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Professional Development for the Expert

Course Title

Economic Foundations: Money and Rates

Instructor

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Credit
4 PDU

Questions
20

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Adaptation Statement

- *This course is chapter 3 titled "Economic Foundations: Money and Rates" adapted from the book titled "Principles of Finance", which can be downloaded for free from the following link: https://open.umn.edu/opentextbooks/textbooks/principles-of-finance*

- *The book is used under a Creative Commons Attribution 4.0 International License, except where otherwise noted.*

- *Check additional references and sources (if any) at the end of the course.*

- *This adaptation has reformatted the original text, and may have replaced some images and figures to make the resulting whole more shareable. This adaptation has not significantly altered or updated the original text.*

- *Few modifications have been made for the purpose of presenting this course on this website.*

Figure 3.1 Every company is impacted by the global economy. (credit: "World Currency" by Kari/flickr, CC BY 2.0)

Chapter Outline

Why It Matters

American Airlines is one of the largest airlines in the world, flying to 350 destinations in 50 countries.[1] The managers of American Airlines are running a complex company. They have to be familiar with aeronautical science, they have to know the laws and regulations impacting commercial air travel, and they must keep abreast of global weather conditions. There is a lot to know about the airline industry itself.

However, operating a company such as American Airlines requires more than knowledge of the science and technology of the industry. American Airlines does not operate in a vacuum. Like every company, it is impacted by the economic environment in which it operates. American Airlines has to be familiar with how supply and demand will impact fuel costs and other expenses. It must also be familiar with macroeconomic trends. During periods of high unemployment, it may be difficult for the company to sell tickets to people wanting to travel to vacation getaways. During periods of low unemployment, American Airlines may find it difficult to hire quality workers at a wage rate it considers reasonable. Global economic conditions will also impact American Airlines; as the economies of Europe expand rapidly, the euro will increase in value and impact the cost of items that American Airlines purchases along its European routes.

In "Item 1A. Risk Factors," beginning on page 16 of the 2019 annual report for American Airlines (https://openstax.org/r/2019-annual-report-for-american-airlines), the company lists some of the ways that it

1 American Airlines. "American Airlines Group." AA.com. Accessed October 25, 2021. https://www.aa.com/i18n/customer-service/about-us/american-airlines-group.jsp

is impacted by macroeconomic and microeconomic conditions and the risks that these conditions place on the company. In this chapter, we explore some of the economic concepts that managers should use as part of their strategic plan.

3.1 Microeconomics

Learning Outcomes

By the end of this section, you will be able to:

- Identify equilibrium price and quantity.
- Discuss how changes in demand will impact equilibrium price and quantity.
- Discuss how changes in supply will impact equilibrium price and quantity.

Demand

Microeconomics focuses on the decisions and actions of individual agents, such as businesses or customers, within the economy. The interactions of the decisions that businesses and customers make will determine the price and quantity of a good or service that is sold in the marketplace. Financial managers need a strong foundation in **microeconomics**. This foundation helps them understand the market for the company's products and services, including pricing considerations. Microeconomics also helps managers understand the availability and prices of resources that are necessary for the company to create its products and services.

A successful business cannot just create and manufacture a product or provide a service; it must produce a product or service that customers will purchase. **Demand** refers to the quantity of a good or service that consumers are willing and able to purchase at various prices during a given time period, **ceteris paribus** (a Latin phrase meaning "all other things being equal").

Let's consider what the demand for pizza might look like. Suppose that at a price of $30 per pizza, no one will purchase a pizza, but if the price of a pizza is $25, 10 people might buy a pizza. If the price falls even lower, more pizzas will be purchased, as shown in Table 3.1.

Price ($)	Quantity
30	0
25	10
20	20
15	30
10	40
5	50

Table 3.1 Demand Schedule for Pizza

The information in Table 3.1 can be viewed in the form of a graph, as in Figure 3.2. Economists refer to the line in Figure 3.2 as a *demand curve*. When plotting a demand curve, price is placed on the vertical axis, and quantity is placed on the horizontal axis. Because more pizzas are bought at lower prices than at higher prices, this demand curve is downward sloping. This inverse relationship is referred to as the **law of demand**.

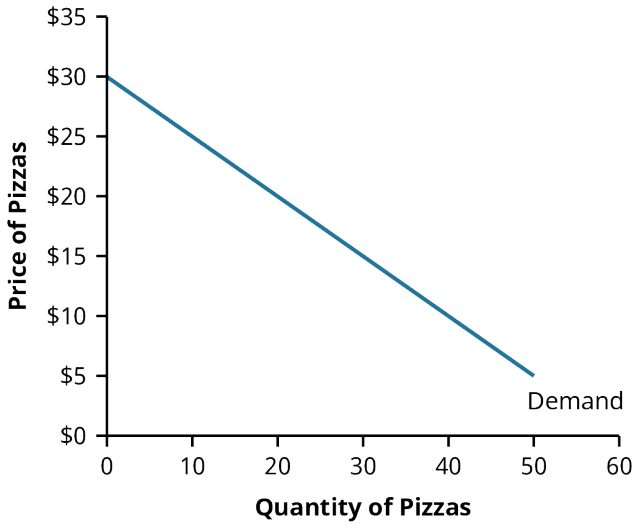

Figure 3.2 Demand Curve for Pizzas

The inverse relationship between the price of a good and the quantity of a good sold occurs for two reasons. First, as you consume more and more pizza, the amount of happiness that one more pizza will bring you diminishes. If you have had nothing to eat all day and you are hungry, you might be more willing to pay a high price for a pizza, and that pizza will bring you a great deal of satisfaction. However, after your hunger has been somewhat satisfied, you may not be willing to pay as much for a second pizza. You may only be willing to purchase a third pizza (to freeze at home) if you can get it at a fairly low price. Second, demand depends not only on your willingness to pay but also on your ability to pay. If you have limited income, then as the price of pizza rises, you simply cannot buy as much pizza.

The demand curve is drawn as a relationship between the price of the good and the quantity of the good purchased. It isolates the relationship between price and quantity demand. A demand curve is drawn assuming that no relevant factor besides the price of the product is changing. This assumption is, as mentioned above, ceteris paribus.

If another relevant economic factor changes, the demand curve can change. Relevant economic factors would include consumer income, the size of the population, the tastes and preferences of consumers, and the price of other goods. For example, if the price of hamburgers doubled, then families might substitute having a pizza night for having a hamburger cookout. This would cause the demand for pizzas to increase.

If the demand for pizzas increased, the quantities of pizza purchased at every price level would be higher. The demand schedule for pizzas might look like Table 3.2 after an increase in the price of hamburgers.

Price ($)	Quantity
30	9
25	19
20	29
15	39
10	49
5	59

Table 3.2 Demand Schedule for Pizzas after the Price of Hamburgers Doubles

This change leads to a movement in the demand curve—outward to the right, as shown in Figure 3.3. This is known as an increase in demand. Now, at a price of $25, people will purchase 19 pizzas instead of 10; and at a price of $15, people will purchase 39 pizzas instead of 30.

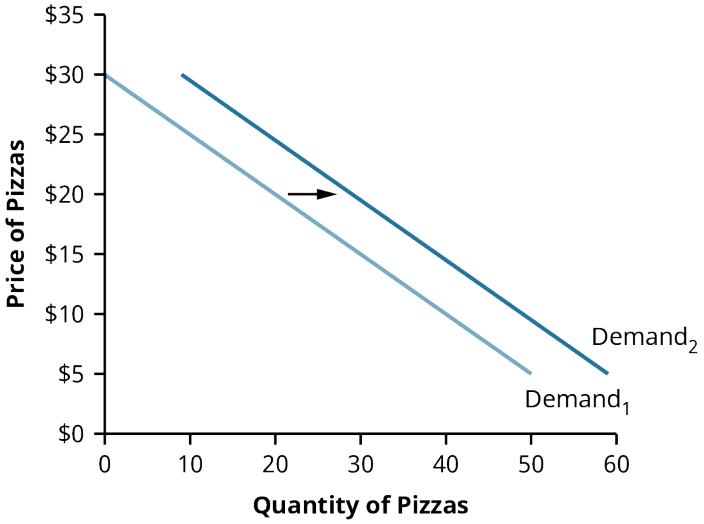

Figure 3.3 An Increase in Demand Represented as a Movement of the Demand Curve to the Right

A decrease in demand would cause the demand curve to move to the left. This could happen if people's tastes and preferences changed. If there were, for example, increased publicity about pizza being an unhealthy food choice, some individuals would choose healthier alternatives and consume less pizza.

LINK TO LEARNING

Demand Curve Shifts

If any of the items that are assumed not to change when a demand curve is drawn do change, then the demand curve can shift.

Supply

Supply is the quantity of a good or service that firms are willing to sell at various prices, during a given time period, ceteris paribus. Table 3.3 is a fictional example of a supply schedule for pizzas. In some cases, higher prices encourage producers to provide more of their product for sale. Thus, there is a positive relationship between the price and quantity supplied.

Price ($)	Quantity
30	60
25	50
20	40
15	30
10	20
5	10

Table 3.3 Supply Schedule for Pizzas

The data from the supply schedule can be pictured in a graph, as is shown in Figure 3.4. Because a higher price encourages suppliers to sell more pizzas, the supply curve will be upward sloping.

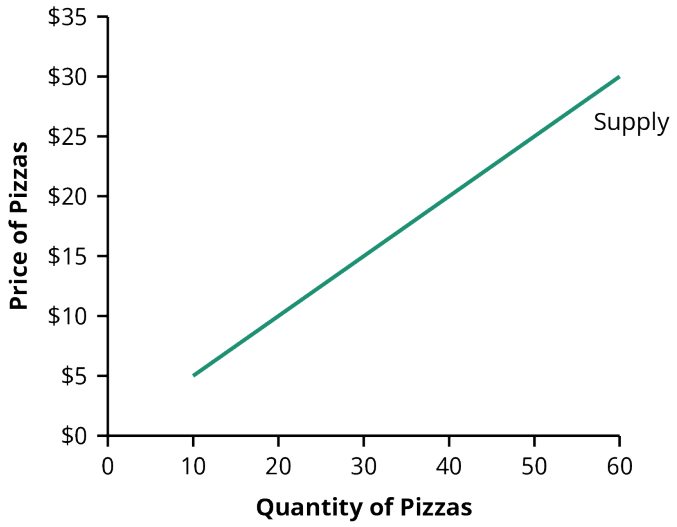

Figure 3.4 Supply Curve for Pizzas

The supply curve isolates the relationship between the price of pizzas and the quantity of pizzas supplied. All other relevant economic factors are assumed to remain unchanged when the curve is drawn. If a factor such as the cost of cheese or the salaries paid to workers changes, then the supply curve will move. A shift to the right indicates that a greater quantity of pizzas will be provided by firms at a particular price; this would indicate an increase in supply. A decrease in supply would be represented by a shift in the supply curve to the left.

LINK TO LEARNING

Supply Curve Shifts

The ceteris paribus assumption is made when drawing a supply curve, just as it is when drawing a demand curve. If a relevant economic variable other than the price of the good for which the supply curve is drawn changes, the supply curve will shift.

Equilibrium Price

Demand represents buyers, and supply represents sellers. In the market, these two groups interact to determine the price of a good and the quantity of the good that is sold. Because both the demand curve and the supply curve are graphed with price on the vertical axis and quantity on the horizontal axis, these two curves can be placed in the same graph, as is shown in Figure 3.5.

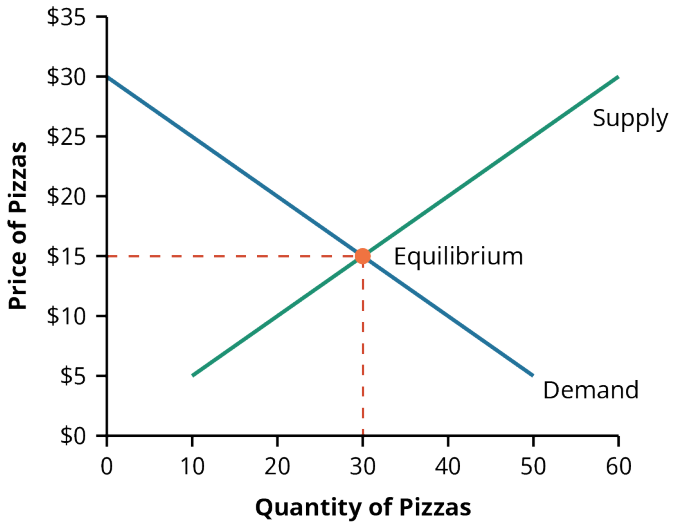

Figure 3.5 Graph of Demand and Supply Showing Equilibrium Price and Quantity

The point at which the supply and demand curves intersect is known as the **equilibrium**. At the **equilibrium price**, the quantity demanded will equal exactly the quantity supplied. There is no shortage or surplus of the product. In the example shown in Figure 3.5, when the price is $15, consumers want to purchase 30 pizzas and sellers want to make 30 pizzas available for purchase. The market is in balance.

A price higher than the equilibrium price will not be sustainable in a competitive marketplace. If the price of a pizza were $20, suppliers would make 40 pizzas available, but the quantity of pizzas demanded would be only 20 pizzas. This would be a surplus, or excess quantity supplied, of pizzas. Restaurant owners who see that they have 40 pizzas to sell but can only sell 20 of those pizzas will lower their prices to encourage more customers to purchase pizzas. At the same time, the restaurant owners will cut back on their pizza production. This process will drive the pizza price down from $20 toward the equilibrium price.

The opposite would occur if the price of a pizza were only $5. Customers may want to purchase 50 pizzas, but restaurants would only want to sell 10 pizzas at the low price. Quantity demanded would exceed quantity supplied. At a price below the equilibrium price, a shortage would occur. Shortages drive prices up toward the equilibrium price.

THINK IT THROUGH

Graphing Demand and Supply

Consider the demand and supply schedules for sweatshirts shown below. Sketch a graph of demand and supply, placing quantity on the horizontal axis and price on the vertical axis. What will the equilibrium price for sweatshirts be? Table 3.4 provides the demand and supply schedules for the sweatshirts.

Demand Schedule for Sweatshirts		Supply Schedule for Sweatshirts	
Price ($)	Quantity	Price ($)	Quantity
55	0	55	45
50	4	50	40
45	8	45	35
40	12	40	30
35	16	35	25
30	20	30	20
25	24	25	15
20	28	20	10
15	32	15	5
10	36	10	0
5	40		

Table 3.4 Demand and Supply Schedules for Sweatshirts

Solution:

The demand curve for sweatshirts is the downward-sloping curve in Figure 3.6, showing the inverse relationship between price and quantity demanded. The upward-sloping curve is the supply curve for sweatshirts. The equilibrium price will be $30. At a price of $30, the quantity demanded of 20 sweatshirts equals the quantity supplied of 20 sweatshirts.

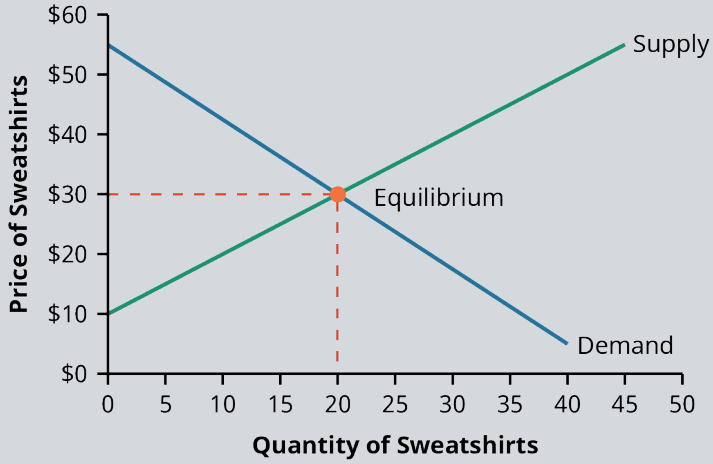

Figure 3.6 Graph of Demand and Supply for Sweatshirts

Changes in Equilibrium Price

A price that is either too high (above the equilibrium price) or too low (below the equilibrium price) is not sustainable in a competitive market. Market forces pull prices to the equilibrium, where they stay until either supply or demand changes.

If supply increases and the curve moves outward to the right, as in Figure 3.7, then the equilibrium price will fall. With the original supply curve, $Supply_1$, the equilibrium price was $15; quantity demanded and quantity supplied were both 30 pizzas at that price. If a new pizza restaurant opens, increasing the supply of pizzas to

$Supply_2$, the equilibrium will move from $Equilibrium_1$ (E_1) to $Equilibrium_2$ (E_2). The new equilibrium price will be $10. This new equilibrium is associated with a quantity demanded of 40 pizzas and a quantity supplied of 40 pizzas.

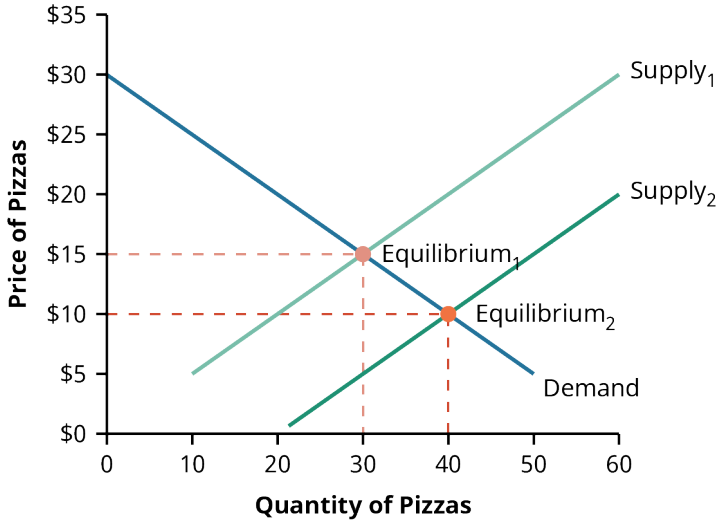

Figure 3.7 Supply Curve Changes When Supply Increases An increase in supply leads to a lower equilibrium price and an increase in quantity demanded.

It is important to note that the demand curve in Figure 3.7 does not move. In other words, demand does not change. As the equilibrium price falls, consumers move along the demand curve to a point with a combination of a lower price and a higher quantity. Economists call this movement an *increase in quantity demanded*. Distinguishing between an increase in quantity demanded (a movement along the demand curve) and an increase in demand (a shift in the demand curve) is critical when analyzing market equilibriums.

Equilibrium price will also fall if demand falls. Remember that a decrease in demand is represented as a shift of the demand curve inward to the left. In Figure 3.8, you can see how a decrease in demand causes a change from E_1 to E_2.

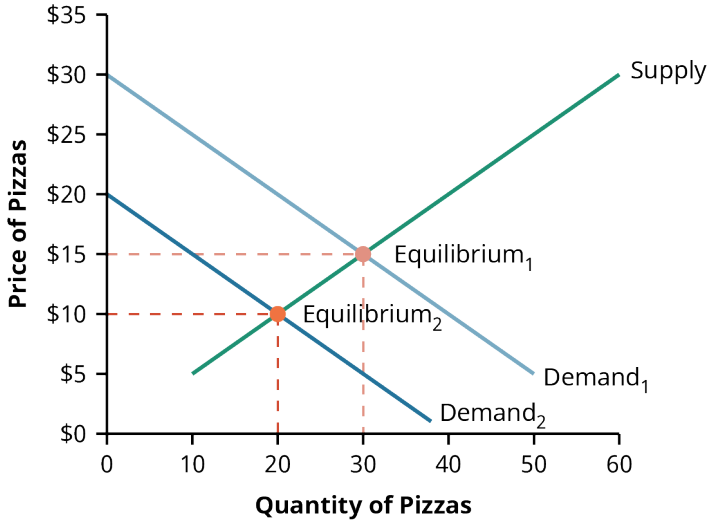

Figure 3.8 A Decrease in Demand

At the new equilibrium, E_2, the price of a pizza is $10. The new equilibrium quantity is 20 pizzas. Note that the supply curve has not moved. Producers moved along their supply curve, producing fewer pizzas as the price dropped; this is known as a *decrease in quantity supplied*.

THINK IT THROUGH

Graphing Demand

Suppose that the demand for sweatshirts in our previous example changes, and the demand schedule becomes the data shown in Table 3.5.

Price ($)	Quantity
55	18
50	22
45	26
40	30
35	34
30	38
25	42
20	46
15	50
10	54
5	58

Table 3.5 Demand Schedule for Sweatshirts

Has the demand for sweatshirts increased or decreased? Show this movement in a graph. What happens to the equilibrium? What are some reasons you can think of that may have caused this change in demand?

Solution:

This is an increase in demand. At every price, consumers now want to purchase more sweatshirts than they did before. This is shown in the graph as a movement of the demand curve outward to the right. Both the equilibrium price and the equilibrium quantity will rise because of this increase in demand. The equilibrium price will now be $40, and the equilibrium quantity of sweatshirts will be 30. Note that there is not an increase in supply; the supply curve does not move. There is simply an increase in quantity supplied (see Figure 3.9).

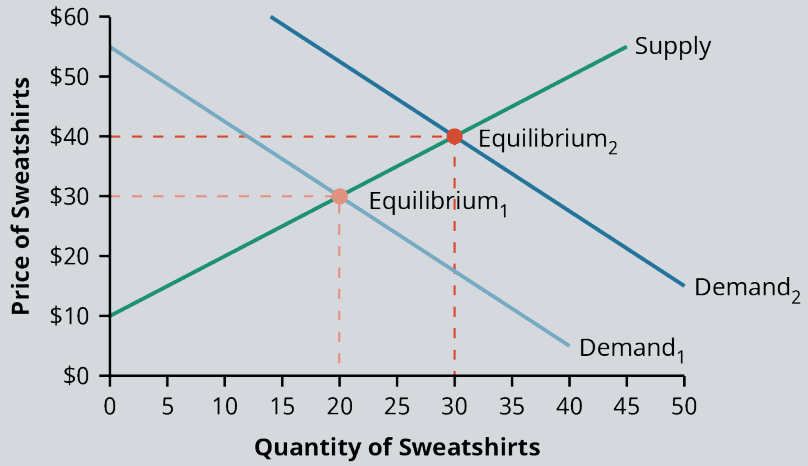

Figure 3.9 Graph Showing Increase in Sweatshirt Supply

A change in any of the factors that are assumed to be held constant under the ceteris paribus assumption could have caused the demand curve to shift to the right. Perhaps a rise in consumers' incomes led them to purchase more clothing, including sweatshirts. Or an unseasonably cool fall could result in more people purchasing sweatshirts. If a popular TV personality indicates that their favorite weekend wardrobe consists of jeans and a sweatshirt and the tabloids run pictures of the celebrity wearing sweatshirts, the tastes and preferences of consumers may change. Another possibility is that the price of sweaters may have risen, causing people to substitute sweatshirts for sweaters.

3.2 Macroeconomics

Learning Outcomes

By the end of this section, you will be able to:

- Define inflation and describe historical trends in inflation.
- Define unemployment and describe how unemployment is measured.
- Define gross domestic product and describe historical trends in gross domestic product.

Inflation

Macroeconomics looks at the economy as a whole. It focuses on broad issues such as inflation, unemployment, and growth of production. When the managers of an automotive company look at the market for steel and how the price of steel impacts the company's production costs, they are looking at a microeconomic issue. Rather than being concerned about individual markets or products, macroeconomics is the branch of economic theory that considers the overall environment in which businesses operate.

Perhaps you have heard your parents talk about how much they paid for their first automobile. Or maybe you have heard your grandparents reminisce about spending a quarter to purchase a Coke. These conversations often turn to a discussion of how a dollar just doesn't go as far as it used to. The reason for this is **inflation**, or a general increase in price levels.

It is not that just the price of an automobile has increased or that the price of a Coke has increased. Over time, the prices of many other things, from the salt on your table to college tuition, have increased. Also, you were paid a higher hourly wage at your first job than your parents and grandparents were paid; the price of labor has risen.

When economists talk about inflation, they are discussing this phenomenon of the price of many things rising. Instead of tracking the price of one particular item, they consider the price of purchasing a basket of goods.

Inflation means that the purchasing power of currency falls. Whenever there is inflation, a $100 bill will not purchase as much as it did before.

LINK TO LEARNING

CPI Inflation Calculator

According to the US Bureau of Labor Statistics, $100 in January 1913 had the same purchasing power as $1,722.45 in January 2000 and $2,699.20 in January 2021. If you would like to compare the purchasing power of a dollar amount in two different time periods, you can use the CPI Inflation Calculator (https://openstax.org/r/cpi-inflation-calculator). You can enter a current dollar amount and calculate its value in an earlier period. Alternatively, you can calculate the current value of dollar amounts from years ago.

How Is Inflation Measured

Each month, the US Bureau of Labor Statistics (BLS) collects price data and publishes measures of inflation. The measure most commonly cited is the **consumer price index (CPI)**. The CPI is based on the cost of buying a fixed basket of goods and services comprising items a typical urban family of four might purchase. The BLS divides these purchases into eight major categories: food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services.

Sometimes you will hear a **core inflation index** being quoted. This index is calculated by excluding volatile economic variables, such as energy and food prices, from the CPI measure. Energy and food prices can jump around from month to month because of weather or other short-lived events. A drought can cause food prices to spike; a temporary rise in gasoline prices can occur as a hurricane approaches the coastline. These types of shocks are transitory in nature and do not represent underlying economic conditions.

While the CPI and the core inflation index are based on the prices that households pay, the **producer price index (PPI)** is based on prices that producers of goods and services pay for their supplies and raw materials. The PPI captures price changes that occur prior to the retail level. Because it indicates rising costs to producers, increases in the PPI can foreshadow increases in the CPI.

Both the CPI and the PPI are calculated by the BLS. The Bureau of Economic Analysis (BEA) also calculates a measure of inflation known as the **GDP deflator**. The calculation of the GDP, or gross domestic product, deflator follows a different approach than that used to calculate the CPI and the PPI. Instead of using a fixed basket of items and measuring the price change of that fixed basket, the GDP deflator includes all of the components of the gross domestic product. Prices are taken from a base year and used to calculate what the GDP would have been in a given year if prices were identical to those in the base year.

LINK TO LEARNING

The Billion Prices Project

Although the concept of inflation as a rise in the general price level is simple, measuring and documenting this increase is complicated. The CPI is designed to measure the cost of a market basket of goods that a typical urban family purchases. But what the typical family purchases over time changes. As an item in the basket becomes more expensive, families tend to substitute and replace the item with similar goods. Also, the quality of goods changes over time. Think of how purchases in a typical household have changed over the last two decades. Today, few families purchase answering machines, CDs, DVDs, or alarm clocks; smartphones have replaced many such products. Smartphones are even used to make purchases for

delivery from an online retailer. Although keeping the items in the market basket constant allows economists to focus on price changes, the market basket quickly becomes outdated and does not reflect a typical family's purchases.

In an attempt to provide new measures of inflation that better represent the changing basket of goods purchased and the purchasing habits of families, Alberto Cavallo and Roberto Rigobon founded the Billion Prices Project. Through this academic initiative at the Massachusetts Institute of Technology, prices are collected daily from online retailers around the world. The Billion Prices Project website (https://openstax.org/r/billion-prices-project) provides measures for inflation using this data as well as research papers regarding macroeconomic research.

Historical Trends in the Inflation Rate

Inflation, as measured by the CPI for 1947–2020, is displayed in Figure 3.10. The graph shows that for the past 70 years, inflation has been the norm. Although inflation dipped into negative territory several times, each period of negative inflation was short-lived. Also, you will notice that during the 1970s and early 1980s, inflation was abnormally high; the inflation rate remained above 5% for approximately a decade. This was also the only time period in which the US economy experienced double-digit inflation. By the mid-1980s, inflation had fallen below 5%, and it has remained below 5% for much of the past 35 years.

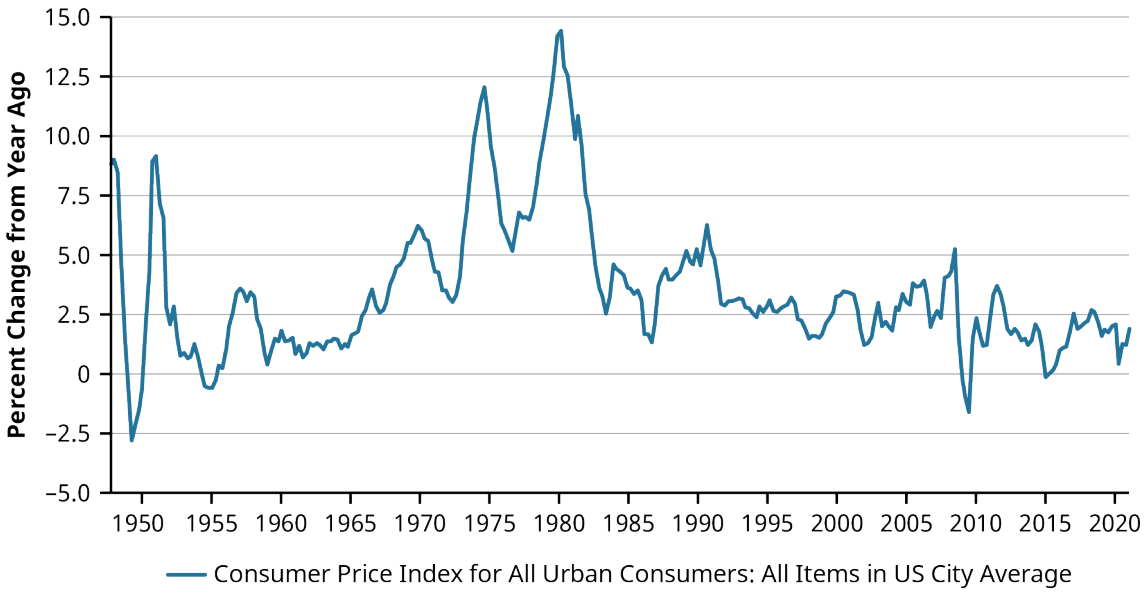

Figure 3.10 Rate of Inflation Measured by the Consumer Price Index, 1947–2020[2]

The Consumer Price Index for All Urban Consumers: All Items (CPIAUCSL) is a measure of the average monthly change in the price for goods and services paid by urban consumers between any two time periods. It can also represent the buying habits of urban consumers. This particular index includes roughly 88% of the total population, accounting for wage earners, clerical workers, technical workers, self-employed workers, short-term workers, unemployed workers, retirees, and those not in the labor force.

The CPIs are based on prices for food, clothing, shelter, fuels, transportation fares, service fees (e.g., water and sewer service), and sales taxes. Prices are collected monthly from about 4,000 housing units and approximately 26,000 retail establishments across 87 urban areas. To calculate the index, price changes are averaged with weights representing their importance in the spending of a particular group. The index measures price changes (as a percent change) from a predetermined reference date. In addition to the original unadjusted index distributed, the BLS also releases a seasonally adjusted index. The unadjusted series reflects all factors that may influence a change in prices. However, it can be very useful to look at the

seasonally adjusted CPI, which removes the effects of seasonal changes such as weather, the school year, production cycles, and holidays.

The CPI can be used to recognize periods of inflation and deflation. Significant increases in the CPI within a short time frame might indicate a period of inflation, and significant decreases in CPI within a short time frame might indicate a period of deflation. However, because the CPI includes volatile food and oil prices, it might not be a reliable measure of inflationary and deflationary periods. For more accurate detection, the core CPI, or CPILFESL (https://openstax.org/r/fred-stlouisfed-org)—the CPIAUCSL minus food and energy—is often used. When using the CPI, please note that it is not applicable to all consumers and should not be used to determine relative living costs. Additionally, the CPI is a statistical measure vulnerable to sampling error because it is based on a sample of prices and not the complete average.

Unemployment

Unemployment is a measure of people who are not working. For the individuals who find themselves without a job, unemployment causes financial hardship. From a macroeconomics standpoint, unemployment means that society has labor resources that are not being fully utilized.

Not everyone who is without a job is **unemployed**. To be considered unemployed, a person must be (1) jobless, (2) actively seeking work, and (3) able to take a job. The official unemployment rate is the percentage of the labor force that is unemployed. It is calculated as

$$\begin{aligned}\text{Unemployment Rate} &= \frac{\text{Number Unemployed}}{\text{Labor Force}} \\ &= \frac{\text{Number Unemployed}}{\text{Number Employed} + \text{Number Unemployed}}\end{aligned}$$

Note that the unemployment rate is calculated as the percentage of the labor force that is unemployed, rather than the percent of the total population. Only those who are currently employed or who meet the definition of being unemployed are counted in the labor force. In other words, someone who is retired or a stay-at-home parent and is not seeking employment is not counted as unemployed and is not part of the labor force.

The Bureau of Labor Statistics (BLS) of the US Department of Labor reports the unemployment rate each month. These figures are attained through an interview process of 60,000 households conducted by the Census Bureau. (See Figure 3.11 for a graphic representation of historical trends in unemployment from 1950 to early 2021.)

2 Data from US Bureau of Labor Statistics. "Consumer Price Index for All Urban Consumers: All Items in US City Average (CPIAUCSL)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/CPIAUCSL

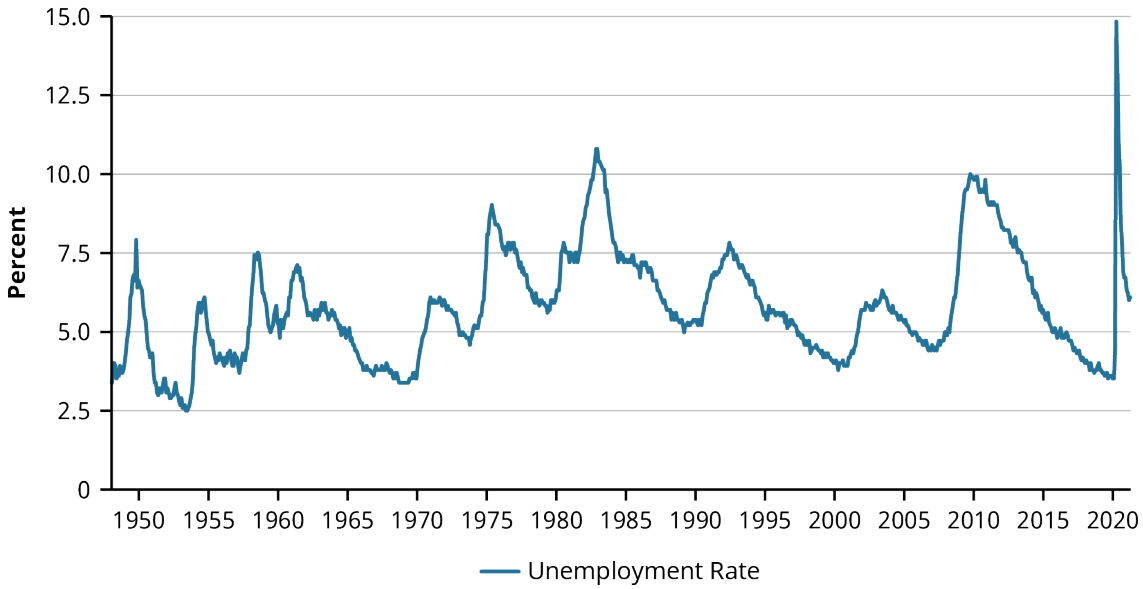

Figure 3.11 Historical Trends in the Unemployment Rate by Year, 1950–2021[3] The unemployment rate represents the number of unemployed as a percentage of the labor force. Labor force data are restricted to people 16 years of age and older who currently reside in one of the 50 US states or the District of Columbia, who do not reside in institutions (e.g., penal or mental facilities, homes for the aged), and who are not on active duty in the US Armed Forces.

LINK TO LEARNING

Unemployment around the World

The World Bank publishes unemployment figures for countries around the world. In 2020, the World Bank figures showed that Cambodia had the lowest unemployment rate at 0.3% and that South Africa has the highest unemployment rate at 28.7%. To compare the rates in various countries, visit the unemployment statistics section (https://openstax.org/r/data-world-bank) of the World Bank website.

Gross Domestic Product

Gross domestic product (GDP) is a measure of the size of an economy. A country's GDP is the dollar value of all of the final goods and service produced within that country during a year. GDP measures the value of all of the automobiles produced, apples grown, heart surgeries performed, students educated, and all other new goods and services produced in a current year.

How Is GDP Measured?

GDP can be measured by adding up all of the items that are purchased in the economy. Purchases are divided into four broad expenditure categories: consumption spending, investment, government spending, and net exports. Consumption spending measures the items that households purchase, such as movie theater tickets, cups of coffee, and clothing. Consumption expenditure accounts for about two-thirds of the US GDP.[4]

Investment spending refers primarily to purchases by businesses. It is important to note that in this context, the term *investment* does not refer to purchasing stocks and bonds or trading financial securities. Instead, the term refers to purchasing new capital goods, such as buildings, machinery, and equipment, that will be used to produce other goods. Residential housing is also included in the investment-spending category, as are inventories. Products that producers make but do not sell this year (and so are not included in consumption

3 Data from US Bureau of Labor Statistics. "Unemployment Rate (UNRATE)." FRED. Federal Reserve Bank of St. Louis, accessed July 6, 2021. https://fred.stlouisfed.org/series/UNRATE
4 US Bureau of Economic Analysis. "GDP and the Economy: Advance Estimates for the First Quarter of 2020." Survey of Current Business 100, no. 5 (May 2020): 1–11. https://apps.bea.gov/scb/2020/05-may/0520-gdp-economy.htm

spending) are included in this year's GDP calculation through the investment component. The investment spending category is roughly 15% to 18% of the US GDP.

Government spending includes spending by federal, state, and local governments. Federal spending would include purchases of items such as a new military fighter jet and services such as the work of economists at the BLS. State governments purchase products such as concrete for a new highway and services such as the work of state troopers. Local governments purchase a variety of goods and services, such as books for the city library, playground equipment for the community park, and the services of public school teachers. In the United States, government spending accounts for nearly 20% of the GDP.

Some items that are produced in the United States are sold to individuals, businesses, or government entities outside of the United States. For example, a bottle of Tabasco sauce produced in Louisiana may be sold to a restaurant in Vietnam, or tires produced in Ohio may be sold to an auto producer in Mexico. Because these items represent production in the United States, these exports should be included in the US GDP. Conversely, some of the items that US consumers, businesses, and government entities purchase are not produced in the United States. A family may purchase maple syrup from Canada or a Samsung television that was produced in South Korea. A business may purchase a Toyota vehicle that was produced in Japan. These items are imported from other countries and represent production in the country of origin rather than the United States. Because we already counted these items when adding consumption, investment, and government spending, we must subtract the value of imports in our GDP calculation. Net exports equals exports from the United States minus imports from other countries. Including net exports in the GDP calculation adjusts for this international trade.

Historical Trends in GDP

US GDP over the past 70 years is represented by the blue line in Figure 3.12. At the turn of the millennium, the yearly GDP of the United States was approximately $10 trillion. By 2020, the GDP exceeded $21 trillion, indicating that the US economy had more than doubled in size in the first 20 years of the 21st century.[5]

Because GDP is the market value of all goods and services produced, it can increase either because more goods and services are being produced or because the market value of these goods and services is rising. If 100 cars were produced and sold for $30,000 each, that would contribute $3,000,000 to the GDP. If, instead, the cars were sold for $33,000 each, the same 100-car production would contribute $3,300,000 to the GDP. The $300,000 increase in GDP would be due simply to higher prices, or inflation.

Multiplying the current price of goods by the number of goods produced results in what is known as nominal GDP. In order to determine what the actual increase in production is, nominal GDP must be adjusted for inflation. This adjustment results in a calculation known as real GDP. To calculate real GDP, the amounts of goods and services produced are multiplied by the price levels in a base year. Thus, real GDP will rise only if more goods and services are being produced. The red line in Figure 3.12 represents the real GDP. Although its growth has not been as large as that of nominal GDP, real GDP has also grown significantly over the past 70 years.

5 "GDP (Current US$): United States." The World Bank. 2020. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=US

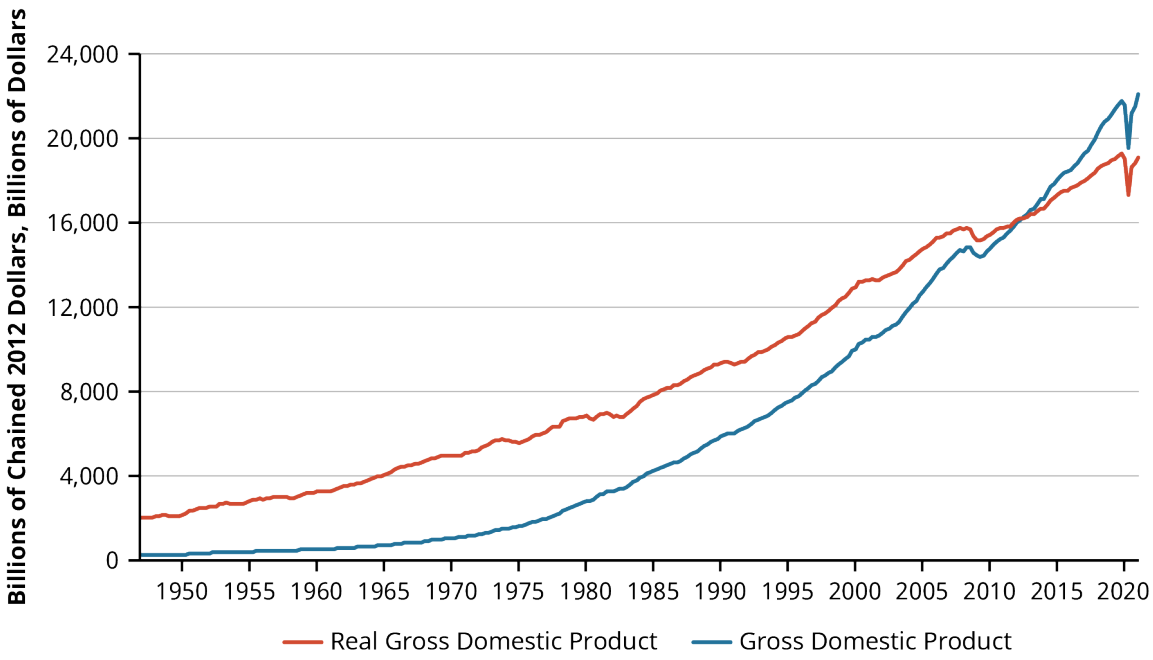

Figure 3.12 Growth of the US GDP[6] Gross domestic product (GDP), the featured measure of US output, is the market value of the goods and services produced by labor and property located in the United States. Real gross domestic product is the inflation-adjusted value of the goods and services produced by labor and property located in the United States. For more information, see the *NIPA Handbook: Concepts and Methods of the US National Income and Product Accounts* and the US Bureau of Economic Analysis.

LINK TO LEARNING

US Bureau of Economic Analysis

The US Bureau of Economic Analysis, an agency of the Department of Commerce, produces economic accounting statistics, including GDP. The agency's economists and statisticians also produce measures of state and local economies, foreign trade statistics, and industry data. To learn more about the US Bureau of Economic Analysis and how it measures economic activity, visit the BEA website (https://openstax.org/r/bea-website). You can find data regarding the GDP and economic growth in your state, as well as international trade and industry statistics.

3.3 Business Cycles and Economic Activity

Learning Outcomes

By the end of this section, you will be able to:

- Outline the stages of the business cycle.
- Identify recessionary and expansionary periods.

What Is the Business Cycle?

Although the US economy has grown significantly over time, as seen in Figure 3.12, the growth has not occurred at a constant, consistent pace. At times, the economy has experienced faster-than-average growth, and occasionally the economy has experienced negative growth.

The percentage change in real GDP for each quarter is shown in Figure 3.13. For any quarter in which real GDP is growing, the percentage change will be positive. When the growth rate of real GDP is negative, the economy

6 Data from US Bureau of Economic Analysis. "Gross Domestic Product (GDP)." FRED. Federal Reserve Bank of St. Louis, accessed July 27, 2021. https://fred.stlouisfed.org/series/GDP

is shrinking.

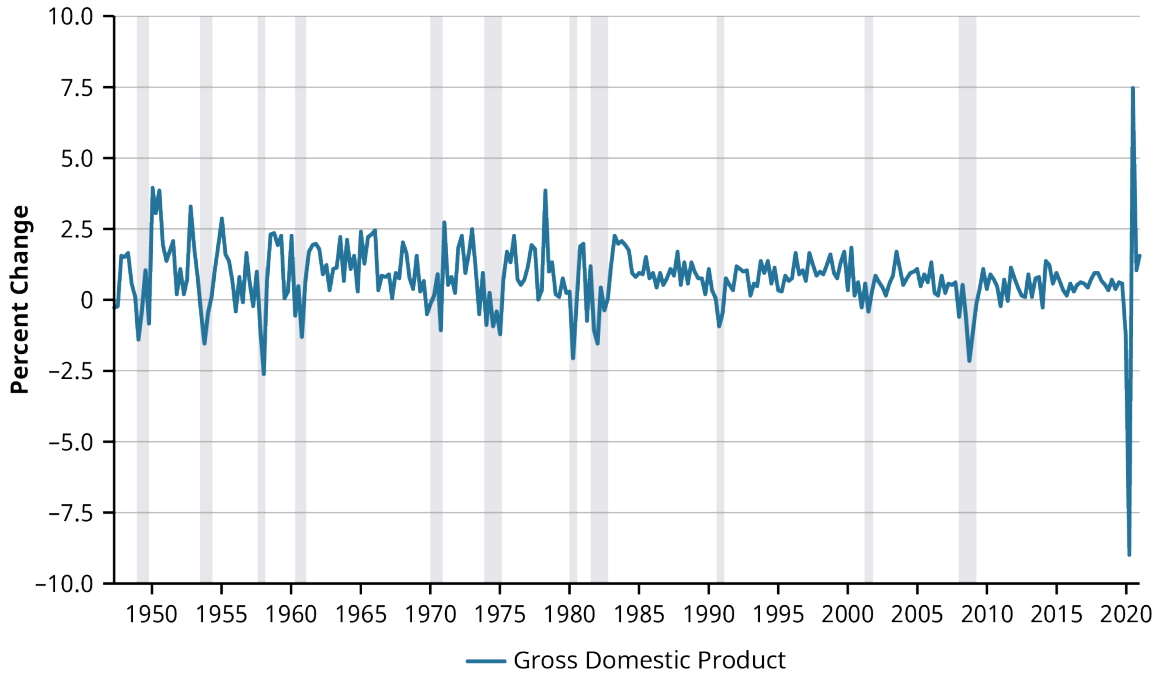

Figure 3.13 Quarterly Percentage Change in US Real GDP with Shading Representing Recessions[7]

Figure 3.14 is an illustration of the growth of GDP over time. There has been a definitive long-term upward trend in GDP, but it has not been in a straight line. Instead, the economy has expanded much like the curve; periods of quick growth are followed by slower or even negative growth. These alternating growth periods are known as the **business cycle**.

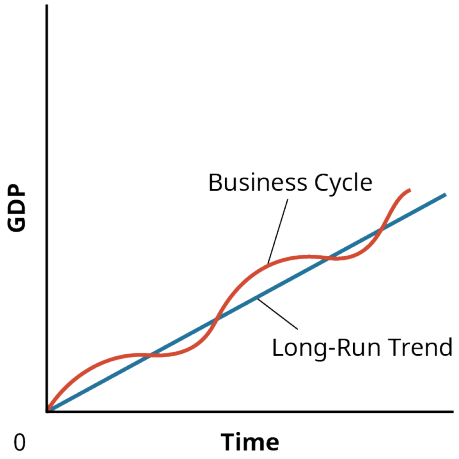

Figure 3.14 Growth of GDP and the Business Cycle

Stages of the Business Cycle

The business cycle consists of a period of economic expansion followed by a period of economic contraction. During the period of economic **expansion**, GDP rises. Employment expands as businesses produce more; conversely, unemployment falls. Other measures of economic growth may include increased new business starts and new home construction. The economy is said to be "heating up." As the expansion continues, inflation often becomes a concern.

7 Data from US Bureau of Economic Analysis. "Gross Domestic Product (GDP)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/GDP

Fast-paced economic expansion is not sustainable. Eventually, growth slows and unemployment rises. The economy has moved from expansion to contraction when this occurs. The point at which the business cycle turns from expansion to contraction is known as the *peak*. The point at which the contraction ends and the economy begins to expand again is known as the *trough*. The length of one business cycle is measured by the time from one trough to the trough of the next cycle, as shown in Figure 3.15.

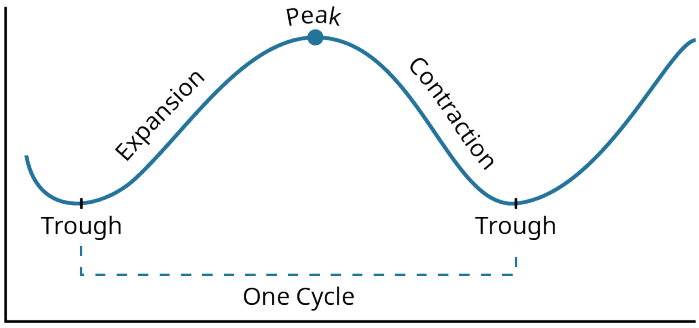

Figure 3.15 Stages of the Business Cycle

Often, the contraction is referred to as a **recession**. A private think tank, the National Bureau of Economic Research (NBER), tracks the business cycle in the United States. The NBER is the entity that officially declares recessions in the United States. Historically, a recession was defined as two consecutive quarters of declining GDP. Today, the NBER defines a recession in a broader, less precise manner; it will declare a recession when there is a significant decline in economic activity that is spread across the economy and lasts for at least a few months.[8] Measures of real income, employment, industrial production, and wholesale and retail sales are considered in addition to real GDP.

LINK TO LEARNING

National Bureau of Economic Research

The National Bureau of Economic Research was founded in 1920 to create measures of economic activity that could be used in public policy discussions. It is a private, nonpartisan organization that conducts research that is followed by businesses and the public sector. You can find out more about the NBER and view many of its research papers by visiting its website (https://openstax.org/r/nber-website).

Historical Trends

The NBER has identified business cycle peaks and troughs in data going back to the mid-19th century. Figure 3.16 lists each of these cycles, denoting the months of peaks and troughs. We see a repetition of the economic behavior—an expansion, a peak, a recession, and a trough, followed by yet another expansion, peak, recession, and trough. The cycles are events that repeatedly occur in the same order.

8 National Bureau of Economic Research. "Business Cycle Dating Committee Announcements." July 19, 2021. https://www.nber.org/research/business-cycle-dating/business-cycle-dating-committee-announcements

Business Cycle Reference Dates				Contraction	Expansion	
Peak Month	Peak Year	Trough Month	Trough Year	Peak to Trough (Months)	Previous Trough to This Peak (Months)	Trough from Previous Trough (Months)
-	-	December	1854	-	-	-
June	1857	December	1858	18	30	48
October	1860	June	1861	8	22	30
April	1865	December	1867	32	46	78
June	1869	December	1870	18	18	36
October	1873	March	1879	65	34	99
March	1882	May	1885	38	36	74
March	1887	April	1888	13	22	35
July	1890	May	1891	10	27	37
January	1893	June	1894	17	20	37
December	1895	June	1897	18	18	36
June	1899	December	1900	18	24	42
September	1902	August	1904	23	21	44
May	1907	June	1908	13	33	46
January	1910	January	1912	24	19	43
January	1913	December	1914	23	12	35
August	1918	March	1919	7	44	51
January	1920	July	1921	18	10	28
May	1923	July	1924	14	22	36
October	1926	November	1927	13	27	40
August	1929	March	1933	43	21	64
May	1937	June	1938	13	50	63
February	1945	October	1945	8	80	88
November	1948	October	1949	11	37	48
July	1953	May	1954	10	45	55
August	1957	April	1958	8	39	47
April	1960	February	1961	10	24	34
December	1969	November	1970	11	106	117
November	1973	March	1975	16	36	52
January	1980	July	1980	6	58	64
July	1981	November	1982	16	12	28
July	1990	March	1991	8	92	100
March	2001	November	2001	8	120	128
December	2007	June	2009	18	73	91
February	2020	-	-	-	128	-

Figure 3.16 Peak and Trough Months of Historical Business Cycles (source: National Bureau of Economic Research)

However, the cycles are not identical; the lengths of the cycles vary greatly. On average, the contractions have lasted about 17 months and expansions have lasted about 41 months. The typical business cycle has been about 4.5 years long.

At the time of this writing, the United States is in an economic recession.[9] The previous trough was in June 2009. From the summer of 2009 through February 2020, the US economy was in the expansionary phase of the business cycle. This expansion peaked in February 2020, when the economy fell into a contractionary period associated with the COVID-19 pandemic. This 128-month expansion is the longest expansion in US history. Only two other expansions have lasted for over 100 months: the 120-month expansion that ran through the 1990s and the 106-month expansion that ran during the 1960s. The longest recessionary period on record is the 65-month recession that occurred during the 1870s. The recession that began in 1929 was the second-longest recession in US history. At 43 months long, this recession that ended in 1933 was so severe that it has been called the Great Depression.[10]

9 National Bureau of Economic Research. "Business Cycle Dating Committee Announcements." July 19, 2021. https://www.nber.org/research/business-cycle-dating/business-cycle-dating-committee-announcements

3.4 Interest Rates

Learning Outcomes

By the end of this section, you will be able to:

- Explain the relationship between the nominal interest rate and inflation.
- Calculate the real rate of interest.
- Explain the relationship between interest rates and risk.

Market for Loanable Funds

An interest rate is the rental price of money. The concepts of supply, demand, and equilibrium apply in this market just as they do in other markets. This market is referred to as the *market for loanable funds*.

In the market for loanable funds, the suppliers of funds are economic entities that currently have a surplus in their budget. In other words, they have more income than they currently want to spend; they would like to save some of their money and spend it in future time periods. Instead of just putting these savings in a box on a shelf for safekeeping until they want to spend it, they can let someone else borrow that money. In essence, they are renting that money to someone else, who pays a rental price called the *interest rate*.

The suppliers of loanable funds, also known as lenders, are represented by the upward-sloping curve in Figure 3.17. A higher interest rate will encourage these lenders to supply a larger quantity of loanable funds.

The demanders of funds in the loanable funds market are economic entities that currently have a deficit in their budget. They want to spend more than they currently have in income. For example, a grocery store chain that wants to expand into new cities and build new grocery stores will need to spend money on land and buildings. The cost of buying the land and buildings exceeds the chain's current income. In the long run, its business expansion will be profitable, and it can pay back the money that it has borrowed.

The downward-sloping curve in Figure 3.17 represents the demanders of loanable funds, also known as borrowers. Higher interest rates will be associated with lower quantities demanded of loanable funds. At lower interest rates, more borrowers will be interested in borrowing larger quantities of funds because the price of renting those funds will be cheaper.

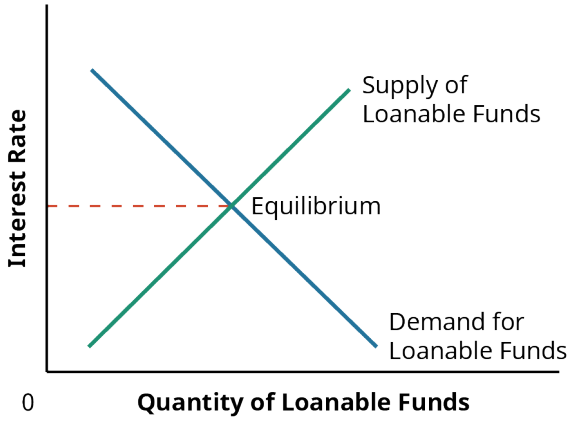

Figure 3.17 Equilibrium in the Loanable Funds Market

The equilibrium interest rate is determined by the intersection of the demand and supply curves. At that interest rate, the quantity supplied of loanable funds exactly equals the quantity demanded of loanable funds. There is no shortage of loanable funds, nor is there any surplus.

10 National Bureau of Economic Research. "US Business Cycle Expansions and Contractions." Last updated July 19, 2021. https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions

Nominal Interest Rates

The **nominal interest rate** is the stated, or quoted, interest rate. If you want to borrow money to purchase a car and the bank quotes an interest rate of 5.5% on a four-year auto loan, the 5.5% is the nominal interest rate.

Or suppose you have $1,000 you would like to place in a savings account. If the bank quotes an interest rate of 6% on its savings accounts, the 6% is a nominal interest rate. This means that if you place your $1,000 in a savings account for one year, you will receive $60 in interest for the year. At the end of the year, you will have a balance of $1,060 in your savings account—your original $1,000 plus the $60 in interest that you earned.

Real Interest Rates

Suppose you are deciding between saving your $1,000 for the year and using it to purchase a flat-screen TV. The advantage of spending the money on the TV today is that you can enjoy watching programs on it over the next year. The advantage of saving the money is that you will earn 6% nominal interest; in one year, you will have $1,060 to spend.

If there is a 2% inflation rate, you would expect the TV that costs $1,000 today to cost $1,020 in one year. If you save the $1,000, you will have $1,060 in one year. You could purchase the TV for $1,020 and have $40 left over; then you could use the $40 to order pizza to celebrate the first big game you are watching on the new TV.

Your choice comes down to enjoying a TV today or enjoying a TV and $40 in one year. The $40 is your reward for delaying consumption. It is your real return for saving money. The remaining $20 of the interest you earned just covered the rate of inflation. This reward for delaying consumption is known as the **real interest rate**. The real interest rate is calculated as

$$\text{Real Interest Rate} = \text{Nominal Interest Rate} - \text{Inflation Rate}$$

The real interest rate, rather than the nominal interest rate, is the true determinant of the cost of borrowing and the reward for lending. For example, if a business had to pay 15% nominal interest rate in 1980, when the inflation rate was 12%, the real cost of borrowing for the firm was 3%. The company would have had to pay $15 in interest each year for each $100 it borrowed, but $12 of that was simply compensating the lender for inflation. In real terms, the business was only paying $3 to borrow $100.

In recent years, a business may have paid 6% interest to borrow money. This nominal rate is half of what it was in 1980. However, inflation has been much lower. If inflation is 1% and the company pays 6% nominal interest, that results in a 5% real interest rate. For every $100 the company borrows, it pays $6 in interest; $1 is compensating for inflation, and the remaining $5 is the real cost of borrowing.

Risk Premiums

As we have discussed interest rates, we have talked about how the interest rate is determined by the demand and supply of loanable funds. This tells us the underlying interest rate in the economy. You will notice, however, if you look at the financial news, that there is more than one interest rate in the economy at any given time.

Figure 3.18 shows the interest rates that three different types of borrowers have paid over the past 20 years. The bottom line shows the interest rate that the US government paid to borrow money for a three-month period. This rate is often referred to as the risk-free rate of interest. While theoretically it would be possible for the US government to default and not pay back those people who have loaned money to it, the chances of that are occurring are extremely low.

When someone borrows money, they enter into a contract to repay the money and the interest owed. However, sometimes, certain circumstances arise such that the lender has a difficult time collecting the money, even though the lender has the legal right to the money. For example, if a company goes bankrupt after borrowing the money and before paying back the loan, the lender may not be able to collect what is due. The chance that the lender may not be able to collect all of the money due at the time it is due is considered

credit risk. Lenders want to be rewarded for taking on this risk, so they charge a premium to borrowers who are higher risk.

Companies are more likely to go bankrupt and not be able to pay their bills on time than is the US government. So, corporations have to pay a higher interest rate than the US government. If a lender can earn 1% lending to the US government, the lender will only be willing to lend to the riskier corporation if they can earn more than 1%. In Figure 3.18, the interest rates paid by very creditworthy companies is shown. The prime rate is the interest rate that banks charge their very best customers—large companies that are financially very strong and have a very low risk of default.

It is generally riskier for a lender to make a loan to an individual than to a corporation. Individuals are more likely to become ill, lose their job, or experience some other financial setback that makes it difficult for them to repay their loans. In Figure 3.18, the interest rate on credit card loans is much higher than the interest rate charged to corporate borrowers. That is because credit card loans are a high risk to the lender. Unlike other loans made to an individual, such as a car loan, the credit card company has no collateral if a consumer cannot pay back the loan. With car loans, if the borrower fails to repay the borrowed money, the lender can repossess the automobile and sell it to recoup some of the money it is owed. If you use a credit card to buy groceries and do not repay the loan, the credit card company cannot repossess the groceries that you purchased. Therefore, credit card loans have notoriously high interest rates to compensate the lender for the high risk.

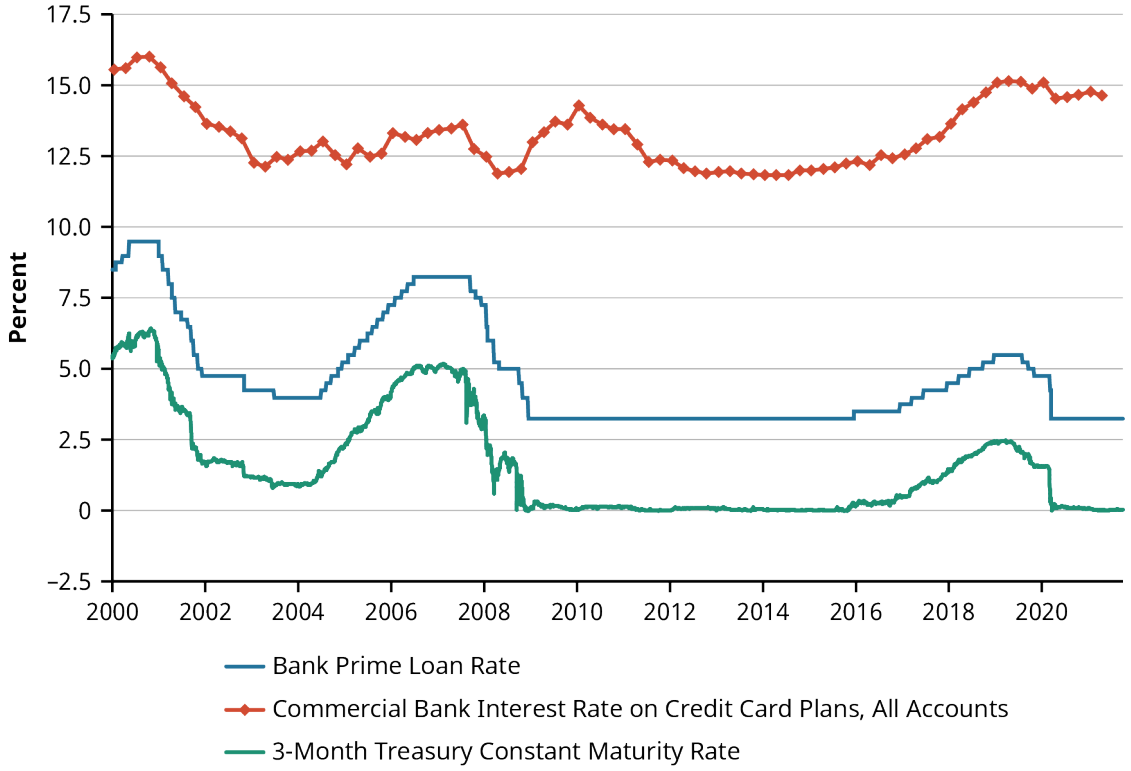

Figure 3.18 Interest Rate on US Treasury Bills and Credit Cards[11] This graph shows the rates posted by a majority of top 25 (by assets in domestic offices) insured US-chartered commercial banks. The prime rate is one of several base rates used by banks to price short-term business loans. For further information regarding Treasury constant maturity data, please refer to the Board of Governors and the Treasury.

11 Data from Board of Governors of the Federal Reserve System (US). "Bank Prime Loan Rate (DPRIME)." FRED. Federal Reserve Bank of St. Louis, accessed July 8, 2021. https://fred.stlouisfed.org/series/DPRIME; Board of Governors of the Federal Reserve System (US). "3-Month Treasury Constant Maturity Rate (DGS3MO)." FRED. Federal Reserve Bank of St. Louis, accessed July 8, 2021. https://fred.stlouisfed.org/series/DGS3MO; Board of Governors of the Federal Reserve System (US). "Commercial Bank Interest Rate on Credit Card Plans, All Accounts (TERMCBCCALLNS)." FRED. Federal Reserve Bank of St. Louis, accessed July 8, 2021. https://fred.stlouisfed.org/series/TERMCBCCALLNS

3.5 Foreign Exchange Rates

Learning Outcomes

By the end of this section, you will be able to:

- Explain what it means for a currency to appreciate or depreciate.
- Define spot exchange rate.
- Explain the risks involved in translation exposure.

Spot Exchange Rate

An exchange rate is simply the price of a currency. If you live in the United States and are going on a trip to Mexico, you will need pesos to pay for your food, hotel, and other items. You will need to purchase pesos. Suppose that you go to your bank to purchase pesos. Suppose the bank tells you that it will cost $0.0625 to purchase one Mexican peso. If you want to take 10,000 Mexican pesos with you on your trip, it will cost you $625 to purchase the desired pesos.

In this example, the price of one peso is six and one-quarter cents. This price will often be written in the form of

$$\text{MXN}\,1 = \text{USD}\,0.0625$$

MXN is an abbreviation for the Mexican peso, and USD is an abbreviation for the US dollar. This price is known as a currency exchange rate, or the rate at which you can exchange one currency for another currency. Because this is the price you would pay to purchase Mexican pesos right now, it is known as the **spot exchange rate**.

If you know the price of Mexican pesos in dollars, you can easily find the price of US dollars in Mexican pesos. Simply divide both sides of the equation by 0.0625, or the price of a peso:

$$\begin{gathered}\text{MXN}\,1 = \text{USD}\,0.0625 \\ \frac{\text{MXN}\,1}{0.0625} = \frac{\text{USD}\,0.0625}{0.0625} \\ \text{MXN}\,16 = \text{USD}\,1\end{gathered}$$

If you have Mexican pesos and you want to exchange them for dollars, you will be using the pesos to buy dollars. Each US dollar will cost you MXN 16.

LINK TO LEARNING

Currency Conversion

Do you want to know how many British pounds your $100 would buy? Or would you like to see how much that 10,000-yen-per-night hotel room will cost you in your home currency? You can enter the amount of one currency in the MSN Money currency converter (https://openstax.org/r/currencyconverter) to see what the equivalent amount is in another currency.

Currency Appreciation

Just as the price of gasoline changes, resulting in it costing more to purchase gasoline on some visits to the gas station than on other visits, the price of a currency also changes. Currency appreciation occurs when it costs more to purchase a currency than it did before.

If the next time you go to the bank to purchase pesos, the bank quotes an exchange rate of $\text{MXN}\,1 = \text{USD}\,0.0800$, it means that it now costs $0.0800 (up from $0.0625) to purchase a Mexican peso. Hence, the price of a peso has risen, or the peso has appreciated.

Currency prices are determined in the marketplace through the same types of supply-and-demand forces we discussed earlier in this chapter. What would cause the peso to appreciate? Either an increase in the demand for pesos or a decrease in the supply of pesos.

Currency Depreciation

Just as a currency can appreciate, it can depreciate. If the quote at the bank was $\text{MXN}\,1 = \text{USD}\,0.0500$, it would only cost $0.0500 to purchase a Mexican peso. When it costs fewer dollars to purchase a peso, the peso has depreciated. Either a decrease in demand for pesos or an increase in supply of pesos will cause the peso to depreciate.

Because an exchange rate is the price of one currency expressed in terms of another currency, if one of the currencies depreciates, the other currency must, by definition, appreciate. If it costs $0.0500 to purchase a Mexican peso, the price of a US dollar, in terms of a Mexican peso would be calculated as

$$\begin{gathered}\text{MXN}\,1 = \text{USD}\,0.0500 \\ \frac{\text{MXN}\,1}{0.0500} = \frac{\text{USD}\,0.0500}{0.0500} \\ \text{MXN}\,20 = \text{USD}\,1\end{gathered}$$

So, the price of one US dollar would be 20 Mexican pesos.

Exchange Rate Risk

Businesses that engage in international business face currency exchange rate risk. As exchange rates change, a business can be impacted in a number of ways. One of these risks, **transaction exposure**, is the risk that the value of a business's expected receipts or expenses will change as a result of a change in currency exchange rates. A pottery-making business that has sold merchandise to a company in the United States for $20,000, for example, will need to exchange the $20,000 for pesos to be able to pay its workers and other expenses in pesos. How many pesos it will receive for $20,000 will change depending on the exchange rate. If the exchange rate is $\text{MXN}\,16 = \text{USD}\,1$, the company will receive 320,000 pesos for the $20,000. If the exchange rate is $\text{MXN}\,20 = \text{USD}\,1$, the company will receive 400,000 pesos for the $20,000. Thus, as the peso depreciates (and the US dollar appreciates), the same number of dollars will provide more pesos. Conversely, as the peso appreciates (and the US dollar depreciates), the same number of dollars will provide fewer pesos.

Firms that hold assets in a foreign country also face **translation exposure**. When a company creates its financial statements, items are reported using one currency. As foreign exchange rates change, the value of how items are reported on these financial statements can change. This type of risk is an accounting risk.

Economic exposure is the risk that a change in exchange rates will impact a business's number of customers and sales. For example, tourists have the option of spending a week-long vacation at a resort in the United States or in Mexico. As the dollar appreciates, US citizens can exchange their dollars for more pesos, resulting in their purchasing power going further at a Mexican resort. Because an appreciating dollar also means a depreciating peso, it would mean that Mexicans who earn pesos will receive fewer dollars when they exchange their pesos. A Mexican who wants to stay at a $200-per-night hotel in Colorado will need more pesos to pay for the room when the peso depreciates. The depreciating peso will likely mean that more Mexicans will spend their vacation week in Mexico, and fewer will vacation in the United States.

Even businesses that do not view themselves as involved in international business can face economic exposure. The ski lodge in Colorado will find that its customers from Mexico decrease when the dollar appreciates. Likewise, when the dollar appreciates, some of the ski lodge's US-based customers may choose instead to visit a resort in Mexico, where their purchasing power is strong.

3.6 Sources and Characteristics of Economic Data

Learning Outcomes

By the end of this section, you will be able to:

- Interpret economic data.
- Compute the percent change for economic variables.

FRED: Federal Reserve Economic Data

One of the largest sources of economic data is the Federal Reserve Economic Data (FRED) database.[12] This database is maintained by the Federal Reserve Bank of St. Louis and contains more than 765,000 economic time series. These time series are compiled by the Federal Reserve and come from a number of sources, including the Bureau of Labor Statistics and the US Census.

LINK TO LEARNING

FRED

Data included in the FRED database is divided into these broad categories:

- Money, Banking, and Finance
- Population, Employment, and Labor Markets
- National Accounts
- Production and Business Activity
- Prices
- International Data
- US Regional Data
- Academic Data

Watch this FRED introduction video (https://openstax.org/r/what-is-fred) to learn more information about how to use FRED.

You can find statistics on employment, inflation, exchange rates, gross domestic product, interest rates, and many other economic variables in the FRED database. Although much of the data is about the US markets, macroeconomic data from other countries is also available. In addition to being viewable in graphical and text form on the FRED site, the data is easily downloaded into an Excel spreadsheet for analysis.

LINK TO LEARNING

Creating a Stacked Area Graph

Not only does FRED provide an excellent source for economic data, but it allows users to create custom graphs that can be used in presentations and reports. To learn more about how to create these graphs, read this article on using stacking (https://openstax.org/r/fred-gdp-stacking). This tutorial provides step-by-step instructions for creating a stacked area graph of real GDP and its separate components and a real GDP area graph showing the percent that each of these components contributes to the total value of real GDP.

12 Federal Reserve Bank of St. Louis. Economic Resources & Data. Accessed October 25, 2021. https://www.stlouisfed.org/

Levels versus Percentage Changes

The same information can be presented in graphs several different ways. The particular format you choose will depend on how you are using the data.

Figure 3.19 shows the real GDP of Japan for 2010–2020. This chart is created showing the level of real GDP. The steep drop in 2020 highlights the economic decline associated with the COVID-19 pandemic. Looking at the chart, it is easy to see that after 10 years of a general upward trend, Japan's GDP quickly fell to a level not seen in the previous decade as COVID-19 began spreading in early 2020.

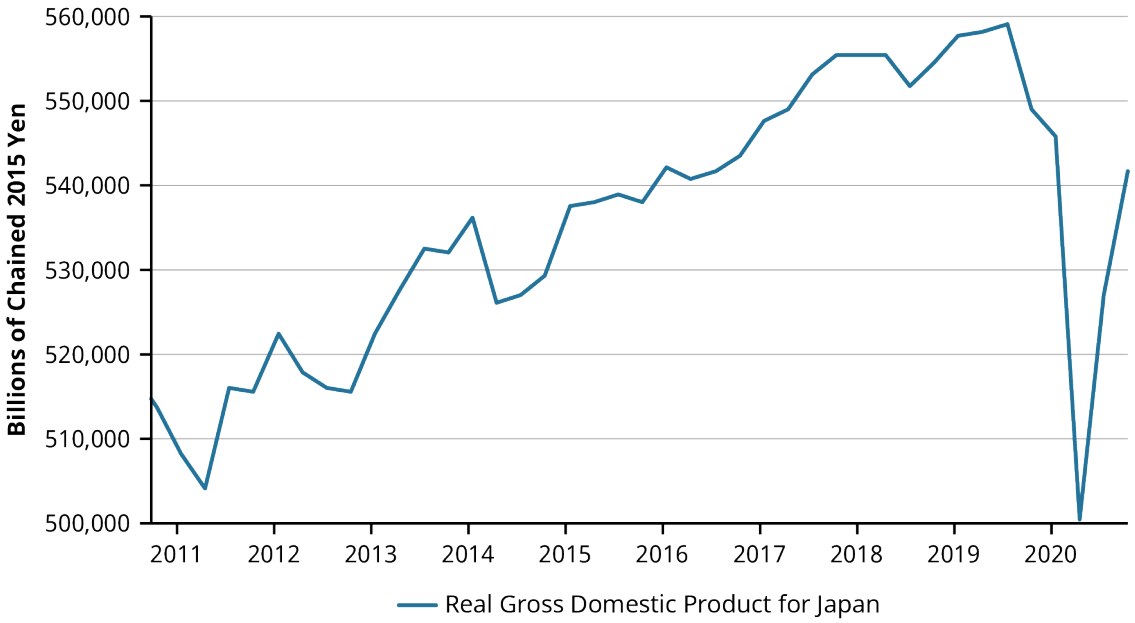

Figure 3.19 Real Gross Domestic Product for Japan, 2010–2020[13]

The vertical axis in Figure 3.19 is measured in yen. Over the time period shown, the real GDP ranged from 500 trillion yen to 560 trillion yen. The general trend (until COVID-19) was upward, indicating growth in the Japanese economy. However, the growth was not consistent from year to year.

Figure 3.20 also contains information about Japanese real GDP from 2010 to 2020. This chart measures the percent change for each quarter on the vertical axis. It is created using the same underlying data as Figure 3.19. Figure 3.20 demonstrates a way of highlighting the growth (or contraction) of an economy at a particular point in time.

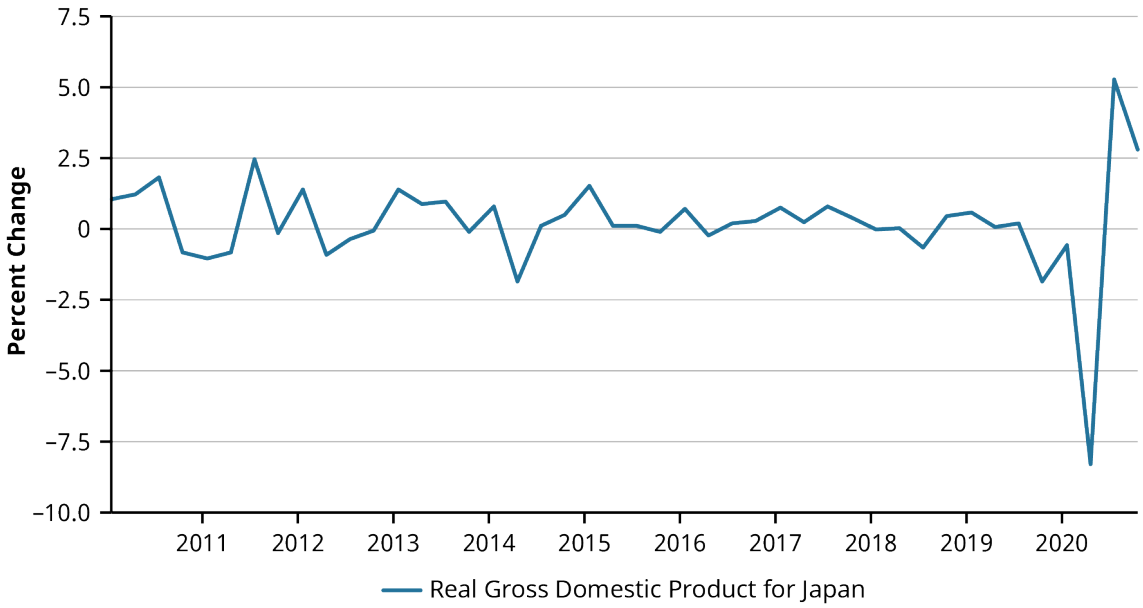

Figure 3.20 Percent Change for Gross Domestic Product for Japan, 2010–2020[14]

The formula to calculate the percentage change from one quarter to the next is

$$\text{Percentage Change} = \frac{\text{Quarter}_2 - \text{Quarter}_1}{\text{Quarter}_1}$$

In the first quarter of 2013, the real GDP for Japan was 522,594.2 billion yen. In the second quarter of 2013, the real GDP had risen to 527,277.0 billion yen. Thus, the percentage change in real GDP from quarter one to quarter two was

$$\text{Percentage Change} = \frac{\text{Quarter}_2 - \text{Quarter}_1}{\text{Quarter}_1} = \frac{527{,}277.0 - 522{,}594.2}{522{,}594.2} = 0.00896 = 0.896\%$$

As long as the percentage change for a quarter is positive, the real GDP in Figure 3.20 will rise; this indicates that the economy is growing. If the percentage change shown in Figure 3.20 is negative, then real GDP will fall; this indicates that the economy is contracting. Looking at the percentage change in Figure 3.20 is helpful for detecting when the economy is growing but the growth is slowing. If the percentage change is positive but lower than it was for the previous quarter, then GDP is growing, but the growth rate is slowing.

Indexes

An index is created to track the performance of a particular aspect of the economy or the financial markets. An index helps compare the level of a variable at one point in time relative to another point in time. Indexes are often used when movement over time is more important than the absolute level of the variable at any one point in time.

Earlier in this chapter, we looked at the rate of change in the CPI to measure the rate of inflation. In its raw form, the CPI is an index. Remember that the CPI is a measure of the cost of a market basket of goods. When the index is created, the total cost of the market basket, whether it is $300 or $950, is irrelevant. What economists are interested in is the magnitude of the difference in cost of the same market basket at a later date.

In order to focus on the change over time, a base year is identified. The cost of the market basket in the base

13 Data from JP, Cabinet Office. "Real Gross Domestic Product for Japan (JPNRGDPEXP)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/JPNRGDPEXP
14 Data from JP, Cabinet Office. "Real Gross Domestic Product for Japan (JPNRGDPEXP)." FRED. Federal Reserve Bank of St. Louis, accessed July 7, 2021. https://fred.stlouisfed.org/series/JPNRGDPEXP

year is given an index level of 100. Let's assume that the market basket costs $300 in the base year. If the same basket of goods costs $330 the following year, then the index level the following year would be 110. The index level increases by 10% when the cost of the market basket increases by 10%. This makes it easy to compare different measures of inflation.

For example, suppose a market basket costs 40,000 yen in the first year and 42,000 yen in the second year. In the base year, the CPI in Japan would be set at 100; the following year, the index would rise to 105 (because of the 5% rise in the market basket cost). Comparing the levels of the index in Japan with the index in the United States allows you to compare inflation trends in the two countries.

Table 3.6 contains the CPI for the United States, Japan, and Switzerland for each decade since 1970. A base year of 1970 is used for all three countries, so the index level is 100 for all three countries in 1970. You can see that Japan has experienced virtually no inflation for the last several decades. If the index level remains the same from one year to the next, there is a zero rate of inflation. Negative rates of inflation, or deflation, would be associated with a falling index level.

Year	United States	Switzerland	Japan
1970	100.0	100.0	100.0
1980	212.3	162.3	232.5
1990	336.5	226.4	291.2
2000	443.5	278.2	322.1
2010	561.6	304.3	313.6
2020	666.6	302.3	331.8

Table 3.6 CPI Levels for the United States, Switzerland, and Japan[15]

Using an index level helps us compare the impact that inflation has had on the cost of living in the three countries. Prices were rising rapidly in Japan in the 1970s, outpacing price increases in both the United States and Switzerland. By the mid-1980s, however, price increases in Japan tapered off. Although prices in Switzerland rose much more slowly in the 1970s, the price level continued to rise over the next couple of decades. Even though the price increases have followed different patterns in Switzerland and Japan, the overall price level today is about three times what it was in 1970 in both of those countries. However, the price level in the United States has continued to rise; today, the price level in the United States is about seven times higher than it was in in the 1970s.

15 Data from US Bureau of Labor Statistics. "Consumer Price Index for All Urban Consumers: All Items in US City Average (CPIAUCNS)." FRED. Federal Reserve Bank of St. Louis, accessed July 31, 2021. https://fred.stlouisfed.org/series/CPIAUCNS; Organization for Economic Co-operation and Development. "Consumer Price Index: All Items for Switzerland (CHECPIALLMINMEI)." FRED. Federal Reserve Bank of St. Louis, accessed July 31, 2021. https://fred.stlouisfed.org/series/CHECPIALLMINMEI; Organization for Economic Co-operation and Development. "Consumer Price Index of All Items in Japan (JPNCPIALLMINMEI)." FRED. Federal Reserve Bank of St. Louis, accessed July 31, 2021. https://fred.stlouisfed.org/series/JPNCPIALLMINMEI