ECONOMICS COLLECTION

Philip J. Romero and Jeffrey A. Edwards, *Editors*

Learning Basic Macroeconomics

A Policy Perspective from Different Schools of Thought

Hal W. Snarr

BUSINESS EXPERT PRESS

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Abstract

Because macroeconomics is grounded in microeconomics and uses mathematical models to simplify and illustrate complex processes, learning it can be difficult. Traditional macroeconomic-principles textbooks fail to connect topics and models in a concise, cohesive, and meaningful way. So, it should not surprise when a 2008 presidential candidate says, "Economics is something that I've really never understood" (Zuckman 2008). This book overcomes these shortcomings with better topic selection and organization, by literally building a model of the macroeconomy, and utilizing a single hypothetical numerical example throughout the book to teach the principles. Keynesian economics, a school of economic thought based on the views of the British economist John Maynard Keynes (1883 to 1946), is used to construct the model of the macroeconomy because it is elegant, simplistic, intuitive, and politicians apply it when enacting stimulus bills. That said, the book is not an endorsement of Keynesian economics, nor does it suggest that mathematical modeling is the quintessential element of economic analysis. Only by building this model upon a Keynesian foundation can one truly appreciate the various perspectives in economics, the limitations of mathematical modeling, and why politicians tend to prescribe Keynesian solutions. This book allows business executives, graduate and undergraduate students, policy makers, and others to gain a fuller understanding of how the macroeconomy reacts to economic shocks and policy changes from several economic perspectives.

Keywords

aggregate demand, aggregate expenditure, austrian economics, consumption function, crowding-out, demand and supply, discount rate, fiscal policy, fiscal policy lags, fiscal policy multipliers, fractional reserve banking, free trade, interest on reserves, long run aggregate supply, monetary policy, open market operations, rational expectations, required reserves ratio, short run aggregate supply, supply-side economics, the chicago school, the classical school, the federal funds market, the Keynesian school

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CHAPTER 1

Introduction

Joan Robinson (1903 to 1983), professor of economics at Cambridge University, once remarked that you study economics to avoid being fooled by economists (Mankiw 2010). An economist, according to the Merriam-Webster dictionary, is a person who practices economy. This definition suggests that anyone who is thrifty or uses material or nonmaterial resources efficiently is an economist, which would include everyone from good writers, who scrub unnecessary words from their articles and books, to truck drivers, who map out the shortest delivery paths.

Economics is a social science that studies the production, distribution, and consumption of commodities. Edmond Dantès, played by Jim Caviezel in 2002's *The Count of Monte Cristo*, translates this as, "Dig first, money later." Professional and academic economists would define economics more precisely as the social science that studies how individuals use limited resources to satisfy unlimited wants. Although this definition ignores the role of firms and government, both are populated by self-interested individuals who tend to have conflicting objectives. For example, in *Moneyball*, the owner of the Oakland Athletics and his general manager, played by Brad Pitt, have very different aims. Pitt's character is driven to win the last game of every season, the final game of the World Series. To do this, he needs to keep the team intact, but cannot because it has one of the lowest payrolls in Major League Baseball. The owner seeks the highest profit possible, but his team's revenue is limited by being in a small television market. More and better players may win more games, but they also cost more. Thus, winning the final game of the World Series is less profitable than winning just enough to make the playoffs.

Economics is broken into two major fields: microeconomics, which analyzes issues that individuals and firms are concerned with, and macroeconomics, which studies issues affecting the economy as a whole. Because macroeconomics is grounded in microeconomics, and uses mathematical models to simplify and illustrate complex processes, learning it can be difficult, especially for those who struggle in mathematics. Computer simulation can aid this, but Wetzstein (1988) asserts that it may do more harm than good because such tools "stifle students' imagination, contribute to a dependent learning style, and fail to stimulate interest in the subject matter." The linear models developed herein are used to literally build and analyze a model of the macroeconomy to gain a richer understanding of how the economy reacts to various shocks.

This book is organized into three parts. Chapters 1 and 2 lay the foundation of the aggregate market model that is constructed in Chapters 3 and 4. After this model is assembled using data, Keynesian economics,[1] and simple linear equations, it is analyzed using hypothetical numerical values to understand how the macroeconomy responds to economic shocks and policy changes. To aid in performing these numerical analyses, I have written several EXCEL simulations that can be downloaded from www.halsnarr.com/teaching.htm.[2] The model is then used to study the effectiveness of fiscal policy in Chapter 5 from different schools of economic thought. In Chapter 6, money, banking, and monetary policy are introduced, analyzed, and evaluated. After evaluating mainstream economics, in the context of the 2008 financial collapse and subsequent recovery, Chapter 7 presents and analyzes an alternative model of the macroeconomy developed by Austrian macroeconomist Roger Garrison (2001).

In the remainder of this chapter, macroeconomics is introduced. However, before proceeding to this, microeconomics is introduced using several interesting applications because it is the foundation of macroeconomics (Lucas 1976).

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[1] Keynesian economics is a school of economic thought based on the views of the British economist John Maynard Keynes (1883 to 1946).

[2] The EXCEL simulations are downloaded by clicking on the links titled Simulated Consumption, Simulated Consumer Expenditure, Simulated AE, Simulated AD, Production Function and LRAS, SRAS and LRAS, AD-AS equilibrium, Short-run Discretionary Policy, and Federal Funds Market.

Microeconomics

Microeconomics studies the behavior of individuals and firms. Firms seek maximum profits and individuals seek maximum satisfaction, or utility, but both are faced with constraints and scarce resources. For example, a cheese maker cannot sell its cheddar for *any* price it wants even if it is a monopolist, the only seller of a product. Likewise, it cannot buy milk from dairy farmers at any price it wants even if it is a monopsonist, the only buyer of a product.

Demand

Demand is the force that prevents a firm from charging any price it wants. This is so because a product's demand represents the maximum price consumers are willing to pay for a given level of scarcity. The amount of a good or service that is purchased by a consumer at a given price is referred to as the *quantity demanded*, while demand is the set of prices that correspond to a set of quantities demanded. Thus, demand refers to a curve, and quantity demanded corresponds to a point on that curve.

The *Law of Demand* states that, all else being equal, the quantity demanded of a product declines with its price. The law is tested in a hypothetical experiment that asks people working near Main and Elm the question: With tacos selling at $1.25,[3] how many hot dogs will you buy per week at a price of $6.50, or at $0.50? Table 1.1 displays hypothetical data from 875 respondents. The middle column indicates that respondents collectively demand 1,000 hot dogs when the price is $6.50, which corresponds to point A in Figure 1.1. In the left column of Table 1.1, survey participants collectively demand 7,000 hot dogs when the price drops to $0.50, which corresponds to point B. The line that connects points A and B represents the demand for hot dogs. It gives the *expected* quantity of hot dogs demanded for a given price. The *movement along demand* between points A and B indicates that the Law of Demand holds true.

The equation for hot dog demand can be fit using the point-slope formula. The slope is computed by dividing the change in price by a

[3] All values, unless otherwise stated, are in U.S. dollars.

Table 1.1 Consumer demand for hot dogs

Name	Quantity demanded at P = 6.50	Quantity demanded at P = 0.50
Tonya	0	18
George	0	6
Harold	4	9
. . .	. . .	. . .
Velma	0	1
Total	*1,000*	*7,000*

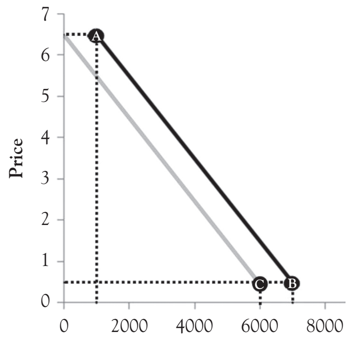

Figure 1.1 Movement along and shifts in demand

corresponding change in quantity. From point A to point B, the change in price equals –$6, and the change in quantity equals 6,000. Hence, the slope of demand is –0.001. Substituting the slope and either point A or B into the point-slope formula gives the equation for the black hot dog demand curve in Figure 1.1:

$$P_d = 7.5 - 0.001Q$$

A product's demand *shifts* when a factor other than its price changes. Suppose the participants of the survey are asked how their responses change if the taco price drops to $0.75, and their responses to these questions produce the gray line in Figure 1.1. With the hot dog price held at $0.50 and the taco price falling from $1.25 to $0.75, the quantity of hot dogs demanded declines by 1,000 (according to Figure 1.1) as the quantity of tacos demanded rises (according to the law of demand). Therefore, the gray and black lines in the figure model a *decreased demand* for hot dogs. Thus, hot dogs and tacos are *substitute goods*. If the drop in taco price had instead *increased demand* for hot dogs, the gray line in the figure would lie to the right of the black line, and hot dogs and tacos would be considered *complement goods*. If the decrease in demand had been caused by an increase in income, hot dogs would be considered an *inferior good*. If the decrease in demand had been caused by a decrease in income, hot dogs would be considered a *normal good*. The decrease in hot dog demand could have also been caused by a change in *tastes and preferences* or a decline in the neighborhood's *population*.

Price elasticity of demand measures consumer sensitivity to price changes. At point B, the price is $0.50 and the quantity of hot dogs demanded is 7,000. Dividing their ratio by demand's slope (–0.001) gives a price elasticity of demand equal to –0.07. This implies that a 1-percent increase in price reduces hot dog consumption by 0.07 percent. Because the percent change in consumption is smaller than the percent change in price, consumers are very insensitive to the price change, and demand is said to be *inelastic*. With a price-quantity ratio of $6.50 per 1,000 hot dogs at point A, price elasticity of demand equals –6.5. At the higher price, a 1-percent increase in price reduces hot dog consumption by 6.5 percent. Because the percent change in consumption is larger than the percent change in price, consumers are very sensitive to the price change, and demand is said to be *elastic*. The elasticities imply that consumers get increasingly sensitive to rising prices.

Supply

While demand models consumer behavior, *supply* models firm behavior. It is the section of the marginal cost curve that lies above the average variable cost curve.[4] Intuitively, it gives the minimum price firms are willing to accept to produce a given amount of their product. The amount produced is referred to as the *quantity supplied*, while supply is the set of

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[4] Marginal cost is the change in firm costs resulting from a 1-unit increase in output, while average variable cost is the firm's variable cost at a given level of output divided by that output level.

prices that corresponds to a set of quantities supplied. Thus, supply refers to a curve, and quantity supplied corresponds to a point on that curve.

Supply slopes up because, according to the *Law of Supply*, a firm will generally increase output as its product's price rises. This is tested in the following hypothetical experiment. Suppose that there is a database that tracks U.S. hot dog production at the city level, and *regression analysis*[5] is applied to these data, which yields the following equation:

$$P = 0.995 - 0.1T + 0.7W + 0.01R + 1P_b + 0.001Q$$

Variable T indicates that a solar panel is installed on a hot dog cart's roof,[6] W is the wage paid to cart workers, R is the city regulation index, and P_b is the price of hot dog buns. To graph supply, all variables but P and Q are set equal to their averages. Suppose 60 percent of carts have solar panels, the average wage is \$7.25, the average city regulation index is 30 percent, and the average price of buns is \$0.13. Substituting these values into the equation above gives the equation for hot dog supply.

$$P_s = 0.5 + 0.001Q$$

The black line passing through point A in Figure 1.2 is its graph.

The coefficient of Q indicates how quantity supplied responds to a change in price, holding all other factors constant. Its value, 0.001, says that the quantity supplied is expected to increase by 1,000 hot dogs if the price increases by \$1, which is demonstrated by the movement along supply from point A to B. At point A, 4,000 hot dogs are supplied at \$4.50. At point B, the price and quantity supplied have risen to \$5.50 and 5,000 hot dogs. Thus, the Law of Supply holds true.

Supply's other coefficients determine by how much and in what direction supply shifts. For example, the coefficient of P_b associates a 1-dollar decrease in the price of buns with hot dog supply shifting downward by

[5] Regression analysis is a statistical technique that is used to estimate linear functions.

[6] T equals 1 if a hot dog cart has a solar panel, but equals 0 if the panel is not installed.

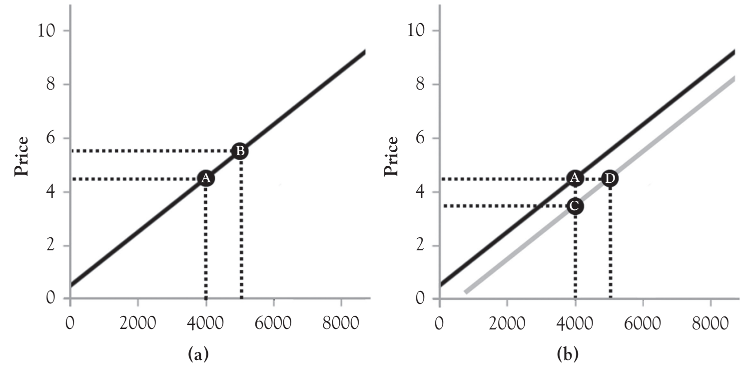

Figure 1.2 Movement along and shifts in supply

$1, which is modeled by supply shifting from point A to C in Figure 1.2*b*. Between these points, the quantity supplied is held constant at 4,000 hot dogs. The downward shift in supply represents a *decrease in marginal cost*. Because point D is on the same curve as point C, the price of hot dogs is held constant at $4.50 from point A to D, and the quantity of hot dogs supplied increases from 4,000 to 5,000, the decrease in marginal cost (from point A to C) corresponds to an *increase in supply* (from point A to D). The coefficients of *R* and *W* associate more regulation and higher wages to lower supply, while *T*'s coefficient links technology adoption to greater supply.

Price elasticity of supply measures firm sensitivity to a change in price. At point B, the price is $5.50 and the quantity of hot dogs supplied is 5,000. Dividing their ratio by supply's slope (0.001) gives a price elasticity of supply equal to 1.1. This implies that a 1-percent increase in price raises hot dog production by 1.1 percent. Since the percent change in production is larger than the percent change in price, firms are sensitive to the price change, and supply is said to be *inelastic*.

The Law of Supply and Demand

The *Law of Supply and Demand* states that forces of supply and demand push the price of a good toward the price at which quantity supplied and quantity demanded are equal. The first step to finding this point, which is called the *equilibrium*, is to graph hot dog demand against supply. Initial

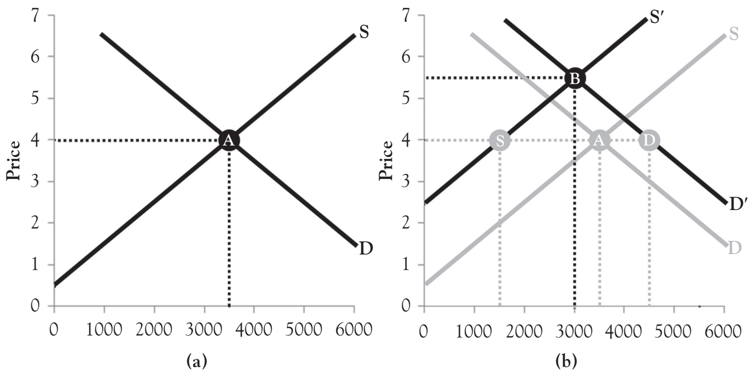

Figure 1.3 The law of demand and supply

demand and supply are shown in Figure 1.3*a*, which give an initial equilibrium at point A. To find the equilibrium quantity, demand is set equal to supply:

$$7.5 - 0.001\ Q = 0.5 + 0.001\ Q$$

This result is then solved for equilibrium quantity, which equals 3,500 hot dogs. Substituting this value into either supply or demand gives an equilibrium price $4. At this price, the number of hot dogs firms produce equals the number consumers buy, and the market is said to have *cleared*.

In Figure 1.3*b*, hot dog demand has increased to D′ and supply has decreased to S′. If the price remains at $4, the market will not clear, which results in a *shortage* of 3,000 hot dogs, the difference in the quantities at points D and S. To prevent a stock out, vendors must raise their prices to the new market clearing price of $5.50. A *surplus* of hot dogs would have resulted instead had price exceeded its equilibrium, which is not shown in the figure. To shed a surplus, firms must lower their prices to clear the market.

The law of supply and demand is analyzed with two meaningful examples that follow. The effect of immigration is depicted in Figure 1.4*a*. In free societies, people are *free* to migrate. An increase in immigration shifts the supply of low-skilled laborers rightward. This reduces the low-skilled wage by 50 percent. In the short run, immigration has a cost that is borne by native low-skilled workers. However, what is not shown is the effect of lower wages on product supply. Because lower wages reduce the

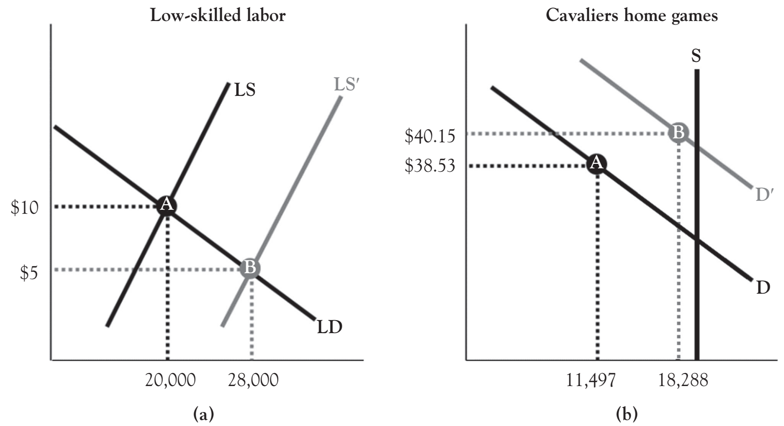

Figure 1.4 Free market dynamics

marginal cost of production, product supply curves shift rightward. This reduces prices and increases output. To increase their output, firms hire more high-skilled workers due to them and low-skilled workers being complements in production. If natives supply the high-skilled labor to the economy, natives' incomes rise, and so too does their consumption. Higher consumption generally increases output, which causes firms to hire even more labor. Higher low-skilled labor demand—not shown in the figure—implies that low-skilled wages do not fall as much as opponents of immigration fear.

Figure 1.4*b* is used to illustrate why sports super stars like LeBron James are paid so much. After a stellar high-school career, LeBron was drafted in 2003 by the National Basketball Association's Cleveland Cavaliers. The average ticket price of the club's home games increased from $38.53 to $40.15,[7] while its average attendance for its home games soared from 11,497 to 18,288.[8] Given that LeBron's high-school games were televised on local pay-per-view television and ESPN, attributing the increase in demand, from D to D′ in Figure 1.4*b*, entirely to his addition to the roster is realistic. After all, the 6,791 additional fans did not start attending Cleveland's home games to see the last guy off the bench sit on the end of the bench. Because each NBA team hosts 41 home games, Cavaliers ticket revenue rose from 18.2 million to 30.1 million dollars as

[7] See www.leagueoffans.org/nbafancost03-04.html.

[8] See www.nba.com/cavaliers/history/attendance.html.

a result of drafting LeBron. In economics, the additional revenue accruing to a firm for adding a unit of labor is called the *marginal revenue product of labor* (MRPL), and labor is added until it equals the wage rate. With LeBron's MRPL at 11.9 million dollars a year, and his rookie salary at 4.02 million dollars,[9] Cleveland, if it could have, would have continued to hire LeBrons until the MRPL of the last LeBron hired equaled the wage. Unfortunately, for Cleveland, there is only one LeBron, and unfortunately for LeBron, the model suggests that he was underpaid.

Free Markets Versus Central Planning

Free market capitalism is the antithesis of *central planning*. To demonstrate the difference, suppose Figure 1.3*b* represents the gasoline market in the southern region of the United States just before (gray lines) and just after (black lines) a hurricane strikes. The rise in demand is due to consumer hoarding, while the decline in supply results from Gulf coast oil rigs and gasoline refineries in the path of the hurricane being shut down and evacuated. The storm further disrupts supply by interrupting the distribution of gasoline over road and rail. Collectively, the shocks push the market price of gasoline up to $5.50, and reduce overall gasoline consumption from 3,500 (at point A) to 3,000 (at point B). The higher price is an important consequence of free-market capitalism. In the wake of a natural disaster, it encourages conservation and averts a shortage.

In Figure 1.3*b*, suppose the gray lines represent the gasoline market in the West just after the hurricane hits the South, and the black lines represent the gasoline market in the South at the same moment in time. In a free-market economy, the large regional price differential encourages gasoline producers to shift gasoline supplies from West to South. The increase in southern supply and the decrease in western supply pushes the regional price differential toward zero. Once the (cost-adjusted) differential is zeroed, suppliers adjust inventory replenishment rates to keep it zero. The self-interested, profit-maximizing suppliers in a free market supply more gasoline to the storm-ravaged southern economy, which makes western consumers share the burden of the natural disaster, and renders

[9] See http://assets.espn.go.com/nba/news/2003/0703/1576436.html.

government disaster planning, like price controls, unnecessary. Adam Smith explains why this is so in *An Inquiry into the Nature & Causes of the Wealth of Nations*, writing "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own self-interest."

If the gasoline price remains elevated for an extended period of time, consumers may trade gas guzzlers for fuel-efficient cars, and firms may drill for more crude oil, or introduce vehicles that are less costly to operate. All of these reduce gasoline demand in the long run, which pushes the gasoline price lower, holding all other factors constant.

Under central planning, prices are set by government decrees. These can take the form of a *price ceiling* or *price floor*. Suppose Figure 1.3*b* represents the southern gasoline market before (gray lines) and after (black lines) the hurricane hits the coast, and Congress imposes a price ceiling of $4. This well-intentioned policy has an unintended consequence. According to the figure, a 3,000-gallon gasoline shortage results from the market clearing price being higher than the price ceiling. Although the price ceiling is an easy political sell at the moment it is enacted, discontent will build as the shortage it causes lingers. If the price ceiling is kept in place, government may decide to ration gasoline by limiting the quantity of gasoline purchased during a fill-up, or using the last character on license plates to determine the day of the week drivers can purchase gas (Powell 2012). When policy-induced shortages are severe, consumers cannot buy gasoline at the artificial price. This is why black markets[10] form in centrally planned economies.

Figure 1.5 models the effect of rent control. The city's price ceiling, $1,000 per month, is below the equilibrium rent of $1,600. Although the policy is enacted to lower the rent for low-income families, the figure shows that it causes a shortage of 30,000 rental units. Because renters are willing to pay up to $1,600 per month, they may be willing to bribe landlords as much as $7,200, the difference in the market and government-decreed annual rent rates. In the fifth episode of Seinfeld's second season, Elaine applies for a rent-controlled apartment in Jerry's

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[10] Examples of black markets include illegal services procured by pimps, or illegal stimulants sold by drug dealers.

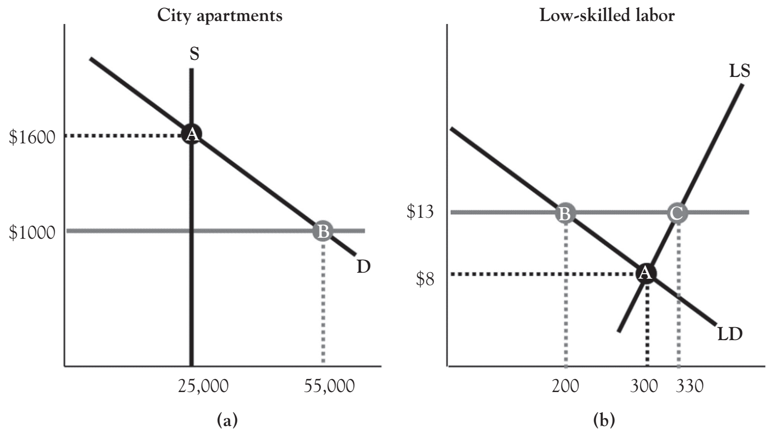

Figure 1.5 Consequences of price ceilings and price floors

building. Although she is the first in line and the rent is just $400, the bribe needed to get the apartment is $5,000. Unless low-income families have friends like Jerry, they will lose out to those who can afford bribes. Other unintended consequences include landlords evicting tenants for the sole purpose of raising rents, or a rent-control neighborhood becoming a slum because rents may not be sufficient to cover maintenance or repair expenses.

Price floors have unintended consequences, too. Price floors can result in excessive inventories. In low-skilled labor markets, hiking the minimum wage can increase the number of unemployed workers. In Figure 1.5, the minimum wage is set at $13 per hour, which is $5 higher than the market clearing wage. As a result, firms shed 100 workers from their workforces, 30 low-skilled laborers enter the labor market to look for work, and the number of unemployed workers rises from 0 to 130. The consequence of a price floor on milk in the 1980s raised the government's dehydrated milk inventory to a problematic level. To alleviate the problem, warped solutions like paying farmers to kill dairy cows or mixing dehydrated milk into the fresh milk supply were tried (Bovard 1991).

Figure 1.6 illustrates the effect of ignoring free-market forces in the labor markets of newly minted, certified high-school teachers. Figure 1.6*a* shows college graduates with mathematics skills earning $60,000 per year working in the private sector as engineers, economists, or financial analysts. Figure 1.6*b* shows those not endowed with mathematical skill

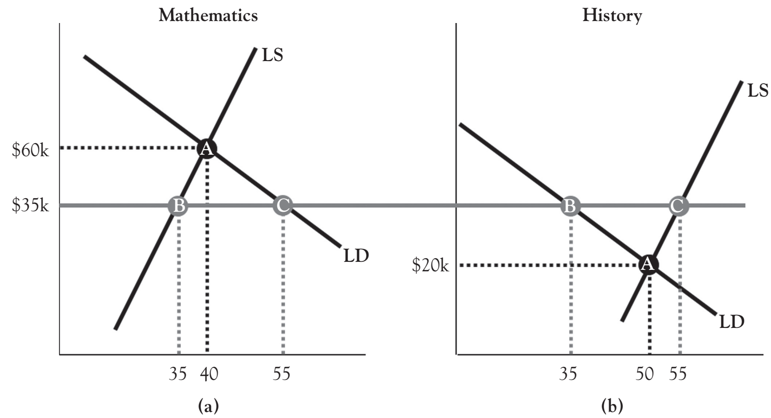

Figure 1.6 Consequences of wage setting

earning $20,000 in the private sector. The consequence of paying all first-year teachers a salary of $35,000, according to the figure, results in shortage of 20 math teachers, and a surplus of 20 history teachers. Math teacher shortages are filled by school districts hiring experts from the private sector or surplus nonmath teachers using conditional or emergency teacher certification programs. Thus, the 20 surplus history teachers in Figure 1.6 can be reallocated to temporarily cover the math shortage *until* 20 qualified math teachers can be hired. This was a long-term problem for Guilford County, North Carolina schools until they began paying math teachers compensating wage differentials of up to $10,000 per year (Silberman 2006). The problem is not unique to that county. It is widespread throughout the United States, especially in middle schools. According to the National Center for Education Statistics, less than a third of math teachers are qualified to teach middle-school math, and about 10 percent of teachers are qualified to teach middle-school science (Koebler 2011).

Two very funny scenes in the movie *Moscow on the Hudson*, which is set before the collapse of the U.S.S.R., humorously summarize the difference between free-market capitalism and central planning. The first scene shows Robin Williams, who plays a saxophone player with the Moscow Circus, freezing while standing in a block-long line for toilet paper. Such shortages were common in the central-planning nation. In another scene, Williams's character, who had defected to the United States at Bloomingdale's, enters a New York City grocery store to buy coffee. After seeing shelves plentifully stocked with numerous varieties of coffees, he collapses in shock, and is subsequently rushed to the hospital.

Macroeconomics

The *Production Possibilities Frontier* (PPF) is used to introduce macroeconomics, the study of issues affecting the economy as a whole. A PPF depicts different combinations of two products that an economy can produce using the best available technology and all available resources. The first PPF example is used to introduce gross domestic product (GDP), potential output, unemployment, and the natural rate of unemployment. In a second example, two linear PPFs are used to demonstrate the benefits of free trade. The section concludes with a final PPF example that is used to introduce government budget surpluses and deficits.

The Economics of Government Provided Healthcare

Figure 1.7 graphs a PPF for healthcare against the consumption of all other products. Point A is *inefficient* because resources are underemployed. Points B, C, and D are *attainable* and *efficient* because the economy is utilizing all of its available resources. The point on the PPF where products' prices equal their marginal costs is said to be *allocatively efficient*. It can be shown that there can only be one such point on the PPF, which is assumed to be point D. Although E is unattainable in the short run, it is attainable in the long run if the PPF shifts outward after new resources and technologies are discovered (or lands are conquered).

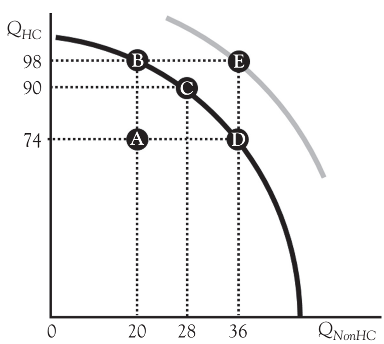

Figure 1.7 Modeling macroeconomic output using a PPF

If the economy is at point A, it is producing 74 units of healthcare and 20 units of other goods. The dollar value of this is referred to as GDP. Because it is less than the *potential output*, the value of economic output at points along the PPF, the economy is said to be in a *recessionary gap*. In this situation, the *unemployment rate*, the share of the labor force that is unemployed and looking for work, exceeds the *natural rate of unemployment*, the rate that prevails at points along the PPF. If the economy moves to point D, no healthcare is given up to get the additional 16 units of other products. This might seem like the society is getting something for nothing, a free lunch if you will, but is not because high unemployment at point A causes idle workers to bid down wages. This reduces firms' marginal costs and increases production, which pushes the economy from A to B. Thus, GDP tends to hover near the PPF in a free society.

With the economy at allocatively efficient point D, the decision to produce more of a good involves a *trade-off*. If government directs the economy to produce 16 more units of healthcare, society must give up 8 units of other products. This puts the economy at point C. The *opportunity cost*[11] of healthcare is computed by dividing the number of units of other goods that must be given up, 8 in this case, by the number of healthcare units gained, 16 in this case. Hence, from point D to C, it costs society an average of 0.5 units of other goods to produce an additional unit of healthcare. Suppose that the government nudges the economy from C to B because it believes that even more healthcare is better. The move from C to B means that the society gets 8 more units of healthcare, but gives up 8 units of other products. Thus, on average, the opportunity cost of an additional healthcare unit increases to one unit of other goods. Thus, moving up along the PPF, from the right to the left, increases the cost of healthcare. This results from the economy becoming increasingly specialized as more and more resources that are poorly suited

[11] More formally, opportunity cost is the value of the next-highest-valued alternative use of a resource. For example, the opportunity cost of college does not include room and board because these expenses are paid whether or not a person goes to college. It does, however, include the earnings from a job that is forgone to attend college.

to produce healthcare, such as economists with bad bedside manners, are being used to produce it.

The Economics of Free Trade

Figure 1.8 depicts two PPFs that model trade between Mississippi and Alabama. For simplicity, both economies produce tobacco or corn. The PPFs are assumed to be linear because the resources used to produce these goods are nearly identical. If both economies devote all of their resources to the production of tobacco, neither economy produces corn. In this situation, Mississippi produces 1,200 hogsheads of tobacco and Alabama produces 1,000. Because Mississippi produces more tobacco when both economies devote all of their resources to its production, Mississippi is said to have an *absolute advantage* in tobacco. If, on the other hand, the states devote all resources to the production of corn, Figure 1.8 indicates that Mississippi produces 300 bushels of corn and Alabama produces 500. Thus, Alabama has an absolute advantage in corn. If an economy has the absolute advantage in both goods, it has an *absolute advantage in trade*, which is not the case here.

Trade and production decisions are based not on absolute advantage but on *comparative advantage*, which is the ability of a state to produce a product at the lowest cost. With regard to producing one more bushel of corn, the slopes of the PPFs, –4 for Mississippi and –2 for Alabama, indicate that Mississippi must give up 4 hogsheads of tobacco and Alabama must give up 2. Hence, Alabama's opportunity cost of corn production

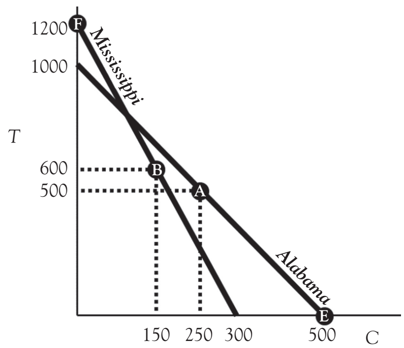

Figure 1.8 The benefits of free trade

is lower, which gives it the comparative advantage in corn. With regard to producing one more hogshead of tobacco, the inverses of the slopes, –0.25 for Mississippi and –0.5 for Alabama, indicate that Mississippi must give up 0.25 bushels of corn and Alabama must give up 0.5. Because Mississippi's cost of producing tobacco is lower than Alabama's, it has the comparative advantage in tobacco. Each state will have a comparative advantage in an industry even if one of them has an absolute advantage in trade, provided the PPFs are not parallel. When linear PPFs intersect, as they do in Figure 1.8, the states do not have the absolute advantage in trade, and the state with the absolute advantage in an industry has the comparative advantage in that industry.

If Alabama and Mississippi have erected trade barriers (import tariffs and quotas) in a trade war, the two states must devote resources to both industries if their citizens wish to consume both goods. Assuming that the resources are split equally, Alabama produces 250 bushels of corn and 500 hogsheads of tobacco (point A), and Mississippi produces 150 bushels of corn and 600 hogsheads of tobacco (point B). If the prices of corn and tobacco are $2.50 per bushel and $1 per hogshead, Alabama's GDP is $1,125, and Mississippi's is $975. The combined GDP of both economies is $2,100.

Suppose that the states sign a free-trade agreement. With Mississippi having the comparative advantage in tobacco, it will produce 1,200 hogsheads of tobacco and 0 bushels of corn (point F). Because Alabama has the comparative advantage in corn, it produces 500 bushels of corn and 0 hogsheads of tobacco (point E). Thus, free trade increases Alabama's GDP to $1,250, Mississippi's to $1,200, and total GDP to $2,450. The costs of the free-trade agreement include Mississippi outsourcing corn jobs to Alabama, and Alabama outsourcing tobacco jobs to Mississippi. Opponents of free trade point this out when they argue against free trade pacts. When making this argument, they fail to mention that free trade grows the industries the economies have comparative advantages in. In the example, Alabama's corn and Mississippi's tobacco industries doubled in size, which provided employment opportunities to displaced workers. Moreover, the additional income accruing in these states can be used to buy potatoes from Idaho, oranges from Florida, and MBAs from Massachusetts's Harvard University.

Government Budget Deficits Are the Norm

The *budget balance* is the difference between tax revenue (T) and government expenditure (G). When the budget balance is 0, expenditure equals tax revenue. If expenditure exceeds tax revenue in a given year, the budget balance is negative, and the amount is called a *budget deficit*. Because it is financed with newly auctioned treasury bonds, running budget deficits increases the national debt. If tax revenue exceeds expenditure in a given year, the budget balance is positive, and is called a *budget surplus*. Running budget surpluses pays down the national debt.

The *budget line* depicts the combinations of government services that produce balanced budgets for a given level of tax revenue. Assuming that the government provides Q_h units of healthcare at \$100 per unit and Q_m units of military protection at \$120 per unit, and collects \$24,000 in taxes per citizen, budget balance $T - G$ is given by

$$24{,}000 - 120Q_m - 120Q_h$$

If the budget is balanced, the expression above is equal to zero. Solving the resulting equation for Q_h yields the budget line below that is graphed in Figure 1.9.

$$Q_h = 240 - 1.2Q_m$$

Allocations of government services along the budget line, like points C and L, balance the budget, but a point inside the line, such as S, results in a budget surplus.

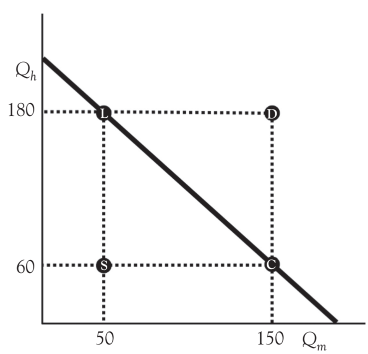

Figure 1.9 The fiscal budget balance

To show why budget deficits are the rule rather than the exception in the United States, assume that liberal politicians get voted out of office if healthcare falls below 180 units, and conservatives get voted out if military protection falls below 150 units. If the rhetoric of both politicians includes platitudes for balancing the budget, liberals will propose point L and conservatives will propose point C. If liberals are unwilling to compromise on healthcare and conservatives are unwilling to compromise on military spending, a deficit of $12,000 (point D) is the likely result because a balanced budget is not required by law. To politicians, this compromise is a free lunch of sorts. Conservative voters get the military they demanded and more healthcare than they asked for, liberal voters get the healthcare they demanded and more military protection than they asked for, and voters' taxes are not raised. Deficits, however, are not a free lunch. Treasury bonds are sold to cover them, which are paid back in the future by people who are currently too young to vote.

Aggregate Demand and Supply

In microeconomics, there are numerous demand and supply curves. Every consumer has a demand curve for each good or service that is supplied. Aggregating individuals' demand curves for a given product yields that product's market demand. Aggregating these yields *aggregate demand*, the relationship between the price level (PL) and the quantity of real GDP demanded, holding all other influences on spending plans constant. Aggregating firms' marginal cost curves for a product gives market supply. Aggregating these yields *aggregate supply*, the relationship between the PL and the quantity of real GDP supplied, holding all other influences on production plans constant. The intersection of aggregate demand and supply determines real GDP and the PL, while the difference between GDP and its potential determines unemployment. Since macroeconomic performance is assessed using these and other measures, they are covered in greater depth in Chapter 2.

CHAPTER 2

Macroeconomic Indicators

Inflation, interest rates, economic growth, and unemployment are key macroeconomic indicators used in assessing the overall health of the economy.[1] Understanding them is important because they are interrelated. For example, accelerating economic growth increases real *gross domestic product* (GDP) relative to potential output. This pushes unemployment below its natural rate. As unemployment falls, labor markets tighten. This puts upward pressure on wages, as firms compete for fewer and fewer workers to keep pace with strong product demand. If firms pass on higher and higher production costs to consumers, inflation rises. This may lead to higher interest rates.

Inflation

Most textbooks define *inflation* as a general increase in the prices of products. This suggests that *anything* that causes prices to rise is inflationary. *Demand-pull inflation* results when aggregate demand grows faster than aggregate supply. A spike in crude oil prices raises production costs, reduces aggregate supply, and results in *cost-push inflation*. However, according to Milton Friedman (1970), inflation arises from the money supply growing more rapidly than real GDP. Monetarists like Friedman argued that, because price spikes reduce the money that is available for products when the quantity of money is constant, expanding it at an excessive rate allows all prices to adjust up. Figure 2.1 supports this view.[2] The figure indicates that, in the long run, inflation rises nearly one-for-one in the growth of a country's money supply.

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[1] All data used in this book were downloaded from the Federal Reserve Economic Database unless otherwise noted.

[2] International Financial Statistics data for 120 countries, averaged over the years 1996 to 2004, are used in Figure 2.1.

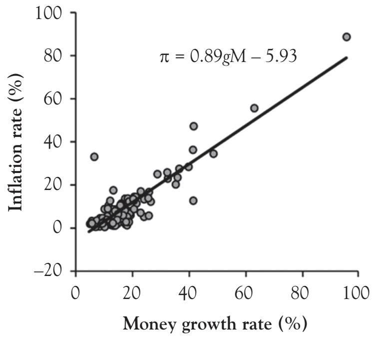

Figure 2.1 Inflation versus the growth in money

However inflation is defined, it is measured by computing the growth rate in the *price level* (PL) from year to year. In the United States, the *Consumer Price Index* (CPI) is used to measure inflation. The CPI is an average price of products. The set of products used to compute this average is referred to as the *market basket*. It includes 80,000 products, divided into eight categories, with the largest being housing. Because urban consumers purchase several loaves of bread a month and a new television once in a while, items included in the market basket are weighted. Product weights, which can be thought of as the quantities of products purchased each month by the typical consumer, are determined by the Consumer Expenditure Survey. The weights are held constant for a few years to compare prices over time. Every month, each item in the market basket is priced in multiple locations, and then averaged over 30 metropolitan areas. The total cost of this market basket is the dollar-valued PL.

Table 2.1 shows how the PL is computed using a hypothetical market basket of products. Some of the quantities in the table are less than one but others are not. For example, the typical consumer in this hypothetical is expected to go to the movies 5 times per month, and is expected to buy 0.04 televisions per month, or 4 every 100 months. After multiplying the quantities by their respective 2011 prices, the costs in the final column are totaled. The total, which equals 1260.07 dollars, represents the dollar-valued PL for 2011.

Table 2.2 displays hypothetical PLs, including the one computed in Table 2.1. The Bureau of Labor Statistics does not publish dollar-valued PLs. Instead, it releases the CPI. For a given year, the CPI equals the

Table 2.1 Hypothetical market basket

Product	Quantity	2011 price	2011 cost
Rent	1	755.57	755.57
Cable television	1	59.00	59
Movies	5	7.50	37.5
Cellular phone service	1	65.56	65.56
Television	0.04	850.00	34
Gasoline (gallon)	56	3.75	210
Tacos	21	1.50	31.5
Orange Juice (gallon)	15	4.50	67.5

Table 2.2 Price level, consumer price index, and inflation

Month	PL* (dollars)	CPI (percent)	Inflation (percent)
1982	543.47	97	6.6
1983	560.28	100	3.1
1984	582.69	104	4.0
⋮	⋮	⋮	⋮
2007	1,159.78	207	2.5
2008	1,204.60	215	3.9
2009	1,204.60	215	0.0
2010	1,221.41	218	1.4
2011	1,260.63	225	3.2

*The CPI from the BLS and the dollar-valued PL from Table 2.1 were used to simulate these values.

PL divided by the PL in base year 1983, which is listed as $560.28 in Table 2.2. The CPI values in the table are computed using

$$\text{CPI} = \frac{\text{PL}}{560.28}$$

Plugging the 1983 PL, $560.28, into the above equation gives a CPI of 1. Multiplying this by 100 gives the 1983 CPI in Table 2.2. It equals 100 percent, which is the case for any index in its base year. In Table 2.2, the 2011 PL is $1,260.07. Plugging this into the CPI equation above gives 2011 CPI, which equals 225 percent. Subtracting a CPI value from its base year value gives the *percent* increase in prices between the years. The difference between the 2011 and 1983 CPI values indicates that prices rose by 125 percent over the 28-year period. This implies that a taco costing $1 in 1983 is expected to cost $2.25 in 2011.

The CPI is one of many price indices. The Personal Consumption Expenditure Price Index (PCEPI) is broader than the CPI because it includes the prices of all consumer products. The Federal Reserve, or the Fed, monitors inflation using the core PCEPI, which is the PCEPI with food and energy prices excluded. The GDP Deflator Price Index (DPI) is broader than PCEPI because it includes the prices of all final goods and services produced domestically.

The annual percent change in the price index (*PI*) is the *inflation rate* (π), which can be computed using the following equation:

$$\pi = \frac{\text{PI}_{\text{is}}}{\text{PI}_{\text{was}}} - 1$$

Annual CPI inflation between 2011 and 2010 is found by substituting what the price index *is* in 2011 (2.25) and what it *was* a year earlier (2.18) into the equation above. Multiplying the result by 100 gives 3.2 percent, the 2011 inflation rate reported in Table 2.2. Negative inflation is called *deflation*, which indicates that prices generally fell during a given year. *Disinflation* is present if inflation declines over time. Table 2.2 indicates disinflation between 1982 and 1983, and between 2008 and 2009.

If wages are not adjusted for inflation over a long period of time, inflation acts like a tax.[3] For example, suppose a manufacturer is able to convince a labor union to agree to a 6-year freeze in the after-tax wage of $10 per hour, or $20,000 per year with inflation at 2 percent each year. This rate of inflation seems harmless but is not due to compounding. If the cost of living (COL) is $1,500 per month, or $18,000 per year, the household saves $2,000 per year in the absence of inflation. The equation below adjusts the COL for 2 percent inflation.

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[3] In Chapter 2 of Keynes (1924), inflation is described as a hidden tax. Governments can levy an inflation tax more subtly than a legislative change in the tax code.

$$\text{COL} = 18{,}000 \cdot (1 + 0.02)^j$$

Setting j equal to 1 in the above equation yields the COL for the *first* year, which is reported as $18,360 in Table 2.3. It is $360 higher than it was at the start of the first year, which causes the annual household savings to dip to $1,640. In the second year, j in the equation above is set equal to 2. The result is $367 higher than the COL at the end of the first year. Thus, the *rise* in the COL and the *decline* in savings are accelerating. The remaining costs of living and savings are listed in Table 2.3. It shows that the household is unable to live within its means by year six of the contract.

The CPI is an imperfect *cost of living adjustment* (COLA) because it does not include all components of the COL, and some of its components are mismeasured. According to Boskin et al. (1996), the CPI overstated inflation by 1.1 percentage points because it suffers from several sources of bias, which arise from the market basket being fixed for a few years. Product improvements and new goods do a better job than the older ones they replaced, but their higher prices are mistakenly measured as inflation. An increase in the price of beef relative to chicken causes some to switch to chicken, while a decline in incomes triggered by a recession may cause shoppers to switch from Macy's to Walmart. Because neither substitution is captured by the CPI market basket, the higher price of beef and relatively higher prices at Macy's overstate inflation.

Government's use of the CPI as a COLA pushes up budget deficits. Because the CPI is used to adjust the income levels at which higher tax rates apply, more and more individuals over time escape higher tax brackets.

Table 2.3 Inflation and the cost of living (COL)

Year	COL	Savings	Wage adjusted by CPI	Wage adjusted by COL
1	18,360	1,640	10.00	10.00
2	18,727	1,273	11.03	10.40
3	19,102	898	11.58	10.61
4	19,484	516	12.16	10.82
5	19,873	127	12.76	11.04
6	20,271	−271	13.40	11.26

This means fewer and fewer individuals are paying taxes at higher tax rates. This lowers tax revenue, *provided* entrepreneurialism and work effort are *unaffected* by lower marginal tax rates. Using the CPI to adjust government transfer payments makes the following more costly than they would have otherwise been: social security, military and civil service pensions, unemployment insurance (UI) compensation, Supplemental Nutritional Assistance Program (SNAP, formerly known as the Food Stamp Program), Medicare, and Medicaid. Finally, if increasingly generous transfers draw more and more workers out of labor markets over time, tax revenue will be even lower than what would have otherwise been collected.

Using the CPI as a COLA also distorts private contracts. In the labor contract example above, wages were frozen for six years. Suppose that the contract adjusts wages by CPI inflation, which is assumed to be 5 percent per year. If the contract affects 5,000 employees working 2,000 hours per year, and the actual COL grows at 2 percent each year, using CPI will distort the contract. The equation below adjusts the after-tax wage of $10 using the CPI inflation rate of 5percent or 0.05.

$$w = 10 \cdot (1 + 0.05)^{j-1}$$

During the *first* year of the contract, j is equal to 1. This results in a *first*-year contract wage of $10 per hour. With $j = 2$, the equation yields a *second*-year wage of $11.03 per hour. The remaining CPI-adjusted wages are listed in Table 2.3.

The wages in the final column of Table 2.3 have been adjusted using the actual rise in the COL, which was assumed to be 2 percent. To compute these values, 0.05 is replaced with 0.02 in the equation above. This column indicates that wages need to rise from $10 to $11.26 just to keep up with the actual increase in the COL. The table demonstrates how CPI inflation substantially overstates the cost of the contract. By the final year, employees are earning $2.14 per hour more than they would have earned, had the actual COLA been used. Individually, this seems great. However, since 5,000 employees work 2,000 hours per year, they collectively work 10 million hours per year. The firm's six-year wage bill, 709 million dollars, is 68 million dollars more than it would have been, had the actual COLA been used. With zero economic profits in the long run, firms may decide to move facilities to other states or countries to avoid such labor contracts.

Even if wages keep up with the COL, inflation is not costless. Consider the worst two cases on record: Hungary in 1946 and Zimbabwe in 2008 (Hanke 2009). At some point, prices in these economies were doubling daily. Firms in such an environment have to constantly update prices. This is costly because it involves printing new menus and catalogs, relabeling cans, and changing signs and websites. These monetary and time costs are called *menu costs*. When prices are doubling daily, holding money in one's wallet, purse, cash register, or couch is devastating because its value is cut in half by the day's end. Thus, money has to be deposited in interest-bearing accounts immediately to preserve its value. Before electronic transactions, people literally wore out the leather soles of their shoes running to the bank. In the age of electronic-commerce, *shoe leather costs* now represent the time and effort it takes to convert earnings, rents, and other payments denominated in a ravaged currency into stable foreign currencies or gold.

Persistently high inflation is costly in other ways. It distorts markets by making some goods relatively cheaper. This misallocates resources because these are being utilized in ways that would not have prevailed otherwise. If income tax rates are not indexed to inflation, earnings that rise with inflation end up in higher tax brackets, and workers will pay a higher share of income in taxes. An unexpected change in inflation redistributes wealth from savers to debtors because it makes the value of debt and returns on assets lower. Pensioners, living on fixed payments agreed to years earlier, are especially hurt by an unexpected change in inflation.

The value of earnings that is printed on an Internal Revenue Service Form W-2 is an example of a *nominal variable*. Over time, its value tends to rise for two primary reasons. First, the Mincer (1958) earnings function indicates the real value of earnings rise (at a diminishing rate) throughout one's life because investments in human capital decline as returns on earlier investments rise. Second, modest steady inflation is a goal of the Fed. In order to compare values of a nominal variable over time, inflation must be stripped from it. A nominal variable that is stripped of inflation is called a *real variable*. The *real variable equation* below converts nominal variable x_n into real variable x using price index PI.

$$x = \frac{100}{\text{PI}} \cdot x_n$$

We use the CPI as the price index when accounting for inflation in consumer goods and worker pay. Because the numerator in the fraction of the above equation equals the value of the CPI in 1983, the equation values variable x in 1983-dollars.

The federal minimum wage rates in 1984 and 2010 cannot be compared because the first is in 1984-dollars and the other is in 2010-dollars. Plugging the 1984 values of the nominal minimum wage ($3.35) and CPI (104) into the equation above gives a real wage of $3.22 per hour. Doing the same with the nominal minimum wage ($7.25) and CPI (218) for the year 2010 gives the real 2010 minimum wage, $3.33 per hour. The real values are comparable because both are in 1983-dollars. The comparison implies that minimum wage workers are slightly better off in 2010 than they were in 1984.

The comparisons do not have to be made with 1983-dollars. Any year's dollars can be used. For example, if one wishes to compare the price of a Hershey bar in 1936 ($0.05, according to FoodTimeline.org) to its price in 2011, the 1936 nominal price can be inflated to 2011-dollars. The following equation values prices in 2011-dollars because its numerator is the 2011 CPI:

$$x = \frac{225}{\text{PI}} \cdot x_n$$

Substituting the 1936 values of the CPI (14) and nominal price of a Hershey candy bar ($0.05) into the modified equation yields a real price of $0.80. Since this is in 2011-dollars, it is comparable to the nominal price of a Hershey bar purchased in 2011, which was about $1. In real terms, the Hershey bar is cheaper in 1936.

Interest Rates

The interest rate stated on a mortgage is an example of a *nominal interest rate*. It is the percentage of the *principal*, the amount borrowed, that the borrower agrees to pay each period until the loan matures. In the final period of the loan, the borrower pays the lender the final interest payment and any remaining principal. Interest compensates lenders for their time value of money. Instead of making the loan, the lender could have spent the amount buying consumer goods. Interest also compensates lenders for taking on risks.[4] Because short-term securities are less risky than longer term securities, interest rates generally increase with maturity. For securities issued by a given organization, the relationship is called the yield curve, which tends to steepen as economic growth accelerates.

Although there are numerous nominal interest rates, due in part to risks varying across types of loans and individuals, there is only one rate in macroeconomics. It is determined in the loanable funds market. In this market, borrowers demand funds supplied by lenders, and borrowers pay lenders nominal interest rate i, which is the sum of real interest rate r and inflation rate π.

$$i = r + \pi$$

This equation suggests a one-for-one relationship between inflation and the nominal interest rate, which is called the *Fisher effect*. Figure 2.2*a*, however, indicates that the interest rate on three-month U.S. Treasury

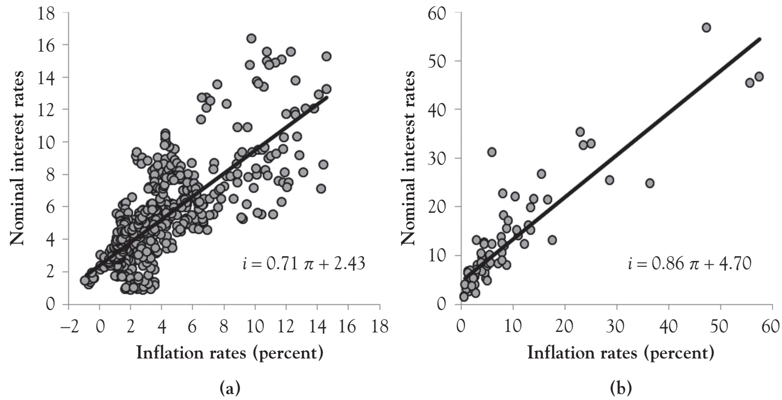

Figure 2.2 Nominal interest rate versus inflation

[4] Borrowers may default and collateral may have been overvalued (systematic risk), government may change regulation and tax rules before loans are paid off (regulatory risk), or future payments may be eroded by an unexpected jump in inflation or exchange rates (inflation risk).

bills only increases by 0.71 percentage points when CPI inflation rises by one percentage point. Using international data, Figure 2.2*b* provides stronger support for the effect.[5]

Using current inflation to determine the nominal rate of interest assumes that inflation will not change. The real rate of interest in the future will likely be much different from what it was when loan papers were signed. Borrowers do better and lenders do worse when loans are repaid with devalued money. In a world of uncertainty, the Fisher equation is

$$i = r + \pi_e$$

where π_e is expected inflation. Central banks are interested in real rates because they affect investment decisions of firms and savings decisions of individuals.

The yield on government-issued, inflation-indexed bonds is used to compute expected inflation. In the United States, these bonds are called *Treasury Inflation Protected Securities* (TIPS). The difference between the yields from conventional Treasuries and TIPS of the same maturity is called the *TIPS spread*. It is the market's valuation of expected inflation, which differs from that of the Survey of Professional Forecasters (SPF). The Fed refers to this difference as *bias*. It estimated *bias* using regression analysis, which resulted in the equation below.[6]

$$\text{Bias} = \underbrace{0.95}_{\textit{bias due to inflation risk}} - \underbrace{12.7 \cdot l + 20.9 \cdot l^2}_{\textit{bias due to liquidity}}$$

where l is liquidity premium, the difference between yields on 10-year Treasuries auctioned in the primary market and those traded in the secondary market. If the liquidity premium is 0.5, the Fed's estimate of *bias* is found by plugging this value into the equation above. With this equal to −0.175, and the TIPS spread assumed to be 3.5 percent, the Fed's estimate of π_e is 3.325 percent. If the current interest rate on three-month U.S. Treasury bills is 1 percent, subtracting the estimate of π_e from this

[5] International Financial Statistics data for 75 countries, averaged over the period 1996 to 2004 are used in Figure 2.2*b*.

[6] See www.clevelandfed.org/Research/data/TIPS/bg.cfm.

value gives a real interest rate equal to –2.325 percent. In such a situation, lenders pay interest on the loans they make to borrowers.

Economic Growth

GDP is the market value of all final goods and services produced domestically during the year. It can be computed using the production, aggregate expenditure, or income methods, which are illustrated in the example summarized in Table 2.4. The production method sums the value added by firms. Osgood Farm's value added is equal to its revenue, $118, because its raw material purchases were zero. For IdaWa Fries, the value added is $82 because its $166 in revenue has to be adjusted for the $84 potatoes purchased from Osgood Farm. The income method sums up incomes from labor ($50 and $33) and capital ($52 and $39), and the taxes government collects, which extracted $16 from Osgood Farm

Table 2.4 The production, income, and expenditure methods of computing GDP

Firm	Value	Production	Income	Expenditure
Osgood Farm				
Wages paid to employees	50		50	
Taxes paid to government	16		16	
Raw materials	0			
Revenue from sale of potatoes				
Potatoes sold to consumers	34			34
Potatoes sold to other firms	84	118		
Profit	52		52	
IdaWa Fries				
Wages paid to employees	33		33	
Taxes paid to government	10		10	
Potatoes purchased from Osgood Farm	84			
Revenue received from sale of French Fries	166	82		166
Profit	39		39	
		200	200	200

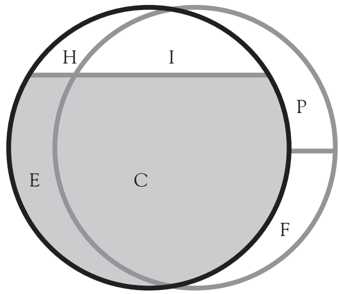

Figure 2.3 Inclusions and exclusions of GDP

and $10 from IdaWa Fries. The aggregate expenditure method sums up consumer, business, government, and net foreigner expenditures, and all but consumer expenditures are zero in the table. All three methods give the same value of GDP because production equals income, which equals expenditures.

Calculating GDP is messy. This is illustrated in Figure 2.3. The black circle includes all legal and illegal final products produced domestically; the gray circle includes all recorded and unrecorded domestic transactions; and the gray area measures GDP. Area C includes all recorded transactions of final products produced within the year. It does not include purchases of stocks and bonds, but proceeds from these sales show up in C if they are used to purchase new products. Commissions from bond and stock sales are in C since the services are rendered this year. War and natural disasters overstate C because money spent rebuilding structures destroyed by bombs and Mother Nature could have been used to expand factories. Product quality improvements understate C because newer and older models are treated the same.

Current transactions inside the gray circle include future (F) and past (P) production. Because used cars, previously owned homes, and items sold in yard sales were produced in prior years, these transactions are included in area P. If transactions in P are included in this year's GDP, the production of these goods would be doublecounted because they were already counted in a previous year's GDP. Intermediate goods like computer chips and tires produced during the year are in area F because these are installed on final products sold at a future date. Including intermediate products in GDP in the year that they were sold double-counts them because these costs are included in the price of the final product they were installed in or on. Proceeds from sales of stocks and bonds show up in F if firms use the proceeds to purchase capital goods.

Area I includes the production of illegal goods and services like crack and prostitution. If drug dealers and pimps reported annual sales to government (to ensure GDP is accurately measured), the value of their production would be included in GDP. The estimated value of these transactions is 8percent to 19percent of GDP.[7] In a 15-trillion-dollar economy, economic activity in I represents 1.2 trillion to 2.85 trillion dollars in unreported income that is not being taxed.

Unpaid household production and leisure are in area H because no transactions record these activities. Examples of household production[8] includes members of households cooking their own meals, cleaning and maintaining their homes, hemming their pants and shirts, and remodeling their bathrooms and kitchens. Leisure is an economic good that has a price equal to one's hourly wage because leaving work an hour early costs an hour of pay.

Area E includes all unrecorded transactions that are included in GDP as estimates, which are called *imputations*. Between 2005 and 2012, imputations accounted for 16.5 percent of GDP.[9] Job perks like employer-provided parking spaces are estimated using rents of nearby parking spaces. Other imputations include the proportion of vegetables, fruits, and meat produced on farms that farmers use to feed themselves and their families. Owner-occupied housing is the largest imputation. It is based on the idea that homeowners are essentially renting their homes to themselves.

Nominal GDP (denoted as GDP*n*) is equal to the economy's output for a given year valued in the said year's prices, whereas *real GDP* is that

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[7] This is according to estimates published in Morris (1993); Johnson, Kaufmann, and Zoido-Lobaton (1998); Schneider and Enste (2000); and Dell'Annoa and Solomon (2008).

[8] Chadeau (1992) estimates household production to be about 45 percent of GDP.

[9] U.S. Bureau of Economic Analysis, "Table 2.6.12. National Income and Product Accounts" (accessed 3/25/14).

output valued in the base year's prices. If firms sell only to consumers, intuitively, both of these definitions can be expressed as

$$\mathrm{GDP}_n = P_{2012}^{\mathrm{Potatoes}} \cdot Q_{2012}^{\mathrm{Potatoes}} + P_{2012}^{\mathrm{Milk}} \cdot Q_{2012}^{\mathrm{Milk}} + P_{2012}^{\mathrm{Gas}} \cdot Q_{2012}^{\mathrm{Gas}} + \cdots$$

$$\mathrm{GDP} = P_{2005}^{\mathrm{Potatoes}} \cdot Q_{2012}^{\mathrm{Potatoes}} + P_{2005}^{\mathrm{Milk}} \cdot Q_{2012}^{\mathrm{Milk}} + P_{2005}^{\mathrm{Gas}} \cdot Q_{2012}^{\mathrm{Gas}} + \cdots$$

The first equation computes nominal GDP in 2012 because firms' outputs in 2012 are being valued in 2012 prices. The second is real GDP in 2012 because firms' outputs in 2012 are being valued in base prices. Although nominal GDP rises if prices or quantities rise from year to year, real GDP rises only if quantities are generally higher because prices are "chained" to base year 2005. In practice, the nominal GDP equation works but the real GDP equation does not because products are improved and replaced over time.

The first version of the real variable equation in the inflation section of this chapter is used to strip inflation from the nominal GDP values listed in Table 2.5. Because the DPI is used instead of the CPI and the DPI is equal to 100 in year 2005, the equation values GDP in 2005-dollars. Substituting the 2011 values of nominal GDP (15.08 trillion dollars) and DPI (113.4) into this equation yields the value of real GDP in 2011 that is reported as 13.30 trillion dollars in Table 2.5. Repeating this calculation for the other years in the table gives the remaining values of real GDP. Real GDP is less than its nominal value prior to 2005, equal to its nominal value in 2005, but greater than its nominal value after 2005. Thus, stripping inflation from GDP *inflates* it to 2005-dollars in years prior to 2005, but *deflates* it thereafter.

With inflation stripped from real GDP, it can be used to compare economic output from year to year. *Economic growth*, the annual percent change in real GDP, is used to compare real GDP from year to year. It can be computed using the equation below.

$$g = \frac{\mathrm{GDP}_{\mathrm{is}}}{\mathrm{GDP}_{\mathrm{was}}} - 1$$

Table 2.5 reports real GDP for select years. Plugging in what real GDP *is* in 2007 (13.21 trillion dollars) and what it *was* a year earlier (12.97

Table 2.5 Nominal GDP, real GDP, economic growth

Year	Nominal GDP (trillion dollars)	DPI (percent)	Real GDP (trillion dollars)	Growth (percent)
2004	11.85	97.8	12.24	3.38
2005	12.62	100.0	12.62	3.10
2006	13.38	103.2	12.97	2.77
2007	14.03	106.2	13.21	1.85
2008	14.29	108.6	13.16	–0.38
2009	13.97	109.5	12.76	–3.04
2010	14.50	111.0	13.06	2.35
2011	15.08	113.4	13.30	1.84

trillion dollars) gives an annual economic growth for 2007 equal to 1.85 percent. Applying the same equation to nominal GDP values over this same period gives the growth rate of nominal GDP, 4.9 percent. The difference in these growth rates is roughly equal to the inflation rate for the same year. This will generally be the case for all years.

The economy is *expanding* when economic growth is positive, but is *contracting* when growth is negative. Most textbooks define a *recession* as two consecutive quarters of negative growth, and a *persistent* one as a *depression*. In the United States, the National Bureau of Economic Research (NBER) dates recessions, and defines a recession as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." The black line in Figure 2.4 plots economic growth (*g*) over a three-decade period, and the vertical gray bars mark the last five U.S. recessions. The figure shows economic growth accelerating, peaking, declining, and bottoming out five times. This cycling is called the *business cycle*. In the United States, expansions tend to be longer than contractions.

The well-being of a nation's citizenry is difficult to measure. Ideally, it would be measured by the quality of one's life and that of his or her loved ones. In reality it is measured by *per capita GDP*, the ratio of real GDP and the size of the population. For a given nation, per capita GDP, one of

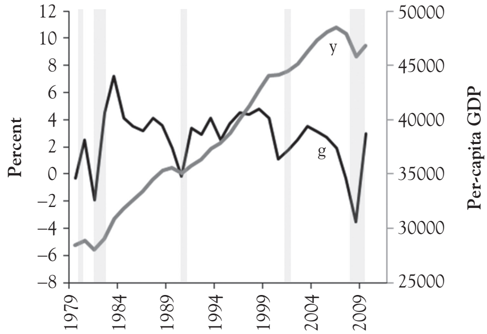

Figure 2.4 Graphs of economic growth and per capita GDP

the many measures of its standard of living,[10] grows when its economic growth rate exceeds its population growth rate. The gray line in Figure 2.4 graphs U.S. per capita GDP (*y*) over time. In 2010, the real GDP was $46,844 per American, which is below its high of $48,532 in 2007 but much higher than what it was 10 years earlier, $44,081.

Unemployment

The Current Population Survey (CPS) is used to compile labor force statistics for the United States. Each month, members of 60,000 households are interviewed. Every person in the survey who is 16 years or older is in the *working age population* (WAP), provided they are not jailed, hospitalized, institutionalized, or in the armed forces. Figure 2.5 demonstrates how the WAP is broken up into its various parts: the number of people who are employed (E), the number of unemployed workers (U), and the number of people who have dropped out of the civilian labor force (O).

People in the WAP are *employed* during the reference week[11] if they worked at least one hour for pay, worked in their own businesses, or performed at least 15 hours of unpaid work in family-owned businesses. People who did not work during the reference week are classified as employed

[10] Investopedia.com defines standard of living as "[t]he level of wealth, comfort, material goods and necessities available to a certain socioeconomic class in a certain geographic area."

[11] The CPS reference week is the one that contains the 12th day of the month. If the week containing the 5th of December is entirely in the month, it is the reference week for December (see www.census.gov/cps/methodology).

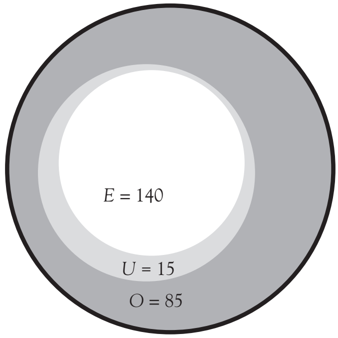

Figure 2.5 Components of the working age population (WAP)

if they were absent from work due to a work-related reason.[12] Foreigners not living on embassy grounds who satisfy one of these conditions are considered employed. People having more than one job are counted once. As seen in Figure 2.5, 140 million workers are employed.

Individuals in the WAP who quit their jobs or get laid off or fired are counted among the *unemployed* provided they looked for work during the reference period.[13] Laid-off workers expecting to be called back to work within six months are considered unemployed even if they have not looked for work in the reference period. The long-term unemployed and first-time job seekers are counted among the unemployed only if they looked for work during the reference period. As seen in Figure 2.5, 15 million workers are unemployed.

The *civilian labor force* (L) is the sum of employment and unemployment levels. As seen in Figure 2.5, adding the 140 million employed workers and 15 million unemployed workers gives a labor force of 155 million people.

The *unemployment rate* is the share of the labor force that is unemployed. It is the most cited labor force statistic. It can be computed using the following equation.[14]

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[12] Work-related reasons include illness, vacation, inclement weather, strike, lockout, job training, and family issues.

[13] The reference period is the reference week and the preceding three-week period.

[14] Unemployment does not include discouraged workers, self-employed contractors, involuntarily retired workers aged 64 years or younger, disabled workers looking for work, and part-timers wanting to work full time (Krueger and Katz 1999).

Table 2.6 Labor force, employment, unemployment, unemployment rate

Year	Average *L* (millions)	Average *E* (millions)	*U* (millions)	*u* (percent)
2003	146.50	137.73	8.77	5.99
2004	147.38	139.24	8.14	5.52
2005	149.29	141.71	7.58	5.08
2006	151.41	144.42	6.99	4.62
2007	153.12	146.05	7.07	4.62
2008	154.32	145.37	8.95	5.80
2009	154.19	139.89	14.30	9.27
2010	153.89	139.07	14.82	9.63
2011	153.62	139.87	13.74	8.94

$$u = 1 - \frac{E}{L}$$

Between the years 2010 and 2011, Table 2.6 indicates that the number of workers in labor force fell from 153.89 million to 153.62 million as employment rose from 139.07 million to 139.87 million. Plugging these values into the equation above gives the unemployment rates for 2010 and 2011, which are 9.63 percent and 8.95 percent, respectively. The decline in unemployment occurred for two reasons. Overall employment rose, which is considered a healthy labor market signal. However, this coincided with the labor force shrinking. If the decline in the labor force results from discouraged workers exiting the labor force because they quit looking for work, declining unemployment is not necessarily good news.

Figure 2.6 plots the labor force participation rate (lfpr = *L*/WAP), employment-to-population ratio (epr = *E*/WAP), and unemployment over time. According to it, labor force participation and employment are near 30-year lows, while unemployment is just under a 30-year high. The figure also shows the labor force continuing to fall as employment leveled off after 2008. An increasing number of baby boomers, Americans born between 1946 and 1964, reaching retirement age is a primary driver of the labor force participation rate beginning its marked decline in 2000.

Figure 2.6 shows how unemployment changes over the business cycle. It suggests that unemployment fluctuates around a long-run trend that is called the *natural rate of unemployment*. From the early 1980s to 2008, the natural

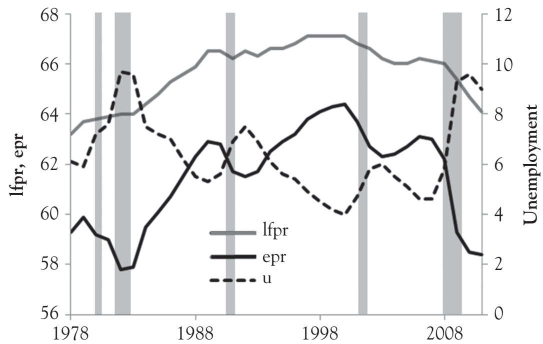

Figure 2.6 Graphs of lfpr, epr, and u

rate appears to generally decline from about 7 percent to about 5 percent, but appears to have risen above 7 percent in 2009. The difference between it and the unemployment rate is called the *cyclical unemployment* rate. The natural rate includes structural unemployment and frictional unemployment. Frictional unemployment includes idle workers who decline job offers paying wages below their reservation wages.[15] It also includes workers who are temporarily between jobs due to a move or career change. Structural unemployment includes those who lose their jobs due to automation. It tends to rise after a slump in manufacturing or organizational restructuring.

Natural unemployment is a function of many factors. The 2009 spike in unemployment coincides with the 2007 Fair Minimum Wage Act, which raised the minimum wage to $7.25 in 2009, as well as the 2009 American Recovery and Reinvestment Act, which expanded the UI and SNAP programs, substantially. An increase in the minimum wage raises the cost of low-skilled labor, which can reduce employment and increase the number of people looking for work. SNAP, UI, and Medicaid can increase low-skilled workers' reservation wages (Borjas 2012), which would lengthen unemployment spells. Laws restricting layoffs can make a firm less willing to hire new employees because it is more difficult to fire unproductive workers and shirkers.[16]

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[15] The reservation wage is the lowest wage at which a worker is willing to accept a job offer.

[16] French firms skirt labor laws by starting a new company when its workforce reaches 50 (Viscusi and Deen 2012).

Persistently high unemployment is costly. It indicates that the economy is inside its production possibilities frontier for an extended period of time, which results in lost GDP. Unemployed workers receive UI compensation, pay fewer taxes, and may enroll in public assistance programs. These actions raise government expenditures and reduce tax collections, which widens the annual budget deficit. This requires more government borrowing, which is a tax on future generations. High persistent unemployment lengthens unemployment spells, which accelerates the depreciation of human capital, as skills become increasingly dated. It reduces the probability that idle workers will be offered jobs because firms may perceive them to be unproductive. It is linked to crime (Box 1987), divorce (Charles and Stephens 2004), and obesity (Morris 2007). It can push young mobile workers out of a region (Snarr and Romero 2014), which would leave behind an aging or unproductive work force.

A Synthesis

If John Donne (1572 to 1631) had been an economist rather than the poet and lawyer that he was, he would have likely concluded that no macroeconomic indicator "is an island, entire of itself, each is a piece of the continent, a part of the main," meaning, indicators are intertwined. For example, accelerating economic growth pushes real GDP beyond its potential and unemployment below its natural rate. As unemployment falls, labor markets tighten, putting upward pressure on wages as firms compete for fewer and fewer workers to keep up with strong labor demand. If firms can pass higher costs to consumers, prices will rise, pushing up inflation and interest rates.

Figure 2.7*a* shows how the gap between real GDP (the black line) and its potential (the gray line) evolve over time. From 2009 onward, real GDP is well below its potential, with the unemployment rate above 8 percent as shown in Figure 2.7*b*. In 1996 and 2002, real GDP and potential output intersect at points E and F, suggesting that the economy was at full employment in these years. At points E and F in Figure 2.7*b*, unemployment is about 5 percent for these years, which implies that the natural rate of unemployment for 1996 to 2002 is in the neighborhood of 5 percent.

The discussion above implies that real GDP and unemployment are linked. This relationship is called *Okun's law* and is shown in Figure 2.8*a*, which plots annual growth of quarterly real GDP against the annual change in quarterly unemployment for 1948 to 2012. Point A implies that a growth rate of 7.3 percent will prevail if unemployment declines by 2 percentage points. This is perhaps due to idle workers bidding down wages when unemployment is high.

The line in Figure 2.8*b* is called the *Phillips curve*. It makes the case for a trade-off between unemployment and inflation between 1958 and 1969. The relationship disappears when additional years, 1970 to 2004,

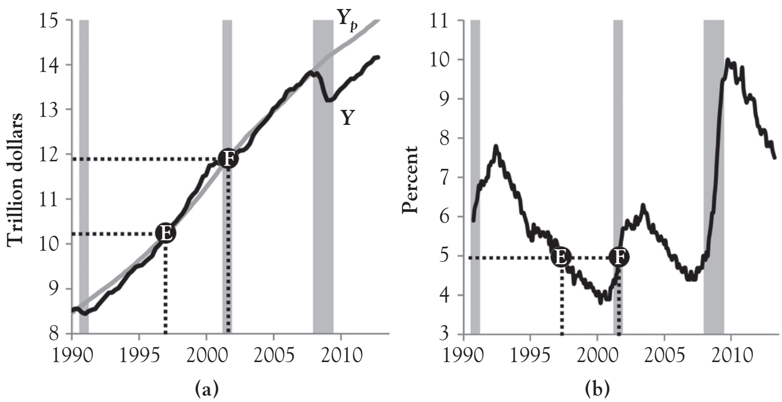

Figure 2.7 Graphs of potential GDP, real GDP, and unemployment

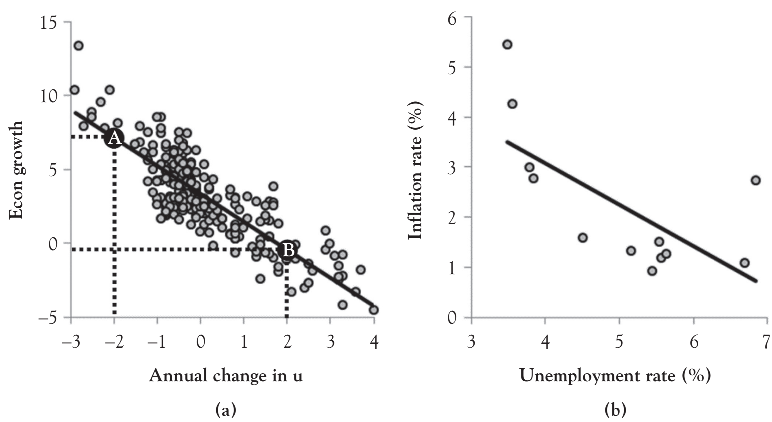

Figure 2.8 Okun's law and the phillips curve

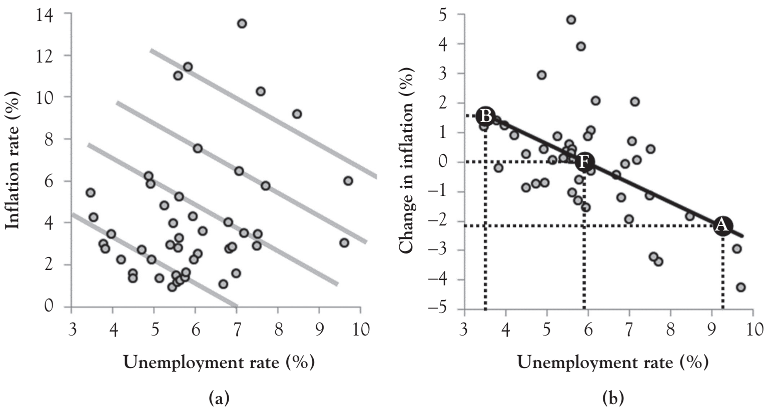

Figure 2.9 The slayed phillips and augmented phillips curves

are included, which is the case in Figure 2.9*a*. Large fluctuations in inflation expectations began shifting the Phillips curve in 1969. The *augmented Phillips curve*, the line in Figure 2.9*b*, accounts for these fluctuations. It shows the relationship between unemployment and the expected *change* in inflation. Point F implies that inflation is not expected to change when unemployment is 5.9 percent. This suggests that the natural rate of unemployment is 5.9. Point B indicates that inflation is expected to rise by 1.6 points when unemployment is 3.5 percent, whereas Point A suggests inflation is expected to decline by 2.1 points when unemployment is 9.2 percent.

CHAPTER 3

Aggregate Expenditure

Aggregate expenditure (AE), summarized in the final column of Table 2.4, is the sum of consumer expenditure, investment expenditure (new home sales and firm investments in new buildings, equipment, tools, and inventory), government purchases of goods and services, and net exports. This definition implies that a recession triggered by a cutback in consumer or firm expenditure can be offset one-for-one with a boost in government expenditure. This notion is the core of Keynesian economics, and assumes that the last dollar government spent building the "Bridge to Nowhere"[1] is as productive as the last dollar spent improving computer processors, motion picture sound and visual effects, or the aerodynamics of passenger jets. In his 1974 Nobel Prize acceptance speech, F.A. Hayek said that this kind of thinking has "made a mess of things … [because] it leads to the belief that we can permanently assure full employment by maintaining total money expenditure at an appropriate level." Despite this and other criticisms, Keynesian economics remains relevant because government expenditure and total employment are strongly correlated;[2] it justifies politicians cutting taxes and "spending public monies on projects that yield some demonstrable benefits to their constituents" (Buchanan and Wagner 1999); and its simple elegance makes it easy to teach and understand.

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[1] The "Bridge to Nowhere" refers to a proposed bridge connecting Ketchikan, Alaska (population 8,900) with its airport on the Island of Gravina (population 50) at a cost of $320 million (Utt 2005).

[2] Using quarterly, seasonally adjusted data FRED from the period 1959–2013, the correlation between total federal government expenditures and civilian employment is 0.91.

Consumer Expenditure

The *consumption function* is at the heart of Keynesian economics. It models the relationship between disposable income (DI) and consumer expenditure (*C*). Real personal consumption expenditure and real disposable personal income are graphed in Figure 3.1*a*, with recessions indicated by gray bars. The variables move together through time. Both dipped near the start of the 1991 and 2008 recessions. Although their growth rates began to accelerate in 1997, the growth rate in consumption picked up in the first quarter of that year and remained elevated for a couple of years thereafter. DI jumped substantially in the third quarter of 1997, perhaps due to a tax policy change, and in the quarter preceding what many mistook as the start of the third millennium, January 2000. None of these jumps in DI was sustainable.

The line that fits the scatterplot of consumer expenditure and DI in Figure 3.1*b* is called the *consumption function*. From O to F, consumption increases by 2.21 trillion dollars as DI increases by 2.3 trillion dollars. The ratio of the two changes gives the slope of the equation displayed in the figure, 0.96. The slope is called the *marginal propensity to consume* (mpc). It implies that consumers spend 96 cents of each additional dollar of DI received. The intercept of the consumption function is called *autonomous consumption* (*A*) because it models the portion of consumer spending that is independent of DI. The equation in Figure 3.1 gives an empirical estimate of *A* that equals –0.32. This value implies that consumer spending can be negative and DI can be zero. This is absurd, and results from *A*

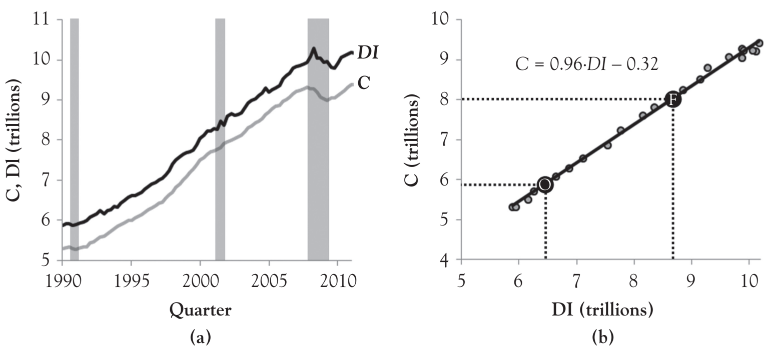

Figure 3.1 Graphs of DI, consumption, and DI versus consumption

being an extrapolated value.[3] More generally, the consumption function is

$$C = A + \text{mpc}\cdot\text{DI}$$

In this book, changes to autonomous consumption are used to shift the consumption function. They are caused by exogenous factors[4] like consumer wealth (W), expected future consumer income (Y_e), the price level (PL), and the real interest rate (r). Because increases in consumer wealth or expected future income, or decreases in the PL or real interest rate raise consumption, *simulated autonomous consumption* is defined as

$$A = W + Y_e - \text{PL} - r$$

Substituting this into the consumption function gives *simulated consumption*:

$$C = [W + Y_e - \text{PL} - r] + \text{mpc}\cdot\text{DI}$$

Simulated consumption can be graphed after values for the mpc (or slope) and the linearly combined autonomous factors (or intercept) are assumed. Suppose that the *initial* values of consumer wealth, expected future income, the PL, the real interest rate, and the mpc equal 8 trillion dollars, 12 trillion dollars, 14.5 thousand dollars, 3.5 percent, and 0.75, respectively. With the units ignored, substituting the numbers into the equation above yields *initial* consumption:

$$C_0 = [8 + 12 - 14.5 - 3.5] + 0.75\cdot\text{DI}$$

or

$$C_0 = 2 + 0.75\cdot\text{DI}$$

[3] A regression equation is valid over the range of the dependent variable, DI in this case. The value of the estimated regression intercept in Figure 3.1*b* is an extrapolated value because the range of DI does not include zero. The error in it is potentially very large since DI's minimum value is about $6 trillion.

[4] An exogenous factor is an independent variable whose value is unaffected by the model.

Simulated consumption *shifts* when one of the factors in its intercept changes. Because the PL and real rate of interest are *subtracted* from two other factors in the intercept, a decrease (an increase) in either shifts consumption upward (downward). Since wealth and expected future income are added in the intercept, an increase (a decrease) in either shifts consumption upward (downward). For example, suppose that a decline in consumer sentiment reduces expected future income to 11 trillion dollars. In the equation that follows, the change is highlighted by the number in bold font. Simplifying the result gives *final* consumption.

$$C_1 = [8 + \mathbf{11} - 14.5 - 3.5] + 0.75 \cdot \text{DI}$$

or

$$C_1 = 1 + 0.75 \cdot \text{DI}$$

Final and *initial* consumption are graphed in Figure 3.2*a*. Holding DI constant at 8 trillion dollars, the decline in expected future income reduces consumer spending from 8 trillion dollars (at point O) to 7 trillion dollars (at point F).

The *consumption model* combines the consumption function with a 45-degree line. When the *initial* consumption line, the black line in Figure 3.2*b*, crosses the gray 45-degree line, which occurs at point O, *consumer savings* is zero due to DI equaling consumer spending. In aggregate, consumers save at points along the consumption function that lie below the 45-degree line. For example, at point A consumer savings is 0.5

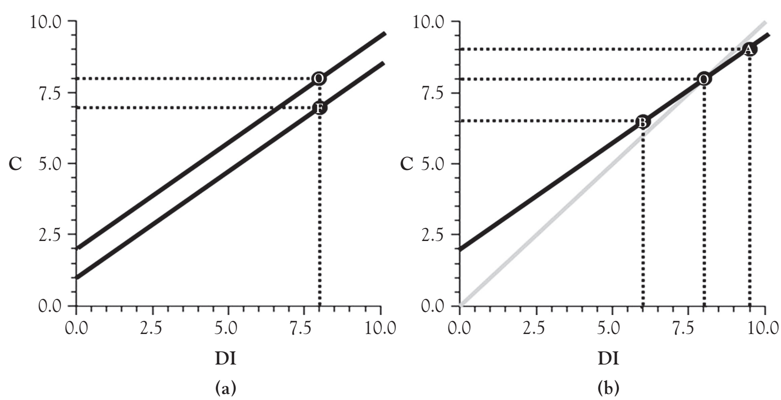

Figure 3.2 Shifts and movements along the consumption function

trillion dollars because consumer expenditure is 9 trillion dollars and DI is 9.5 trillion dollars. At point B, DI exceeds consumer spending, indicating that dissaving occurs at points on the consumption function that lie above the 45-degree line.

Since DI at the macroeconomic level is the difference between real GDP (Y) and net tax revenue (T), replacing DI with $Y - T$ in simulated consumption yields:

$$C = [W + Y_e - \text{PL} - r] + \text{mpc}\cdot(Y - T)$$

Rearranging this algebraically gives *simulated consumer expenditure*:

$$C = [W + Y_e - \text{PL} - r - \text{mpc}\cdot T] + \text{mpc}\cdot Y$$

Although simulated consumer expenditure is mathematically equivalent to simulated consumption, the two have noteworthy differences. Tax revenue shifts simulated consumer expenditure but not simulated consumption. Simulated consumer expenditure is a function of real GDP, but simulated consumption is a function of DI. To show this, substitute the numbers used to graph *initial* consumption in Figure 3.2*b* into simulated consumer expenditure:

$$C_0 = [8 + 12 - 14.5 - 3.5 - 0.75\cdot T] + 0.75\cdot Y$$

If *initial* tax revenue is 3 trillion dollars, *initial* consumption in terms of real GDP is given by

$$C_0 = [8 + 12 - 14.5 - 3.5 - 0.75 \times 3] + 0.75\cdot Y$$

or

$$C_0 = -0.25 + 0.75\cdot Y$$

The previously assumed 1-trillion-dollar decline in expected future income, from 12 trillion to 11 trillion dollars, is highlighted by the bold number in the following equation:

$$C_1 = [8 + \mathbf{11} - 14.5 - 3.5 - 0.75 \times 3] + 0.75\cdot Y$$

Simplifying this gives *final* consumption in terms of real GDP:

$$C_1 = -1.25 + 0.75 \cdot Y$$

Increases in the real interest rate and PL and a decline in consumer wealth wield similar effects on the intercept of simulated consumer expenditure. Although an increase (a decrease) in net tax revenue does not affect the intercept of simulated consumption, it decreases (increases) the value of simulated consumer expenditure's intercept.

Net Foreigner Expenditure

The difference in exports (X), the amount of money foreigners spend on products produced within the boundaries of the United States, and imports (M), the value of products produced overseas that are purchased within the boundaries of the United States, is called net exports (NX). It is given by

$$\text{NX} = X - M$$

Since the GDP of other nations determines how much their citizens spend on products produced in the United States, exports are exogenous. Imports, on the other hand, increase as real GDP rises. This is evident in Figure 3.3, the scatterplot of imports versus real GDP for 1990 to 2007.

The black line that fits the data really well in Figure 3.3 is called the import function. It indicates that imports generally rise as real GDP increases. This is due to Americans generally having more income to spend on goods and services produced here and abroad, as real GDP increases. The slope of the line is called the *marginal propensity to import* (mpm), and is equal to 0.29, according to the equation in Figure 3.3. This value implies that each additional dollar of real GDP raises imports by 29 cents. Although the intercept of the equation in the figure is –1.69, it is assumed to be zero because a nation cannot import products if its GDP is zero. With the mpm undefined, the following gives the *simulated import function*:

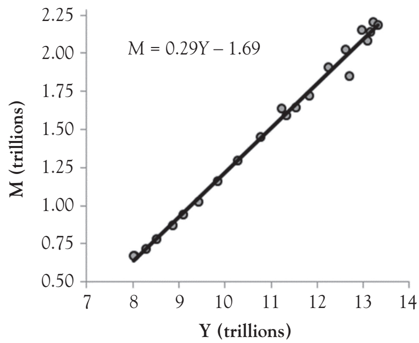

Figure 3.3 Imports (M) versus real GDP (Y)

$$M = \text{mpm}\cdot Y$$

Replacing M in the net exports equation with what it is defined to be above gives *simulated net foreigner expenditure*:

$$\text{NX} = X - \text{mpm}\cdot Y$$

The above model can be graphed after assuming *initial* values for exports and the mpm. Suppose their *initial* values are 2 trillion dollars and 0.25, respectively. With the units ignored, substituting the numbers into simulated net foreigner expenditure gives:

$$\text{NX} = 2 - 0.25\cdot Y$$

When the above expression is evaluated at real GDP's value, the result is called the *trade balance*. If the real GDP is 15 trillion dollars, the trade balance equals –1.75 trillion dollars, which represents a *trade deficit*. A *trade surplus* is present when the trade balance is positive.

Aggregate Expenditure

Aggregate expenditure (AE) is the sum of consumer expenditure, net exports, government purchases of goods and services (G), and investment expenditure (I):

$$\text{AE} = C + I + G + \text{NX}$$

Substituting simulated consumer expenditure and simulated net foreigner expenditure into the above equation yields

$$\text{AE} = \boldsymbol{W + Y_e - PL - r - \text{mpc} \cdot T + \text{mpc} \cdot Y} + I + G + \boldsymbol{X - \text{mpm} \cdot Y}$$

The left linear combination of variables in bold font is simulated consumer expenditure, while the right linear combination of variables in bold font is simulated net foreigner expenditure. Factoring real GDP gives *simulated AE*:

$$\text{AE} = [W + Y_e - PL - r - \text{mpc} \cdot T + I + G + X] + \{\text{mpc} - \text{mpm}\} \cdot Y$$

The linear combination of variables in the square brackets is simulated AE's intercept. It models autonomous AE. The expression in the squiggly brackets is AE's slope.

Using the assumed numerical values in the previous two sections, simulated AE can be graphed after assuming values for government expenditure and investment. Suppose their *initial* values equal 3 trillion dollars and 2.75 trillion dollars, respectively. With the units ignored, substituting the numbers into simulated AE yields *initial* AE:

$$\text{AE}_0 = [8 + 12 - 14.5 - 3.5 - 0.75 \times 3 + 2.75 + 3 + 2] + \{0.75 - 0.25\} \cdot Y$$

or

$$\text{AE}_0 = 7.5 + 0.5 \cdot Y$$

The *AE model* combines the AE line with a 45-degree line, which is graphed in Figure 3.4*a*. The point where AE, the black line in the figure, crosses over the 45-degree line, the gray line, is called the *Keynesian equilibrium* (point O). At this point, real GDP and AE equal 15 trillion dollars. If the economy is at point B, the aggregate planned expenditure is 13 trillion dollars and the real GDP is 11 trillion dollars. This difference causes an unplanned drop in inventories due to consumers, government, and foreigners buying more goods than they used to. Accelerating inventory depletion rates signal firms that business is picking up. Firms react to higher demand by boosting inventory replenishment rates and ramping up production. This induces a *movement along* the AE line until the economy reaches the Keynesian equilibrium. At point A, real GDP

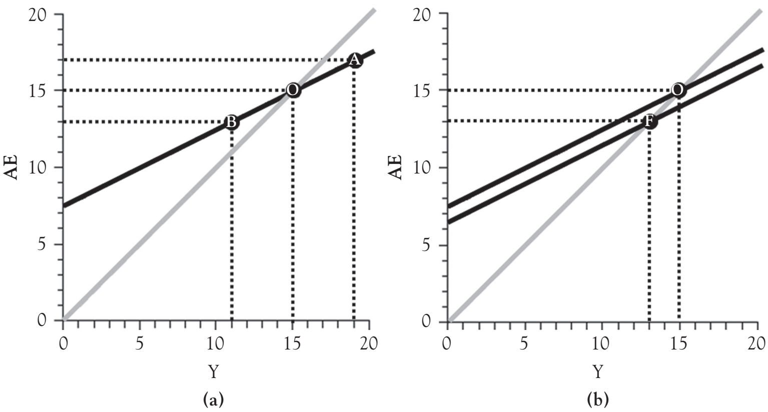

Figure 3.4 Movement along and shifts in AE

exceeds aggregate planned expenditure due to consumers, government, and foreigners buying less than they had been buying. This causes an unplanned increase in inventories, signaling firms that business is slowing. Firms respond to lower demand by cutting inventory replenishment rates and production levels. This reduces GDP and pushes the economy toward the Keynesian equilibrium.

Simulated AE *shifts* when one of the factors in its intercept changes. An increase (a decrease) in all these factors but the PL, real interest rate, and net tax revenue shifts AE upward (downward). An increase (a decrease) in the PL, real interest rate, and net tax revenue shifts AE downward (upward). For example, recall the previously assumed 1-trillion-dollar decline in expected future income from 12 trillion to 11 trillion dollars. The change in this factor is highlighted by the bold number in the equation below, which represents *final* AE after it is simplified.

$$AE_1 = [8 + \mathbf{11} - 14.5 - 3.5 - 0.75 \times 3 + 2.75 + 3 + 2] + \{0.75 - 0.25\} \cdot Y$$

or

$$AE_1 = 6.5 + 0.5 \cdot Y$$

Final and *initial* AE are graphed in Figure 3.4*a*. The decrease in AE caused by the decline in expected future income reduces the real GDP from 15 trillion dollars (at point O) to 13 trillion dollars (at point F). Multiplying both of these values by the mpm demonstrates that an economic contraction reduces imports. With imports falling from 3.75 trillion to

3.25 trillion dollars and exports being held constant at 2 trillion dollars, the trade deficit falls from 1.75 trillion to 1.25 trillion dollars. The decline in the trade deficit should not be viewed as an "improvement" because it results from an economic contraction.

Fiscal Policy Multipliers

Economists, think-tank policy wonks, executive branch administrators and policy makers, and elected officials who are concerned with short-run fluctuations in unemployment advocate using the federal budget to stabilize the economy. If the 1-trillion-dollar decline in expected future income puts the economy at point F in Figure 3.4*a*, and potential output is 15 trillion dollars, unemployment is higher than its natural rate. To reduce unemployment and raise real GDP from its present level at point F to its potential at point O, the AE model needs to be shifted back up. A cut in the amount of net tax revenue collected or an increase in government expenditure will increase the value of simulated AE's intercept, which shifts AE upward and increases real GDP. Deliberate changes to tax rates and government expenditure are called *discretionary fiscal policy*. At the federal level, it is conducted by Congress and the president. With tax revenue (T) and government expenditure (G) both assumed to be 3 trillion dollars, a cut in taxes or an increase in government expenditure will turn a balanced budget into a budget deficit, which is financed by the U.S. Treasury auctioning securities. Keynesian economics is okay with this because the deficit can be paid off with a budget surplus after the economy returns to full employment.

The *government expenditure multiplier* is the increase in real GDP that results when government spends an additional dollar. With the economy at point F due to expected future income falling to 11 trillion dollars, suppose that government expenditure is raised by 0.5 trillion dollars to push the economy back toward point O in Figure 3.4*b*. The increase in government expenditure is highlighted by the bold number in the equation that follows.

$$AE_2 = [8 + 11 - 14.5 - 3.5 - 0.75 \times 3 + 2.75 + \mathbf{3.5} + 2] + \{0.75 - 0.25\} \cdot Y$$

or $$AE_2 = 7 + 0.5 \cdot Y$$

The change in fiscal policy raises the intercept of AE. This shifts AE up to a point along the 45-degree line that is halfway between points O and F. The new line is not shown in Figure 3.4. The shift increases the real GDP from 13 trillion to 14 trillion dollars. Dividing the 1-trillion-dollar increase in real GDP by the 0.5-trillion-dollar increase in government expenditure yields a government expenditure multiplier equal to 2. This value implies that real GDP increases by 2 dollars for each additional dollar government spends.

The *tax-cut multiplier* is the amount by which GDP rises when taxes are cut by a dollar, holding all else constant. Suppose that the increase in government expenditure is followed by a cut in net tax revenue equal to 0.667 trillion dollars. The new level of net tax revenue equals 2.333 trillion dollars, and is highlighted by the bold number in the equation that follows.

$$AE_3 = [8 + 11 - 14.5 - 3.5 - 0.75 \times \mathbf{2.333} + 2.75 + 3.5 + 2] + \{0.75 - 0.25\} \cdot Y$$

or

$$AE_3 = 7 + 0.5 \cdot Y$$

The change in fiscal policy raises the intercept of AE. Together, the back-to-back changes of fiscal policy restore AE's intercept to its initial value of 7.5. These policy changes shift AE back to its initial level at point O in Figure 3.4*b*. By itself, the tax cut increases the real GDP from 14 trillion to 15 trillion dollars. Dividing the 1-trillion-dollar rise in real GDP by the 0.667-trillion-dollar tax cut gives a multiplier of −1.5. It implies that real GDP increases by 1.50 dollars for each 1-dollar reduction in taxes. Although the tax-cut multiplier is smaller than the government expenditure multiplier, empirical estimates of tax-cut multipliers tend to be larger than government spending multipliers.[5]

Although the back-to-back fiscal policies raise real GDP by a total of 2 trillion dollars, they are costly because they result in a budget deficit of 1.167 trillion dollars that is financed with government securities. For this

[5] The tax-cut multiplier is estimated at 3 in Romer and Romer (2010), and estimates of the government-spending multiplier are between 0.8 and 1.5 (Ramey 2011).

reason, some advocate for a balanced approach. The *balanced-budget multiplier* is the value by which real GDP increases when government spending and net tax revenue are raised by equal amounts. To demonstrate, suppose that the government responds to the drop in expected future income by raising its expenditure and taxes net of transfers from 3 trillion to 3.5 trillion dollars. Because the previously assumed trillion-dollar decline in expected future income pushed AE to point F in Figure 3.4*b*, the increases in government expenditure and tax revenue are highlighted by the bold numbers in the equation that follows.

$$AE_2 = [8 + 11 - 14.5 - 3.5 - 0.75 \times \mathbf{3.5} + 2.75 + \mathbf{3.5} + 2] + \{0.75 - 0.25\} \cdot Y$$

or

$$AE_2 = 6.625 + 0.5 \cdot Y$$

The balanced approach barely nudges up AE. It shifts AE from point F in the figure to a new line not shown. This raises real GDP from its dip to 13 trillion dollars (point F) to 13.25 trillion dollars (point not shown). Although the balanced approach seems costless because the budget remains balanced, it is not. Higher tax rates can stifle entrepreneurialism and reduce work effort. The balanced approach is also impotent when the mpc equals 1 because the government expenditure and tax cut multipliers are equal at this value.

The AE model's fiscal policy multipliers beckon politicians to provide demand when the private sector pulls back. However, the multipliers are overstated because the PL is held constant in the AE model. This is not a concern in Keynesian economics because prices and wages are assumed to be sticky in the short run. This assumption is relaxed in the next chapter.

Aggregate Demand

Aggregate demand (AD) is the relationship between real GDP and the PL, holding all other influences on expenditure plans constant. It is mapped out when a change in the PL shifts the AE line along the 45-degree line, holding all other factors constant. To demonstrate, assume that all of AE's factors are equal to their assumed initial values. This means that the PL

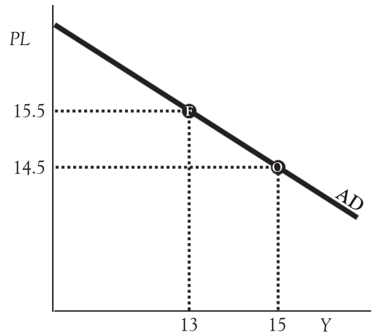

Figure 3.5 Derived aggregate demand

is 14.5 thousand dollars, the economy is at point O in Figure 3.4*b*, the real GDP demanded is 15 trillion dollars, and simulated AE is given by

$$AE_0 = 7.5 + 0.5 \cdot Y$$

The point corresponding to the initial values of PL and real GDP is labeled "O" in Figure 3.5.

Suppose that the PL increases to 15.5 thousand dollars. This change is illustrated by the bold number in the equation below.

$$AE_1 = [8 + 12 - \mathbf{15.5} - 3.5 - 0.75 \times 3 + 2.75 + 3 + 2] + \{0.75 - 0.25\} \cdot Y$$

or

$$AE_1 = 6.5 + 0.5 \cdot Y$$

The increase in the PL shifts the AE line from O to F in Figure 3.4*b*, which reduces real GDP to 13 trillion dollars. The point corresponding to the final values of PL and real GDP is labeled "F" in Figure 3.5. Drawing a line from O to F in Figure 3.5 traces out AD because the 1-thousand-dollar decline in the PL triggered a 2-trillion-dollar increase in real GDP, holding all other influence on expenditure plans constant.

CHAPTER 4

The Aggregate Market Model

The *aggregate market model* combines aggregate demand (AD) with aggregate supply (AS), which has short-run and long-run components. Short-run aggregate supply (SRAS) is the relationship between the price level (PL) and real *gross domestic product* (GDP) supplied, holding all other production plans constant. Long-run aggregate supply (LRAS) is the value of potential output (Y_p) in the short run. While SRAS and AD determine the PL and real GDP, the gap between real GDP and potential output determines the unemployment rate.

Simulated Aggregate Demand

In the previous chapter, AD was traced out by observing real GDP decline after an increase in the PL shifted the AE line down along the 45-degree line. The AE model reached equilibrium (Y = AE) before and after the price change. Replacing AE with Y imposes the Keynesian equilibrium condition (Y = AE) on the simulated AE model:

$$Y = [W + Y_e - \text{PL} - r - \text{mpc}\cdot T + I + G + X] + \{\text{mpc} - \text{mpm}\}\cdot Y$$

Solving this for PL gives

$$\text{PL} = [W + Y_e - r - \text{mpc}\cdot T + I + G + X] - \{1 - \text{mpc} + \text{mpm}\}\cdot Y$$

Since the marginal propensity to consume (mpc) represents the increase in consumer expenditure resulting from an additional dollar of disposable income, 1 – mpc is the increase in consumer savings resulting from that 1-dollar increase in disposable income. In economics, 1 – mpc is referred to as the marginal propensity to save (mps). In the continuing numerical example, the mps is 0.25 because the mpc was assumed to be 0.75. The two values imply that consumers spend \$0.75 and save \$0.25 of each additional dollar of disposable income received. Replacing 1 – mpc with mps in the equation above gives *simulated AD*:

$$PL_{ad} = [W + Y_e - r - \text{mpc}\cdot T + I + G + X] - \{\text{mps} + \text{mpm}\}\cdot Y$$

The equation for the graph of AD in Figure 3.5 is derived by substituting the assumed initial values of AE's factors into simulated AD:

$$PL_{ad} = [8 + 12 - 3.5 - 0.75 \times 3 + 2.75 + 3 + 2] - \{0.25 + 0.25\}\cdot Y$$

or

$$PL_{ad} = 22 - 0.5\cdot Y$$

Evaluating this at real GDP equal to 15 trillion dollars gives the assumed initial PL of 14.5 thousand dollars, which corresponds to point O in Figure 3.5. Evaluating it at real GDP equal to 13 trillion dollars yields a PL of 15.5 thousand dollars, which corresponds to point F in the figure.

AD *shifts* when one of the factors in its intercept changes. Because the real interest rate and net tax revenue are *subtracted* in simulated AD's intercept, a decrease (an increase) in either shifts AD upward (downward). Since consumer wealth, expected future income, government expenditure, exports, and investment expenditure are added up in simulated AD's intercept, an increase (a decrease) in any of these shifts AD upward (downward). To demonstrate, recall the example from Chapter 3 where expected future income declined to 11 trillion dollars. The decline in expected future income is highlighted by the bold number in the equation below.

$$PL'_{ad} = [8 + \mathbf{11} - 3.5 - 0.75 \times 3 + 2.75 + 3 + 2] - \{0.25 + 0.25\}\cdot Y$$

or

$$PL'_{ad} = 21 - 0.5\cdot Y$$

The decrease in expected future income reduces AD's intercept. It shifts the AD line graphed in Figure 3.5 downward, which is not shown. The downward shift represents a decrease in AD.

Long-Run Aggregate Supply

Economic output is determined by labor (L), technology and entrepreneurial talent (Z), land and natural resources (R), and physical capital (K). The *production function* describes how these factors are combined. For simplicity, it is assumed to be

$$Y = Z\sqrt{R \cdot K \cdot L}$$

The production function gives the value of real GDP if L is the number of laborers in the domestic economy. It gives the *potential output* of the economy if L equals the size of the labor force (L_f). This distinction matters only in the short run because labor markets equilibrate in the long run. Because the production factors are flexible in the long run, the above equation can be viewed as the *long-run production function*.

Although physical capital, technology and entrepreneurial talent, and land and natural resources are fixed in the short run, labor is not. The number of laborers is flexible because some workers are underemployed, unemployed, or discouraged.[1] The *short-run production function* results when the numerical values for the real value of physical capital, technology and entrepreneurial talent, and the real value of land and natural resources are substituted into the economy's production function. If these factors are *initially* equal to 0.4 trillion dollars, 1.25 percent, and 2.5 trillion dollars, respectively, the *initial* short-run production function is

$$Y = 1.25\sqrt{2.5 \times 0.4 \times L}$$

or

$$Y = 1.25\sqrt{L}$$

The short-run production function determines the value of real GDP for the current number of laborers in the domestic economy, and is graphed passing through point D in Figure 4.1.

The short-run production function bends because firms' production lines get increasingly crowded as more and more labor is added. This

[1] A discouraged worker has given up looking for work because he or she has had no success in finding a job.

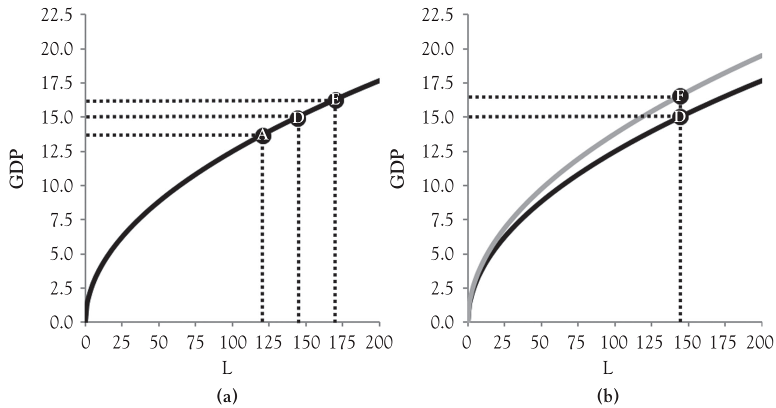

Figure 4.1 The short-run production function

principle is called the *law of diminishing marginal productivity*. Production lines get crowded as more labor is hired because physical capital, technology and entrepreneurial talent, and land and natural resources are constant in the short run. If 121 million laborers are in the domestic economy, the economy is at point A, and real GDP equals 13.75 trillion dollars. If 23 million laborers are added, the economy moves to point D as real GDP increases by 1.25 trillion dollars. Adding an additional 25 million laborers pushes the economy to point E, which increases real GDP by another 1.25 trillion dollars. The ratio of the increase in GDP and the corresponding increase in labor is the *marginal product of labor*, which is $54,348 per worker from A to D and $50,000 per worker from D to E. The marginal product of labor *diminishes* for any set of three consecutive points plotted on the production function.

If the labor force is initially assumed to be 144 million workers, the economy is at point D in Figure 4.1*a*, and unemployment would be 0 percent because the number of laborers equals the size of the labor force. This is unrealistic because frictional and structural unemployment are *natural*. Frictional unemployment arises for voluntary reasons like job dissatisfaction, family moves, or better employment prospects elsewhere. It is not surplus labor, and can be viewed as beneficial because the economy is healthier when workers are taking the time to find jobs best suited for their skills. Structural unemployment is a persistent surplus of labor. It can be caused by a binding minimum wage in low-skilled labor markets;

other government interventions like unemployment insurance (UI) compensation, Supplemental Nutritional Assistance Program (SNAP), Medicaid, and other public-assistance programs; employees organized in labor unions; and firms offering efficiency wages to limit employee shirking. It can also be caused by automation that generates an endless cycle of job creation and job destruction. Some structural unemployment is viewed as beneficial because wage offers exceeding the market wage increase productivity and job satisfaction.

To reconcile the conundrum above, the number of laborers is defined to be the employment level (E) plus the level of natural unemployment. If the *natural rate of unemployment* is 6.25 percent, 9 million of the 144 million workers are frictionally or structurally unemployed, and the initial short-run production function becomes

$$Y = 1.25\sqrt{E + 9}$$

This transformation is valid because, again, some unemployment is healthy for the economy. If unemployment equals its natural rate, 135 million workers are employed. Substituting this into the function above gives real GDP equal to 15 trillion dollars. Thus, the transformation allows real GDP and potential output to be equal with nonzero unemployment. In this situation, cyclical unemployment is 0 percent, the quantity of labor supplied (or size of the labor force) equals the quantity of labor demanded (or the employment level) plus the level of natural unemployment, and there is no pressure on wages and prices of other inputs to change.

As mentioned previously, the size of the labor force is considered a long-run variable, even though it can change in the short run. Such changes are triggered by shocks. A temporary extension of UI compensation to 99 weeks can knock the labor force participation rate off its long-run trend for a year. A shift in a demographic trend, on the other hand, can put the labor force participation rate on a different long-run trajectory. For example, the aging of the baby-boomer generation means that an increasing number of workers born between 1946 and 1964 are leaving the labor force as more and more retire.[2] Figure 2.6 shows this

[2] The U.S. Census Bureau considers a baby boomer to be a person who was born between 1946 and 1964.

occurring just after the labor force participation rate peaked in 2000. Over time, such changes tend to slow potential output's growth rate.

Simulated potential output results when the size of the labor force (L_f) is substituted for L in the economy's production function:

$$Y_p = Z\sqrt{R \cdot K \cdot L_f}$$

Substituting the assumed initial values of technology and entrepreneurial talent (1.25 percent), physical capital (0.4 trillion dollars), land and natural resources (2.5 trillion dollars), and the labor force (144 million workers) yields potential output in trillions of dollars:

$$Y_p = 1.25\sqrt{2.5 \times 0.4 \times 144}$$

or

$$Y_p = 15$$

LRAS is a vertical line when graphed with AD, and its location in this graph is determined by the value of potential output. This is so because, in the numerical example above, potential output is 15 trillion dollars whether the PL is 1, 100, 1,000, or any other positive value, and LRAS represents the value of what real GDP should be if real long-run production factors (Z, R, K, and L_f) are fully employed. *Initial* LRAS and *initial* AD are graphed together in Figure 4.2 passing through point O.

LRAS shifts to the right if physical capital, technology and entrepreneurial talent, land and natural resources, or the size of the labor force

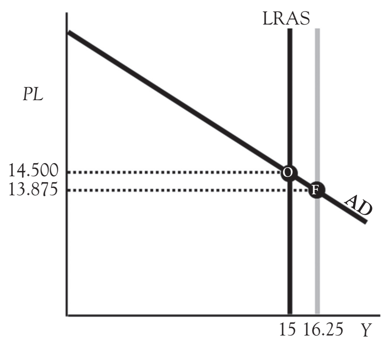

Figure 4.2 AD and LRAS

increases. For example, suppose a major technological advancement shifts the economy's PPF from D to E in Figure 1.7 and rotates the short-run production function counterclockwise from D to F in Figure 4.1*b*. According to Figure 4.1*b*, potential output increases to 16.25 trillion dollars. This increase is modeled in Figure 4.2 by LRAS shifting to the gray line. The slide down AD from O to F in this figure suggests that advances in technology, greater investment in physical capital, discoveries of natural resources, or a growing labor force are deflationary.

Short-Run Aggregate Supply

Although LRAS is independent of the PL, SRAS shows the relationship between real GDP supplied and the PL, holding all other influences on production plans constant. SRAS is shifted by several exogenous variables, including the long-run production factors and short-run factors like the nominal wage rate (w), the nominal prices of other production inputs (p), and supply-side taxes (t) (Bade and Parkin 2009). With SRAS's slope generically defined as b, *simulated SRAS* is given by

$$PL_{sras} = [w + p + t - b \cdot Y_p] + b \cdot Y$$

Simulated SRAS can be graphed and analyzed after the slope and short-run production factors are assigned assumed initial values. Suppose the nominal wage rate, the nominal price of other production factors, the supply-side tax rate, and slope b are equal to 7 dollars per hour, 3 dollars per hour, 9 percent, and 1, respectively. Substituting these values and the *initial* value of potential output, 15 trillion dollars, gives *initial* SRAS:

$$PL_{sras} = [7 + 3 + 9 - 1 \times 15] - 1 \cdot Y$$

or

$$PL_{sras} = 4 + Y$$

Initial SRAS is graphed in Figure 4.3 with AD and LRAS.

The intersection of SRAS and AD determines the short-run equilibrium. The first step to finding this involves setting SRAS equal to AD:

$$4 + Y = 22 - 0.5 \cdot Y$$

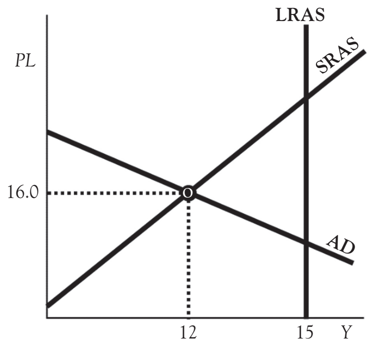

Figure 4.3 AD, SRAS, and LRAS

Solving this for *Y* gives an equilibrium real GDP equal to 12 trillion dollars. Substituting this value into either AD or SRAS gives an equilibrium PL of 16 thousand dollars. Thus, the economy is in equilibrium at point O in Figure 4.3. Since real GDP is less than its potential of 15 trillion dollars, unemployment is higher than its natural rate and the economy is said to be in a *recessionary gap*. If point O had been to the right of LRAS, the economy would have been in an *inflationary gap*, real GDP would have exceeded its potential, and unemployment would have been below its natural rate. Although output gaps occur in the short run, they do not in the long run. This is so because aggregate factor markets clear in the long run.

A change in a short-run production factor *shifts* SRAS but not LRAS. For example, suppose government temporarily reduces supply-side taxes from 9 to 7 percentage points. The change is highlighted by the bold number in simulated SRAS:

$$PL'_{sras} = [7 + 3 + \mathbf{7} - 1 \times 15] - 1 \cdot Y$$

or

$$PL'_{sras} = 2 + Y$$

Final SRAS is graphed with initial SRAS and LRAS in Figure 4.4*a*. The temporary cut in the supply-side tax rate temporarily reduces firms' marginal costs, shifting SRAS temporarily down to the gray line. If the PL is held constant at 18.5 thousand dollars, real GDP supplied will rise from 15 trillion dollars (point O) to 17 trillion dollars (point F). Because

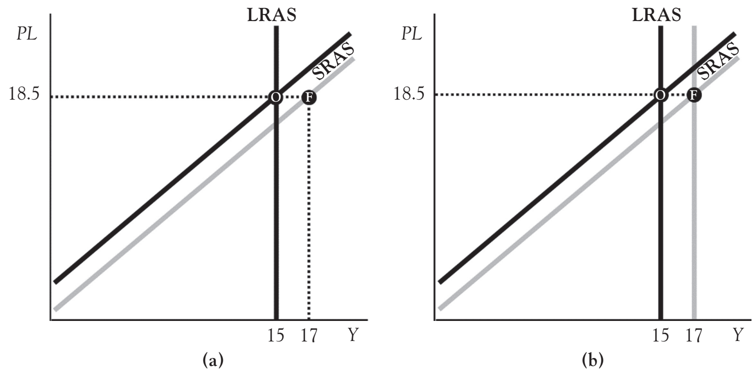

Figure 4.4 Change in a short-run factor versus a change in a long-run factor

w and *p*, like *t*, are added in SRAS's intercept, a decline in the nominal wage rate or the nominal prices of other production inputs has a similar effect on SRAS as a temporary cut in the supplied-side tax rate.

Unlike short-run factors, an increase in a long-run factor shifts LRAS and SRAS to the right by the same amounts. Consider a change in immigration policy that boosts the labor force to 184.96 million workers. The change is highlighted by the bold number in simulated LRAS:

$$Y_{\mathrm{p}} = 1.25\sqrt{2.5 \times 0.4 \times \mathbf{184.96}}$$

or
$$Y_{\mathrm{p}} = 17$$

With the supply-side tax rate is reset to its assumed *initial* value of 9 percent, the value of SRAS's intercept falls when potential output increases, which is highlighted by the bold number below:

$$\mathrm{PL}_{\mathrm{sras}} = [7 + 3 + 9 - 1 \times \mathbf{17}] - 1 \cdot Y$$

or
$$\mathrm{PL}'_{\mathrm{sras}} = 2 + Y$$

Initial SRAS and LRAS are graphed with final SRAS and LRAS in Figure 4.4*b*, with the initial lines intersecting at O and the final lines intersecting at F. The shift in SRAS is *permanent* unless immigrant workers are deported at a future date. Like an increase in the size of the labor force, increases in land and natural resources, technology and entrepreneurial talent, or physical capital shift SRAS to the right by the same amount as LRAS shifts by.

The Aggregate Market Model

The aggregate market model is comprised of AD, SRAS, and LRAS, and is graphed in Figure 4.3. It is widely taught in macroeconomic principles courses because it accommodates Keynesians, who focus on the demand side and are concerned with short-run fluctuations, and classical economists, who emphasize the supply side and are concerned with the long-run health of the economy. A more appropriate name for this model is the aggregate *product* market because GDP is the value of *final* goods and services produced domestically, and aggregate financial and aggregate resource markets are at work in the background. The aggregate financial market provides the money that buyers use to purchase real GDP, while the aggregate resource market provides the inputs to produce real GDP.

The aggregate market model is useful in understanding how the economy adjusts to short-run fluctuations in real GDP or a deliberate change in fiscal policy. At point O in Figure 4.5*a*, the aggregate market is in a short-run equilibrium called a recessionary gap. In the absence of SNAP, Medicaid, UI compensation, other government safety nets, and a minimum wage rate, there is much pressure on wages to fall because unemployment is high at point O. In the movie *Cinderella Man*, James J. Braddock's (played by Russell Crowe) reservation wage fell substantially when he had to beg for work on the docks after losing his boxing license and using up his family's savings. With workers bidding down the wage rate, the arrow above *w* in the equation below illustrates how SRAS self-adjusts, increasing from point O to point B.

$$PL_{sras} = [\overset{\downarrow}{w} + p + t - b \cdot Y_{p}] + b \cdot Y$$

At point B, the economy remains in a recessionary gap due to slackness in other resource markets. This pushes the price of other production inputs down. The arrow above *p* in the following equation illustrates how SRAS self-adjusts to shift to point F.

$$PL_{sras} = [w + \overset{\downarrow}{p} + t - b \cdot Y_p] + b \cdot Y$$

At point F, the output gap is eliminated without government intervention. Allowing SRAS to self-adjust is *laissez faire* economic policy. The process, however, decreases the PL from 16 to 14.5 thousand dollars, which is why recessionary gaps are also called deflationary gaps. If Medicaid, UI compensation, SNAP, and the minimum wage raise workers' reservation wages, the gap will close slowly. This is why low-skill wages are said to be "sticky" in the short run.

At point O in Figure 4.5*b*, the aggregate market is in a short-run equilibrium called an *inflationary gap*. The name is appropriate because there is upward pressure on prices when unemployment is too low due to real GDP exceeding its potential. When the economy is beyond its PPF, as it is here, resources are overemployed. The tightness in the resource markets causes firms to bid up wages as they try to hire more labor to keep up with rising product demand. The arrow above *w* in the equation below illustrates how SRAS self-adjusts to point B.

$$PL_{sras} = [\overset{\uparrow}{w} + p + t - b \cdot Y_p] + b \cdot Y$$

The economy is still in an inflationary gap at point B. This pushes the prices of other production inputs up. The arrow above *p* in the equation below illustrates how SRAS self-adjusts to point F.

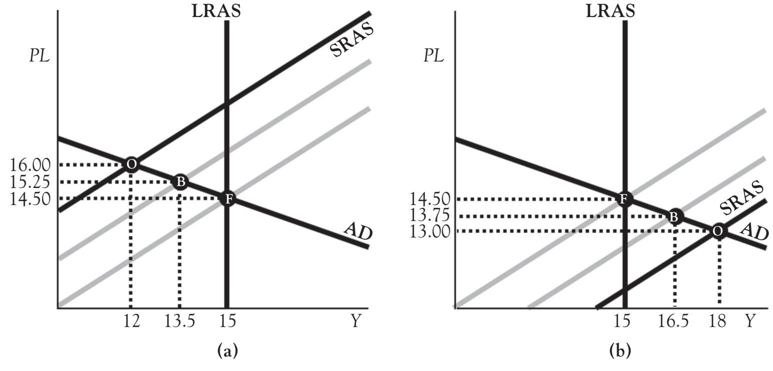

Figure 4.5 SRAS self-adjustment

$$PL_{sras} = [w + \overset{\uparrow}{p} + t - b \cdot Y_p] + b \cdot Y$$

Laissez faire policy allows self-adjusting SRAS to close the inflationary gap, which returns unemployment to its natural rate and raises the PL from 13 thousand to 14.5 thousand dollars.

Fiscal Policy Multipliers Revisited

High unemployment in a recessionary gap and rising prices in an inflationary gap can inflict economic pain. Since upset voters are more likely to vote than satisfied voters (Harpuder 2003), politicians are compelled to act when the economy is in an output gap. These actions are called *fiscal policy*. In Figure 3.4*b*, the 0.5-trillion-dollar increase in government expenditure and the subsequent 0.667-trillion-dollar tax cut stimulate AE. This raised real GDP back to 15 trillion dollars, the value that had prevailed prior to the decline in expected future income. This effect, however, rests on the assumption that the PL is constant in the AE model.

In this chapter, the PL is flexible in the short run due to SRAS's slope being positive. At point O in Figure 4.6*a*, the PL is 16 thousand dollars and real GDP is 12 trillion dollars. If government expenditure is raised by 0.5 trillion dollars, AD shifts to point B. The arrow above G in the equation below shows how raising government expenditure affects AD.

$$PL_{ad} = [W + Y_e - r - \text{mpc} \cdot T + \overset{\uparrow}{G} + X + I] - \{\text{mps} + \text{mpm}\} \cdot Y$$

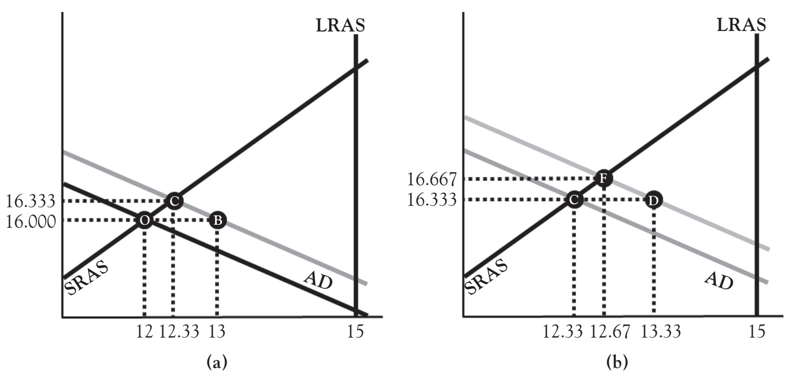

Figure 4.6 Fiscal policy in the aggregate market model

At the moment, the increase in government expenditure is injected into the economy, the PL remains at 16 thousand dollars, and real GDP demanded (at point B) exceeds real GDP supplied (at point O). The resulting 1-trillion-dollar excess in real GDP pushes the PL up to 16.333 thousand dollars at point C. So instead of real GDP rising from 12 trillion to 13 trillion dollars, as seen in Chapter 3, it rises to just 12.33 trillion dollars (at point C). Dividing the rise in real GDP (from O to C) by the increase in government spending gives a multiplier of just 0.667. It implies that real GDP rises by only 67 cents for each additional dollar in government expenditure.

Figure 4.6*b* shows how a 0.667-trillion-dollar tax cut affects the economy after government expenditures are raised by 0.5 trillion dollars. The arrow above T in the flowing equation shows how tax cuts affect AD.

$$\mathrm{PL}_{\mathrm{ad}} = [W + Y_{\mathrm{e}} - r - \mathrm{mpc} \cdot \overset{\downarrow}{T} + G + X + I] - \{\mathrm{mps} + \mathrm{mpm}\} \cdot Y$$

At the moment, the tax cut is injected into the aggregate market depicted in Figure 4.6*b*, the PL remains at 16.333 thousand dollars, and real GDP demanded (at point D) exceeds real GDP supplied (at point C). The resulting 1-trillion-dollar excess in real GDP pushes the PL up to 16.667 thousand dollars at point F. As such, real GDP rises from 12.33 trillion to 12.67 trillion dollars. Dividing the rise in real GDP (from C to F) by the size of the tax cut gives a multiplier of just −0.5. It implies that each $1 cut in taxes raises real GDP by only $0.5. If the mpc had equaled 1 instead, the tax cut multiplier would have been equal to −0.667.

The analysis above implies that fiscal policy is not as effective as it appears to be in the AE model. The multipliers above are *less* than 1 because the absolute value of AD's slope was assumed to be *less* than that of SRAS. If the absolute value of AD's slope had been *larger* than that of SRAS, the aggregate market multipliers would be *larger* than 1 but less than their counterparts in the AE model. If SRAS's slope is *equal* to zero, the aggregate market multipliers are *identical* to their counterparts in the AE model. Thus, fiscal policy is increasingly inflationary and ineffective (at closing output gaps) as the slope of SRAS increases. Despite this, fiscal stimulus is sold as a means to close a recessionary gap. This is perhaps due to the resulting budget deficit being financed with bonds that mature after the politicians who enacted the policy have retired.

The Business Cycle

The *business cycle* refers to the irregular fluctuations in real GDP around its long-run trend, which are plotted in Figure 2.7*a*. The figure shows real GDP below its long-run trend for the period preceding point E and above it between points E and F. From the Great Recession onward, real GDP has been trending in a deep rut that is parallel to potential output.

The business cycle has two phases, expansion and contraction. An *expansion* is a period of increasing real GDP, while a *contraction* is a period of declining real GDP. Since expansions are the norm and contractions are the exception, the long-run average growth rate of real GDP is positive. The transition from expansion to contraction is called the peak, and the transition from contraction to expansion is called the trough. The early portion of an expansion is called the recovery. Although rapid and deep contractions are historically followed by robust recoveries, the Great Recession of 2007 to 2009 was followed by a historically weak recovery.

Because GDP's long-run trend represents its potential output through time, the economy is at full employment when real GDP crosses over it, as it does at points E and F in Figure 2.7*a*. Inflationary pressures build as real GDP climbs further and further above its long-run trend, which is the case for periods between points E and F. The aggregate market model equilibrates in inflationary gaps during such periods. Conversely, deflationary pressures build as real GDP dips further and further below its long-run trend. This was the case during the 1991 recession, but deflationary pressures subsided during the periods between the recession's end and point E. Over this period, the aggregate market model equilibrated in recessionary gaps.

Real GDP's bumpy ride along its long-run trend is due to AS and AD shocks.[3] Supply-side shocks include changes in nominal wages or prices of other inputs to production, technology, government policies promoting or inhibiting entrepreneurialism, subsidies and taxation, regulations that drive up production costs, natural disasters that destroy physical capital

[3] Samuelson's (1939) multiplier-accelerator model, which assumes that consumption depends on last year's income and investment is proportional to the change in consumption, produces a cyclical response to a surge in expenditure.

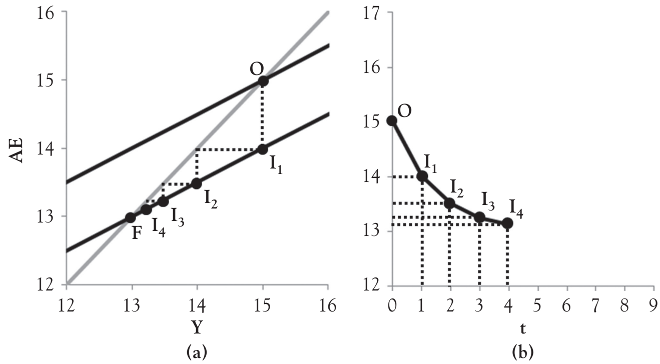

Figure 4.7 The trough of the business cycle

used to mine resources or convert raw materials into product, and immigration policies that allow workers of various skill levels to enter domestic labor markets. Demand-side shocks include changes in consumer wealth or expected future income, government purchases, exports, interest rates, investment expenditure, and taxes. Both types of shocks can produce positive or negative effects.

Figure 4.7 shows the effect of a negative shock on the economy that is at full employment. In Chapter 3, the decline in expected future income, from 12 trillion to 11 trillion dollars, triggered a 2-trillion dollar decline in real GDP. Figure 3.4*b* portrays this as an instantaneous change, but Figure 4.7 shows the economy *eventually* converging to point F. The speed of this convergence depends on the slope of the AE line. The assumed initial 1-trillion-dollar drop in expected future income shifts AE from points O to I_1. The decline in AE causes real GDP to fall by the same amount. This is modeled in Figure 4.7*a* as the horizontal move from point I_1 to the 45-degree line. Because AE's slope implies that each \$1 decline in income reduces planned expenditure by \$0.5, AE falls in a second iteration by 0.5 trillion dollars. With the economy at point I_2, this process repeats itself in progressively smaller steps until the economy converges to point F. Figure 4.7*b* graphs the incremental changes in GDP over time, showing the business cycle in a trough in period 4.

Figure 4.8*a* shows the effect of a positive shock on the economy that is in a trough in period 4. Although real GDP and AE converge at point F in Figure 4.7, Figure 4.8 shows the economy bouncing off the bottom before it reaches this point. Suppose that the bounce from point I_4 to point

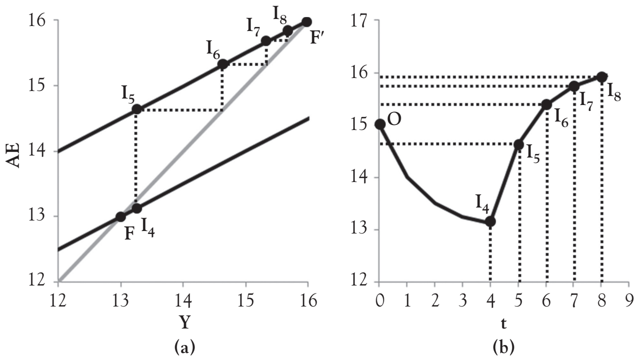

Figure 4.8 The expansion of the business cycle

I_5 is caused by the Fed cutting interest rates, resulting in a drop in the real rate of interest and a jump in investment expenditure. At point I_5, the aggregate planned expenditure is 1.5 trillion dollars higher than the real GDP, which increases by an equal amount due to firms raising production after observing unplanned drops in inventories. The 1.5-trillion-dollar increase in real GDP is modeled in the figure as a horizontal move from point I_5 to the 45-degree line. Since AE's slope implies each \$1 rise in income raises planned expenditure by \$0.5, AE rises by an additional 0.75 trillion dollars, which is half of the initial 1.5-trillion-dollar increase in investment expenditure. With the economy at point I_6, the process repeats itself in progressively smaller steps until the economy converges to point F′. Figure 4.8*b* shows the business cycle in a robust recovery from period 4 to 5. The subsequent expansion begins to fade as the economy nears a peak in period 8.

CHAPTER 5

Fiscal Policy

Fiscal policy was introduced with the calculation of fiscal policy multipliers. It is deemed effective in the aggregate expenditure (AE) model of Chapter 3, but not in the aggregate market model of Chapter 4. Although fiscal policy increases aggregate demand (AD) in both frameworks, it raises the price level (PL) in the aggregate market model. The PL is permitted to rise when short-run aggregate supply (SRAS) slopes upward, as it does in Figure 5.1*a*. When the PL rises, it dampens fiscal policy's expansionary effect on the real gross domestic product (GDP). This is not the case in the AE model because the PL is held constant when the effects of fiscal policy are analyzed. The constant PL assumption is carried over to the aggregate market model by assuming perfectly elastic SRAS, which is the case in Figure 5.1*b*.

The slope of SRAS splits macroeconomics into two major schools of thought. The long-run model of classical economics is shown in Figure 5.1*a*, while the short-run Keynesian model is shown in Figure 5.1*b*. In the classical model, SRAS slopes up, intersects AD at long-run aggregate supply (LRAS) due to factor markets clearing in the long run, and is indicated in gray to emphasize the irrelevance of the short run. Keynesian economics

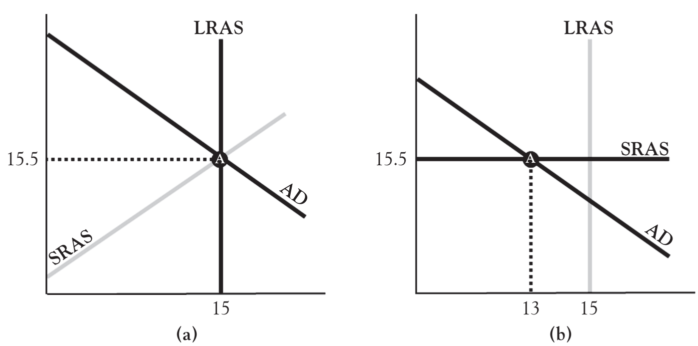

Figure 5.1 Classical economics versus Keynesian economics

assumes that prices and wages are rigid in the short run. This makes SRAS very elastic. It also inhibits resource markets from clearing in the short run, which can make output gaps persistent. Persistently high unemployment in a recessionary gap (point A in Figure 5.1*b*) and rising prices in an inflationary gap beckon elected officials to alleviate short-run hardships with fiscal stimulus. The attention Keynesians pay to closing short-run output gaps explains why LRAS is gray in the model on the right.

The Fiscal Budget Balance

The fiscal budget balance is the difference between net tax revenue and government expenditure ($T - G$). The black line in Figure 5.2*a* is the trend in the real value of the fiscal budget balance by quarter. The budget balance is stated in per capita terms to allow for year-to-year comparisons, which is necessary since the economy and population expand together through time.[1] In a given quarter, a budget deficit occurs when the budget balance is negative because government has spent more than it has collected. In such quarters, the trend in the figure tracks below the horizontal axis. A deficit is financed by the U.S. Treasury selling securities, which adds to the national debt. The national debt, roughly 17 trillion dollars in 2013,[2] is paid down with budget surpluses. To run a surplus, government cuts expenditure or collects more taxes until the budget balance is positive. This pushes the trend in the figure above the horizontal axis.

Prior to the Nixon administration, budget surpluses were common, and budget deficits tended to be small, relative to the size of the population. Eisenhower, Kennedy, and Johnson all presided over surpluses, all of which pale in comparison to Clinton's. Per capita budget deficits began a fairly consistent downward trend in the Johnson administration. From the late 1960s to just prior to the Great Recession, represented by the right-most gray bar in Figure 5.2, the largest per-capita deficits occurred in Ford's second full quarter and during the administrations of President Bush and his son. The largest per capita budget deficit in the post-World

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[1] GDP can be used as a divisor but its fluctuations overstate deficits in recessions and surpluses in expansions.

[2] See the White House's Office of Management and Budget's Historical Table 1.1.

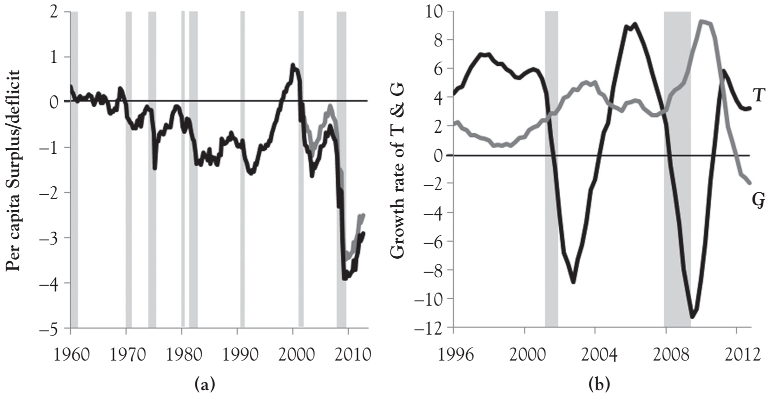

Figure 5.2 Graphs of the fiscal budget balance, growth in T, and growth in G

War II era was recorded near the end of the Great Recession. It was more than twice the size of any other.

With the gray bars in Figure 5.2*a* indicating recessions, the figure shows the budget balance peaking at the start of recessions and bottoming out at the start of recoveries. Large budget deficits that accompany business cycle troughs shrink rapidly in subsequent economic recoveries and expansions. The figure shows that the celebrated Clinton surplus and its disappearance were driven in part by the business cycle. The surplus peaked in the second quarter of 1999, declined in Clinton's last two quarters, and continued to fall in his successor's first quarter, the start of the 2001 recession.[3] In the second quarter of 2001, the fiscal budget balance went from being in surplus to being in deficit.

Figure 5.2*b* disaggregates the fairly recent budget balance story into its two components. The black line in the figure shows the growth rate of per capita tax revenue accelerating until 1997 and then leveling off at around 6 percent per year until 2000. The drop in tax revenue growth to −9 percent began before the 2001 recession started. This drop preceded the enactment of the 2001 Economic Growth and Tax Relief Reconciliation Act (EGTRRA). EGTRRA authorized the Treasury to mail tax rebate checks between July 20 and September 21 of that same year (Snow 2001)

[3] The National Bureau of Economic Research dated the start of the recession in March 2001.

and gradually phased in tax-rate reductions between 2002 and 2006 (Dalton and Gangi 2007). The passage of the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) advanced the 2006 tax rate reductions to 2003. This change was accompanied by tax revenue growing at around 9 percent by 2005. With the lower tax rates set to expire in 2010, the Obama administration extended them to 2012. According to the figure, tax collections are highly correlated with the business cycle.

The gray trend in Figure 5.2*b* shows the volatility in per-capita government expenditure, which is much smaller than that of tax revenue. After six consecutive quarters of government expenditure growing at a slow rate, its growth rate increased substantially between 1999 and the start of the 2001 recession. The acceleration in earmarks[4] (Utt 1999) and the business cycle were large drivers of this. Twenty-six days after the 9/11 attacks, the war on terror was launched. With its cost estimated at over 1 trillion dollars (Belasco 2011), the gray line in Figure 5.2*a* subtracts out the average annual war appropriation from the budget balance. The government expenditure growth accelerated from 2.4 percent at the start of the 2001 recession to peaks of 5 percent in the second and final quarters of 2003. The enactment of the 3.1-trillion-dollar 2009 budget, the Troubled Asset Relief Program (TARP), the omnibus and other appropriations bills, and tax rebates in the final year of the Bush administration coincided with government expenditure growth jumping to 4 percent. This was followed by an even larger acceleration in government expenditure after the Obama administration enacted the American Recovery and Reinvestment Act and the Omnibus Appropriations Act months apart during its first year.

Figure 5.2 indicates that budget deficits have become the norm in the United States. In the classical view, discretionary changes to the fiscal budget are unnecessary because output gaps are not present in the long run. The Keynesian view, on the other hand, prescribes budget deficits for recessionary gaps, which are to be paid off with budget surpluses during subsequent economic expansions. Given how rare surpluses are, fiscal policy is

[4] An earmark is legislative provision that directs a specified amount of money to a project or an organization in a Senator's home state or Representative's home district. It is associated with "pork barrel" legislation.

not being implemented as prescribed by the Keynesian school of economics. This is perhaps a result of cuts in expenditures on government programs being viewed as political suicide by progressive politicians, and hikes in tax rates being viewed as political suicide by conservative politicians.

Treasury Bond Auctions

The U.S. Treasury borrows to cover budget deficits by selling securities to banks, other nations' central banks and governments, large corporations, and others. U.S. securities include bills, notes, and bonds. Bills mature in 1 year or less, notes in 2 to 10 years, and bonds in more than 10 years. Although U.S. securities are auctioned and redeemed by the U.S. Treasury in what is called the *primary market*, holders can sell them before they mature in the *secondary market*. The yield on a U.S. security—the rate of return that accounts for purchase price, coupon payments, and face value (FV)—is considered the benchmark for fixed-income securities with the same attributes because it is considered risk free. The yield curve, the relationship between the yields and maturities of U.S. securities, normally slopes up but flattens as the likelihood of recession rises.

U.S. securities are sold in periodic auctions. In 2012, 264 public auctions worth 8 trillion dollars were conducted.[5] This amount is about eight times larger than that year's budget deficit because the auctions must be large enough to cover the deficit, pay interest payments, and retire maturing securities. After auctions are announced, investors submit bids to the U.S. Treasury. When an auction ends, bids exceeding the winning price are accepted. To demonstrate this, consider a one-year Treasury bill auction intended to raise 1 billion dollars. Suppose the bill has a FV of \$100, a maturity (n) of one year, and a price of the winning bid (P) equal to \$98.91. Substituting these values into the equation below gives a yield of 0.011 or 1.1 percent.

$$i = \left(\mathrm{FV}/P\right)^{1/n} - 1$$

Since the bill sold for \$98.91 and the auction intended to raise 1 billion dollars, 10.11 million bills must be issued. If the price of the winning bid

5 See www.treasurydirect.gov/instit/auctfund/work/work.htm

had been \$99.11, the yield would have been 0.9 percent. Thus, Treasury bills are typically discounted, and their prices and yields are inversely related. Prices and yields of securities with longer maturities are also inversely related, but may not sell at a discount because bearers receive interest (coupon) payments twice a year.

Discretionary Fiscal Policy

A deliberate change in the budget balance is called *discretionary fiscal policy*. Figure 5.3 shows its effects on the major macroeconomic models. In classical economics, AD and SRAS intersect at LRAS, point A in Figure 5.3*a*, because labor and other resource markets clear in the long run. If tax rates are reduced or government expenditure is increased, the budget goes from being balanced to being in deficit. The arrows above *G* and *T* in the equation below show how expansionary fiscal policy affects AD.

$$\mathrm{PL}_{ad} = [W + Y_e - r - \mathrm{mpc} \cdot \overset{\downarrow}{T} + \overset{\uparrow}{G} + X + I] - \{\mathrm{mpm} + \mathrm{mpm}\} \cdot Y$$

Raising the budget deficit increases AD's intercept, which shifts AD to point B in Figure 5.3*a*. At this point, the economy is an *induced inflationary gap* because real GDP exceeds its potential.

At point B, labor markets are tight because unemployment is below its natural rate. If the Fed does not offset fiscal stimulus with tighter money, firms bid wages up. The prices of other production inputs are bid

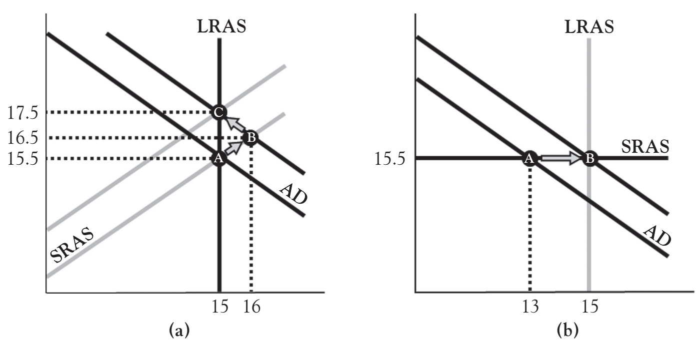

Figure 5.3 Expansionary fiscal policy in the classical and Keynesian schools

up too due to the heavy utilization of facilities and overemployment of resources. The arrows above *w* and *p* in the following equation show how the model self-adjusts.

$$PL_{sras} = [\overset{\uparrow}{w} + \overset{\uparrow}{p} + t - b \cdot Y_p] + b \cdot Y$$

Rising wages and prices of other inputs to production increase the value of SRAS's intercept, shifting SRAS from point B to C. At point C, wages and prices of other inputs to production no longer change because resource markets have equilibrated. With real GDP equal to its potential, the PL settles at 17.5 thousand dollars. Thus, in classical economics, expansionary fiscal policy is inflationary, has no effect on real GDP, and increases the budget deficit, which adds to the national debt.

In Keynesian economics, perfectly elastic SRAS and AD intersect at points that are to the left or right of LRAS. SRAS is perfectly elastic because Keynesian economics assumes that wages and prices are rigid in the short run. This makes *w* and *p* fixed parameters. In Figure 5.3*b*, the aggregate market is in a recessionary gap at point A. As in the classical model, an increase in government expenditure or a cut in taxes increases the size of the budget deficit and AD's intercept. The figure shows that the budget deficit is just enough to close the 2-trillion-dollar recessionary gap. Thus, expansionary fiscal policy returns the economy to full employment, is not inflationary, but raises the national debt by the amount of the budget deficit.

The effects of discretionary restrictive fiscal policy are shown in Figure 5.4. In the long-run classical model on the left, the economy is initially at point A. If taxes are raised or government expenditure is cut, the fiscal budget goes from being balanced to being in surplus. The arrows above *G* and *T* in the equation below illustrate how restrictive fiscal policy affects AD.

$$PL_{ad} = [W + Y_e - r - \text{mpc} \cdot \overset{\uparrow}{T} + \overset{\downarrow}{G} + X + I] - \{\text{mpm} + \text{mpm}\} \cdot Y$$

Cutting government expenditure or raising taxes reduces AD's intercept, which shifts AD from point A to B. At point B the economy is in an *induced recessionary gap* because potential output exceeds real GDP.

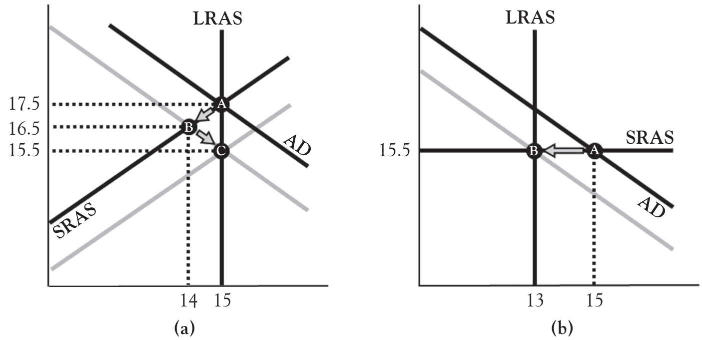

Figure 5.4 Restrictive fiscal policy in the classical and Keynesian schools

This causes unemployment to rise above its natural rate, which means that facilities are underutilized and resources are underemployed. Wages and the prices of other inputs fall because government does not intervene in markets in the classical model. The arrows above *w* and *p* in the following equation show how the model self-adjusts.

$$PL_{sras} = [\overset{\downarrow}{w} + \overset{\downarrow}{p} + t - b \cdot Y_p] + b \cdot Y$$

As wages and prices of production inputs fall, SRAS self-adjusts to point C. As real GDP returns to its potential level, the PL drops to 15.5 thousand dollars. Thus, in classical economics, restrictive fiscal policy has no effect on real GDP and is deflationary.

The Keynesian model in Figure 5.4*b* is in an inflationary gap at point A. As in the classical model, raising taxes or cutting government expenditure decreases AD's intercept, which shifts AD from point A to B. This implies that restrictive fiscal policy in Keynesian economics can return the economy to full employment and is not deflationary. In addition, the resulting fiscal surplus can then be used to pay off budget deficits that were used to close recessionary gaps.

Shortcomings of Fiscal Policy

Although discretionary fiscal policy is seemingly effective in the Keynesian model, in practice, it is futile. Because forecasting is difficult and gets increasingly unreliable the further into the future predictions are made, fiscal policy will overshoot or undershoot an output gap. If the fiscal stimulus is too small in Figure 5.3*b*, AD will shift along SRAS to a point between A and B. This leaves the economy in a smaller recessionary gap. If the initial stimulus was too large with the economy at point A, AD will shift along SRAS to a point to the right of point B. This induces an inflationary gap, and requires a withdrawal of stimulus or tighter money from the Fed to prevent SRAS from *eventually* self-adjusting upward due to resources being overemployed.

Even if the size of discretionary fiscal stimulus is predictable, there are delays in its implementation. It takes time to observe that the economy is in a recessionary gap because GDP and unemployment are not observed in the present. In addition, several months of observations are needed to make an accurate prognosis. After a problem has been diagnosed, it takes time to decide the best course of action because Congress must debate, compromise, amend, and vote on the action to be taken. When the President's party does not control both chambers of Congress, adopting fiscal policy is very challenging. Even if the President's party controls the House and Senate, the Senate minority can stop legislation if it gets at least 41 senators to support a filibuster. After fiscal policy is signed into law by the President, its effects are further delayed by revenue from new taxes being collected a year or more after the change was made or by bureaucratic red tape that includes departments altering budgets, adjusting spending habits, and screening grant or transfer payment applicants. Sometimes, its implementation is purposely lagged by several years, with EGTRRA being a great example. Even the theory behind multipliers implies that the economic benefits of fiscal stimulus take time to unwind.

Figure 5.5 shows how poorly timed discretionary fiscal policy can destabilize the economy. SRAS slopes upward because stagflation[6] in the 1970s implies that wages and prices are not rigid. At point A, unemployment is equal to its natural rate because real GDP is equal to its potential. Suppose that investment slumps. This is modeled by the arrow above *I* in the following equation.

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[6] Stagflation is high inflation, high unemployment, and sluggish economic growth.

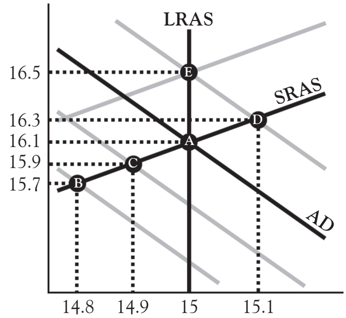

Figure 5.5 Expansionary fiscal policy in the presence of policy lags

$$\text{PL}_{\text{ad}} = [W + Y_{\text{e}} - r - \text{mpc} \cdot T + G + X + \overset{\downarrow}{I}] - \{\text{mpm} + \text{mpm}\} \cdot Y$$

If the decline in the intercept causes AD to shift from point A to B, the real GDP falls to 14.8 trillion dollars. As unemployment rises, voters implore elected officials to take action. Complying with this is difficult because certain politicians support a temporary boost in government expenditure while others back tax cuts. As Congress debates a plan of action, suppose that good news from overseas sparks a stock market rally that increases consumer wealth (W) just enough to push AD to point C. The arrow above W in the following equation illustrates this effect.

$$\text{PL}_{\text{ad}} = [\overset{\uparrow}{W} + Y_{\text{e}} - r - \text{mpc} \cdot T + G + X + I] - \{\text{mpm} + \text{mpm}\} \cdot Y$$

With the economy at point C, suppose that the House and Senate start reconciling their stimulus bills. As this continues, the increase in consumer wealth boosts expected future income (Y_e) enough to push AD to point A. The arrow in the equation below shows how AD is affected by this.

$$\text{PL}_{\text{ad}} = [W + \overset{\uparrow}{Y_{\text{e}}} - r - \text{mpc} \cdot T + G + X + I] - \{\text{mpm} + \text{mpm}\} \cdot Y$$

The increases in consumer wealth and expected future income are enough to return the economy to full employment. Although this typically happens before fiscal stimulus is injected into the economy, repealing the stimulus bill is not politically popular. After the President signs the bill, consumers receive tax cuts and firms get paid for filling orders for new public works projects, and AD shifts from point A to D. If the Fed fails to offset this with tighter money (to push AD back toward point A), overemployment of labor and high resource and facility utilization causes firms to bid up wages and prices of other inputs. These shift SRAS up to point E. Thus, poorly timed fiscal policy adds to the national debt, is inflationary, and, in the end, does not affect real GDP or unemployment.

Discretionary fiscal policy has domestic and international consequences, too. Suppose that a tax cut and increase in government expenditure are able to close the recessionary gap shown in Figure 5.6*a*. Since these actions increase the budget deficit, government must borrow funds in the *loanable funds market* depicted in Figure 5.6*b*. Savers supply loanable funds when they purchase bonds from governments and firms. The price of loanable funds is nominal interest rate *i*, which is used to compute interest paid to savers. If it is 0 percent, demanders will want to borrow a lot of these funds, but savers will not supply them. As the nominal interest rate rises, the shortage in funds declines as borrowers demand fewer funds and savers supply more. The shortage disappears when the nominal interest rate reaches its equilibrium of 2.5 percent at point A. At the moment government borrows to finance the budget deficit the demand for loanable funds (D_{LF}) shifts to point B. With loanable funds supply (S_{LF}) held constant, higher loanable funds demand pushes the nominal interest rate up to 3.5 percent.

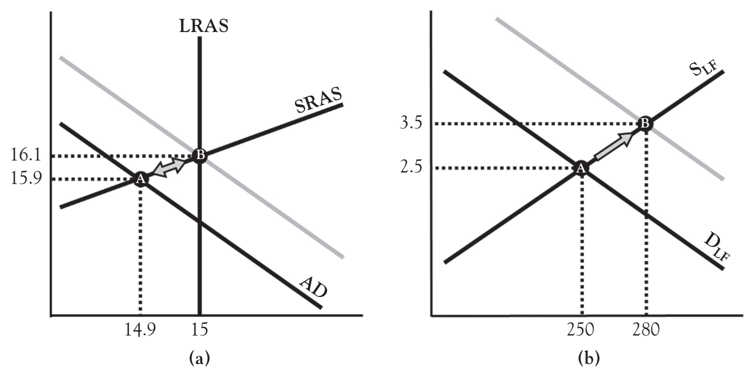

Figure 5.6 Fiscal policy and the crowding-out effect

Foreign and domestic capital is attracted to U.S. securities when real interest rate *r* is pushed up by a higher nominal interest rate.[7] With domestic capital flowing to government securities, less is being invested in new plants, equipment, and homes (*I*). Foreign capital flowing into the United States reduces the amount of capital that is invested in other countries. The decline in private investment, here and abroad, caused by an increase in U.S. government borrowing is called *crowding out*. Since U.S. securities are purchased in dollars, foreign investors swap their currencies for dollars, which causes the dollar to appreciate. This makes U.S. products more expensive abroad, which reduces U.S. exports (*X*). The arrows in the following equation show how the consequences of increased government borrowing affect AD.

$$\mathrm{PL}_{\mathrm{ad}} = [W + Y_{\mathrm{e}} - \overset{\uparrow}{r} - \mathrm{mpc} \cdot \overset{\downarrow}{T} + \overset{\uparrow}{G} + \overset{\downarrow}{X} + \overset{\downarrow}{I}] - \{\mathrm{mpm} + \mathrm{mpm}\} \cdot Y$$

Although increasing the size of the budget deficit (higher *G* and lower *T*) shifts AD from point A to B in Figure 5.6*a*, crowding out (higher *r* and lower *X* and *I*) shifts AD back to point A. Hence, the intended consequence of fiscal policy is accompanied by unintended domestic consequences, which consist of higher interest rates and lower investment expenditure, and an unintended international consequence, the decline in exports that is caused by an appreciating dollar.

Although Keynesian economics advocates for countercyclical changes in the budget balance to smooth the business cycle, the continual adjustment of tax rates and expenditures makes it difficult for individuals and firms to plan for the future. Not knowing what tax rates will be next year, in two years, or in five years makes computing expected returns difficult. This retards economic activity and job creation (Meltzer 2012) and hinders long-run economic growth.

Oddly enough, politicians need not take action when the economy slips into recession because there are *automatic fiscal stabilizers* at work in the economy. Automatic stabilizers are countercyclical effects that are

[7] The real and nominal rates of interest have moved together from the early 1980s and beyond (Mishkin 2010).

not hindered by legislative delays. Examples of these include progressive income taxation, unemployment insurance (UI), and Supplemental Nutritional Assistance Program (SNAP). As growth accelerates, incomes rise. This means that more and more people are paying an increasing proportion of income in taxes because they find themselves in higher and higher income tax brackets. This dampens consumption expenditure, and limits the peak of the business cycle. As the economy approaches the trough in the business cycle, more and more people are paying less in income taxes—because they find themselves in lower and lower income tax brackets—or are receiving transfer payments from UI or SNAP. As the deficit automatically widens without legislative delay, immediate stimulus is injected into the economy, which pushes real GDP back toward its potential level. The additional tax revenue accruing to the Treasury during an expansion automatically pays down the fiscal deficit resulting from an economic contraction.

The Supply-Side School

At the end of World War II, the views of John Maynard Keynes and F.A. Hayek split economics into two camps. Unlike Keynes, Hayek argued for limited government, economic freedom, and personal responsibility. While Keynes's view dominated mainstream economic thought and policy formation in the decades following the war, Hayek's views helped revive classical economics. As this was going on, shifting inflation expectations of the 1970s ushered in stagflation. This revealed that prices and wages were not as rigid as Keynesian theory had assumed. As a result, the aggregate market model became the standard in macroeconomic principles textbooks.

In *The Way the World Works*, after attributing high tax rates and poor monetary policy to the stagflation of the 1970s, Jude Wanniski made the case for *supply-side economics*. The theory emphasizes *permanent* reductions in tax rates and regulations, which fuel continual increases in production capabilities over time. This pushes LRAS and SRAS outward at a pace higher than what would have prevailed under a regime of continuous fiscal policy adjustment. Because the three curves of the

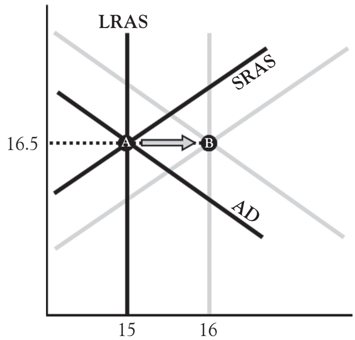

Figure 5.7 Supply-side fiscal policy

aggregate market model equilibrate in the long run, AD shifts outward to keep up with LRAS and SRAS,[8] which is shown in Figure 5.7. The figure implies supply-side economic policy results in zero inflation and ever-expanding GDP.

The marginal tax rate is crucial in supply-side economics. If the tax rate is 100 percent, people will not work and firms will not produce, resulting in zero taxes being collected. Conversely, people and firms pay zero income taxes when the tax rate is 0 percent. Thus, tax revenue rises and then falls as the tax rate is raised from 0 to 100 percent. This relationship is called the *Laffer curve*.[9] It was the topic being discussed by Ferris's economics teacher, played by Ben Stein in 1986's *Ferris Bueller's Day Off*, during his infamous day off from high school. The empirical Laffer curves graphed in Figure 5.8 show how tax revenue and the top marginal tax rate relate over time in the United States.[10] According to the left figure, tax revenue as a percentage of GDP is maximized when the tax rate is 50 percent. The figure on the right, however, implies that per capita tax revenue reaches a maximum when the tax rate is less than 25 percent. Although both curves suggest that cutting "high" tax rates raises tax revenue, the

[8] This is a take on *Say's Law*, which Keynes rephrased as "supply creates its own demand" (Keynes 1936).

[9] Although the curve is named after economists Arthur Laffer, Laffer acknowledged that Ibn Khaldun, a 14th Century philosopher, first observed the relationship centuries ago. (Laffer 2004).

[10] Figure 5.8 uses quarterly data covering the 1954 to 2012 period. These data are from FRED and TaxFoundation.org

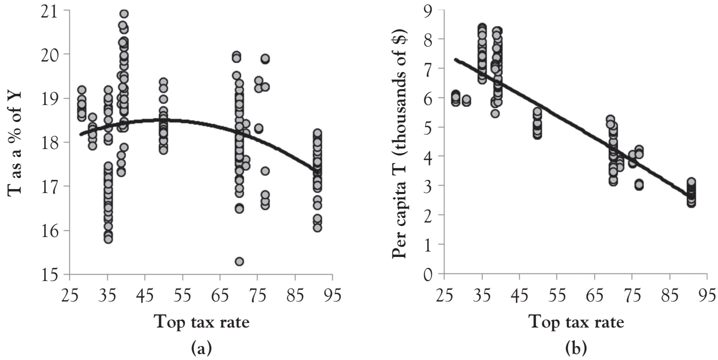

Figure 5.8 Empirical laffer curves

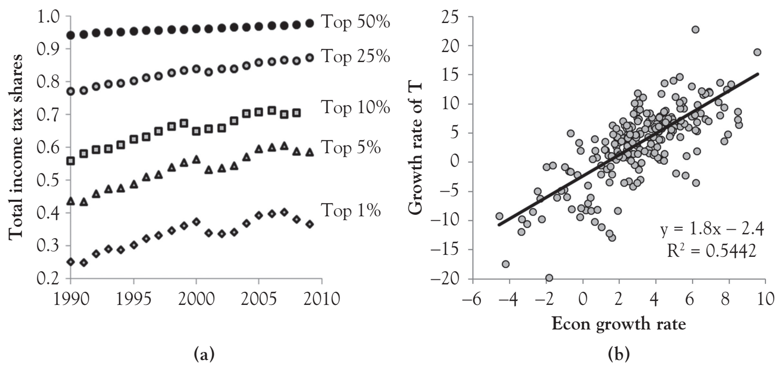

Figure 5.9 Tax burden, and growth in T versus GDP growth

left curve implies that this only works up to a point. Since real GDP is more volatile than population estimates, and it is highly correlated with tax revenue (see Figure 5.9*b*), the empirical Laffer curve on the right fits its scatterplot better than the curve on the left.

Figure 5.9a[11] seems to confirm the Laffer effect. Although it shows that the tax burden borne by those in the top three income brackets is sensitive to the business cycle, the income tax burden borne by those in the top five income brackets generally rises over time. From 2003, the year the EGTRRA income tax rate cuts were completely phased in, to the year preceding the start of the Great Recession, the burden of taxation borne by those in the top two income tax brackets increased rapidly by 5 to 7 percentage points.

[11] The data are from TaxFoundation.org

The Laffer curve implies that there is a limit to the amount of taxes that can be collected from taxpayers in the short run. Thus, government cannot provide services costing more than this limit unless it runs a budget deficit. Elected officials interested in balancing the fiscal budget and providing services exceeding the limit imposed by the Laffer curve can do so if they enact policies that will shift the curve up. *Permanent* reductions in tax rates and regulations expand the long-run productive capacity of the economy. This in turn shifts the economy's PPF outward, rotates the short-run production function counterclockwise, and shifts LRAS to the right. If these policy prescriptions achieve a sustainable economic growth rate of 5 percent, annual tax revenue will grow at the rate of about 7 percent, according to Figure 5.9*b*.

Since Congress cannot bind future Congresses to the policies it enacts,[12] a cut in the payroll tax rate firms pay, a reduction in regulations, or a tax holiday on overseas corporate profits represent discretionary fiscal policy. Thus, any critical evaluation of what are classified as supply-side economic policies is really an indictment of discretionary fiscal policy.

The Chicago School

Hayek's views also helped shape the Chicago school. It is associated with the following tenets: markets allocate resources more efficiently than do governments, monopolies are created by government regulation, and central banks should maintain low and steady rates of money growth. The Chicago school views fiscal policy as ineffective because households form *rational expectations*.[13] If households do not expect their taxes will be raised to retire the bonds used to finance today's budget deficit, fiscal stimulus shifts AD toward point B in Figure 5.10*a*.

Recent experience, however, suggests that households form *rational expectations*.[14] If so, households expect that tax rates will be raised in

[12] Congress lowered the top marginal tax rate to 28 percent in 1986, but raised it to 31 percent in 1990.

[13] Robert Lucas won the Nobel Prize in economics in 1995 for his work on rational expectations.

[14] According to Shilling (2010), households saved 80 percent of the tax rebates from Economic Stimulus Act of 2008.

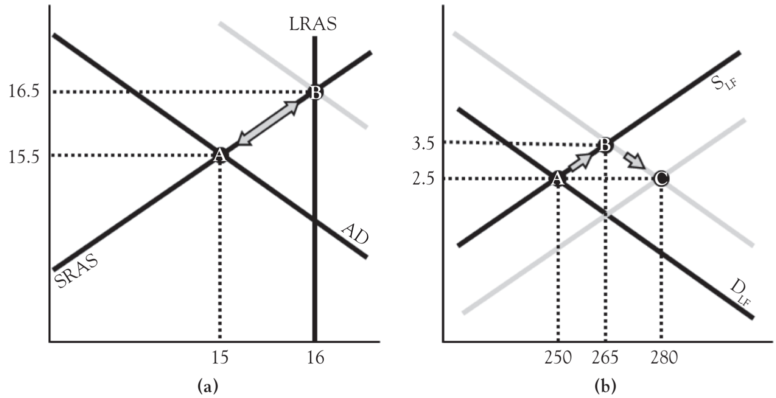

Figure 5.10 Fiscal policy in the presence of rational expectations

the future to pay off today's budget deficit. This reduces expected future consumer income (Y_e). In addition, when government borrows more to cover a budget deficit, demand for loanable funds shifts from A to B in Figure 5.10*b*. Since households save tax rebates and paychecks earned from public works projects to pay higher future taxes, loanable funds supply shifts from B to C. This keeps the nominal interest rate at 2.5 percent. If the expected inflation is steady, real interest rates and investment expenditure are constant. The arrows in the following equation show how rational expectations offset fiscal stimulus.

$$PL_{ad} = [W + \overset{\downarrow}{Y_e} - r - \text{mpc} \cdot \overset{\downarrow}{T} + \overset{\uparrow}{G} + X + I] - \{\text{mpm} + \text{mpm}\} \cdot Y$$

Although fiscal stimulus shifts AD to point B in Figure 5.10*a*, this is completely offset by a decline in expected future income that pushes AD back to point A. Thus, in the Chicago school, fiscal policy has no effect on interest rates, real GDP, or unemployment.

The Austrian School

The 1871 publication of Carl Menger's *Principles of Economics* established the Austrian school of economics. Unlike its cousins—supply-side economics and the Chicago school, which advocate a limited role for government in managing the economy—Austrian economics adheres to classical liberalism. To Austrian economists, mainstream macroeconomics is an oxymoron because, to them, the appropriate unit of analysis is at the individual level. This, however, does not preclude Austrians from commenting on macroeconomic issues.

Austrians view the injection of fiscal stimulus into the economy as treating the symptoms of economic malaise rather than being its cure. The Austrian prescription for persistently high unemployment would be painful to low-skilled workers in the short run because it involves the elimination of the policies that make wages and prices rigid.[15] The rigidities are a result of government interventions that raise low-skilled laborers' reservation wages, which include UI compensation (Layard, Nickell and Jackman 1991), the minimum wage and pro-labor policy (Barro 1988), public assistance (Borjas 2012), and price controls present in farm bills (Bakst and Katz 2013). Artificially low mortgage rates and easy credit terms in the early to mid-2000s trapped low-skilled workers in homes in the mid-2000s, which can inhibit migration to low-unemployment regions.

After regulations, subsidies, and other government interventions are repealed, the Austrian solution to recessionary and inflationary gaps is laissez faire policy. It would allow markets to adjust to various dynamics. The resulting changes to prices and wages send clear signals to self-interested individuals. Consider the inflationary gap at point A in Figure 5.11. It and allowing SRAS to self-adjust to point B are viewed as being very beneficial to the economy. This is because firms cannot pass higher labor and resource costs off onto consumers when faced with stiff competition at home and abroad. In the absence of intervention, allowing overemployment to persist drives cost-saving innovation because firms employ individuals who find creative ways to lower production costs. Greater entrepreneurialism and technological advancement shifts LRAS and SRAS to point A. As this occurs, unemployment adjusts upward toward its natural rate as workers are replaced by the adoption of labor-saving technologies.

Although economic prosperity is linked to core tenets of Austrian economics, namely economic and political freedom, this school of thought is routinely dismissed or marginalized by mainstream economists

[15] Government interventions begetting government intervention is a key point of Mises (1996) and Hayek (2007).

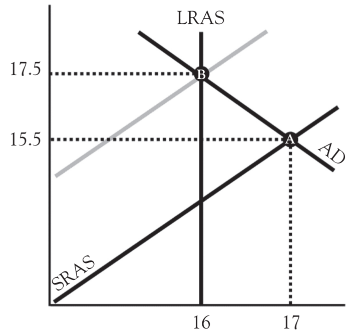

Figure 5.11 Inflationary gaps in the austrian school

(e.g., Krugman 2013). This is the case despite prices falling, quality rising, *and* consumer choice increasing in the long-run in markets that are relatively free of government intervention (e.g., cellular phones, tablets, Internet, electronics, software, and computers). On the other hand, inflation, stagnant quality, inefficiency, *or* moral hazard is typical of industries regulated, managed, or owned by government (e.g., landline telephones prior to the breakup of Ma Bell, banking, education, healthcare, and the post office). Thus, it is surprising that the Austrian view has not gained wider acceptance. This is perhaps due to mainstream economics offering sellable solutions to recession. While Austrian economics leaves people to their own devices when unemployment is high, mainstream economics does not. Keynesian solutions, like public works projects, extensions to UI compensation, and payroll tax cuts, are well received among working-class voters. Supply-side and Chicago school policy prescriptions, such as capital gains tax rate cuts, low interest rates, and deregulation, appeal to investors and entrepreneurs.

Fiscal Policy and Economic Performance

Due to policy lag, past values of annual budget deficits should impact current economic growth. However, correlations between economic growth rates and quarterly lags of the growth rate of budget balances are essentially zero. A similar story plays out when correlations of economic growth rates and lags of the per capita budget balance are computed. The strongest correlation occurs when the per capita budget balance is lagged by eight quarters. This relationship is shown in Figure 5.11 for

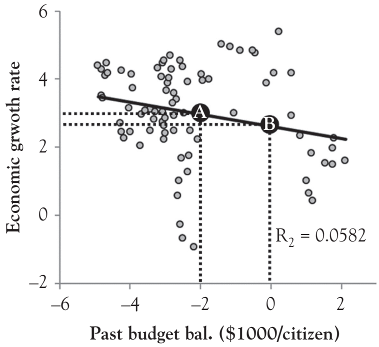

Figure 5.12 Economic growth versus lagged fiscal budget balance

the 1986 to 2005 period. The trend line in the figure implies that raising the budget deficit by $2,000 per citizen leads to a modest 0.35-percentage-point increase in economic growth two years later. Given the weak correlation between growth and lags of these budget measures, and the budget balance's modest effect in Figure 5.11*a*, other policies should perhaps be pursued.

The persistence of budget deficits in Figure 5.12 suggests that they are politically popular. Near the peak of the Clinton surplus, Congress accelerated its expenditures. Although government expenditures had been growing steadily at 1 percent per year, its growth rate steadily increased to 5 percent between 1999 and 2003. The growth in government spending remained near this elevated rate through 2004 even though the recession had ended three years earlier. Meanwhile, the temporary EGTRRA tax rates had been fully phased in by 2003. In 2008 and 2009, the Bush and Obama administrations enacted stimulus bills and bailed out corporations and banks using TARP funds to rescue the United States' "financial system from almost certain meltdown [and help] avoid the feared second Great Depression" (Weller 2012). Given that the fiscal stimulus used to combat the 2001 recession was injected late, and the record fiscal stimulus of 2008 and 2009 did not pull the economy out of the deepest and most persistent recessionary gap since the Great Depression (see Figure 2.7), will politicians abandon fiscal policy? Perhaps not, because (a) higher government spending and lower taxes directly benefit their constituents, and (b) they will be long retired by the time the bonds that financed their policies mature.

CHAPTER 6

Monetary Policy

Monetary policy is the process by which a nation's central bank manipulates the supply of money to achieve full employment, maintain a low rate of inflation, or both. In the United States, the central bank is the Fed. Although the Chicago school advocates for central banks to pursue low, steady rates of money growth, the Fed historically has targeted interest rates to fulfill its dual mandate of full employment and low stable inflation.[1] Presently, the Fed's target for unemployment is 5 to 6 percent, and its inflation target is 2 percent.[2] For most of its history, the Fed has used the discount rate (i_d), the reserve requirement ratio (rrr), and its primary policy lever, open market operations, to achieve these objectives. In 2006, Congress gave the Fed an additional monetary tool, paying interest on reserves (i_{or}). Although it was set to begin in 2011,[3] due to the 2008 financial crisis, Congress moved its implementation up three years.[4] In Operation Twist (Censky 2011), the Fed deviated from purchasing short-term government debt to buying longer term securities to push down long-term interest rates, and spur on home sales and firm investment. Unlike fiscal policy, the Fed can immediately change the supply of money using these tools to counter a recession or fight inflation.

Money

Money takes many forms. It is something that is accepted as payment for products and repayment of debts, legal tender within a country, a store of value, and a standard unit of account. In the absence of money, goods

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[1] Congress restated the Federal Reserve's objectives when it amended The Federal Reserve Act in 1977.

[2] See www.chicagofed.org/webpages/publications/speeches/our_dual_mandate.cfm

[3] See the Financial Services Regulatory Relief Act of 2006 at www.gpo.gov

[4] See the Emergency Economic Stabilization Act of 2008 at www.gpo.gov

and services are exchanged in a barter system, where individuals directly exchange the surplus from the fruits of their labor. In a barter system, a potato farmer who cannot find anyone looking to trade sacks of potatoes for a plow horse must find someone who needs potatoes and has something horse owners need. Horse owners have a different problem. Unlike a sack of potatoes, a horse cannot be converted into smaller units to be exchanged for an ice cream sundae—unless it is butchered. None of these commodities are a good store of value because ice cream melts, potatoes rot, and horses age.

Money spontaneously arises out of necessity to facilitate exchanges of goods and services.[5] The least marketable forms of money were "one by one rejected until at last only a single commodity remained, which was universally employed as a medium of exchange" (Mises 1953). The winner of this contest is divisible, transportable, difficult to counterfeit, and durable. Items ranging from mollusk shells, buckskins, and gold have served as money. In the 1994 movie *The Shawshank Redemption*, inmates exchanged cigarettes for posters, whiskey, and playing cards. In 2011's *In Time*, time is literally money that is used to purchase immortality.

While coins were first minted between 700 and 500 bc (Weatherford 1997), the first paper money, chiao-tzu, was issued in 10th-century Szechwan, China (Lui 1983). It was a bank receipt for iron coins deposited in Szechwan banks. When the Szechwan government took control of this money in 1023, chiao-tzu became the world's first *fiat money*, money backed not by commodities but by government decree. In 16th-century London, goldsmiths—artisans who made jewelry out of precious metals—began charging fees for safely storing gold coins.[6] The receipts were redeemable to only the depositor *unless* "or bearer" was printed next to his or her name. In 1694, the Bank of England began issuing receipts named the British Pound. The notes circulated as money because the bearer could redeem them in gold. The notes became fiat money when the United Kingdom abandoned the gold standard in 1931.[7]

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[5] "When the inhabitants of one country became more dependent on those of another, and they imported what they needed, and exported what they had too much of, money necessarily came into use."—Aristotle in *Politics*.

[6] See www.bankofengland.co.uk/banknotes/Pages/about/history.aspx

[7] Ibid.

Currently, monetary systems throughout the world use fiat money. In the United States, converting the dollar into fiat money took nearly 40 years. President Franklin Roosevelt essentially ended the gold standard in domestic exchanges and restricted private ownership of gold after signing the Emergency Banking Act of 1933, Executive Order 6102, and the Gold Reserve Act of 1934. President Nixon ended the gold standard in foreign exchanges by issuing Executive Order 11615 in 1971. Meanwhile, "In God We Trust" began appearing on U.S. paper money in 1957.[8] Hence, presidents from Roosevelt to Nixon essentially removed the "l" in "gold" on the dollar to slowly transition it from the gold standard to the God standard.

The Market for Money

If holding money or buying bonds are the only stores of wealth,[9] the nominal rate of interest determined in the loanable funds market (Figure 5.6*b*) is the same rate that is determined by equating money demand and supply in the *market for money*.[10] The loanable funds market is ideal for studying discretionary fiscal policy and changes in expected inflation, while the market for money is ideal for understanding the effects of monetary policy; innovation in financial technologies; and changes in income, the PL, and nominal wages.

Money demand is the quantity of money held by the public (M^d) at nominal rate of interest i, holding all else equal.[11] The narrowest definition of money is M1. It includes the currency held by the public, which is all paper and coin money held outside of bank vaults. Included in this is the money held in wallets and piggy banks, between couch cushions and car seats, and in businesses' petty cash drawers. Traveler's checks, which are not as common as they once were, are included in M1. Although demand

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[8] See www.treasury.gov/about/education/Pages/in-god-we-trust.aspx

[9] This is an assumption of Keynes's (1936) liquidity preference theory.

[10] The market for money and the money market are not the same because the money market determines the price of securities with maturities of one year or less (e.g., T-bills, municipal anticipation notes, commercial paper, etc.).

[11] Rothbard (2000) argues that interest rates are solely determined by market participants' time preferences.

deposits include checkable deposits and savings deposits, only checkable deposits are included in M1 because money in checking accounts is easier to access than money in savings accounts. Adding savings deposits and money market mutual funds to M1 yields a broader definition of money called M2.

People and firms demand money because there are benefits to doing so. Although doing so makes it easier to pay for things, the marginal benefit of holding an additional dollar diminishes as the amount held increases. For example, the benefit of holding $2 rather than $1 is much greater than holding an additional dollar when starting with $1,000. Holding the additional dollar is costly because interest is forgone and inflation reduces its buying power. Thus, the nominal rate of interest (i), the sum of the real interest rate earned on an alternative asset (r) and expected inflation (π_e), is the price of holding money. As it rises, the quantity of money demanded falls. Thus, the Law of Demand holds for money.

The size of money demand's slope is under debate. On one side of this debate is Irving Fisher with his quantity theory of money, and on the other is Keynes with his liquidity preference theory. Money demand evolved from Fisher's equation, $M \cdot V = Y \cdot \text{PL}$, where V is *money velocity*, the number of times one dollar is used to buy products in a given period of time. This equation says the quantity of money multiplied by its velocity equals the nation's nominal GDP, the product of real GDP (Y) and the PL. Although Fisher's view assumes that velocity is constant in the long run and the quantity of money is insensitive to changes in the nominal rate of interest, data suggest that velocity generally slows during recessions and is positively correlated with interest rates.[12] Keynes, on the other hand, held that people hold money as a precaution and to conduct daily transactions, and that the quantity of money held for these reasons increases as their incomes rise. He also posited that people hold money for speculative reasons, which would make money demand elastic with respect to the nominal rate of interest.

Friedman's rework of Fisher's equation represents a compromise of the competing views. It recognizes current and expected future income as

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[12] See research.stlouisfed.org/publications/mt/page12.pdf

determinants of money demand. This result suggests that the quantity of money demanded is sensitive to changes in the nominal rate of interest. When the current rate is low, the public speculates that future rates will be higher. This makes money more attractive in the present. In addition to recognizing returns from multiple assets and assuming that money and goods are substitutes, the reworked model also allows the return on money to float. This means that money demand is not as sensitive to changes in the nominal rate as Keynes had posited. Figure 6.1*a* depicts money demand as viewed by Fisher, Keynes, and Friedman. Empirical studies agree that money demand is sensitive to interest rates (Laidler 1993), which is why it is depicted as the downward-sloping line in Figure 6.1*b*.

In addition to money demand depending on nominal interest rate *i* and real GDP, Fisher's equation suggests that it also determined by the PL and factors that affect its velocity. His equation implies that the quantity of money demanded will rise by the same percentage as the PL, a view supported by Figure 2.1. Technological innovations such as ATMs, debit cards, and interest-bearing checking accounts increase the velocity of money because they increase the speed at which transactions occur, which in turn increases the demand for money.

The *supply of money* is the relationship between the *quantity of money supplied* (M^s) and nominal interest rate *i*. In Figure 6.1*b*, the supply of money is perfectly inelastic because the quantity of money supplied is determined by bank lending and the Fed's open market operations.

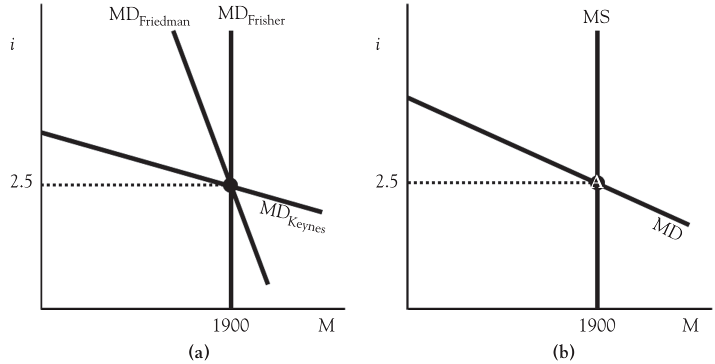

Figure 6.1 Demand for money and the market for money

The *equilibrium* in the market for money occurs at the intersection of money demand and money supply. The nominal rate of interest adjusts to make the quantities of money demanded and supplied equal. When the nominal interest rate is above its equilibrium, the quantity of money supplied exceeds the quantity of money demanded, which means people are holding too much money. To rid themselves of it, they buy financial assets like bonds. This increases the demand for bonds, which increases their prices. Since bond prices and interest rates are negatively related, the nominal interest rate falls until the quantities of money supplied and money demanded equate (at point A in Figure 6.1*b*). When the quantity of money demanded exceeds the quantity supplied, the interest rate is below its equilibrium. This means that people are holding too little money and seek more by selling bonds. This reduces bond prices and pushes nominal interest rates up until the quantities of money demanded and supplied are equal.

Banking

The modern U.S. bank is a financial intermediary that accepts deposits from savers and lends money to borrowers. It evolved from 16th-century London goldsmiths. Goldsmiths had a history of safely storing gold coins, which was the medium of exchange at the time. Table 6.1*a* shows a hypothetical T-account for a 16th-century London goldsmith, whose first gold coin deposit was made by John for the amount of 200 coins. Notice that the amount is considered an asset and a liability as it is listed on both sides of the T-account. The value on the left is called *reserves* because the gold coins are being *reserved* for the depositor. The value on the right is called *demand deposits* because the *depositor* can *demand* his gold at any time.

Storing gold is profitable because John, whose employer pays him in gold coins, is willing to pay to have it safely kept by the goldsmith. Storing it in one's home or carrying it on one's person is risky, and depositing it at the goldsmith is not too inconvenient because it is located near his village's ale house and shops. Table 6.1*b* shows what happens when word spreads of the goldsmith's ability to safely store John's gold. Others deposit their gold in the goldsmith's safe, raising his assets and liabilities to 1,000 coins. As the proceeds from storage fees pile up, the goldsmith's wealth grows, and storing gold becomes his primary business.

Table 6.1 Sixteenth century London goldsmith T-accounts

Assets	Liabilities
Reserves	*Demand deposits*
200	200 (John)

(a)

Assets	Liabilities
Reserves	*Demand deposits*
1000	200 (John)
	150 (Adam)
	250 (Sally)
	275 (Jane)
	125 (Tony)

(b)

Assets	Liabilities
Reserves	*Demand deposits*
100	200 (John)
Loans	150 (Adam)
900 (James)	250 (Sally)
	275 (Jane)
	125 (Tony)

(c)

Assets	Liabilities
Reserves	*Demand deposits*
1000	200 (John)
Loans	150 (Adam)
900 (James)	250 (Sally)
	275 (Jane)
	125 (Tony)
	400 (Bill)
	500 (Jill)

(d)

After observing the goldsmith's growing affluence, James inquires about borrowing some of the gold that is sitting idle in the goldsmith's safe to turn his alehouse into an inn. The goldsmith will accommodate the request if he believes depositors will keep their coins in his safe for the desired length of the loan, the inn will be profitable, and James is willing and able to pay back the *principal*, the borrowed gold coins, and *interest*, compensation for accepting credit risk.

Because the gold coins are the property of others, lending them to others could be viewed as unscrupulous. To overcome this, the goldsmith offers to pay depositors interest. If the *net interest margin*, the difference between the rate borrowers pay and the rate depositors require, is negative, the goldsmith makes a loss. Even if the net interest margin is positive, the goldsmith may hesitate to make the loan because demand deposits can be withdrawn at any time. The goldsmith, however, can protect himself by offering higher interest to depositors who agree to keep gold coins in his safe for a given length of time, say, the life of the loan. Such a deposit is called a *time deposit*. Although it comes with a lower net interest margin, time deposits safely securitize the loan. This is important because government backstops (e.g., discount loans, Federal Deposit Insurance Corporation, bailouts for too-big-to-fail banks, and Fannie Mae and Freddie Mac) did not exist at the time.

Table 6.1*c* shows the immediate effect of the goldsmith agreeing to give James a one-year interest-bearing loan of 900 gold coins. The goldsmith's reserves drop to 100 coins because 900 have been removed from the goldsmith's safe and handed over to James. After James pays 500 gold coins to Jill for building materials and 400 to Bill for his labor, the borrowed gold coins get deposited back into the goldsmith's safe, which is shown in Table 6.1*d*. Notice that even though the total number of coins in the safe is only 1,000, demand deposits increased to 1,900. The ratio of these two numbers, called the *reserves ratio*, indicates that only 53 percent of the goldsmith's reserves are backing demand deposits.

A self-imposed reserves ratio is called the *desired reserves ratio*. Its value is determined over time, via trial and error. During the process of making additional loans and accepting more gold coin deposits, suppose the goldsmith discovers a reserves ratio of 0.2 is enough to balance outflows (gold withdrawals and gold payments from new loans) with inflows (new gold deposits and loan payoffs in gold) under *normal* economic conditions. The goldsmith will make loans until demand deposits swell to five times the number of gold coins held in reserve. This is shown in Table 6.2*a*. With 10,000 coins physically held in the goldsmith's safe, he comfortably makes loans worth 40,000 coins to villagers. This inflates the value of demand deposits, which are worth 50,000 coins. The goldsmith also discovers that the paper receipts he has issued are circulating in the local economy. As long as he always redeems the receipts in gold coins, villagers consider them money because they are as *good* as gold. The coin receipts are increasingly preferred to gold coins because they can be folded, and their use eliminates trips to the goldsmith.

The system described above is called *fractional reserve banking* because reserves are a *fraction* of demand deposits. Such a system is inherently

Table 6.2 Banking before and after reserve requirements were imposed

Assets	Liabilities
Reserves	*Demand deposits*
10,000	50,000
Loans	
40,000	

(a)

Assets	Liabilities
Reserves	*Demand deposits*
5,000 *required*	50,000
5,000 *excess*	
Loans	
18,000 *consumer*	
12,000 *business*	
10,000 *securites*	

(b)

risky because bank profits increase as the reserves ratio falls. Consider the goldsmith example above. As his banking operations expand, he works less and less as an artisan and increasingly more as a banker. Balancing his T-account and reviewing loan applications is time consuming but is necessary to ensure a desired reserves ratio of 0.2. If the economy over performs for a longer-than-expected period of time, it may give him a false sense of security. As such, he may decide that a desired reserves ratio of 0.1 is fine. At that ratio, only 10,000 coins are backing 100,000 in demand deposits. This allows him to make loans worth 90,000 in coins. At 5 percent interest, this increases the interest payments he receives by 125 percent. His new position is more profitable but riskier. For example, an unexpected event like the Little Ice Age (1560 to 1850) that killed English vineyards wipes him out. A collapse in winery revenues slows the number of gold coins being deposited and increases the number of coins being withdrawn as vineyard workers migrate to southern France. After workers withdraw 10,000 coins, the remaining 90,000 receipts for coins are worthless.

In the United States' fractional reserve banking system, the Fed, currently imposes a *required reserves ratio* (rrr) of 0.1 on *checkable demand deposits* (*D*). This makes banks' T-accounts slightly different from the goldsmith's. Reserves and loans are still listed on the asset side, but reserves are split into *required reserves* and *excess reserves*. Table 6.2*b* illustrates this difference. For purposes of comparison, the table assumes that the bank's inflows and outflows are balanced, with a desired reserves ratio of 0.2. This means that the bank voluntarily lends out all but $10,000 of the $50,000 in checkable demand deposits. The bank's outstanding loans of $40,000 are split among loans to government (in the form of securities), consumers (for homes and autos), and businesses. With bank reserves equaling $10,000 and a rrr of 0.1, the bank's required reserves and excess reserves each equals $5,000.

Multiple Deposit Creation

While lending in the goldsmith example above increased the supply of money in a few steps, infinitely many progressively smaller loans are made in the *simple multiple deposit creation* model found in most textbooks. In the simplest version of this model, banks do not hold excess reserves, and no one holds currency. Suppose Fred deposits $1,000 he found buried in his backyard. At the moment Fred finds the money, the money supply increases by $1,000. With a rrr of 0.1, Fred's bank must hold $100 of the $1,000 deposit in reserve. This allows the bank to lend George $900 to buy a TV. The money supply increases by $900 the moment the bank deposits the loan into George's checking account. If George immediately swipes his debit card at Biggie-Mart to buy a $900 TV, the bank moves $900 from George's account to Biggie-Mart's. At that moment, the money supply does not change because moving money from one depositor to another is like moving sand from one side of a beach to the other. Because the bank is required to hold $90 of the $900 deposit as reserves, it can lend the rest to Carol. At the moment the $810 is deposited in her checking account, the money supply increases by that amount in a second round of lending. Lending money into existence continues. It increases by $729 in the third round of lending, by $0.03 in the 100th round, by *almost* 0 in round 150, and *exactly* 0 after infinitely many rounds. Fred's $1,000 deposit raises demand deposits to $1,900 after the first round, to $2,710 after the second, to $3,439 after third, to $9,999.76 after the 100th, *almost* $10,000 after the 150th, and *exactly* $10,000 after infinitely many. Because the increase in demand deposits equals Fred's $1,000 cash injection divided by the rrr, the inverse of the rrr is the *simple money multiplier*.

The *money multiplier* is the increase in money circulating in the economy for each dollar the Fed adds to reserves. It is the inverse of the rrr, provided no one holds cash and banks convert all excess reserves into loans. Individuals and firms hold currency for some transactions, which means that borrowers tend to convert a small portion of checkable deposits into currency. This is called the *currency ratio* (c), and is equal to the ratio of currency (c) to checkable demand deposits. Banks also hold cash called excess reserves (R_e). Some banks hold more than others. The ratio of excess reserves to checkable deposits is called the *excess reserves ratio* (err). When banks and others hold cash, the money multiplier is given by[13]

[13] The monetary base (MB) is the sum of currency in circulation (C) and reserves, which is excess reserves (R_e) plus required reserves (rrr·D). With M1 = $C + D$, the money multiplier is derived as follows:

$$m = \text{M1}/\text{MB} = (C + D)/(\text{rrr}\cdot D + R_e + C) = (C/D + 1)/(\text{rrr} + R_e/D + C/D) = (c + 1)/(\text{rrr} + \text{err} + c)$$

$$m = \frac{c + 1}{\text{err} + \text{rrr} + c}$$

If the err equals 0.1, the rrr is 0.1, and currency drain is 0.05, the money multiplier is 4.2. This means that, for each dollar the Fed adds to reserves, the money supply increases by $4.20. If the Fed removes a dollar instead, the money circulating in the economy falls by $4.20. Thus, banks can lend money into and out of existence.

Unforeseen events and economic cycles affect the potency of the Fed's injections and withdrawals of reserves. A shock to the economy caused by a terrorist attack or a natural disaster can induce depositors to convert demand deposits into cash and banks to hold more excess reserves. If the currency ratio and err rise to 0.4 and 0.8, respectively, the money multiplier dips to 1.08 and the potency of monetary policy declines by 74 percent. When the economy grows robustly, banks tend to make more loans. This pushes the err toward zero, and raises the money multiplier and the potency of monetary policy.

The Federal Reserve System

The Fed was established in 1913 and is charged with regulating banks, supervising the payments system, setting reserve requirements, and being a lender of last resort in times of financial emergencies. The system is comprised of 12 district banks and is managed by the Board of Governors (BOG). The seven members of the BOG are appointed by the president and confirmed by the Senate. Each member serves for 14 years, cannot serve more than one complete term, and cannot be removed for political reasons. Staggering members' terms every two years provides a modicum of certainty to markets, while term length hinders political influence from elected officials. Political influence is further limited by the Fed financing its operations from check-clearing fees and interest collected on loans to commercial banks and government.

Although independence allows the board to pursue policies that are "best" for the economy—not the president or Congress—this autonomy is somewhat limited. Every four years the president appoints and the Senate confirms a member of the BOG to serve as its chair. Members of the BOG also testify before Congressional committees and meet or work with the Council of Economic Advisors, Treasury, Federal Advisory Council, Federal Deposit Insurance Corporation, and others. The Fed submits biannual reports to Congress and is subject to annual Government Accountability Office audits.

The Federal Open Market Committee (FOMC) sets monetary policy for the Fed. All seven BOG members, the president of the New York Federal Reserve Bank, and four other District Bank presidents sit on the FOMC. The board's chair also heads the FOMC, which meets every sixth Tuesday. Monetary policy is set in these meetings.

The Federal Funds Market

To keep unemployment and inflation in check, the Fed controls the quantity of reserves circulating in the *federal funds market* using the discount rate, the reserve requirement ratio, open market operations, and interest on reserves. In the absence of discount lending and interest payments on reserves, the market for money and the federal funds market look very similar. In Figure 6.2*a*, *reserves supply* (RS) is perfectly inelastic, and *reserves demand* (RD) slopes downward. The federal funds market is in equilibrium at point H, reserves equal 80 billion dollars, and the federal funds rate is 1.5 percent, which is less than the interest rate shown in Figure 6.1*b*.

The quantity of reserves demanded is the sum of required reserves and the quantity of excess reserves demanded. Required reserves is total checkable demand deposits in the banking system multiplied by the rrr.

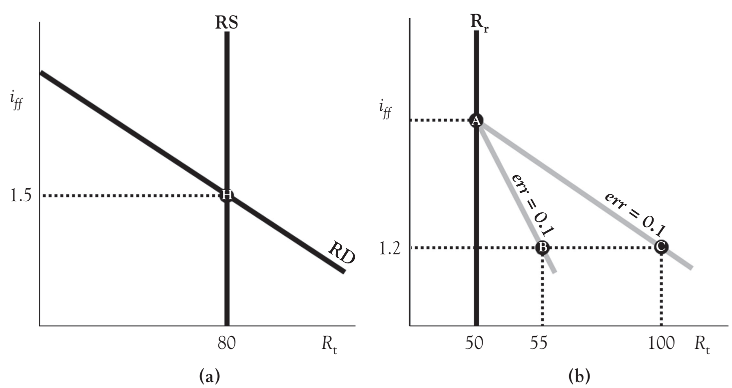

Figure 6.2 Historical mode in the federal funds market and derivation of reserves demand

For example, when the rrr is 0.1 and checkable demand deposits equal 500 billion dollars, the quantity of required reserves is 50 billion dollars.

The quantity of excess reserves demanded depends on many factors. Early macroeconomists attributed high excess reserves during the Great Depression to too few worthy loan opportunities (Frost 1971). This was perhaps due to poor economic growth or New Deal wage and price controls interfering with pricing signals that may have stifled innovation and entrepreneurialism. The quantity of excess reserves demanded varies inversely with deposit potential (Frost 1971), the maximum deposit level that can be maintained with no excess reserves and no vault cash. It declines in real GDP because, as the economy expands, default risk falls and consumer and business lending rises. It varies with overdraft fees the Fed charges banks for not covering daily transactions (Edwards 1997), and jumps up when the Fed adjusts the rrr (up or down) due to heightened uncertainty (Dow 2001). Excess reserves spike following bank panics (Friedman and Schwartz 1963) that are caused by natural disasters, acts of war, or economic shocks at home or abroad. Because the above factors are assumed constant within a given day, they are lumped into shock *s*.

In addition to the aforementioned factors, the quantity of excess reserves demanded depends on the federal funds rate (i_{ff}). The relationship between these two variables is negative (Poole 1968), and, for the moment, is assumed to be the following simple relationship.

$$R_{\mathrm{e}} = s - i_{\mathrm{ff}}$$

Holding excess reserves insures against withdrawals, but doing so has a cost. The cost increases as the federal funds rate rises. When a bank holds excess reserves, it foregoes the opportunity to lend them to another bank needing to meet its reserve requirement. Thus, holding excess reserves is analogous to adding collision and comprehensive coverage to a car's liability insurance policy.

Adding required reserves (rrr·D) and excess reserves ($s - i_{ff}$) gives total reserves (R_{t}):

$$R_{\mathrm{t}} = \mathrm{rrr} \cdot D + s - i_{\mathrm{ff}}$$

Solving it for the federal funds rate yields reserves demand:

$$i_{ff} = \text{rrr} \cdot D + s - R_t$$

Although the equation suggests that reserves demand has a slope of −1, Figure 6.2*b* suggests that the slope is related to the err. At all three points in the figure, required reserves total 50 billion dollars. This is due to banks being *required* to keep 10 percent of their checkable deposits, 500 billion dollars in this example, on *reserve*. At point A, banks hold zero excess reserves because the federal funds rate is relatively high. The quantity of excess reserves is 5 billion dollars at point B but is 50 billion dollars at point C. With checkable deposits totaling 500 billion dollars, the err is zero at point A, 0.01 at point B, and 0.1 at point C. Thus, the line in the figure steepens as the err rises. Accounting for this in the equation above is accomplished by replacing slope –1 with –*a*, which gives *simulated reserves demand*:

$$i_{ff} = [\text{rrr} \cdot D + s] - a \cdot R_t$$

For simulation purposes, *a* is scaled between 0 and 1. It models banks' *aversion* to holding excess reserves because it is inversely related to the err. Suppose slope *a* equals 0.8 and shock *s* equals 15.5. With a rrr of 0.1 and checkable deposits equal to 500 billion dollars, the equation for reserves demand is given by

$$i_{ff} = [0.1 \times 500 + 15.5] - 0.8 \cdot R_t$$

or

$$i_{ff} = 65.5 - 0.8 \cdot R_t$$

The graph of this equation passes through point H in Figure 6.2*a*.

Reserves demand shifts if the reserve requirement ratio, checkable demand deposits, or a bank panic occurs. For example, suppose a bank panic at a large international bank causes shock *s* to jump from 15.5 to 16.5. This change is highlighted by the number in bold font below.

$$i_{ff} = [0.1 \times 500 + \mathbf{16.5}] - 0.8 \cdot R_t$$

or

$$i_{ff} = 66.5 - 0.8 \cdot R_t$$

The graph of this equation would lie to the right of the black line in Figure 6.2*a*, if shown.

Prior to 2003, the discount rate was set below the federal funds rate. This situation is called *historic mode*. When the federal funds market is in historic mode there is an incentive for banks to borrow from the Fed instead of other banks. The Fed deterred this by requiring banks to exhaust all other credit sources and justify their credit needs, and audited banks that abused the discount window. Ninety years after its founding, the Fed began setting the discount rate 1 percentage point above its target for the federal funds rate. This kinks reserves supply at point K in Figure 6.3*a*.

The kinked *simulated reserves supply curve* has two parts. The vertical part is the sum of nonborrowed reserves (R_n) and borrowed reserves (R_b), while the horizontal section is the nonbinding price ceiling known as the discount rate. Suppose nonborrowed and borrowed reserves are 0 and 80 billion dollars, respectively. With the sum of the two equal to 80 billion dollars, the vertical section of reserves supply is the vertical line segment in Figure 6.3*a* that ends at point K. With the discount rate at 2.5 percent, the horizontal section of reserves supply is the horizontal line segment that starts at point K and continues to the right.

When reserves demand intersects the vertical section of supply, as it does at point N, the federal funds market is in *normal mode*. The federal funds market remains in normal mode as long as reserves demand crosses the vertical section of reserves supply. Normal fluctuations in real GDP vary with real incomes, causing checkable deposits to fluctuate. According

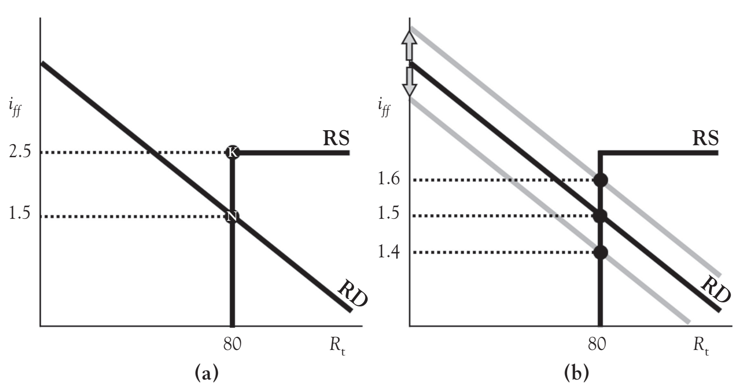

Figure 6.3 Normal mode in the federal funds market

to the following equation, fluctuations in checkable deposits causes the intercept of simulated reserves demand to vary and reserves demand to bounce.

$$i_{\text{ff}} = [s + \text{rrr} \cdot \overset{\updownarrow}{D}] - a \cdot R_{\text{t}}$$

These oscillations are demonstrated in Figure 6.3*b*. They cause the federal funds rate to cycle between 1.4 percent and 1.6 percent. As this happens, the federal funds market remains in normal mode.

A bank panic has two effects. Demand flattens as aversion to holding excess reserves (*a*) falls. After demand flattens, it shifts rightward because the panic causes *s* to jump in value.

$$i_{\text{ff}} = [\overset{\uparrow}{s} + \text{rrr} \cdot D] - \overset{\downarrow}{a} \cdot R_{\text{t}}$$

Figure 6.4*a* shows that the bank panic puts the federal funds market in *emergency mode*, a situation where the equilibrium (point E) is on the flat section of reserves supply. At this point, banks demand 90 billion dollars but only 80 billion dollars is supplied. If the Fed, the lender of last resort, does not lend banks the difference, the federal funds rate rises to 2.6 percent. The Fed averts this by making 10 billion dollars in discount loans. This raises borrowed reserves to 10 billion dollars, and total reserves to 90 billion dollars.

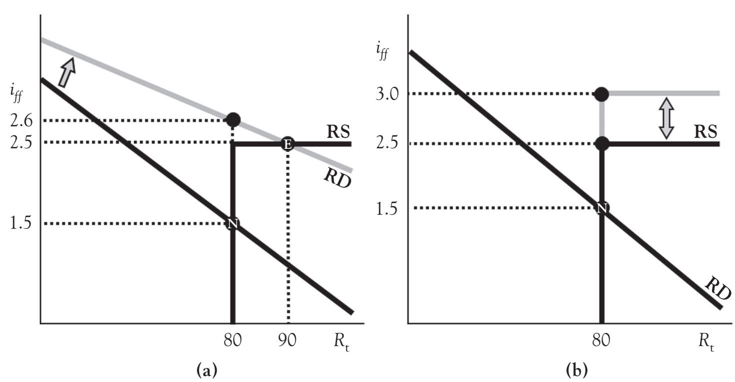

Figure 6.4 Emergency mode in the federal funds market and adjustment of the rrr

Monetary Policy

The Fed currently regulates the federal funds market to maintain unemployment between 5 percent and 6 percent and inflation near 2 percent. Because the Fed cannot directly control unemployment, inflation, and economic growth, it targets money growth or interest rates by injecting or pulling reserves from the federal funds market. Because monetarists like Milton Friedman advocate for low, steady, stable money growth, targeting money aligns with the classical school and its focus on the long run. Targeting interest rates is embraced by Keynesians because a reduction in interest rates boosts AD via greater investment. Austrian economists would consider targeting money the lesser of the two evils, because artificially low interest rates lead to malinvestment and speculative economic bubbles.[14] The Fed uses several tools to target interest rates or money growth.

Discount lending is an emergency monetary policy tool. After a 2003 policy change, the Fed sets the discount rate one percentage point above its target for the federal funds rate. Figure 6.4*b* shows what happens when the *discount rate* is adjusted between 2.5 percent and 3.0 percent. The figure shows that small adjusts to the discount rate have no effect on reserves or the federal funds rate.

Adjusting the rrr has an effect similar to that of a bank panic. Raising it shifts reserves demand outward. Because the change injects uncertainty into the banking system, shock *s* spikes and aversion to holding excess reserves (*a*) falls.

$$i_{\text{ff}} = [\overset{\uparrow}{s} + \overset{\uparrow}{\text{rrr}} \cdot D] - \overset{\downarrow}{a} \cdot R_{\text{t}}$$

The three effects make predictions difficult because they flatten and shift demand outward, as shown in Figure 6.4*a*. Although the figure shows reserves rising, the money supply falls from point A to point B in

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[14] Austrian Business Cycle Theory (ABCT) predicts that speculative asset bubbles and malinvestment are caused by easy credit and central banks keeping interest rates too low for too long. Hayek won the 1974 Nobel Prize in part for his contribution to ABCT.

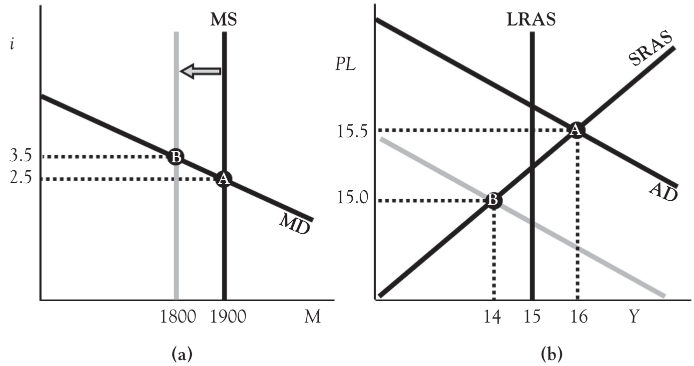

Figure 6.5 Effects of adjusting the rrr

Figure 6.5*a*. A decline in the money supply increases the nominal rate of interest and the real interest rate (r), if expected inflation does not change. This dampens private investment (I), and strengthens the dollar, which reduces exports (X). The effects of the changes in these variables are modeled by arrows in the equation below.

$$\mathrm{PL}_{\mathrm{ad}} = [W + Y_{\mathrm{e}} - \overset{\uparrow}{r} - \mathrm{mpc}\,T + G + \overset{\downarrow}{I} + \overset{\downarrow}{X}] - \{\mathrm{mps} + \mathrm{mpm}\} \cdot Y$$

In Figure 6.5*b*, the net effect of hiking the rrr decreases AD from the inflationary gap at point A to the recessionary gap at point B, reduces real GDP and the PL, and raises unemployment above its natural rate.

If the Fed decides to lower the rrr instead, the uncertainty triggered by this change in policy causes shock *s* to spike up and banks' aversion to holding excess reserves to fall:

$$i_{\mathrm{ff}} = [\overset{\uparrow}{s} + \overset{\downarrow}{\mathrm{rrr}} \cdot D] - \overset{\downarrow}{a} \cdot R_{\mathrm{t}}$$

Although less aversion to holding excess reserves flattens reserves demand, the net effect of shock *s* and cutting the rrr is ambiguous. After flattening, reserves demand shifts up if shock *s* swamps the rrr effect, but shifts down if shock *s* is swamped by the rrr effect. This unpredictability is perhaps why the Fed has not adjusted the rrr since 1992.[15]

[15] On April 2, 1992, the rrr was reduced 2 percentage points to 10 percent.

It appears that the Keynesian school has won the what-to-target debate, because the Fed has historically targeted interest rates. Interest rates are adjusted when the Fed sells and buys Treasuries. These transactions are called *open market operations*, which were discovered accidentally. During World War I, Federal Reserve District Banks were earning substantial interest on loans made to banks. The deflationary recession of 1920 to 1921 allowed banks to pay off most of these loans. Left with dwindling streams of income, District Banks began buying securities from banks to cover their expenses. The purchases, uncoordinated at the time, led to an enormous expansion in the money supply. In response to that discovery, the Fed formed what is now known as the FOMC in 1922. Due to its proximity to world financial markets, the New York Federal Reserve Bank conducts open market operations on behalf of the FOMC.

Suppose the Fed decides to lower its target for the federal funds rate from 1.5 percent to 0.25 percent to stimulate the economy out of a recessionary gap. To do this, it buys securities from banks in *open market purchases*. In Figure 6.6*a*, the 12.5-billion-dollar open market purchase increases the quantity of nonborrowed reserves by the same amount, and pushes the federal funds from 1.5 percent (point A) to its new target of 0.25 percent (point B). In accordance with its 2003 policy change, the Fed lowers the discount rate from 2.5 to 1.25 percent. If the money multiplier is 4.2, the 12.5-billion-dollar increase in reserves is expected to increase the money supply by 52.5 billion dollars and reduce the nominal interest rate to 1.25 percent, according to Figure 6.6*b*.

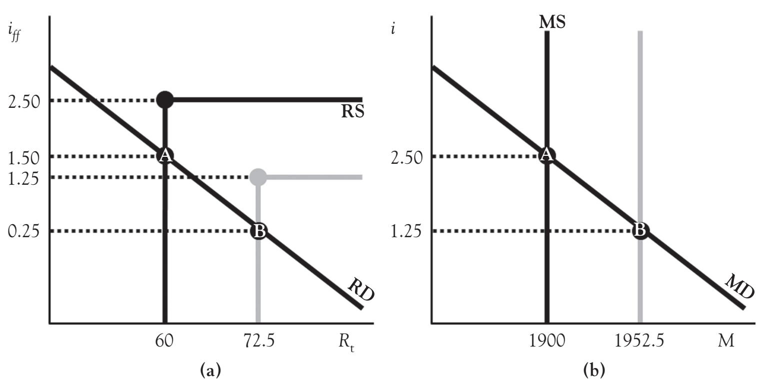

Figure 6.6 Open market purchase and its effect on the market for money

The open market purchase affects AD in several ways. If expected inflation remains unchanged, the decline in the nominal interest rate decreases the real rate (r). This boosts private investment (I), and lowers the value of the dollar, which raises exports (X).

$$PL_{ad} = [W + Y_e - \overset{\downarrow}{r} - mpc\,T + G + \overset{\uparrow}{I} + \overset{\uparrow}{X}] - \{mps + mpm\} \cdot Y$$

Collectively, these effects shift AD from A to B in Figure 6.7*a*. This closes the output gap, reduces unemployment, and causes the PL to rise to 16.5 thousand dollars.

An *open market sale* is used to close an inflationary gap, like the one at point A in Figure 6.7*b*. It involves the Fed selling previously purchased Treasuries to banks. In Figure 6.8*a*, the federal funds rate is increased from 1.2 percent to 1.5 percent by a sale that reduces the quantity of reserves from 65 billion to 60 billion dollars. If the money multiplier is 4.2, the 5-billion-dollar decrease in reserves is expected to decrease the money supply by 21 billion dollars. The resulting increase in the nominal interest rate raises real rates, if expected inflation is stable. Higher interest rates reduce private investment. The higher interest rates also increase the value of the dollar as foreign investors use dollars to buy U.S. securities. The appreciating dollar makes American goods more expensive overseas, which reduces U.S. exports. These effects shift AD from A to B in Figure 6.7*b*, which closes the output gap and raises unemployment and the PL.

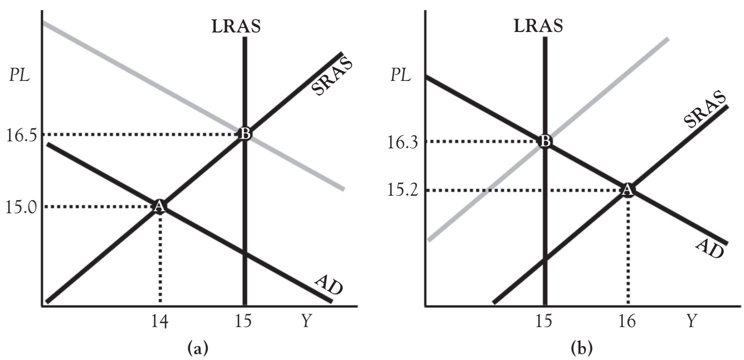

Figure 6.7 The effects of open market operations on the aggregate market model

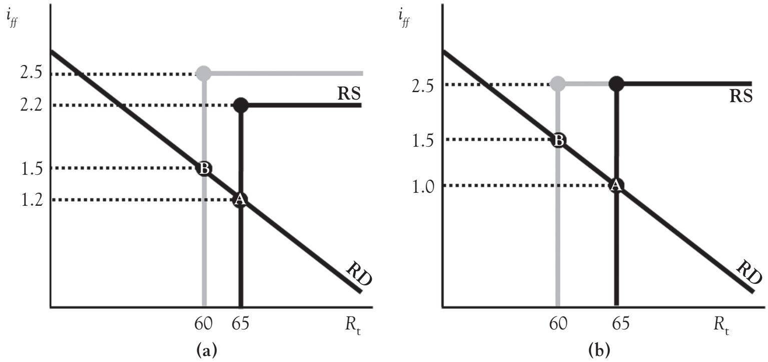

Figure 6.8 Open market sales

Oscillations in reserves are normal. They are caused by fluctuations in checkable deposits that are due to economic cycles. At point A in Figure 6.8*b*, one such fluctuation has the federal funds rate at 1 percent, which is below its target of 1.5 percent. To push the rate back up to its 1.5 percent target, the figure shows the Fed conducting an open market sale of 5 billion dollars. However, in doing this, the money supply falls by 21 billion dollars, assuming that the money multiplier is 4.2. Although only one open market operation is used in this example, the New York Federal Reserve Bank constantly sells and buys Treasuries to keep the federal funds rate near its target. In doing this, the Fed causes money supply variations via multiple deposit creation. If instead the Fed targets money, it injects or withdraws reserves to keep money growing at a slow steady pace. As this is going on, interest rates fluctuate due to oscillations in reserves demand. Thus, the Fed can target interest rates *or* money growth—not both.

Near the beginning of the Fed's rescue of the financial system in 2008, it began paying *interest on reserves* (i_{or}), which is a price floor on the federal funds rate. From the 2008 collapse of Lehman Brothers to the spring of 2010, the Fed's holdings of securities rose by roughly 1.7 trillion dollars (Zumbrun 2013). If the Fed had not begun paying interest on reserves, the example depicted in Figure 6.9*a* shows that its unprecedented purchases of mortgage-backed securities and Treasuries would have resulted in a negative federal funds rate. Paying interest on reserves kinks reserves demand at D because banks prefer earning that rate for the reserves they

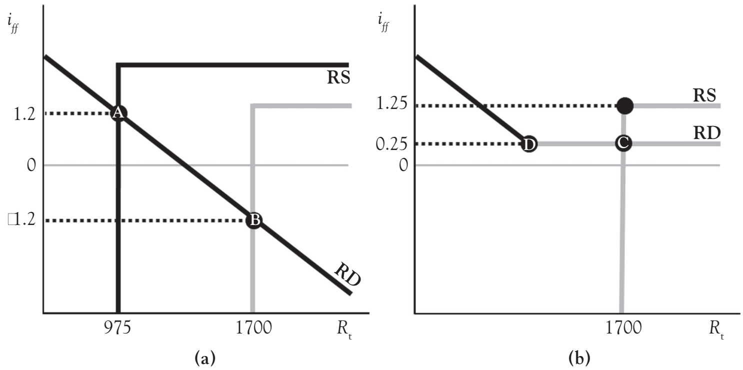

Figure 6.9 Crisis mode in the federal funds market

hold at the Fed rather than a negative rate they would have earned had they lent their reserves to other banks. The federal funds market is in *crisis mode* when it equilibrates at point C in Figure 6.9*b*.

Crisis mode has several interesting consequences. It allows the Fed to buy and sell securities without affecting changes in the federal funds rate. This is so because reserves supply slides left and right as the Fed conducts open market operations. Kinking reserves demand at a near zero interest rate also allows the Fed to buy or sell securities without affecting changes in the money supply. According to Frost (1971), the federal funds market is in a liquidity trap when reserves demand is very elastic and the federal funds rate is below 0.5 percent. The flat section of reserves demand in Figure 6.9 mimics the elastic section of the reserve demand curve Frost observed.

Monetary Policy in Practice

As demonstrated earlier, the Fed can target interest rates or money growth, not both. If it targets interest rates, it uses open market sales and purchases to keep a fluctuating federal funds rate near its target. This causes the money supply to contract and expand via multiple deposit creation. On the other hand, the normal ebbs and flows of money demand and reserves demand can cause interest rates to fluctuate *if* the Fed follows Milton Friedman's monetary rule: low and steady money growth. In theory, this can cause real GDP to cycle around potential output as AD

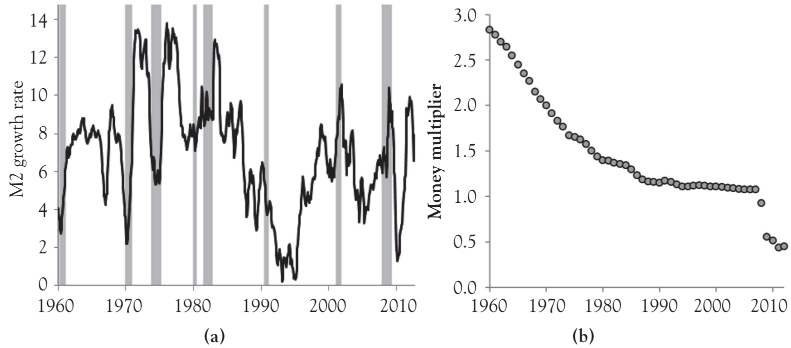

Figure 6.10 Graphs of M2 growth and the money multiplier

undulates around LRAS and SRAS. Since news reports of accelerating inflation and persistently high unemployment pull on the heartstrings of voters, money targeting is the harder sell, politically.

The Fed has mostly targeted interest rates in the post-World War II era. Between 1952 and 1969, the Fed explicitly targeted interest rates. Figure 6.10*a* indicates that annual M2 growth dropped to about 2 percent during the recessions at the beginning and end of the 1960s. In between the two recessions, money growth increased by a factor of 4. This results from the Fed conducting substantial open market purchases to keep interest rates low for an extended period of time during a long economic expansion. Between the two recessions, each dollar that the Fed injected into reserves raised the money supply by about $2.74, according to Figure 6.10*b*.[16] The resulting high rate of money growth, which was near 8 percent for most of the decade, fans inflationary flames. Although inflation floated steadily near 1.3 percent for the 1959 to 1964 period, it accelerated from 1.1 percent in the third quarter of 1964 to 6.2 percent by first quarter of 1970. This is one of the consequences Friedman (1968) foresaw when the Fed tries to keep interest rates too low for too long.

Although Friedman's monetary rule was the stated policy of the Fed in 1970 when Arthur Burns became its chair, it continued to target interest

[16] Figure 6.10*b* shows estimates of the money multiplier for 1960 to 2012. The estimates were computed using annual averages of R_e, D, C, and R_r from the Federal Reserve Economic Database.

rates. This is evident in Figure 6.10*a*. Money growth was more volatile during the 1970s than it had been during the previous decade. Money growth peaked near 14 percent during expansions and fell to 6 percent during the recession of the mid-1970s. The procyclical monetary policy caused inflation expectations to fluctuate wildly, which slayed the Phillips curve and spurred on an inflation spiral that Paul Volcker was charged with tackling when he was appointed to head the Fed in 1979.

Unlike his predecessors, Volcker's monetary policy was countercyclical, which is evident in Figure 6.10*a*. His targeting of bank reserves yielded relatively low volatility in money growth that trended upward during the recession of the early 1980s. Thereafter, money growth was a bit more volatile. The rate of growth in money generally fell from its high of nearly 13 percent at the beginning of the 1980s to 0.3 percent by the second month of 1993. The high federal funds rate at the beginning of the 1980s is associated with persistently high unemployment. This was not unintended because the augmented Phillips curve in Figure 2.9*b* predicts that inflation will fall by two percentage points per year when unemployment remains elevated at around 9 percent. The high persistent unemployment lowered inflation from 13 percent in 1980 to 11 percent in a year, 9 percent in 2 years, and 4 percent by 1984.

After Alan Greenspan was appointed to chair the Fed in 1987, the Fed began targeting interest rates again. Near the end of 1992, the Fed set the federal funds rate to 3 percent, where it remained until early 1994. Figure 6.11*a* shows that this was followed by a precipitous decline in

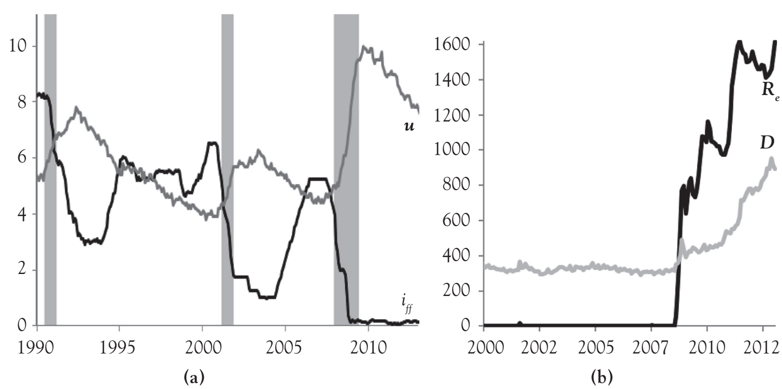

Figure 6.11 Graphs of iff, u, R_e, and D

unemployment. The Fed responded by raising the federal funds rate to 6 percent in 1995 and held it there until 1998. However, as unemployment continued to fall, the Fed bumped the funds rate up to 6.5 percent. A sharp rise in unemployment ensued, which preceded the 2001 recession. To right the ship, the Fed dropped the funds rate to 2 percent near the end of 2001. Unemployment stabilized, but another marked decline began. In 2004, as unemployment continued to fall, the Fed steadily raised the federal funds rate from 1 percent to 5.25 percent. About halfway through that process, Ben Bernanke was picked to head the Fed. After bottoming out a few months prior to the start of the Great Recession, unemployment exploded and crested above 10 percent in 2009. The Fed responded to this by essentially zeroing the federal funds rate with the trillions of reserves it injected into the banking system.

With banks currently holding trillions of dollars in excess reserves (see Figure 6.11*b*), and the Fed owning trillions of dollars in securities, the seeds of future inflation have been sowed. Although the persistent output gap (see Figure 2.7*a*) and continued weakness in labor markets is keeping inflation at bay, robust economic growth at some point in the future will make banks more optimistic and more averse to holding excess reserves. The excess reserves would result in a trillion or so of additional dollars circulating in the economy, if the money multiplier returns to its pre-Great Recession level of about 1.1 (see Figure 6.10*b*). If the money multiplier returns to its President Kennedy-era level, excess reserves could burst into 4 trillion dollars or more in additional money in circulation. To keep the inflation genie in the bottle, the Fed will have to raise interest on reserves while selling off some of the securities it owns. However, if these securities are liquidated too quickly, the Fed could flood the economy with trillions of dollars. Because banks can buy securities from whomever they want, the Fed and the U.S. Treasury would be competing for the same buyers. With Figure 2.1 indicating a nearly one-for-one relationship between inflation and money growth, future inflation could be substantial.

History is littered with examples of hyperinflation. Larry Allen's (2009) *The Encyclopedia of Money* discusses 21 such examples. Prior to the 1917 Bolshevik Revolution, hyperinflation resulted in prices rising two to three times faster than wages. After the Bolsheviks took power, hyperinflation exploded from 92,300 percent for the period 1913 to

1919 to 64,823,000,000 percent for the period 1913 to 1923. In 1914, there were 6.3 billion marks circulating in the German economy, but by 1923, there were 17,393 billion. A newspaper costing one mark in May 1922 cost 1,000 marks 16 months later and 70 million marks a year-and-a-half later. Erich Maria Remarque's *The Black Obelisk* describes how hyperinflation adversely affected the German people, writing: "Workmen are given their pay twice a day now—in the morning and in the afternoon, with a recess of a half-hour each time so that they can rush out and buy things—for if they waited a few hours the value of their money would drop." Customers rolled wheelbarrows full of money to the grocery store, the cost of meals at restaurants were negotiated before orders were placed, and paper money was baled like hay to heat one's home. Although it took about four days for prices to double with inflation at its worst in Germany, prices doubled in 33.6, 24.7, and 15.6 hours in 1994 Yugoslavia, 2008 Zimbabwe, and 1946 Hungary, respectively (*Hanke 2009*).

CHAPTER 7

What Have We Learned?

In a Bloomberg Television interview about a year and a half after the 2008 financial crisis, previous Fed chairman Alan Greenspan said, "Everybody missed it—academia, the Federal Reserve, all regulators." In this same interview, he dismissed the notion that the Fed fueled the housing bubble with its loose monetary policy. To rescue the economy from the ensuing Great Recession, and the deep and persistent recessionary gap shown in Figure 2.7*a*, unprecedented actions were taken. The Fed's monetary policy and the fiscal policy enacted by the Bush administration—and continued by the Obama administration—pushed the budget deficit, in per capita terms, to levels that were more than twice that of the previous record, quadrupled the Fed's balance sheet,[1] and resulted in excess reserves exploding from its precrisis level of about 50 billion dollars to trillions of dollars. Rather than putting a dent in the deep recessionary gap the economy is presently stuck in, record fiscal and monetary stimulus appears to be reflating asset bubbles (Keenan 2013; Ro 2013). Despite all of that, most economists in the 2012 National Association for Business Economics policy survey said that they wanted fiscal or monetary policy to continue.[2] A year later, economists in that same survey indicated that monetary policy was about right.[3] Thus, it appears that little has been learned from excessive government meddling in markets.

The problem arises from how mainstream economic theory is being and has been applied. Although monetarism and supply-side economics are *politically* lumped with the Austrian school, given the way in which these

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[1] The Fed's balance sheet has grown from $869 billion on August 8, 2007, to $3470 billion on June 10, 2013. See www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm

[2] See http://nabe.com/survey/policy/1209

[3] See http://nabe.com/Policy_Survey_August_2013.

schools of thought have been applied, grouping them with the Keynesian school is perhaps more appropriate. Consider Milton Friedman's monetarist view that calls for slow and predictable money growth (Willoughby 2013).Compared to interest-rate targeting, his monetary rule is welcomed by classicalists because it ignores short-run variations in gross domestic product (GDP) and lessens economic uncertainty, which improves the economy's long-run growth path. Although Austrian economists consider this to be the lesser of the two evils, they view his acknowledgment that the Fed is here to stay as an endorsement of sorts. This has contributed to the overwhelming support the Fed receives from policy makers, politicians, journalists, and economists. With its detractors sidelined, the Fed wields much power and influence over economic matters. Since it is not bound by Freidman's monetary rule, the Fed has chosen to target interest rates to manage short-run output gaps rather than toe Friedman's line. In this light, it is not surprising that Austrian economists view Friedman as the guy who put the kids in charge of the candy store (Rothbard 2002). Thus, monetarism, in practice, is more Keynesian than classical. The same can be said of supply-side economics because Congress cannot bind future Congresses to low permanent tax rates it enacts.

Unlike many mainstream economists who are prescribing the same policies that created the housing bubble that triggered the subsequent financial crisis, the Austrian prescription is to repeal the string of government interventions that led to both. In *The Road to Serfdom*, Hayek points out that the unintended consequences of a government intervention are addressed with additional interventions. Because these have unintended consequences, the adoption of interventions in the form of federal regulations becomes a never-ending cycle. Figure 7.1 shows the number of regulations, as measured by the number of pages in the Federal Register,[4] with long-run economic growth.[5] Although the figure shows the number of pages peaking at around 87,000 pages in 1980, the number of pages has generally increased as long-run economic growth has declined.

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[4] Office of the Federal Register, Federal Register & CFR Publications Statistics. (https://www.federalregister.gov/uploads/2014/04/OFR-STATISTICS-CHARTS-ALL1-1-1-2013.pdf)

[5] Here, long-run economic growth is the 10-year running average of annual real GDP growth.

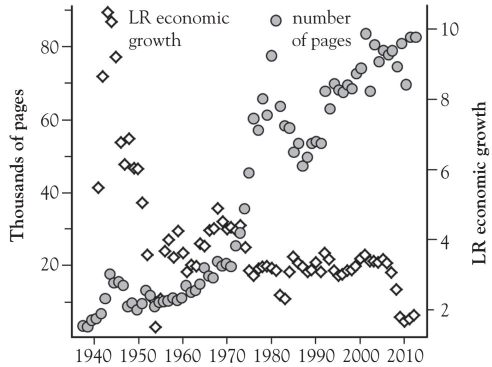

Figure 7.1 Number of pages in the federal register and long run economic growth

The Austrian prescription is not popular because it involves repealing institutions and regulations that most believe are necessary. The most notable are the legislation and regulations that keep the Fed and fractional reserve banking in place. Fractional reserve banking works well as long as depositors do not drain their checking accounts. The money that is lent into existence, which is made possible by the required reserves ratio permitting banks to lend out up to 90 percent of their customers' demand deposits, can vanish at a moment's notice. The bank panic sparked by the collapse of Lehman Brothers put the federal funds market in emergency mode. This resulted in a shortage of reserves that had to be filled with discount loans, which increased by nearly 578 percent in the weeks following Lehman's demise.

Prior to Lehman's collapse, the Fed's policies of artificially low interest rates and relaxed credit standards set the stage for the housing bubble. Rather than expanding or opening up businesses, Americans used leverage to speculate in housing markets. Leverage works as long as home values appreciate. Consider a home that is purchased for $200,000 today and sold for $220,000 a year later. If the purchase is not financed, a cash sale yields an investor a 10 percent return. If the home purchase is financed at 5 percent, the yield is 42 percent with 20 percent down or 168 percent if leveraged with 1 percent down. The widespread use of leverage drove home demand ever higher, which created supply. As home prices crest, yields on heavily leveraged homes decline to zero. When prices start declining, the yields on leveraged properties are negative, and the more leverage that is used, the more negative the yield.

Following the recommendations of mainstream economics keeps in place the policies that led to the financial crisis. This is precisely why the U.S. financial system needs federal deposit insurance, the Fed to be the lender of last resort, the too-big-to-fail doctrine, and mortgages securitized by Fannie Mae and Freddie Mac. The problem with these safeguards, however, is that lenders are more likely to make risky loans when others, taxpayers in this case, incur the cost of failed mortgages. The *moral hazard* these interventions create encourages banks to play faster and looser with depositors' money than what would have been the case otherwise. For example, small local credit unions are hesitant to make 30-year fixed rate mortgages when interest rates are at historic lows because (a) they know interest rates will be higher in the future and (b) they understand that they are too small to be bailed out. When future interest rates rise above the rate on 30-year fixed-rate mortgages made today, credit unions that made too many of these loans will go broke.

Since the Fed has set interest rates lower than they were before the housing bubble popped, large national banks continue to make 30-year mortgages, and near-zero down-payment mortgages are being backed by the Federal Housing Administration, it appears that little has been learned from the 2008 financial crisis.

Repealing all federal banking regulations and backstops would transform our factional reserve banking system into a free-banking system. Under such a system, banks would have to be very good stewards of their customers' deposits. Without government backstops, bankers would know that their banks will go under if they play too fast and loose with their customers' money. Hence, banks are held accountable by their desire to maintain a trustworthy reputation, and their officers are held accountable by the least merciful of all regulators, depositors who love their money. Perhaps this is why credit unions and Midwestern banks were able to weather the financial crisis, and continue to be cautious today.[6] In a free banking system, deposits are considered the property of depositors.

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[6] See Kansas City Federal Reserve President Thomas Hoenig's August 23, 2010, testimony to the House subcommittee hearing, "Too Big to Fail: Learning from Midwest Banks and Credit Unions."

Without government backstops and bailouts, banks would be reluctant to borrow short from demand deposits to lend long to home buyers. Instead, banks would have to borrow long to make mortgages. To do this, they would need to raise the interest paid on time deposit just enough to get its customers to move monies from demand deposits to time deposits.

Although Greenspan said *all* regulators and *everybody* at the Fed and in academia failed to predict the housing bubble and the financial crisis, this is not so according to Axel Leijonhufvud. In 2008 he wrote, "Operating an interest-targeting regime keying on the CPI, the Fed was lured into keeping interest rates far too low far too long. The result was inflation of asset prices combined with a general deterioration of credit … a variation on the Austrian overinvestment theme."[7] Randal Forsyth concurred, "The Austrians were the ones who could see the seeds of collapse in the successive credit booms, aided and abetted by Fed policies."[8] How is it that the Austrian school foresaw the coming financial crisis but mainstream economics did not? To answer this, one must gain a better understanding of Austrian Macroeconomics, which Garrison (2001) refers to as Capital Based Macroeconomics (CBM).

A major difference between the two views on macroeconomics is the treatment of capital. Capital is aggregated into variable K in mainstream macroeconomics but is divided across stages of production in CBM. For simplicity, capital is divided into three stages of production here. Capital goods produced in the first stage, like rubber and steel, are high-order goods. Capital goods like tires and engines are medium-order goods that are produced in the second stage of production. Final goods like cars and pickups are low-order goods and are produced in the final stage of production. K_1, K_2, and K_3 are the values of physical capital at each stage of production, I_1 and I_2 are the values of business expenditures on goods produced in the first and second stages of production, while C is the value of consumer expenditures on low-order goods produced in the final stage. High-order goods were committed to the production of medium-order goods two periods ago, and medium-order goods were committed to the production of consumer goods one period ago. This intertemporal

[7] See Leijonhufvud (2008).

[8] See Forsyth (2009).

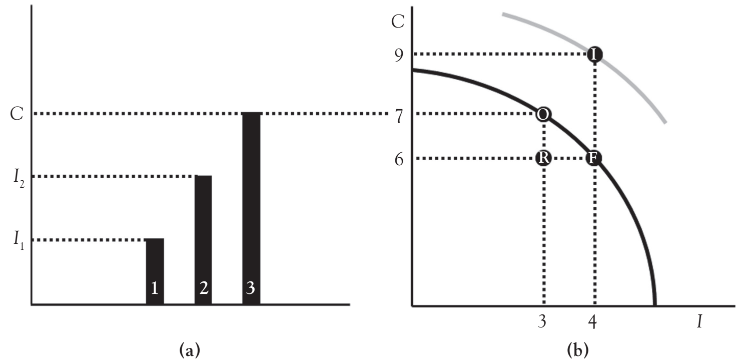

Figure 7.2 The Hayekian triangle and the economy's PPF

allocation of resources in CBM is a more realistic representation of production than what is assumed in mainstream macroeconomics. Figure 7.2*a* shows three stages of production forming a Hayekian triangle.[9] It gets taller from left to right because high-order goods derive their value from being inputs to the production of medium-order goods, which derive their value from being inputs to the production of consumer goods.

Another major difference between the macroeconomic views is the treatment of consumption and investment. The two are assumed to rise and fall together in mainstream macroeconomics but are considered trade-offs in CBM. Figure 7.2*b* models this trade-off using a production possibilities frontier (PPF). Along the PPF, the economy is at full employment (points O and F). The economy is in an inflationary gap beyond the PPF (point I) and in a recessionary gap inside it (point R). If the economy depicted in Figure 7.2 is presently at point O, consumption equals 7 trillion dollars, real GDP equals its potential, and unemployment is equal to its natural rate. Also, I_2 and I_1 sum up to 3 trillion dollars, which represents gross investment. Gross investment is the sum of replacement capital and net investment. If the economy is at point O with net investment equal to $0, the PPF does not shift. If consumers decide to save 1 trillion dollars by reducing their expenditures by the same amount, the economy moves to point F. The increase in savings raises net investment from 0 to 1 trillion dollars over the period. This shifts the PPF to the gray curve,

[9] See Figure 1 on page 39 of F. A. Hayek (1935) *Prices and Production* (1935, p. 39).

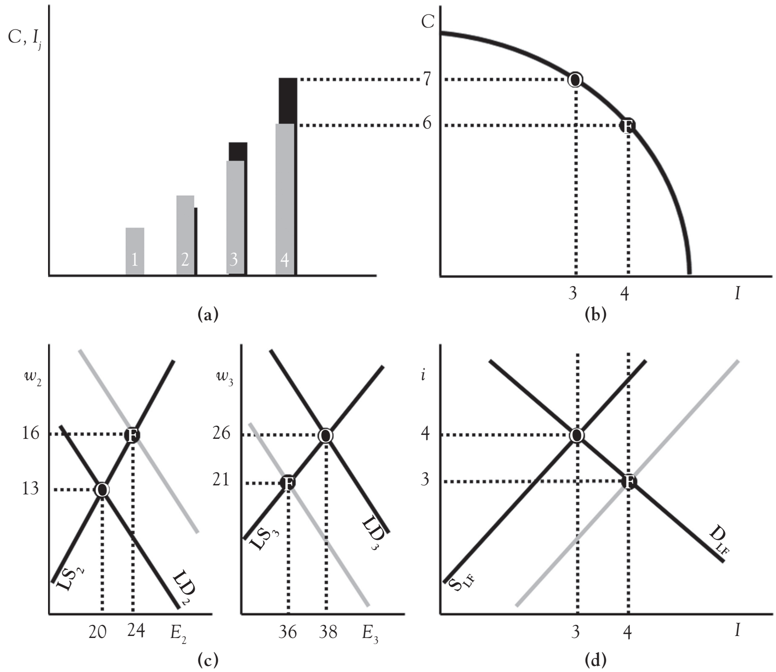

Figure 7.3 Integrated effects of increased thriftiness in CBM

resulting in ultimately higher overall consumption and investment next period. If net investment was 0.5 trillion dollars at point O, it increases to 1.5 trillion dollars when the economy moves to point F as savings increase by 1 trillion dollars. The long-run effect of increased savings in this situation pushes the PPF beyond the gray curve in Figure 7.2*b*. Thus, increased savings accelerates economic growth, which contradicts Keynes's paradox of thrift.[10]

The loanable funds market, the third component of CBM, is helpful in understanding why the paradox of thrift does not hold. If consumers become more forwardlooking, they become thriftier. This increases the supply of loanable funds from the black line to the gray line in Figure 7.3*d*. At the moment this happens, the nominal interest rate has yet to change. This results in an excess supply of loanable funds, which would be represented by a horizontal line segment from point O to the

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[10] "Thrift may be the handmaiden of Enterprise. But equally she may not. And, perhaps, even usually she is not." (Keynes 1930).

gray line, if shown in the figure. The excess supply, however, creates competition among savers, who bid down the nominal interest rate from 4 to 3 percent. When the market clears at 3 percent, both investment and savings rise from their initial levels. If output and factor markets are allowed to clear, the economy will remain on its PPF and move from point O to point F in Figure 7.3*b*.

The decline in consumer expenditures flattens the Hayekian triangle in Figure 7.3*a*. This is called the *derived demand effect* because the decline in the demand for consumer goods reduces investment activities in the second-to-last stage of production. The decline in this stage's investment expenditure is modeled by the second tallest black bar in the Hayekian triangle shrinking to the second tallest gray bar. In time period 2, the economy has added a stage of production where the third stage has become the fourth, the second has become the third, and so on. The widening of the triangle is called the *time-discount effect* because the nominal interest rate falling to 3 percent causes investment activities in early stages of production to increase. The change in the shape of the triangle models the reallocation of capital from the last stage (e.g., retail inventories) to earlier stages (e.g., product development).

The final innovative feature of CBM is the disaggregation of stage-specific labor markets. Figure 7.3*c* shows the labor markets for the second and third stages of production. The decline in third-stage investment causes labor demand in that stage to fall, which results in lower wages and less employment. Just the opposite is true in the second stage. Greater investment in this stage increases labor demand, resulting in greater employment and higher wages. This is an important result because mainstream macroeconomics operates under the assumption that all markets are in recession when the economy sinks into a recessionary gap. In reality, some labor and product markets expand while others contract when economic output shrinks. During the second time period, some of the two million workers that lost jobs in the third stage of production migrate to the second stage of production. This reduces third-stage labor supply (not shown in Figure 7.3*c*) and increases second-stage labor supply (not shown in Figure 7.3*c*), which equalizes wage rates across the two stages of production. Because four million jobs are added in the second stage and two million are lost in the third stage, third-stage output falls as second stage output increases.

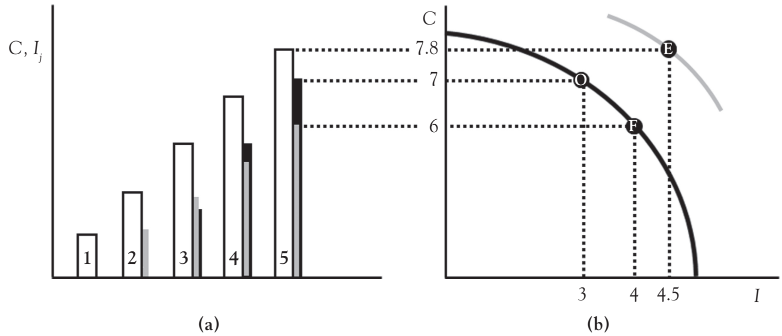

Figure 7.4 The long run effects of increased thriftiness in CBM

By the start of period 3, capital restructuring is complete and saving-induced investments have worked their way through the economy. The restructuring results in the economy adding a fifth stage of production in Figure 7.4*a* and the PPF shifting out to point E in Figure 7.4*b*. At this point, consumption expenditure is greater than it was in the first period. Thus, forgoing consumption in period 1 pays dividends in the third period. However, this is only possible if markets are allowed to work. Market interventions like social security, unemployment insurance, minimum wage laws, welfare and SNAP benefits, and interest rate setting reduce consumer saving, and make wages, prices, and interest rates sticky. In the presence of these market interventions, short-run aggregate supply is unable to self-correct in a recessionary gap, and unemployment remains high for a prolonged period of time. Hence, the unintended consequences of these government interventions require additional interventions, the fiscal and monetary stimulus that is enacted during recessions.

Figure 7.5 illustrates the effect of a rapid expansion of credit by the Fed after it injects a large amount of reserves into the banking system via open market purchases of Treasuries. Through multiple deposit creation, the additional reserves are multiplied into new money. This shifts the supply of loanable funds to the gray line in Figure 7.5*c*, which causes the nominal rate of interest to fall to 3 percent. As a result, savings is 2 trillion dollars less than investment, which has increased to 4 trillion dollars. Thus, expansionary monetary policy drives a wedge, triangle OCI in Figure 7.5*c*, between investors and savers. At the lower rate of interest, the difference in investment (4 trillion dollars at point I) and savings (the 2-trillion-dollar decline in consumption from point I to point C) equals

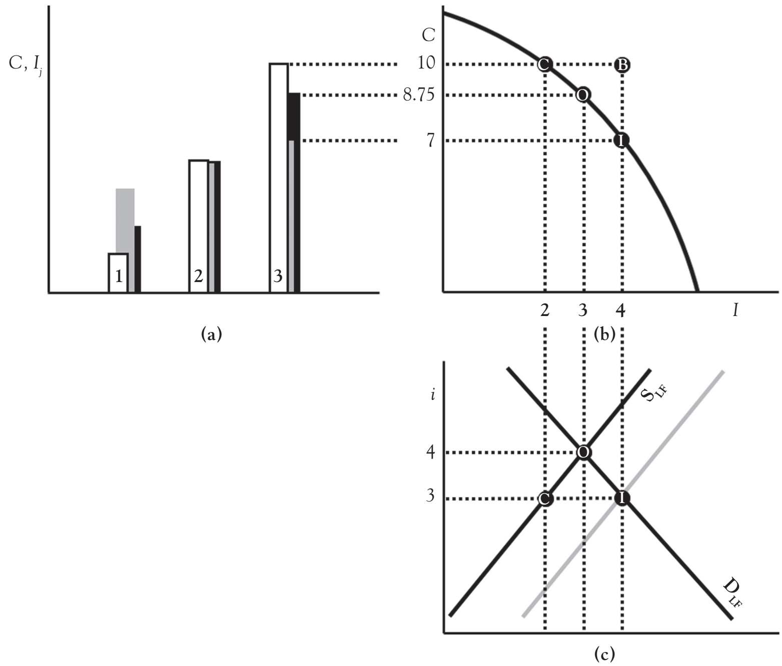

Figure 7.5 The effects of monetary intervention in CBM

the amount of new money that was lent into existence. The expansionary monetary policy increases consumption expenditures and investment expenditure to point B in Figure 7.5*b*. In the Austrian school, this is the boom in the boom-and-bust cycle.

The boom is unsustainable. If the economy was at point I instead of point B, capital would have been restructured. Investments would have been redirected from late to early stages of production. This is represented in Figure 7.5*a* by the Hayekian triangle shifting from the initial black bars to the gray bars. If, on the other hand, the economy was at C instead of B, capital would have been restructured differently. Investments would have been redirected from early to late stages of production, which represents the Hayekian triangle shifting from black to white bars. Because the economy is at point B, investment activities in the first and third stages both increase. The difference in the height of the white bar (10 trillion dollars) and the black bar (8.75 trillion dollars) in the third stage of production is overconsumption, while the difference in the height of the gray and black bars in the first stage represents malinvestment. With relaxed credit standards and low interest rates, consumers and the firms that operate in the first stage of production use leverage to compete for the economy's limited resources. Overconsumption and malinvestment push asset prices higher. As asset bubbles inflate, yields and inflation expectations rise. To dampen inflation expectations, the Fed withdraws stimulus. As soon as asset prices fall, yields on heavily leveraged asset purchases go negative, investors and consumers are underwater on their loans, asset bubbles pop, and the boom becomes the bust.

The unintended consequence of fiscal and monetary policy, according to Austrian Business Cycle, drives the cycle of the boom and bust.

So, who should we trust?

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A Policy Perspective from Different Schools of Thought

Hal W. Snarr

Macroeconomics is grounded in microeconomics and uses mathematical models to simplify and illustrate complex processes, learning it can be difficult. And because of this, macroeconomic principles textbooks fail to connect topics and models in a concise, cohesive, and meaningful way. This book is a part of a series that recognizes that the intense competition among emerging markets and against advanced economies to capture their share of the global economy. Most important to this end is the study and practice of international business and foreign trade.

The author details better topic selection and organization by building a model of the macroeconomy, and utilizing a single hypothetical numerical example throughout the book to teach you the key principles. Keynesian economics, a school of economic thought based on the views of the British economist John Maynard Keynes, is used to construct the model of the macroeconomy because it is elegant, simplistic, intuitive, and politicians apply it when enacting stimulus bills. (That said, the book is not an endorsement of Keynesian economics, nor does it suggest that mathematical modeling is the quintessential element of economic analysis.)

Hal W. Snarr is currently teaches at Westminster College, which is located in Salt Lake City, Utah. He graduated from Naval Nuclear Power School, has bachelor's degrees in business and mathematics, and earned a PhD in economics from Washington State University. His teaching career began in the U.S. Navy; today, Hal has a YouTube channel (The Snarr Institute) and website (www.halsnarr.com) that are used to deliver lectures on macroeconomic principles and other topics in statistics and economics.

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