initially worsens before improving. The period ranges from three to six months, denoted as t_1 and t_2 on the graph.

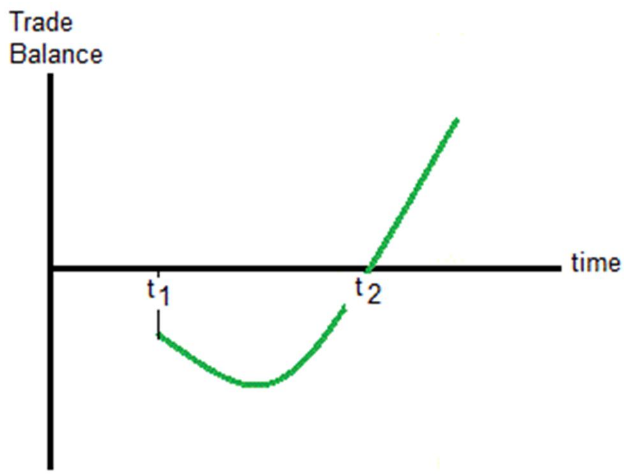

Figure 1. The J-curve Effect

If a country experiences a balance-of-payment surplus, then it allows its currency to appreciate. Consequently, its exports decrease while its imports increase, and the balance-of-payments approaches zero.

Most countries use a managed float, where a government or central bank varies the interest rate to intervene in the foreign exchange market. For instance, a country is experiencing a balance-of-payments deficit. Consequently, the central bank contracts the money supply, boosting the interest rate. Next, international investors invest in a country, earning a higher interest rate and raising the financial account until the balance of payments equals zero again.

A central bank or government can finance a balance-of-payments surplus easily under a managed float system. Central banks expand the money supply, lowering interest rates. Hence, the international investors reduce their investments in the country because they can earn higher returns elsewhere. Consequently, the financial account falls until the balance-of-payments surplus approaches zero.

A country can have difficulties financing a balance-of-payments deficit for all exchange rate regimes. Consequently, a government might impose foreign-exchange rate controls to correct the imbalance. A government can alter the rules and regulations, especially for foreigners, such as prohibiting foreigners from transferring their money out of the country. A government can impose special taxes and fees on interest earnings and dividends. The government then collects revenue, rather than money flowing out of the country.

A country could experience ***capital flight*** when foreign investors become spooked and quickly withdraw their investments. They believe they will lose their investments, and they rapidly cash out, causing a massive financial account outflow. A capital flight is similar to a bank run, where all the depositors appear at their bank to withdraw money from their accounts, but capital flight is a bank run on a whole nation. Unfortunately, capital flight causes problems for a government because it could depreciate a currency rapidly. For example, the Asian Financial Crisis started in Thailand in 1997. Investors were pouring money into the Thai real estate market in the 1990s. The Thai government could no longer support the fixed exchange rate for the baht, and it devalued the baht. International investors panicked and quickly withdrew their investments, sparking a crisis. Then the crisis sparked a contagion. Investors questioned their investments in other countries, spreading the crisis to Hong Kong, Indonesia, Laos, Malaysia, South Korea, and the Philippines as massive capital flows left the countries. Other countries devastated by capital flight included Mexico in 1994-1995 and Russia in 1998.

Causes of capital flight vary. Usually, an event or government policy triggers the capital outflow. For example, France imposed a new tax on the wealthy in 2006, causing the rich to transfer their investments out of France. Although the French government collected \$2.6 billion per year in new taxes, it lost more than \$125 billion in capital as the wealthy avoided the tax. As another example, the Thai government devalued the baht, which harmed investments denominated in bahts. Thus, international investors panicked, and started capital outflows from Thailand that sparked the 1997 Asian Financial Crisis. Finally, a government nationalizing industries could trigger capital flight as investors worry about governments seizing their investments through nationalizations.

International investors use the following methods to cash out investments from a foreign country:

- ❖ International investors transfer their cash out of the country via bank transfers. Once the capital outflow becomes severe, the government may impose capital controls on the banks to limit outflows.

- ❖ Investors could smuggle currency out of the country. Then they deposit it into banks in their home country or into an offshore account. A government can tighten security at airports and seaports, and customs can seize currency if they catch any traveler who carries too much cash.

- ❖ Investors could convert their currency to precious metals, such as gold, silver, or platinum. Then they smuggle the metals outside the country.

- ❖ Investors could utilize money laundering that uses many techniques to structure cash deposits into the banking system, hiding the investors' activities.

- Investors could utilize false invoices if they deal with an importer. For example, an investor could falsify invoices that overprice imported items or underprice the exported items. Thus, they transfer more money out of the country by paying more for imports and receiving less money from selling exports.

Hegemony

A nation can exert relational and/or structural power over other nations. ***Relational power*** refers to the ability of one nation to influence another nation's actions. Many sports, like football, soccer, or chess, are forms of relational power. For countries, a nation’s military strength determines its relational power. On the other hand, ***structural power*** represents a nation’s ability to shape and influence international institutions. All nations, political institutions, businesses, and people operate under international institutions. Some nations possess structural power to affect the international institutions and change the rules in their favor.

The United States possesses both relational and structural powers. It gained both powers after World War II. The United States leads countries in technology, has the world’s largest economy, and possesses a strong military. Furthermore, the U.S. has the structural power to influence the World Bank and the International Monetary Fund. Of course, the United States helped create these institutions and is the largest financial contributor.

A ***hegemony*** exceeds relational and structural powers. A hegemony occurs when one country dominates others in international commerce. Hegemony is the wealthiest and most powerful nation that establishes the institutions of global trade. Hegemony is a leader in industrial and agricultural production, has a strong financial system, and dominates international trade. Hence, the hegemony becomes a source of wealth, power, and economic growth. The modern world has seen three modern hegemonies. The United Provinces (or Holland) ruled international trade in the 18th century; Great Britain ruled the world during the 19th century across a vast empire, and the United States has dominated the world since World War II.

A hegemony is critical for free trade because international markets and institutions are public goods. Hegemony fosters free trade, ensures peace and security by protecting trade from pirates and rogue nations, balances nations’ powers, creates the system of international payments or the money system, and establishes the global institutions. These public goods are expensive to provide, and many nations can free ride on the international system without contributing to it. A free rider is a country that opens itself to global trade and benefits from trade without paying for the public goods that establish and maintain free trade.

A hegemony provides the international public goods, even supporting the free riders, because the benefits outweigh the costs. When a hegemony rises, the world economy grows and prospers. Thus, the markets create wealth for all participating nations. For example, the United States supports a system of free trade. After World War II, the U.S. became the largest industrial producer because the European factories lay in ruins. Then the United States greatly benefited from international trade after creating the Bretton Woods System. The U.S. experienced a strong world demand for goods produced in its manufacturing industries during the 1950s and 1960s, leading to high wages and a high standard of living.

Costs of a hegemony, unfortunately, rise over time, weakening the hegemony's wealth and power. If the hegemony fails, then the public goods for international trade disappear, causing world trade to break down. Then the world’s economy stagnates and begins declining. An interesting twist for a hegemony is that a rich and powerful nation gains control after a large war. Over time, the hegemony starts declining, and harmonious relationships break down. Then a war follows, and, in the aftermath, a new hegemony rises.

Some people argue that the United States grew into a selfish hegemony. The U.S. dollar became the international currency that the U.S. government abuses. The U.S. government accumulated a large public debt of $37 trillion in 2025, and the U.S. economy suffers from sizeable trade deficits, causing an outflow of U.S. dollars into the international markets. Some foreigners and central banks hold onto these dollars. For example, the U.S. buys petroleum from Saudi Arabia. As Saudi Arabia sends oil to the U.S., the Arabs retain the U.S. dollars, which are pieces of paper. Furthermore, many foreigners save their earnings in U.S. dollars, while others invest in the U.S. government’s debt. Again, they are buying U.S. Treasury Securities, which are pieces of paper. For now, these pieces of paper have value, but some question whether the U.S. government can finance the dual deficits over a long period. If the U.S. dollar collapses in value, then foreigners will possess worthless pieces of paper. Consequently, countries that are not hegemonies cannot accumulate a large government debt by getting foreigners to invest in it.

As the United States grew into a hegemon, it could not have a current account surplus because the surplus could devastate the world’s economy. International businesses, banks, and governments use U.S. dollars to settle international payments. If the U.S. current account were to approach zero, a liquidity crisis would ensue, as people, businesses, and the government would lack the means to settle international payments. A hegemony’s trade deficits become a source of money for the world’s economy.

Investors and nations have begun questioning the United States as a hegemon in 2025. The following events could lead to the collapse of the U.S. dollar.

- **Aggressive tariffs:** The Trump Administration directed aggressive tariff policies at U.S. trading partners. The policies have disrupted supply chains and generated uncertainty in the financial markets, which is also fueling inflation. The higher prices already stress many households as they have depleted their savings and credit. This supply chain shock has disrupted exports, and many countries are experiencing slowdowns in their economies.

- **Weak-dollar policy:** U.S. officials propose the weakening of the U.S. dollar. Governments, businesses, and people hold the world’s reserve currency because it is widely accepted and retains its value, i.e., a store of value. Foreign investors lose their appeal to hold a reserve currency if they believe it will become weaker. It also weakens the demand for U.S. Treasuries since they are denominated in dollars.

- **Seized Reserve Account:** After Russia invaded Ukraine in February 2022, the United States and its allies froze about $300 billion in Russian currency exchange reserves. The interest of these funds was diverted to Ukraine to help finance its war effort. This event, while strategic, caused many nations to question the safety of holding U.S. dollar reserves. In response, Brazil, Russia, India, China, and South Africa, known as BRICS, have banded together to discuss forming an alternative financial system free from U.S. dominance. Many nations are interested in joining this new financial system.

- ***De-dollarization:*** Along with the BRICS's discussion of an alternative payment system, many countries, such as China, Canada, and Japan, are divesting their U.S. Treasuries and moving away from dollar-denominated assets. Furthermore, many central banks and governments are acquiring gold and divesting their U.S. dollar reserve holdings. Lastly, some trading partners prefer to settle trade in their currency rather than the U.S. dollar.

Gold and, to a lesser extent, silver remain ***safe-haven assets***, which are assets that investors hold during financial crises. The Swiss franc is another safe-haven asset. Although U.S. Treasuries and the U.S. dollar are considered safe-haven assets, the financial stability of the United States is being questioned in 2025. The U.S. debt surpassed $37 trillion in 2025, far earlier than projected, with the interest exceeding $1 trillion per year, the third largest item in the budget. Investors continue to invest in short-term Treasuries, such as T-bills and T-notes, but show less appetite for T-bonds in 2025. Investors are also investing in short-term securities in France, Germany, Japan, and the United Kingdom. Unfortunately, a financial crisis could trigger a massive capital flight away from the U.S. dollar and dollar-denominated assets as confidence for the U.S. dollar erodes.

A currency collapse and reset has the following seven stages:

Excessive debt accumulation: The government operates persistent deficits and excessively borrows to fund current spending, like social programs, subsidies, and wars. Foreigners and the public lose confidence as government financing becomes unsustainable. The central bank may have to step in to monetize the debt to stabilize the economy and financial markets.

Debt-to-GDP ratio balloons: The deficits and public debt continually rise faster than the GDP growth. Once the ratio becomes too high, the rating agencies downgrade the government's credit rating. Unfortunately, the bond yields or interest rates begin to rise, worsening the sustainability of government finance. An excellent example includes the Greek sovereign crisis in 2012. Although the U.S. federal government has avoided default, the massive injection of funds into the financial system raised questions about its stability during the 2020 COVID-19 pandemic.

Monetization and currency devaluation: Raising taxes or downsizing government programs are not popular and could lead to protests, riots, and civil unrest. The central bank begins buying government bonds through quantitative easing. The inflation rate begins to rise while the currency weakens. Black markets may develop. Capital flight could begin as foreigners and residents transfer their wealth abroad or into safe havens, like gold and silver. For example, Argentina frequently devalued the peso.

Inflation: Foreigners and residents lose confidence in their currency as the inflation erodes their purchasing power and lowers returns on financial investments. Inflation becomes persistent and could even accelerate. Citizens begin to hoard tangible assets, such as gold, silver, and foreign currencies. They could start bartering. If foreigners stop investing in the debt, local banks could become insolvent and be stuck with unsellable debt as the market value of the debt declines. The government may respond with price controls, capital controls, or restrict foreign currency exchange.

Hyperinflation: Hyperinflation could occur if the government and central bank do not address the monetization of debt. Government revenues would collapse, and taxes would become difficult to collect, further eroding the government's stability. Furthermore, government institutions are weakened, and citizens may evade taxes since the government lacks the resources to detect and prosecute tax evaders. If the government prevents hyperinflation, it must impose austerity measures that could cripple its budget and the economy. Several notable examples of hyperinflation include the following: At the peak of the Weimar hyperinflation in 1923, a loaf of bread cost more than 1 trillion marks, completely collapsing a currency's value. Zimbabwe experienced a 79.6 billion percent inflation rate in 2008.

Currency Collapse and Default: The old system dies as the currency becomes worthless. The government defaults on its debt. Social unrest or regime change could occur. Citizens resort to using another country's currency and precious metals like gold and silver. Examples include the Argentine debt default in 2001 and the Russian default in 1998. The government could force a ***soft default***. For example, the government forces all bondholders to exchange their T-bills, T-notes, and T-bonds for 100-year bonds at a low interest rate without declaring a default. The debt restructuring would lower the government's obligations and interest expense.

Currency Reset and Replacement: The country introduces a new currency and, to gain trust (if that is possible), the new currency is pegged to a strong currency, gold, or Special Drawing Rights. The central bank introduces a new monetary regime with new bank policies. The IMF may be involved to help with foreign aid as the country transitions to a new system. For example, Argentina pegged its currency to the U.S. dollar in 1991, while Ecuador completely dollarized its economy. Unfortunately, few countries return to the gold or silver standard.

Key Terms

current account
financial account
balance-of-payments equation
U.S. Official Reserve Assets
statistical discrepancy
exchange rate regime
gold standard
fixed exchange rate system
deflation
Bretton Woods System
International Monetary Fund (IMF)
World Bank
Special Drawing Rights (SDRs)
free float
clean float
managed float
dirty float
pegged exchange rate
dollarization
seigniorage
J-curve Effect
capital flight
relational power
structural power
hegemony
de-dollarization
safe-haven assets

Chapter Questions

1. Explain the purpose of the balance-of-payments accounts.

2. Please define the following terms: current account, trade balance, financial account, and official settlement balance.

3. Why does a statistical discrepancy occur in the balance-of-payments accounts?

4. Please define and distinguish the three exchange rate regimes.

5. Identify the functions of the World Bank.

6. Identify the functions of the IMF.

7. If a country has a fixed rate regime and experiences a balance-of-payments deficit, please explain how the country must maintain this exchange rate. Furthermore, what happens if the government runs out of reserves and refuses to let the official exchange rate change?

8. Explain the J-curve Effect.

9. If a country has a managed float exchange rate regime and experiences a balance-of-payments surplus, please explain how the country must maintain this exchange rate. In our answer, include the actions of the central bank.

10. Why is capital flight disruptive to a country, and which four methods could investors use to transfer their financial capital from a country experiencing a crisis?

11. Many foreign investors are concerned about the U.S. government's large trillion-dollar deficits, as well as the massive trade deficits that plague the U.S. economy. What happens to the U.S. hegemony's power if the U.S. dollar collapses in value?

17. The Foreign-Currency Exchange Rate Markets

Many countries across the world use a flexible exchange rate regime. Consequently, this chapter builds upon a market's currency exchange rates and explains how investors can calculate a cross exchange rate for two countries that rarely engage in trade. Moreover, investors can profit from arbitrage when currency exchange rates differ between two or more markets. Then we learn supply and demand analysis to predict changes in a currency's exchange rate, as a country's income, inflation, interest rates, and other factors change. Finally, we expand the supply and demand analysis to include a pegged exchange rate and explain how a central bank devaluing its currency can trigger capital flight and a financial crisis.

Foreign Exchange Rates

The ***foreign-currency exchange market*** is where traders exchange the currency of one country for that of another. Consequently, five groups of people need foreign currency. First, international banks specialize in foreign currencies. They transfer billions in foreign currencies to other banks. Second, any person or business engaged in global trade and commerce, especially importing and exporting. Third, international travelers need foreign currency to pay for food, lodging, and entertainment in a foreign country. Fourth, central banks and governments use a cache of foreign currencies to finance balance-of-payments deficits or to manipulate their exchange rate. Finally, international investors invest in foreign countries, seeking greater profits.

International investors have different reasons for engaging in foreign currency. First, they invest in several countries to mitigate risk, which we call ***hedging***. In contrast, others engage in speculative activities, buying currency at a low price and selling it at a higher one. ***Speculation*** is a form of gambling because speculators gamble on future prices. Lastly, investors could use ***arbitrage***. They observe a price difference of the same currency in two separate markets; thus, they buy currency for a low price and sell it for a higher price in the other market, reducing the price difference to zero between the markets.

The foreign exchange market is the largest in the world, with traders exchanging nearly $7.5 trillion daily in 2022. Most transactions are electronic transfers between international banks, and transactions occur 24 hours per day, 7 days per week. The foreign exchange market has retail and wholesale markets. The retail market is a small market where agents buy and sell foreign currencies, usually at booths at shopping malls, airports, and train and bus stations. Retailers display two exchange rates: the selling (offer) price and the buying (bid) price. A retailer always sells currency for a higher price than the buying price. Hence, the price spread reflects the retailers' commission. On the other hand, the wholesale market comprises a network of about 2,000 banks and brokerage firms. They buy and sell currencies with each other or with large corporations. The wholesale market utilizes an international clearing system for exchanging electronic deposits. The international clearing system is similar to a clearinghouse for checks.

Supply and demand analysis for foreign currencies assumes no government interference and flexible exchange rates. For example, one U.S. dollar equals 3.0 Malaysian ringgits (or $1 = 3

RM). How much would a one-liter bottle of Coca-Cola cost in dollars if Coca-Cola costs 1.5 RM? Just multiply the ringgit price by the ratio (\$1 / 3 RM) in Equation 1, which equals \$0.50.

$$1.5\ RM\left(\frac{\$1}{3.0\ RM}\right) = \$0.50 \tag{1}$$

Investors and bankers can calculate an exchange rate for currencies that investors rarely trade. They calculate the ***cross rate*** to determine the exchange rate for these currencies. For example, the Mexican peso to U.S. dollar exchange rate is well established, while the peso-euro exchange rate is not. Since euros and U.S. dollars are widely traded, we can calculate the peso-euro exchange rate. If the peso-U.S. dollar exchange rate equals 12.9 pesos per \$1, and the euro-U.S. dollar is € 0.77 per \$1, we calculate the peso-euro exchange rate in Equation 2 as 16.75 per €. We use a trick; we retain the currency units; thus, the correct calculation has one of the currency units drop out, which is U.S. dollars in this case.

$$\left(\frac{12.9\ p}{\$1}\right)\left(\frac{\$1}{€\ 0.77}\right) = 16.75\ \mathrm{p}/_{€} \tag{2}$$

Using another example, a cross rate is the exchange rate between the Myanmar kyat and the U.S. dollar. If one Malaysian ringgit equals 282.6 Myanmar kyats, we use the U.S. dollar-exchange rate to calculate the rarely traded exchange rate. Consequently, we calculate the U.S. dollar-kyat exchange rate in Equation 3 as 847.8 kyats per \$1.

$$\left(\frac{282.6\ k}{1\ RM}\right)\left(\frac{3\ RM}{\$1}\right) = 847.8\ k/_{\$1} \tag{3}$$

Currency exchange rates are continually fluctuating, and a banker or investor can profit from price differences, called ***intermarket arbitrage***. For example, a trader at Citibank has \$100,000 and observes the following banks' exchange rates. We denote the British pound by the symbol £.

Citibank	\$1.54 / 1 £
Credit Suisse	€ 1.6 / 1 £
Deutsche Bank	\$0.97 / 1 €

We calculate the cross rate between Citibank and Credit Suisse in Equation 4, which equals \$0.9625 per euro. Then we compare this exchange rate to Deutsche Bank, equaling \$0.97 per euro. Since the exchange rates differ, arbitrage exists, and we can profit from the exchange rate differences. It does not matter which exchange rates we use to calculate the cross rate from.

$$\left(\frac{\$1.54}{1\,£}\right)\left(\frac{1\,£}{€\,1.6}\right) = {}^{\$0.9625}/_{€\,1} \quad (4)$$

Step 1: The trader converts the $100,000 to British pounds at Citibank, yielding 64,935.06 £. We calculate the result in Equation 5.

$$\$100{,}000\left(\frac{1\,£}{\$1.54}\right) = 64{,}935.06\,£ \quad (5)$$

Step 2: The trader converts the British pounds into euros at Credit Suisse, yielding 103,896.10 €. We compute the amount in Equation 6.

$$\left(\frac{€\,1.6}{1\,£}\right) = 103{,}896.10\,€ \quad (6)$$

Step 3: The trader converts the euros into U.S. dollars at Deutsche Bank. The trader has $100,779.22, gaining a $779.22 profit. We calculated the results in Equation 7. As the trader converts money from one currency to another, he or she simultaneously creates demand and supplies for currencies. Over time, the price differences between exchange rates disappear. In the modern age, international banks use computers to spot differences in exchange rates and quickly execute transactions to profit from arbitrage.

$$\left(\frac{\$0.97}{1\,€}\right) = \$100{,}779.22 \quad (7)$$

The Demand and Supply of Foreign Currencies

The demand function for a currency originates from international trade between Malaysia and the United States. The price for Malaysian ringgit is the exchange rate of U.S. dollars per ringgit. We always show the currency's price in the denominator of the currency exchange rate because a price decrease reflects a currency depreciating, while a price increase is an appreciating currency. The demand for ringgits originates from U.S. consumers who want to import goods and services from Malaysian companies. Thus, U.S. consumers need ringgits to pay for the Malaysian goods. As U.S. consumers convert dollars into ringgits, the demand for ringgits simultaneously creates a supply of U.S. dollars on the foreign exchange market.

We show the demand for ringgits in Figure 1. As we move from Point A to Point B, the ringgit exchange rate falls. Thus, the ringgit depreciated because one ringgit buys fewer U.S. dollars. Meanwhile, the U.S. dollar appreciated because one dollar buys more ringgits. (We just have to figure how one currency responds and the other currency must do the opposite.) The price of U.S. goods increased, while Malaysian goods became cheaper. Malaysian imports decrease while exports increase. Accordingly, U.S. exports and imports move in opposite directions. The U.S. exports fall while imports rise.

We show the exchange rates for Points A and B in Equation 8. We write the currency price first, while the standard exchange ratio is in brackets. As we move from Point A to Point B, the Malaysian ringgits depreciate while the U.S. dollar appreciates.

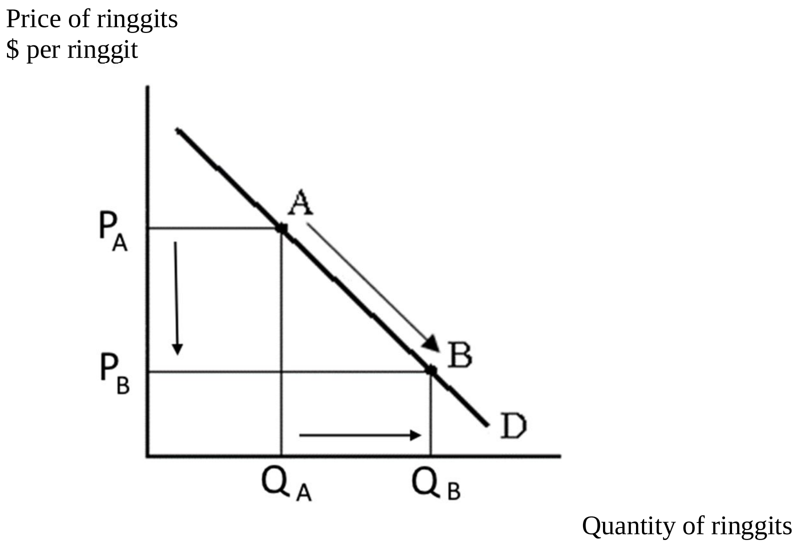

Figure 1. The demand function for Malaysian ringgits

$$\text{Point A: \$0.333 per 1 ringgit} \quad \text{or} \quad [\$1 = 3.0\text{ RM}] \tag{8}$$

$$\text{Point B: \$0.25 per 1 ringgit} \quad \text{or} \quad [\$1 = 4.0\text{ RM}]$$

The supply function for ringgit originates from Malaysian consumers who buy U.S. products. U.S. firms sell products and services to Malaysian consumers, which are U.S. exports. The Malaysian consumers need U.S. dollars to pay for it. Consequently, they have a demand for dollars, which converts ringgits to U.S. dollars, thereby supplying ringgits on the exchange market. Thus, the demand for ringgits in one market simultaneously creates a supply of U.S. dollars in another market, and vice versa.

We show the supply function for Malaysian ringgits in Figure 2. As we move from Point A to Point B, the ringgit exchange rate rises. Consequently, the ringgit appreciated while the U.S. dollar depreciated. The price of U.S. goods decreased, while the price of Malaysian goods increased. The U.S. imports decrease while U.S. exports increase. Malaysia experiences the opposite pattern. Its imports rise while its exports fall.

We show the demand and supply functions for ringgits in Figure 3. We represent the equilibrium exchange rate as P* and the equilibrium quantity as Q*. As an illustration, Americans increase their demand for more Malaysian products, ceteris paribus. Thus, the demand function increases and shifts rightward. The price of ringgits increases. Consequently, the U.S. dollar depreciates while the ringgit appreciates. Furthermore, U.S. products become cheaper to

Malaysians. U.S. exports rise, and U.S. imports decrease, while the exact opposite occurs to Malaysian imports and exports.

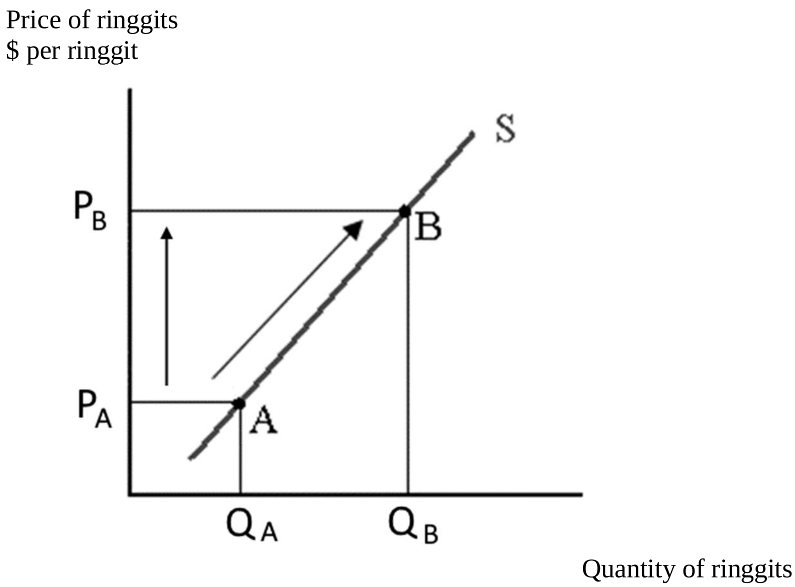

Figure 2. The supply function for ringgits

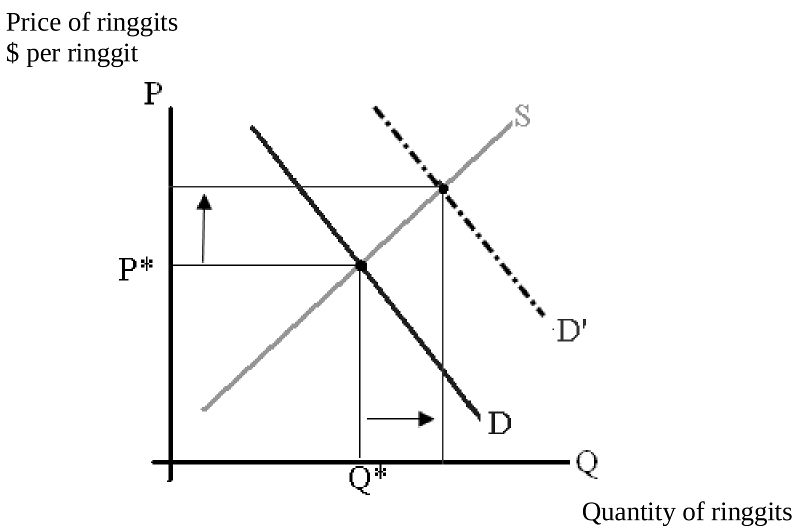

Figure 3. The demand increases for the Malaysian ringgits

Exchange rate fluctuations alter prices of all goods, services, and assets that businesses, people, and the government trade on the international markets. Analysts use appreciation and depreciation to compare two currencies. As one currency appreciates, the other must depreciate because these terms are relative to one another. When analysts refer to a weak or strong U.S.

dollar, they compare the U.S. dollar to a basket of currencies from industrialized countries. A weak U.S. dollar means the value of the dollar has decreased relative to a basket of other currencies, such as the British pound, euro, and Japanese yen. A strong U.S. dollar is the opposite.

Factors that Shift Demand and Supply Functions

Many factors influence supply and demand functions for foreign exchange rates. Several factors include interest rates, inflation, income, and actions by central banks. For instance, interest rates affect investment and financial capital inflows and outflows for a country, while inflation affects a country's prices and hence its trade flows. Inflation is a continual increase in prices. Furthermore, a growing economy creates higher incomes and greater demands for everyday goods, which are the majority of products. Finally, central banks could influence exchange rates by buying and selling currencies.

The real interest rate affects the currency exchange rates. The real interest rate refers to the nominal interest rate minus the country's inflation rate. For example, we show the Malaysian ringgit exchange market in Figure 4, and the original market price and quantity are P* and Q*. If Malaysia has a greater real interest rate than the United States, then U.S. investors will increase their demand for ringgits to earn the higher interest rate. The demand for ringgits rises and shifts rightward. Furthermore, Malaysian citizens invest more within their country, decreasing the supply of ringgits on the international markets. When the supply and demand both shift, either the market quantity becomes indeterminate or the market price. In this case, the market price increases while the market quantity becomes indeterminate. Consequently, the U.S. dollar depreciates while the ringgit appreciates.

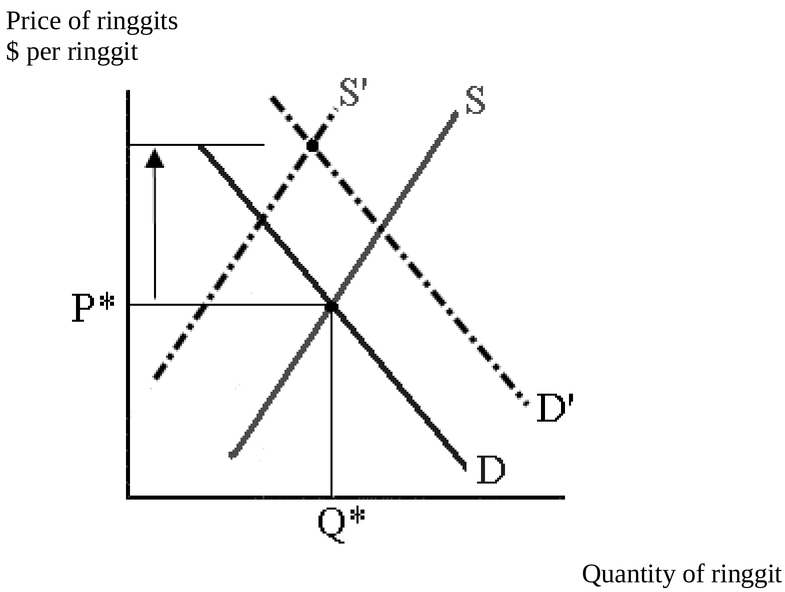

Figure 4. The impact of higher interest rates on the ringgit exchange market

We can use a trick to determine which variable becomes indeterminate. First, we shift the demand function. Then we draw three supply function shifts, where the first one shifts a little, the second shifts a little more, and the third shifts a lot. Consequently, one variable always moves in one direction while the other can increase and decrease, making it indeterminate.

Inflation rates of countries could impact the foreign exchange market. For example, Mexico experiences greater inflation than the United States. We depict the U.S. dollar exchange market in Figure 5. The market price and quantity are P* and Q*. the higher inflation rate causes the prices of Mexican goods to become expensive while prices for U.S. goods become relatively cheaper. Therefore, Mexicans increase their demand for U.S. goods, increasing the demand for U.S. dollars. On the other side of the border, U.S. citizens are buying more domestic goods, which decreases their demand for Mexican goods. Hence, the supply of U.S. dollars decreases and shifts leftward. Consequently, the U.S. dollar appreciates while the peso depreciates. In this case, the equilibrium quantity for U.S. dollars becomes indeterminate. Thus, the relatively higher inflation depreciates a country's currency.

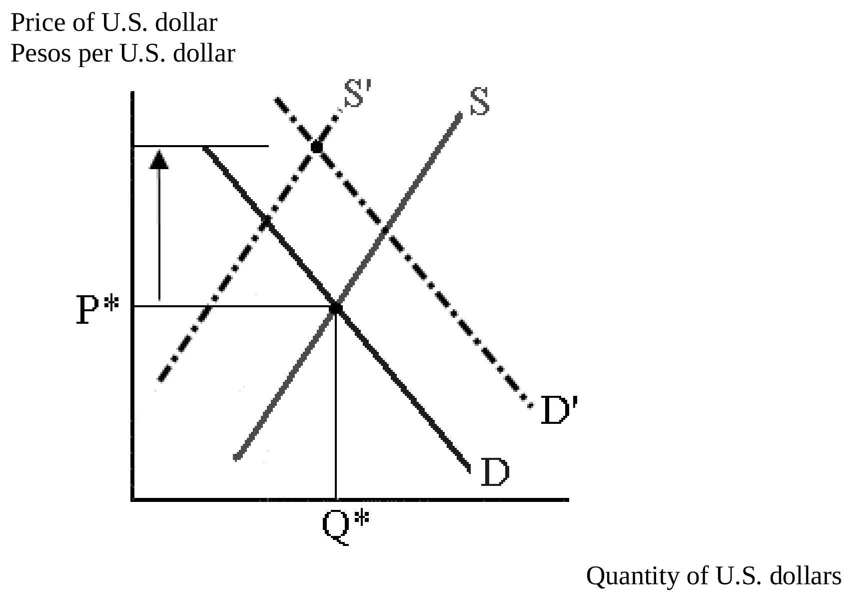

Figure 5. The impact of inflation on the U.S. dollar exchange market

A central bank can increase or decrease the supply of its currency on the foreign exchange markets. For example, we show the U.S. dollar exchange market in Figure 6. The market price is P*, while Q* represents market quantity. The Federal Reserve System, the U.S. central bank, increases the U.S. dollars on the international exchange market by buying foreign currencies. Consequently, the supply function increases, shifting to the right, decreasing the market price. Thus, the U.S. dollar depreciates while the Malaysian ringgit appreciates. Some of this can be not easy to understand. Just remember – scarcity raises the market price while abundance lowers it. The Fed's decision to inject more U.S. dollars into the foreign currency exchanges increases the dollar's abundance while lowering its value.

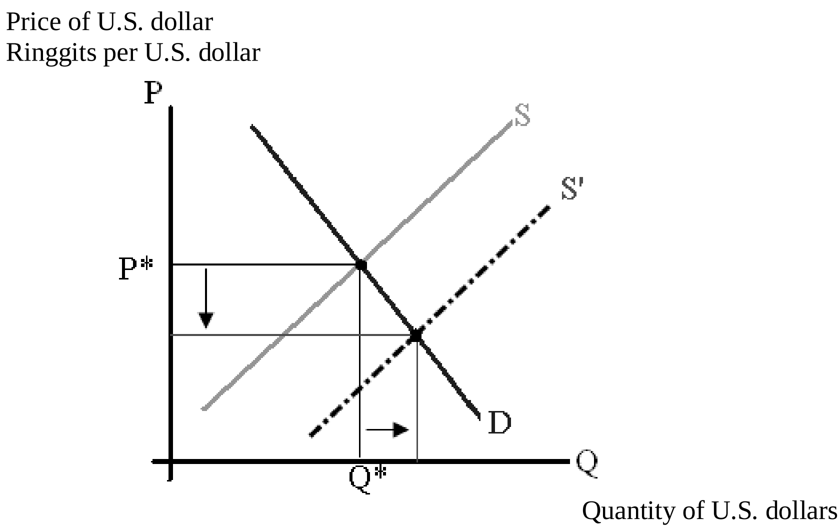

Figure 6. The Federal Reserve increases the supply of dollars on the exchange market

A central bank holds foreign currencies. If a central bank wants to strengthen its currency, it must buy its currency using a foreign currency. Consequently, a central bank's cache of foreign currencies would decrease. If a central bank weakens its currency, it subsequently buys foreign currencies using its currency. Hence, a central bank accumulates more foreign currencies. The key is scarcity. If the exchange market has little of a country's currency, then the currency becomes more scarce. Consequently, investors, central banks, and the general public value it more.

If investors believe a currency will depreciate, then their beliefs become self-fulfilling prophecies. For example, we depict the international currency market for U.S. dollars in Figure 7. Unfortunately, investors believe the U.S. dollar will depreciate. Consequently, the investors reduce their demand for U.S. dollars and shift the demand to the left, decreasing the exchange rate. Thus, the U.S. dollar depreciates while the euro appreciates. Investors' beliefs turned into reality. In a worst-case scenario, a depreciating currency triggers a capital flight. International investors withdraw their investments from a foreign country, collapsing its currency and creating a severe financial crisis for the country.

The supply and demand analysis can be ambiguous in certain situations. For example, Malaysia's GDP grows faster than the U.S. GDP. Malaysian citizens experience growing incomes and would increase their demand for all products, including imports. Thus, Malaysian citizens increase their demand for U.S. dollars, increasing the supply of ringgits on the currency exchange market. The U.S. dollar appreciates while the ringgit depreciates. A rapidly growing country experiences greater inflation, which causes its currency to depreciate. However, a prosperous country tends to have higher interest rates, which has the opposite effect on the market.

In the real world, many factors influence exchange rates. For example, a country could impose trade barriers like tariffs and quotas. A tariff is a tax on imports, while a quota limits the quantity of imports. Both trade barriers reduce a country's imports. Furthermore, some countries impose strict regulations and high taxes. Excessive regulations and taxes reduce trade and financial capital flows. Lastly, investors' expectations and uncertainty can impact trade flows. For instance, the Trump Administration imposed aggressive tariffs on key trading partners in 2025, creating widespread uncertainty. Businesses cannot anticipate how or when tariffs will change because of the frequent and unpredictable policy changes. The aggressive U.S. tariffs have disrupted global supply chains and raised financial volatility.

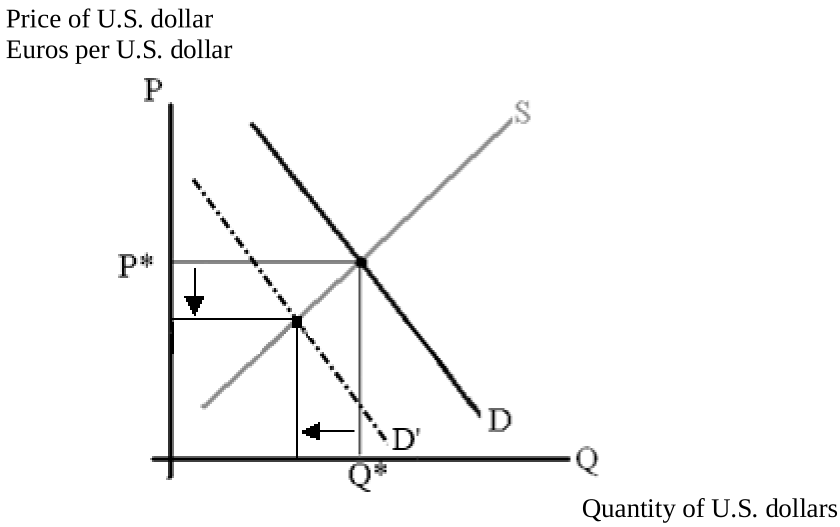

Figure 7. Investors decrease their demand for U.S. dollars

Fixed Exchange Rates

Central banks in several countries established a ***fixed exchange rate*** with a strong currency, such as the U.S. dollar or euro. A fixed exchange rate is a ***pegged exchange rate***. Usually, a government or central bank establishes a currency board that maintains the exchange rate. For example, Argentina, Bermuda, and Hong Kong pegged their currencies to the U.S. dollar while Bosnia and Herzegovina, Bulgaria, and Estonia fixed their currencies to the euro. Lastly, a central bank must hold a cache of currency reserves to buy or sell currencies to balance its currency flows that maintain the fixed exchange rate.

We expand the supply and demand analysis to include a fixed exchange rate. A central bank does not specify an exact price, but it allows its currency to fluctuate within a band, depicted in Figure 8. Consequently, a central bank allows the market to change the exchange rate within the band. If the exchange rate falls outside of the band, the central bank must intervene in the currency market to return the exchange rate within the band. Thus, a central bank requires a cache of currency reserves.

The United Arab Emirates (UAE) pegged its currency exchange rate to U.S. dollars, where one U.S. dollar equals three dirhams. As an illustration, international investors reduce their demand for the dirhams, which decreases the exchange rate below the band. Consequently, the UAE central bank must buy dirhams from the currency exchange market. It exchanges U.S. dollars or euros for dirhams, decreasing the supply function and shifting it to the left. Thus, the exchange rate returns within the band.

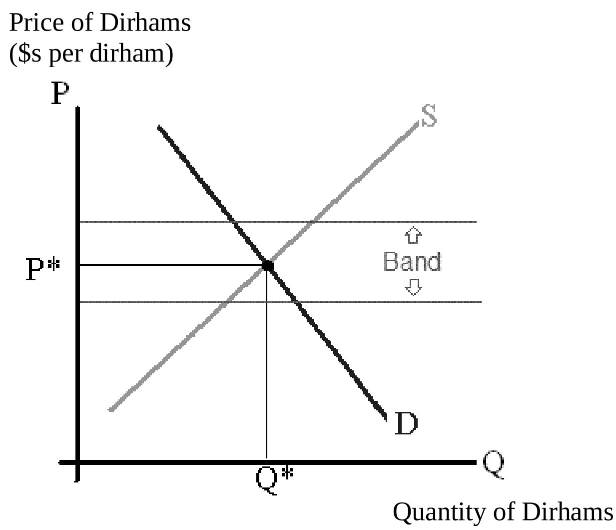

Figure 8. The currency exchange market for dirhams

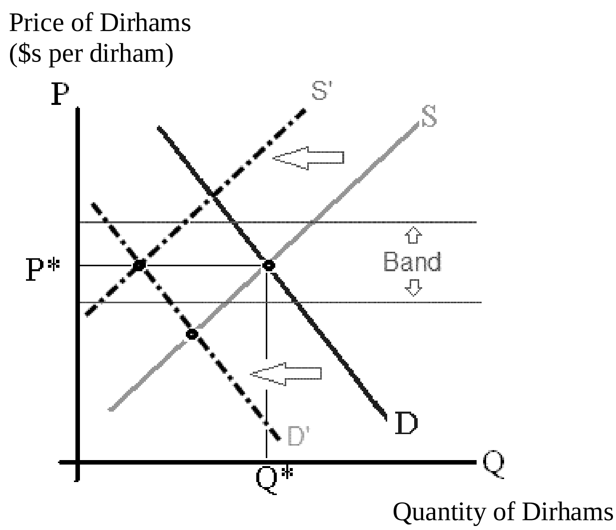

Figure 9. A central bank intervenes in the currency market

Two important terms are associated with a pegged exchange rate. If a central bank allows its currency to appreciate permanently outside the band, then we call it a ***revaluation***. A central bank may not strengthen its currency too often because it accumulates capital from the surplus inflow.

On the other hand, if the central bank allows the currency to depreciate permanently outside the band, we call it a ***devaluation***. A country experiences a continuous outflow of capital, and the central bank does not have the reserves to buy its currency from the currency exchange markets. Thus, this country could devalue its currency to reduce its balance-of-payments deficit.

A devaluation can trigger ***capital flight*** and a severe financial crisis. A devaluation lowers investors' faith in a government's leaders. For example, international investment fund managers invested approximately $45 billion in Mexico to earn the higher interest rate before 1994. The influx of foreign capital appreciated the Mexican peso, which reduced exports and boosted imports. Furthermore, Mexicans reduced their savings and increased their consumption. Unfortunately, the Mexican government could not finance the large trade deficits as it depleted its reserve funds. Then Mexico devalued the peso on December 20, 1994, triggering capital flight. International investors cashed in their Mexican stocks and bonds and began massive capital withdrawals from Mexico. The peso depreciated roughly 40% by January 1995. The Bank of International Settlements and International Monetary Fund (IMF) bailed out Mexico with a $53 billion package, which stabilized the world's financial markets. Unfortunately, capital flight can lead to a contagion, when investors question their investments in other neighboring countries, spreading the crisis to other countries.

As another example, investors were drawn to Asian countries due to their rapid economic growth, where they could earn high investment returns. The Thai government pegged the baht to the U.S. dollar. The Thai government devalued the baht on July 2, 1997. Subsequently, the investors panicked and suddenly withdrew their investments from Thailand. The crisis became a contagion, spreading to Indonesia, Malaysia, the Philippines, and South Korea as investors questioned their investment in those countries. The crisis continued to spread until it reached Russia and Brazil. Unfortunately, all the countries experienced large devaluations of their currencies. Companies and corporations that accepted loans denominated in foreign currencies quickly defaulted. Once their home currency began depreciating, they could not afford to repay their foreign debt.

The IMF bailed out Indonesia, South Korea, and Thailand. As part of the loan conditions, the countries imposed austerity measures. ***Austerity*** requires the government to reduce spending and/or raise taxes to reduce governments' budget deficits. Austerity helps governments deal with government debt, especially if the debt is high. The IMF also wanted the countries to increase the interest rates to stop capital flight. International investors are attracted to high interest rates. Unfortunately, Thailand and Indonesia experienced declines of 20% or more of their industrial production. Austerity, in this case, worsened their economies. According to Keynesian economics, during a downturn in an economy, a government must increase spending and/or reduce taxes to boost the economy. Unfortunately, austerity does the opposite, which slows down the economy. Lastly, a central bank must reduce the money supply to raise a country's interest rates, which again slows down the economy, increasing the severity of the crisis.

The ***Rule of Incompatible Trinity*** states that a central bank can only control two out of the three variables: Fixed exchange rate, free international flow of capital, and independent monetary policy. For example, Hong Kong allows the free flow of capital and pegs the exchange rate to the U.S. dollar. Thus, it cannot support an independent monetary policy because the central bank must maintain the fixed exchange rate. On the other hand, China and India impose capital controls that prevent investors from withdrawing from their economies. Consequently, both countries could impose a fixed exchange rate while the central bank can pursue an independent monetary policy.

Key Terms

foreign-currency exchange market	pegged exchange rate
hedging	revaluation
speculation	devaluation
arbitrage	capital flight
cross rate	austerity
intermarket arbitrage	Rule of Incompatible Trinity
fixed exchange rate	

Chapter Questions

1. The United Arab Emirates uses the dirham as its currency. How much does a Pepsi costs in dirhams if Pepsi cost $0.75 with an exchange rate $1 = 3 dirhams?

2. Please calculate the cross-rate exchange rate for the convertible mark (KM) and U.S. dollar for the following exchange rates:

   KM to euros: KM 2 / 1 €
   Euros to U.S. dollars: € 0.714 / 1$

3. A trader at Citibank has 500,000 Bosnian convertible marks (KM) and observes the following exchange rates:

Citibank:	€ 1 /2 KM
National Westminster:	kuna 100 / € 1
Deutsche Bank	kuna: 46 / 1 KM

Please note that the kuna is Croatia's currency. Please calculate the cross rate to determine if arbitrage exists. If intermarket arbitrage exists, how much profit could the Citibank trader earn?

4. As we examine the demand and supply of U.S. dollars in a market, where does the supply of U.S. dollars originate from?

5. Please draw a supply and demand function for Mexican pesos. What would happen to the market if the 2008 Financial Crisis causes Americans to reduce their demand for Mexican-made products?

6. Please draw the demand and supply for the U.S. dollar exchange market with the euro as the other currency. How can the Federal Reserve strengthen the U.S. dollar relative to the euro? Could the European Central Bank oppose this?

7. The Federal Reserve reduces the U.S. interest rate to jump-start the U.S. economy. What would happen to the U.S. dollar exchange market if the Fed pursues a low “real” interest rate policy?

8. Please draw the international market for the Uzbek som. The Uzbek government established a fixed exchange rate between the Uzbek som and the U.S. dollar. What would happen if people had less demand for this currency? What should the Uzbek government do to maintain the pegged exchange rate?

9. The Japanese government has a government debt-to-GDP ratio of approximately 250%. The Japanese central bank holds most of the debt. Does Japan have a risk of capital flight if investors believe the Japanese government will default on its debt?

18. International Parity Conditions

Supply and demand analysis allows investors and economists to predict directional changes in a country's exchange rate. Unfortunately, the analysis cannot answer questions about quantitative changes. Consequently, this chapter builds on the supply and demand analysis and uses several theories to predict quantitative changes in a country's currency exchange rates. We study the random walk, Purchasing Power Parity Theory, the Relative Purchasing Power Parity Theory, the Interest Rate Parity Theorem, and the International Fisher Effect. Furthermore, we study the Big Mac Index from *The Economist* because it allows us to easily determine whether a country's currency is over- or undervalued relative to the U.S. dollar. Then we can predict which direction the exchange rate should move over time.

A Random Walk

Currency market exchange rates could exhibit a random walk in the short run. Statisticians define a ***random walk*** whose current value is the previous period's value plus a random disturbance. We show a random walk in Equation 1. The value of the spot exchange rate today is s_t, which equals yesterday's exchange rate, s_{t-1}, plus a random disturbance, e_t. We assume the random disturbance is distributed normally with a mean of zero and a fixed standard deviation. For example, if the U.S. dollar-euro exchange rate equals $1.30 per euro today, then we expect the exchange rate to be $1.30 per euro tomorrow, plus a random fluctuation.

$$s_t = s_{t-1} + e_t \tag{1}$$

We show the monthly U.S. dollar-euro exchange rate in Figure 1. A random walk has a unique characteristic – the variable drifts in a particular direction before changing direction. If we take a first difference of the exchange rate, then the difference equals the random disturbance, illustrated in Equation 2. A key difference is that we calculate the change by subtracting the previous period's spot exchange rate from today's spot exchange rate, which is monthly for our case. We show the first difference for the U.S dollar-euro exchange rate in Figure 2. The line indicates the randomness of the exchange rate, but it is not entirely random. Lastly, statistical tests indicate the U.S. dollar-euro exchange rate is almost a random walk[6]. However, these statistical tests are beyond the scope of this book.

$$s_t - s_{t-1} = e_t \tag{2}$$

[6] The U.S. dollar-euro exchange rate has the structure, $s_t = p_1 s_{t-1} + p_2 s_{t-2} + e_t$, where p_1 is close to one while p_2 has a significant second lag. Unfortunately, this is not an anomaly. Many exchange rates exhibit this structure or exhibit a pure random walk.

Although currency exchange rates exhibit a random walk in the short run, economists and financial analysts use several theories to explain long-run movements.

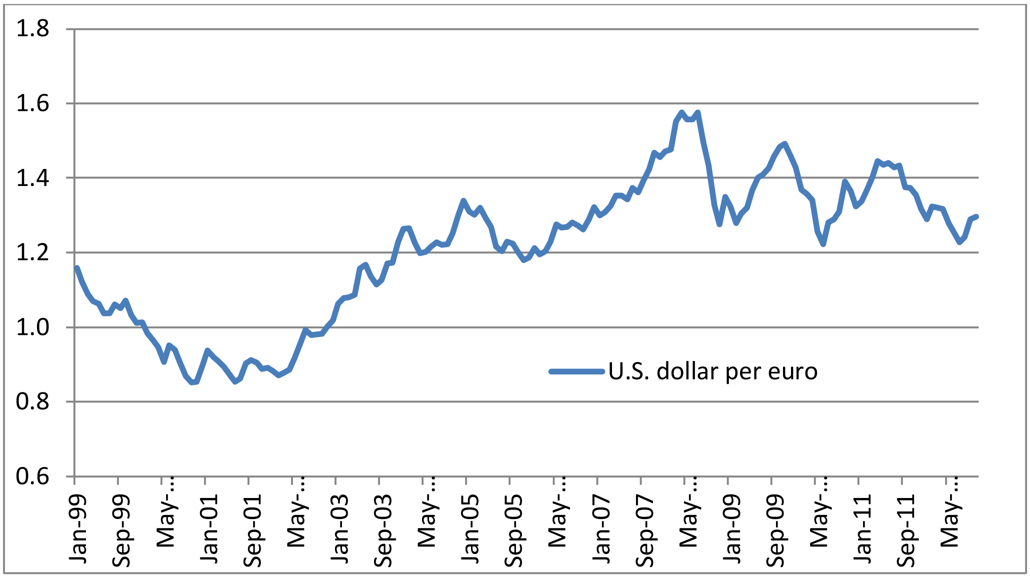

Figure 1. The U.S. dollar per euro exchange rate

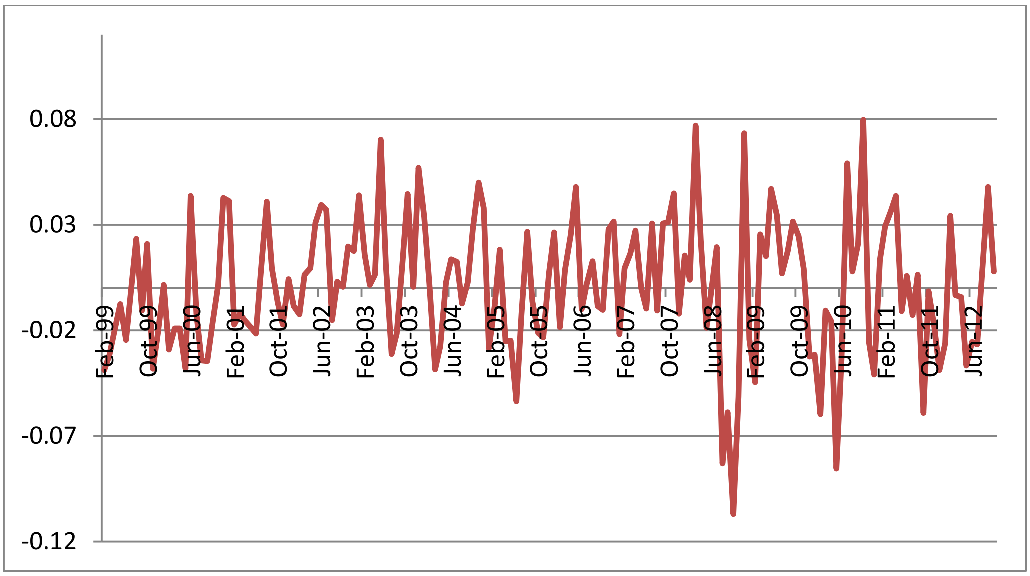

Figure 2. The first difference of the U.S. dollar per euro exchange rate

Purchasing Power Parity (PPP) Theory

Purchasing Power Parity (PPP) Theory is based on the Law of One Price. Goods and products denominated in the same currency should have the same price between markets after adjusting for transportation costs. If a price difference exists between two markets, then arbitrage is possible. Traders would buy products from the low-price market and sell products to the expensive market. Consequently, prices would converge to one price across all markets as traders shifted supply from the low-price market to the high-price market. The high prices would fall while the low prices would rise over time.

Prices could differ between markets because the price difference reflects the transportation costs of shipping the product from one market to another. Nevertheless, the Purchasing Power Parity helps predict changes in exchange rates. For example, the petroleum price equals $90 per barrel in the United States and 850 pesos per barrel in Mexico. The implied exchange rate is one U.S. dollar equals 9.444 Mexican pesos (or pesos 850 ÷ $90). If the actual exchange rate is $1 = 10 Mexican pesos, then the U.S. dollar is overvalued while the peso is undervalued. The $1 gets us 10 pesos, but in terms of petroleum, it should $1 get us 9.44 pesos. The actual exchange rate means that a $90 per barrel of petroleum costs $85 per barrel in Mexico. Consequently, traders could buy petroleum from Mexico and ship and sell it to the United States. Over time, the petroleum price in Mexico has risen due to reduced supply, whereas in the United States, it has decreased as supply increases. Eventually, arbitrage stops when the prices converge between the two countries. Thus, Purchasing Power Parity estimates the equilibrium exchange rate.

Economists expand the Purchasing Power Parity to include many products in a society. The ***Consumer Price Index (CPI)*** is a measure of a basket of goods in the United States. The CPI is an aggregate measure of prices, and economists use it to measure inflation. The Absolute Purchasing Power Parity states that the foreign exchange rate between two currencies is the ratio of the two countries' general price levels. Economists compare a basket of goods from one country to another. We define the notation as the following:

- The domestic price level for home country equals P_d.
- The foreign price level equals P_f.
- The spot exchange rate between countries equals S.

We define the absolute PPP exchange rate by Equation 3.

$$S = \frac{P_f}{P_d} \tag{3}$$

For example, the CPI for the United States equals $755.3 while the CPI for Switzerland is 1,241.2 francs. Thus, the absolute PPP predicts that the exchange rate should be 1.64 francs per U.S. dollar, which we calculated in Equation 4.

$$S = \frac{P_f}{P_d} = \frac{1{,}241.2 \text{ francs}}{\$755.3} = 1.64 \text{ francs}/_{\$1} \tag{4}$$

If the spot exchange rate is 1.4 francs per $1, traders can use arbitrage. The CPI in the United States is 1,057.42 in francs (or $755.3 × 1.4 francs per $1), which is smaller than the CPI of Switzerland. Thus, traders could profit by purchasing a basket of goods from the United States and selling it to Switzerland. Therefore, they could earn 1,241.20 – 1,057.42 = 183.78 francs per basket of goods. Thus, the U.S. dollar is undervalued while the Swiss franc is overvalued.

The *Economist* publishes the ***Big Mac Index***, based on the Purchasing Power Parity. McDonald’s sells Big Macs in over 100 countries around the world. The Big Mac requires many ingredients like beef, buns, lettuce, tomatoes, onions, and its special sauce. Furthermore, restaurants pay labor, retail space, and utilities like water, electricity, and natural gas. Consequently, a Big Mac’s price correlates with the prices of its inputs, and the inputs represent various sectors in a country’s economy. Thus, the price of a Big Mac reflects a country’s PPP, which we show for 11 countries in Table 1. Finally, some analysts designed a Starbucks Index similarly to the Big Mac Index.

Table 1. The Economist’s Big Mac Index for January 2025

Country	Big Mac Price U.S. $	Implied PPP currency per U.S. $	Exchange Rate currency per U.S. $	Over Valued (+) Under Valued (-)
United States	5.79	-	-	-
Argentina	6.95	1,252.63	1,043.56	20.03
Australia	4.87	1.35	1.61	-15.89
China	3.52	4.44	7.30	-39.21
Europe (Eurozone)	5.95	1.00	0.97	2.76
Japan	3.11	84.00	156.39	-46.29
Malaysia	3.00	2.32	4.47	-48.19
Mexico	4.60	16.34	20.57	-20.55
Singapore	5.17	1.21	1.36	-10.71
South Korea	3.84	963.18	1,452.30	-33.68
Switzerland	7.99	1.26	0.91	38.00

Source: The Economist Big Mac Index. January 2025.

The Big Mac price is denominated in U.S. dollars, and we convert it to U.S. dollars using the spot exchange rate. The implied PPP is the ratio of a Big Mac’s price in the foreign currency divided by the average U.S. price in dollars. Finally, the exchange rate is the spot exchange rate in January 2025. We could earn a profit by buying Big Macs in Malaysia for $3.00 and selling the hamburgers in the United States for $5.79. However, we must pay transportation costs and would experience difficulties bringing numerous hamburgers through customs. Lastly, the Big Macs would not be fresh, and they would quickly spoil before they reached their destination.

We can easily calculate the Big Mac. For example, the price of a Big Mac in Malaysia averaged 13.41 ringgits, which is the spot exchange rate multiplied by the Big Mac’s price in U.S. dollars (or 3.00 × 4.47). If the costs are identical for both Malaysia and the United States, then the implied PPP value is the Big Mac's price in ringgits divided by the U.S. price, which equals 2.32 ringgits per U.S. dollar. However, the spot exchange rate equals 4.47 ringgits per U.S. dollar. Consequently, we estimate in Equation 5 that the Malaysian ringgit is undervalued to the U.S. dollar by approximately 48.19%. The dot above the Big Mac's price is the percentage change in price. Thus, analysts predict the ringgit will appreciate against the U.S. dollar over time. Have we noticed that the PPP indicates that the U.S. dollar is overvalued to most currencies except the euro and Swiss franc? Politicians in Washington, D.C., are debating that the U.S. dollar is too strong and must be devalued.

$$\dot{P}_{Big\ Mac} = \frac{P_{Malaysia} - P_{U.S.}}{P_{U.S.}} \cdot 100 = \frac{\$3.00 - \$5.79}{\$5.79} 100 = -48.19\% \tag{5}$$

In general, the PPP tends to hold in the long run, but not in the short run, for the following reasons:

- ❖ Countries impose trade restrictions, such as tariffs and quotas, especially on agricultural products. Countries use trade restrictions to protect their agricultural industries from pests, such as bacteria, viruses, insects, or damaging plants or species. For example, the United States, Canada, and other countries ban importing British beef to stop the spread of hoof-and-mouth disease.

- ❖ The PPP emphasizes only price levels and exchange rates. The PPP excludes transportation costs and transaction costs.

- ❖ The PPP will not hold if governments define different baskets for their CPIs. Furthermore, some goods and services are not tradable, such as haircuts, medical services, and real estate. For example, land and housing construction are expensive in developed countries, and relatively cheap in developing countries. Unfortunately, high-priced real estate incurs a significant cost on businesses when they rent, buy, or lease buildings and space. Subsequently, the businesses pass the greater cost onto product' prices.

The ***Relative Purchasing Power Parity Theory*** states that changes in products' prices between countries affect the exchange rate over time. The relative PPP assumes the legal system does not change, and we define the notation as:

- ❖ We define the change in the domestic exchange rate as the foreign currency per one unit of domestic currency.

- ❖ The foreign country's inflation rate between now and time period T is π_f.

- ❖ The domestic country's inflation rate between now and T is π_d.

- S_T and S_0 are the domestic exchange rates measured at times 0 and T. Thus, the exchange rate at:

$$Time\ 0\ is\ S_0 = \frac{P_f}{P_d} \text{ and Time T is is } S_T = \frac{P_f\left(1+\pi_f\right)}{P_d(1+\pi_d)}$$

The change in the currency exchange rate is the percent change in the spot exchange rates. Then we substitute the relative price levels into the equation, shown in Equation 6.

$$e = \frac{S_T - S_0}{S_0} = \frac{\frac{P_f\left(1+\pi_f\right)}{P_d(1+\pi_d)} - \frac{P_f}{P_d}}{\frac{P_f}{P_d}} = \frac{1+\pi_f}{1+\pi_d} - 1 \tag{6}$$

We use a linear approximation to yield Equation 7.

$$e \approx \pi_f - \pi_d \tag{7}$$

For example, the annual U.S. inflation rate equals 3% while Mexico's inflation rate is 25%. If we defined the domestic currency as the peso, then the Mexican peso depreciates approximately 22% per year while the U.S. dollar appreciates roughly 22% per year. (A negative e is a depreciation while a positive e is an appreciation.) International investors prefer to hold currencies with low inflation rates because inflation erodes the value of currency. Thus, consumers and businesses would hold U.S. dollars and would sell their Mexican pesos. The relative PPP tends to have a long-term impact on countries with significant differences in inflation rates. Thus, countries experiencing relatively high inflation experience depreciating currencies.

We modify the relative PPP to allow analysts to determine whether a country has a competitive export industry. We begin with Equation 6 and rewrite it as Equation 8.

$$e = \frac{1+\pi_f}{1+\pi_d} - 1 \tag{8}$$

We add a positive one to both sides of the equation and then divide by (e – 1) to yield Equation 9.

$$1 = \frac{1+\pi_f}{(1+\pi_d)(1+e)} \tag{9}$$

We replace the one with a k that represents the competitive ratio. For example, Malaysia experiences a 5% inflation rate, and we defined Malaysia as the domestic currency. Meanwhile, the United States experiences a 2% inflation rate. If the ringgit had depreciated against the U.S.

dollar by 1%, we calculated the competitiveness ratio for Malaysia, where k = 0.981 in Equation 10. Consequently, our calculation does not equal one, and the higher inflation rate and the depreciating currency keep Malaysian manufacturing competitive, boosting its export industries.

$$k = \frac{1 + \pi_f}{(1 + \pi_d)(1 + e)} = \frac{1 + 0.02}{(1 + 0.05)(1 - 0.01)} = 0.981 \tag{10}$$

The competitiveness ratio rule states that a k greater than one indicates a country's export industries are not competitive. In contrast, a k less than one means the country's industries are competitive internationally.

The Quantity Theory of Money

We can use the ***Quantity Theory of Money*** to expand the Purchasing Power Parity Theory. The Quantity Theory of money begins with Equation 11, and we define every term as:

❖ The demand for money equals M^D.

❖ We denote the price level by P.

❖ A country's real income is Y, and economists measure real income by a country's real GDP. Moreover, P × Y represents a country's nominal GDP.

❖ The unique term is the velocity of money, V.

$$M^D \cdot V = P \cdot Y \tag{11}$$

The people's demand for money must equal the supply of money. We denote the supply of money by M^S and substitute it into the equation by $M^D = M^S$. The supply and demand for money must equal each other because a central bank injects money into the economy that the public uses. The public cannot use money that the central bank does not supply. The interest rate ensures that the supply and demand of money are equal. Furthermore, we solve for the velocity of money, shown in Equation 12.

$$V = \frac{P \cdot Y}{M^S} \tag{12}$$

For example, if the nominal GDP of the United States equals $15 trillion or P × Y, and the money supply is $1 trillion, then the velocity of money equals 15. Consequently, each U.S. dollar is circulated in the economy, on average, 15 times during the year.

We can substitute the Quantity Theory of Money into the Purchasing Power Parity Equation, yielding Equation 13. The price level for the United States is in the numerator, while the price level for the Eurozone is in the denominator. Thus, the exchange rate equals U.S. dollars per euro.

$$S = \frac{P_{US}}{P_{euro}} = \frac{M_{US}^{S} V_{US} Y_{euro}}{M_{euro}^{S} V_{euro} Y_{US}} \tag{13}$$

Economists utilize a mathematical trick to convert the absolute levels of Equation 13 into percentage change, yielding Equation 14. We switched the variables to lowercase with a dot above each one to indicate a percentage change for that variable.

$$\dot{s} = (\dot{m}_{US}^{S} - \dot{m}_{euro}^{S}) + (\dot{v}_{US} - \dot{v}_{euro}) + (\dot{y}_{euro} - \dot{y}_{US}) \tag{14}$$

$$\dot{s} = (1\% - 3.3\%) + (0\% - 0\%) + (0.9\% - 1.5\%) = -2.9\%$$

Economists can apply Equation 14 to many situations. For example, the real GDP in the Eurozone is growing by 0.9% per year, whereas the United States is experiencing a 1.5% real GDP growth in 2025. Furthermore, the European Central Bank expanded the money supply by 3.3%, while the Federal Reserve expanded it by 1%. If the velocities for money do not change (i.e., equal zero), the euro should depreciate by 2.9% against the U.S. dollar. Consequently, the lower real income growth and a greater expanding money supply weaken the euro. Remember, the denominator of the fraction defines the domestic currency.

International Fisher Effect

The ***Fisher Effect*** relates the nominal interest rate to the rate of inflation and the real interest rate. We define the terms as follows:

- The real interest rate equals r.
- The nominal interest rate equals i.
- The expected inflation rate equals π.

We define the Fisher Effect by Equation 15:

$$i + 1 = (1 + r)(1 + \pi) \tag{15}$$

Many economists use algebra to reduce the Fisher Effect to Equation 16, which becomes an approximation. They set the cross term, r × π, to zero.

$$i = (1 + r)(1 + \pi) - 1 = 1 + r + \pi + r\pi - 1 \approx r + \pi \tag{16}$$

As long as the expected inflation and real interest rates are small, the approximation will be accurate. For example, if the expected inflation, π, is 10% and the nominal interest rate, i, equals 5%, the real interest rate is approximately -5%. The cross term, r × π, is roughly 0.5%. Consequently, all prices in a society rose by 10%, whereas our nominal investment grew by only 5%. Unfortunately, a person facing this scenario would lose nearly 5% of their purchasing power every year.

The ***International Fisher Effect*** relates the real interest rate to a nominal interest rate in a foreign country. We build upon the Law of One Price for financial transactions. For instance, international investors should earn comparable returns in foreign countries as compared to their home country, after we adjust their returns to a currency's exchange rate. Thus, the currency exchange rates reflect interest rate differences that the international investors can profit from. We must be careful because investors are not trading commodities. They choose whether to invest in a foreign country. We define the mathematical notation as follows:

- The domestic nominal interest rate in APR is i_d, while r_d represents the domestic rate of return of the investment in T days.
- The foreign nominal interest in APR rate for an investment for T days is i_f.
- The percent change in the exchange rate from the beginning of the investment period to the period T is e.

We derive the International Fisher Effect with Equation 17. The domestic return is the interest rate earned by a $1 investment in a foreign bank account after T days of maturity converted into the domestic country's currency. If the domestic currency is appreciating, a positive e, then this weakens the return on the foreign investment, making r_d smaller. On the other hand, if the domestic currency depreciates, the exchange rate (e) subsequently increases the returns to the foreign investment. Thus, both the foreign interest rate and the change in currency exchange rate determine an investor's real return.

$$(1 + r_d)(1 + e) = \left(1 + i_f \frac{T}{360}\right) \tag{17}$$

Investors can invest in their home country for T days. We calculated their return on their home bank deposit in Equation 18.

$$r_d = i_d \frac{T}{360} \tag{18}$$

International investors are indifferent between investing within their home country and investing in a foreign country. Consequently, arbitrage drives the rate of returns together. First, we solve Equation 17 for r_d. Then we set Equations 17 and 18 equal to each other because international arbitrage causes both investment returns to converge to the same rate, shown in Equation 19.

$$r_d = i_d \frac{T}{360} = \left(1 + i_f \frac{T}{360}\right) \frac{1}{(1+e)} - 1 \tag{19}$$

Then we solve for e, yielding Equation 20.

$$e = \frac{1 + i_f \frac{T}{360}}{1 + i_d \frac{T}{360}} - 1 \tag{20}$$

If the interest rates are low, then we can use a linear approximation that yields Equation 21.

$$e \approx \left(i_f - i_d\right) \frac{T}{360} \tag{21}$$

The International Fisher Effect lets analysts and economists solve for equilibrium exchange rates. Equilibrium occurs when no capital flows from one country to another. Once investors have exhausted their arbitrage opportunities, they stop moving their capital to the foreign country. If the International Fisher Effect holds, the expected cost and expected return of lending funds become identical across currencies.

For example, the domestic interest rate for the United States is i_d = 3%, while the foreign interest rate for Japan is i_f = 12%. If the investment period is 90 days, we use the International Fisher Effect to predict the exchange rate changes. The U.S. dollar should appreciate approximately 2.25%, as calculated in Equation 22.

$$e \approx \left(i_f - i_d\right) \frac{T}{360} \approx (0.12 - 0.03) \frac{90}{360} \approx 0.0225 \tag{22}$$

The result seems counterintuitive because we expect the country with the greater interest rate to experience an appreciating currency. Usually, international investors want to earn a higher interest rate, strengthening the demand for that country’s currency. Consequently, that country's currency should appreciate in the short run. However, a country with a higher interest rate would experience higher inflation, and the central bank cannot sustain the high interest rate. Thus, that country’s currency would depreciate in the long run as the central bank expands the money supply. Hence, Equations 20 and 21 are long-run equilibrium equations.

For the second example, the Mexican Peso Crisis struck Mexico during the early 1990s, when the Mexican peso depreciated roughly 5% per year. The interest rate differential between Mexico and the United States (i_{MEX}–i_{US}) ranged between 7% and 16%. A country with a greater interest rate relative to another country has a depreciating currency over time. Consequently, the Mexican peso had depreciated in December 1994, triggering Mexico’s financial crisis.

Fidelity utilized this financing strategy to earn profits from the significant interest rate difference.

- Fidelity borrowed funds from the United States at i_d = 5% and invested in Mexican funds and earned the interest rate, i_f = 12%. Thus, the interest rate differential ($i_{MXN} - i_{US}$) is 7%, while the investment period equals one year.

- Fidelity converted U.S. dollars to Mexican pesos on the spot market at time t to invest in Mexico and then converted pesos back into U.S. dollars after the investment had matured. Meanwhile, the U.S. dollar appreciated approximately 5% or e = 5%. Remember, we defined Mexico as a foreign country while the United States is a domestic country.

We compute Fidelity's expected return from Mexican investment in Equation 23.

$$r_d = \left(1 + i_f \frac{T}{360}\right)\frac{1}{(1+e)} - 1 = \left(1 + 0.12\frac{360}{360}\right)\frac{1}{(1+0.05)} - 1 = 0.067 \tag{23}$$

Fidelity borrowed funds from a U.S. bank at 5%, as calculated in Equation 24.

$$r_d = i_d \frac{T}{360} = 0.05\frac{360}{360} = 0.05 \tag{24}$$

We calculate the expected profit by subtracting the investment earnings from the cost of borrowing, or 6.7% – 5% = 1.7% per year. Fidelity utilized this strategy during the early 1990s and earned profits between 1.5% and 11%. Unfortunately, Fidelity lost all its earnings in December 1994 after the Tequila Devaluation. Fidelity employed an ***uncovered position*** strategy[7], exposing itself to exchange rate risk by relying on a future spot exchange rate. Fidelity should have used a ***covered position***, where it uses derivative contracts to protect its future cash flows from a foreign investment.

Interest Rate Parity Theorem

Investors use the ***Interest Rate Parity Theorem*** to price forward contracts. A forward contract’s price originates from the interest rate difference between countries. Consequently, international investors move financial capital into countries with higher interest rates. We can examine price derivatives contracts and predict future exchange rates. We list the mathematical notation below:

- The domestic nominal interest rate in APR equals i_d while the rate of return is r_d.

[7] For options, we called an uncovered position a naked position. It can expose the option issuer to high risk if the market substantially changes.

- The foreign nominal interest rate in APR is i_f, while the foreign rate of return equals r_f.

- The currency spot exchange rate at Time 0 is S. We write the exchange rate as a ratio, such as \$ per euro.

- The forward contract issued today at Time 0 for currency delivery on a future specific date at Time T is F. The forward rate is also written as a ratio, like \$ per euro.

International investors use arbitrage to price a forward contract. An investor invests \$1 within the United States for T days and earns the domestic interest rate. We compute his or her rate of return in U.S. dollars in Equation 25.

$$r_d = \left(1 + i_d \frac{T}{360}\right) \tag{25}$$

The investor believes Malaysia offers better investment opportunities and invests in Malaysia for T days, earning the foreign interest rate. Consequently, the investor exchanges the U.S. dollars for Malaysian ringgits at the spot exchange rate. The exchange rate is the U.S. dollars per Malaysian ringgit, denoted by S. The rate of return of the Malaysian investment yields Equation 26 because the interest and principal are denominated in ringgits.

$$r_f = \left(1 + i_f \frac{T}{360}\right) \cdot \frac{1}{S} \tag{26}$$

Today, the investor buys a T-day forward contract to exchange the ringgits back into U.S. dollars, once the investment has ended. The investor exchanges the ringgit for U.S. dollars at the U.S. dollar-ringgit exchange rate, F. Thus, the investor locks into a forward contract today for a fixed exchange rate, protecting the investor from the exchange rate risk. We calculated the rate of return in U.S. dollars of the Malaysian investment in Equation 27.

$$r_f = \left(1 + i_f \frac{T}{360}\right) \cdot \frac{F}{S} \tag{27}$$

The investor is indifferent between investing in the United States and Malaysia. Consequently, the investors use arbitrage to invest in the United States and Malaysia until the rates of return for both countries converge to the same rate. Thus, we can set the two investments equal to each other, yielding Equation 28.

$$\begin{gathered} r_f + 1 = r_d + 1 \\ \frac{F}{S}\left(1 + i_f \frac{T}{360}\right) = \left(1 + i_d \frac{T}{360}\right) \end{gathered} \tag{28}$$

Solving for the forward contract yields Equation 29:

$$F = S\frac{\left(1 + i_d \frac{T}{360}\right)}{\left(1 + i_f \frac{T}{360}\right)} \tag{29}$$

We can use an approximation to simplify the equation in Equation 30.

$$F \approx S\left[1 + \left(i_d - i_f\right)\frac{T}{360}\right] \tag{30}$$

We can derive another equation to solve for the interest rates, yielding Equation 31.

$$\frac{F - S}{S} \approx \left(i_d - i_f\right)\frac{T}{360} \tag{31}$$

For example, the interest rate in the United States is 5% and 3% for Malaysia. If the spot U.S. dollar-Malaysian ringgit exchange rate equals \$0.3333 per ringgit, then we price a six-month forward contract for \$0.3366 per ringgit. Thus, investors believe the Malaysian ringgit will appreciate roughly 1% while the U.S. dollar will depreciate. This sounds counterintuitive because investors are attracted to and want to earn the greater interest rate. However, this analysis assumes arbitrage brings the two investments into equality. If the interest rates differ between two countries, the country with a higher nominal interest rate must have greater inflation that would depreciate its currency. Therefore, this analysis assumes a country with a higher interest rate possesses a depreciating currency.

We can reverse our logic to yield an identical equation to Equation 29. At Time 0, we borrow one unit of a foreign currency for T days from a foreign bank. When we repay the bank loan at Time T, we pay the foreign bank the following units of the foreign currency in Equation 32.

$$\left(1 + i_f \frac{T}{360}\right) \tag{32}$$

Today, we exchange one unit of foreign currency for the domestic currency; therefore, we multiply by the spot exchange rate S. Today, we deposit the domestic currency, S, into a domestic bank for T days and earn the domestic interest rate, shown in Equation 33:

$$S\left(1 + i_d \frac{T}{360}\right) \tag{33}$$

Today, we also buy a T-day forward contract to exchange the domestic currency for foreign currency at F. Thus, we exchange the domestic currency for the foreign currency, using the contract, F. Then we obtain the following units of foreign currency, calculated in Equation 34.

$$\frac{S}{F}\left(1 + i_d \frac{T}{360}\right) \tag{34}$$

This strategy is not profitable if, at time T, the amount we receive in foreign currency is less than or equal to what we pay for it. Thus, arbitrage ensures that the source of funds from the foreign country is equal to the use of the funds for the domestic country, yielding Equation 35.

$$\frac{S}{F}\left(1 + i_d \frac{T}{360}\right) = \left(1 + i_f \frac{T}{360}\right) \tag{35}$$

We solve for F to obtain Equation 36, which is the same as Equation 29. Consequently, two different scenarios yield the same equation.

$$F = S\frac{\left(1 + i_d \frac{T}{360}\right)}{\left(1 + i_f \frac{T}{360}\right)} \tag{36}$$

The arbitrage adjustment process can be slow, and rates of return can differ between countries. Thus, international investors can exploit these differences to earn a higher rate of return. For example, a U.S. investor can invest in the United States to earn 2% interest or invest in Japan to earn 5%. He plans to invest for one year. The spot exchange rate is \$0.0127 per yen while a one-year forward contract equals \$0.0120 per yen. Although the domestic country is the United States for this investor, we reversed the exchange rate to conform to this analysis.

The investor calculates the rate of return to invest in the United States in Equation 37. The expected rate of return equals 2%, which is identical to the U.S. interest rate.

$$\left(1 + i_d \frac{T}{360}\right) - 1 = \left(1 + 0.02\frac{360}{360}\right) - 1 = 0.02 \tag{37}$$

The investor calculates the rate of return for his Japanese investment in Equation 38. An investor would earn a negative return of 0.8%. Although Japan has a higher interest rate, the depreciating yen wipes out any gains from the higher interest rate. Hence, the investor should invest in the United States, where the return is greater.

$$\left(1 + 0.05\frac{360}{360}\right) \cdot \frac{0.0120}{0.0127} - 1 = -0.008 \tag{38}$$

Terms

random walk	Quantity Theory of Money
Purchasing Power Parity Theory	Fisher Effect

Consumer Price Index	International Fisher Effect
Big Mac Index	uncovered position
transportation costs	covered position
Relative Purchasing Power Parity Theory	Interest Rate Parity Theorem

Chapter Questions

1. We believe the Malaysian ringgit-U.S. dollar exchange rate follows a random walk. If the exchange rate equals 3 RM per U.S. dollar yesterday, what is our best forecast for the exchange rate today?

2. Identify the problems with the Purchasing Power Parity.

3. Using data from Table 1, how could we earn the highest profit by transporting Big Mac between countries if it were theoretically possible?

4. According to the Big Mac Index, estimate whether the Japanese yen is overvalued or undervalued relative to the U.S. dollar.

5. Distinguish between Purchasing Power Parity (PPP) and Relative PPP.

6. Russia has a 7% inflation rate while the United States has a 3%. Using both the exact and the approximation, estimate the level of currency depreciation.

7. The United States experiences a 3% inflation rate, whereas Europe has a 2% inflation rate. If we define the United States as the domestic country and the U.S. dollar is appreciating 2% against the euro, estimate the U.S. competitiveness ratio.

8. Malaysia experienced a strong GDP growth rate of 7% per year, while the United States experienced a growth rate of 3%. If Malaysia's central bank expands the money supply at 5% while the Federal Reserve expands the money supply 2%, estimate the change to the U.S. dollar-ringgit exchange rate.

9. Using the approximation, how much should the exchange rate change if the home interest rate is 10%, the foreign interest rate equals 5%, and we plan to invest for 180 days?

10. We invested money in a foreign country for two years. The foreign interest rate equals 16%, and the exchange rate is appreciating at 4% per year. Estimate our return on the foreign investment.

11. The domestic interest rate in Europe is 7%, whereas the United States interest rate is 5%. If the spot exchange rate is S = 0.7 € / $1, estimate the approximate price of a forward contract due in six months.

19. Derivative Securities and Derivative Markets

We explain the derivatives market in this chapter. Up to this point, we assumed all transactions were spot transactions. Buyers and sellers exchange money and the financial instrument immediately. In a derivatives market, investors can buy and sell contracts today that specify future purchases of financial securities and commodities. This chapter explains the derivative forms: futures and options contracts, credit default swaps, and currency swaps. Finally, we distinguish the role between hedging and speculation. Although derivative contracts allow investors to protect themselves from future price volatility, speculators can buy and sell derivatives to earn significant profits or suffer massive losses. Lastly, the chapter ends with the unusual development in the COMEX gold and silver futures market in 2025.

Forward and Spot Transactions

Financial derivatives received bad publicity from infamous bankruptcies during the 1990s and from the 2008 Financial Crisis. In 1995, Orange County, California, experienced the largest bankruptcy for a municipal government with losses of nearly $2 billion. The press concentrated on derivatives as the cause of the bankruptcy, but the fund manager made poor decisions. Another famous case was Barings PLC. Barings was a London investment firm that was founded in 1763. One trader, Nick Leeson, lost roughly $1.3 billion in the derivatives market, bankrupting Barings in 1995. Finally, commercial and investment banks created various new securities, called Credit Default Swaps (CDS), that played a role in the 2008 Financial Crisis. CDS is similar to insurance for investors. The 2008 Financial Crisis created hardship for many financial firms and investment banks. These institutions guaranteed payment on pools of mortgages that went bankrupt. Thus, these firms paid billions of dollars in payments to honor these CDS contracts. We discuss CDS contracts in this chapter.

Derivatives are a contract, a piece of paper. Farmers and merchants invented derivatives in the Middle Ages to protect themselves from price fluctuations. Buyers and sellers agree to a price today, but they exchange the goods for money at a future date. Financial derivatives protect investors from price uncertainty. Previous chapters focused on ***spot transactions***, where a buyer and seller complete a transaction by immediately exchanging money for the commodity. However, ***forward transactions*** delay the exchange of money and assets to a future date. For example, a bread company needs six tons of flour in six months. Many things could occur within six months. A drought causes the wheat's price to soar, or heavy rains could cause a bumper crop, causing the wheat's price to plummet. The bread company wants to protect itself from fluctuating prices. Consequently, the bread company enters into contracts with wheat farmers, where the bread company and farmers negotiate a price for wheat today. However, the bread company will pay the farmers for the wheat when the farmers harvest the wheat six months from now. A contract protects both the bread company and farmers from price fluctuations.

The price of derivatives receives or "derives" its value from the underlying assets. Assets could be commodities such as coffee, corn, petroleum, pork bellies, and wheat, or financial assets such as stocks, bonds, currencies, Eurodollars, and other financial instruments. ***Derivatives*** are contracts, and buyers and sellers exchange the contracts in the ***derivative markets***. They do not trade assets. Common derivatives include futures, forwards, options, Credit Default Swaps, and currency swaps.

Investors use two strategies to invest in the financial markets: Speculation and hedging. Some investors use ***speculation*** when they buy or sell securities because they believe they can sell the securities for a higher price in the future. Speculators search for quick profits and are gamblers. As we guessed, a speculator can gain or lose massive amounts of money from the derivatives market. Speculators are vital to the market because their presence increases the liquidity of the securities.

Investors use ***hedging*** to buy and sell securities to reduce risk or use long-term investment strategies. Hedgers protect themselves in three ways by using derivatives. First, they lock in a future price today, protecting themselves from price fluctuations. Second, derivatives are liquid assets. If investors need money now, they can easily sell their futures contract in a derivatives market. Finally, investors buy and sell derivatives on organized exchanges, and they can monitor and gather information on the market prices of derivatives.

Hedgers use financial derivatives for the following three cases:

Case 1: Hedgers use a financial derivative to reduce price uncertainty because a derivative locks in a future price today.

Case 2: Hedgers could reduce the interest-rate risk. If a banker knows they will grant a loan on a specific date in the future, they can subsequently buy a derivative that locks in the future interest rate. The interest rate becomes the price of the financial derivative. Thus, the banker borrows at a low interest rate and lends at a high interest rate.

Case 3: Hedgers could reduce the exchange rate risk. The currency exchange rate is the price of a currency derivative. For example, a corporation operates in a foreign country. If that country's currency depreciates, then a corporation could experience gains or losses in profits from that country.

Futures and Forward Contracts

The first class of derivatives is ***futures*** and ***forward contracts***. They specify size, maturity date, and price. The size indicates the number of units in each contract, while the maturity date is the day the parties complete the transaction. Finally, the futures price is the selling price of the asset on the maturity date. However, futures differ from forwards. A forward contract is tailor-made by banks or dealers. The issuer’s reputation and collateral guarantee the contract. On the other hand, a futures contract is standardized. Maturity, size, and collateral are the same for all contracts. Standardized agreements allow investors to buy and sell futures contracts on organized exchanges. For example, the Chicago Board of Trade allows the trade of futures for agricultural products and precious metals. At the same time, the New York Mercantile Exchange allows the exchange for energy commodities like petroleum and electricity.

Futures and forward contracts allow the buyer and seller to agree on a price for a commodity today, and the exchange of money for the commodity will occur on a specific date in the future.

For example, we buy a government bond one year from now. We could enter a futures contract where we and the seller agree on the price today, but we pay for the government bond one year from now. A futures contract is a legal document that assigns rights. A buyer's right obligates us to buy the government bond, called the ***long position***. The seller's right obligates them to sell the government bond, known as the ***short position***.

The derivatives market determines the price of the futures contract. Futures price reflects the expectations of investors and savers. For example, we bought a futures contract for petroleum, and we negotiated a price of $80 per barrel. The seller will deliver the oil within six months. We could sell our futures contract on the derivatives market if we no longer want the contract. If investors and savers believe that oil will be $90 per barrel, then the market value of our futures contract rises. We could either sell our futures contract for a higher price or wait until we receive the oil and sell the oil for $10 per barrel profit. However, the opposite could occur. If investors and savers believe the price of oil will be $70 per barrel, the market value of our futures contract drops. We must buy oil at $80 per barrel, which will cost $70 in the future.

Speculators buy derivatives because the market value of the derivatives could experience wide swings. As the delivery date approaches for a futures contract, the futures contract market price will converge to the spot price. On the day of delivery, the market value of a derivative must equal the spot price. A buyer never purchases a futures contract if the market price of the futures contract exceeds the spot price. For example, if petroleum costs $90 per barrel today, then a buyer would never buy a contract today for a petroleum price of $91 or higher. Furthermore, a seller would never sell a futures contract when the market price of the futures contract is lower than the spot price. For instance, if the spot petroleum market price were $90 per barrel today, then no one would sell a derivatives contract that matures today for a price below $90.

Buyers and sellers do not know each other when they buy or sell a futures contract through an exchange. Consequently, a buyer or seller deposits money with a broker to cover possible losses from a futures contract. As the spot market price changes for a commodity daily, either the buyer or seller will lose money if the exchange were to occur today. However, the loser deposits money into a margin account. A ***margin account*** helps guarantee the parties will honor the contract. Usually, the market price must exceed some threshold before a buyer or seller must deposit money. (A forward contract may not have a margin account.)

Example 1: A petroleum refinery buys 10 futures contracts of petroleum that mature in six months. The contract size is 10,000 barrels of oil with a contract price of $75 per barrel.

Who pays the margin if the spot petroleum price equals $90 per barrel today? The seller deposits $10 \cdot 10{,}000 \cdot (\$90 - \$75) = \$150{,}000$ with his broker. If this contract were to mature today, a buyer would purchase the oil for $75 and sell it for $90, thereby earning a large profit of $15 per barrel. If a speculator bought 10 petroleum contracts, they could earn $150,000 if the derivatives contracts matured today. Thus, the seller loses on this transaction.

Who pays the margin if the petroleum price falls to $60 per barrel? The buyer deposits $10 \cdot 10{,}000 \cdot (\$75 - \$60) = \$150{,}000$ with his broker. If this contract were to mature today, the seller would purchase oil on the spot market at $60 per barrel and sell it to the buyer for $75, thereby earning a substantial profit of $15 per barrel. If a speculator bought 10 contracts, subsequently, he or she would earn a $150,000 loss if the contracts matured today. Thus, speculators could earn enormous profits or experience massive losses from the derivatives markets.

Derivatives can protect investors from interest rate risks. Interest-rate risk occurs when a bank borrows funds at a higher interest rate than it earns on its loans. Remember, banks lend money at a higher interest rate than the funds they borrow, thereby earning profits. Unfortunately, the interest-rate risk could reverse this, imposing losses on a bank.

Example 2: We manage a money-market mutual fund, and it is June 2024. A money-market fund is a type of fund that invests in financial securities with maturities of a year or less. Furthermore, we expect an inflow of $1 million in funds in June 2025. We can buy a futures contract today that earns a 10% return for the new funds in June 2025, and we begin earning interest after June 2025. If the interest rate falls, the derivatives contract guarantees us a 10% return, protecting our fund. A futures contract could be for Certificates of Deposit (CDs). A CD is a customer who deposits money into a bank account for a fixed period and is similar to a savings account. If customers close and withdraw their CDs before maturity, then they forfeit the interest on their CDs. Many countries call CDs time deposits.

On the other side of the CD derivative, a bank grants a loan for $1 million to a customer next year. The bank would transfer the funds in June 2025 at a 12% interest rate. The bank could issue a Certificate of Deposit on the futures market at 10%. Subsequently, the bank has guaranteed a funding source for this loan next year. If interest rates rise next year, then the futures contract protects the bank from interest-rate risk because the bank is "locked" into a funding source at 10% that ensures a profit of 2%.

Futures and forward contracts can reduce exchange rate risk. If a corporation operates in a foreign country, that corporation can use derivative contracts to protect itself from currency exchange rate fluctuations.

Example 3: Exxon is a U.S. corporation that uses U.S. dollars to purchase petroleum from Malaysia. Consequently, Exxon needs Malaysian ringgits and enters into a futures contract because Exxon must pay 4,000,000 ringgits (RM) in 90 days. A Malaysian bank issued a derivatives contract that specifies the exchange rate as $1 = 4 ringgits (RM).

Exchange rates between countries fluctuate continually. Who pays the margin if the exchange rate changes to $1 = 5 ringgits? The U.S. dollar appreciated while the ringgit depreciated. Unfortunately, Exxon has U.S. dollars, and it contracted to pay for ringgits at a lower exchange rate. Thus, Exxon must deposit money into the margin account because Exxon "locked" into a depreciating contract. On the other side of the contract, the bank benefits from this contract.

An easy way to determine the benefits is to convert the ringgits into U.S. dollars for both the spot and futures markets. We computed the spot transaction in Equation 1 and the futures contract in Equation 2.

$$\text{Spot market: } 4{,}000{,}000\ RM \frac{\$1}{5\ RM} = \$800{,}000 \tag{1}$$

$$\text{Futures market: } 4{,}000{,}000\ RM \frac{\$1}{4\ RM} = \$1{,}000{,}000 \tag{2}$$

Exxon loses on the futures contract because it must pay one million U.S. dollars to fulfill its contract in Malaysia. If a speculator bought this contract from the Malaysian bank, he or she would lose approximately $200,000 on this contract if it were to mature today. The Malaysian bank profits by buying 4 million ringgits for $800,000 and selling them for $1 million to Exxon.

Who pays the margin if the exchange rate changes to $1 = 3 ringgits? The ringgits appreciated while the U.S. dollar depreciated. The Malaysian bank must deposit money into a margin account. In this case, Exxon benefits from the exchange rate because its ringgit contract has appreciated. An easy way to determine who benefits is to convert the ringgits into U.S. dollars for both the spot and futures markets. We calculate spot transactions in Equation 3 and the futures transactions in Equation 4.

$$\text{Spot market: } 4{,}000{,}000\ RM \frac{\$1}{3\ rm} = \$1{,}333{,}333 \tag{3}$$

$$\text{Futures market: } 4{,}000{,}000\ RM \frac{\$1}{4\ RM} = \$1{,}000{,}000 \tag{4}$$

Exxon gains from the derivatives contract because it pays one million U.S. dollars. However, if Exxon exchanged its U.S. dollars on the spot market, Exxon would exchange $1.333 million U.S. dollars to pay its ringgit contract in Malaysia. For this case, a speculator could earn a profit of one-third of a million U.S. dollars if the futures contract matured today. A speculator buys 34 million ringgits for $1 million and sells them for $1.333 million.

Options Contract

An ***options contract*** represents the second class of derivatives. An options contract differs from a futures contract because the option holder has the choice to buy or sell an asset. For example, we entered into an options contract, giving us the right to purchase petroleum for $80 per barrel in 6 months. On the day of delivery, if the price of oil equals $70 per barrel, we do not exercise the options contract. That is our option! If the oil price is $90 per barrel on the day of delivery, we will exercise our options contract. The investor who sold this contract must sell the oil for $80 per barrel to us. Options contracts are defined as either call or put options. A ***call option*** gives the holder the right to buy an asset for a specific price in the future. On the other hand, the ***put option*** gives the holder the right to sell an asset for a particular price in the future.

All options have an ***exercise*** or ***strike price***, which is the price listed on the option. An option has an expiration date, which is the date the right to buy or sell expires. Furthermore, options are either American or European. ***American options*** allow the option holder to exercise the option at any time before the expiration date. In contrast, ***European options*** restrict the right to exercise the option only on the expiration date. Furthermore, options are not free. Option holders must pay a fee, called the ***option premium***. Calculating premiums and exercising options are different between American and European options. Keeping the chapter simple, we use the European options for all examples.

The amount paid for an option premium depends on the probability that the buyer will exercise their right. Thus, options contracts are insurance. For example, a driver with a history of car accidents usually has a greater probability of having future accidents. Hence, this driver pays a greater premium for his car insurance company.

We list the following five factors that influence an option premium:

- ❖ If the spot market price rises, subsequently, the option's premium for a European call option increases while the premium decreases for the put option. Remember, option holders exercise an option when they can buy low and sell high. An investor would more likely exercise the call option to buy at the strike price and sell at the spot price. A put option is the opposite.

- ❖ If the strike price increases, then the option's premium for a European call option decreases while the premium increases for a put option. An investor would not exercise the call option if the strike price exceeds the spot price. Otherwise, he would buy high and sell low. On the other hand, an investor would exercise a put option if the strike price exceeds the spot price. Thus, they buy low using the spot price to sell to the option holder using the strike price.

- ❖ If a commodity's price is highly volatile, the commodity's price fluctuates wildly, and an option holder is likely to exercise both the call and put options. Consequently, the option issuer charges a greater option premium for both calls and puts. For example, the market price of Asset A fluctuates between \$20 and \$100, while Asset B fluctuates between \$60 and \$70. Therefore, the option premium for Asset A is greater because the large swings in the price raise the likelihood that the investor exercises the option.

- ❖ An option with a longer time maturity has a greater option premium. For example, Option A has a maturity of one year while Option B has a maturity of one month. Thus, Option A has a larger option premium because investors experience more uncertainty in its asset's prices. Dramatic events could happen during the year that ensure the investors exercise the option.

- ❖ Interest rates affect options just like bonds and stock. A higher interest rate reduces the present value of the option, increasing the value of the call option and decreasing the value of the put option.

Example 1: The strike price for petroleum is \$80 per barrel, and the European's option premium equals \$0.1 per barrel with an option size of 10,000 barrels. A company buys 10 call options with a total quantity of petroleum of 100,000 barrels. Thus, the company pays $\$0.1 \cdot 10{,}000 \cdot 10 = \$10{,}000$ for the premium.

Two scenarios occur with an options contract:

Scenario 1: If the spot market price exceeds the \$80 strike price on the maturity date, then the company exercises the call options. The company buys petroleum at \$80 and resells it on the spot market to earn a significant profit. For example, if the spot price for petroleum is $90 per barrel, we calculate that the company could earn $990,000 in earnings in Equation 5:

$$profit = (spot\ price - strike\ price) \cdot quantity - premium \tag{5}$$
$$profit = (\$90 - \$80) \cdot 100{,}000 - \$10{,}000 = \$990{,}000$$

If the spot market price falls below $80 per barrel, the company will not exercise the option on the maturity date. However, the company has paid the $10,000 premium.

Example 2: The strike price for a European put option is $40 per ton of corn, and the premium equals $0.07 per ton. Each option contract specifies a quantity of 10,000 tons. A farmer buys five put options, entailing 50,000 tons of corn. Consequently, the farmer pays $0.07 × 10,000 × 5 = $3,500 in premiums.

A farmer will experience two scenarios:

Scenario 1: If the spot market price exceeds the $40 strike price on the maturity date, the farmer does not exercise the put option because they could sell corn for a greater price on the spot market. Nevertheless, the farmer has paid the option premium of $3,500.

Scenario 2: If the spot market price falls below the $40 per ton strike price on the maturity date, the farmer exercises the put option. Accordingly, the farmer could buy corn from the spot market and sell it to the holder of the put option. For example, the spot corn price is $25 per ton. Consequently, we calculate that the farmer earns $746,500 in profit, as shown in Equation 6.

$$profit = (strike\ price - spot\ price) \cdot quantity - premium \tag{6}$$
$$profit = (\$40 - \$25) \cdot 50{,}000 - \$3{,}500 = \$746{,}500$$

Currency options are similar to commodity options, but the strike price is an exchange rate. Furthermore, currency options have two markets. The first market is the Interbank (OTC) market, which is located in London, New York, and Tokyo. The OTC options are tailor-made for size, maturity, and exercise price. The second market is Philadelphia, United States, which has a market for currency options with fixed maturities at 1, 3, 6, and 12 months.

Although currency options are more complicated to understand, the trick is to calculate both scenarios: whether to exercise or not exercise the option. Then choose the scenario that yields the greater benefit to the option holder.

Example 3: An investor buys a six million ringgit European call option, and they have U.S. dollars (USD). The call option has a strike price of $0.3 USD / ringgit. Did we notice the ringgit is in the denominator of the strike price? Thus, we know this option is for ringgits. The premium equals $0.01 per ringgit, and the contract size is 100,000 ringgits. The investor needs 60 contracts and pays $60,000 for the premium, calculated in Equation 7.

$$premium = \frac{\$0.01}{ringgit} \cdot 60 \cdot 100{,}000\ ringgits = \$60{,}000 \tag{7}$$

The investor faces two scenarios on the maturity date:

Scenario 1: If the exchange rate exceeds $0.3 USD per ringgit, the investor exercises the call option. For example, if the exchange rate equaled $0.4 USD / ringgit, the ringgit appreciated while the U.S. dollar depreciated. Investors need $1.8 million (0.3 × 6 m = $1.8 m) to purchase the six million ringgits using the call option, or they pay $2.4 million (0.4 × 6 m = $2.4 m) if they buy the ringgits on the spot market. We calculated a speculator's profit of $540,000 in Equation 8. A speculator can buy at the exercise price and sell on the spot market.

$$profit = (spot\ price - exercise\ price) \cdot quantity - premium$$
$$profit = \left(\frac{\$0.4}{ringgit} - \frac{\$0.3}{ringgit}\right) \cdot 6{,}000{,}000\ ringgits - \$60{,}000 = \$540{,}000 \tag{8}$$

Scenario 2: If the exchange rate drops lower than $0.3 USD / ringgit, then the investor does not exercise the call option. For instance, if the exchange rate equals $0.2 USD / ringgit, the ringgit depreciated while the U.S. dollar appreciated. The investor pays $1.2 million for the six million ringgit (0.2 × 6 million), or they could exercise the call option and pay $1.8 million (0.3 × 6 million). Thus, this investor would not exercise the call option but incur a loss, which equals the premium.

Example 4: An investor has U.S. dollars and wants to sell 500,000 euros using a European put option. The strike price is $0.8 USD / euro. The premium equals $0.02 USD per euro while the contract size is 25,000 euros. The investor needs 20 contracts and pays $10,000 for the premium, calculated in Equation 9.

$$premium = \frac{\$0.02}{€} \cdot 20 \times 25{,}000\ € = \$10{,}000 \tag{9}$$

The investor observes two scenarios on the expiration date:

Scenario 1: If the exchange rate exceeds $0.8 USD / euro, then the investors do not exercise the put option. The euro appreciated while the U.S. dollar depreciated. For example, if the exchange rate rises to $0.9 USD / euro, the investors sell 500,000 euros for $450,000 on the spot market. Investors could sell those same euros for $400,000 if they had exercised the put option. Thus, the investors do not exercise the put option but incur a loss equal to the option's premium. Remember – we do not have to exercise an option if it will financially harm us.

Scenario 2: If the exchange rate drops lower than $0.8 US / euro, then the investor exercises the put option. For instance, if the exchange rate is $0.7 US / euro, the investor sells the 500,000 euros for $400,000 by exercising the put option. Instead, if the investors sell the euros on the spot market, they would receive $350,000 for those same euros. Thus, investors exercise a put option. Speculators would earn $40,000 in profits that we calculated in Equation 10.

$$profit = (exercise\ price - spot\ price) \cdot quantity - premium$$
$$profit = \left(\frac{\$0.8}{€} - \frac{\$0.7}{€}\right) \cdot 500{,}000\ € - \$10{,}000 = \$40{,}000 \tag{10}$$

Did we notice something strange about the call and put options? Investors exercise call and put options “as opposites” when an investor exercises an option. Furthermore, we switched the exercise and spot prices in Equations 8 and 10.

Special Derivatives

Several financial institutions offer futures and options that are based on a market index, such as the Dow Jones Industrial Average and S&P 500. For example, the Chicago Board Options Exchange (CBOE) offers options on the Dow Jones Industrial Average, which it calls DJX. Technically, the derivatives are not tied to a commodity. A financial company does not invest in a mutual fund that mirrors a stock index. For example, a fund manager could buy 1,000 shares each of every company listed in the Dow Jones Industrial Average and let investors buy into the fund. Instead, the financial companies base the stock market index on a computed stock market index and settle cash accounts. Since no commodities are exchanged, the financial companies offer call and put options on the stock market indices. These companies cannot provide futures and forwards because buyers and sellers cannot trade a commodity.

Issuers of index derivatives could suffer large losses due to rapid market changes. For example, one investor, Nick Leeson, bankrupted Barings, P.L.C. Nick Leeson observed that the stocks on the Tokyo stock market fluctuated over a narrow range. The Nikkei stock index fluctuated around 20,000 points in 1995. Nick Leeson used a ***straddle*** and issued an equal number of call and put options with identical maturities for the Nikkei stock index. Hence, the investors rarely exercised the options because the stock prices fluctuated over a narrow range. Thus, the option premiums became pure profits to Barings. As profits were soaring, the top management at Barings let Nick Leeson continue his speculation. Then an earthquake struck Kobe, Japan, and both the stock prices and the Nikkei average fell rapidly on the Tokyo stock exchange. Leeson speculated that the stock prices would increase and bought futures contracts to protect his position. Subsequently, the stock prices continued plummeting, resulting in a $1.4 billion loss for Barings. Unfortunately, Barings was forced to settle with option holders who bet the Nikkei average would fall.

The Chicago Board of Options Exchange (CBOE) offers put and call options for the Volatility Index (VIX), calculated from the Standard & Poor’s (S&P) 500-stock index. The VIX represents a measure of risk and volatility, otherwise known as the investor’s fear gauge. Similar to a stock index derivative, the options are not tied to an asset or commodity. On maturity, a holder receives payment as the CBOE settles the obligation in cash. Furthermore, the VIX suffers from exposure if the VIX increases or decreases dramatically. Then CBOE could suffer large losses as it pays out for exercised options.

One must be careful with the meaning of the VIX number. For example, if the VIX equals 20, the investors expect the S&P 500 stock index to swing by 20% over the next 12 months. If the VIX increases, investors become more pessimistic, and the financial markets become more volatile. Some economists and analysts use the VIX as a recession indicator, as shown in Figure 1. We see spikes during the 2008 Financial Crisis and the COVID-19 pandemic. The VIX exceeded 60 during both times, and the stock markets lost roughly half their market value during the financial crisis and about 5% during the pandemic.

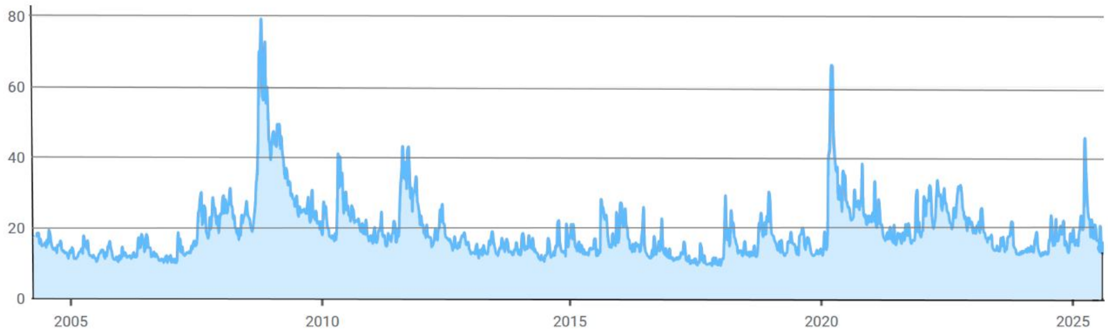

Figure 1. The Volatility Index (VIX) between 2005 and 2025

Insurance companies and investment banks created ***Credit Default Swaps (CDS)***. This financial instrument is similar to insurance. Some investors would like to purchase speculative-grade (i.e., risky) bonds because these bonds pay greater interest rates than safe investments. However, if the business goes bankrupt, these bonds become worthless and the investors lose their investment. Thus, CDSs were born. Investors could buy both risky bonds and CDS contracts. Furthermore, investors would pay premiums on CDSs as if they were paying for insurance to the investment banks or insurance companies. If a company were to go bankrupt and its risky bonds collapsed in value, the investment bank or insurance company would subsequently pay the investors the losses specified under the CDS contract. If the company with the risky bonds had not gone bankrupt, the investment bank would have kept the premium payments as profits. Subsequently, investors can buy and sell credit default swaps on the derivatives market.

CDSs have two severe drawbacks. First, CDS contracts are not transparent. Many investors did not understand how to use CDS, except the analysts at the large investment banks. Second, investors rarely buy CDS contracts for bonds or other debt from financially strong companies with AAA ratings. These companies are unlikely to go bankrupt, so investors have little reason to purchase insurance for an unlikely event. Investors are likely to purchase insurance for probable events. Thus, investors are likely to buy CDSs for speculative-grade bonds or debt. Furthermore, companies rarely file for bankruptcy during good economic times, even risky businesses that issued risky bonds. Consequently, the investment banks would collect CDS premiums as pure profit. During good times, AAA-rated companies have a zero default rate while speculative grade bonds have a default rate of less than 4%. However, during the 2001 Recession, AAA-rated companies still had close to a zero default rate while the default rate soared to 10% for speculative investments. As bankruptcies climb, companies can accumulate staggering losses during a downturn in the economy.

Investors trade CDS contracts in the derivatives markets. Anyone can buy them, even if the investors do not own the risky bonds that are specified within the CDS contract. Therefore, speculators can enter the market and gamble on outcomes. For example, gamblers believe

Company XYZ will go bankrupt. These gamblers do not hold any bonds for this company, but they buy CDS contracts. Gamblers only pay the CDS premiums. However, if this company does indeed go bankrupt, then the gamblers receive a payout from the issuer of the CDS contract. If Company XYZ does not go bankrupt, the gamblers will subsequently lose their bet, the CDS premiums. Imagine the money people could earn if they had inside information about a company's finances.

Some investors bet the housing market would collapse. They bought CDS contracts on mortgage asset-backed securities because they predicted the collapse of the housing bubble in 2007 and purchased CDS contracts as a bet. As the mortgage asset-backed funds went bankrupt, the holders of CDS contracts requested their payout. If we are having trouble understanding CDS contracts, consider this analogy. We bought insurance on our neighbor's house, and we hope it burns down so we can collect the insurance.

The CDS contracts have a flaw. A company can stack CDS contracts on top of other CDS contracts. For example, Company X buys a CDS contract from an insurance company and pays 2% of the contract's value as a premium. Unfortunately, the financial health of the company, specified in the CDS contract, deteriorates, increasing the risk on its bonds. Company X can exploit this situation by creating and selling a new CDS contract to Company Y for a 6% premium, earning a 4% commission on the deal. If that company goes bankrupt, then the insurance company pays Company X its CDS insurance. In turn, Company X transfers its payout to Company Y, earning a quick 4% commission on the deal. Thus, multiple CDS contracts insure the same debt. Unfortunately, the CDS contracts depend on one crucial assumption. Issuing companies can indeed pay out the CDS contracts if the companies do indeed fail.

The CDS market in the United States quickly grew into $47 trillion market by June 2008, covering a debt of roughly $34 trillion. Putting this number into perspective, the size of the U.S. economy was approximately $14 trillion in Gross Domestic Product (GDP) in 2012. Consequently, the potential losses if the investment banks and insurance companies must pay out all CDS contracts would exceed three times the size of the U.S. economy. Commercial and investment bankers used CDS contracts to guarantee an AAA rating for Collateralized Debt Obligations, which contained securities tied to the mortgage market. They used the CDS contracts to cancel the impact of subprime mortgages included in the mortgage securities. We already discussed Collateralized Debt Obligations in Chapter 11 under Securitization.

During the downturn of the U.S. economy in December 2007, AIG quickly accumulated billions in losses as investors requested payouts from the CDS contracts. AIG's losses exceeded $60 billion in 2009 and grew by the day. This became the largest loss in U.S. corporate history. The U.S. federal government bailed out AIG by purchasing 80% equity in the company. Furthermore, it promised AIG four bailout loans worth a total of $163 billion. Unfortunately, AIG worked with several investment banks like Goldman Sachs and Lehman Brothers, which also experienced severe financial troubles.

The U.S. government bailed out the investment banks and insurance companies except Lehman Brothers. After the public had learned that Lehman Brothers was insolvent, and the government would not help it, the financial markets plummeted in September 2008. Furthermore, the credit markets froze as all financial institutions stopped granting loans. Roughly 350 banks and investors would lose their CDS insurance because Lehman Brothers issued approximately $400 billion in CDSs on debt that was valued at $155 billion. Unfortunately, Lehman Brothers issued more CDS contracts than the amount of debt by a factor of 2.5. Finally, Lehman Brothers went bankrupt and began liquidating its assets. Lehman Brothers was the greatest casualty of the 2008 Financial Crisis and the largest bankruptcy in U.S. history. Barclays, the second-largest bank in England, bought Lehman Brothers' U.S. core assets for $1.3 billion, including Lehman Brothers' skyscraper in Manhattan. Excessive greed doomed a 158-year-old company.

Evaluating Currency Swaps

A ***currency swap*** is a periodic exchange of foreign currencies between two parties, viewed as a swap of two forward currency contracts. One party is a swap dealer, usually a banker, while the other is an investor. Each payment to the counterparty is called a "leg." Swaps allow companies to invest in foreign countries. The company borrows from its local bank at a low interest rate and then swaps its loan with another company in a different country, where it invests. Thus, the company has access to the foreign currency at a low interest rate. Swap contracts specify the following:

- Frequency of the payments between the two parties.
- Duration of the swap.
- A method to calculate the swap payments or legs. One leg is a fixed payment, while the other leg is a floating payment. The fixed payment has a fixed rate, called the coupon of the swap.

We define swaps in four ways, and they differ in how the payments of the legs are indexed. This book only discusses a currency swap, where both legs of the swap are denominated in different currencies. At period 0, the value of a swap to both parties should be zero or close to 0. No one would enter a swap with a significant negative present value for them, which means they are already paying money. We list the notation as:

- The present value of discounted cash flows from the foreign currency cash flows is $PV_{foreign}$.
- The current spot exchange rate is S_0, the time we calculate the swap's value.
- The present value of discounted cash flows from the domestic currency cash flows is $PV_{domestic}$.

We calculate the swap value in Equation 11.

$$Swap\ Value = PV_{foreign} \cdot S_0 - PV_{domestic} \tag{11}$$

For example, Company XYZ enters into a 10-year swap agreement with a dealer. Nine years have passed, and two semi-annual payments are remaining. Investors valued the swaps at $200 million and 210 million euros with coupon interest of 4% for U.S. dollars ($200 m x 0.04 x 0.5) and 5% for euros (210 m € x 0.05 x 0.5). Therefore, coupon payments are $4 million and 5.25 million euros. Furthermore, the implicit exchange rate is $4 million divided by 5.25 million euros, or $0.762 per euro. However, the current spot exchange rate equals S_t = $1.25 per euro. The current discount rates are 5% APR for the United States and 6% APR in Europe.

We compute the present value of cash flows for the European swap in Equation 12.

$$PV_{foreign} = \frac{5.25\ million\ €}{1 + {}^{0.06}/_{2}} + \frac{210\ million\ € + 5.25\ million\ €}{\left(1 + {}^{0.06}/_{2}\right)^2} = 208.0\ million\ € \tag{12}$$

We compute the value of cash flows for the U.S. swap in Equation 13.

$$PV_{domestic} = \frac{\$4\ million}{1 + {}^{0.05}/_{2}} + \frac{\$200\ million + \$4\ million}{\left(1 + {}^{0.05}/_{2}\right)^2} = \$198.1\ million \tag{13}$$

We computed the swap's present value in Equation 14.

$$\begin{gathered} Swap\ Value = PV_{foreign} \cdot S_0 - PV_{domestic} \\ Swap\ Value = 208.0\ million\ € \cdot \frac{\$1.25}{1\ €} - \$198.1\ million = \$61.9\ million \end{gathered} \tag{14}$$

If Company XYZ liquidates the swap, the company must receive $61.9 million to sell the swap. Company XYZ benefited because it exchanged dollars for appreciating euros. Thus, the currency swap has a credit risk. Unfortunately, the other party, the dealer, has a significant negative present value and could default on the swap.

Why does the value of a currency swap change? Although the terms of the swap are fixed, fluctuating interest rates and changing exchange rates alter the swap’s value. If a company holds a foreign currency while the domestic exchange rate appreciates, then the value of the swap decreases. Remember, the company entered into a contract for a foreign currency. If the domestic interest rate increases, the present value of the swap rises. Moreover, if the foreign interest rate increases, then the present value of the swap must fall. The opposite is true for the issuer of the swap.

The COMEX in 2025

The Commodities Exchange (COMEX) is the leading U.S. exchange for futures and options contracts on metals, such as aluminum, copper, gold, palladium, platinum, and silver. The

COMEX was founded in 1933 by consolidating several metal exchanges in New York City and is a division of the CME Group.

The COMEX has been experiencing unusual activity in recent years. Before 2023, investors usually closed their positions 99% of the time, settling their positions in cash. About 1% of the time resulted in physical delivery. This pattern changed in 2024. Gold futures have witnessed a surge in deliveries by 3 to 10 times the typical levels. Starting in January 2025, COMEX accepted delivery of 36 metric tons (or 20.4 million troy ounces) into approved warehouses. Much of this gold was imported from Asia, London, and Switzerland. Figure 2 shows the number of contracts in which investors specified physical delivery, indicating that investors would rather physically own the gold instead of paper claims. Figure 2 also shows a similar trend in silver futures. Each gold futures contract specifies 100 troy ounces, while a silver futures contract requires 5,000 troy ounces. Thus, we have noticed a shift in the market in 2025.

Gold and silver have served as money throughout human civilization. The convertibility of U.S. dollars into gold ended in 1971 as the United States left the Bretton Woods System. Since then, gold and silver have usually earned lower returns than investing in an ETF that tracks the S&P500 index. However, gold and silver always remained safe-haven assets that investors flock to during economic crises and periods of financial stress. The surge in COMEX gold deliveries since 2024 may signal an important shift in the functioning of the financial system.

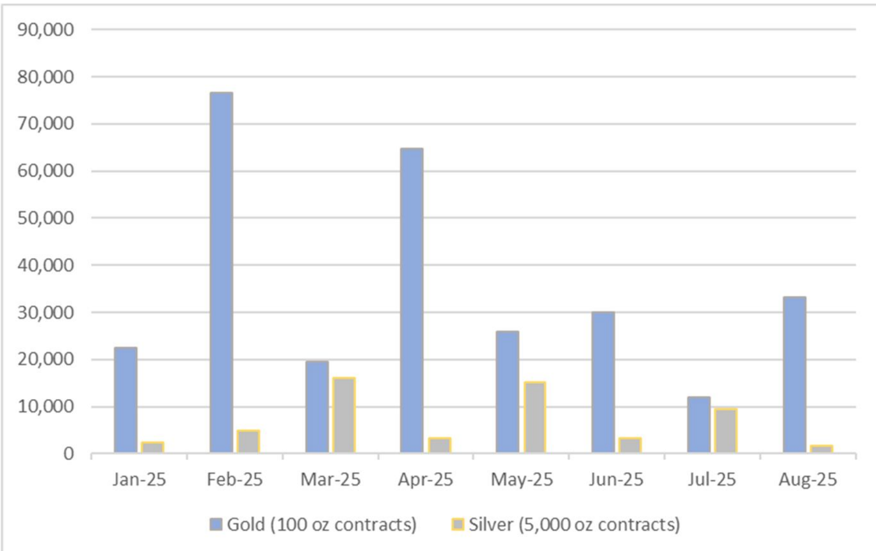

Figure 2. The COMEX gold and silver contract deliveries for 2025

Key Terms

spot transaction
forward transaction
derivative
call option
put option
exercise price

derivative market
derivative security
hedging
speculation
futures
forward contract
long position
short position
margin account
options contract
strike price
expiration date
American option
European option
option premium
straddle
Volatility Index (VIX)
Credit Default Swaps (CDS)
currency swap

Chapter Questions

1. Distinguish between spot and forward transactions.

2. Where do derivatives get their value?

3. Distinguish between hedging and speculation.

4. Distinguish between long and short positions.

5. Define a margin account.

6. A company buys 10 contracts for petroleum that specify a price of $75 per barrel. Each contract specifies 1,000 barrels. Who pays and how much into the margin account if the price of petroleum shoots up to $150 per barrel?

7. An investor buys a currency futures contract for $1 = 1.5 euros from a bank for 150,000 euros. Who pays and how much into a margin account if the exchange rate changes to $1 = 1 euro?

8. Distinguish between a futures and an options contract.

9. Distinguish between a call option and a put option.

10. Which factors determine the value of an option's premium?

11. We are holding 10 call options for petroleum with a strike price of $75 per barrel. The option premium equals $0.5 per barrel, and each contract specified a quantity of 1,000 barrels. Compute the premium and determine whether we will exercise this option if the market price is $50 per barrel.

12. A farmer bought 100 put options for corn. The strike price of corn equals $5 per bushel; the option premium is $0.01 per bushel, and each contract specifies a quantity of 100 bushels.

Calculate the farmer's premium, and whether he will exercise this option if the market price of corn equals $6 per bushel?

13. Can we identify any problems for a finance company to issue derivatives that are not based on a commodity, but on a stock market index?

14. What are Credit Default Swaps (CDS)?

15. Could the Federal Reserve or the U.S. government have prevented the 2008 Financial Crisis?

16. Company XYZ enters into a 5-year swap agreement with a dealer, and four years have passed. The payments are semi-annual, with two payments remaining. The swap's face values are $100 million and 110 million euros with a coupon interest of 3% for U.S. dollars and 4% for the euros. The current discount rates are 5% APR for the U.S. and 6% APR in Europe, while the current spot exchange is S_t = $1.2 / euro. Calculate the swap's present value.

20. Transaction and Economic Exposures

As a business invests or operates in a foreign country, a changing exchange rate causes gains or losses on international business activities. We define these gains or losses as transaction exposure, economic exposure, translation exposure, and tax exposure. Consequently, this chapter describes the types of exposures and outlines the strategies an international company can use to reduce its losses from the transaction and economic exposures. Unfortunately, the translation and tax exposures are beyond the scope of this book.

Exposure Types

Firms are subjected to currency risk, called exposure. ***Exposure*** changes a company's profits, net cash flow, and market value. Every international corporation or business can experience four exposures, originating from its global activities. We explain each exposure in detail.

Transaction exposure comes from the risk of transactions denominated in different currencies. Consequently, a change in an exchange rate alters the value of outstanding financial obligations, such as accounts receivable and accounts payable. Unfortunately, a change in an exchange rate impacts cash flow and alters a company's current contractual obligations. For example, Swiss Cruises, a Swiss company, buys U.S. supplies and sells cruises to U.S. customers. Hence, it prices its supplies and vacation cruises in U.S. dollars. Any fluctuations in the U.S. dollar-Swiss franc exchange rate will alter its financial obligations.

Economic exposure is how a firm's expected cash flows are affected by unexpected changes in currency exchange rates. Exchange rate alters future sales, prices, and costs. We also call it operating exposure, competitive exposure, or strategic exposure. For example, Swiss Cruises pays most of its costs in francs and receives 50% of its revenues in U.S. dollars. Unfortunately, Swiss Cruises cannot raise its price because vacation cruises are highly competitive, and it would lose customers by higher prices. If the Swiss franc is appreciating while the U.S. dollar is depreciating, its cash flows will worsen. Unfortunately, its revenues are in U.S. dollars that are losing value while its costs are in francs that are strengthening in value. Keeping them straight, economic exposure refers to how a change in an exchange rate influences a company's finances over time. In contrast, transaction exposure is the impact of a change in exchange rates on current assets and liabilities.

Translation exposure, also known as accounting exposure, refers to the fluctuations in currency exchange rates that affect a firm's consolidated statements. For example, Swiss Cruises has inventories of U.S. dollars and U.S. dollar loans of an equal amount. Then accountants convert balance sheet items into francs. A depreciating U.S. dollar causes the value of loans to decrease because its liabilities are decreasing. However, the value of current assets is also decreasing due to the dollar inventories. Nevertheless, due to Swiss accounting rules, accountants use different exchange rates to convert U.S. dollar inventories and the U.S. dollar loans into francs. Consequently, accountants generate accounting gains or losses by using the various exchange rates to calculate a company's financial statements. The company must consider the accounting rules among different countries, and how cash flows will impact a company's financial statements.

Tax exposure is affected by fluctuations in currency exchange rates, which in turn affect a company's cash flow and, consequently, its taxable income. Thus, losses from transaction exposure can reduce taxable income, whereas losses from economic exposure reduce taxable income over future years. On the other hand, translation exposures are not related to cash flows and do not reduce taxable income. Thus, companies could gain profit from favorable changes in the exchange rates.

Measuring and Protecting against Transaction Exposure

We can identify and measure transaction exposure. Firms sell products or purchase resources by entering into contracts. Firms can even buy and sell contracts on the derivatives markets to hedge against price uncertainty. If firms do not have contracts, then they must forecast future spot prices, and spot prices can fluctuate wildly.

For example, Swiss Cruises sold cruise packages to a U.S. wholesaler for \$2.5 million U.S. dollars and bought fuel oil for \$1.5 million in U.S. dollars. Both transactions will occur in 30 days, giving a predictable cash flow. If today's spot exchange rate is 1.45 Swiss francs equal \$1, then we calculated the profit, 1.45 million francs, by using Equation 1.

$$profit = \frac{1.45\ franc}{\$1}(\$2{,}500{,}000 - \$1{,}500{,}000) = 1{,}450{,}000\ francs \tag{1}$$

The transaction occurs in 30 days, and the spot exchange rate can fluctuate. Consequently, Swiss Cruises' profits in francs will fluctuate along with the exchange rate. A large company would employ a specialist who predicts and forecasts prices and exchange rates. In Swiss Cruises' case, the specialist has determined that the franc-U.S. dollar exchange rate fluctuates ±10%. Thus, the net transaction exposure could fluctuate between 1,305,000 and 1,595,000 francs, which we calculate by multiplying the profit by 1±0.10, or by 0.9 for the lower number and 1.1 for the upper number. In this case, Swiss Cruises has a favorable transaction exposure because revenues in dollars consistently exceed the costs in dollars.

A company can use strategies to protect its revenues and expenses in a foreign country. For example, a U.S. company, Trident, sold equipment to a British company for 3 million pounds, due in 90 days as accounts receivable. Although Trident sold the equipment, it must wait 90 days for its revenue, and anything could happen within 90 days. An analyst at Trident views four strategies to reduce any losses from this international transaction. The four strategies are as follows:

1. The spot exchange rate is \$1.762 per pound, and the company will use this rate in 90 days.

2. Trident Company can use a derivatives contract. Trident can buy a 90-day forward contract with an exchange rate of \$1.785 / 1 pound from a large bank.

3. Trident Company can buy a 90-day put option for pounds. The put option grants Trident the right to sell British pounds at the strike price of $1.75 / pound with a premium of 1.5%. On the other hand, Trident could buy a 90-day call option for U.S. dollars, which would achieve the same thing.

4. The Trident Company could borrow funds from a British bank. The 90-day loan rate in pounds is 14% Annual Percentage Rate (APR).

Strategy 1: Trident does nothing, and it exchanges funds using the spot exchange rate. If the exchange rate does not change, then Trident will receive $5.286 million, computed in Equation 2. Nevertheless, Trident has an exchange rate risk. If the British pound appreciates, Trident will subsequently gain more U.S. dollars. On the other hand, if the British pounds depreciate, then Trident receives fewer U.S. dollars.

$$amount(\$) = 3\ million\ pounds \left({}^{\$1.762}/_{1\ pound} \right) = \$5.286\ million \qquad (2)$$

Strategy 2: Trident enters a forward contract. A forward contract is preferable to a currency futures contract because it is tailor-made to specific amounts and does not require a margin call. Consequently, Trident does not have any exchange rate risk because it is locked into an exchange rate today. Trident will receive $5.355 million in 90 days, calculated in Equation 3. A forward contract is preferable to the future spot exchange rate.

$$amount(\$) = 3\ million\ pounds \left({}^{\$1.785}/_{1\ pound} \right) = \$5.355\ million \qquad (3)$$

Strategy 3: Trident buys the put option. It pays a premium of $78,750, as calculated in Equation 4, and insures its transaction for an exchange rate of $1.75 per pound. Thus, Trident does not have an exchange rate risk, and the option guarantees at least $5.25 million, computed in Equation 5. Trident will only exercise the put if the British pounds depreciate, and the exchange rate falls below $1.75 per pound. Although the put option yields less revenue than the forward, Trident would buy the put option if it strongly believes the British pound will appreciate. If the pound does indeed appreciate, Trident sells its pounds in the spot exchange market. However, if the pounds depreciate, then Trident uses the put option to sell its pounds, preventing a loss.

$$premium(\$) = 3\ million\ pounds (0.015) \left({}^{\$1.750}/_{1\ pound} \right) = \$78{,}750 \qquad (4)$$

$$amount(\$) = 3\ million\ pounds \left({}^{\$1.750}/_{1\ pound} \right) = \$5.25\ million \qquad (5)$$

Strategy 4: Trident could borrow from a British bank. This strategy is more involved and entails no exchange rate risk. First, Trident borrows 2.899 million pounds today, calculated in Equation 6. Accordingly, the British bank charges 14% interest, and Trident will owe the bank 3 million pounds in 90 days. Consequently, we use the present value formula to calculate the present value that grows into the amount the British company will pay in 90 days.

$$funds\ to\ borrow(£) = \frac{future\ value}{1 + i\frac{T}{360}} = \frac{3\ million\ pounds}{1 + 0.14\frac{90}{360}} = 2.899\ million\ pounds \tag{6}$$

Then Trident immediately transfers the bank loan in U.S. dollars today using the spot exchange rate. Consequently, Trident receives \$5.107 million today, calculated in Equation 7. Once the British company pays its accounts receivable, Trident repays the British bank loan. This transaction differs from the first three strategies because Trident receives funds today for an accounts receivable that the British company pays in 90 days. Although Strategy 4 yields the lowest amount, Trident receives money today that it could invest and earn interest, whereas Trident would have to wait 90 days to receive cash for the first three strategies.

$$amount(\$) = 2.899\ million\ pounds\left({}^{\$1.762}/_{1\ pound}\right) = \$5.107\ million \tag{7}$$

A company could use various strategies to reduce the exchange rate risk. For example, the U.S. company, Caterpillar, bought a South Korean company for 6,030 million won, due in 6 months. In this case, Caterpillar has accounts payable. A specialist at Caterpillar observes the following strategies:

1. Caterpillar could use the current spot exchange, 1,200 won per \$1.

2. Caterpillar could enter a 180-day forward contract with the exchange rate set at 1,260 wons / \$1.

3. Caterpillar could buy a 180-day call option for wons with a strike price of \$1 / 1,200 wons and a premium of 3%. Conversely, Caterpillar could buy a 180-day put option to sell U.S. dollars.

4. A caterpillar could deposit funds into a Korean bank and earn interest for 180 days. The Korean interest rate is 16% APR.

Strategy 1: Caterpillar decides to do nothing and pay its obligation using the spot exchange rate in six months. Unfortunately, this strategy comes with an exchange rate risk. If the Korean won appreciates, Caterpillar would pay more U.S. dollars to satisfy this obligation. If the spot exchange rate remains the same, then Caterpillar would pay \$5.025 million for the company, calculated in Equation 8.

$$amount(\$) = 6{,}030\ million\ wons\left({}^{\$1}/_{1{,}200\ wons}\right) = \$5.025\ million \tag{8}$$

Strategy 2: Caterpillar could use a forward contract to lock in a future exchange rate. Consequently, this strategy has no exchange rate risk, and Caterpillar would pay $4.785 million, computed in Equation 9. Strategy 2 is better than Strategy 1 because Caterpillar knows the exact future value of its legal obligation.

$$amount(\$) = 6{,}030\ million\ wons\left(\$1/_{1{,}260\ wons}\right) = \$4.786\ million \tag{9}$$

Strategy 3: Caterpillar could buy a call option to buy won at a fixed price, and this strategy has no exchange rate risk. Thus, Caterpillar would pay the premium of $150,750, calculated in Equation 10. Then Caterpillar will exercise this call option if the won appreciates relative to the U.S. dollar. Caterpillar would pay $5.025 million at most, computed in Equation 11. Although this strategy is worse than Strategy 2, Caterpillar would use this strategy if it believed the Korean won would depreciate, which would reduce Caterpillar's obligation. Then, if the Korean won appreciates, Caterpillar will exercise the call option.

$$premium(\$) = 6{,}030\ million\ wons(0.03)\left(\$1/_{1{,}200\ wons}\right) = \$150{,}750 \tag{10}$$

$$amount(\$) = 6{,}030\ million\ wons\left(\$1/_{1{,}200\ wons}\right) = \$5.025\ million \tag{11}$$

Strategy 4: Caterpillar could transfer funds today into South Korea using the spot exchange rate. Then it deposits funds into a Korean bank and earns interest for six months. Although this strategy has no exchange rate risk, it does have country risk. The company deposits funds in a foreign country for six months, but in some countries, this approach may not be wise. We discuss a country's risk in Chapter 21.

Caterpillar needs 6,030 million won in six months. We work backwards to determine the amount Caterpillar needs to deposit today, so the interest allows the balance to grow into 6,030 million won. We calculated the present value of 5,853.3 million won in Equation 12. Consequently, Caterpillar uses today's currency exchange rate to transfer $4.65 million to Korea, calculated in Equation 13. This strategy yields the lowest costs to pay for accounts payable because Caterpillar deposits funds in a Korean bank. In theory, it could deposit these funds in a U.S. bank to earn interest for six months, and then use the other strategies.

$$funds\ to\ deposit = \frac{future\ value}{1 + i\frac{T}{360}} = \frac{6{,}030\ million\ wons}{1 + 0.16\frac{180}{360}} = 5{,}583.3\ million\ wons \tag{12}$$

$$amount(\$) = 5{,}583.3\ million\ wons\left(\$1/_{1{,}200\ wons}\right) = \$4.65\ million \tag{13}$$

In another example, Seattle Scientific sold equipment for 12.5 million yen to a Japanese firm. Accounts receivable are due in 30 days. An analyst at Seattle Scientific observes the four strategies:

1. Seattle Scientific uses today's spot exchange rate, 111.40 yen per $1.

2. Seattle Scientific buys a 30-day forward with a fixed exchange rate of 111.00 yen per $1.

3. Seattle Scientific uses a 90-day forward rate with an exchange rate of 110.40 yen per $1.

4. The Japanese firm pays cash today if Seattle Scientific grants a 4.5% discount.

Strategy 1: Seattle Scientific does nothing and uses the spot exchange rate. Unfortunately, this strategy entails an exchange rate risk. If the spot exchange rate does not change, then Seattle Scientific receives $112,208.26, computed in Equation 14. If the yen depreciates relative to the U.S. dollar, Seattle Scientific would subsequently receive fewer U.S. dollars.

$$amount(\$) = 12.5\ million\ yen \left(\$1 / 111.40\ yen\right) = \$112{,}208.26 \tag{14}$$

Strategy 2: Seattle Scientific uses a 30-day forward contract and locks in the future exchange rate. This strategy carries no exchange rate risk and is better than Strategy 1. Thus, Seattle Scientific receives $112,612.61, calculated in Equation 15.

$$amount(\$) = 12.5\ million\ yen \left(\$1 / 111.00\ yen\right) = \$112{,}612.61 \tag{15}$$

Strategy 3: Seattle Scientific uses a 90-day forward contract. Again, this strategy has no exchange rate risk. Hence, Seattle Scientific receives $113,224.64 in ninety days, computed in Equation 16. Although this strategy seems odd, Seattle Scientific would deposit the money in a Japanese bank for an extra 60 days, earning interest. Although Strategy 3 is better than the first two strategies, the analyst should consider the time value of money, which was removed from these examples, making them easy to understand. For instance, once Seattle Scientific received funds from Japan in Strategies 1 and 2, it would deposit the funds at a U.S. bank to earn interest for two months. Thus, all these strategies would have the same time horizon and therefore be comparable.

$$amount(\$) = 12.5\ million\ yen \left(\$1 / 110.40\ yen\right) = \$113{,}224.64 \tag{16}$$

Strategy 4: Seattle Scientific granted the 4.5% discount and received its funds today. This strategy has no exchange rate risk because the firm transfers the funds to the U.S. today using the spot exchange rate. Consequently, Seattle Scientific receives $107,158.89, calculated in Equation 17. This strategy yields the smallest amount for the accounts receivable. Nevertheless, Seattle Scientific receives its funds today. Next, it could invest these funds into a U.S. financial institution and earn interest for 90 days. An analyst would need to adjust the time horizon for this strategy to align with the time horizons of the other strategies. Lastly, Strategy 3 sets the greatest time horizon at 90 days.

$$amount(\$) = 12.5\ million\ yen(0.955)\left(\$1/_{111.40\ yen}\right) = \$107{,}158.89 \qquad (17)$$

For the last example, Farah Jeans, a company, plans to construct a new factory in Guatemala and owes 8.4 million quetzals within six months, creating accounts payable. Farah Jeans wants to reduce its exposure for this transaction. A specialist devises the following strategies.

1. The spot exchange rate equals 7.0 quetzals per $1. The analyst believes the Guatemalan Central Bank will devalue the quetzal to 8.0 quetzals per $1. However, the analyst believes a slight chance that the quetzal could strengthen to 6.4 quetzals per $1.

2. Farah Jeans could enter a 180-day forward contract with an exchange rate of 7.1 quetzals / $1.

3. Farah Jeans immediately transfers the funds to Guatemala and earns an interest rate of 14% APR for 180 days.

4. Farah Jeans could invest in the United States and earn 6% APR for 180 days and then use a forward contract to transfer funds to Guatemala.

Strategy 1: Farah Jeans could use the spot exchange rate to pay its accounts payable. Unfortunately, the spot exchange rate entails an exchange rate risk. In some cases, a currency forecast is not accurate because unanticipated events cause wild fluctuations in currency exchange rates. If the quetzal depreciates, Farah Jeans would pay $1,050,000, as calculated in Equation 18. However, if the quetzal appreciates, subsequently, Farah Jeans would pay out $1,312,500, computed in Equation 19.

$$amount(\$) = 8.4\ million\ quetzals\left(\$1/_{8.0\ quetzals}\right) = \$1{,}050{,}000 \qquad (18)$$

$$amount(\$) = 8.4\ million\ quetzals\left(\$1/_{6.4\ quetzals}\right) = \$1{,}312{,}500 \qquad (19)$$

Strategy 2: Farah Jeans uses a 180-day forward contract to hedge against the exchange rate risk, thus ensuring no exchange rate risk. Farah Jeans would pay $1,183.098.59, calculated in Equation 20.

$$amount(\$) = 8.4\ million\ quetzals\left(\$1/_{7.1\ quetzals}\right) = \$1{,}183{,}098.59 \qquad (20)$$

Strategy 3: Farah Jeans could invest money in Guatemala today and earn interest for six months. Then the company uses the funds to pay its accounts payable. Although this strategy does not have an exchange rate risk, the company could experience country risk. We work backwards to calculate the amount we need to deposit in the bank today, ensuring it grows into 8.4 million quetzals in six months. We calculated 7.85 million quetzals in Equation 21.

$$funds\ to\ deposit = \frac{future\ value}{1 + i\frac{T}{360}} = \frac{8.4\ million\ quetzals}{1 + 0.14\frac{180}{360}} = 7.85\ million\ quetzals \quad (21)$$

Farah Jeans transfers $1.121 million today to Guatemala using the spot exchange rate, computed in Equation 22. Unfortunately, this strategy has a different time horizon than the previous two strategies. If Farah Jeans has $1.121 million in its accounts, it could earn interest by depositing it in a U.S. financial institution and then use Strategies 1 or 2.

$$amount(\$) = 7.850\ million\ quetzals\left({}^{\$1}/_{7.0\ quetzals}\right) = \$1.121\ million \quad (22)$$

Strategy 4: This strategy addresses the time horizon and has no exchange rate risk or country risk. Farah Jeans invests funds in the United States today and subsequently uses a forward contract to transfer money to Guatemala in six months. Farah Jeans need $1,183,098.59 in six months for the forward contract, already computed in Equation 20. Then working backwards, the company must invest $1,148,639.41 in the U.S. to earn the 6% interest for six months, calculated in Equation 23. Consequently, Farah Jeans would earn interest in the United States for six months and use a forward contract to transfer funds to Guatemala to pay off its obligation.

$$funds\ to\ deposit = \frac{future\ value}{1 + i\frac{T}{360}} = \frac{\$1{,}183{,}098.59}{1 + 0.06\frac{180}{360}} = \$1{,}148{,}639.41 \quad (23)$$

An international company can naturally hedge and protect its existing contractual obligations in a foreign country by employing various strategies. First, a company has both accounts receivable and accounts payable in the same foreign country. If they are roughly equal with similar maturities, then the company uses the proceeds from the accounts receivable to pay its accounts payable with no exchange rate exposure. Second, a company could require payment in its home currency. For example, U.S. firms would require that all payments be made in U.S. dollars, while companies in the Eurozone would require payments in euros. Thus, the companies force the exchange rate risk upon the other parties. Finally, a company could require payment in Special Drawing Rights because the International Monetary Fund sets the value of the SDRs to equal a currency basket of British pounds, euros, U.S. dollars, and Japanese yen.

Measuring and Protecting against Economic Exposure

Analysts have difficulties measuring economic exposure. A firm must accurately forecast cash flows and exchange rates because the transaction exposure alters future cash flows as the currency exchange rates fluctuate. If a subsidiary sees positive cash flows after correcting for the currency exchange rates, then its net transaction exposure is low. Analysts can estimate economic exposure accurately if currency exchange rates display a trend, and they know future cash flows with certainty.

Some companies have an unfavorable exposure. For example, PEMEX, Mexico's National Petroleum Company, has a monopoly in the extraction, refining, and distribution of petroleum in Mexico, and it sells petroleum to the international markets. However, PEMEX does not have a favorable exposure because it pays costs, denominated in pesos, while it receives petroleum revenues, priced in U.S. dollars. As the U.S. dollar depreciates, PEMEX's exposure causes its revenues to fall while its costs to rise, squeezing profits.

An analyst measures the economic exposure by estimating a regression equation, shown in Equation 24. Using a simple example, our home country is the United States, while Europe is the foreign country. Thus, the price, P, is the foreign asset's price in U.S. dollars while S indicates the spot exchange rate, defined as U.S. dollars per euro. The regression equation measures the association between the asset's price and the exchange rate. We assume the random error term, ε, equals zero with a constant variance, while α and β are the estimated parameters. Consequently, this equation estimates a straight line between P and S with an intercept of α and a slope of β. We refer to the parameter b as the ***Forex Beta*** or ***Exposure Coefficient***, which indicates the exposure level.

$$P = \alpha + \beta \cdot S + \varepsilon \tag{24}$$

We can estimate the regression equation easily, and we calculate β by using Equation 25. The covariance measures the variation of the asset's price to the exchange rate, while the variance shows the variation of the exchange rate. Consequently, the two factors influence β: the fluctuations in the exchange rate and the sensitivity of the asset's price to changes in the exchange rate.

$$\beta = \frac{covariance(P,S)}{variance(S)} \tag{25}$$

We, for example, own and rent out a condominium in Europe. We hire a property manager who can adjust the rent, ensuring that the property is always occupied. We keep the example simple and assume we receive 1,800 €, 2,000 €, or 2,200 € per month in cash for rent, shown in Table 1. We refer to each rent as a state, and each rent could occur with a 1/3 probability. We also forecasted the exchange rate for each state, denoted as S. Then we calculated the asset's price, P, in U.S. dollars by multiplying that state's rent by the exchange rate.

We calculate 800 for β in this case. A positive β indicates our cash rent varies with the exchange rate fluctuations, and we have a potential economic exposure. Did we notice that as the euro appreciated, the rent in dollars also increased? We could buy a forward contract for 800 € at a contract price of $1.25 per 1 € to hedge against the exchange rate risk. This example works out nicely because we evenly spaced out the exchange rates, and the middle exchange rate determines the forward contract price.

Table 1. Renting out our condo for Case 1

State	Probability	Rent (€)	Exchange Rate (S)	Rent (P)
1	1/3	1,800 €	\$1.00 / 1 €	\$1,800
2	1/3	2,000 €	\$1.25 / 1 €	\$2,500
3	1/3	2,200 €	\$1.50 / 1 €	\$3,300

In Table 2, we show that β is the correct hedge for Case 1. The forward price is the exchange rate in the forward contract, while the exchange rate is the spot exchange rate for a state. We purchased a forward contract with a price of \$1.25 per euro. If State 1 occurs, we gain from the exchange rate because the euro depreciates against the U.S. dollar. By exchanging 800 € into dollars, we earn \$200, and we compute it in the yield column in Table 2. If State 2 occurs, the forward rate equals the spot rate, so we neither gain nor lose anything. Finally, if State 3 occurs, the euro appreciates against the U.S. dollar, so we lose \$200 on the forward contract. Since each state has the same probability of occuring, we, on average, break even by buying the forward contract.

Table 2. The β is the correct hedge for Case 1

State	Forward Price	Exchange Rate (S)	Yield
1	\$1.25 / 1 €	\$1.00 / 1 €	(1.25−1.00)×800 €= \$200
2	\$1.25 / 1 €	\$1.25 / 1 €	(1.25−1.25)×800 €= \$0
3	\$1.25 / 1 €	\$1.50 / 1 €	(1.25−1.50)×800 €= -\$200
Total			\$0

We continue with the same example. However, our rents have changed in Table 3. In Case 2, we could receive 1,667.67 €, 2,000 €, or 2,500 € per month in cash, and any rent is equally likely. Although our rent fluctuates wildly, the exchange moves in the opposite direction to the rent. Did we notice when we calculate the rent in dollars, the rent amounts equal the same number, \$2,500, and β equals -1,666.66? A negative β indicates that the exchange rate fluctuations cancel out the changes in rent. Consequently, we cannot use a forward contract in this case because we do not have economic exposure.

Table 3. Renting out our Condo for Case 2

State	Probability	Rent (€)	Exchange Rate (S)	Rent (P)
1	1/3	2,500 €	\$1 / 1 €	\$2,500
2	1/3	2,000 €	\$1.25 / 1 €	\$2,500
3	1/3	1,666.67 €	\$1.5 / 1 €	\$2,500

We examine the last case in Table 4. We charge the same rent, 2,000 € per month for Case 3, regardless of exchange rate changes. Once we calculate the rent in U.S. dollars, the exchange rate and rent amount move in the same direction. However, the β equals 0 in this case because the rent in euros does not vary. Consequently, we could hedge against the exchange rate risk by purchasing a forward for 2,000 €, rather than the amount for β. By deciding to charge the same rent, we can use a forward to protect this amount.

Table 4. Renting out our Condo for Case 3

State	Probability	Rent (€)	Exchange Rate (S)	Rent (P)
1	1/3	2,000 €	\$1.00 / 1 €	\$2.000
2	1/3	2,000 €	\$1.25 / 1 €	\$2,500
3	1/3	2,000 €	\$1.50 / 1 €	\$3,000

The condominium example was simple but difficult to implement in practice. Thus, international firms can use the following five techniques to reduce their economic exposure.

Technique 1: A company reduces its manufacturing costs by shifting production to low-cost countries. For example, the Honda Motor Company produces high-quality cars, trucks, and motorcycles in factories located in Brazil, Canada, China, India, Indonesia, Japan, Pakistan, Thailand, the United States, and other countries. If the Japanese yen appreciates relative to other currencies and raises Honda's production costs, the company can subsequently shift its production to other facilities, scattered across the world.

Technique 2: A company outsources its production or uses low-cost labor. For instance, many hotels and restaurants operate in highly competitive markets as they compete in prices to attract consumers. Consequently, hotels and restaurants in countries with an appreciating currency rely on immigrants or even undocumented workers to reduce both their costs and prices. In another example, Foxconn, a Taiwanese company, is the largest electronics company in the world, and it produces electronic devices for some of the world's largest corporations, such as the iPad, iPhone, iPod, Kindle, and PlayStation. It is expanding into servers for artificial intelligence and electric vehicles.

Technique 3: A company can diversify its products and services by selling to consumers around the world. For example, many U.S. corporations produce and market fast food, snack food, and sodas in many countries globally. Although the weakening U.S. dollar reduces the companies' profits inside the United States, their foreign operations offset the depreciating dollar while sustaining their earnings.

Technique 4: A company continually invests in research and development. Subsequently, it offers innovative products that consumers want. For instance, Apple Inc. set the standard for high-quality smartphones and tablet computers. Although Apple sells its products in a country with a depreciating currency, it possesses some monopoly power to raise its products' prices without reducing its sales.

Technique 5: A company can use derivatives and hedge against exchange rate changes. For example, Porsche entirely manufactures its cars within the European Union and sells between 40 to 45% of its vehicles to the United States. The U.S. dollar was depreciating against the euro until 2008. Consequently, the depreciating U.S. dollar reduced its U.S. sales while its costs rose. Thus, the Porsche financial managers hedged or shorted against the U.S. dollar, and some financial analysts estimated 50% of Porsche's profits came from its hedging activities.

Key Terms

exposure
transaction exposure
economic exposure
translation exposure
tax exposure
forex beta
exposure coefficient

Chapter Questions

1. Define the four types of exposure.

2. We are expanding a resort business in Mexico. We accept pesos for payment but purchase all our supplies from the United States. Identify our company's exposure if the U.S. dollar appreciates relative to the Mexican peso.

3. We operate a hotel in Europe. We market our hotel to Americans who pay in dollars, but we purchase all our supplies in Europe. These transactions will occur in 30 days, and the spot currency exchange rate equals $1.25 per euro. Moreover, we expect the U.S. dollar-euro exchange rate to fluctuate by 15%. Identify our net transaction exposure if we sold hotel packages to a U.S. wholesaler for $1 million in U.S. dollars and bought supplies from Europe that cost 500,000 euros.

4. Our company will receive 5 million Canadian Dollars (CAD) in three months for selling a shipment of tractors. We are concerned about this transaction exposure and are investigating four methods to protect our company. We have the following data:

   - ❖ Our company uses the spot exchange rate, which equals $0.9 / 1 CD.
   - ❖ Our company enters a three-month forward rate that fixes the exchange rate to $1 / 1 CAD
   - ❖ The company plans to borrow against the accounts receivable in Canada, and the three-month loan rate in Canada is 5% APR.
   - ❖ The company would pay immediately if our company granted a 3% discount rate.

5. Our company will purchase tomatoes from Mexico for 500,000 pesos in 30 days. We are concerned about this transaction exposure and are investigating four methods to protect our company. We have the following data:

- Our company decides to use the spot exchange rate, which equals $1 / 11 pesos.
- Our company enters a forward contract that fixes the exchange rate to $1 / 12 pesos.
- Our company invests in Mexico for thirty days, earning an 11% APR interest rate.
- Our company buys a thirty-day call option for pesos. The strike price equals $1 / 13 pesos while the premium is 1.5%

6. Please define the Forex Beta and identify the sources of variation.
7. Our company manufactures and sells backpacks across the world. Identify two methods to reduce economic exposure.

21. Political, Country, and Global Specific Risks

Political risk originates from the government because a government can impose its authority over an enterprise's operations within a border or even outside its borders. Once an international company or investor establishes a business within a foreign country, the host government enforces its laws, rules, regulations, and taxes. Some governments view foreign companies or international investors unfavorably, and they punish the business or expropriate the business's assets.

This section examines the numerous risks a foreign business or investor could experience, and predicts whether to invest in a particular country. Some countries are pro-business, and international investors and companies can invest there with little danger. Unfortunately, other countries are dangerous because a government can interfere with business investment, impose excessive taxes and regulations, or even nationalize investors' and businesses' assets. Thus, we examine a country's risk in detail and the methods the international investors use to minimize their exposure to a country's risk level. Lastly, we study the methods to calculate a country's risk and the risk premium that we need to compensate investors for the greater investment risk.

Political, Country, and Global Specific Risks

Political risk comes in many forms. For instance, ***firm-specific risk***, also known as micro risk, occurs when a foreign business and the host government encounter a conflict. Different firms experience distinctive risks. For example, a restaurant chain would experience a different risk level than an electronics manufacturing company. A restaurant chain leases its space and competes with numerous local businesses, whereas an electronics manufacturing facility requires billions of U.S. dollars for investment. Moreover, officials in a foreign government will likely be familiar with the electronics company, but the restaurant chain may not be on their radar. In addition, a firm has a currency exchange rate risk, which we discussed in Chapter 20. Although the exchange rate risk is a firm-specific risk, a government does not directly impose the risk on a business.

A government and a foreign company may experience conflicts over control of key industries, or when a foreign company infringes on national sovereignty. For example, a Dubai state-owned company, Dubai Ports World, wanted to buy six U.S. ports in 2006, which caused a political uproar in the United States. President Bush wanted to proceed with the deal, but Congress blocked it. Although a British company owned the ports, Americans worried about Dubai's association with the Arab world, and Arab ownership would lead to a rise in terrorism. Subsequently, Dubai World sold its interest in the ports to an American company, AIG.

A government and a foreign company could clash over local interests versus a foreign company's self-interests. A government retains control over its defense industries and restricts ownership of production for military equipment and supplies. If a government relied on a foreign country for military supplies, then that foreign country could withhold exports as a means of control or as a bargaining chip. Furthermore, a government restricts control over energy, communication, and agricultural industries. For example, Europe and the United States heavily protect their agricultural markets because the political leaders are afraid a foreign country could withhold food exports as a means of control.

A government could prevent international investment or stop foreign companies from entering and operating within the country. A government could use the Infant Industries argument to protect its new, young domestic industries. For instance, the United States protected its manufacturing industries during the 18th century, allowing them to thrive and grow until they could compete with Europe. Consequently, a government hinders foreign investment or restricts foreign enterprises from operating within its borders as a government protects its industries and companies.

A government might impose tariffs on its imports. A tariff boosts the product’s market price while it reduces its imports. In some cases, governments in developing countries impose high tariffs because they need the tax revenue. Governments in developing countries usually have tax evasion problems, but they retain tight controls over their air and seaports. Thus, they can collect tariff revenue as products move through the ports. Some foreign companies might invest within a country to circumvent the trade barriers.

A country could join a ***trade bloc*** with other countries, forming a free trade zone. Members of a trade bloc allow free trade between members while non-members face trade protection. Hence, a foreign company invests within a country to not only circumvent a trade barrier, but also gain more access to consumers who live within the trade bloc. For example, the North American Free Trade Association (NAFTA), a free trade zone between Canada, Mexico, and the United States, allows free trade among members. Still, each country erects its customs to the outside world. The European Union (EU) is a common market, allowing the free flow of labor, products, services, capital, and money between members. Nevertheless, the EU government erects a single customs barrier to non-EU members. Consequently, foreign companies have an incentive to invest within the trade bloc, thereby gaining access to more consumers.

A government can impose many conditions on foreign companies, which include the following:

Condition 1: A government forces foreign firms to use local companies, purchase local resources and supplies, and hire local labor. A government could also restrict or limit the number of expatriates a foreign firm can employ. Usually, the foreign company hires expatriates from its home country for upper management and highly technical positions.

Condition 2: A government could be in a position where a foreign company has a pipeline, highway, or electrical wires passing through the government’s territory. Consequently, a government seeks to gain control by threatening to shut down operations. For example, Sudan was split into two countries. South Sudan possesses and extracts petroleum, while the petroleum pipelines pass through North Sudan to the seaports. Thus, North Sudan can threaten to shut down the pipeline and bargain for a portion of the profits from South Sudan.

Condition 3: A firm or government strives for control over the international markets. For instance, the members of the Organization of Petroleum Exporting Countries (OPEC) nationalized and seized the petroleum companies that operated within their borders. Then OPEC operates as a cartel that imposes production quotas on its members. Production quotas reduce petroleum supplies, which in turn boosts petroleum prices and profits.

Condition 4: A government requires foreign companies to form joint ventures with the government or state-owned firms. Western firms bring investment, technology, and efficient management practices, while the government retains control over the business activities. Joint ventures are common in national defense, agriculture, banking, or the minerals industries, and governments in post-Soviet states, Japan, Mexico, China, India, and South Korea use them or have used them.

Although political risk can be challenging to predict, a country could exhibit characteristics that endanger investment. The characteristics include the following:

Characteristic 1: A country often experiences changes in government leadership, or a country has too many political parties. Unfortunately, government policies and laws are subject to frequent changes. For example, many South American countries alternate between pro-business and socialist governments. During the pro-business phase, the government relaxes taxes and regulations. Subsequently, the government changes its position during its socialist phase, punishing businesses. Political leaders with a strong nationalistic leaning may view foreign investment unfavorably.

Characteristic 2: International investors and business people can collect information about a foreign country's political leaders or a country's economic environment. Political leaders who believe in free markets and limited government are likely to pass favorable government laws and regulations for foreign investment. Some organizations, such as the Heritage Foundation, collect statistics on countries and attempt to measure the level of economic freedom. Consequently, economic freedom corresponds directly to business freedom and the level of interference by government.

Characteristic 3: Some countries are composed of fractious and contentious ethnic groups or plagued with religious fanaticism. These countries are poor choices for international investment. For example, Bosnia and Herzegovina has three ethnic groups: Bosnians, Croats, and Serbs. Each ethnic group occupies a specific region in Bosnia, and they do not like each other. Furthermore, the Bosnians are Muslims; the Croats are Catholics, while the Serbs are Orthodox Christians; they fought the fierce Bosnian War during the early 1990s after Yugoslavia had broken up into several countries.

Characteristic 4: Enterprises relocate to countries with uneven income gaps. Enterprises take advantage of the cheap labor force. The enterprises hire highly educated workers, who then become part of the high-income group, thereby widening the income gap. However, foreign investors avoid investing in a country with deteriorating economic conditions. A country plagued with high levels of poverty and massive unemployment breeds protests, riots, and revolutions. Protestors could associate the foreign investors with the government leaders, whom the protestors want to overthrow. Subsequently, the protestors and rioters could damage the foreign investors' assets. In extreme cases, the rioters and protestors could murder foreigners and tourists. As tourists and foreigners flee, a government would see its revenue and tax base plummet.

Investors could face ***country risk*** that extends beyond political risk when they invest in a foreign country. We also call it macro risk. The government could impose rules, laws, and regulations that hamper or interfere with free enterprise. For instance, a government could restrict a firm's ability to move funds into and outside of the country, called ***transfer risk***. For example, a government restricts capital outflows because it cannot attract investors to buy its government bonds. Thus, a government could block funds and prevent foreign firms from transferring funds outside of a country, keeping the investment within a country. A government could also avoid the convertibility of its currency. Financial analysts could view transfer risk as a micro firm risk at the firm level, but it constitutes a macro risk that applies to all firms in the country. Unfortunately, blocked funds reduce the present value of investments because a firm could have trouble selling its investments and assets, or transferring profits outside of a country.

Religion could pose challenges for investing in some countries. For example, most Muslim countries that follow Sharia Law, except Turkey have different financial regulations. Governments following Sharia Law often have the state and religion overlap. For example, Sharia Law prohibits financial institutions from charging interest on mortgages, loans, and other credit instruments. Financial institutions that are compliant with Sharia Law are called Islamic banking. Lastly, some Muslim countries discourage women from holding high managerial positions in government and companies.

For the last type, ***global specific risk*** originates at the worldwide level. Firms have no control over this risk, and it could be challenging to predict. For example, the terrorist attack on the United States on September 11, 2001, raised awareness of terrorism. Unfortunately, terrorists can attack multinational enterprises in any country because terrorists associate them with their home country. Businesses lack the resources to combat terrorism and must rely on government support. Nevertheless, terrorists are not the only global problem. Violent riots and protests erupted in Greece, Spain, and the Middle East in 2011 as protestors and rioters destroyed the property and assets of multinational enterprises. Lastly, the coronavirus sparked the COVID-19 pandemic as many countries shut down the dining, entertainment, and retail industries in 2020.

Another global risk is just-in-time inventory systems, adopted by many businesses. Businesses hold low inventories because they incur storage costs for parts and products. Consequently, enterprises produce parts just in time as they are needed. Unfortunately, just-in-time inventory systems are susceptible to supply disruptions if a specific part comes from one country or one region in the world. For example, the 2011 tsunami and earthquake in Japan shut down several steel and auto parts companies, disrupting the parts supply for Japanese companies. Manufacturing plants worldwide shut down due to a lack of critical parts from Japan. The COVID-19 pandemic in 2020 and the Trump Administration's aggressive tariffs in 2025 exposed the vulnerability of the supply chains again.

Protests cause another global risk. For example, the protestors formed anti-globalization movements against multinational corporations and governments because they are at the center of globalization. Protestors are angry over job losses and increased competition with other countries. In addition, a cyber attack is similar to protests against governments and corporations. Governments and business enterprises use large networks of computer systems to store data. Computer hackers can break into these computer systems and steal or destroy the data. Some hacking groups demand ransom to restore a government's or company's computer systems.

Environmental issues create a global risk because ecological regulations and programs raise a business's costs. Hence, a company could relocate to countries with weak environmental laws, such as China, to reduce its production costs. Then the enterprises could pollute more, with some of the pollution drifting to other countries through the air and water.

Many corporations implemented corporate responsibility to appease the protestors and critics. Consequently, corporations claim they do more than earn profits; they benefit the communities where they operate. They claim they improve the social, environmental, and economic conditions that surround the business. For example, Starbucks pays a higher market price for coffee because the company wants to help the small, struggling coffee farmers in third-world countries. Of course, Starbucks advertises this activity, enhancing its image. The concepts of green finance and environmental, social, and governance continue to evolve.

Government Corruption

Some countries are afflicted with severe corruption, and a business can experience corruption in four ways. First, companies and individuals bribe government officials to obtain business licenses and permits, or they overlook legal violations. Second, government officials and enforcement officers may extort payments from businesses. They use threats, assess excessive fines, or penalize a business until the company pays their demand. Third, government officials and leaders may demand kickbacks from businesses. A kickback is a practice where a bureaucrat or politician secretly receives a portion of a government contract that they awarded to a business. Thus, the kickback rewards a person for granting the contract. Finally, nepotism is usually a severe problem in corrupt countries because government agencies hire relatives and friends for high posts in government and state-owned companies.

Transparency International publishes the Corruption Perception Index, where it attempts to measure a country's corruption level. Investors and businesspeople should research a country thoroughly before investing, as they could experience significant losses from highly corrupt countries. International investor should remember these five suggestions.

Suggestion 1: Investors and business people should avoid investing in highly corrupt countries, as they risk losing their entire investment.

Suggestion 2: Investors and business people should avoid paying bribes. If a company pays a bribe, the bureaucrat or politician may then return with greater demands in the future. Subsequently, other agencies may demand bribes and kickbacks once they discover that a company has paid bribes.

Suggestion 3: Court systems are usually weak in corrupt countries, and the judges could be just as corrupt as the bureaucrats and politicians. Even if a businessman and a corrupt politician form a verbal contract, judges might not enforce the contract because corruption is illegal. Thus, the businessman has no legal recourse if the corrupt politicians change the terms of the contract.

Suggestion 4: A company or investor could experience bad public relations if a news reporter publishes the corruption.

Suggestion 5: Corruption is illegal within the corrupt country and usually a business's home country. Some countries, like the United States, could pursue criminal charges if they catch a U.S. businessperson involved in corruption in a foreign country.

Suppose businesspeople or investors ignore the five suggestions and still want to invest in a highly corrupt country. In that case, they should subsequently use a local advisor to handle government officials and form friends and connections at high places.

Multinational enterprises can use eight strategies to minimize political and country risk, which include the following:

Strategy 1: A multinational company can use ***fronting loans*** to reduce its transfer risk. For example, a parent company deposits U.S. dollars (or euros) into an international bank in a safe country. Then the international bank lends to the subsidiary, located in the foreign country. Usually, a government allows a foreign business to repay loans to global banks. If a government prevents repayment, it hurts its image, and international investors may avoid investing in the country in the future.

Strategy 2: An international corporation or investor can use leverage. Unfortunately, leverage has several meanings in finance. In our case, ***leverage*** means a firm or investor acquires loans without increasing its equity. A firm borrows heavily from a foreign country. If a firm experiences a conflict with the foreign government and exits the country, it could subsequently default on its loans and obligations. A default could spark a backlash against the government, and this strategy is effective if a government seizes or nationalizes an industry. Thus, the firm leaves the country and stops paying its loans.

Strategy 3: A firm artificially creates exports to transfer its funds outside the country, minimizing transfer risk. For instance, the military in Burma had overthrown the government. It imposed strong currency controls, preventing the outflow of currency from the country. Pepsi produced and distributed sodas within the country and could not transfer its profits outside because of government restrictions. Instead, it bought beans with its profits; then it exported and sold the beans to foreign consumers, recouping its earnings in U.S. dollars outside the country.

Strategy 4: Some firms have bargaining power with the government, known as ***special dispensation***. Thus, a firm could convince a government to transfer funds outside the country or to demand exemptions. Companies specializing in high-tech industries, pharmaceuticals, and electronics have special dispensation. Many governments want these industries to operate within their borders because these industries create spillover effects. For example, these industries utilize skilled labor, thereby strengthening a country's image and prestige. Moreover, political leaders view these industries as vital for economic development, and they relax rules, regulations, and taxes to attract them to their country. For example, the United States suffered from a jobs crisis since the 2007 Great Recession. Economic recovery was slow, and job growth was weak. Some firms threatened to leave a state and take their jobs with them unless the state government reduced their taxes.

Strategy 5: A business could buy investment insurance from the home country or receive a government guarantee. Insurance covers any profits that an investor loses from a project located in a foreign country. Insurance could pay claims where a foreign government has expropriated the business, or the company experienced a loss from a war, revolution, or riots.

Strategy 6: A business enterprise could locate a small piece of manufacturing within a country. The business produces goods in facilities spread across several countries. Although this method increases the transportation costs, it reduces its risk. If the business loses its factory in one foreign country, it loses only a part of its operations. For example, companies extract petroleum in the Middle East and refine the petroleum products in the U.S. and Europe. Refineries cost billions of U.S. dollars, and many Middle Eastern governments could nationalize the industries. The Middle Eastern governments nationalized the petroleum industries in the 1960s when they created their state petroleum companies and formed the organization, Organization of the Petroleum Exporting Countries.

Strategy 7: A firm could use intellectual property rights to protect its investment and assets in a foreign country. For instance, a firm controls its technology by owning rights to patents, trademarks, and brand names. In theory, a foreign government cannot operate the facility without permission from the holders of the intellectual property rights. This strategy is effective when a company continually upgrades technology. Even if a government stole the technology, it would become obsolete quickly. Although some countries do not enforce intellectual property rights, countries such as the European Union and the United States force countries to comply with intellectual property rights. They are cracking down on piracy and violations.

Strategy 8: A government could impose capital and exchange controls, preventing the outflow of capital. Companies or investors can reinvest their funds within the country if they cannot transfer funds outside the country and have no other options. Then they wait until they can transfer their funds out of the country. Usually, international businesses do not invest in countries with exchange controls, and the exchange control could hamper future investment.

Measuring Country Risk

Firms investing in foreign markets are exposed to the risk associated with that country. Investors and corporations must continually monitor a country’s ever-changing political and economic conditions. For instance, voters had elected socialists or nationalists into a government that began seizing property. Consequently, the value of foreign investment and foreign assets could plummet as international investors and businesses flee the country. After the people had elected Hugo Chavez as president in Venezuela, his government began nationalizing industries, causing an exodus of foreign capital. Furthermore, a government could weaken property rights or impose new taxes on foreign businesses. Finally, the Russian debt crisis in 1998 and Argentina's international loan default in 2002 triggered the rapid decline of Russian and Argentina assets after both crises.

International investors, buying foreign bonds, can experience a currency exchange rate risk, an interest-rate risk, a borrower default, and/or a country risk. An investor experiences exchange rate risk because a country’s exchange rates are constantly fluctuating, changing an investment’s value. For example, an investor’s investment would significantly plummet in value if a country's currency had considerably depreciated.

For interest-rate risk, investors observe that as the interest rate rises, the bond’s market price falls. Therefore, the market value of a bond investment decreases. The bondholders do not earn a higher interest rate because they have already purchased the bonds and are locked in an interest rate.

Investors protect themselves from credit risk by increasing the borrower's interest rate. Consequently, the interest rate is comprised of the risk-free interest rate and the risk premium. The ***risk-free interest rate*** reflects the market interest rate with a zero default rate. For instance, the investors consider U.S. government securities to be risk-free because the U.S. government has never defaulted on its debt, or at least not yet. However, many investors are becoming alarmed after the U.S. government debt surpassed $37 trillion in 2025. Investors believe the U.S. government debt is risk-free because the U.S. government can increase taxes or print money to repay the bonds. Finally, the ***risk premium*** reflects a borrower's credit risk. If the borrower is likely to default on a loan, subsequently, the borrower pays a higher interest rate, compensating the investor for lending to a risky borrower.

A credit risk occurs when a borrower fails to repay the principal and/or interest of a loan. Credit-rating agencies measure a borrower's risk. For instance, Moody's and Standard & Poor's assign the risk level for corporate and government bonds with a letter grade. Thus, a higher grade implies a smaller default risk, and consequently, the bondholders would earn a lower interest rate.

Analysts and economists measure a country's risk similarly, applying the same credit rating rules. Investors earn smaller interest rates for projects and investments in a foreign country with a higher letter credit grade. Consequently, a project's rate of return is the country's risk plus the rate of return to a comparable U.S. Treasury security. A similar financial security has an identical maturity. Thus, a country's risk influences the interest rate on the debt issued by that country's government.

We can add a risk premium to calculate the yield on Mexican government bonds. In this case, the risk premium reflects the creditworthiness of the Mexican government and not the country's risk for investing in Mexico. A country's risk encompasses its entire legal and economic environment, whereas this example pertains explicitly to the Mexican government. Accordingly, the yields on Mexican government debt should equal the return of a comparable U.S. government security plus a risk premium. Furthermore, a credit-rating agency rated the Mexican government a letter grade of BBB, which equals a spread of 140 ***basis points (bps)***. The spread becomes the risk premium, and the 140 basis points equal 1.40%, or 140 ÷ 100. If a comparable U.S. government bond has a 4% interest rate, subsequently, the yield for a comparable Mexican bond would be 5.40%, or 4% + 1.40%.

We show a country's credit rating and spread in Table 1. As a bond's maturity lengthens, the basis points spread rises. The investors want an additional reward for waiting longer. Financial analysts and investors consider a country's rating of BBB or better to be "investment grade," while they rate a BB or lower as "junk." The usual spread of junk debt ranges from 400 to 600 basis points over one-year U.S Treasury bills. The range could be broad with spreads over 2600 basis points.

Country risk reflects the risk to a particular country by its location. It differs from a currency exchange rate risk. A country's risk could be zero, but that country has a significant currency exchange risk. The reverse could happen, but it occurs rarely. Thus, a country's risk reflects the negative influences of a country's economic and political environment.

Financial analysts use qualitative and quantitative approaches to measure country risk. Qualitative research encompasses a country's data and expert opinions from politicians, union members, and economists. Furthermore, financial analysts monitor local radio, TV, newspapers, and embassy publications for information. Unfortunately, expert opinions are subjective, but an analyst can use experts' consensus to obtain a credit grade. Analysts would consider a country's historical stability and political turmoil. On the other hand, the quantitative approach involves analyzing a country's data to compute a score. The quantitative approach "appears" to be more objective because analysts calculate it from data.

Table 1. A Country's Rating and Spread over U.S. Treasuries

Overall Grade	Rating	Spread (basis points)	Average (basis points)
Excellent			
91 -100	AAA	10 -70	50
81 – 90	AA	50 – 100	70
71 – 80	A	80 – 130	100
Average Risk			
61 – 70	BBB	110 – 220	160
51 – 60	BB	190 – 300	240
41 – 50	B	270 – 410	350
Excessive Risk			
31 – 40	CCC	360 – 490	450
21 – 30	CC	450 – 700	570
10 – 20	C	Above 700	800
0 – 10	In Default		

The ***Risk Rating Method***, a quantitative approach, combines qualitative and quantitative measures. Using this method, we compute a weighted average of grades for four aspects of a country. An analyst grades each factor from zero to 100. A high score indicates a low country risk, while a low score implies high risk. The four factors include the following:

- ***Economic Indicators (EI)*** are easy to obtain and indicate a country's financial condition. Economic Indicators include GDP per capita, GDP growth rate, inflation, and interest rates. Investors are likely to invest in a country with a strong GDP growth rate, a low inflation rate, and stable interest rates.

- ***Debt Management (DM)*** indicates a country's ability to repay a debt and includes money growth, trade balance, foreign and domestic debt, and a government's budget deficit. A country rapidly accumulating debt or experiencing massive trade deficits indicates future instability. Thus, investors would avoid investing in this country because the government could impose taxes on investment, impose capital controls, or seize assets if a crisis erupts.

- ***Political Factors (PF)*** are grades of political stability. A high grade indicates a politically stable country, while a low grade indicates coups, violent protests, and possibly a revolution. This grade incorporates experts' opinions, as analysts lack reliable quantitative measures for political stability. Even if the measure were accurate, a forecast could still be incorrect because an election or revolution can bring new leaders into power who radically alter the rules, regulations, and economy.

- ***Structural Factors (SF)*** include socioeconomic conditions, such as education level, healthcare, and poverty rate.

We calculate a country's score, x, by using Equation 1. The variable w_i indicates a weight, while the score is one of the factors listed above. A weight is positive and ranges between zero and one. For example, if an analyst weighs all factors equally, then every weight is set to 0.25, and a country's score equals the average of its four factors. Furthermore, the weights must sum to one, which we show in Equation 2. After an analyst calculates a country's score, the score always ranges between zero and 100 because the weights sum to one. Finally, an analyst could adjust the weights to reflect their preferences. For instance, some analysts view debt management as an extremely important factor. Thus, they could assign a greater weight to this factor and reduce the weights of other factors.

$$x = w_1 Score(EI) + w_2 Score(DM) + w_3 Score(PF) + w_4 Score(SF) \qquad (1)$$

$$w_1 + w_2 + w_3 + w_4 = 1 \qquad (2)$$

A country's score lies between 0 and 100. If a country possesses a low score, analysts and economists would add a significant risk premium to the risk-free interest rate. Thus, a country's basis points (bps) are greater for lower scores. Moreover, investors could adjust the weights and grades to reflect different time horizons. Therefore, the various weights yield distinctive risk forecasts for short-term, medium-term, and long-term investments. For example, some analysts assign more weight to debt management and political factors for short-term investments. In comparison, they assign more weight to economic indicators and structural factors for long-term investments.

The Risk Rating Method appears objective because an analyst calculates a country's risk rating from economic data. However, the formula weights are subjective because an analyst selects the weights arbitrarily. Consequently, this method is an art rather than a science.

International Credit Rating Agencies

International credit-rating agencies do not focus on risk for particular companies but assess investment risk associated with countries. Risk reflects the overall danger to global investors in investing in a specific country because every country has various institutions, laws, and customs. For example, we transferred money to a Jamaican company for a coffee shipment. The company eagerly accepted our money, but it failed to deliver our coffee. In developed countries, we could sue a company to enforce a contract, but Jamaica has weak institutions, and, unfortunately, judges and magistrates may not enforce contracts. An investor's legal options vary by country. Some countries impose harsh rules, regulations, and taxes on businesses, imposing hardship on any business venture.

Two well-known credit agencies are A.M Best and Coface. A.M. Best is an international credit agency that classifies country risk into five tiers. The scale uses Roman numerals and ranges from I to V, with I being the lowest risk while V being the highest risk. Table 2 shows a country's rating for 2025. A.M. Best assesses country risk by analyzing outside factors that can affect an insurer's control and a country's ability to meet its obligations to its policyholders. A.M. Best examines local accounting rules, government policies and regulations, a country's economic growth, and social stability.

Table 2. A.M. Best's Five-Tier Scale for Country Risk for 2025

Rating	Country
Tier 1	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Gibraltar, Guernsey, Ireland, Isle of Man, Jersey, Luxembourg, Netherlands, Norway, Singapore, Sweden, Switzerland, United Kingdom, and United States
Tier II	Bermuda, British Virgin Islands, Cayman Islands, Chile, Czech Republic, Hong Kong, Iceland, Italy, Japan, Liechtenstein, Macau, New Zealand, Poland, Portugal, Slovenia, South Korea, Spain, and Taiwan
Tier III	Anguilla, Bahamas, China, Cook Islands, Croatia, Curacao, Cyprus, Greece, Hungary, Israel, Kuwait, Malaysia, Malta, Mexico, Qatar, Romania, Saudi Arabia, St. Lucia, St. Maarten, Thailand, Turks and Caicos, United Arab Emirates, and St. Kitts and Nevis
Tier IV	Albania, Antigua and Barbuda, Armenia, Azerbaijan, Bahrain, Barbados, Belize, Botswana, Brazil, Brunei Darussalam, Bulgaria, Colombia, Costa Rica, Dominican Republic, El Salvador, Georgia, Guatemala, Guyana, India, Indonesia, Jamaica, Jordan, Kazakhstan, Mauritius, Morocco, North Macedonia, Oman, Panama, Paraguay, Peru, Philippines, Serbia, Seychelles, South Africa, Trinidad and Tobago, Turkiye, Uruguay, and Vietnam
Tier V	Algeria, Angola, Argentina, Bangladesh, Belarus, Bhutan, Bolivia, Bosnia and Herzegovina, Cambodia, Cameroon, Côte d'Ivoire, Ecuador, Egypt, Ethiopia, Gabon, Ghana, Honduras, Iraq, Kenya, Laos, Lebanon, Libya, Maldives, Micronesia, Moldova, Mongolia, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Russia, Senegal, Sierra Leone, Sri Lanka, Suriname, Tanzania, Togo, Tunisia, Ukraine, Uzbekistan, Venezuela, Zambia, and Zimbabwe

Source: A.M. Best. 2025. Available from http://www3.ambest.com/ratings/cr/crisk.aspx (accessed on 8/27/2025)

Coface, France's export credit underwriter, is another international credit-rating agency. Table 3 shows Coface's 2025 rating of countries. The A1 category includes the lowest risk countries, while the D category includes highly risky countries. Coface offers insurance to companies that deal with foreign companies. If a foreign business defaults on a payment to the insured company, then Coface would pay the insurance claim. Unfortunately, a foreign company could suffer financial troubles from bankruptcy, violent protests, revolution, or an international war. Consequently, companies pay greater insurance premiums for insuring business transactions as foreign companies operate businesses in high-risk countries. Finally, Coface compiles a similar ranking scale for countries' business climate.

Table 3. Coface's Seven-Tier Rating of Countries for 2025

Country	Rating	Definition of Rating
Denmark, Luxembourg, Norway, and Switzerland	A1	Steady political and economic environment has positive effects on an already good payment record of companies. Very small default probability.
Australia, Belgium, Canada, Japan, South Korea, Netherlands, Portugal, Spain, Taiwan, and the United States of America	A2	Default probability is still small even in the case when one country's political and economic environment or the payment record of companies are not as good as A1-rated countries.
Austria, Croatia, Estonia, Finland, France, Germany, Hong Kong, Iceland, Ireland, Malta, New Zealand, Qatar, Singapore, Slovenia, Sweden, United Arab Emirates, and United Kingdom	A3	Adverse political or economic circumstances may lead to a worsening payment record that is already lower than the previous categories. Probability of a payment default is still low.
Cabo Verde, Chile, Costa Rica, Cyprus, Czechia, Greece, Hungary, Indonesia, Israel, Kuwait, Latvia, Lithuania, Malaysia, Mauritius, Philippines, Poland, Rwanda, Saudi Arabia, Slovakia, and Uruguay	A4	An already patchy payment record could be further worsened by a deteriorating political and economic environment. Nevertheless, the probability of a default is still acceptable.
Albania, Armenia, Azerbaijan, Bahamas, Benin, Botswana, Brazil, Bulgaria, China, Côte d'Ivoire, Dominican Republic, Georgia, Guyana, India, Italy, Kazakhstan, Mexico, Morocco, Namibia, Oman, Panama, Papua New Guinea, Paraguay, Peru, Romania, Senegal, Tanzania, Thailand, Trinidad & Tobago, Uzbekistan, and Vietnam	B	An unsteady political and economic environment is likely to affect an already poor payment record.
Algeria, Angola, Bahrain, Barbados, Belize, Bosnia & Herzegovina, Cambodia, Cameroon, Colombia, Congo, Djibouti, Egypt, Ethiopia, Fiji, Gabon, Gambia, Ghana, Guatemala, Guinea, Honduras, Jamaica, Jordan, Kenya, Kyrgyz Republic, Lesotho, Madagascar, Mauritania, Moldova, Mongolia, Montenegro, Nepal, Nigeria, North Macedonia, Serbia, South Africa, Togo, Tunisia, Türkiye, and Uganda	C	A very unsteady political and economic environment could deteriorate an already bad payment record.
Argentina, Bangladesh, Belarus, Bolivia, Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of Congo, Ecuador, El Salvador, Laos, Lebanon, Liberia, Malawi, Maldives, Mali, Mozambique, Myanmar, Nicaragua, Niger, Pakistan, Russian Federation, Sierra Leone, Sri Lanka, Suriname, Eswatini, Tajikistan, Timor-Leste, Turkmenistan, Ukraine, and Zambia	D	High-risk profile of a country's economic and political environment will further worsen further a generally very bad payment record.
Cuba, Iran, Iraq, Libya, Sudan, Venezuela, and Zimbabwe	E	Advised against conducting business because of US sanctions or engaged in a devastating war

Source: Coface. 2025. Rating Table. Available from https://www.coface.com/news-economy-and-insights/business-risk-dashboard/comparative-table-of-country-assessments (accessed on 8/27/2025)

Key Terms

political risk
firm specific risk
special dispensation
global specific risk

trade bloc
country risk
transfer risk
Transparency International
fronting loans
leverage
risk-free interest
risk premium
basis points (bps)
Risk Rating Method
international credit-rating agencies

Chapter Questions

1. How can a firm safeguard its business interests in a foreign country through strategic facility location, effective intellectual property rights management, and strategic leverage?

2. Which industries does a government usually protect?

3. How does a firm use export creation to reduce a country's risk?

4. Define special dispensation.

5. We had purchased bonds from a country with a CCC credit rating. Calculate the expected interest rate we would charge if a comparable U.S. Treasury security has an interest rate of 5%, and we use the average bps for this grade level.

6. What is the Risk Rating System, and which four factors are included in this system? Please explain whether or not the Risk Rating System is objective.

7. Distinguish between qualitative and quantitative measures for measuring a country's risk?

8. How would we rate Hong Kong using A.M. Best and Coface?

9. How would we rate Ukraine using A.M. Best and Coface?

Answers to Chapter Questions

Answers to Chapter 1 Questions

1. The purpose of financial markets and financial institutions is to connect savers with borrowers. Wealthy countries have developed financial markets. If savers hide their money under the mattress, they effectively remove it from the economy. Then banks cannot inject the savings into an economy by lending to households and businesses.

2. Financial institutions accumulate and analyze information about borrowers and their ability to repay loans, which lowers the lending risk to various borrowers and increases liquidity. Savers can easily convert their deposits into cash.

3. Many assets are technically not money, but the public can easily convert them into cash. Thus, some assets are good as money, which we call liquid.

4. A central bank uses the money supply to affect its economy. The goal is to maintain a growing economy at a sustainable rate, characterized by low unemployment and low inflation.

5. Three variables are inflation, GDP, and interest rates.

6. Inflation is a continual increase in the average prices; GDP measures the total amount of production of all goods and services within the economy annually. Finally, interest rates reflect the borrower's cost, but are a benefit to the saver.

7. Real refers to a variable with the impact of inflation removed, whereas nominal means inflation still influences the variable.

8. Barter is inefficient because it does not allow people to specialize in the production of goods and services. Furthermore, it requires a large number of exchange ratios. People would have considerable search costs to find each other, and people could not store perishable products.

9. Money becomes a medium of exchange, a store of value, a unit of account, and a standard of deferred payment. Each function of money overcomes a problem with barter and allows people to specialize in the production of goods and services.

10. Seigniorage allows governments to create value out of thin air by minting coins. Seigniorage occurs when the face value of a coin exceeds the cost of minting the coin.

11. Debit cards are electronic. They allow customers access to their deposits from anywhere within the United States and developed countries around the world. Checks enable people to exchange money by depositing funds at a bank. Checks are helpful for large transactions. Fiat money is paper money and is more convenient to carry around than gold coins. However, a

central bank can print as much fiat money as it needs. Finally, commodity money retains its value and serves other purposes beyond its role as money.

12. The transaction approach focuses on any assets that are used as money in a transaction, while the liquidity approach defines any liquid assets as money. People can easily convert some assets to cash, effectively turning them into money.

13. M2 differs from M1 by the small denomination time deposits and savings accounts. Differences between L, M3, M2, and M1 indicate the size of a country's financial system. Significant differences imply a country has more developed financial markets.

14. Credit cards are loans from a bank or finance company. Of course, many people use credit cards as money, further complicating the definition of money even more.

Answers to Chapter 2 Questions

1. Bank deposits are liquid. Banks diversify their loans as a way to reduce the risk. Finally, banks collect information about borrowers, so banks know whom to lend to, reducing the default risk.

2. Stocks are ownership of a corporation, while bonds are a loan to a corporation.

3. The primary market is for newly issued stocks and bonds, while the secondary markets allow investors to buy or sell existing stocks or bonds. Dealers usually operate in the primary market, while the secondary market is an exchange.

4. The presence of a secondary market increases liquidity. Thus, investors can sell their securities easily if they no longer wish to hold them.

5. Financial disintermediation occurs when depositors withdraw their deposits from financial institutions and invest directly in the financial markets, seeking better returns and/or reduced risks.

6. Money market instruments include: U.S. Treasury bills (T-bills), commercial paper, bankers' acceptances, negotiable bank certificates of deposit (CDs), repurchase agreements, Federal Funds, and Eurodollars. Capital market instruments are Treasury notes (T-notes), Treasury bonds (T-bonds), general-obligation bonds, revenue bonds, and mortgages.

7. The money market is for securities with a maturity of less than one year, while the capital market includes securities with maturities of over one year.

8. Stock has no maturity date because a corporation can live forever, theoretically.

9. A state bank has a charter from a state government, while a federal bank has a charter from the U.S. federal government.

10. The Comptroller of the Currency, the FDIC, and the Fed regulate the national banks. A state bank could be regulated by one or more regulatory agencies, depending on the state where the bank is located.

11. The U.S. government wants a stable financial system that protects banking customers, encourages homeownership, promotes efficiency in the intermediation process, and controls the money supply.

12. The FDIC insures bank deposits up to $250,000 per person, not per account. The FDIC helps prevent bank runs, which wiped out the banking system during the Great Depression.

13. The FDIC liquidates a bank's assets and refunds the deposits to the depositors, or the FDIC finds another bank to merge with the failed bank. Then the FDIC will grant low-interest loans or buy the bad loans to make a bank merger more attractive.

14. A bank run occurs when depositors show up at their bank at once and demand their deposits back. A contagion occurs when one bank run triggers other bank runs, even among financially healthy banks. A financial panic is a wave of bank failures that pushes a society into a severe recession.

15. Countries repealed laws that allow international businesses to operate outisde their borders. Furthermore, growing incomes enable people and businesses to invest more funds in international markets. Finally, corporations and banks are global as their activities spread across borders.

16. A government wants a stable financial system and financial institutions to disclose accurate information. Regulations help a central bank exert more control over monetary policy.

17. First, a bank acquires stock in another bank, allowing it to cross a state line. Second, a bank can issue commercial paper on itself and transfer funds between subsidiaries. Finally, banks could acquire nonbanks and enter other spheres of activity.

18. A nonbank bank stops one function, like accepting deposits or granting loans; thus, it is no longer a bank. Furthermore, Automated Teller Machines allow customers to bank from a distance, even in foreign countries.

19. Banks offer MMDA, while financial companies offer MMMF. Thus, the MMDA is covered by deposit insurance, while MMMFs are not.

Answers to Chapter 3 Questions

1. One person, the owner, is limited in the level of capital they can raise. However, corporations can issue stocks and bonds and raise millions or billions of dollars. Partnerships can raise capital by pooling funds from two or more partners.

2. Corporations can raise a substantial amount of capital, have limited liability, easily transfer ownership, have continuity of life, and are free from the mutual agency relationship.

3. A corporation could issue preferred stock or corporate bonds because it does not dilute the shares of the common stockholders.

4. A common fraud occurs when a subsidiary hides a corporation's debt and excludes it from the corporation's financial statements. Enron used this tactic to hide its massive debt.

5. Unfortunately, this was a bad investment. Our rate of return is:

$$return = 100 \cdot \frac{\$0.5}{\$25} + 100 \cdot \frac{\$15 - \$25}{\$25} = -38\%$$

6. If we had read the chapter carefully, we would have seen that the U.S. experienced a massive financial crisis in 2008. If we examined the U.S. financial system, many business leaders became ingenious at circumventing regulations.

7. A bank as part of a Keiretsu can cause problems. When the Japanese economy entered a three-decade recession in the 1990s, the bank continued lending to its partners, despite not being justified to do so.

8. We need to examine the incentives. Counselors want to maximize their salaries, so they enroll as many students as possible, even students who should not enroll. The university's management seeks individuals who possess the drive and ability to complete their education.

9. This is a case when investors use a euphemism to describe investment opportunities. Emerging economies were third-world countries. Would we invest in an emerging market or a third-world country? Emerging market sounds better.

10. A country could produce within the interior of a production possibilities curve. It means a society is not utilizing all of its resources, including workers who are available for employment.

11. A company can circumvent trade barriers, gain access to resources in China, request tax breaks and subsidies from the Chinese government, reduce economic exposure, and diversify its business. Furthermore, both labor and transportation costs are cheaper. Finally, a company in

China could expand to other cities if it experiences strong demand for its products and services.

12. Free trade occurs when a country specializes in producing a good and then exports it to its trading partner. The trading partner does the opposite, so free trade is the mutual exchange of products. Outsourcing is when a firm sends part of its production outside the country to reduce costs. However, the firm sells the cheaper product in its home country. A mutual exchange of products does not occur, and thus, outsourcing is not free trade.

13. Bosnia would produce 500 units of tobacco and 250 units of coffee. Colombia grows 250 units of tobacco and 500 units of coffee. Thus, total coffee and tobacco production are 750 units each. If they engage in trade, Bosnia produces 1,000 units of tobacco while Colombia produces 1,000 units of coffee. Consequently, both countries gain 250 units in production for both commodities after trade.

Answers to Chapter 4 Questions

1. Banks can structure their business to circumvent regulations or lower taxes. Furthermore, banks can accept deposits in one country and lend to borrowers in another country.

2. An offshore market is where banks are located in countries with lax regulations, low taxes, and strict consumer confidentiality. The traditional offshore markets include the Bahamas, Cyprus, Hong Kong, Malta, Singapore, and Switzerland.

3. A U.S. bank can open a branch bank or form a holding company with another bank in another country. A U.S. bank can become an Edge Act corporation or an international banking facility.

4. A foreign bank forms an agency office, opens a foreign bank branch in the U.S., or acquires an existing U.S. bank, converting it into a subsidiary.

5. Exchange rate risk is the change in the asset's value that is denominated in another currency. When the exchange rate changes, investors can gain or lose depending which way the exchange rate moves.

6. The value of the loan is $100,000 or one million pesos. However, the loan drops in value to $66,666.67. Remember, the dollar appreciated while the peso depreciated. Thus, the investors lose value in investments denominated in depreciating currencies.

7. A spot market is where the buyer and seller immediately exchange a commodity for money. In contrast, a derivative market involves the buyer and seller agreeing on a price today, with the commodity being exchanged for the money on a future date.

8. A forward contract is a tailor-made contract that a bank usually issues. Buyer and seller agree to a price and quantity today, and they exchange the commodity and money on a future date.

9. A spot against a forward is a particular currency swap. An investor buys currency today from a bank on the spot market and sells the currency back to the bank on a specific date for a specific price in the future.

10. A currency swap allows a corporation to invest in a foreign country by borrowing from its local bank. Then the company swaps its debt obligation with a foreign company to get the currency it needs for investing in another country.

11. An exporter and an importer do not know each other, but can enter a transaction. A bank creates credit on behalf of the importer, guaranteeing payment.

12. Eurodollars are U.S. dollars held in foreign bank accounts, while Euroloans and Eurobonds are debt instruments denominated in dollars. The U.S. dollar is the international reserve currency and is relatively stronger than other currencies. Dollars have little exchange rate risk.

13. The banking system connects all countries, but a government's regulation is limited when a bank’s business crosses a border. Countries have different deposit insurance and regulations, and banks have become skilled at circumventing these regulations when entering the international markets.

Answers to Chapter 5 Questions

1. Brokers, investment bankers, and organized exchanges. For example, the New York Stock Exchange is an organized exchange, while bond dealers buy and sell government and corporate bonds. Finally, Lehman Brothers was an investment bank that went bankrupt during the 2008 Financial Crisis.

2. The Dow Jones Average is an average of the top, blue-chip stocks on the New York Stock Exchange. Some stocks rise while others fall. However, a market index shows a trend in stock prices.

3. A stock market crash occurs when stock prices reach a peak and quickly plummet. People and investors hold stock as wealth. If stock prices fall too, then people’s wealth disappears. Furthermore, some investors borrowed to buy stock, and they cannot repay the loans. Thus, a stock market crash could lead to a severe financial crisis.

4. Mutual funds and finance companies. For example, Vanguard offers mutual funds, while GMAC offers financing for automobiles.

5. Adverse selection occurs when a person who knows they drive recklessly buys insurance to protect their car. Moral hazard occurs when a driver becomes more careless, such as leaving their keys in the car, which allows a thief to steal the car easily.

6. Insurance companies and pension funds. For example, AIG is a large insurance company, while TIAA-Cref is a pension company for teachers and professors.

7. Commercial banks, savings institutions, and credit unions.

8. Common U.S. government institutions referred to in this book are the Federal Deposit Insurance Corporation, Fannie Mae, Freddie Mac, and Sallie Mae.

9. The college bubble is not likely to affect France. Once French students graduate or drop out and cannot find employment, they have little or no debts to repay because of the extremely low tuition. The French students only lose the value of their time at the university.

Answers to Chapter 6 Questions

1. Crypto users can do one or more of the following: first, crypto users may dodge and not pay their taxes. Second, users can use crypto to launder money, also known as money laundering. Third, crypto users can circumvent a country's currency controls; countries with economic sanctions may utilize cryptocurrencies to circumvent these sanctions. Fourth, criminals may offer illegal products and services while being paid in cryptocurrencies. Lastly, crypto users may engage in international trade while using crypto as a means of payment.

2. Cryptocurrencies have rapidly appreciated in value. The rapidly growing market created thousands of crypto millionaires in 2017. Several investors have even become billionaires. Thus, cryptocurrencies allow investors to diversify their portfolios and add rapidly appreciating assets.

3. Proof of work and proof of stake allow the creation of newly minted coins. The miners earn newly minted cryptocurrencies as they solve the problem and add a new block to the blockchain. For proof of stake, investors can deposit their coins on the company's crypto network. Then they earn interest as the network mines new coins.

4. When investors buy a cryptocurrency, they are essentially investing in a specific company's network system. Some coins allow investors to vote on corporate policy, similar to stock, but coin holders may not have claims to the company's assets if the company becomes bankrupt. In addition, the straightforward buying and selling of cryptocurrency function similarly to money.

5. The crypto wallet does not store transactions. Instead, it reads the blockchain for a particular number and lists the balance and transactions for cryptocurrencies. Nevertheless, the crypto wallets store both the private and public keys. Users need their private keys to approve a transaction. Suppose a hacker gets a user's private key, the hacker has control over the crypto wallet and can conduct transactions, usually taking all the user's cryptocurrencies and moving them into the hacker's crypto wallet.

6. A decentralized ledger that records transactions across a network of computers. Blockchains are made up of blocks linked together by cryptographic codes, which forms a database. Cryptocurrencies use a blockchain and are digital financial assets that represent money.

7. The answer is below:

   3c78f599f1512f8ce7bd32f07e29b69cb8c5e5b907075a4fb8fcb8d846cf1691

Answers to Chapter 7 Questions

1. Net income is calculated as \$50,000 + \$60,000 – \$100,000 – \$30,000 – \$30,000, resulting in a net loss of –\$50,000.

2. Retained earnings are \$20,000 + \$50,000 – \$60,000 = \$10,000. Do not include the sales of stock because stock transactions are recorded under the common stock account.

3. Cash balance equals \$10,000 – \$70,000 + \$100,000 – \$10,000 = \$30,000. Do not include the accounts receivable because these are credit sales, and the business did not collect cash.

4. We calculated it below:

$$PV_0 = \frac{PV_T}{(1+i)^T} = \frac{\$1{,}000{,}000}{(1+0.05)^{100}} = \$7{,}604.49$$

5. We calculated it below:

$$PV_T = PV_T(1+i)^T = \$5{,}000(1+0.1)^{50} = \$586{,}954.26$$

6. Substitute the known variables into the equation and use algebra to solve for the interest rate, i, which equals 9.54%.

$$FV_2 = PV_0(1+i)^T$$
$$\$1{,}200 = \$1{,}000(1+i)^2$$
$$i = 0.0954$$

7. Using the Rule of 72, our bank account doubles in 24 years, or 72 ÷ 3.

8. Using the Rule of 72, the U.S. economy doubles in 14.4 years, or 72 ÷ 5.

9. We calculated it below:

$$PV_0 = \frac{\$1{,}000}{(1+0.07)^0} + \frac{\$1{,}000}{(1+0.07)^1} + \frac{\$1{,}000}{(1+0.07)^2} = \$2{,}808.02$$

10. We calculated \$2,928.54. The question was unclear because we did not know when the deposit was made. Consequently, we showed deposits being made at the beginning of the period.

$$FV_3 = \$700(1+0.03)^3 + \$700(1+0.03)^2 + \$700(1+0.03)^1$$
$$FV_3 = \$2{,}228.54$$

11. We calculated the present value of

$$PV_0 = \frac{\$100}{(1+0.01)^1} + \frac{\$100}{(1+0.01)^2} + \frac{\$100}{(1+0.01)^3} = \$294.10$$

12. We calculate the growth in the savings account for each compounding frequency.

$$FV_{30} = \$500(1+0.05)^{30} = \$2{,}160.97$$
$$FV_{30} = \$500\left(1 + {}^{0.05}\!/_{12}\right)^{12\cdot 30} = \$2{,}233.87$$
$$FV_{30} = \$500 \cdot e^{0.05\cdot 30} = \$2{,}240.84$$

13. We calculate the effective annual rate (EAR) of 12.55% below.

$$EAR = \left(1 + {}^{0.12}\!/_{4}\right)^4 - 1 = 0.1255$$

14. Using the formula for an ordinary annuity, we calculate the annuity value of \$81,990.98 below:

$$FV_T = \$2{,}000\left[\frac{(1+0.07)^{20} - 1}{0.07}\right] = \$81{,}990.98$$

15. Using the formula for an ordinary annuity, we calculate our annual payments as \$4,817.11 below:

$$P = \frac{0.05 \cdot \$50{,}000}{1 - (1+0.05)^{-15}} = \$4{,}817.11$$

16. We calculate the monthly mortgage payment of $3,326.38 below. We could have rounding error.

$$P = \frac{0.005833 \cdot \$500{,}000}{1 - (1 + 0.005833)^{-30 \cdot 12}} = \$3{,}326.38$$

17. We calculate the present value of 43,126.54 RM below:

$$PV = 2{,}000€\left(4.00\, {}^{RM}/_{€}\right) + \frac{3{,}000€\left(4.25\, {}^{RM}/_{€}\right)}{(1+0.04)^1} + \frac{4{,}000€\left(4.50\, {}^{RM}/_{€}\right)}{(1+0.04)^2} + \frac{5{,}000€\left(5.00\, {}^{RM}/_{€}\right)}{(1+0.04)^3}$$
$$PV = 43{,}126.54\ RM$$

Answers to Chapter 8 Questions

1. Both a note payable and a corporate bond are loans to the corporation. However, a bond is standardized and allows investors to buy and sell them in the secondary markets, while a bank usually grants a note payable.

2. Bonds are a liability that could lower a corporation's tax burden. Furthermore, the bondholders do not vote at a corporate stockholders' meeting and thus, do not compete with the stockholders over control of a corporation. Consequently, stockholders could earn a higher dividend if a corporation uses bonds to expand operations.

3. We adjusted the calculation already for the annual yield to maturity of the discount bond, which is:

$$PV_0 = \frac{FV_1}{\left(1 + {}^{r \cdot T}/_{360}\right)} = \frac{\$20{,}000}{\left(1 + {}^{0.03 \cdot 270}/_{360}\right)} = \$19{,}559.90$$

4. We calculated it below:

$$PV_0 = \frac{FV}{i} = \frac{\$100}{0.06} = \$1{,}666.67$$

5. We calculated it below:

$$PV_0 = \frac{\$100}{(1+0.025)} + \frac{\$100}{(1+0.025)^2} + \cdots + \frac{\$2{,}100}{(1+0.025)^6} = \$2{,}275.41$$

6. We calculated it below:

$$PV_0 = \frac{\$100}{(1+0.1)} + \frac{\$100}{(1+0.1)^2} + \cdots + \frac{\$2{,}100}{(1+0.1)^6} = \$1{,}564.47$$

7. Money market securities have maturities of less than a year. Thus, when the interest rate changes, the money market securities swing less in market value as compared to the capital market securities.

8. When the interest rate decreases, the value of bonds increases. Thus, we should buy bonds now and resell them for a higher price when the interest rate decreases. However, if we are wrong, then we lose money, or we could be holding onto the bonds for a while.

9. We set up the equation as below:

$$\$4{,}500 = \frac{\$5{,}000}{(1+YTM)^3}$$

Then we use algebra to solve for the YTM, equaling 3.57%.

10. We computed it below:

$$P_0 = \frac{D}{r-g} = \frac{\$1}{0.04 - 0.03} = \$100.00$$

11. First, we set $D_1 = D_2 = 0$. Second, we calculate the stock price as below:

$$P_2 = \frac{D_3}{r-g} = \frac{\$1}{0.10 - 0.05} = \$20.00$$

However, this is for Year 3. Then we discount the cash flow back to Year 0, yielding the present value below:

$$P_0 = \frac{\$20.00}{(1+0.10)^2} = \$16.53$$

Answers to Chapter 9 Questions

1. The six factors include wealth, expected returns, expected inflation, risk, liquidity, and information costs.

2. The four factors are expected profits, business taxes, expected inflation, and government borrowing.

3. Demand for bonds decreases and shifts leftward. Thus, both the bond price and quantity decrease. Furthermore, the bond interest rate would rise.

4. Supply for bonds decreases and shifts leftward. Thus, the bond price increases while quantity decreases. Furthermore, the bond interest rate would fall.

5. Demand for bonds increases and shifts rightward. Thus, both the bond price and quantity rise. Furthermore, the bond interest rate would decrease.

6. During a business cycle, both supply and demand for bonds increase and shift rightward. During a recession, both the supply and demand for bonds decrease and shift leftward. Thus, the quantity increases during the business cycle and decreases during a recession. However, bond prices and bond interest rates are indeterminate.

7. The approximate real interest rate equals -10% because 0.9 = r + 1.00. Meanwhile, the real interest rate is -5% for the exact. We have a significant discrepancy.

$$(0.90 + 1) = (1 + r)(1 + 1.00) = -0.05$$
$$\frac{1.9}{2.0} = 1 + r$$
$$r = -0.05$$

8. If investors, businesses, and the government expect higher inflation, then the supply of bonds increases while investors purchase fewer bonds because inflation erodes the value of their investments. Businesses and governments issue more bonds because they can repay them with cheaper dollars. Thus, the bond price decreases, while the nominal interest rate rises.

9. Loanable funds and the bond market are opposites of each other. Loanable funds indicate the direction the money flows, while the bond is the product. If investors buy a bond, they are supplying money, i.e., loanable funds. If a business issues bonds, then it demands money, i.e., loanable funds.

10. The world’s interest rate is higher. Thus, investors would loan their surplus funds abroad to earn a greater interest rate.

11. The world’s interest rate is lower. Thus, businesses and the government would borrow cheaper funds from foreign investors.

Answers to Chapter 10 Questions

1. Investors are usually risk-averse. Thus, investors increase their demand for the low-risk bonds and decrease their demand for the high-risk ones. Consequently, bond prices rise for the lower-risk bonds but decrease for the higher-risk bonds. Thus, the interest rates are lower for the low-risk bonds and higher for the high-risk bonds.

2. Investors prefer to hold liquid securities. Investors increase their demand for the highly liquid bonds and decrease their demand for the less liquid ones. Consequently, bond prices rise for the liquid bonds but decrease for the non-liquid bonds. Therefore, the interest rates are lower for the liquid bonds and higher for the non-liquid bonds.

3. Investors prefer to invest in securities that entail low information costs. Investors increase their demand for low-information-cost bonds and decrease their demand for high-information-cost ones. Consequently, bond prices increase for low-information-cost bonds and decrease for high-information-cost bonds. Hence, the interest rates are lower for the bonds with low information costs and higher for the other bonds.

4. Investors prefer to invest in securities that have lower taxes. Investors increase their demand for the tax-exempt bonds and decrease their demand for the taxed ones. Consequently, bond prices rise for the tax-exempt bonds but decrease for the taxed bonds. Thus, the interest rates are lower for the tax-exempt bonds and higher for the taxed bonds.

5. The term structure of interest rates refers to an entity that offers a large variety of securities with different interest rates. Thus, the securities have the same risk, liquidity, information costs, and taxes. However, the interest rates still differ; long maturity interest rates tend to be higher than those of shorter maturities.

6. The three theories are segmented markets theory, expectations theory, and preferred habitat theory. The segmented markets theory suggests that investors prefer to invest in specific bond markets, each with its unique supply and demand. The expectations theory suggests that investors would invest in longer-term securities because they anticipate a higher interest rate, which in turn causes a positively sloping yield curve. The preferred habitat theory suggests that investors prefer a specific type of bond. However, they are persuaded to invest in a longer-term security if they receive a higher interest rate, via the term premium. The preferred habitat theory does the best in explaining the characteristics of the yield curve.

7. An inverted yield curve indicates that either investors are pessimistic about the future or the Federal Reserve has implemented quantitative tightening. Thus, the economy usually enters a recession a year later.

Answers to Chapter 11 Questions

1. Liabilities include demand deposits, savings accounts, small and large-denomination time deposits, borrowings, discount loans, and federal funds (if the bank borrowed funds). Assets include vault cash, deposits at other banks, deposits at the Federal Reserve, loans, and the bank’s physical assets like its buildings and computers. The capital reflects a bank’s net worth.

2. A bank’s net worth equals the bank’s total assets minus total liabilities. Investors want a positive net worth because the stockholders have a claim on assets if the bank is liquidated.

3. Liquidity risk is the risk that depositors show up at the bank and withdraw too much at one time. Consequently, the banks must use good management to meet depositors' withdrawals.

4. Something severe happens to a bank that causes total liabilities to exceed total assets.

5. Banks use credit risk analysis, collateral, credit rationing, credit histories, and restrictive covenants to reduce adverse selection. Furthermore, banks could foster a long-term relationship with their customers.

6. The housing bubble deflated, causing housing prices to plummet. If a bank forecloses on a home that is losing value, then too many foreclosures cause total liabilities to exceed total assets.

7. Banks categorize their assets and liabilities into long-term and short-term categories. Then banks scrutinize the short-term assets and liabilities because if the interest changes, it immediately impacts these assets and liabilities. Banks can develop strategies, whether a bank manager believes interest rates will rise or fall.

8. Floating-rate debt is a loan with a variable interest rate. If the interest rate increases, then borrowers must pay more interest on their loans.

9. Securitization is the bundling of illiquid assets like mortgages into a fund. This fund then allows investors to invest in it. A fund offers different tranches with different credit ratings and rates of return.

10. This is a tricky question. If banks retained their rigid lending standards and the credit-rating agencies accurately rated the CDOs and ABS, then the housing bubble would still form, but at a slower rate. The Great Recession would still have occurred, but the effects would not have been as harmful and severe.

Answers to Chapter 12 Questions

1. The Fed's assets are the discount loans and holdings of U.S. government securities, while its liabilities are bank reserves and currency in circulation.

2. The money multiplier shows how the money supply changes when the monetary base changes. Consequently, the public, banks, and the Fed all influence the money multiplier.

3. We calculated it below:

$$\Delta \text{Deposits} = \Delta \text{Reserves} \times \frac{1}{r_r} = \$50{,}000 \times \frac{1}{0.05} = \$1\ million$$

4. We calculated it below:

$$\Delta \text{Deposits} = \Delta \text{Reserves} \times \frac{1}{r_r} = -\$10{,}000 \times \frac{1}{0.20} = -\$50{,}000$$

5. We calculated this below. Do not include the first \$1,000 because the person converted \$1,000 of currency into a bank deposit.

$$\Delta \text{Deposits} = \Delta \text{Reserves} \times \frac{1}{r_r} = \$900 \times \frac{1}{0.1} = \$9{,}000$$

6. We calculated this below. Please exclude the first \$5,000 because the person withdrew \$5,000 from his checking account and converted it into cash.

$$\Delta \text{Deposits} = \Delta \text{Reserves} \times \frac{1}{r_r} = -\$4{,}500 \times \frac{1}{0.1} = -\$45{,}000$$

7. The currency-to-deposit ratio represents the portion of money held by the public as currency. An increase in wealth, higher interest rates, lower risk from bank failures, and an increase in illegal activities will decrease this ratio.

8. This occurred during the 2008 Financial Crisis. The Federal Reserve granted \$2 trillion in loans. However, the banks held onto this money and did not increase loans. Thus, the multiple deposit creation ceased to work. The purpose of the bailout was to get the U.S. banking system to start lending again. Of course, the Fed started paying interest on bank reserves.

9. Banks and the public can thwart the Fed's action by changing their behavior. Banks can hold excess reserves, while the public influences the currency to deposit ratio.

10. We calculated both the M1 and M2 money multipliers below:

$$m_2 = \left[\frac{C/_D + 1}{C/_D + R/_D}\right] = \left[\frac{0.55\bar{5} + 1}{0.55\bar{5} + 0.77\bar{7}}\right] = 1.667$$

$$m_2 = \left[\frac{C/_D + T/_D + 1}{C/_D + R/_D}\right] = \left[\frac{0.55\bar{5} + 1.33\bar{3} + 1}{0.55\bar{5} + 0.77\bar{7}}\right] = 2.167$$

Answers to Chapter 13 Questions

1. The Fed's assets include securities, discount loans, Items in the Process of Collection (CIPC), Gold Certificates, Special Drawing Rights (SDRs), coins, buildings, and foreign-currency reserves. The Fed's liabilities are currency outstanding, deposits by depository institutions,

U.S. Treasury deposits, foreign and other deposits, Deferred Availability Cash Items (DACI), and Federal Reserve float. The Fed's net worth equals total assets minus total liabilities.

2. Review the T-account transactions for the checking writing process by adjusting the check amount.

3. Float changes in December and April because people buy Christmas presents in December and pay their taxes in April. Anything could affect the float if it slows down the mail, such as bad weather or a transportation strike.

4. A rise in the float increases both the monetary base and the money supply.

5. The Treasury Deposit increases the Fed's liabilities, shrinking both the monetary base and money supply.

6. If the banks reduce the amount of discount loans, then the Fed's assets fall, decreasing both the monetary base and money supply.

7. The Fed cannot control the U.S. Treasury deposits, the float (CIPC - DACI), gold certificates, SDRs, and foreign government deposits.

8. The U.S. Treasury does not influence the monetary base or money supply by changing taxes or issuing more U.S. securities, as long as it sells the securities to the public.

9. The Fed tries to stabilize interest rates. If the U.S. Treasury issues too much debt, the interest rate will increase as a way to attract more investors. Thus, the Fed must purchase these U.S. securities to lower the interest rate.

10. Developed countries like the United States and Europe want strong currencies. It attracts foreign investors. China and the Asian tigers maintain weak currencies, boosting their export industries. A weak currency can create jobs and generate wealth.

11. A weak dollar means $1 can purchase fewer foreign currencies, i.e., as a basket of currencies, while a strong dollar means $1 can buy more foreign currencies. If the U.S. dollar is strong, subsequently, the U.S. customers buy more imports while the U.S. export industry ships and sells fewer goods to foreign countries. A strong dollar makes foreign products cheaper, and U.S. products become more expensive. Consequently, the U.S. trade deficit worsens.

12. As the Federal Reserve buys or sells foreign currencies, the Fed's assets and liabilities change. Thus, the monetary base and money supply change. Unsterilized transactions do not offset the change in the money supply when the Fed intervenes in the foreign exchange market. In contrast, sterilized transactions involve the Fed using open-market operations to offset any potential change in the money supply as it intervenes in the foreign exchange market.

Answers to Chapter 14 Questions

1. The Federal Reserve has 12 Federal Reserve Banks.

2. Each region of the country has a distinct economy. Thus, each Federal Reserve Bank tailors its services for each unique area. Furthermore, the power of a central bank is dispersed among the 12 Fed banks.

3. The Federal Reserve System has 12 Fed banks. Every national bank must purchase stock in its regional Fed bank and can vote for three directors from the banking. Furthermore, the Board of Governors can choose three directors and approve the choice of the Fed's bank president. Finally, businesses can elect the last three directors.

4. The Board of Governors manages the Federal Reserve System. The Board has seven members whom the U.S. President appoints with Senate approval.

5. The Fed raises its funding independent of the U.S. government. Moreover, the members of the Board of Governors have staggered terms, so one President cannot change the entire board at once. Finally, the U.S. government cannot thoroughly audit the Fed.

6. The Federal Open Market Committee puts monetary policy into action. They determine open-market operations, while the Board of Governors controls the FOMC.

7. The Chairman advises the President and informs Congress on the Fed's actions. The financial analysts pay close attention to the chairman's policies and speeches.

8. The consequences could be disastrous because the country reverses the gains of a single currency. For example, the Greek government faces severe budget problems, as it cannot balance its budget, and investors are reluctant to invest in Greek bonds. The public believes that if the Greek government reintroduces the drachma, it will devalue it to cover budget deficits. Consequently, the Greek citizens started a run on the banks to withdraw their savings in euros before the Greek government will convert the currency to drachmas.

9. The Executive Board implements monetary policy, while the Governing Council determines monetary policy.

10. The euro reduces exchange rate risk, lowers transaction costs, and promotes competition within the Eurozone. However, an EU country loses control of its monetary policy. Moreover, the prices are high relative to incomes in southern Europe, and the European Central Bank is prohibited from helping EU countries, such as buying a country's bonds. The ECB has only one goal – price stability, which means inflation must be 2% or lower.

11. The public interest view is that a government agency solves the problem that it was created to solve. The principal-agent view is that a bureaucracy serves its self-interest and may not perform the actions for which a government made it.

12. Countries with independent central banks usually have low inflation rates.

Answers to Chapter 15 Questions

1. The Fed creates a higher demand in the bond market. Thus, the bond's market price rises while the interest rate falls. The Fed injected reserves into the banking system, expanding the money supply.

2. The Fed increases the supply in the bond market. Thus, the bond's price falls while the interest rate rises. The Fed removed reserves from the banking system, contracting the money supply.

3. If the Fed increases the money supply by 3%, it must buy enough U.S. Treasury securities to achieve this goal. However, the Fed's purchase of securities from the bond market decreases the interest rate. If the Fed concentrated on the interest rate, it would have to buy or sell bonds to achieve the target interest rate. Nevertheless, the buying or selling of bonds changes the bank reserves, and hence, the money supply.

4. A repo is a repurchase agreement. The Fed temporarily buys a U.S. government security, and the seller will repurchase it on a specific date in the future. A reserve repo is when the Fed sells a U.S. government security and agrees to repurchase it on a particular date in the future. Repos temporarily inject reserves into the banking system, while reverse REPOs temporarily remove reserves.

5. A defensive transaction offsets unexpected changes in the money supply, such as bad weather that slows down the check-clearing process. A dynamic transaction is when the Fed implements monetary policy as specified in the general directive.

6. The Fed has complete control over the quantity of securities it can buy or sell. Thus, it can change the money supply by a little or a lot, easily correct mistakes, and implement monetary policy quickly.

7. If the Fed decreases the discount rate, it encourages banks to borrow more from the Fed. A lower discount rate is an expansionary monetary policy because it could inject more funds into the banking system, expanding the money supply. If the Fed raises the discount rate, it subsequently implements contractionary monetary policy.

8. The Fed could grant adjustment credit, seasonal credit, or extended credit.

9. The Fed could audit the bank more, impose fines on the bank, or stop lending to the bank.

10. The Federal Reserve cannot force banks to accept loans. The Fed could lower the discount rate, but banks might not increase their borrowings from the Fed.

11. When the Fed conducts monetary policy, the policy affects the federal funds rate first. If the federal funds rate rises, then the Fed may be pursuing contractionary monetary policy. If the federal funds rate drops, the Fed may subsequently use expansionary monetary policy.

12. Changing the reserve requirements changes the money multipliers. Thus, even a small change in the reserve requirement could have a significant impact on the money supply.

13. One benefit is that the government could eliminate deposit insurance. Banks would hold all deposits. Furthermore, the money multipliers will be one, and the Fed has exact control over the money supply. However, this stops banks from being financial intermediaries. They connect savers to borrowers. Banks are critical to finance mortgages and lend to businesses and households.

14. The Fed's goals are price stability, high employment, economic growth, financial market and institution stability, interest rate stability, and foreign-exchange market stability.

15. The time lags are information, administrative, and impact lags. The economy may be on the verge of a recession. By the time monetary policy influences an economy, the economy is already growing, and the monetary policy causes the economy to grow quickly, creating inflation.

16. Although the Fed has six goals, it cannot control them. However, the Fed uses targets because it has better control over them, and in turn, the targets influence the goals.

17. Monetary policy has an immediate impact on operating targets like the federal funds rate and non-borrowed reserves. Over time, monetary policy influences the intermediate targets. Operating and intermediate targets differ by Fed control and time lags.

18. The Fed must accurately measure the targets and exert control over them. Furthermore, the target must respond to monetary policy predictably, and the target influences the Fed's goals.

19. The Fed's monetary policy reinforces the business cycle. Thus, monetary policy causes the economy to grow faster during a boom cycle and slower during a recession. Monetary policy is supposed to do the opposite and smooth out the business cycles. One way it can occur is from the time lags.

20. Economists suggest other targets, such as nominal GDP, yield curve, commodity prices, and U.S. dollar exchange rate.

Answers to Chapter 16 Questions

1. The purpose of the balance-of-trade accounts is to account for money flows between one country and the rest of the world. Economists classify money flows into categories that allow them to analyze patterns in the cash flows.

2. The current account includes exports and imports, services and transportation insurance, and gifts. A financial account keeps track of investments in real estate, stocks, and bonds. Finally, the official settlements account represents the intervention of the central bank.

3. Statistical discrepancies arise from errors, omissions, and unreported activities. Unreported activities include tax evasion, hiding money from the government, or profits from illegal activities.

4. Three exchange rate regimes are the gold standard, the Bretton Woods System, and flexible exchange rates. The gold standard creates a fixed exchange rate system by setting a weight of gold to a currency's value. The Bretton Woods System was a gold standard that allowed countries to adjust their exchange rate relative to the U.S. dollar, while the U.S. dollar became fixed at $35 = one ounce of gold. Finally, the flexible exchange rate regime allows supply and demand of currencies to determine exchange rates.

5. The World Bank lends to developing countries, helping them invest in their infrastructure, such as new roads, dams, electric power plants, and other key development projects.

6. The IMF is the lender of the last resort to countries with balance of payment deficits. It helps countries finance a balance-of-payments deficit. The IMF has a cache of gold and foreign currencies that it can lend.

7. A balance-of-payment deficit causes a surplus of currency on the international exchange markets. Thus, that country's central bank must buy its currency using official asset reserves. If the country refuses to use reserves or devalue its currency, then black markets would form for its currency.

8. If a country devalues its currency, the impact on the trade deficit does not occur immediately. A country's imports continue rising while its exports fall after a devaluation and then improve after a time lag.

9. The country has too much money flowing into it. Consequently, the central bank increases the money supply and reduces the interest rate. International investors slow down their investments in the country, which reduces the financial account. The central bank can buy foreign currencies with its currency. Surpluses are easy to finance; it is deficits that drain a central bank's resources.

10. Capital flight is similar to a bank run on a foreign country. International investors cause a massive outflow of capital as they cash in their investments. A capital flight could lead to the collapse of a country's currency. Investors use four methods to transfer money out of the country: bank transfers, money laundering, false invoicing for imports and exports, or converting cash into precious metals.

11. This will be a terrible day indeed. If the U.S. dollar collapses in value, then the paper wealth of anyone holding dollars will disappear. Furthermore, the foreigners would stop investing in the U.S. economy and the U.S. government debt. Then trade could halt as nations and people stop accepting dollars for payment unless investors find a replacement currency. A dollar collapse would cause a severe recession for all trading partners.

Answers to Chapter 17 Questions

1. The Pepsi costs 2.25 dirhams.

2. We calculated it below:

$$\left(\frac{2\text{ KM}}{€1}\right)\left(\frac{€0.714}{\$1}\right) = 1.428\,{}^{KM}/_{\$1}$$

3. We calculated the cross-exchange rate below. Did we notice the trick when I calculated the cross rate? Consequently, arbitrage is possible.

$$\left(\frac{2\text{ KM}}{€1}\right)\left(\frac{€1}{100\ kuna}\right) = {}^{1km}/_{50\ kuna}$$

Step 1: The trader converts the convertible markets into euros, calculated below:

$$500{,}000\ KM\left(\frac{1€}{2\ KM}\right) = 250{,}000€$$

Step 2: The trader converts the euros into Croatian kunas, shown below:

$$\left(\frac{100\text{ kuna}}{€1},\right) = 25{,}000{,}000\text{ kunas}$$

Step 3: The trader converts the kunas back into Bosnian convertible marks, calculated below. Consequently, the trader earns 43,478.26 KM in profits.

$$\left(\frac{1\text{KM}}{46\text{ kuna}}\right) = 543{,}478.26\text{ KM}$$

4. Supply for U.S. dollars comes from people holding U.S. dollars, and they trade those dollars for another currency. A demand for currency in one market automatically creates a supply of currency in another market as people exchange currencies. Finally, a central bank could expand the supply of U.S. dollars.

5. Americans buy fewer Mexican-made goods. Thus, the demand for pesos falls and shifts leftward. Consequently, the peso depreciates while the U.S. dollar appreciates, causing Mexican imports to decrease while exports increase.

6. The Federal Reserve must reduce the supply of U.S. dollars. It can trade euros for U.S. dollars, causing the U.S. dollar to appreciate and the euro to depreciate. However, the European Central Bank can nullify this by purchasing the supply of euros with U.S. dollars. Hence, the Federal Reserve bought U.S. dollars off the currency exchange markets while the European Central Bank injects new U.S. dollars in their place.

7. Foreign investors reduce their demand for U.S. currency, shifting the demand function leftward. Furthermore, U.S. investors invest in other countries for a higher interest rate. As they convert their U.S. dollars into another currency, the supply function for U.S. dollars increases. Consequently, the U.S. dollar depreciates while the market quantity of U.S. dollars becomes ambiguous.

8. A lower demand for the Uzbek som causes the som to depreciate against the U.S. dollar. The Uzbek central bank must reduce its supply on the currency exchange markets by purchasing som with its official reserves. The supply for som decreases and shifts leftward, returning the som to the original exchange rate.

9. Japan has a low risk of capital flight. The Central Bank of Japan holds most of the Japanese debt. International investors have few investments in Japan. Consequently, if the Japanese government defaulted on its debt, Japan could contain the crisis. However, the crisis could spread to other countries. France, the United Kingdom, and the United States have much higher debts. Bond investors may stop lending to these countries, causing severe crises.

Answers to Chapter 18 Questions

1. The best forecast for a random walk is the previous period’s value, 3 RM per U.S. dollar.

2. First, countries erected trade restrictions and barriers that prevent the free flow of goods entering or leaving a country. Second, PPP does not include transportation and transaction costs. Third, some services are not internationally traded, such as haircuts and real estate. Finally, countries define their basket of goods differently.

3. Buy the Big Macs from Japan for \$3.22 and ship them to Switzerland for \$7.99.

4. The Japanese yen is undervalued approximately 46.29% relative to the U.S. dollar.

$$\dot{P}_{Big\ Mac} = \frac{P_{Jaoan} - P_{U.S.}}{P_{U.S.}} \cdot 100 = \frac{\$3.11 - \$5.79}{\$5.79} 100 = -46.29\%$$

5. The PPP only includes the absolute price levels, while the relative PPP allows relative price differences between countries because the inflation rates cause the exchange rate to change predictably.

6. Using the approximation, the U.S. dollar appreciates approximately 4% per year relative to the Russian ruble (or 7% – 3%). Using the exact formula, the U.S. dollar appreciates 3.9% relative to the ruble.

$$e = \frac{1 + \pi_f}{1 + \pi_d} - 1 = \frac{1 + 0.07}{1 + 0.03} - 1 = 0.039$$

7. We calculated the U.S. competitive ratio below: Thus, U.S. exports are competitive.

$$k = \frac{1 + \pi_f}{(1 + \pi_d)(1 + e)} = \frac{1 + 0.02}{(1 + 0.03)(1 + 0.02)} = 0.971$$

8. We assume the change in the velocity of money is zero because the problem did not refer to it. If the ringgit is defined as the home currency, the ringgit should appreciate approximately 1% per year, calculated below:

$$\dot{s} = \left(\dot{m}_{US}^{S} - \dot{m}_{Malay}^{S}\right) + \left(\dot{v}_{US} - \dot{v}_{Malay}\right) + \left(\dot{y}_{Malay} - \dot{y}_{US}\right) = 0.02 - 0.05 + 0.07 - 0.03$$
$$\dot{s} = 0.01$$

9. The home currency should depreciate approximately 2.5%, calculated below:

$$e_{f,T} \approx \left(i_f - i_d\right)\frac{T}{360} \approx (0.05 - 0.10)\frac{180}{360} \approx 0.025$$

10. An appreciating currency boosts our investment. Thus, we computed the return below:

$$r_d = \left(1 + i_f\frac{T}{360}\right)(1 + e) - 1 = \left(1 + 0.16\frac{720}{360}\right)(1 + 0.04) - 1 = 0.3728$$

11. We used the approximation formula. Thus, the forward contract expects the U.S. dollar to appreciate with an exchange rate of 0.707 € / \$1.

$$F \approx {}^{0.7\ €}/_{\$1}\left(1 + (0.07 - 0.05)\frac{180}{360}\right) \approx {}^{0.707\ €}/_{\$1}$$

Answers to Chapter 19 Questions

1. Spot transactions occur when a buyer and seller agree to an exchange, and they exchange immediately. A forward transaction occurs when a buyer purchases a contract today for an asset that will be sold in the future at a fixed, known price. Then the seller is obligated to sell the buyer the asset for the contract price.

2. Derivatives obtain their value from the asset that is specified in the contract.

3. Investors use hedging to protect themselves from future volatile prices. Speculators, on the other hand, buy and sell securities to earn quick profits. As we guessed, speculators can earn large profits or massive losses from the derivatives market.

4. Once an investor buys a futures contract, the buyer is obligated to purchase the asset at the specified price (i.e., long position). In contrast, the seller is obligated to sell the asset at the specified price (i.e., short position).

5. An asset's price will fluctuate daily on the spot market. If the difference between the asset price and contract price exceeds a threshold, either the buyer or seller must deposit money with the broker. The margin helps guarantee that parties will honor the contract.

6. The issuer deposits$10 \cdot 1{,}000 \cdot (\$150 - \$75) = \$750{,}000$ with the exchange because the holder can buy petroleum via the futures and sell it on the spot market for a massive profit if the futures mature today.

7. The value of the contract on the spot market is below:

$$150{,}000\ euro\frac{\$1}{1\ euro} = \$150{,}000$$

The value of the futures contract is below:

$$150{,}000\ euros\frac{\$1}{1.5\ euro} = \$100{,}000$$

The investor pays only \$100,000 by using the contract, instead of \$150,000. Thus, the issuer deposits money into the margin account.

8. A futures is a contract. Both the buyer and seller are obligated to carry through with the transaction. With the options contract, the holder chooses to exercise it or not.

9. A call options give the contract holder the right to buy an asset at the stated price, while a put option gives the holder the right to sell at the price in the contract.

10. An option's premium is affected by the volatility of an asset's price on the spot market, the magnitude of the strike price, the maturity of the option, and interest rates.

11. Our premium equals: $\$0.5 \cdot 1{,}000 \cdot 10 = \$5{,}000$. We could either exercise the option and pay \$75 for petroleum or buy it from the spot market at \$50. Consequently, we would buy the oil from the spot market. Thus, we lose our premium.

12. The premium equals: $\$0.01 \cdot 100 \cdot 100 = \$100$. The farmer could sell his corn for \$6 per bushel on the spot market, or exercise the put option and sell his corn for \$5 per bushel. Thus, the farmer would sell his corn to the spot market. Thus, he loses the premium.

13. The problem with the derivatives based on the stock market index or the volatility index is that no commodity or financial instrument is traded. Instead, the investor gambles on future index numbers. Unfortunately, the company issuing the index derivative could have a massive exposure if the stock market rapidly drops during a financial crisis. For these contract types, they are always settled in cash.

14. Credit Default Swaps are a form of insurance. The issuer guarantees payment if a mortgage fund or company goes bankrupt as their bonds plummet in value. Thus, risk-averse investors can buy this insurance to protect their speculative grade investments.

15. We could not avoid this crisis. However, the impact could have been less severe. The government could tighten laws that required mortgage companies to verify homeowners' income. The Federal Reserve could have raised interest rates to slow the housing value bubble.

16. The coupon payments are \$1.5 million and 2.2 million euros, respectively. The implicit exchange rate is \$1.5 million ÷ 2.2 million euros, which equals \$0.682 per euro. The present values of the cash flows are:

$$PV_{foreign} = \frac{2.2\ million\ €}{1 + 0.03} + \frac{110\ million\ € + 2.2\ million\ €}{(1 + 0.03)^2} = 107.9\ million\ €$$

$$PV_{domestic} = \frac{\$1.5\ million}{1 + 0.025} + \frac{\$100\ million + \$1.5\ million}{(1 + 0.025)^2} = \$98.1\ million$$

We calculate the Swap's present value as:

$$Swap\ Value = PV_{foreign} \cdot S_0 - PV_{domestic}$$

$$Swap\ Value = 107.9\ million\ € \cdot \frac{\$1.2}{1\ €} - \$98.1\ million = \$31.4\ million$$

Answers to Chapter 20 Questions

1. Transaction exposure refers to the impact on current transactions, such as accounts receivable and accounts payable in a foreign country, when the exchange rate changes. Economic exposure is when fluctuating exchange rates affect expected cash flows over time. Translation exposure is the change in a company's consolidated financial statements because accountants use different exchange rates to convert accounts into the domestic currency. Finally, changes in exchange rates influence a firm’s cash flows, revenues, and costs, and thus, they affect a company's taxes.

2. This is not a good situation because we earn revenue from sales in pesos while we pay costs in dollars. Thus, the transaction exposure is that our costs rise while our revenues fall. Economic exposure refers to the impact of an appreciating U.S. dollar on our business over time, and in this case, we expect our profits to decline over time.

3. We calculated our gain from this transaction below:

$$profit = \$1\ million\left(\frac{1\ €}{\$1.25}\right) - 500{,}000\ € = 300{,}000\ €$$

A fluctuating exchange only impacts the revenue while our hotel’s costs remain constant. Thus, our profit would fluctuate between 180,000 and 420,000 euros, computed below:

$$exposure = \$1\ million(1 \pm 0.15)\left(\frac{1\ €}{\$1.25}\right) - 500{,}000\ € = [180{,}000\ €, 420{,}000\ €]$$

4. First, the company has an exchange rate risk. If the exchange rate does not change, then the company receives \$4.5 million or 5,000,000 CAD x \$0.9 / 1 CAD.

$$amount(\$) = 5\ million\ CAD\left({}^{\$0.9}/_{1\ CAD}\right) = \$4.5\ million$$

Second, the company eliminates the exchange rate risk and receives \$5 million.

$$amount(\$) = 5\ million\ CAD\left({}^{\$1}/_{1\ CAD}\right) = \$5\ million$$

Third, the company borrows \$4,938,271.60 in CAD today and transfers \$4,444,444.44 using the spot exchange rate today. Then the company pays the bank when it receives its account receivables.

$$funds\ to\ borrow(CAD) = \frac{5\ million\ pounds}{1 + 0.05\frac{90}{360}} = 4{,}938{,}271.60\ CAD$$

$$amount(\$) = 4{,}938{,}271.60\ CAD\left({}^{\$0.9}/_{1\ CAD}\right) = \$4{,}444{,}444.44$$

Fourth, the company receives $4,365,000 today.

$$amount(\$) = 5\ million\ CAD(0.97)\left({}^{\$0.9}/_{1\ CAD}\right) = \$4.365\ million$$

5. First, the company has an exchange rate risk. If the exchange rate does not change, then the company receives $45,454.55.

$$amount(\$) = 500{,}000\ p\left({}^{\$1}/_{11\ \mathrm{p}}\right) = \$45{,}454.55$$

Second, the company eliminated the exchange rate risk, and it will pay $41,666.67.

$$amount(\$) = 500{,}000\ p\left({}^{\$1}/_{12\ \mathrm{p}}\right) = \$41{,}666.67$$

Third, the company needs 495,458.30 pesos to deposit today, and it would transfer $45,041.66 today using the spot exchange rate.

$$funds\ to\ invest(pesos) = \frac{500{,}000\ p}{1 + 0.11\frac{30}{360}} = 495{,}458.30\ p$$

$$amount(\$) = 495{,}458.30\ \mathrm{p}\ \left({}^{\$1}/_{11\ \mathrm{p}}\right) = \$45{,}041.66$$

Fourth, the premium equals $576.92, while the company is guaranteed a minimum of $38,461.54.

$$amount(\$) = 500{,}000\ p(0.015)\left({}^{\$1}/_{13\ \mathrm{p}}\right) = \$576.92$$

$$amount(\$) = 500{,}000\ p\left({}^{\$1}/_{13\ \mathrm{p}}\right) = \$38{,}461.54$$

6. The Forex Beta measures the economic exposure and is a parameter estimate of a linear regression equation. It has two sources of variation: Fluctuations in the exchange rate and the sensitivity of the asset’s price to changes in the exchange rate.

7. First, the company could locate its production in countries where it sells its backpacks, trying to equate accounts payable and accounts receivable. Then it uses accounts receivable to offset its accounts payable. Second, the company can shift its production to low-cost countries, particularly those with a weak currency to lower costs as much as possible.

Answers to Chapter 21 Questions

1. A firm only invests and operates a small portion of its production in a foreign country. If a firm has a conflict with the government, then only that portion of the production facility is in jeopardy. Furthermore, if a company continually updates its technology, it can subsequently use intellectual property rights to protect its technology. In theory, the firm does not update the technology with the government. Finally, a firm could use leverage, where it heavily borrows from banks within the foreign country. If the firm has a conflict with the government, it can exit the country and default on its bank loans.

2. A government protects its agricultural, defense/military, energy, and communication industries. These industries are critical for a modern, functioning society, and a supply disruption could cause a severe crisis within the country.

3. A firm cannot transfer its profits outside a country because the country imposes capital controls. Thus, a firm could buy a local product and export it to recoup its earnings abroad.

4. Special dispensation refers to government grants, exceptions, and favors extended to specific industries, such as pharmaceuticals, high-tech, electronics, and computers. These industries are prestigious and lead to a rise in a skilled and educated labor force.

5. Average basis points for the CCC grade are 450. Thus, we add 4.5% to the 5%, yielding 9.5%.

6. The Risk Rating System is a method to measure a country's risk. The Rating System uses four measures: Economic Indicators, Debt Management, Political Factors, and Structural Factors. We measure each factor on a scale from zero to 100. A country's score is a weighted average of the four factors. Although this method is objective, the weights and measures of some factors are subjective.

7. Qualitative measures rely on experts' opinions. Unfortunately, experts have biases and opinions that taint their opinions. Quantitative measures use a variety of statistics and demographics of a country. Then an analyst computes a country's score.

8. Hong Kong is politically stable, and A.M. Best rated it Tier II while Coface rated it A3.

9. Ukraine, a former republic of the Soviet Union, implemented few market reforms. Also, the Russian-Ukrainian war is taking place. A.M. Best rated Ukraine as a Tier V while Coface rated it a D.

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