

L = liquidity (reserves)

S = sensitivity to market risk.

A, M, and S are even more difficult to ascertain than C, E, and L and, as noted above, any or all of the variables can change very rapidly. Moreover, as discussed in [Chapter 10 "Innovation and Structure in Banking and Finance"](#), *much banking activity these days takes place off the balance sheet, where it is even more difficult for regulators to find and accurately assess*. Finally, in many jurisdictions, examiners are not paid well and hence do not do a very thorough job.

Barth, Caprio, and Levine argue that the third pillar of Basel II, financial market monitoring, is different. In aggregate, market participants can and in fact do monitor banks and bankers much more often and much more astutely than regulators can because they have much more at stake than a relatively low-paying job. *Barth, Caprio, and Levine argue persuasively that instead of conceiving of themselves as police officers, judges, and juries, bank regulators should see themselves as aides, as helping bank depositors (and other creditors of the bank) and stockholders to keep the bankers in line*. After all, nobody gains from a bank's failure. The key, they believe, is to ensure that debt and equity holders have incentives and opportunities to monitor bank management to ensure that they are not taking on too much risk. That means reducing asymmetric information by ensuring reliable information disclosure and urging that corporate governance best practices be followed. ^[1]

Regulators can also provide banks with incentives to keep their asset bases sufficiently diversified and to prevent them from engaging in inappropriate activities, like building rocket ships or running water treatment plants. Screening new banks and bankers, if regulators do it to reduce adverse selection (omit shysters or inexperienced people) rather than to aid existing banks (by blocking all or most new entrants and hence limiting competition) or to line their own pockets (via bribes), is another area where regulators can be effective. By focusing on a few key reachable goals, regulators can concentrate their limited resources and get the job done, the job of letting people look after their own property themselves. The market-based approach, scholars note, is most important in less-developed countries where regulators are more likely to be on the take (to enact and enforce regulations simply to augment their incomes via bribes).



KEY TAKEAWAYS

- Basel I and II have provided regulators with more sophisticated ways of analyzing the adequacy of bank capital.
- Nevertheless, it appears that regulators lag behind banks and their bankers, in part because of agency problems within regulatory bureaucracies and in part because of the gulf of asymmetric information separating banks and regulators, particularly when it comes to the quality of assets and the extent and risk of off-balance-sheet activities.
- If scholars like Barth, Caprio, and Levine are correct, regulators ought to think of ways of helping financial markets, particularly bank debt and equity holders, to monitor banks.
- They should also improve their screening of new bank applicants without unduly restricting entry, and set and enforce broad guidelines for portfolio diversification and admissible activities.

[1] Frederick D. Lipman, *Corporate Governance Best Practices: Strategies for Public, Private, and Not-for-Profit Organizations* (Hoboken, N.J.: Wiley, 2006).



11.6 Suggested Reading

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Chapter 12

The Financial Crisis of 2007–2008

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Define financial crisis and differentiate between systemic and nonsystemic crises.
2. Describe a generic asset bubble.
3. Define leverage and explain its role in asset bubble formation.
4. Explain why bubbles burst, causing financial panics.
5. Define and explain the importance of lender of last resort.
6. Define and explain the importance of bailouts.
7. Narrate the causes and consequences of the financial crisis that began in 2007.



12.1 Financial Crises

LEARNING OBJECTIVE

1. What is a financial crisis?

A financial crisis occurs when one or more financial markets or intermediaries cease functioning or function only erratically and inefficiently. A nonsystemic crisis involves only one or a few markets or sectors, like the Savings and Loan Crisis described in [Chapter 11 "The Economics of Financial Regulation"](#). A systemic crisis involves all, or almost all, of the financial system to some extent, as during the Great Depression.

Financial crises are neither new nor unusual. Thousands of crises, including the infamous Tulip Mania and South Sea Company episodes, have rocked financial systems throughout the world in the past five hundred years. Two such crises, in 1764–1768 and 1773, helped lead to the American Revolution. ^[1]After its independence, the United States suffered systemic crises in 1792, 1818–1819, 1837–1839, 1857, 1873, 1884, 1893–1895, 1907, 1929–1933, and 2008. Nonsystemic crises have been even more numerous and include the credit crunch of 1966, stock market crashes in 1973–1974 (when the Dow dropped from a 1,039 close on January 12, 1973, to a 788 close on December 5, 1973, to a 578 close on December 6, 1974) and 1987, the failure of Long-Term Capital Management in 1998, the dot-com troubles of 2000, the dramatic events following the terrorist attacks in 2001, and the subprime mortgage debacle of 2007. Sometimes, nonsystemic crises burn out or are brought under control before they spread to other parts of the financial system. Other times, as in 1929 and 2007, nonsystemic crises spread like a wildfire until they threaten to burn the entire system.

Stop and Think Box

“While we ridicule ancient superstition we have an implicit faith in the bubbles of banking, and yet it is difficult to discover a greater absurdity, in ascribing omnipotence to bulls, cats and onions, than for a man to carry about a thousand acres of land . . . in his pocket book. . . . This gross bubble is practiced every day, even upon the infidelity of avarice itself. . . . So we see wise and honest Americans, of the nineteenth century, embracing phantoms for realities, and running mad in schemes of refinement, tastes, pleasures,



wealth and power, by the soul [sic] aid of this *hocus pocus*.”—*Cause of, and Cure for, Hard Times*.^[2] When were these words penned? How do you know?

This was undoubtedly penned during one of the nineteenth century U.S. financial crises mentioned above. Note the negative tone, the allusion to Americans, and the reference to the nineteenth century. In fact, the pamphlet appeared in 1818. For a kick, compare/contrast it to blogs bemoaning the crisis that began in 2007:

<http://cartledged.blogspot.com/2007/09/greedy-bastards-club.html>

http://www.washingtonmonthly.com/archives/individual/2008_03/013339.php

<http://thedefenestrators.blogspot.com/2008/10/death-to-bankers.html>

Both systemic and nonsystemic crises damage the real economy by preventing the normal flow of credit from savers to entrepreneurs and other businesses and by making it more difficult or expensive to spread risks. Given the damage financial crises can cause, scholars and policymakers are keenly interested in their causes and consequences. You should be, too.

KEY TAKEAWAYS

- Throughout history, systemic (widespread) and nonsystemic (confined to a few industries) financial crises have damaged the real economy by disrupting the normal flow of credit and insurance.
- Understanding the causes and consequences of financial crises is therefore important.

[1] Tim Arango, “The Housing-Bubble and the American Revolution,” *New York Times* (29 November 2008), WK5.http://www.nytimes.com/2008/11/30/weekinreview/30arango.html?_r=2&pagewanted=1&ref=weekinreview

[2] <http://books.google.com/books>



12.2 Asset Bubbles

LEARNING OBJECTIVE

1. What are asset bubbles and what role does leverage play in their creation?

Asset bubbles are rapid increases in the value of some asset, like bonds, commodities (cotton, gold, oil, tulips), equities, or real estate. Some combination of low interest rates, new technology, unprecedented increases in demand for the asset, and leverage typically create bubbles.

Low interest rates can cause bubbles by lowering the total cost of asset ownership. Recall from [Chapter 4 "Interest Rates"](#) that interest rates and bond prices are inversely related. Algebraically, the i term is in the denominator of the PV formula— $PV = FV/(1 + i)^n$ —so as it gets smaller, PV must get larger (holding FV constant, of course).

Stop and Think Box

In colonial New York in the 1740s and 1750s, interest rates on mortgages were generally 8 percent. In the late 1750s and early 1760s, they fell to about 4 percent, and expected revenues from land ownership increased by about 50 percent. What happened to real estate prices? Why?

They rose significantly because it was cheaper to borrow money, thus lowering the total cost of real estate ownership, and because the land was expected to create higher revenues. Thinking of the land as a perpetuity and FV as the expected revenues arising from it:

$$PV = FV/i$$

$$PV = £100/.08 = £1,250$$

$$PV = £100/.04 = £2,500$$

And that is just the real estate effect. Increasing FV by £50 leads to the following:

$$PV = £150/.04 = £3,750, \text{ or a tripling of prices.}$$

In 1762, Benjamin Franklin reported that the “Rent of old Houses, and Value of Lands, . . . are trebled in the last Six Years.” ^[1]



The effect of new technology can be thought of as increasing FV , leading, of course, to a higher PV . Or, in the case of equities, low interest rates decrease k (required return) and new inventions increase g (constant growth rate) in the Gordon growth model— $P = E \times (1 + g)/(k - g)$ —both of which lead to a higher price.

Large increases in the demand for an asset occur for a variety of reasons. Demand can be increased merely by investors' expectations of higher prices in the future, as in the one period valuation model— $P = E/(1 + k) + P_1/(1 + k)$. If many investors believe that P_1 must be greater than P a year (or any other period) hence, demand for the asset will increase and the expectation of a higher P_1 will be vindicated. That sometimes leads investors to believe that P_2 will be higher than P_1 , leading to a self-fulfilling cycle that repeats through P_3 to P_x . At some point, the value of the asset becomes detached from fundamental reality, driven solely by expectations of yet higher future prices. In fact, some scholars verify the existence of an asset bubble when news about the price of an asset affects the economy, rather than the economy affecting the price of the asset.

To increase their returns, investors often employ leverage, or borrowing. Compare three investors, one who buys asset X entirely with his own money, one who borrows half of the price of asset X, and one who borrows 90 percent of the price of asset X. Their returns (not including the cost of borrowing, which as noted above is usually low during bubbles) will be equal to those calculated in Figure 12.1 "The effects of leverage on returns in a rising market".

Figure 12.1 The effects of leverage on returns in a rising market

Period	Asset Price	Cumulative Return, No Leverage (%)	Cumulative Return, 50% Leverage (%)	Cumulative Return, 90% Leverage (%)
0	100	--	--	--
1	110	10	60	100
2	120	20	70	110
3	130	30	80	120

The figures were calculated using the rate of return formula: $R = (C + P_t - P_{t0})/P_{t0}$ discussed in Chapter 4 "Interest Rates". Here, coupons are zero and hence drop out so that $R = (P_t - P_{t0})/P_{t0}$.



In this example, returns for the unleveraged investor are great:

$$110 - 100/100 = .1 \text{ (rendered as 10\% in the figure)}$$

$$120 - 100/100 = .2$$

$$130 - 100/100 = .3$$

But the returns are not as high as the investor who borrowed half the cash, in essence paying only \$50 of his own money for the \$100 asset at the outset:

$$110 - 50/100 = .6$$

$$120 - 50/100 = .7$$

$$130 - 50/100 = .8$$

But even he looks like a chump compared to the investor who borrowed most of the money to finance the original purchase, putting up only \$10 of his own money:

$$110 - 10/100 = 1$$

$$120 - 10 = 1.1$$

$$130 - 10 = 1.2$$

If you are thinking the most highly leveraged investor is the smart one, go back and reread the section of [Chapter 2 "The Financial System"](#) that discusses the trade-off between risk and return before continuing.

KEY TAKEAWAYS

- Asset bubbles occur when the prices of some asset, like stocks or real estate, increase rapidly due to some combination of low interest rates, high leverage, new technology, and large, often self-fulfilling shifts in demand.
- The expectation of higher prices in the future, combined with high levels of borrowing, allow asset prices to detach from their underlying economic fundamentals.

[1] For more on the crisis, see Tim Arango, "The Housing-Bubble Revolution," *New York Times* (30 November 2008), WK 5.

http://www.nytimes.com/2008/11/30/weekinreview/30arango.html?_r=2&pagewanted=1&ref=weekinreview

[w](#)



12.3 Financial Panics

LEARNING OBJECTIVE

1. What are financial panics and what causes them?

A financial panic occurs when leveraged financial intermediaries and other investors must sell assets quickly in order to meet lenders' calls. Lenders call loans, or ask for repayment, when interest rates increase and/or when the value of collateral pledged to repay the loan sinks below the amount the borrower owes. Calls are a normal part of everyday business, but during a panic, they all come en masse due to some shock, often the bursting of an asset bubble. Bubbles, like people, are bound to die but nobody knows in advance when they will do so. A burst is sometimes triggered by an obvious shock, like a natural catastrophe or the failure of an important company, but sometimes something as seemingly innocuous as a large sell order can touch them off.

During a panic, almost everybody must sell and few can or want to buy, so prices plummet, triggering additional calls, and yet more selling. Invariably, some investors, usually the most highly leveraged ones, cannot sell assets quickly enough, or for a high enough price, to “meet the call” and repay their loans. Banks and other lenders begin to suffer defaults. Their lenders (other banks, depositors, holders of commercial paper), in turn, begin to wonder if they are still credit-worthy. Asymmetric information and uncertainty, as described in [Chapter 11 "The Economics of Financial Regulation"](#), reign supreme, inducing lenders to restrict credit. *At some point, investors' emotions take over, and they literally go into a panic, one that makes Tony Soprano's panic attacks seem like a stroll in the park.*^[1]

Panics often cause the rapid de-leveraging of the financial system, a period when interest rates for riskier types of loans and securities increase and/or when a credit crunch, or a large decrease in the volume of lending, takes place. Such conditions often usher in a negative bubble, a period when high interest rates, tight credit, and expectations of lower asset prices in the future cause asset values to trend downward, sometimes well below the values indicated by underlying economic fundamentals. During de-leveraging, the forces that drove asset prices up now conspire to drag them lower.



Stop and Think Box

In New York in 1764, interest rates spiked from 6 to 12 percent and expected revenues from land plummeted by about 25 percent. What happened to real estate prices and why?

They dropped significantly because it was more expensive to borrow money, thus increasing the total cost of real estate ownership, and because the land was expected to yield lower revenues. Thinking of the land as a perpetuity and FV as the expected revenues arising from it:

$$PV = FV/i$$

$$PV = £100/.06 = £1,666.66$$

$$PV = £100/.12 = £833.33$$

And that is just the real estate effect. Decreasing FV by £25 leads to the following:

$$PV = £75/.12 = £625, \text{ or a decrease of about two-thirds.}$$

“I know of sundry Estates [farms and other landed property] that has been taken by Execution [foreclosed upon],” a New York merchant reported late in 1766, “and sold for not more than one third of their value owing to the scarcity of money.”

As shown in [Figure 12.2 "The effects of leverage on returns in a falling market"](#), the most highly leveraged investor suffers most of all.

Figure 12.2 The effects of leverage on returns in a falling market

Period	Asset Price	Cumulative Return, No Leverage (%)	Cumulative Return, 50% Leverage (%)	Cumulative Return, 90% Leverage (%)
0	100	—	—	—
1	90	-10	-10+	-10+
2	80	-20	-20+	-20+
3	70	-30	-30+	-30+

Again, I used the rate of return formula, but coupons are zero so that $R = (P_{t_1} - P_{t_0})/P_{t_0}$. As the price of the asset falls, the unleveraged investor suffers negative returns:

$$90-100/100=-.1$$

$$80-100/100=-.2$$

$$70-100/100=-.3$$

The leveraged investors lose the same percentage and must now pay a high interest rate for their loans, or put up the equity themselves, at a time when the opportunity cost of doing so is substantial:

$$(90 - 50 + 50)/100 = -.1 + \text{interest on } \$50$$

$$(80 - 50 + 50)/100 = -.2 + \text{interest on } \$50$$

$$(70 - 50 + 50)/100 = -.3 + \text{interest on } \$50$$

The higher the leverage, the larger the sum that must be borrowed at high rates.

$$(90-90+90)/100=-.1+\text{interest on } \$90$$

$$(80-90+90)/100=-.2+\text{interest on } \$90$$

$$(70-90+90)/100=-.3+\text{interest on } \$90$$

Also, the higher the leverage, the smaller the price change needs to be to trigger a call. At 50 percent leverage, a \$100 asset could drop to \$50 before the lender must call. At 90 percent leverage, a \$100 asset need lose only \$10 to induce a call.

KEY TAKEAWAYS

- The bursting of an asset bubble, or the rapidly declining prices of an asset class, usually leads to a financial panic, reductions in the quantity of available credit, and the de-leveraging of the financial system.
- The most highly leveraged investors suffer most.

[1] http://www.menshealth.com/cda/article.do?site=MensHealth&channel=health&category=stress.management&conitem=04f999edbbbd201099edbbbd2010_cfe793cd



12.4 Lender of Last Resort

LEARNING OBJECTIVE

1. What is a lender of last resort and what does it do?

As noted above, financial panics and the de-leveraging that often occur after them can wreak havoc on the real economy by decreasing the volume of loans, insurance contracts, and other beneficial financial products. That, in turn, can cause firms to reduce output and employment. *Lenders of last resort try to stop panics and de-leveraging by adding liquidity to the financial system and/or attempting to restore investor confidence.* They add liquidity by increasing the money supply, reducing interest rates, and making loans to worthy borrowers who find themselves shut off from their normal sources of external finance. They try to restore investor confidence by making upbeat statements about the overall health of the economy and/or financial system and by implementing policies that investors are likely to find beneficial. During the darkest days of 1933, for example, the U.S. federal government restored confidence in the banking system through strong executive leadership and by creating the Federal Deposit Insurance Corporation.

Stop and Think Box

In a single day, October 19, 1987, the S&P fell by 20 percent. What caused such a rapid decline? Why did the panic not result in de-leveraging or recession?

According to a short history of the event by Mark Carlson (“A Brief History of the 1987 Stock Market Crash with a Discussion of the Federal Reserve Response”),^[1] “During the years prior to the crash, equity markets had been posting strong gains. . . . There had been an influx of new investors. . . . Equities were also boosted by some favorable tax treatments given to the financing of corporate buyouts. . . . The macroeconomic outlook during the months leading up to the crash had become somewhat less certain. . . . Interest rates were rising globally. . . . A growing U.S. trade deficit and decline in the value of the dollar were leading to concerns about inflation and the need for higher interest rates in the U.S. as well.” On the day of the crash, investors learned that deficits were higher than expected and that the favorable tax rules might change. As prices dropped, “record margin calls” were made, fueling further selling. The panic did not proceed further because Federal Reserve Chairman Alan Greenspan restored confidence in the stock



market by promising to make large loans to banks exposed to brokers hurt by the steep decline in stock prices. Specifically, the Fed made it known that “The Federal Reserve, consistent with its responsibilities as the Nation’s central bank, affirmed today its readiness to serve as a source of liquidity to support the economic and financial system.”

The most common form of lender of last resort today is the government central bank, like the European Central Bank (ECB) or the Federal Reserve. The International Monetary Fund (IMF) sometimes tries to act as a sort of international lender of last resort, but it has been largely unsuccessful in that role. In the past, wealthy individuals like J. P. Morgan and private entities like bank clearinghouses tried to act as lenders of last resort, with mixed success. Most individuals did not have enough wealth or influence to thwart a panic, and bank clearinghouses were at most regional in nature.

KEY TAKEAWAY

- A lender of last resort is an individual, a private institution, or, more commonly, a government central bank that attempts to stop a financial panic and/or postpanic de-leveraging by increasing the money supply, decreasing interest rates, making loans, and/or restoring investor confidence.

[1] <http://www.federalreserve.gov/Pubs/feds/2007/200713/200713pap.pdf>



12.5 Bailouts

LEARNING OBJECTIVE

1. What is a bailout and how does it differ from the actions of a lender of last resort?

As noted above, lenders of last resort provide liquidity, loans, and confidence. They make loans to solvent institutions facing temporary solvency problems due to the crisis, not inevitable bankruptcy. ^[1] Bailouts, *by contrast, restore the losses suffered by one or more economic agents, usually with taxpayer money.* The restoration can come in the form of outright grants or the purchase of equity but often takes the form of subsidized or government-guaranteed loans. Unsurprisingly, bailouts are often politically controversial because they can appear to be unfair and because they increase moral hazard, or risk-taking on the part of entities that expect to be bailed out if they encounter difficulties. *Nevertheless, if the lender of last resort cannot stop the formation of a negative bubble or massive de-leveraging, bailouts can be an effective way of mitigating further declines in economic activity.*

During the Great Depression, for example, the federal government used \$500 million of taxpayer money to capitalize the Reconstruction Finance Corporation (RFC). In its initial phase, the RFC made some \$2 billion in low-interest loans to troubled banks, railroads, and other businesses. *Though at first deprecated as welfare for the rich, the RFC, most observers now concede, helped the economy to recover by keeping important companies afloat.* Also during the depression, the Home Owners Loan Corporation (HOLC), seeded with \$200 million of taxpayer dollars, bailed out homeowners, many of whom had negative equity in their homes, by refinancing mortgages on terms favorable to the borrowers. Similarly, in the aftermath of the Savings and Loan Crisis, the Resolution Trust Corporation (RTC) closed 747 thrifts with total assets of almost \$400 billion. Both HOLC and RTC made the best of bad situations. HOLC made a small accounting profit, and the RTC cost taxpayers a mere \$125 billion while staving off a more severe systemic crisis.

Stop and Think Box



The 1979 bailout of automaker Chrysler, which entailed a government guarantee of its debt, saved the troubled corporation from bankruptcy. It quickly paid off its debt, and the U.S. Treasury, and hence taxpayers, were actually the richer for it. Was this bailout successful?

At the time, many observers thought so. Chrysler creditors, who received 30 cents for every dollar the troubled automaker owed them, did not think so, however, arguing that they had been fleeced to protect Chrysler stockholders. Workers who lost their jobs or were forced to accept reductions in pay and benefits were also skeptical. Now that Chrysler and the other U.S. carmakers are again in serious financial trouble, some scholars are suggesting that the bailout was a disaster in the long term because it fooled Detroit execs into thinking they could continue business as usual. In retrospect, it may have been better to allow Chrysler to fail and a new, leaner, meaner company to emerge like a Phoenix from its ashes.

KEY TAKEAWAYS

- Bailouts usually occur after the actions of a lender of last resort, such as a central bank, have proven inadequate to stop negative effects on the real economy.
- They usually entail restoring losses to one or more economic agents.
- Although politically controversial, bailouts can stop negative bubbles from leading to excessive de-leveraging, debt deflation, and economic depression.

[1] Doug Arner, *Financial Stability, Economic Growth, and the Role of Law* (New York: Cambridge University Press, 2007), 139–140.



12.6 The Crisis of 2007–2008

LEARNING OBJECTIVE

1. What factors led to the present financial crisis?

The present financial crisis began in 2007 as a nonsystemic crisis linked to subprime mortgages, or risky loans to homeowners. In 2008, the failure of several major financial services companies turned it into the most severe systemic crisis in the United States since the Great Depression.

The troubles began with a major housing asset bubble. As shown in [Figure 12.3 "Case-Shiller U.S. Home Price Composite Index, 2000–2008"](#), between January 2000 and 2006, a major index of housing prices in the United States more than doubled. (Prices went up more in some areas than in others because real estate is a local asset.) Home prices rose rapidly for several reasons. As shown in [Figure 12.4 "U.S. interest rates, 2000–2008"](#), mortgage rates were quite low, to a large extent because the Federal Reserve kept the federal funds rate, the rate at which banks lend to each other overnight, very low.

Figure 12.3 Case-Shiller U.S. Home Price Composite Index, 2000–2008



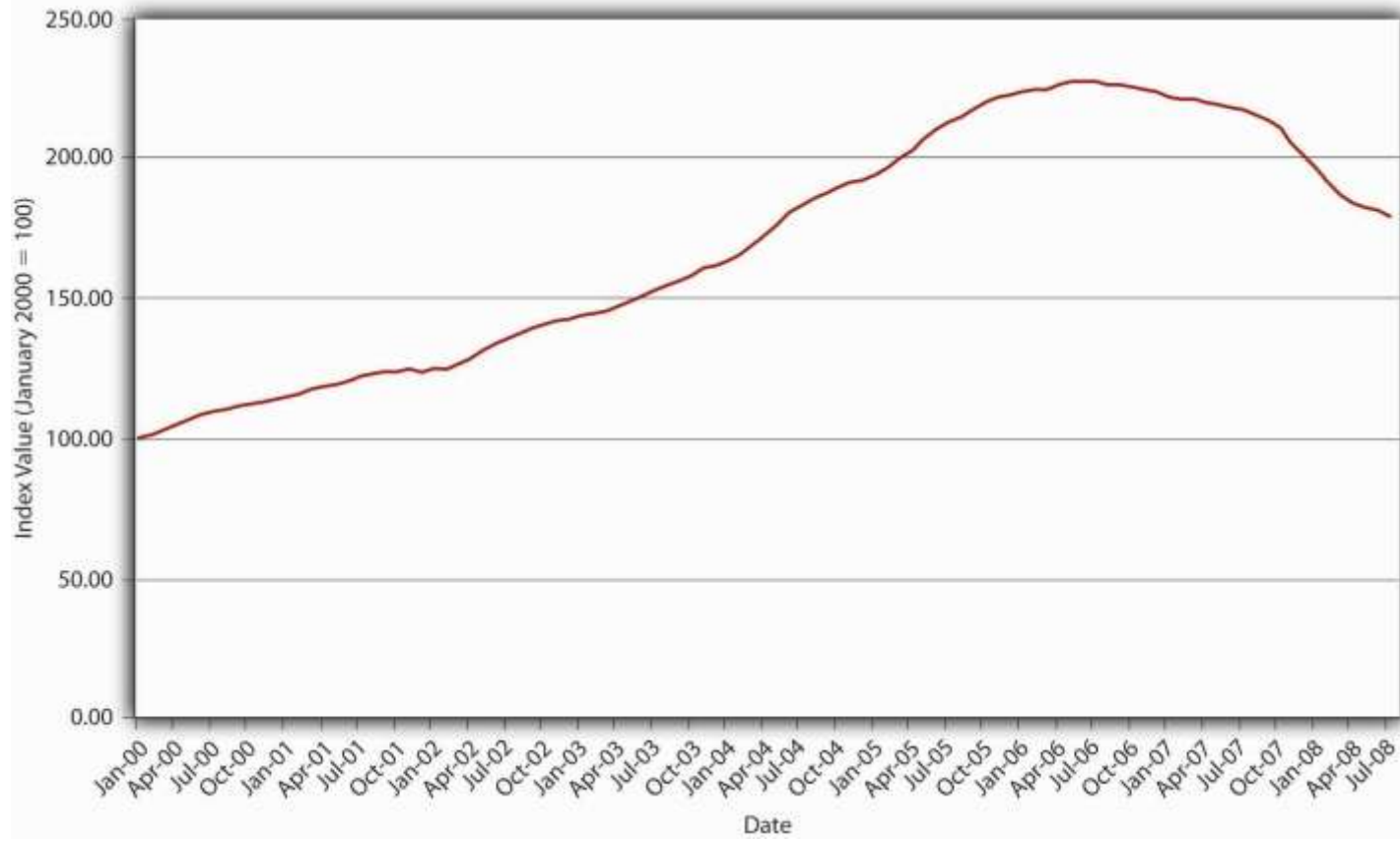
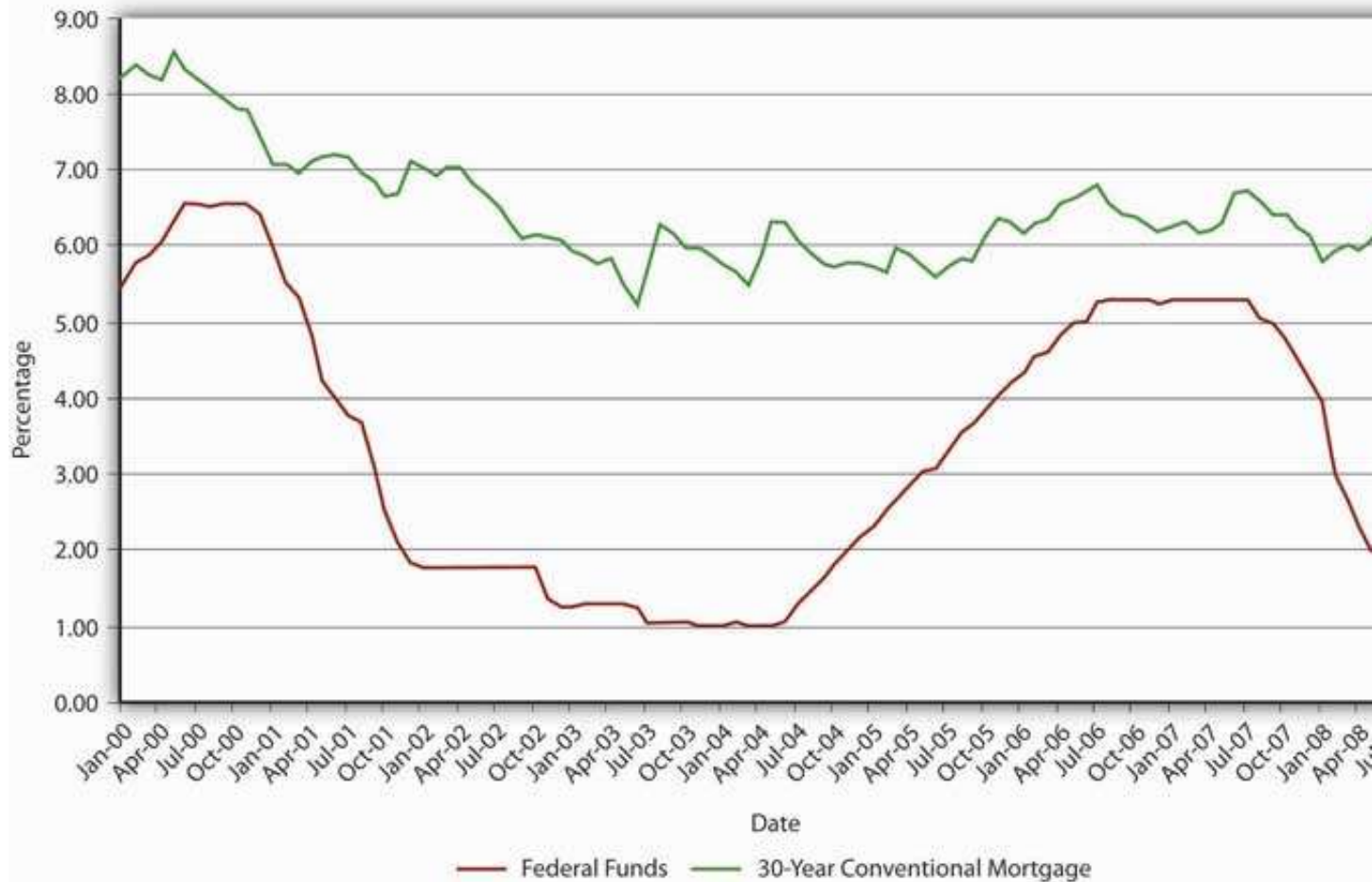


Figure 12.4 U.S. interest rates, 2000–2008



Mortgages also became much easier to obtain. Traditionally, mortgage lenders held mortgage loans on their own balance sheets. If a homeowner defaulted, the lender, usually a bank or life insurance company, suffered the loss. They were therefore understandably cautious about whom they lent to and on what terms. To shield themselves from loss, lenders insisted that borrowers contribute a substantial percentage of the home’s value as a down payment. The down payment ensured that the borrower had some equity at stake, some reason to work hard and not to default. It also provided lenders with a buffer if housing prices declined. Traditionally, lenders also verified that borrowers were employed or had other means of income from investments or other sources.

All that changed with the widespread advent of securitization, the practice of bundling and selling mortgages to institutional investors. Banks also began to “financial engineer” those bundles, called mortgage-backed securities (MBSs), into more complex derivative instruments like collateralized mortgage obligations (CMOs). MBSs afforded investors the portfolio diversification



benefits of holding a large number of mortgages; CMOs allowed investors to pick the risk-return profile they desired. They did so by slicing a group of MBSs into derivative securities (aka tranches) with credit ratings ranging from AAA, which would be the last to suffer losses, to BBB, which would suffer from the first defaults. The AAA tranches, of course, enjoyed a higher price (lower yield) than the lower-rated tranches. The holders of the lowest-rated tranches, those who took on the most risks, suffered most during the subprime maelstrom.

Securitization allowed mortgage lenders to specialize in making loans, turning them more into originators than lenders. Origination was much easier than lending because it required little or no capital. Unsurprisingly, a large number of new mortgage originators, most mere brokers, appeared on the scene. *Paid a commission at closing, originators had little incentive to screen good borrowers from bad and much more incentive to sign up anyone with a pulse.* A race to the bottom occurred as originators competed for business by reducing screening and other credit standards. At the height of the bubble, loans to no income, no job or assets (NINJA) borrowers were common. So-called liars' loans for hundreds of thousands of dollars were made to borrowers without documenting their income or assets. Instead of insisting on a substantial down payment, many originators cajoled homeowners into borrowing 125 percent of the value of the home because it increased their commissions. They also aggressively pushed adjustable rate mortgages (ARMs) that offered low initial teaser rates and later were reset at much higher levels.

Regulators allowed, and even condoned, such practices in the name of affordable housing, even though six earlier U.S. mortgage securitization schemes had ended badly. ^[1] Regulators also allowed Fannie Mae and Freddie Mac, two giant stockholder-owned mortgage securitization companies whose debt was effectively guaranteed by the federal government, to take on excessive risks and leverage themselves to the hilt. They also allowed credit-rating agencies to give investment-grade ratings to complicated mortgage-backed securities of dubious quality. (For the problem with credit-rating agencies, see [Chapter 8 "Financial Structure, Transaction Costs, and Asymmetric Information"](#).)

Observers, including Yale's Robert Shiller ^[2] and Stern's Nouriel Roubini, ^[3] warned about the impending crisis, but few listened. *As long as housing prices kept rising, shoddy underwriting, weak regulatory oversight, and overrated securities were not problems because borrowers who got into*

trouble could easily refinance or sell the house for a profit. Indeed, many people began to purchase houses with the intention of “flipping” them a month later for a quick buck.

In June 2006, however, housing prices peaked, and by the end of that year it was clear that the bubble had gone bye-bye. By summer 2007, prices were falling quickly. Defaults mounted as the sale/refinance option disappeared, and borrowers wondered why they should continue paying a \$300,000 mortgage on a house worth only \$250,000, especially at a time when a nasty increase in fuel costs and a minor bout of inflation strained personal budgets. Highly leveraged subprime mortgage lenders, like Countrywide and Indymac, suffered large enough losses to erode their narrow base of equity capital, necessitating their bankruptcy or sale to stronger entities. By early 2008, investment bank Bear Stearns, which was deeply involved in subprime securitization products, teetered on the edge of bankruptcy before being purchased by J. P. Morgan for a mere \$10 per share.

As the crisis worsened, the Federal Reserve responded as a lender of last resort by cutting its federal funds target from about 5 to less than 2 percent between August 2007 and August 2008. It also made massive loans directly to distressed financial institutions. Mortgage rates decreased from a high of 6.7 percent in July 2007 to 5.76 percent in January 2008, but later rebounded to almost 6.5 percent in August 2008. *Moreover, housing prices continued to slide, from an index score of 216 in July 2007 to just 178 a year later. Defaults on subprime mortgages continued to climb, endangering the solvency of other highly leveraged financial institutions, including Fannie Mae and Freddie Mac, which the government had to nationalize (take over and run).* The government also arranged for the purchase of Merrill Lynch by Bank of America for \$50 billion in stock. But it decided, probably due to criticism that its actions were creating moral hazard, to allow Lehman Brothers to go bankrupt. That policy quickly backfired, however, because Lehman dragged one of its major counterparties, AIG, down with it. Once bitten, twice shy, the government stepped in with a massive bailout for AIG to keep it from bankrupting yet other large institutions as it toppled.

Figure 12.5 Daily closing value of the Dow Jones Industrial Average, September–October 2008



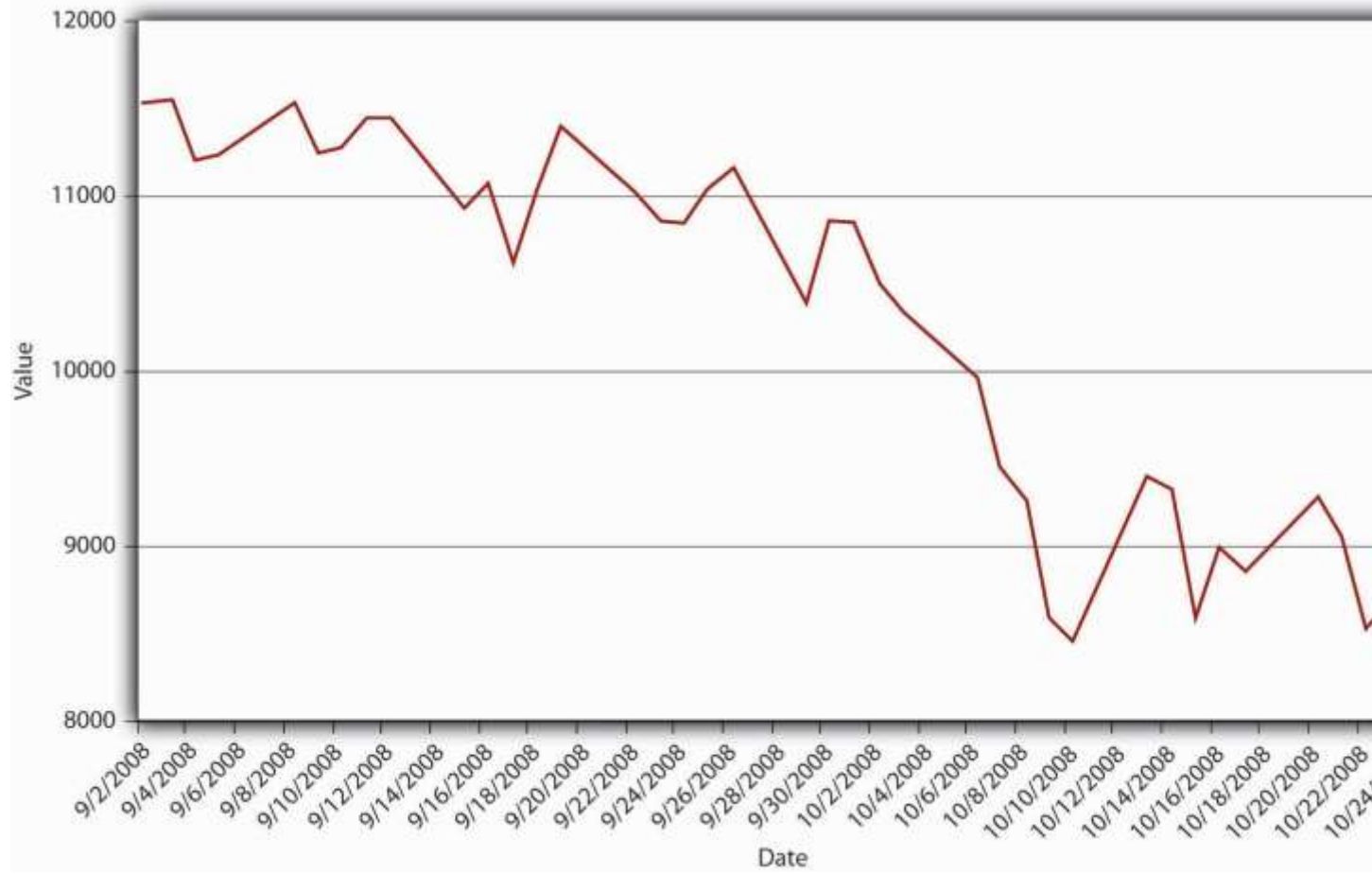
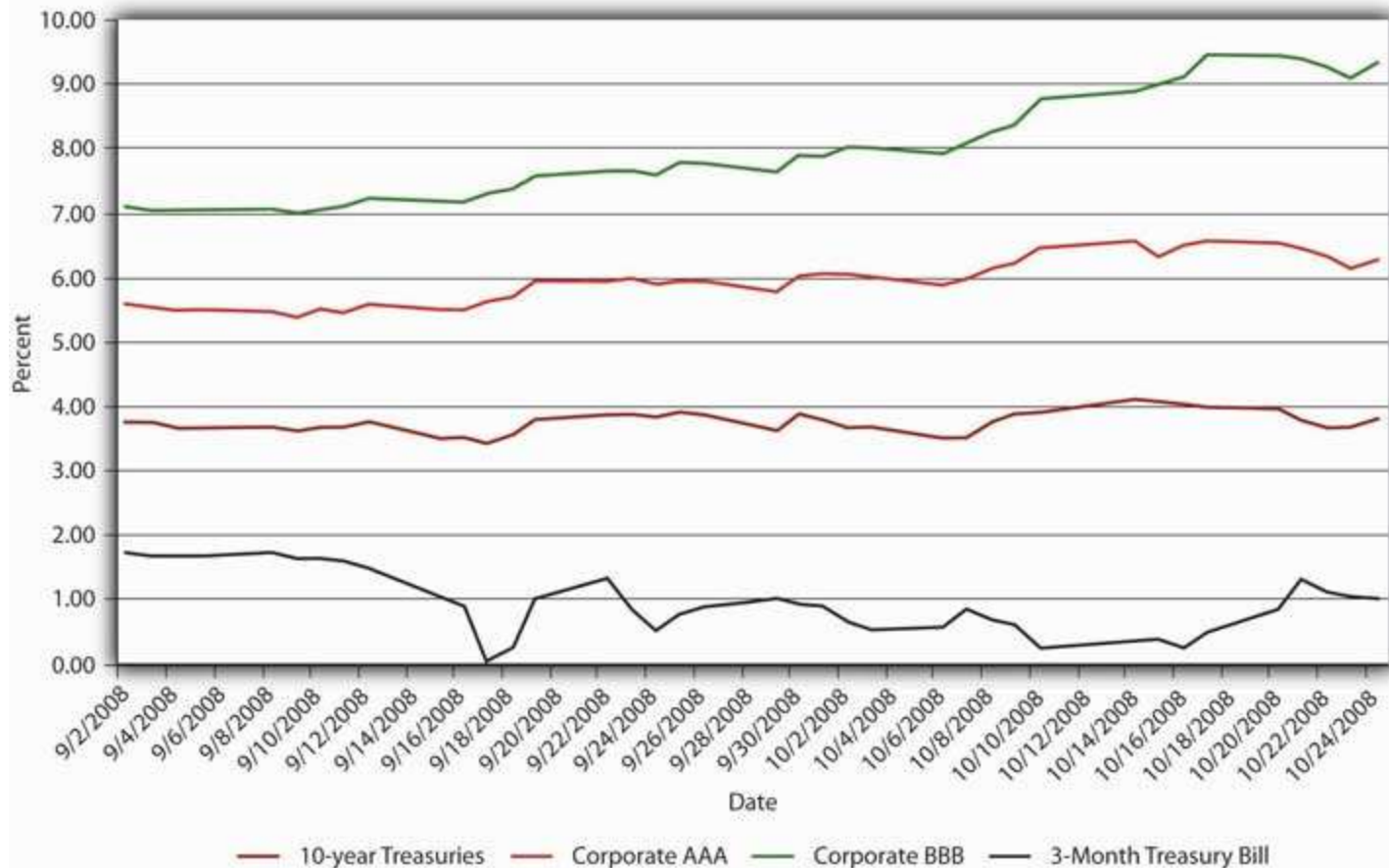


Figure 12.6 Bond yields, September–October 2008





The damage, however, had been done and panic overtook both the credit and stock markets in September and October 2008. Figure 12.5 "Daily closing value of the Dow Jones Industrial Average, September–October 2008" and Figure 12.6 "Bond yields, September–October 2008" portray the carnage graphically.

Stop and Think Box

What is happening in Figure 12.6 "Bond yields, September–October 2008"?

Investors sold corporate bonds, especially the riskier Baa ones, forcing their prices down and yields up. In a classic flight to quality, they bought Treasuries, especially short-dated ones, the yields of which dropped from 1.69 percent on September 1 to .03 percent on the September 17.

With an economic recession and major elections looming, politicians worked feverishly to develop a bailout plan. The Bush administration's plan, which offered some \$700 billion to large financial institutions, initially met defeat in the House of Representatives. After various amendments,

including the addition of a large sum of pork barrel sweeteners, the bill passed the Senate and the House. The plan empowered the Treasury to purchase distressed assets and to inject capital directly into banks. Combined with the \$300 billion Hope for Homeowners plan, a bailout for some distressed subprime borrowers, and the direct bailout of AIG, the government's bailout effort became the largest, in percentage of GDP terms, since the Great Depression. The Treasury later decided that buying so-called toxic assets, assets of uncertain and possibly no value, was not economically or politically prudent. Government ownership of banks, however, has a shaky history too because many have found the temptation to direct loans to political favorites, instead of the best borrowers, irresistible. ^[4]

Economists and policymakers are now busy trying to prevent a repeat performance, or at least mitigate the scale of the next bubble. One approach is to educate people about bubbles in the hope that they will be more cautious investors. Another is to encourage bank regulators to use their powers to keep leverage to a minimum. A third approach is to use monetary policy—higher interest rates or tighter money supply growth—to deflate bubbles before they grow large enough to endanger the entire financial system. Each approach has its strengths and weaknesses. Education might make investors afraid to take on any risk. Tighter regulation and monetary policy might squelch legitimate, wealth-creating industries and sectors. A combination of better education, more watchful regulators, and less accommodative monetary policy may serve us best.

KEY TAKEAWAYS

- Low interest rates, indifferent regulators, unrealistic credit ratings for complex mortgage derivatives, and poor incentives for mortgage originators led to a housing bubble that burst in 2006.
- As housing prices fell, homeowners with dubious credit and negative equity began to default in unexpectedly high numbers.
- Highly leveraged financial institutions could not absorb the losses and had to shut down or be absorbed by stronger institutions.
- Despite the Fed's efforts as lender of last resort, the nonsystemic crisis became systemic in September 2008 following the failure of Lehman Brothers and AIG.



- The government responded with huge bailouts of subprime mortgage holders and major financial institutions.

[1] Kenneth Snowden, “Mortgage Securitization in the United States: Twentieth Century Developments in Historical Perspective,” in Michael Bordo and Richard Sylla, eds., *Anglo-American Financial Systems: Institutions and Markets in the Twentieth Century* (Burr Ridge, IL: Irwin Professional Publishing, 1995), 261–298.

[2] <http://www.econ.yale.edu/~shiller/>

[3] <http://pages.stern.nyu.edu/~nroubini/>

[4] “Leaving Las Vegas: No Dire Mistakes so Far, but Governments Will Find Exiting Banks Far Harder Than Entering Them,” *The Economist* (22 November 2008), 22.



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Chapter 13

Central Bank Form and Function

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Define *central bank* and explain the importance of central banking.
2. Briefly sketch the history of U.S. central banking.
3. Explain when and how a country can do without a central bank.
4. Briefly sketch the structure of the Federal Reserve System.
5. Explain how other central banks compare to the Fed.
6. Define central bank independence and explain its importance.
7. Explain why independent central bankers prefer lower inflation rates than government officials do.



13.1 America's Central Banks

LEARNING OBJECTIVES

1. What is a central bank?
2. Why is central banking important?
3. How can a country manage without a central bank?
4. What is the history of central banking in the United States?

A central bank is a bank under some degree of government control that is generally charged with

- controlling the money supply (to a greater or lesser degree);
- providing price stability (influencing the price level);
- attaining economic output and employment goals;
- regulating commercial banks (and perhaps other depository and nondepository financial institutions);
- stabilizing the macroeconomy (proactively and/or by acting as a lender of last resort during financial crises);
- providing a payments system (check clearing and long-distance payments).

Central banks also often act as the national government's banker by holding its deposits and making payments on its behalf. *During its 200-plus-year existence, the United States has had three different central banks and two periods, one short and one extremely long, with no central bank.*

Chartered by the federal government in 1791, the Bank of the United States (BUS) worked in conjunction with the U.S. Treasury secretary to act as a lender of last resort and a regulator of commercial banks. Specifically, it helped Alexander Hamilton, America's first Secretary of the Treasury, ^[1] to stymie the Panic of 1792. *It also returned the notes of commercial banks for redemption into gold and silver (the era's base money), thereby regulating commercial banks' reserve ratios and hence the money supply.* Owned by private shareholders, *the BUS was quite independent, a good trait for a central bank to have, as we'll see.* Its very independence and power to regulate commercial banks, however, made it unpopular in some influential political circles. Its charter was not renewed when it expired in 1811. The government's difficulties financing the War of 1812 (aka the Second War



for Independence) convinced many that the country needed a new central bank. As a result, the government chartered the Bank of the United States (informally called the Second Bank or SBUS) in 1816. Insufficiently independent of the government at first, the SBUS, which (like the BUS) was headquartered in Philadelphia but had more numerous branches, stumbled by allowing commercial banks to increase their lending too much. It also suffered from internal agency problems, particularly at its branch in Baltimore. When a financial panic struck in late 1818 and early 1819, it failed to prevent a recession and debt deflation. (Sound familiar? See the discussion of the Great Depression in [Chapter 11 "The Economics of Financial Regulation"](#).) Private stockholders reasserted control over the bank, placing it under the able direction of Nicholas Biddle, who successfully prevented the British economic meltdown of 1825 from spreading to America. Under Biddle, the SBUS also became an effective regulator of the nation's commercial banks, which by the 1820s numbered in the hundreds. Like the BUS before it, the SBUS paid for its diligence with its life. Aided by many commercial bankers, particularly those in Philadelphia's financial rival Manhattan, and America's traditional distaste for powerful institutions, Andrew Jackson vetoed the act rechartering it. (The SBUS continued its corporate life under a Pennsylvania charter, but it no longer had nationwide branches and was no longer the nation's central bank. It went bankrupt a few years later.)

From 1837 until late 1914, the United States had no central bank. Private institutions cropped up to clear checks and transfer funds over long distances. The Treasury kept its funds in commercial banks and in the hands of its tax collectors and left bank regulation to the market (deposit and note holders and stockholders) and state governments. The monetary base (gold and silver) it left largely to the whims of international trade. It could do so because the United States and most of the world's other major economies were on a gold and/or silver standard, meaning that their respective units of account were fixed in terms of so many grains of the precious stuff and hence fixed against each other.^[2] As we'll learn in [Chapter 18 "Foreign Exchange"](#), the system was self-equilibrating. In other words, discretionary monetary policy was unnecessary because gold and silver flowed into or out of economies automatically, as needed. Nations today that maintain fixed exchange rates also find no need for a central bank, but instead use a simpler institution called a currency board. Countries that use a foreign currency as their own, a process called dollarization, need nothing at all because they essentially outsource their monetary policy to the central bank of the nation whose currency they



use. (That is often the United States, hence the term *dollarization*.) Other central banking functions, like clearing checks and regulating financial institutions, can be performed by other entities, public and private. The function of lender of last resort typically cannot be fulfilled, however, by anything other than a central bank.

Indeed, the biggest problem with the U.S. arrangement was that there was no official systemwide lender of last resort, nobody to increase the money supply or lower interest rates in the face of a shock. As a result, the United States suffered from banking crises and financial panics of increasing ferocity beginning soon after the Second Bank's demise: 1837, 1839, 1857, 1873, 1884, 1893, and 1907. Most of those panics were followed by recessions and debt deflation because there was no institution wealthy enough to stop the death spiral described in [Chapter 12 "The Financial Crisis of 2007–2008"](#) and in [Chapter 23 "Aggregate Supply and Demand, the Growth Diamond, and Financial Shocks"](#) (a shock, increased asymmetric information, decline in economic activity, bank panic, increased asymmetric information, decline in economic activity, unanticipated decline in the price level). In 1907, J. P. Morgan (the man, with help from his bank and web of business associates) mitigated, but did not prevent, a serious recession by acting as a lender of last resort. The episode convinced many Americans that the time had come to create a new central bank lest private financiers come to wield too much power. Anyone with the power to stop a panic, they reasoned, had the power to start one. Americans still feared powerful government institutions too, however, so it took another six years (1913) to agree on the new bank's structure, which was highly decentralized geographically and chock full of checks and balances. It took another year (1914) to get the bank, often called simply the Fed or the Federal Reserve, into operation. We'll discuss the checkered history of the Fed's monetary policy in [Chapter 17 "Monetary Policy Targets and Goals"](#).

KEY TAKEAWAYS

- A central bank is a bank under some degree of government control that is responsible for influencing the money supply, interest rates, inflation, and other macroeconomic outcomes like output and employment. A central bank is usually the lender of last resort, the institution that can (and should) add liquidity and confidence to the financial system at the outbreak of panics and crises. On a quotidian basis, central



banks also may clear checks, regulate banks and/or other financial institutions, and serve as the national government's bank.

- Early in its history, the United States was home to two privately owned central banks, the Bank of the United States and the Second Bank, that acted as a lender of last resort and regulated commercial banks by returning their notes to them for redemption in base money (then gold and silver). Although economically effective, both were politically unpopular so when their twenty-year charters expired, they were not renewed. From 1837 until the end of 1914, the United States had no central bank, but the Treasury Department fulfilled some of its functions.
- A country can do without a central bank if it is on fixed exchange rates, such as the gold standard, or otherwise gives up discretionary monetary policy, as when countries dollarize or adopt a foreign currency as their own. In such cases, other institutions fulfill central banking functions: government departments regulate financial institutions, commercial banks safeguard the government's deposits, a currency board administers the fixed exchange rate mechanism, clearinghouses established by banks clear checks, and so forth.
- The Treasury Department did not act as a lender of last resort, however, so recurrent banking crises and financial panics plagued the economy. When J. P. Morgan acted as a lender of last resort during the Panic of 1907, political sentiments shifted and the Federal Reserve system emerged out of a series of political compromises six years later.

[1] <http://www.treas.gov/education/history/secretaries/ahamilton.shtml>

[2] This does not mean that the exchange rate didn't change, merely that it stayed within a narrow band of transaction costs.



13.2 The Federal Reserve System's Structure

LEARNING OBJECTIVE

1. What is the structure of the Federal Reserve system?

The Federal Reserve is composed of twelve numbered districts, each with its own Federal Reserve Bank: Boston (1), New York (2), Philadelphia (3), Cleveland (4), Richmond (5), Atlanta (6), Chicago (7), St. Louis (8), Minneapolis (9), Kansas City (10), Dallas (11), and San Francisco (12). Except for regions 1 and 3, each of those district banks also operates one or more branches. For example, the Federal Reserve Bank of New York (FRBNY) maintains a branch in Buffalo; the Atlanta Fed has branches in Nashville, Birmingham, New Orleans, Jacksonville, and Miami. The Fed's headquarters is located in Washington, DC^[1]

Missouri is the only state with two federal reserve district banks. This was thought necessary to secure the votes of Missouri congressional representatives for the bill. (So much for public interest!) *The districts don't seem to be evenly balanced economically.* They were, more or less, when the legislation was passed before World War I, but since then, the West Coast, Southwest, and Southeast (Sunbelt) have grown in economic importance relative to the Northeast and old Midwest (Rustbelt). (District 3 encompasses only southern New Jersey and eastern Pennsylvania, an area that is no longer the economic powerhouse it once was.) Rather than redistrict, the Fed has simply shifted resources over the years toward the larger and economically more potent districts.

Each Federal Reserve bank is owned by the commercial banks in its district, and they are members of the system. Those banks, which include all nationally chartered banks and any state banks that choose to join, own restricted ^[2] shares in the Fed, which they use to elect six directors, three of whom have to be professional bankers and three of whom have to be nonbank business leaders. The Board of Governors in Washington selects another three directors, who are supposed to represent the public interest and are not allowed to work for or own stock in any bank. The nine directors, with the consent of the board, then appoint a president.

The twelve district banks do mostly grunt work:



- Issue new Federal Reserve notes (FRNs) in place of worn currency
- Clear checks
- Lend to banks within their districts
- Act as a liaison between the Fed and the business community
- Collect data on regional business and economic conditions
- Conduct monetary policy research
- Evaluate bank merger and new activities applications
- Examine bank holding companies and state-chartered member banks. ^[3]

The FRBNY is the most important of the district banks because, in addition to the tasks listed above, it also conducts so-called open market operations, buying and selling government bonds (and occasionally other assets) on behalf of the Federal Reserve system and at the behest of headquarters in Washington. Moreover, the FRBNY is a member of the Bank for International Settlements (BIS) ^[4] and safeguards over \$100 billion in gold owned by the world's major central banks. Finally, the FRBNY's president is the only permanent member of the Federal Open Market Committee (FOMC).

*The FOMC is composed of the seven members of the Board of Governors, the president of the FRBNY, and the presidents of the other district banks, though only four of the last-mentioned group can vote (on a rotating basis). The FOMC meets every six weeks or so to decide on monetary policy, specifically on the rate of growth of the money supply or the federal funds target rate, an important interest rate, both of which are controlled via so-called open market operations. Until recently, the Fed had only two other tools for implementing monetary policy, the discount rate at which district banks lend directly to member banks and reserve requirements. Prior to the crisis of 2007–2008, neither was an effective tool for a long time, so the market and the media naturally concentrated on the FOMC and have even taken to calling it “the Fed,” although technically it is only one part of the giant beast. *The head of the Fed is the Board of Governors, which is composed of a chairperson, currently Ben Bernanke, and six governors.* ^[5] All seven are appointed by the president of the United States and confirmed by the U.S. Senate. The governors must come from different Federal Reserve districts and serve a single fourteen-year term. The chairperson is selected from among the governors and serves a four-year,*



renewable term. The chairperson is the most powerful member of the Fed because he or she controls the board, which controls the FOMC, which controls the FRBNY's open market operations, which influences the money supply or a key interest rate. The chairperson also effectively controls reserve requirements and the discount rate. He (so far no women) is also the Fed's public face and its major liaison to the national government. Although de jure power within the Fed is diffused by the checks and balances discussed above, today de facto power is concentrated in the chairperson. That allows the Fed to be effective but ensures that a rogue chairperson cannot abuse his power.

Historically, some chairpersons have made nebbishes look effective, while others, including most recently Alan Greenspan, have been considered, if not infallible demigods, then at least erudite gurus. *Neither extreme view is accurate because all chairpersons have relied heavily on the advice and consent of the other governors, the district banks' presidents, and the Fed's research staff of economists, which is the world's largest.* The researchers provide the chairperson and the entire FOMC with new data, qualitative assessments of economic trends, and quantitative output from the latest and greatest macroeconomic models. They also examine the global economy and analyze the foreign exchange market, on the lookout for possible shocks from abroad. Fed economists also help the district banks to do their jobs by investigating market and competition conditions and engaging in educational and other public outreach programs.

KEY TAKEAWAYS

- The Fed is composed of a Washington-based headquarters and twelve district banks and their branches.
- The district banks, which are owned by the member banks, fulfill the Fed's quotidian duties like clearing checks and conducting economic research.
- The most important of the district banks is the Federal Reserve Bank of New York (FRBNY), which conducts open market operations, the buying and selling of bonds that influences the money supply and interest rates.
- It also safeguards much of the world's gold and has a permanent seat on the Federal Open Market Committee (FOMC), the Fed's most important policymaking body.



- Composed of the Board of Governors and the presidents of the district banks, the FOMC meets every six weeks or so to decide whether monetary policy should be tightened (interest rates increased), loosened (interest rates decreased), or maintained.
- The Fed is full of checks and balances, but is clearly led by the chairperson of the Board of Governors.
- The chairperson often personifies the Fed as he (to date it's been a male) is the bank's public face.
- Nevertheless, a large number of people, from common businesspeople to the Fed's research economists, influence his decisions through the data, opinions, and analysis they present.

[1] For an interactive map of the system, browse <http://www.federalreserve.gov/otherfrb.htm>.

[2] The Fed's stock is not traded in public markets and pays an annual dividend no higher than 6 percent.

[3] The Comptroller of the Currency is the primary regulator of federally chartered banks. State regulators and the FDIC regulate state banks that are not members of the Federal Reserve system.

[4] <http://www.bis.org/>

[5] <http://www.federalreserve.gov/aboutthefed/bios/board/bernanke.htm>



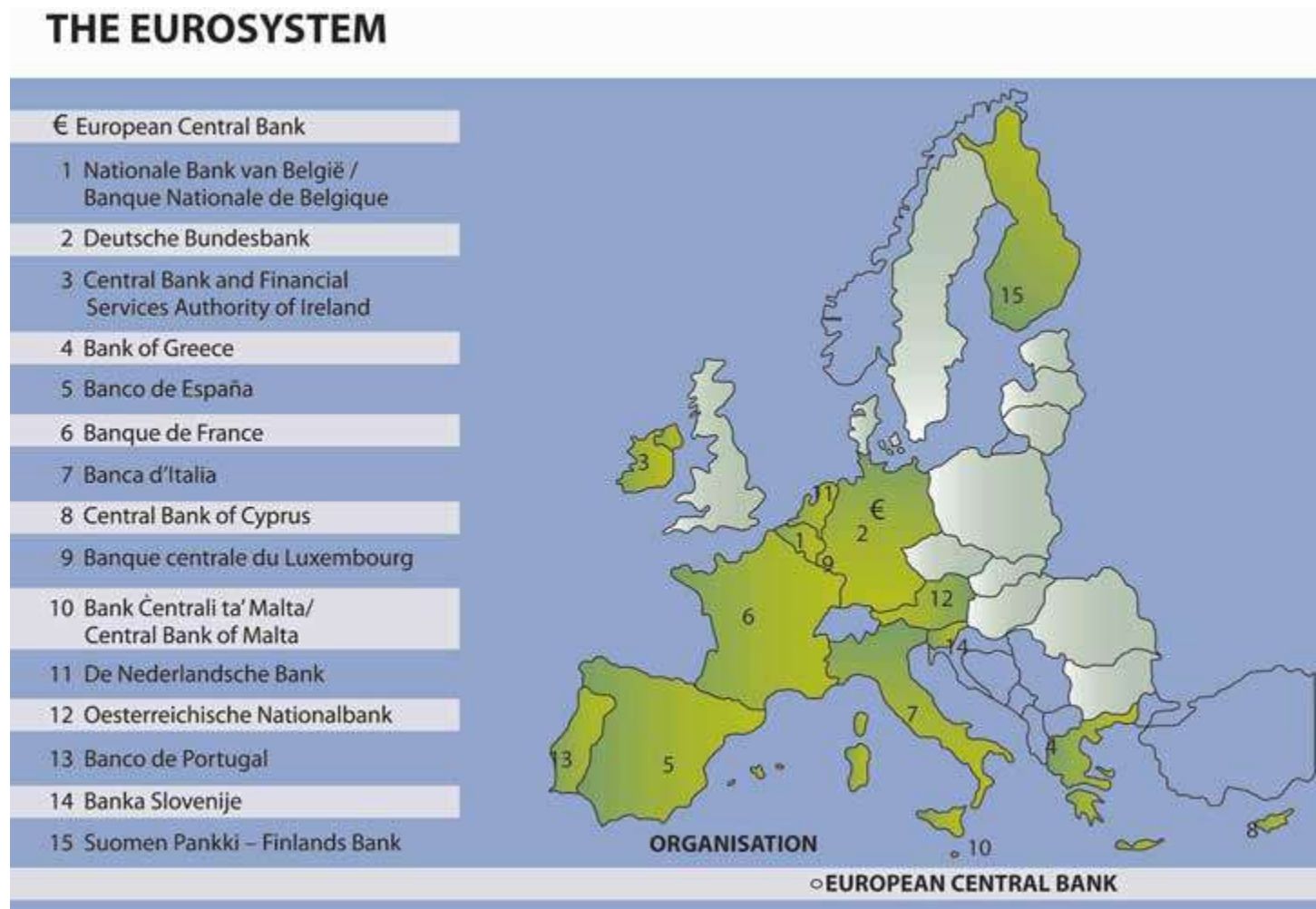
13.3 Other Important Central Banks

LEARNING OBJECTIVE

1. How do other central banks compare to the Fed?

The Fed is the world's most important central bank because the United States has been the world's most important economy since at least World War II. *But the Maastricht Treaty created a contender:* ^[1] *the European Central Bank (ECB),* ^[2] *the central bank of the euro area, the thirteen countries that have adopted the euro as their unit of account: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Slovenia, and Spain (see Figure 13.1 "The Eurozone").*

Figure 13.1 *The Eurozone*



The ECB is part of a larger system, the European System of Central Banks (ESCB), some of the countries of which (Bulgaria, Czech Republic, Denmark, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovakia, Sweden, and the United Kingdom) are part of the European Union but have opted out of the currency union. Other countries in the ESCB, including Denmark, Estonia, Cyprus, Latvia, Lithuania, Malta, and Slovakia, currently link their national currencies to the euro.

The ECB or Eurosystem was consciously modeled on the Fed, so it is not surprising that their structures are similar. Each nation is like a Federal Reserve district headed by its national central bank (NCB). At its headquarters in Frankfurt sits the ECB's Executive Board, the structural equivalent of the Fed's Board of Governors, and the Governing Council, which like the Fed's FOMC makes monetary policy decisions. The ECB is more decentralized than the Fed, however, because the NCBs control their own budgets and conduct their own open market operations. Also unlike the Fed, the ECB does not regulate financial institutions, a task left to each individual country's government. The two central banks, of course, also differ in many matters of detail. The ECB's current head or president is a Frenchman named Jean-Claude Trichet. ^[3]

Three other important central banks, the Bank of England, the Bank of Japan, and the Bank of Canada, look nothing like the Fed or the ECB because they are unitary institutions with no districts. *Although they are more independent than in the past, most are not as independent as the Fed or the ECB.* Despite their structural differences and relative dearth of independence, unit central banks like the Bank of Japan implement monetary policy in ways very similar to the Fed and ECB. ^[4]

KEY TAKEAWAY

- The European Central Bank (ECB), the central bank of the nations that have adopted the euro, and the larger European System of Central Banks (ESCB), of which it is a part, are modeled after the Fed. Nevertheless, numerous differences of detail can be detected. The ECB's national central banks (NCBs), for example, are much more powerful than the Fed's district banks because they control their own budgets and conduct open market operations. Most of the world's other central banks are structured differently than the ECB and the Fed because they are unit banks without districts or branches. Most are less independent than the Fed and ECB but conduct monetary policy in the same ways.



[1] <http://www.eurotreaties.com/maastrichttext.html>

[2] <http://www.ecb.int/home/html/index.en.html>

[3] http://en.wikipedia.org/wiki/President_of_the_European_Central_Bank#Trichet

[4] Dieter Gerdemesier, Francesco Mongelli, and Barbara Roffia, "The Eurosystem, the US Federal Reserve and the Bank of Japan: Similarities and Differences," ECB Working Paper Series No. 742 (March 2007).



13.4 Central Bank Independence

LEARNING OBJECTIVE

1. What is central bank independence, why is it important, and why do independent central bankers prefer lower inflation rates than government officials usually do?

What exactly is central bank independence (sometimes referred to as autonomy) and why is it important? *Independence means just that, independence from the dictates of government, the freedom to conduct monetary policy as central bankers (and not politicians) wish.* Why does it matter whether a central bank is independent or not? [Figure 13.2 "Central bank independence and inflation"](#), the results of a classic study, reveals all.

Figure 13.2 Central bank independence and inflation



Country

Independence

New Zealand

1

Spain

1.5

Italy

1.75

Australia

2

Belgium

2

France

2

Norway

2

Sweden

2

Note that as a country's central bank becomes more independent (as its independence score increases from 1 to 4), its average inflation rate drops. The negative relationship is quite pronounced, producing a correlation coefficient of $-.7976$. The correlation is so strong, in fact, that many believe that independence causes low inflation. Some scholars have argued, however, that the results were rigged, that researchers simply assigned central banks with a good record on inflation with a high independence score. (If this is true, it would destroy the causal implications of the study.) While it is true that rating a central bank's independence is something of an art, there are clear rules to follow. Where there is no rule of law, as in dictatorships, there can be no independence. The central banker must do as he or she is instructed or be sacked or possibly shot. Little wonder, then, that many Latin American and African countries had very high rates of inflation when they were ruled by dictators.

In nations with rule of law, like those in [Figure 13.2 "Central bank independence and inflation"](#), it's best to follow the purse. *If a central bank has control of its own budget, as the Fed and ECB (and some of its predecessors, like the Bundesbank of Germany) do, then the bank is quite independent because it is beholden to no one. The Fed is slightly less independent than the ECB, however, because its existence is not constitutionally guaranteed. (Indeed, as we learned above, the United States had a nasty habit of dispatching its early central banks.) Congress could change or abolish the Fed simply by passing a law and getting the president to sign it or it could override his veto. The ECB, by contrast, was formed by an international treaty, changes to which must be ratified by all the signatories, a chore and a half to achieve, to be sure! Finally, central banks led by people who are appointed are more independent than those led by popularly elected officials. Long, nonrenewable terms are better for independence than short, renewable ones, which tend to induce bankers to curry the favor of whoever decides their fate when their term expires.*

None of this is to say, however, that determining a central bank's independence is easy, particularly when de jure and de facto realities differ. The Bank of Canada's independence is limited by the fact that the Bank Act of 1967 made the government ultimately responsible for Canada's monetary policy. But, in fact, the Canadian government has allowed its central bank to run the money show. The same could be said of the Bank of England. The Bank of Japan's independence was strengthened in 1998 but the Ministry of Finance, a government agency, still controls part of its budget and can request



delays in monetary policy decisions. The current de facto independence of those banks could be undermined and quite quickly at that.

Stop and Think Box

“Bank of Japan Faces Test of Independence,” *Wall Street Journal*, August 10, 2000. “The political storm over a possible interest rate increase by the Bank of Japan is shaping up to be the biggest challenge to the central bank’s independence since it gained autonomy two years ago. Members of the ruling Liberal Democratic Party stepped up pressure on the bank to leave the country’s interest rates where they are now.” Why does the Liberal Democratic Party (LDP) want to influence the Bank of Japan’s (BoJ’s) interest rate policy? Why was the issue important enough to warrant a major article in a major business newspaper?

The LDP wanted to influence the BoJ’s interest rate policy for political reasons, namely, to keep the economy from slowing, a potential threat to its rule. This was an important story because the de facto “independence” of the BoJ was at stake and hence the market’s perception of the Japanese central bank’s ability to raise interest rates to stop inflation in the face of political pressure.

Why, when left to their own devices, are central bankers tougher on inflation than governments, politicians, or the general populace? Partly because they represent bank, business, and creditor interests, all of which are hurt if prices rise quickly and unexpectedly. We learned in [Chapter 9 "Bank Management"](#) that banks are naturally uncomfortable in rising interest rate environments, and in [Chapter 4 "Interest Rates"](#), we saw that inflation invariably brings with it higher rates. Net creditors—economic entities that are owed more than they owe—also dislike inflation because it erodes the real value of the money owed them. Finally, businesses tend to dislike inflation because it increases uncertainty and makes long-term planning difficult. Central bankers also know the damage that inflation can do to an economy, so a public interest motivation drives them as well.

People and the politicians they elect to office, on the other hand, often desire inflation. Many households are net debtors, meaning that they owe more money than is owed to them. Inflation, they know, will decrease the real burden of their debts. Politicians know this, too, so they tend to err on the side of higher rather than lower inflation. Politicians also know that monetary stimulus—increasing the



money supply at a faster rate than usual or lowering the interest rate—can stimulate a short burst of economic growth that will make people happy with the status quo and ready to return incumbents to office. If inflation ensues and the economy turns sour for a while after the election, that is okay because matters will likely sort out before the next election, when politicians will be again inclined to pump out money. *This is called the political business cycle.* Politicians might also want to print money simply to avoid raising direct taxes. The resultant inflation acts like a tax on cash balances (which lose value each day) and blame can be cast on the central bankers.

All in all, then, it is a good idea to have a central bank with a good deal of independence, though some liberals complain that independent central banks aren't sufficiently "democratic." But who says everything should be democratic? Would you want the armed forces run by majority vote? Your company? Your household? Have you heard about the tyranny of the majority?^[1] That's when two wolves and a sheep vote on what's for dinner. Central bank independence is not just about inflation but about how well the overall economy performs. There is no indication that the inflation fighting done by independent central banks in any way harms economic growth or employment in the long run. Keeping the lid on inflation, which can seriously injure national economies, is therefore a very good policy indeed.

Another knock against independent central banks is that they are not very transparent. The Fed, for example, has long been infamous for its secrecy. When forced by law to disclose more information about its actions sooner, it turned to obfuscation. To this day, decoding the FOMC's press releases is an interesting game of semantics. For all its unclear language, the Fed is more open than the ECB, which will not make the minutes of its policy meetings public until twenty years after they take place. It is less transparent, however, than many central banks that publish their economic forecasts and inflation rate targets. As we will see in [Chapter 26 "Rational Expectations Redux: Monetary Policy Implications"](#), theory suggests that central banks should be transparent when trying to stop inflation but opaque when trying to stimulate the economy.

KEY TAKEAWAYS

- Central bank independence is a measure of how free from government influence central bankers are. Independence increases as a central bank controls its own budget; it cannot be destroyed or modified by



mere legislation (or, worse, executive fiat), and it is enhanced when central banks are composed of people serving long, nonrenewable terms. Independence is important because researchers have found that the more independent a central bank is, the lower the inflation it allows without injuring growth and employment goals.

- When unanticipated, inflation redistributes resources from net creditors to net debtors, creates uncertainty, and raises nominal interest rates, hurting economic growth.
- Independent central bankers represent bank, business, and net creditor interests that are hurt by high levels of inflation. Elected officials represent voters, many of whom are net debtors, and hence beneficiaries of debt-eroding inflationary measures.
- They also know that well-timed monetary stimulus can help them obtain re-election by inducing economic growth in the months leading up to the election. The inflation that follows will bring some pain, but there will be time for correction before the next election. Governments where officials are not elected, as in dictatorships, often have difficulty collecting taxes, so they use the central bank as a source of revenue, simply printing money (creating bank deposits) to make payments. High levels of inflation act as a sort of currency tax, a tax on cash balances that lose some of their purchasing power each day.

[1] http://xroads.virginia.edu/~hyper/detoc/1_ch15.htm



13.5 Suggested Reading

Bremner, Robert. *Chairman of the Fed: William McChesney Martin Jr. and the Creation of the American Financial System*. New Haven, CT: Yale University Press, 2004.

Bruner, Robert, and Sean Carr. *The Panic of 1907: Lessons Learned from the Market's Perfect Storm*. Hoboken, NJ: John Wiley and Sons, 2007.

Clark, William Roberts. *Capitalism, Not Globalismml: Capital Mobility, Central Bank Independence, and the Political Control of the Economy*. Ann Arbor, MI: University of Michigan Press, 2005.

Meltzer, Allan. *A History of the Federal Reserve, Volume 1: 1913–1951*. Chicago, IL: University of Chicago Press, 2003.

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Chapter 14

The Money Supply Process

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Describe who determines the money supply.
2. Explain how the central bank's balance sheet differs from the balance sheets of commercial banks and other depository institutions.
3. Define the monetary base and explain its importance.
4. Define open market operations and explain how they affect the monetary base.
5. Describe the multiple deposit creation process.
6. Define the simple deposit multiplier and explain its information content.
7. List and explain the two major limitations or assumptions of the simple deposit multiplier.



14.1 The Central Bank's Balance Sheet

LEARNING OBJECTIVES

1. Who determines the money supply?
2. How does the central bank's balance sheet differ from the balance sheets of other banks?
3. What is the monetary base?

Ultimately the money supply is determined by the interaction of four groups: commercial banks and other depositories, depositors, borrowers, and the central bank. Like any bank, the central bank's balance sheet is composed of assets and liabilities. Its assets are similar to those of common banks and include government securities ^[1] and discount loans. The former provide the central bank with income and a liquid asset that it can easily and cheaply buy and sell to alter its balance sheet. The latter are generally loans made to commercial banks. So far, so good. *The central bank's liabilities, however, differ fundamentally from those of common banks.* Its most important liabilities are currency in circulation and reserves.

Yes, currency and reserves. You may recall from [Chapter 9 "Bank Management"](#) that those are the assets of commercial banks. *In fact, for everyone but the central bank, the central bank's notes, Federal Reserve notes (FRN) in the United States, are assets, things owned. But for the central bank, its notes are things owed (liabilities), just like your promissory note (IOU) would be your liability, but it would be an asset for the note's holder or owner.* Similarly, commercial banks own their deposits in the Fed (reserves), which the Fed, of course, owes to the commercial banks. So reserves are commercial bank assets but central bank liabilities.

Currency in circulation (C) and reserves (R) compose the monetary base (MB, aka high-powered money), the most basic building blocks of the money supply. Basically, $MB = C + R$, an equation you'll want to internalize. In the United States, C includes FRN and coins issued by the U.S. Treasury. We can ignore the latter because it is a relatively small percentage of the MB, and the Treasury cannot legally manage the volume of coinage in circulation in an active fashion, but rather only meets the demand for each denomination: .01, .05, .10, .25, .50, and 1.00 coins. (The Fed also supplies the \$1.00 unit, and for some reason Americans prefer \$1 notes to coins. In most countries, coins fill



demand for the single currency unit denomination.) C includes only FRN and coins in the hands of nonbanks. Any FRN in banks is called vault cash and is included in R, which also includes bank deposits with the Fed. Reserves are of two types: those required or mandated by the central bank (RR), and any additional or excess reserves (ER) that banks wish to hold. The latter are usually small, but they can grow substantially during panics like that of September–October 2008.

Central banks, of course, are highly profitable institutions because their assets earn interest but their liabilities are costless, or nearly so. Therefore, they have no gap problems, and liquidity management is a snap because they can always print more notes or create more reserves. Central banks anachronistically own prodigious quantities of gold, but some have begun to sell off their holdings because they no longer convert their notes into gold or anything else for that matter. ^[2] Gold is no longer part of the MB but is rather just a commodity with an unusually high value-to-weight ratio.

KEY TAKEAWAYS

- The central bank, depository institutions of every stripe, borrowers, and depositors all help to determine the money supply.
- The central bank helps to determine the money supply by controlling the monetary base (MB), aka high-powered money or its monetary liabilities.
- The central bank's balance sheet differs from those of other banks because its monetary liabilities, currency in circulation (C) and reserves (R), are everyone else's assets.
- The monetary base or $MB = C + R$, where C = currency in circulation (not in the central bank or any bank); R = reserves = bank vault cash and deposits with the central bank.
- MB is important because an increase (decrease) in it will increase (decrease) the money supply (M1—currency plus checkable deposits, M2—M1 plus time deposits and retail money market deposit accounts, etc.) by some multiple (hence the “high-powered” nickname).

[1] Students sometimes become confused about this because they think the central bank *is* the government. At most, it is part of the government, and not the part that issues the bonds. Sometimes, as in the case of the BUS and SBUS, it is not part of the government at all.

[2] <http://news.goldseek.com/GoldSeek/1177619058.php>



14.2 Open Market Operations

LEARNING OBJECTIVE

1. What are open market operations and how do they affect the monetary base?

We are now ready to understand how the central bank influences the money supply (MS) with the aid of the T-accounts we first encountered in [Chapter 9 "Bank Management"](#). *Central banks like the Fed influence the MS via the MB. They control their monetary liabilities, MB, by buying and selling securities, a process called open market operations.* If a central bank wants to increase the MB, it need only buy a security. (Any asset will do, but securities, especially government bonds, are generally best because there is little default risk, liquidity is high, and they pay interest.) If a central bank bought a \$10,000 bond from a bank, the following would occur:

Banking System	
Assets	Liabilities
Securities -\$10,000	
Reserves +\$10,000	

The banking system would lose \$10,000 worth of securities but gain \$10,000 of reserves (probably a credit in its account with the central bank but, as noted above, FRN or other forms of cash also count as reserves).

Central Bank	
Assets	Liabilities
Securities +\$10,000	Reserves +\$10,000

The central bank would gain \$10,000 of securities essentially by creating \$10,000 of reserves. Notice that the item transferred, securities, has opposite signs, negative for the banking system and positive for the central bank. That makes good sense if you think about it because one party is selling (giving up) and the other is buying (receiving). Note also that the central bank's liability has the same sign as the banking system's asset. That too makes sense because, as noted above, the central bank's



liabilities are everyone else's assets. So if the central bank's liabilities increase or decrease, everyone else's assets should do likewise.

If the central bank happens to buy a bond from the public (any nonbank), and that entity deposits the proceeds in its bank, precisely the same outcome would occur, though via a slightly more circuitous route:

Some Dude	
Assets	Liabilities
Securities -\$10,000	
Checkable deposits +\$10,000	
Banking System	
Assets	Liabilities
Reserves +\$10,000	Checkable deposits +\$10,000
Central Bank	
Assets	Liabilities
Securities +\$10,000	Reserves +\$10,000

If the nonbank seller of the security keeps the proceeds as cash (FRN), however, the outcome is slightly different:

Some Dude	
Assets	Liabilities
Securities -\$10,000	
Currency +\$10,000	
Central Bank	
Assets	Liabilities
Securities +\$10,000	Currency in circulation +\$10,000

Note that in either case, however, the MB increases by the amount of the purchase because either C or R increases by the amount of the purchase. Keep in mind that currency in circulation means cash (like FRN) no longer in the central bank. An IOU in the hands of its maker is no liability; cash in the hands of its issuer is not a liability. So although the money existed physically before Some Dude sold his bond, it did not exist economically as money until it left its papa (mama?), the central bank. If the



transaction were reversed and Some Dude bought a bond from the central bank with currency, the notes he paid would cease to be money, and currency in circulation would decrease by \$10,000.

In fact, whenever the central bank *sells* an asset, the exact opposite of the above T-accounts occurs: *the MB shrinks because C (and/or R) decreases along with the central bank's securities holdings, and banks or the nonbank public own more securities but less C or R.*

The nonbank public can influence the relative share of C and R but not the MB. Say that you had \$55.50 in your bank account but wanted \$30 in cash to take your significant other to the carnival. Your T-account would look like the following because you turned \$30 of deposits into \$30 of FRN:

Your T-Account	
Assets	Liabilities
Checkable deposits -\$30.00	
Currency +\$30.00	

Your bank's T-account would look like the following because it lost \$30 of deposits and \$30 of reserves, the \$30 you walked off with:

Your Bank	
Assets	Liabilities
Reserves -\$30.00	Checkable deposits -\$30.00

The central bank's T-account would look like the following because the nonbank public (you!) would hold \$30 and your bank's reserves would decrease accordingly (as noted above):

Central Bank	
Assets	Liabilities
	Currency in circulation \$30.00
	Reserves -\$30.00

The central bank can also control the monetary base by making loans to banks and receiving their loan repayments. A loan increases the MB and a repayment decreases it. A \$1 million loan and repayment a week later looks like this:



Central Bank		
Assets	Liabilities	Date
Loans +\$1,000,000	Reserves +\$1,000,000	January 1, 2010
Loans -\$1,000,000	Reserves -\$1,000,000	January 8, 2010
Banking System		
Assets	Liabilities	Date
Reserves +\$1,000,000	Borrowings +\$1,000,000	January 1, 2010
Reserves -\$1,000,000	Borrowings -\$1,000,000	January 8, 2010

Take time now to practice deciphering the effects of open market operations and central bank loans and repayments via T-accounts in Exercise 1. You'll be glad you did.

EXERCISES

Use T-accounts to describe what happens in the following instances:

1. The Bank of Japan **sells** ¥10 billion of securities to banks.
2. The Bank of England **buys** £97 million of securities from banks.
3. Banks **borrow** €897 million from the ECB.
4. Banks **repay** \$C80 million of loans to the Bank of Canada.
5. The Fed **buys** \$75 billion of securities from the nonbank public, which deposits \$70 billion and keeps \$5 billion in cash.

KEY TAKEAWAYS

- Open market operations occur whenever a central bank buys or sells assets, usually government bonds.
- By purchasing bonds (or anything else for that matter), the central bank increases the monetary base and hence, by some multiple, the money supply. (Picture the central bank giving up some money to acquire the bond, thereby putting FRN or reserves into circulation.)
- By selling bonds, the central bank decreases the monetary base and hence the money supply by some multiple. (Picture the central bank giving up a bond and receiving money for it, removing FRN or reserves from circulation.)
- Similarly, the MB and MS increase whenever the Fed makes a loan, and they decrease whenever a borrower repays the Fed.



14.3 A Simple Model of Multiple Deposit Creation

LEARNING OBJECTIVES

1. What is the multiple deposit creation process?
2. What is the money multiplier?
3. What are the major limitations of the simple deposit multiplier?

As shown above, *the central bank pretty much controls the size of the monetary base.* (The check clearing process and the government's banking activities can cause some short-term flutter, but generally the central bank can anticipate such fluctuations and respond accordingly.) *That does not mean, however, that the central bank controls the money supply, which, if you recall from Chapter 3 "Money", consists of more than just MB.* (M1, for example, also includes checkable deposits.) The reason is that each \$1 (or €1, etc.) of additional MB creates some multiple > 1 of new deposits in a process called multiple deposit creation.

Suppose the central bank buys \$1 million of securities from Some Bank. We know that the following will occur:

Some Bank	
	Liabilities
Securities -\$1 million	
Reserves +\$1 million	
Central Bank	
Assets	Liabilities
Securities +\$1 million	Reserves +\$1 million

Some Bank suddenly has \$1 million in excess reserves. (Its deposits are unchanged, but it has \$1 million more in cash.) What will the bank do? Likely what banks do best: make loans. So its T-account will be the following:

Some Bank	
Assets	Liabilities
Loans +\$1 million	Deposits +\$1 million



Recall from [Chapter 9 "Bank Management"](#) that deposits are created in the process of making the loan. The bank has effectively increased M1 by \$1 million. The borrower will not leave the proceeds of the loan in the bank for long but instead will use it, within the guidelines set by the loan's covenants, to make payments. As the deposits flow out of Some Bank, its excess reserves decline until finally Some Bank has essentially swapped securities for loans:

Some Bank	
Assets	Liabilities
Securities -\$1 million	
Loans +\$1 million	

But now there is another \$1 million of checkable deposits out there and they rarely rest. Suppose, for simplicity's sake, they all end up at Another Bank. Its T-account would be the following:

Another Bank	
Assets Bank	Liabilities
Reserves +\$1 million	Checkable deposits +\$1 million

If the required reserve ratio (rr) is 10 percent, Another Bank can, and likely will, use those deposits to fund a loan, making its T-account:

Another Bank	
Assets	Liabilities
Reserves +\$.1 million	Checkable Deposits +\$1 million
Loans +\$.9 million	

That loan will also eventually be paid out to others and deposited into other banks, which in turn will lend 90 percent of them ($1 - rr$) to other borrowers. Even if a bank decides to invest in securities instead of loans, as long as it buys the bonds from anyone but the central bank, the multiple deposit creation expansion will continue, as in [Figure 14.1 "Multiple deposit creation, with an increase in reserves of \\$1 million, if \$rr = .10\$ "](#).

Figure 14.1 Multiple deposit creation, with an increase in reserves of \$1 million, if $rr = .10$



Bank	Increase in Deposits (\$)	Increase in Loans (\$)	Increase in Reserves (\$)
Some	0	1,000,000	0
Another	1,000,000	900,000	100,000
Yet Another	900,000	810,000	90,000
Still Another	810,000	729,000	81,000
You Get the Picture	729,000	656,100	72,900
...
Totals	\$10 million	\$10 million	\$1 million

Notice that the increase in deposits is the same as the increase in loans from the previous bank. The increase in reserves is the increase in deposits times the required reserve ratio of .10, and the increase in loans is the increase in deposits times the remainder, .90. Rather than working through this rather clunky process every time, you can calculate the effects of increasing reserves with the so-called *simple deposit multiplier formula*:

$$\Delta D = (1/rr) \times \Delta R$$

where:

ΔD = change in deposits

ΔR = change in reserves

Rr = required reserve ratio

$1/.1 \times 1 \text{ million} = 10 \text{ million}$, just as in [Figure 14.1 "Multiple deposit creation, with an increase in reserves of \\$1 million, if rr = .10"](#)

Practice calculating the simple deposit multiplier in Exercise 2.

EXERCISE

1. Use the simple deposit multiplier $\Delta D = (1/rr) \times \Delta R$ to calculate the change in deposits given the following conditions:

Required Reserve Ratio	Change in Reserves	Answer: Change in Deposits
.1	10	100
.5	10	20
1	10	10
.1	-10	-100
.1	100	1,000
0	43.5	ERROR—cannot divide by 0

Stop and Think Box

Suppose the Federal Reserve wants to increase the amount of checkable deposits by \$1,000,000 by conducting open market operations. Using the simple model of multiple deposit creation, determine what value of securities the Fed should purchase, assuming a required reserve ratio of 5 percent. What two major assumptions does the simple model of multiple deposit creation make? Show the appropriate equation and work.

The Fed should purchase \$50,000 worth of securities. The simple model of multiple deposit creation is $\Delta D = (1/rr) \times \Delta R$, which of course is the same as $\Delta R = \Delta D / (1/rr)$. So for this problem $1,000,000 / (1/.05) = \$50,000$ worth of securities should be purchased. This model assumes that money is not held as cash and that banks do not hold excess reserves.

Pretty easy, eh? *Too bad the simple deposit multiplier isn't very accurate.* It provides an upper bound to the deposit creation process. The model simply isn't very realistic. Sometimes banks hold excess reserves, and people sometimes prefer to hold cash instead of deposits, thereby stopping the multiple deposit creation process cold. That is why, at the beginning of the chapter, we said that depositors, borrowers, and banks were also important players in the money supply determination process. In the next chapter, we'll take their decisions into account.

KEY TAKEAWAYS

- The multiple deposit creation process works like this: say that the central bank buys \$100 of securities from Bank 1, which lends the \$100 in cash it receives to some borrower. Said borrower writes checks



against the \$100 in deposits created by the loan until all the money rests in Bank 2. Its deposits and reserves increased by \$100, Bank 2 lends as much as it can, say $(1 - rr = .9)$ or \$90, to another borrower, who writes checks against it until it winds up in Bank 3, which also lends 90 percent of it. Bank 4 lends 90 percent of that, Bank 5 lends 90 percent of that, and so on, until a \$100 initial increase in reserves has led to a \$1,000 increase in deposits (and loans).

- The simple deposit multiplier is $\Delta D = (1/rr) \times \Delta R$, where ΔD = change in deposits; ΔR = change in reserves; rr = required reserve ratio.
- The simple deposit multiplier assumes that banks hold no excess reserves and that the public holds no currency. We all know what happens when we assume or *ass|u|me*. These assumptions mean that the simple deposit multiplier overestimates the multiple deposit creation process, providing us with an upper-bound estimate.



14.4 Suggested Reading

Hummel, William. *Money: What It Is, How It Works* 2nd ed. Bloomington, IN: iUniverse, 2006.

Mayes, David, and Jan Toporowski. *Open Market Operations and Financial Markets*. New York: Routledge, 2007.



Chapter 15

The Money Supply and the Money Multiplier

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Compare and contrast the simple money multiplier developed in and the m_1 and m_2 multipliers developed in this chapter.
2. Write the equation that helps us to understand how changes in the monetary base affect the money supply.
3. Explain why the M2 multiplier is almost always larger than the m_1 multiplier.
4. Explain why the required reserve ratio, the excess reserve ratio, and the currency ratio are in the denominator of the m_1 and m_2 money multipliers.
5. Explain why the currency, time deposit, and money market mutual fund ratios are in the numerator of the M2 money multiplier.
6. Describe how central banks influence the money supply.
7. Describe how banks, borrowers, and depositors influence the money supply.



15.1 A More Sophisticated Money Multiplier for M1

LEARNING OBJECTIVES

1. How do the simple money multiplier and the more sophisticated one developed here contrast and compare?
2. What equation helps us to understand how changes in the monetary base affect the money supply?

In [Chapter 14 "The Money Supply Process"](#), you learned that an increase (decrease) in the monetary base (MB, which = C + R) leads to an even greater increase (decrease) in the money supply (MS, such as M1 or M2) due to the multiple deposit creation process. You also learned a simple but unrealistic upper-bound formula for estimating the change that assumed that banks hold no excess reserves and that the public holds no currency.

Stop and Think Box

You are a research associate for Moody's subsidiary, High Frequency Economics, in West Chester, Pennsylvania. A client wants you to project changes in M1 given likely increases in the monetary base. Because of a glitch in the Federal Reserve's computer systems, currency, deposit, and excess reserve figures will not be available for at least one week. A private firm, however, can provide you with good estimates of changes in banking system reserves, and of course the required reserve ratio is well known. What equation can you use to help your client? What are the equation's assumptions and limitations?

You cannot use the more complex M1 money multiplier this week because of the Fed's computer glitch, so you should use the simple deposit multiplier from [Chapter 14 "The Money Supply Process"](#): $\Delta D = (1/rr) \times \Delta R$. The equation provides an upper-bound estimate for changes in deposits. It assumes that the public will hold no more currency and that banks will hold no increased excess reserves.

To get a more realistic estimate, we'll have to do a little more work. *We start with the observation that we can consider the money supply to be a function of the monetary base times some money multiplier (m):*

$$\Delta MS = m \times \Delta MB$$



This is basically a less specific version of the formula you learned in [Chapter 14 "The Money Supply Process"](#), except that instead of calculating the change in deposits (ΔD) brought about by the change in reserves (ΔR), we will now calculate the change in the money supply (ΔMS) brought about by the change in the monetary base (ΔMB). *Furthermore, instead of using the reciprocal of the required reserve ratio ($1/rr$) as the multiplier, we will use a more sophisticated one (m_1 , and later M_2) that doesn't assume away cash and excess reserves.*

We can add currency and excess reserves to the equation by algebraically describing their relationship to checkable deposits in the form of a ratio:

C/D = currency ratio

ER/D = excess reserves ratio

Recall that required reserves are equal to checkable deposits (D) times the required reserve ratio (rr).

Total reserves equal required reserves plus excess reserves:

$$R = rrD + ER$$

So we can render $MB = C + R$ as $MB = C + rrD + ER$. Note that we have successfully removed C and ER from the multiple deposit expansion process by separating them from rrD . After further algebraic manipulations of the above equation and the reciprocal of the reserve ratio ($1/rr$) concept embedded in the simple deposit multiplier, we're left with a more sophisticated, more realistic money multiplier:

$$m_1 = 1 + (C/D) / [rr + (ER/D) + (C/D)]$$

So if

Required reserve ratio (rr) = .2

Currency in circulation = \$100 billion

Deposits = \$400 billion

Excess reserves = \$10 billion



$$m_1 = 1 + (100/400) / (.2 + (10/400) + (100/400))$$

$$m_1 = 1.25 / (.2 + .025 + .25)$$

$$m_1 = 1.25 / .475 = 2.6316$$

Practice calculating the money multiplier in Exercise 1.

EXERCISES

1. Given the following, calculate the M1 money multiplier using the formula $m_1 = 1 + (C/D) / [rr + (ER/D) + (C/D)]$.

Currency	Deposits	Excess Reserves	Required Reserve Ratio	Answer: m_1
100	100	10	.1	1.67
100	100	10	.2	1.54
100	1,000	10	.2	3.55
1,000	100	10	.2	1.07
1,000	100	50	.2	1.02
100	1,000	50	.2	3.14
100	1,000	0	1	1

2. Once you have m , plug it into the formula $\Delta MS = m \times \Delta MB$. So if $m_1 = 2.6316$ and the monetary base increases by \$100,000, the money supply will increase by \$263,160. If $m_1 = 4.5$ and MB decreases by \$1 million, the money supply will decrease by \$4.5 million, and so forth. Practice this in Exercise 2.

3. Calculate the change in the money supply given the following:

Change in MB	m_1	Answer: Change in MS
100	2	200
100	4	400
-100	2	-200
-100	4	-400
1,000	2	2,000
-1,000	2	-2,000
10,000	1	10,000
-10,000	1	-10,000

Stop and Think Box



Explain Figure 15.1 "U.S. MB and M1, 1959–2007", Figure 15.2 "U.S. m", and Figure 15.3 "U.S. currency and checkable deposits, 1959–2007".

Figure 15.1 U.S. MB and M1, 1959–2007

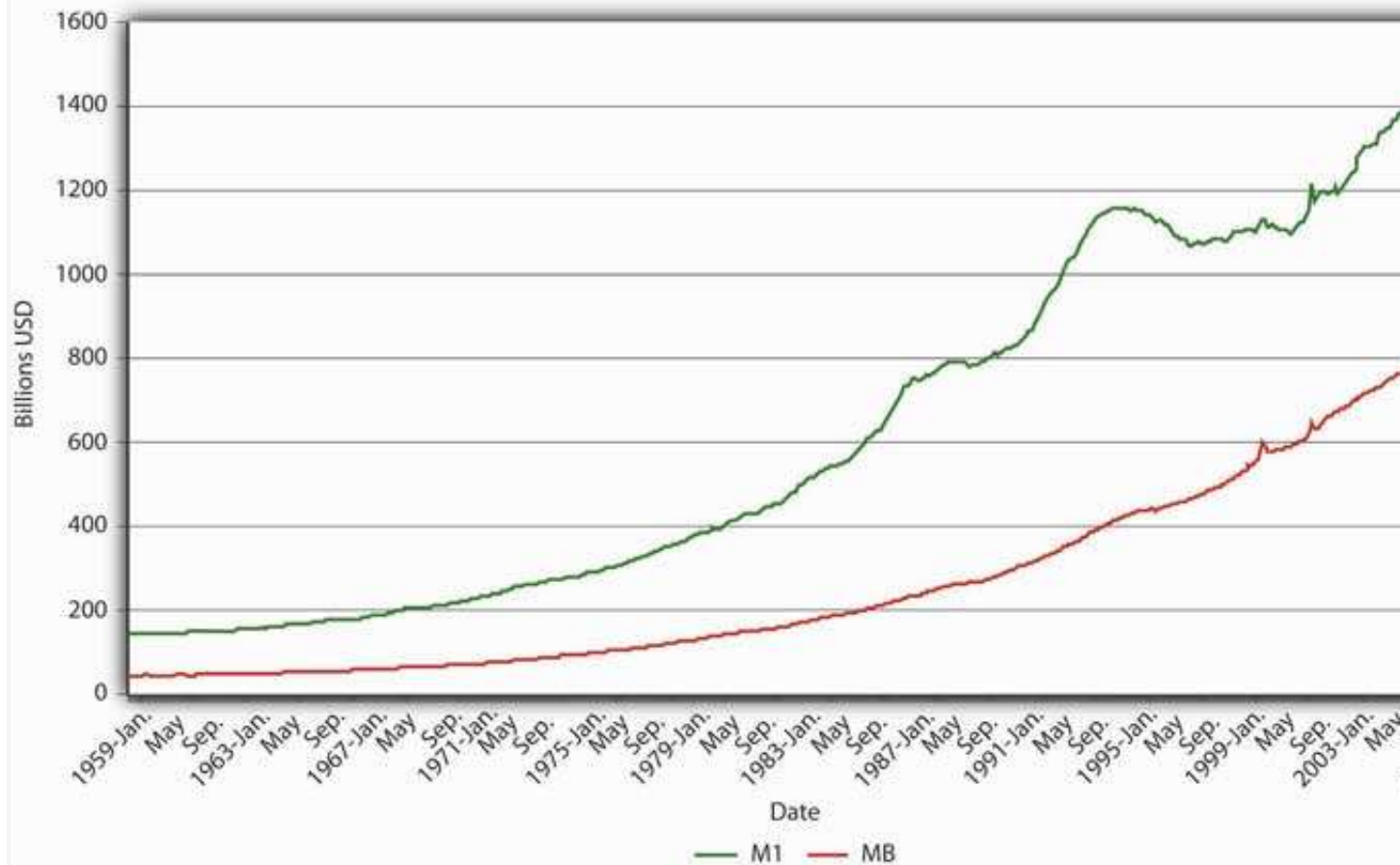


Figure 15.2 U.S. m, 1959–2007.

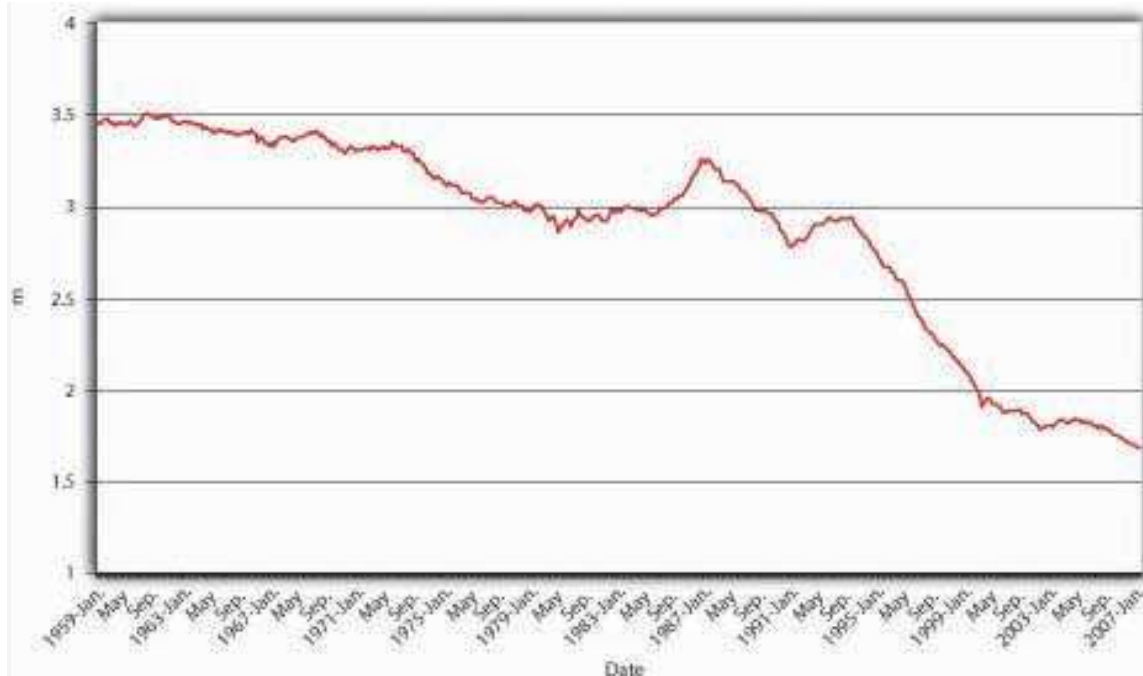


Figure 15.3 U.S. currency and checkable deposits, 1959–2007

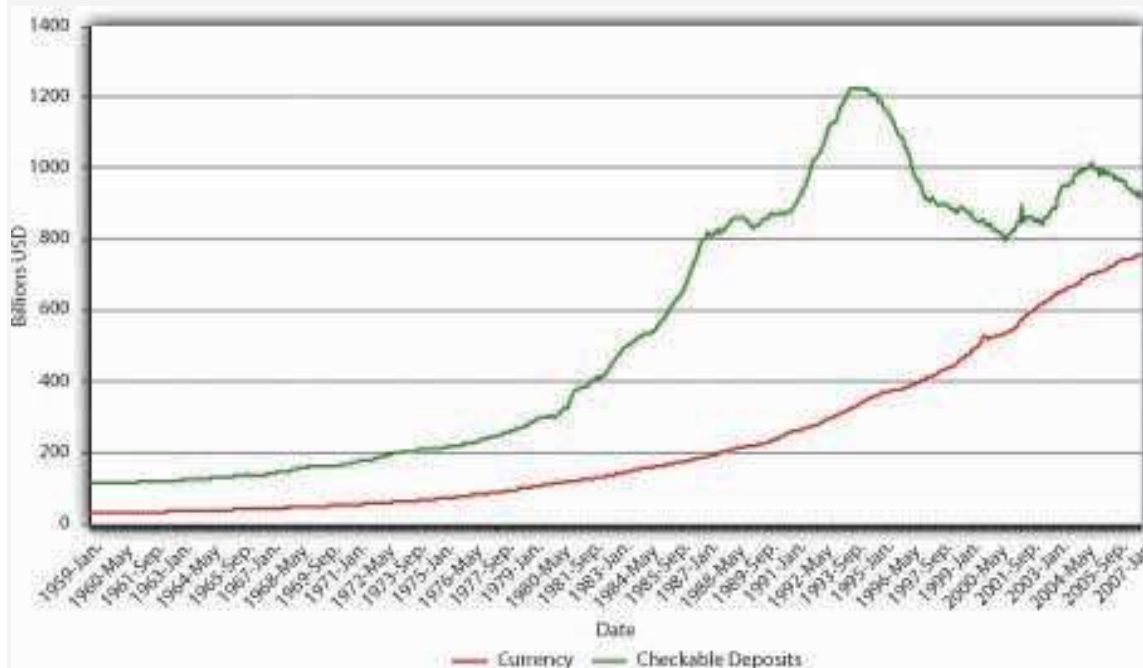
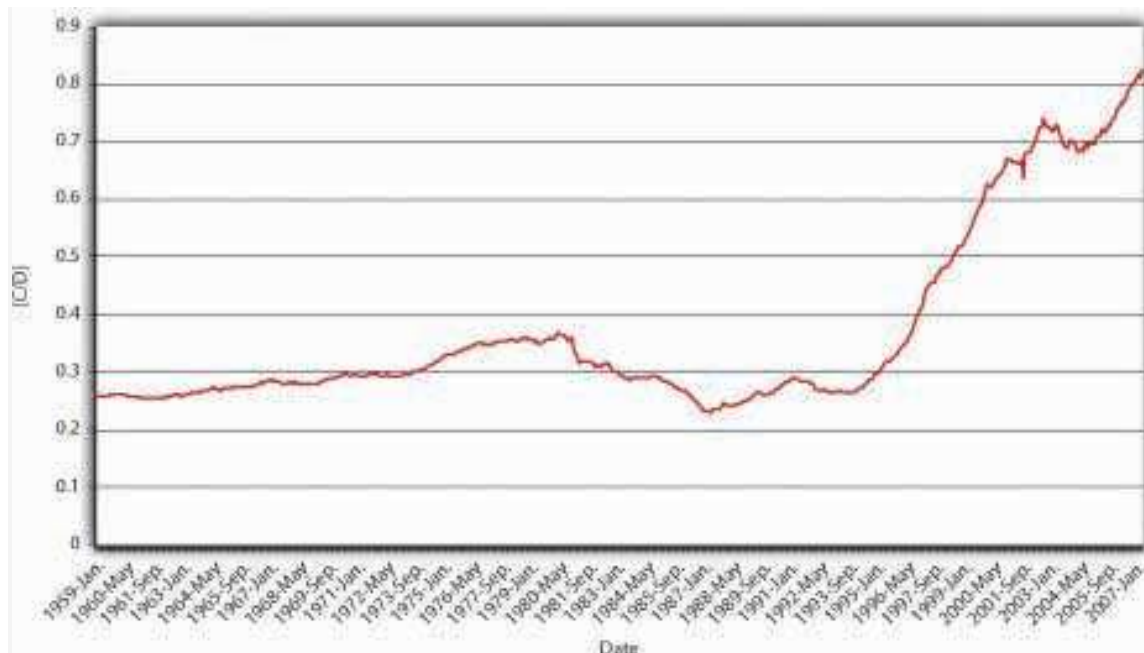


Figure 15.4 U.S. currency ratio, 1959–2007



In Figure 15.1 "U.S. MB and M1, 1959–2007", M1 has increased because MB has increased, likely due to net open market purchases by the Fed. Apparently, m_1 has changed rather markedly since the early 1990s. In Figure 15.2 "U.S. m ", the M1 money multiplier m has indeed dropped considerably since about 1995. That could be caused by an increase in rr , C/D , or ER/D . Figure 15.3 "U.S. currency and checkable deposits, 1959–2007" shows that m decreased primarily because C/D increased. It also shows that the increase in C/D was due largely to the stagnation in D coupled with the continued growth of C . The stagnation in D is likely due to the advent of sweep accounts. Figure 15.4 "U.S. currency ratio, 1959–2007" isolates C/D for closer study.

KEY TAKEAWAYS

- The money multipliers are the same because they equate changes in the money supply to changes in the monetary base times some multiplier.
- The money multipliers differ because the simple multiplier is merely the reciprocal of the required reserve ratio, while the other multipliers account for cash and excess reserve leakages.
- Therefore, m_1 and m_2 are always smaller than $1/rr$ (except in the rare case where C and ER both = 0).
- $\Delta MS = m \times \Delta MB$, where ΔMS = change in the money supply; m = the money multiplier; ΔMB = change in the monetary base. A positive sign means an increase in the MS; a negative sign means a decrease.

15.2 The M2 Money Multiplier

LEARNING OBJECTIVES

1. Why is the M2 multiplier almost always larger than the M1 multiplier?
2. Why are the required reserve ratio, the excess reserve ratio, and the currency ratio in the denominator of the m_1 and m_2 money multipliers?
3. Why are the currency, time deposit, and money market mutual fund ratios in the numerator of the m_2 money multiplier?

Note that m_1 is the M1 money multiplier. With a little bit more work, one can also calculate the M2 money multiplier (m_2). Recall from [Chapter 3 "Money"](#) that $M2 = C + D + T + MMF$, where T = time and savings deposits and MMF = money market funds, money market deposit accounts, and overnight loans. We account for the extra types of deposits in the same way as we accounted for currency and excess reserves, by expressing them as ratios against checkable deposits:

(T/D) = time deposit ratio

(MMF/D) = money market ratio

which leads to the following equation:

$$m_2 = \frac{1 + (C/D) + (T/D) + (MMF/D)}{[rr + (ER/D) + (C/D)]}$$

Once you calculate M2, multiply it by the change in MB to calculate the change in the MS, specifically in M2, just as you did in Exercise 2. Notice that the denominator of the m_2 equation is the same as the m_1 equation but that we have added the time and money market ratios to the numerator. So M2 is always ^[1] $> m_1$, ceteris paribus, which makes sense when you recall that M2 is composed of M1 plus other forms of money. To verify this, recall that we calculated m_1 as 2.6316 when

Required reserves (rr) = .2

Currency in circulation = \$100 million

Deposits = \$400 million



Excess reserves = \$10 million

We'll now add time deposits of \$900 million and money market funds of \$800 million and calculate M2:

$$m2 = 1 + (C/D) + (T/D) + (MMF/D) / [rr + (ER/D) + (C/D)]$$

$$m2 = 1 + (100/400) + (900/400) + (800/400) / [.2 + (10/400) + (100/400)]$$

$$m2 = 1 + .25 + 2.25 + 2 / (.2 + .005 + .25)$$

$$m2 = 5.5 / .455 = 12.0879$$

This is quite a bit higher than m_1 , because time deposits and money market funds are not subject to reserve requirements, so they can expand more than checkable deposits because there is less drag on them during the multiple expansion process.

Practice calculating the M2 money multiplier on your own in the exercise.

EXERCISE

1. Calculate the M2 money multiplier using the following formula: $M2 = 1 + (C/D) + (T/D) + (MMF/D) / [rr + (ER/D) + (C/D)]$.

Currency	Deposits	Excess Reserves	Required Reserve Ratio	Time Deposits	Money Market Funds	Answer: M2
100	100	10	0.1	1,000	1,000	18.33
100	100	10	0.2	1,000	100	10
100	100	10	0.2	100	1,000	10
1,000	100	10	0.2	1,000	1,000	3.01
1,000	100	50	0.2	1,000	1,000	2.90
100	1,000	50	0.2	1,000	1,000	8.86
100	1,000	0	1	1,000	1,000	2.82
100	1	10	0.1	1,000	1,000	19.08

KEY TAKEAWAYS

- Because M1 is part of M2, M2 is always $>$ M1 (except in the rare case where time deposits and money market funds = 0, in which case $M1 = M2$).



- That fact is reflected in the inclusion of the time deposit and money market fund ratios in the numerator of the M2 multiplier equation.
- Moreover, no reserves are required for time and money market funds, so they will have more multiple expansion than checkable deposits will.
- The required reserve ratio, the excess reserve ratio, and the currency ratio appear in the denominator of the m_1 and M2 money multipliers because all three slow the multiple deposit creation process. The higher the reserve ratios (required and excess), the smaller the sum available to make loans from a given deposit. The more cash, the smaller the deposit.
- The currency, time deposit, and money market mutual fund ratios are in the numerator of the M2 money multiplier because M2 is composed of currency, checkable deposits, time deposits, and money market mutual funds.

[1] M2 would equal m_1 iff $T = 0$ and $MMF = 0$, which is highly unlikely. Note: iff means if and only if.



15.3 Summary and Explanation

LEARNING OBJECTIVE

1. How do central banks, banks, depositors, and borrowers influence the money supply?

By way of summary, *Figure 15.5 "Major influences on m_1 "* explains why each of the major variables influences m_1 and m_2 in the ways implied by the equations presented above.

Figure 15.5 Major influences on m_1 and m_2

Variable	Change	MS Response	Rationale
rr	Up	Down	Less multiple deposit expansion
(ER/D)	Up	Down	Less multiple deposit expansion
(C/D)	Up	Down	Less multiple deposit expansion
(T/D)	Up	Up	More multiple deposit expansion
(MMF/D)	Up	Up	More multiple deposit expansion

As we saw in *Chapter 14 "The Money Supply Process"*, currency holdings, excess reserves, and required reserves slow down the multiple deposit creation process by removing funds from it. The bigger rr and ER/D are, the less each bank lends of the new deposits it receives. The bigger C/D is, the less money is deposited in the first place. For those reasons, we place those variables in the denominator. The larger the denominator, holding the numerator constant, the smaller m_1 , or $M2$ will be, of course. The appropriate money supply components compose the numerator—currency, and checkable deposits for m_1 , and currency, checkable deposits, time deposits, and money market mutual funds compose the numerator for $M2$.

This leaves us to consider why C/D , rr , and ER/D change over time. *Short term, the currency ratio varies directly with the interest rate and the stability of the banking system.* As the interest rate increases, the opportunity cost of keeping cash increases, so people are less anxious to hold it. People

are also less anxious to hold currency if the banking system is stable because their money is safer in a checking deposit. If interest rates are extremely low or people believe the banks might be shaky, they naturally want to hold more physical cash. *Longer term, C/D may be influenced by technology and loophole mining, encouraging bankers and depositors to eschew traditional checkable deposits in favor of sweep accounts.*

The required reserve ratio is mandated by the central bank but, as noted in [Chapter 10 "Innovation and Structure in Banking and Finance"](#), loophole mining and technology have rendered it less important in recent years because sweep accounts allow banks to minimize the de jure level of their checkable deposits. *In many places, rr is no longer a binding constraint on banks so, as we'll see, most central banks no longer consider changing it as an effective monetary policy tool.* (This in no way affects the money multiplier, which would provide the same figure for m_1 or M_2 whether we calculate them as above or replace rr and ER/D with R/D , where R = total reserves.)

Stop and Think Box

Prove the assertion made above: "This in no way affects the money multiplier, which would provide the same figure for m_1 or M_2 whether we calculate them as above or replace rr and ER/D with R/D , where R = total reserves." Suppose that $C = 100$, $R = 200$, and $D = 500$ and that R is composed of required reserves of 100 and excess reserves of 100. That means that rr must equal $.2(100/500)$.

Under the formula provided in the text,

$$m_1 = 1 + (C/D) / [rr + (ER/D) + (C/D)]$$

$$m_1 = 1 + .2 / .2 + .2 + .2 = 1.2 / .6 = 2.0$$

Under the formula suggested above,

$$m_1 = 1 + (C/D) / [(R/D) + (C/D)]$$

$$m_1 = 1.2 / .4 + 2 = 2.0$$

Excess reserves (or just reserves in a system without required reserves) are inversely related to the interest rate. In the early 1960s and early 2000s, when the interest rate was well less than 5 percent, ER/D was high, at .003 to .004. In the 1970s and 1980s, when interest rates were 10 percent and



higher, ER/D dropped to .001 to .002. As we learned in [Chapter 9 "Bank Management"](#), *expected deposit outflows directly affect excess reserve levels as banks stock up on reserves to meet the outflows*. When uncertainty is high or a banking crisis is in progress or appears imminent, bankers will increase ER to protect their banks.

In summary, the central bank influences the money supply by controlling the monetary base and, to a far lesser extent, the required reserve ratio. Depositors, banks, and borrowers influence the money supply by influencing m_1 and M_2 , specifically by determining the money multiplier, with depositors largely in control of C/D ; depositors and banks interacting via deposit outflow expectations to determine E/R ; and borrowers, depositors, banks, and the central bank interacting to determine interest rates and hence to some extent both C/D and E/R .

KEY TAKEAWAYS

- Central banks control MB and rr , and affect interest rates, which in turn affect C/D and ER/D .
- Depositors determine C/D by deciding how much cash versus deposits to hold. They also influence interest rates.
- Banks influence interest rates and determine ER/D by deciding how many excess reserves to hold in the face of expected deposit outflows and interest rates.
- Borrowers influence the interest rate and hence to some extent C/D and ER/D .

15.4 Suggested Reading

Macesich, George. *The Money Supply Process: A Comparative Analysis*. New York: Praeger, 1999.



Chapter 16

Monetary Policy Tools

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. List and assess the strengths and weaknesses of the three primary monetary policy tools that central banks have at their disposal.
2. Describe the federal funds market and explain its importance.
3. Explain how the Fed influences the equilibrium fed funds rate to move toward its target rate.
4. Explain the purpose of the Fed's discount window and other lending facilities.
5. Compare and contrast the monetary policy tools of central banks worldwide to those of the Fed.



16.1 The Federal Funds Market and Reserves

LEARNING OBJECTIVES

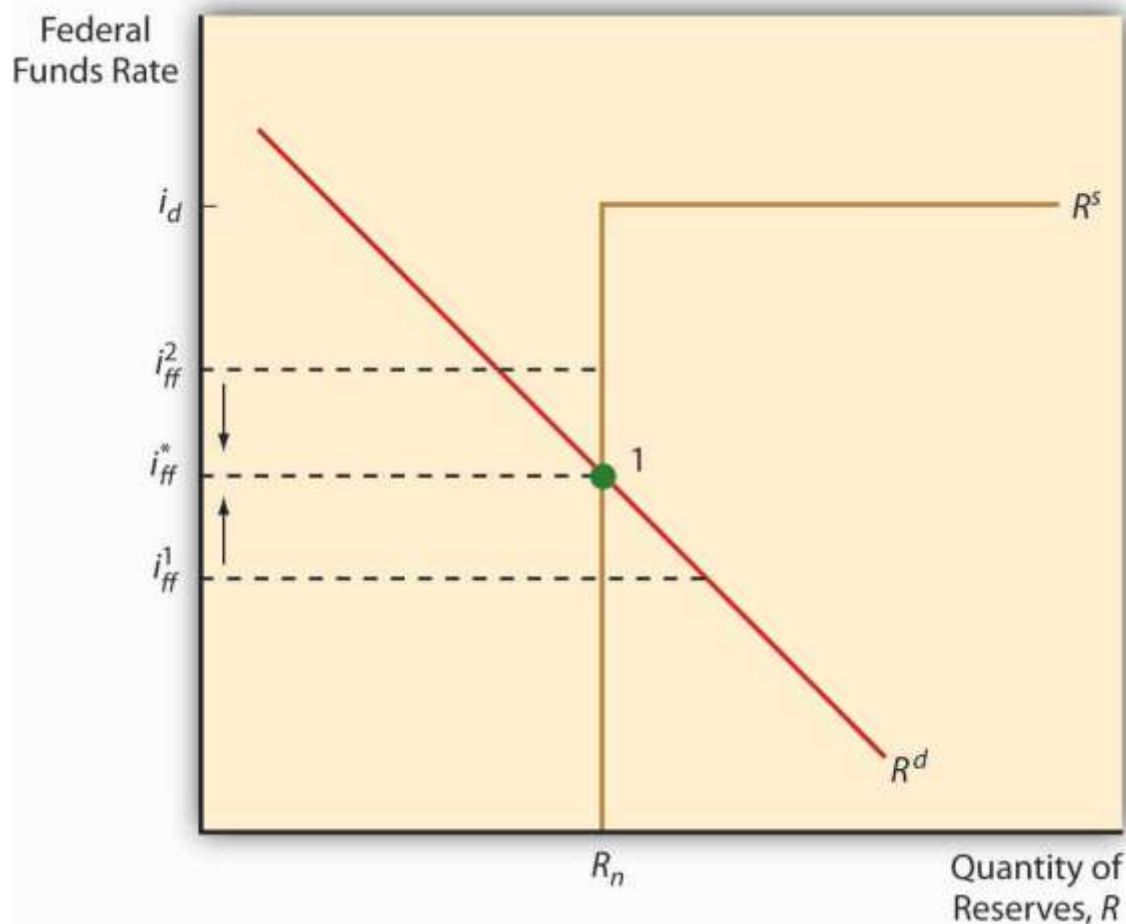
1. What three monetary policy tools do central banks have at their disposal?
2. What are the strengths and weaknesses of each? What is the federal funds market and why is it important?

Central banks have three primary tools for influencing the money supply: the reserve requirement, discount loans, and open market operations. The first, as we saw in [Chapter 14 "The Money Supply Process"](#) and [Chapter 15 "The Money Supply and the Money Multiplier"](#), works through the money multiplier, constraining multiple deposit expansion the larger it becomes. Central banks today rarely use it because most banks work around reserve requirements. The second and third tools influence the monetary base ($MB = C + R$). Discount loans depend on banks (or nonbank borrowers, where applicable) first borrowing from, then repaying loans to, the central bank, which therefore does not have precise control over MB. Open market operations (OMO) are generally preferred as a policy tool because the central bank can easily expand or contract MB to a precise level. Using OMO, central banks can also reverse mistakes quickly.

In the United States, under typical conditions, the Fed conducts monetary policy primarily through the federal funds (fed funds) market, an overnight market where banks that need reserves can borrow them from banks that hold reserves they don't need. Banks can also borrow their reserves directly from the Fed, but, except during crises, most prefer not to because the Fed's discount rate is generally higher than the federal funds rate. Also, borrowing too much, too often from the Fed can induce increased regulatory scrutiny. So usually banks get their overnight funds from the fed funds market, which, as [Figure 16.1 "Equilibrium in the fed funds market"](#) shows, pretty much works like any other market.

Figure 16.1 Equilibrium in the fed funds market





The downward slope of the demand curve for reserves is easily explained. *Like anything else, as the price of reserves (in this case, the interest rate paid for them) increases, the quantity demanded decreases.* As reserves get cheaper, banks will want more of them because the opportunity cost of that added protection, of that added liquidity, is lower. *But what is the deal with that upside down L-looking reserve supply curve?* Note that the curve takes a hard right (becomes infinitely elastic) at the discount rate. That's because, if the federal funds rate ever exceeded the discount rate, banks' thirst for Fed discount loans would be unquenchable because a clear arbitrage opportunity would exist: borrow at the discount rate and relend at the higher market rate. Below that point, the reserve supply curve is vertical (perfectly inelastic) at whatever quantity the Fed wants to supply via open market operations.

The intersection of the supply and demand curves is the equilibrium or market rate, the actual federal funds rate, ff^* . *When the Fed makes open market purchases, the supply of reserves shifts right,*

lowering ff^* (*ceteris paribus*). When it sells, it moves the reserve supply curve left, increasing ff^* , all else constant. The discount rate sets an upper limit to ff^* because no bank would borrow reserves at a higher rate in the federal funds market than it could borrow directly from the Fed.

Figure 16.2 *Fed funds targeting, 2000–2007*

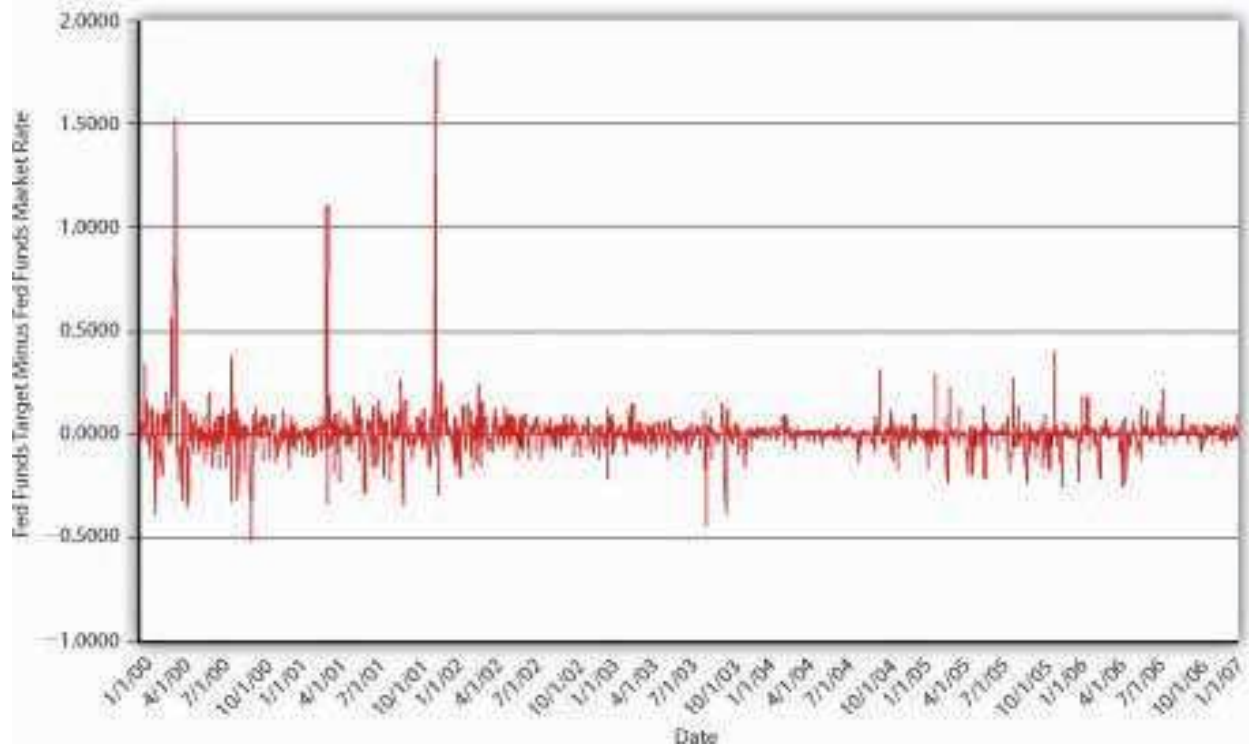
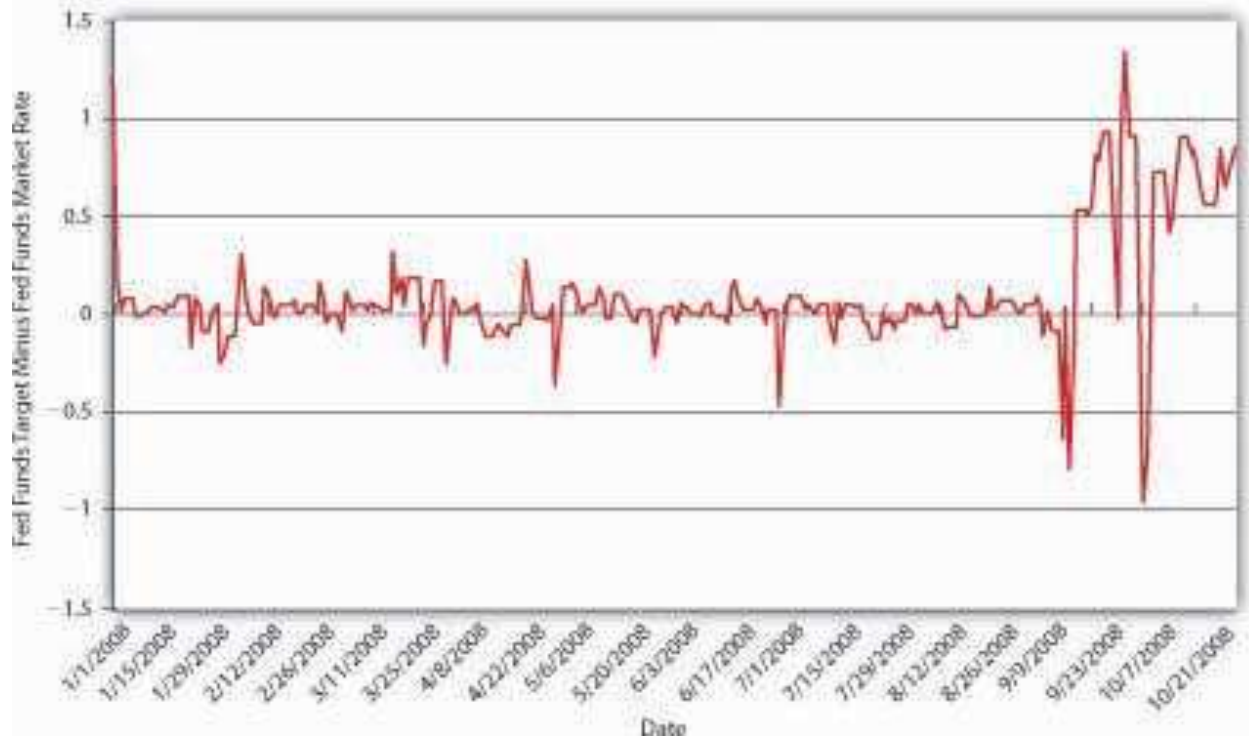


Figure 16.3 *Fed funds targeting, 2008*



Theoretically, the Fed could also directly affect the demand for reserves by changing the reserve requirement. *If it increased (decreased) rr , demand for reserves would shift up (down), increasing (decreasing) ff^* .* As noted above, however, banks these days can so easily sidestep required reserves that the Fed's ability to influence the demand for reserves is extremely limited. Demand for reserves can also shift right or left due to bank liquidity management activities, increasing (decreasing) as expectations of net deposit outflows increase (decrease). The Fed tries to anticipate such shifts and generally has done a good job of it. Although there have been days when ff^* differed from the target by several percentage points (several hundred basis points), between 1982 and 2007, the fed funds target was, on average, only .0340 of a percent lower than ff^* . Between 2000 and the subprime mortgage uproar in the summer of 2007, the Fed did an even better job of moving ff^* to its target, as [Figure 16.2 "Fed funds targeting, 2000–2007"](#) shows. During the crises of 2007 and 2008, however, the Fed often missed its target by a long way, as shown in [Figure 16.3 "Fed funds targeting, 2008"](#).

Stop and Think Box

In Chapter 13 "Central Bank Form and Function", you learned that America's first central banks, the BUS and SBUS, controlled commercial bank reserve levels by varying the speed and intensity by which it redeemed convertible bank liabilities (notes and deposits) for reserves (gold and silver). Can you model that system?

Kudos if you can! I'd plot quantity of reserves along the horizontal axis and interest rate along the vertical axis. The reserve supply curve was probably highly but not perfectly inelastic and the reserve demand curve sloped downward, of course. When the BUS or SBUS wanted to tighten monetary policy, it would return commercial bank monetary liabilities in a great rush, pushing the reserve demand curve to the right, thereby raising the interest rate. When it wanted to soften, it would dawdle before redeeming notes for gold and so forth, allowing the demand for reserves to move left, thereby decreasing the interest rate.

KEY TAKEAWAYS

- Central banks can influence the money multiplier (simple, m_1 , m_2 , etc.) via reserve requirements.
- That tool is somewhat limited these days given the introduction of sweep accounts and other reserve requirement loopholes.
- Central banks can also influence MB via loans to banks and open market operations.
- For day-to-day policy implementation, open market operations are preferable because they are more precise and immediate and almost completely under the control of the central bank, which means it can reverse mistakes quickly.
- Discount loans depend on banks borrowing and repaying loans, so the central bank has less control over MB if it relies on loans alone.
- Discount loans are therefore used now primarily to set a ceiling on the overnight interbank rate and to provide liquidity during crises.
- The federal funds market is the name of the overnight interbank lending market, basically the market where banks borrow and lend bank reserves, in the United States.
- It is important because the Fed uses open market operations (OMO) to move the equilibrium rate r^* toward the target established by the Federal Open Market Committee (FOMC).



16.2 Open Market Operations and the Discount Window

LEARNING OBJECTIVES

1. How does the Fed influence the equilibrium fed funds rate to move toward its target rate?
2. What purpose does the Fed's discount window now serve?

In practical terms, the Fed engages in two types of OMO, dynamic and defensive. As those names imply, it uses dynamic OMO to change the level of the MB, and defensive OMO to offset movements in other factors affecting MB, with an eye toward maintaining the federal funds target rate determined by the Federal Open Market Committee (FOMC) at its most recent meeting.

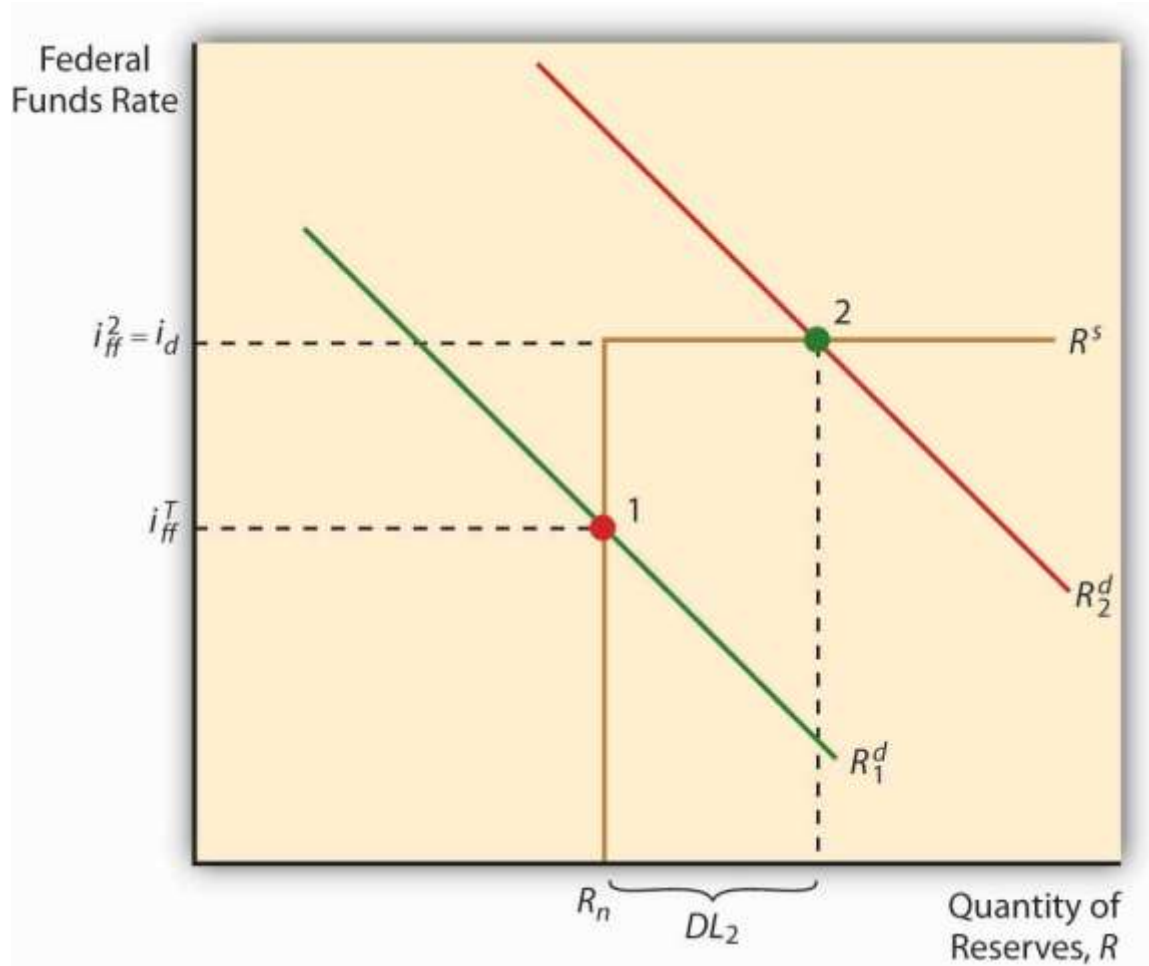
As noted in [Chapter 13 "Central Bank Form and Function"](#), *the responsibility for actual buying and selling government bonds devolves upon the Federal Reserve Bank of New York (FRBNY)*. Each trading day, FRBNY staff members look at the level of reserves, the fed funds target, the actual market fed funds rate, expectations regarding float, and Treasury activities. They also garner information about Treasury market conditions through conversations with so-called primary dealers, specialized firms and banks that make a market in Treasuries. With the input and consent of the Monetary Affairs Division of the Board of Governors, the FRBNY determines how much to buy or sell and places the appropriate order on the Trading Room Automated Processing System (TRAPS) computer system that links all the primary dealers. The FRBNY then selects the best offers up to the amount it wants to buy or sell. It enters into two types of trades, so-called outright ones, where the bonds permanently join or leave the Fed's balance sheet, and temporary ones, called repos and reverse repos. In a repo (aka a repurchase agreement), the Fed purchases government bonds with the guarantee that the sellers will repurchase them from the Fed, generally one to fifteen days hence. In a reverse repo (aka a matched sale-purchase transaction), the Fed sells securities and the buyer agrees to sell them to the Fed again in the near future. The availability of such self-reversing contracts and the liquidity of the government bond market render open market operations a precise tool for implementing the Fed's monetary policy.

The so-called discount window, where banks come to borrow reserves from the Federal district banks, is today primarily a backup facility used during crises, when the federal funds market might not function



effectively. As noted above, the discount rate puts an effective cap on ff^* by providing banks with an alternative source of reserves (see Figure 16.4 "The discount window sets an upper bound on overnight interest rates"). Note that no matter how far the reserve demand curve shifts to the right, once it reaches the discount rate, it merely slides along it.

Figure 16.4 The discount window sets an upper bound on overnight interest rates



As lender of last resort, the Fed has a responsibility to ensure that borrowers can obtain as much as they want to borrow provided they can post what in normal times would be considered good collateral security. To ensure that banks do not rely too heavily on the discount window, the discount rate is usually set a full percentage point above ff^* , a “penalty” of 100 basis points. (This policy is usually known as Bagehot’s Law, but the insight actually originated with Alexander Hamilton, America’s first Treasury secretary, so we call it Hamilton’s Law.) On several occasions (including the 1984 failure of

Continental Illinois, a large commercial bank; the stock market crash of 1987; and the subprime mortgage debacle of 2007), the discount window added the liquidity (reserves) and confidence necessary to stave off more serious disruptions to the economy, like those described in [Chapter 12 "The Financial Crisis of 2007–2008"](#) and [Chapter 23 "Aggregate Supply and Demand, the Growth Diamond, and Financial Shocks"](#).

During the financial crisis of 2008, during which many credit markets stopped functioning properly, the Federal Reserve invoked its emergency powers to create additional lending powers and programs, including the following: ^[1]

1. Term Auction Facility (TAF), a “credit facility” that allows depository institutions to bid for short term funds at a rate established by auction.
2. Primary Dealer Credit Facility (PDCF), which provides overnight loans to primary dealers at the discount rate.
3. Term Securities Lending Facility (TSLF), which also helps primary dealers by exchanging Treasuries for riskier collateral for twenty-eight-day periods.
4. Asset-Backed Commercial Paper Money Market Mutual Liquidity Facility, which helps money market mutual funds to meet redemptions without having to sell their assets into distressed markets.
5. Commercial Paper Funding Facility (CPFF), which allows the FRBNY, through a special-purpose vehicle (SPV), to purchase commercial paper (short-term bonds) issued by nonfinancial corporations.
6. Money Market Investor Funding Facility (MMIFF), which is another lending program designed to help the money markets (markets for short-term bonds) return to normal.

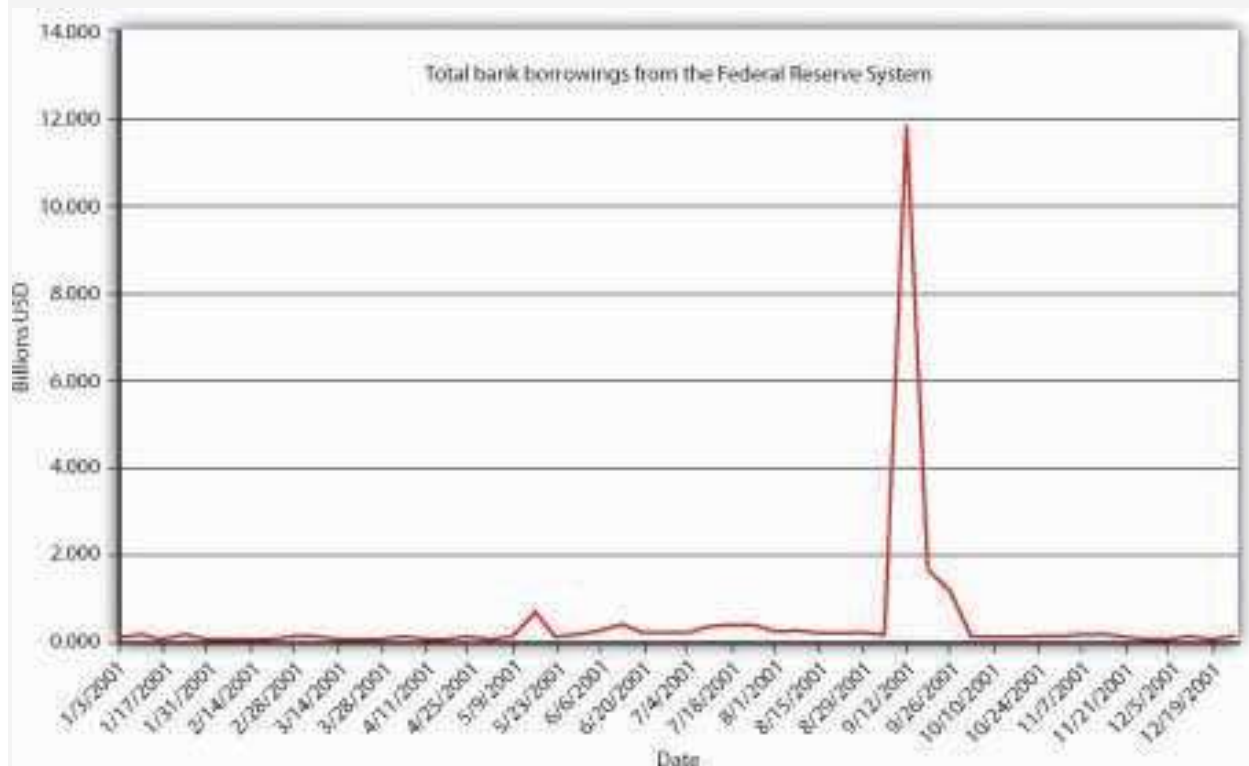
Presumably, most or all of these programs will phase out as credit conditions return to normal. The Bank of England and other central banks have implemented similar programs. ^[2]

Stop and Think Box

What in Sam Hill happened in [Figure 16.5 "Total bank borrowings from the Federal Reserve System, 2001"](#)? (*Hint: The dates are important.*)



Figure 16.5 Total bank borrowings from the Federal Reserve System, 2001



Terrorists attacked New York City and Washington, DC, with hijacked airplanes, shutting down the nation and parts of the financial system for the better part of a week. Some primary dealers were destroyed in the attacks, which also brought on widespread fears of bankruptcies and bank runs. Banks beefed up reserves by selling bonds to the Fed and by borrowing from its discount window. (Excess reserves jumped from a long-term average of around \$1 billion to \$19 billion.) This is an excellent example of the discount window providing lender-of-last-resort services to the economy.

The discount window is also used to provide moderately shaky banks a longer-term source of credit at an even higher penalty rate .5 percentage (50 basis) points above the regular discount rate. Finally, the Fed will also lend to a small number of banks in vacation and agricultural areas that experience large deposit fluctuations over the course of a year. Increasingly, however, such banks are becoming part of larger banks with more stable deposit profiles, or they handle their liquidity management using the market for negotiable certificates of deposit NCDs or other market borrowings.

KEY TAKEAWAYS

- The Fed can move the equilibrium fed funds rate toward its target by changing the demand for reserves by changing the required reserve ratio. However, it rarely does so anymore.
- It can also shift the supply curve to the right (add reserves to the system) by buying assets (almost always Treasury bonds) or shift it to the left (remove reserves from the system) by selling assets.
- The discount window caps ff^* because if ff^* were to rise above the Fed's discount rate, banks would borrow reserves from the Fed (technically its district banks) instead of borrowing them from other banks in the fed funds market.
- Because the Fed typically sets the discount rate a full percentage point (100 basis) points above its fed funds target, ff^* rises above the discount rate only in a crisis, as in the aftermath of the 1987 stock market crash and the 2007 subprime mortgage debacle.

[1] <http://www.federalreserve.gov/monetarypolicy/>

[2] "Credit Markets: A Lifeline for Banks. The Bank of England's Bold Initiative Should Calm Frayed Financial Nerves," *The Economist*, April 26, 2008, 74–75.



16.3 The Monetary Policy Tools of Other Central Banks

LEARNING OBJECTIVE

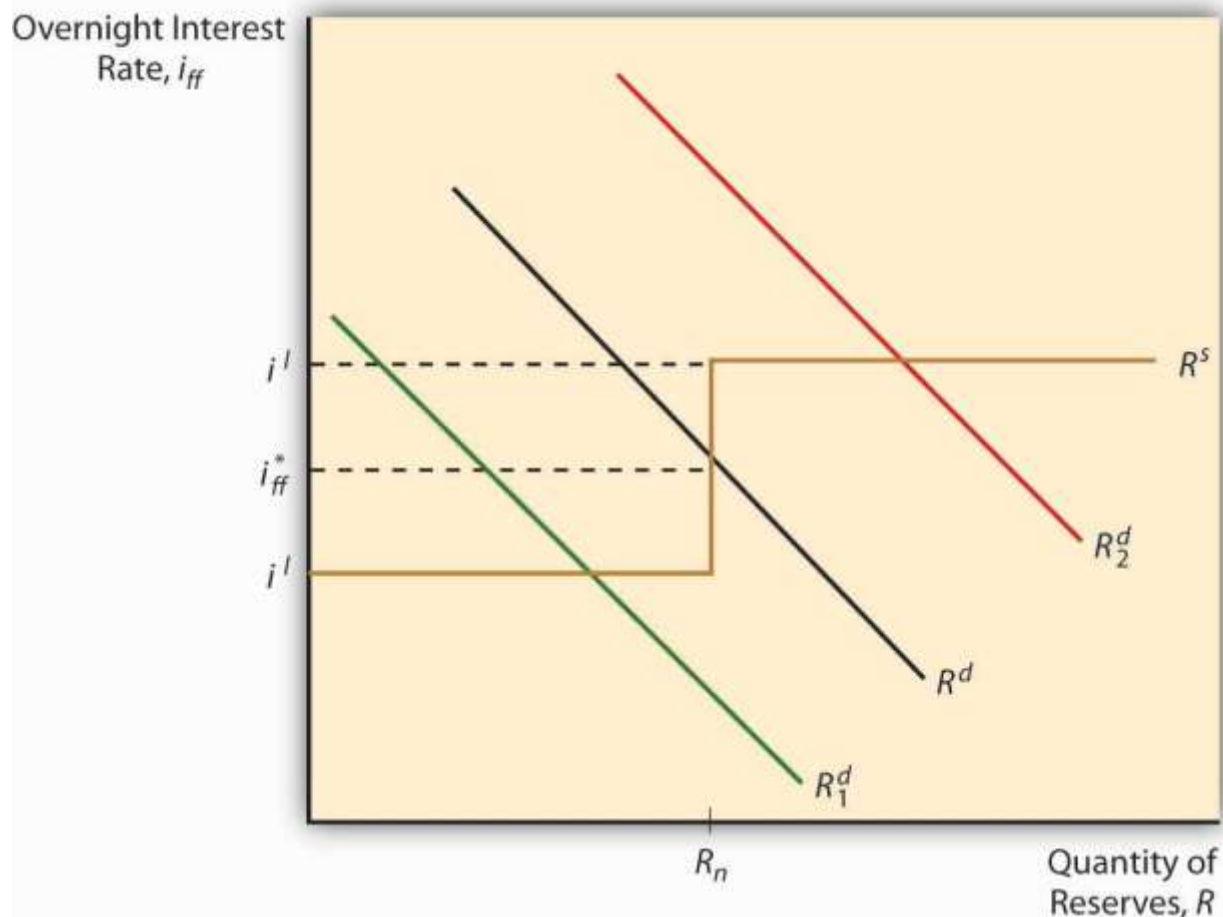
1. In what ways are the monetary policy tools of central banks worldwide similar to those of the Fed? In what ways do they differ?

The European Central Bank (ECB) also uses open market operations to move the market for overnight interbank lending toward its target. It too uses repos and reverse repos for reversible, defensive OMO and outright purchases for permanent additions to MB. Unlike the Fed, however, the ECB spreads the love around, conducting OMO in multiple cities throughout the European Union. The ECB's national central banks (NCBs,) like the Fed's district banks, also lend to banks at a so-called marginal lending rate, which is generally set 100 basis points above the overnight cash rate. The ECB pays interest on reserves, a practice the Fed took up only recently.

Canada, New Zealand, and Australia do likewise and have eliminated reserve requirements, relying instead on what is called the channel, or corridor, system. As [Figure 16.6 "Paying interest on reserves puts a floor under the overnight interest rate"](#) depicts, the supply curve in the corridor system looks like a backward Z. The vertical part of the supply curve represents the area in which the central bank engages in OMO to influence the market rate, i^* , to meet its target rate, i^t . The top horizontal part of the supply curve, i^d for the Lombard rate, is the functional equivalent of the discount rate in the American system. The ECB and other central banks using this system, like the Fed, will lend at this rate whatever amount banks with good collateral desire to borrow. Under normal circumstances, that quantity is nil because i^d (and i^*) will be 25, 50, or more basis points lower, depending on the country. *The innovation is the lower horizontal part of the supply curve, i^r , or the rate at which the central bank pays banks to hold reserves. That sets a floor on i^* because no bank would lend in the overnight market if it could earn a higher return by depositing its excess funds with the central bank. Using the corridor system, a central bank can keep the overnight rate within the bands set by i^d and i^r and use OMO to keep i^* near i^t .*

Figure 16.6 Paying interest on reserves puts a floor under the overnight interest rate





In response to the financial crisis of 2008, the Fed began to pay interest rates on reserves and will likely continue to do so because it appears to have become central bank best practice.

KEY TAKEAWAYS

- Most central banks now use OMO instead of discount loans or reserve requirement adjustments for conducting day-to-day monetary policy.
- Some central banks, including those of the euro zone and the British Commonwealth (Canada, Australia, and New Zealand) have developed an ingenious new method called the channel or corridor system.
- Under that system, the central bank conducts OMO to get the overnight interbank lending rate near the central bank's target, as the Fed does in the United States.
- That market rate is capped at both ends, however: on the upper end by the discount (aka Lombard) rate, and at the lower end by the reserve rate, the interest rate the central bank pays to banks for holding reserves.

- The market overnight rate can never dip below that rate because banks would simply invest their extra funds in the central bank rather than lend them to other banks at a lower rate.
- During the financial crisis of 2008, the Fed adopted the corridor system by paying interest on reserves.



16.4 Suggested Reading

Hetzl, Robert L. *The Monetary Policy of the Federal Reserve: A History*. New York: Cambridge University Press, 2008.

Mishkin, Frederic S. *Monetary Policy Strategy*. Cambridge, MA: MIT Press, 2007.



Chapter 17

Monetary Policy Targets and Goals

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Explain why the Fed was generally so ineffective before the late 1980s.
2. Explain why macroeconomic volatility declined from the late 1980s until 2008.
3. List the trade-offs that central banks face and describe how they confront them.
4. Define monetary targeting and explain why it succeeded in some countries and failed in others.
5. Define inflation targeting and explain its importance.
6. Provide and use the Taylor Rule and explain its importance.



17.1 A Short History of Fed Blunders

LEARNING OBJECTIVES

1. Why was the Fed generally so ineffective before the late 1980s?
2. Why has macroeconomic volatility declined since the late 1980s?

The long and salutary reign of Greenspan the Great (1987–2006)^[1] and the auspicious beginning of the rule of Bernanke the Bald (2006–present)^[2] temporarily provided the Fed with something it has rarely enjoyed in its nearly century-long existence, the halo of success and widespread approbation. While it would be an exaggeration to call Federal Reserve Board members the Keystone Kops of monetary policy, the Fed's history, a taste of which we've already indulged ourselves with in [Chapter 11 "The Economics of Financial Regulation"](#), is more sour than sweet. *Central banks are, after all, the last bastions of central planning in otherwise free market economies.* And central planning, as the Communists and the Austrian economists who critiqued them discovered, is darn difficult.^[3]

This is not a history textbook, but the past can often shed light on the present. History warns us to beware of claims of infallibility. In this case, however, it also provides us with a clear reason to be optimistic. *Between 1985 or so and 2007, the U.S. macroeconomy, particularly output, was much less volatile than previously.* That was a happy development for the Fed because, as noted in [Chapter 13 "Central Bank Form and Function"](#), central banks are generally charged with stabilizing the macroeconomy, among other things. The Fed in particular owes its genesis to the desire of Americans to be shielded from financial panics and economic crises.

The Fed itself took credit for almost 60 percent of the reduction in volatility. (Is anyone surprised by this? Don't we all embrace responsibility for good outcomes, but eschew it when things turn ugly?) Skeptics point to other causes for the Great Calm, including dumb luck; less volatile oil prices (the 1970s were a difficult time in this regard);^[4] less volatile total factor productivity growth;^[5] and improvements in management, especially just-in-time inventory techniques, which has helped to reduce the inventory gluts of yore.^[6] *Those factors all played roles, but it also appears that the Fed's monetary policies actually improved.* Before Paul Volcker (1979–1987), the Fed engaged in pro-



cyclical monetary policies. Since then, it has tried to engage in anti-cyclical policies. And that, as poet Robert Frost wrote in “The Road Not Taken,” has made all the difference. ^[7]

For reasons that are still not clearly understood, economies have a tendency to cycle through periods of boom and bust, of expansion and contraction. *The Fed used to exacerbate this cycle by making the highs of the business cycle higher and the lows lower than they would otherwise have been.* Yes, that ran directly counter to one of its major missions. Debates rage whether it was simply ineffective or if it purposely made mistakes. It was probably a mixture of both that changed over time. In any event, we needn’t “go there” because a simple narrative will suffice.

The Fed was conceived in peace but born in war. As William Silber ^[8] points out in his book *When Washington Shut Down Wall Street*, the Federal Reserve was rushed into operation to help the U.S. financial system, which had been terribly shocked, economically as well as politically, by the outbreak of the Great War (1914–1918) in Europe. ^[9] At first, the Fed influenced the monetary base (MB) through its *rediscounts*—it literally discounted again business commercial paper already discounted by commercial banks. A wholesaler would take a bill owed by one of its customers, say, a department store like Wanamaker’s, to its bank. The bank might give \$9,950 for a \$10,000 bill due in sixty days. If, say, thirty days later the bank needed to boost its reserves, it would take the bill to the Fed, which would rediscount it by giving the bank, say, \$9,975 in cash for it. The Fed would then collect the \$10,000 when it fell due. In the context of World War I, *this policy was inflationary*, leading to double-digit price increases in 1919 and 1920. *The Fed responded by raising the discount rate from 4.75 to 7 percent, setting off a sharp recession.*

The postwar recession hurt the Fed’s revenues because the volume of rediscounts shrank precipitously. *It responded by investing in securities and, in so doing, accidentally stumbled upon open market operations.* The Fed fed the speculative asset bubble of the late 1920s, then sat on its hands while the economy crashed and burned in the early 1930s. Here’s another tidbit: it also exacerbated the so-called Roosevelt Recession of 1937–1938 by playing with fire, by raising the reserve requirement, a new policy placed in its hands by FDR and his New Dealers in the Banking Act of 1935.

During World War II, the Fed became the Treasury's lapdog. Okay, that is an exaggeration, but not much of one. *The Treasury said thou shalt purchase our bonds to keep the prices up (and yields down) and the Fed did, basically monetizing the national debt. In short, the Fed wasn't very independent in this period.* Increases in demand, coupled with quantity rationing, kept the lid on inflation during the titanic conflict against Fascism, but after the war the floodgates of inflation opened. Over the course of just three years, 1946, 1947, and 1948, the price level jumped some 30 percent. There was no net change in prices in 1949 and 1950, but the start of the Korean War sent prices up another almost 8 percent in 1951, and the Fed finally got some backbone and stopped pegging interest rates. As our analysis of central bank independence in [Chapter 13 "Central Bank Form and Function"](#) suggests, inflation dropped big time, to 2.19 percent in 1952, and to less than 1 percent in 1953 and 1954. In 1955, prices actually dropped slightly, on average.

This is not to say, however, that the Fed was a fully competent central bank because it continued to exacerbate the business cycle instead of ameliorating it. *Basically, wealth would increase (decrease), driving interest rates (as we learned in [Chapter 5 "The Economics of Interest-Rate Fluctuations"](#)) up (down), inducing the Fed to buy (sell) bonds, thereby increasing (decreasing) MB and thus the money supply (MS).* So when the economy was naturally expanding, the Fed stoked its fires and when it was contracting, the Fed put its foot on its head. Worse, if interest rates rose (bond prices declined) due to an increase in inflation (think Fisher Equation), the Fed would also buy bonds to support their prices, thereby increasing the MS and causing yet further inflation. This, as much as oil price hikes, caused the Great Inflation of the 1970s. *Throughout the crises of the 1970s and 1980s, the Fed toyed around with various targets (M1, M2, fed funds rate), but none of it mattered much because its pro-cyclical bias remained.*

Stop and Think Box

Another blunder made by the Fed was Reg Q, which capped the interest rates that banks could pay on deposits. When the Great Inflation began in the late 1960s, nominal interest rates rose (think Fisher Equation) above those set by the Fed. What horror *directly* resulted? What Fed goal was thereby impeded?

Shortages known as credit crunches resulted. Whenever $p^* > p_{reg}$, shortages result because the quantity demanded exceeds the quantity supplied by the market. Banks couldn't make loans because they couldn't attract the deposits they needed to fund them. That created much the same effect as high interest rates—entrepreneurs couldn't obtain financing for good business ideas, so they wallowed, decreasing economic activity. In response, banks engaged in the loophole mining discussed in [Chapter 8 "Financial Structure, Transaction Costs, and Asymmetric Information"](#).

By the late 1980s, the Fed, under Alan Greenspan, finally began to engage in anti-cyclical policies, to “lean into the wind” by raising the federal funds rate before inflation became a problem and by lowering the federal funds rate at the first sign of recession. Since the implementation of this crucial insight, the natural swings of the macroeconomy have been much more docile than hitherto, until the crisis of 2007–2008, that is. The United States experienced two recessions (July 1990–March 1991 and March 2001–November 2001) ^[10] but they were so-called soft landings, that is, short and shallow. Expansions have been longer than usual and not so intense. Again, some of this might be due to dumb luck (no major wars, low real oil prices [until summer 2008 that is]) and better technology, but there is little doubt the Fed played an important role in the stabilization.

Of course, past performance is no guarantee of future performance. (Just look at the New York Knicks.) As the crisis of 2007–2008 approached, the Fed resembled a fawn trapped in the headlights of an oncoming eighteen-wheeler, too afraid to continue on its path of raising interest rates and equally frightened of reversing course. The result was an economy that looked like road kill. Being a central banker is a bit like being Goldilocks. It's important to get monetary policy just right, lest we wake up staring down the gullets of three hungry bears. (I don't mean Stephen Colbert's bears ^[11] here, but rather bear markets.)

KEY TAKEAWAYS

- The Fed was generally ineffective before the late 1980s because it engaged in pro-cyclical monetary policies, expanding the MS and lowering interest rates during expansions and constricting the MS and raising interest rates during recessions, the exact opposite of what it should have done.

- The Fed was also ineffective because it did not know about open market operations (OMO) at first, because it did not realize the damage its toying with rr could cause after New Dealers gave it control of reserve requirements, and because it gave up its independence to the Treasury during World War II.
- Also, in the 1970s, it targeted monetary aggregates, although its main policy tool was an interest rate.
- The Fed's switch from pro-cyclical to anti-cyclical monetary policy, where it leans into the wind rather than running with it, played an important role in decreased macroeconomic volatility, although it perhaps cannot take all of the credit because changes in technology, particularly inventory control, and other lucky events conspired to help improve macro stability over the same period.
- Future events will reveal if central banking has truly and permanently improved.

[1] http://wohlstetter.typepad.com/letterfromthecapitol/2006/02/greenspan_the_g.html

[2] <http://www.princeton.edu/pr/pictures/a-f/bernanke/bernanke-03-high.jpg>

[3] <http://www.mises.org/etexts/austrian.asp>

[4] <http://www.imf.org/external/pubs/ft/fandd/2001/12/davis.htm>

[5] http://en.wikipedia.org/wiki/Total_factor_productivity

[6] [http://en.wikipedia.org/wiki/Just-in-time_\(business\)](http://en.wikipedia.org/wiki/Just-in-time_(business))

[7] <http://www.bartleby.com/119/1.html>

[8] In the interest of full disclosure, Silber is a colleague, but also the co-author of a competing, and storied, money and banking textbooks.

[9] <http://www.pbs.org/greatwar/>

[10] <http://www.nber.org/cycles.html>

[11] <http://www.youtube.com/watch?v=KsTVK9Cv9U8>



17.2 Central Bank Goal Trade-offs

LEARNING OBJECTIVE

1. What trade-offs do central banks face and how do they confront them?

Central banks worldwide often find themselves between a rock and a hard place. The rock is price stability (inflation control) and the hard place is economic growth and employment. *Although in the long run the two goals are perfectly compatible, in the short run, they sometimes are not. In those instances, the central bank has a difficult decision to make. Should it raise interest rates or slow or even stop MS growth to stave off inflation, or should it decrease interest rates or speed up MS growth to induce companies and consumers to borrow, thereby stoking employment and growth?* In some places, like the European Union, the central bank is instructed by its charter to stop inflation. “The primary objective of the European System of Central Banks,” the Maastricht Treaty clearly states, “shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community” including high employment and economic growth. The Fed’s charter, by contrast, gives the Fed a dual mandate to ensure price stability and maximum employment. Little wonder that the Fed has not held the line on inflation as well as the European Central Bank (ECB), but unemployment rates in the United States are generally well below those of most European nations. (There are additional reasons for that difference that are not germane to the discussion here.)

Stop and Think Box

When central banks act as a lender of last resort (LLR) to restore stability to the financial system, they create a time inconsistency problem. Can you identify what it is? (*Hint: It involves moral hazard.*)

It is believed that if a central bank or other lender of last resort, like the International Monetary Fund, steps in too often, it creates a moral hazard problem because businesses, including banks, take on extra risks safe in the knowledge that if the system gets in trouble, prompt and effective aid will be forthcoming. This is time inconsistent because, by stopping one panic or crisis, the central bank plants the seeds for the next.



Do note that almost nobody wants 100 percent employment, when everyone who wants a job has one. A little unemployment, called frictional unemployment, is a good thing because it allows the labor market to function more smoothly. So-called structural unemployment, when workers' skills do not match job requirements, is not such a good thing, but is probably inevitable in a dynamic economy saddled with a weak educational system. (As structural unemployment increased in the United States, education improved somewhat, but not enough to ensure that all new jobs the economy created could be filled with domestic laborers.) *So the Fed shoots for what is called the natural rate of unemployment. Nobody is quite sure what that rate is, but it is thought to be around 5 percent, give or take.*

KEY TAKEAWAYS

- The main trade-off that central banks face is a short-term one between inflation, which calls for tighter policy (higher interest rates, slower money growth), and employment and output, which call for looser policy (lower interest rates, faster money growth).
- Some central banks confront trade-offs by explicitly stating that one goal, usually price stability (controlling inflation), is of paramount concern.
- Others, including the Fed, confront the trade-off on an ad hoc, case-by-case basis.

17.3 Central Bank Targets

LEARNING OBJECTIVES

1. What is monetary targeting and why did it succeed in some countries and fail in others?
2. What is inflation targeting and why is it important?

Once a central bank has decided whether it wants to hold the line (no change $[\Delta]$), tighten (increase i , decrease or slow the growth of MS), or ease (lower i , increase MS), it has to figure out how best to do so.

Quite a gulf exists between the central bank's goals (low inflation, high employment) and its tools or instruments (OMO, discount loans, changing rr). So it sometimes creates a target between the two, some intermediate goal that it shoots for with its tools, with the expectation that hitting the target's bull's-eye would lead to goal satisfaction:

TOOLS→TARGET→GOAL

In the past, *many central banks targeted monetary aggregates like $M1$ or $M2$* . Some, like Germany's Bundesbank and Switzerland's central bank, did so successfully. Others, like the Fed, the Bank of Japan, and the Bank of England, failed miserably. Their failure is partly explained by what economists call the time inconsistency problem, the inability over *time* to follow a good plan *consistently*. (Weight-loss diets suffer from the time inconsistency problem, too, and every form of procrastination is essentially time inconsistent.) Basically, like a wayward dieter or a lazy student (rare animals to be sure), they overshot their targets time and time again, preferring pleasure now at the cost of pain later.

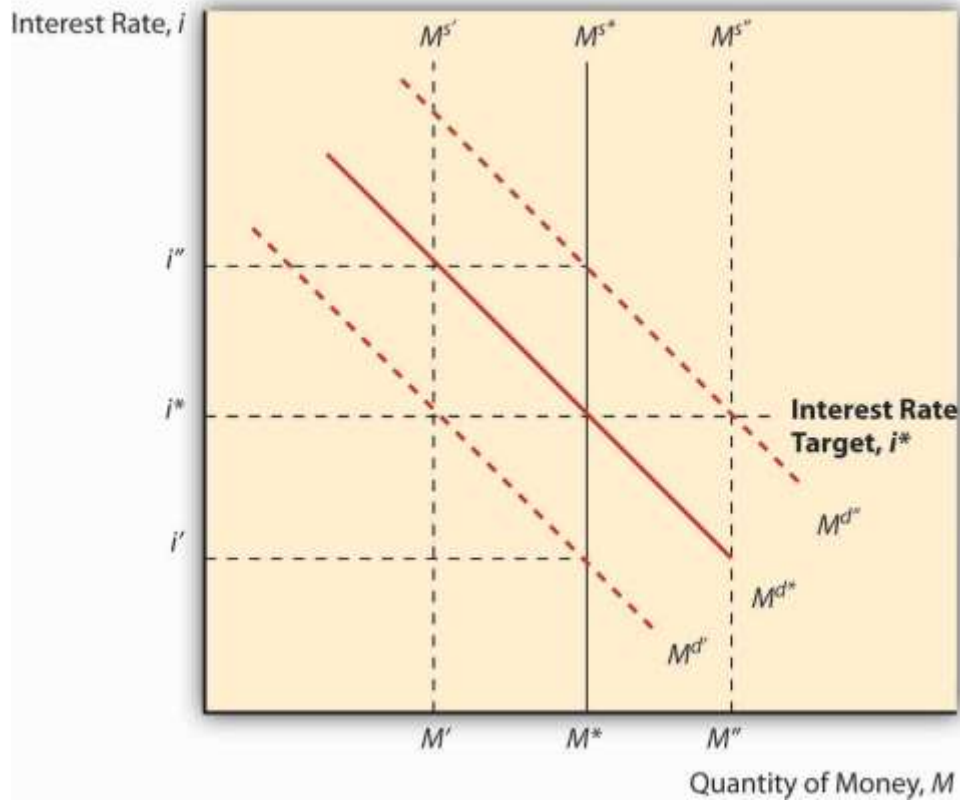
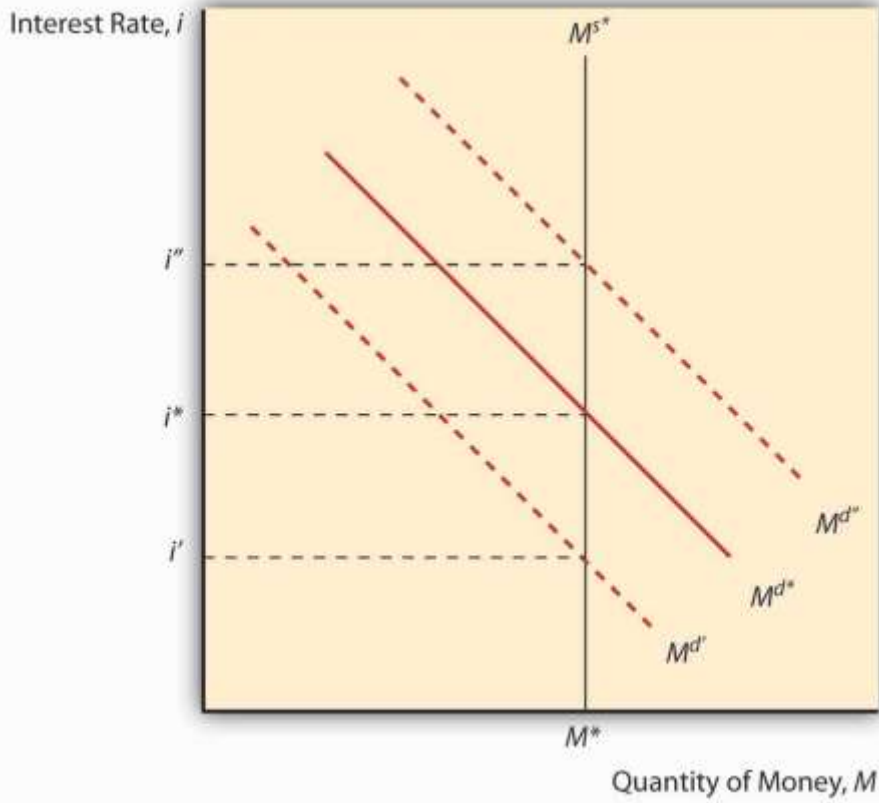
Another major problem was that monetary targets did not always equate to the central banks' goals in any clear way. Long lags between policy implementation and real-world effects made it difficult to know to what degree a policy was working—or not. Worse, the importance of specific aggregates as a determinant of interest rates and the price level waxed and waned over time in ways that proved difficult to predict. Finally, many central banks experienced a disjoint between their tools or operating instruments, which were often interest rates like the federal funds, and their monetary targets. *It turns out that one can't control both an interest rate and a monetary aggregate at the same time.* To see why, study [Figure 17.1](#). Note that if the central bank leaves the supply of money fixed,



changes in the demand for money will make the interest rate jiggle up and down. It can only keep i fixed by changing the money supply. Because open market operations are the easiest way to conduct monetary policy, most central banks, as we've seen, eventually changed reserves to maintain an interest rate target. With the monetary supply moving round and round, up and down, it became difficult to hit monetary targets.

Figure 17.1





Central banks can control ior MS, but not both.

In response to all this, several leading central banks, beginning with New Zealand in 1990, have adopted explicit inflation targets. The result everywhere has been more or less the same: lower employment and output in the short run as inflation expectations are wrung out of the economy, followed by an extended period of prosperity and high employment. As long as it remains somewhat flexible, inflation targeting frees central bankers to do whatever it takes to keep prices in check, to use all available information and not just monetary statistics. Inflation targeting makes them more accountable because the public can easily monitor their success or failure. (New Zealand took this concept a step further, enacting legislation that tied the central banker's job to keeping inflation within the target range.)

Stop and Think Box

What do you think of New Zealand's law that allows the legislature to oust a central banker who allows too much inflation?

Well, it makes the central bank less independent. Of course, independence is valuable to the public only as a means of keeping inflation in check. The policy is only as good as the legislature. If it uses the punishment only to oust incompetent or corrupt central bankers, it should be salutary. If it ousts good central bankers caught in a tough situation (for example, an oil supply shock or war), the law may serve only to keep good people from taking the job. If the central banker's salary is very high, the law might also induce him or her to try to distort the official inflation figures on which his or her job depends.

The Fed has not yet adopted explicit inflation targeting, though a debate currently rages about whether it should. And under Ben Bernanke, it moved to what some have called inflation targeting-lite, with a new policy of communicating with the public more frequently about its forecasts, which now run to three years instead of the traditional two. ^[1] As noted above, the Fed is not very transparent, and that has the effect of roiling the financial markets when expectations about its monetary policy turn out to be incorrect. It also induces people to waste a lot of time engaging in "Fed watching," looking for clues about monetary policy. Reporters actually used to comment on the thickness of Greenspan's briefcase when he went into Federal Open Market Committee (FOMC) meetings. No joke! ^[2]



Why doesn't the Fed, which is charged with maintaining financial market and price stability, adopt explicit targets? It may be that it does not want to be held accountable for its performance. It probably wants to protect its independence, but for its private interest (power) rather than for the public interest (low inflation). *It may also be that the Fed has found the holy grail of monetary policy, a flexible rule that helps it to determine the appropriate federal funds target.*

KEY TAKEAWAYS

- Monetary targeting entails setting and attempting to meet growth rates of monetary aggregates such as M1 or M2.
- It succeeded in countries like Germany and Switzerland, where the central bank was committed to keeping inflation in check.
- In other countries, like the United States and the United Kingdom, where price stability was not the paramount goal of the central bank, the time inconsistency problem eroded the effectiveness of the targets.
- In short, like a dieter who can't resist that extra helping at dinner and two desserts, the central banks could not stick to a good long-term plan day to day.
- Also, the connection between increases in particular aggregates and the price level broke down, but it took a long time for central bankers to realize it because the lag between policy implementation and real-world outcome was often many months and sometimes years.
- Inflation targeting entails keeping increases in the price level within a predetermined range, e.g., 1 and 2 percent per year.
- Countries whose central banks embraced inflation targeting often suffered a recession and high unemployment at first, but in the long run were able to achieve both price level stability and economic expansion and high employment.
- Inflation targeting makes use of all available information, not just monetary aggregates, and increases the accountability of central banks and bankers. That reduces their independence but not at the expense of higher inflation because inflation targeting, in a sense, is a substitute for independence.

[1] "The Federal Reserve: Letting Light In," *The Economist* (17 November 2007), 88–89.



[2] <http://www.amazon.com/Inside-Greenspans-Briefcase-Investment-Strategies/dp/007138913X>;<http://www.amazon.com/Inside-Greenspans-Briefcase-Investment-Strategies/dp/007138913X>



17.4 The Taylor Rule

LEARNING OBJECTIVE

1. What is the Taylor Rule and why is it important?

Many observers suspect that the Fed under Greenspan and Bernanke has followed the so-called Taylor Rule, named after the Stanford University economist, John Taylor, who developed it.

The rule states that

$$ff^t = \pi + ff^{*r} + \frac{1}{2}(\pi \text{ gap}) + \frac{1}{2}(Y \text{ gap})$$

where

ff^t = federal funds target

π = inflation

ff^{*r} = the real equilibrium fed funds rate

$\pi \text{ gap}$ = inflation gap ($\pi - \pi \text{ target}$)

$Y \text{ gap}$ = output gap (actual output [e.g. GDP] – output potential)

So if the inflation target was 2 percent, actual inflation was 3 percent, output was at its potential, and the real federal funds rate was 2 percent, the Taylor Rule suggests that the fed funds target should be

$$ff^t = \pi + ff^{*r} + \frac{1}{2}(\pi \text{ gap}) + \frac{1}{2}(Y \text{ gap}) \quad ff^t = 3 + 2 + \frac{1}{2}(1) + \frac{1}{2}(0) \quad ff^t = 5.5$$

If the economy began running a percentage point below its potential, the Taylor Rule would suggest easing monetary policy by lowering the fed funds target to 5 percent:

$$ff^t = 3 + 2 + \frac{1}{2}(1) + \frac{1}{2}(-1) \quad ff^t = 3 + 2 + .5 + -.5 = 5$$

If inflation started to heat up to 4 percent, the Fed should respond by raising the fed funds target to 6.5:

$$ff^t = 4 + 2 + \frac{1}{2}(2) + \frac{1}{2}(-1) = 6.5$$

Practice calculating the fed funds target on your own in Exercise 1.



EXERCISE

1. Use the Taylor Rule— $ff^* = \pi + ff^r + \frac{1}{2}(\pi \text{ gap}) + \frac{1}{2}(Y \text{ gap})$ —to determine what the federal funds target should be if:

Inflation	Equilibrium Real Fed Funds Rate	Inflation Target	Output	Output Potential	Answer: Fed Funds Target
0	2	1	3	3	1.5
1	2	1	3	3	3
2	2	1	3	3	4.5
3	2	1	3	3	6
1	2	1	2	3	2.5
1	2	1	1	3	2
1	2	1	4	3	3.5
1	2	1	5	3	4
1	2	1	6	3	4.5
7	2	1	7	3	14

Notice that as actual inflation exceeds the target, the Taylor Rule suggests raising the fed funds rate (tightening monetary policy). Notice too that as output falls relative to its potential, the rule suggests decreasing the fed funds rate (easier monetary policy). As output exceeds its potential, however, the rule suggests putting on the brakes by raising rates. Finally, if inflation and output are both screaming, the rule requires that the fed funds target soar quite high indeed, as it did in the early 1980s. In short, *the Taylor Rule is countercyclical and accounts for two important Federal Reserve goals: price stability and employment/output.*

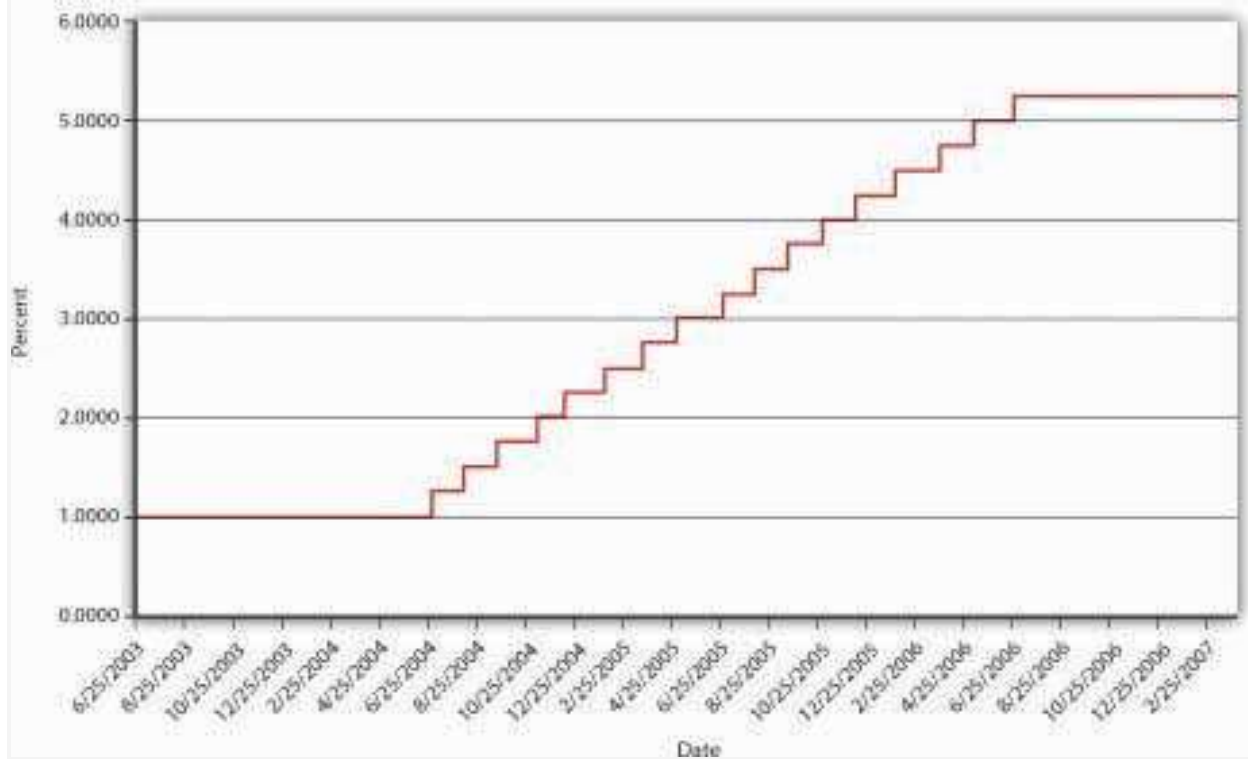
The Taylor Rule nicely explains U.S. macroeconomic history since 1960. In the early 1960s, the two were matched: inflation was low, and growth was strong. In the latter part of the 1960s, the 1970s, and the early 1980s, actual ff^* was generally well below what the Taylor Rule said it should be. In that period, inflation was so high we refer to the period as the Great Inflation. In the latter part of the 1980s, ff^* was higher than what the Taylor Rule suggested. That was a period of weak growth but decreasing inflation. Finally, since 1990 or so, the Taylor Rule and ff^* have again been very closely matched. Like the early 1960s, that period has been one of low inflation and high growth.

Stop and Think Box



Examine Figure 17.2 "The Fed's fed's fund target, 2003–2007" carefully. Assuming the Fed uses the Taylor Rule, what happened to inflation and output from mid-2003 until mid-2006. Then what happened?

Figure 17.2 The Fed's fed's fund target, 2003–2007



Assuming that the Fed's inflation target, the real equilibrium federal funds rate, and the economy's output potential were unchanged in this period (not bad assumptions), increases in actual inflation and increases in actual output would induce the Fed, via the Taylor Rule, to increase its fed's fund target. Both were at play but were moderating by the end of 2006, freezing the funds target at 5.25 percent, as shown in Figure 17.3 "Inflation and per capita gross domestic product (GDP), 2003–2006".

Figure 17.3 Inflation and per capita gross domestic product (GDP), 2003–2006

Year	Inflation Rate	Per Capita GDP Growth Rate
2003	2.28	2.76
2004	2.66	3.92
2005	3.39	3.31
2006	3.23	3.64

None of this means, however, that the Fed will continue to use the Taylor Rule, if indeed it does so. Nor does it mean that the Taylor Rule will provide the right policy prescriptions in the future. Richard Fisher and W. Michael Cox, the president and chief economist of the Dallas Fed, respectively, believe that globalization makes it increasingly important for the Fed and other central banks to look at world inflation and output levels in order to get domestic monetary policy right. ^[1]

Stop and Think Box

Foreign exchange rates can also flummox central bankers and their policies. Specifically, increasing (decreasing) interest rates will, *ceteris paribus*, cause a currency to appreciate (depreciate) in world currency markets. Why is that important?

The value of a currency directly affects foreign trade. When a currency is strong relative to other currencies (when each unit of it can purchase many units of foreign currencies), imports will be stimulated because foreign goods will be cheap. Exports will be hurt, however, because domestic goods will look expensive to foreigners, who will have to give up many units of their local currency. Countries with economies heavily dependent on foreign trade must be extremely careful about the value of their currencies; almost every country is becoming more dependent on foreign trade, making exchange rate policy an increasingly important one for central banks worldwide to consider.

KEY TAKEAWAYS



- The Taylor Rule is a simple equation— $ff^t = \pi + ff^{tr} + \frac{1}{2}(\pi \text{ gap}) + \frac{1}{2}(Y \text{ gap})$ —that allows central bankers to determine what their overnight interbank lending rate target ought to be given actual inflation, an inflation target, actual output, the economy's potential output, and an estimate of the equilibrium real fed funds rate.
- When the Fed has maintained the fed funds rate near that prescribed by the Taylor Rule, the economy has thrived; when it has not, the economy has been plagued by inflation (when the fed funds rate was set below the Taylor rate) or low output (when the fed funds rate was set above the Taylor rate).

[1] See Richard W. Fisher and W. Michael Cox, "The New Inflation Equation," *Wall Street Journal*, April 6, 2007, A11.



17.5 Suggested Reading

Blinder, Alan. *Central Banking in Theory and Practice*. Cambridge, MA: MIT Press, 1999.

Silber, William. *When Washington Shut Down Wall Street: The Great Financial Crisis of 1914 and the Origins of America's Monetary Supremacy*. Princeton, NJ: Princeton University Press, 2007.

Taylor, John B. *Monetary Policy Rules*. Chicago, IL: University of Chicago Press, 2001.



Chapter 18

Foreign Exchange

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Define foreign exchange and explain its importance.
2. Describe the market for foreign exchange.
3. Explain why countries shouldn't be proud that it takes many units of foreign currencies to purchase a single unit of their currency.
4. Define purchasing power parity and explain its importance.
5. List and explain the long-run determinants of exchange rates.
6. List and explain the short-run determinants of exchange rates.
7. Define the interest parity condition and explain when and why it holds.



18.1 The Economic Importance of Currency Markets

LEARNING OBJECTIVE

1. What is foreign exchange and why is it important?

Before we turn to monetary theory (gulp!) in [Chapter 20 "Money Demand"](#), there is one more real-world financial market we need to investigate in this and the next chapter, the market for foreign currencies or foreign exchange, where the relative prices of national units of account or exchange rates are determined. Why should you care how many U.S. dollars (USD) it takes to buy a euro or a yen, a pound (sterling) or a dollar (of Canada or Australia, respectively)? If you plan to travel to any of those places, you'll want to know so you can evaluate prices. Is €1,000 a good price for a hotel room? How about ¥1,000? ^[1] *But even if you remain your entire life in a small village in Alaska, one of Hawaii's outer islands, Michigan's Upper Peninsula, or the northern reaches of Maine, the value of USD will affect your life deeply, whether you know it or not. Come again? How could that possibly be?*

Every nation in the world trades with other nations. Some trade more than others (little islands like Iceland, Mauritius, and Ireland lead the way, in percentage of gross domestic product [GDP] terms anyway) but all do it, even illicitly, when the United Nations says that they can't because they've been bad.^[2] We know from [Chapter 3 "Money"](#) that conducting trade via barter isn't practical in most circumstances. So we use money. *But what happens when people who want to trade use different types of money, when their units of account are not the same? There are several solutions to that problem.*

The most frequent solution today is for one party, usually the buyer, to exchange the money of his or her country for the money of the seller's country, then to consummate the transaction.

How does this affect you? Well, when the unit of account of your country, say, U.S. dollars (USD or plain \$), is strong, when it can buy many units of a foreign currency, say, Canadian dollars (C\$), Canadian goods look cheap to you. And we all know what happens when goods are cheap. So you stop drinking Bud and start drinking Moosehead. Instead of going to Manhattan to shop, you go to Toronto, and check out some Maple Leafs, Raptors, and Blue Jays games while you're at it. (You go in April, that magical month for sports fans.) When the Blue Jays game gets snowed out, you go instead to the Canadian ballet. (Do you have any sense of humor at all?) You might even consider



buying a Canadian computer or automobile. (Okay, let's not get crazy.) *The point is you and your fellow Americans import more from Canada.*

The Canadians are very happy about this, but they are not so thrilled with American goods, which look dreadfully expensive to them because they have to give up many of their dear loonies to buy USD. So they too eschew Manhattan for Toronto and drink Moosehead rather than Bud. *In other words, U.S. exports to Canada fall.* And because Canada is a major U.S. trading partner, that does not bode well for the U.S. economy overall, or U.S. residents, even those in remote villages. If USD were to continue to appreciate (strengthen, buy yet more C\$), the situation would grow increasingly worse. *Were the dollar to depreciate (weaken, buy fewer C\$), the situation would ameliorate and eventually reverse, and you'd go back to Bud, Manhattan shopping sprees, and the Yankees, Mets, Knicks, Nets, Islanders, and Rangers.*

Stop and Think Box

A chain of pizza parlors in the southwestern part of the United States accepts Mexican pesos in payment for its pizzas. Many U.S. retail stores located near the Canadian border accept Canadian currency. (Many Canadian businesses accept U.S. dollars, too.) Why do these businesses accept payment in a foreign currency?

Well, maybe they are good folks who want to help out others and maybe some of them need foreign currencies to purchase supplies. But those are at best ulterior motives in most instances because the exchange rate offered usually heavily favors the retailer. For example, the pizza parlor's exchange rate was 12 pesos to the dollar when the market exchange rate was closer to 11. So a \$10 pizza costs 120 pesos (10×12) instead of 110 pesos (10×11). In short, it makes a tidy and largely riskless profit from the offer.

Or imagine you don't have many assets or a high income, but you need an automobile. You see a commercial that says that there are three V-dubs (German-made Volkswagen automobile models) under \$17,000. You think you can afford that and begin to make arrangements to buy a Rabbit. But look in [Figure 18.1 "The dollar price of a €17,000 Rabbit and the euro price of a \\$10 computer fan"](#) at what happens to the dollar price of a Rabbit when the exchange rate changes. Say that the Rabbit of your dreams costs €17,000. When the dollar and the euro are at parity (1 to 1), the Rabbit costs



\$17,000. If the dollar depreciates (buys fewer euro, and more USD are needed to buy €1), the Rabbit grows increasingly costly to you. If the dollar appreciates (buys more euro, and fewer USD are needed to buy €1), that cool automotive bunny gets very cheap indeed!

Figure 18.1 The dollar price of a €17,000 Rabbit and the euro price of a \$10 computer fan

	USD/€	€/USD	Dollar Price of a Rabbit V-Dub (€17,000)	Euro Price of Each of Your Computer Fans (\$10.00)
Strong Dollar	\$0.80	€1.25	\$13,600.00	€12.50
	\$0.90	€1.11	\$15,300.00	€11.11
	\$1.00	€1.00	\$17,000.00	€10.00
	\$1.10	€0.91	\$18,700.00	€9.09
	\$1.20	€0.83	\$20,400.00	€8.33
Weak Dollar	\$1.30	€0.77	\$22,100.00	€7.69
	\$1.40	€0.71	\$23,800.00	€7.14
	\$1.50	€0.67	\$25,500.00	€6.67

Now imagine that in your remote little town you make fans for French computers that you can sell profitably for \$10.00. The dollar’s movements will affect you as a producer, but in precisely the opposite way as it affected you as a consumer. When the dollar appreciates against the euro, your computer fans grow more expensive in France (and indeed the entire euro zone), which will undoubtedly cut into sales and maybe your salary or your job. When the dollar depreciates, the euro price of your fans plummet, sales become increasingly brisk, and you think about buying a Cadillac (a more expensive American car).

KEY TAKEAWAYS

- Foreign exchange is the trading of different national currencies or units of account.



- It is important because the exchange rate, the price of one currency in terms of another, is a major determinant of a nation's economic health and hence the well-being of all the people residing in it.
-

[1] The symbol for the euro, the currency of the European Union, is €. The symbol for the Japanese yen is ¥.

[2] <http://www.entemp.ie/trade/export/sanctions.htm#overview>



18.2 Determining the Exchange Rate

LEARNING OBJECTIVES

1. What is the structure of the foreign exchange market?
2. Why shouldn't countries be proud that it takes many units of foreign currencies to purchase a single unit of their currency?

We can't teach you how to predict future exchange rates because the markets are highly efficient and because exchange rates follow a random walk. (Check out [Chapter 7 "Rational Expectations, Efficient Markets, and the Valuation of Corporate Equities"](#) again if you need to.) Trying to make a living predicting exchange rate changes is difficult indeed. That said, *you should be able to post-dict why exchange rates changed or, in other words, to narrate plausible reasons why past changes, like those depicted in [Figure 18.2 "How many USD did it take to buy 1 Canadian dollar?"](#) and [Figure 18.3 "How many Canadian dollars did it take to buy 1 USD?"](#), may have occurred.* (This is similar to what we did with interest rates.)

Figure 18.2 How many USD did it take to buy 1 Canadian dollar?

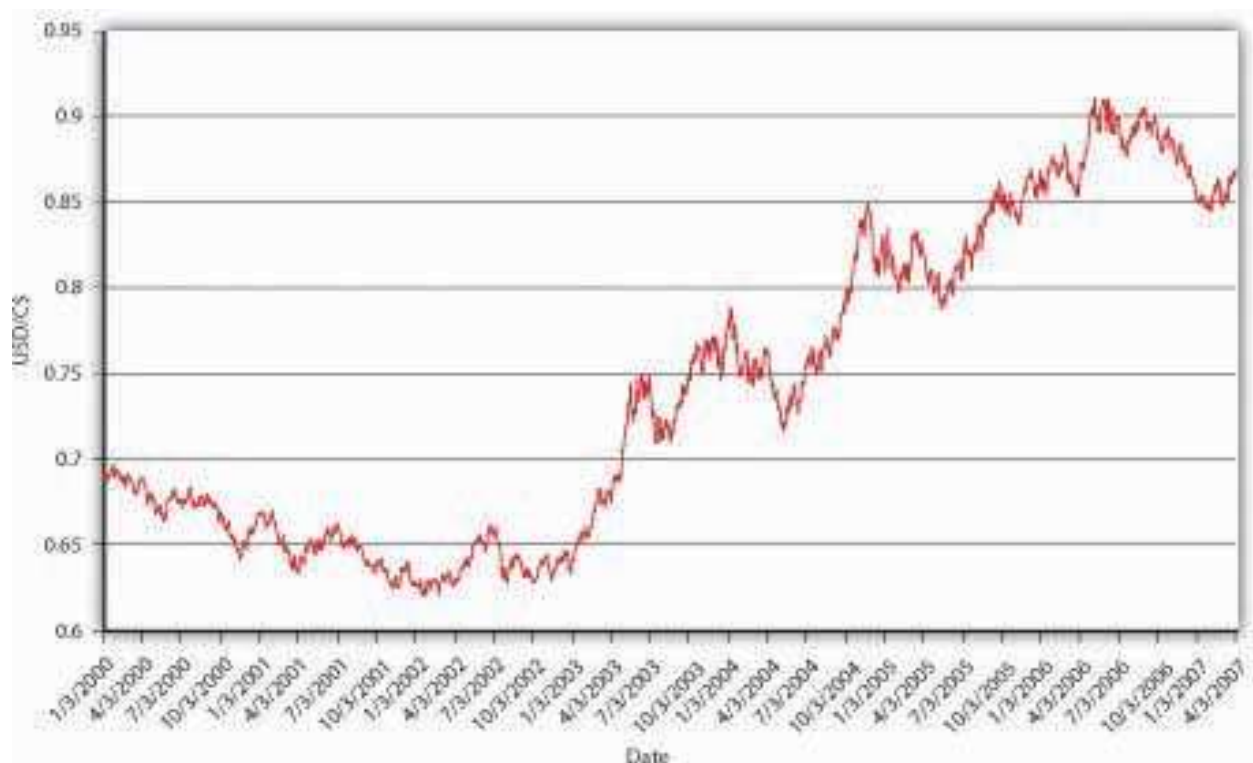
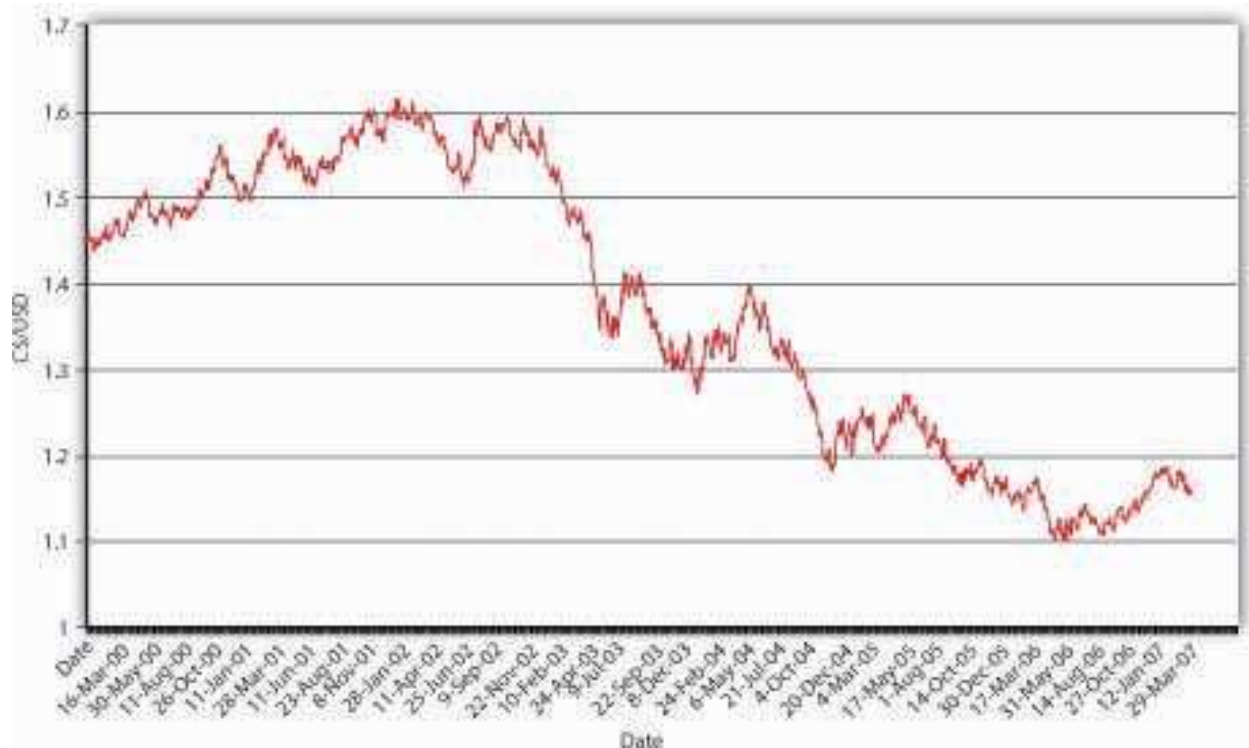


Figure 18.3 How many Canadian dollars did it take to buy 1 USD?



The figures, like the exchange rates in Figure 18.1 "The dollar price of a €17,000 Rabbit and the euro price of a \$10 computer fan", are mathematical reciprocals of each other. Both express the exchange rate but from different perspectives. Figure 18.2 "How many USD did it take to buy 1 Canadian dollar?" asks how many USD it took to buy \$C1, or mathematically USD/C\$. Figure 18.3 "How many Canadian dollars did it take to buy 1 USD?" asks how many \$C it took to buy 1 USD, or C\$/USD. In Figure 18.2 "How many USD did it take to buy 1 Canadian dollar?", USD weakens as the line moves up the chart because it takes more USD to buy \$C1. The dollar strengthens as it moves down the chart because it takes fewer USD to buy \$C1. Everything is reversed in Figure 18.3 "How many Canadian dollars did it take to buy 1 USD?", where upward movements indicate a strengthening of USD (a weakening of \$C) because it takes more \$C to buy 1 USD, and downward movements indicate a weakening of USD (a strengthening of \$C) because it takes fewer \$C to buy 1 USD. Again, the figures tell the same story: USD strengthened vis-à-vis the Canadian dollar from 2000 to early 2003, then weakened considerably, experiencing many ups and downs along the way. We could do the same

exercise ad nauseam (Latin for “until we vomit”) with every pair of currencies in the world. But we won’t because the mode of analysis would be precisely the same.

We’ll concentrate on the spot exchange rate, the price of one currency in terms of another today.

The forward exchange rate, the price today of future exchanges of foreign currencies, is also important but follows the same general principles as the spot market. *Both types of trading are conducted on a wholesale (large-scale) basis by a few score-big international banks in an over-the-counter (OTC) market.* Investors and travelers can buy foreign currencies in a variety of ways, via everything from brokerage accounts to airport kiosks, to their credit cards. Retail purchasers give up more of their domestic currency to receive a given number of units of a foreign currency than the wholesale banks do. (To put the same idea another way, they receive fewer units of the foreign currency for each unit of their domestic currency.) That’s partly why the big banks are in the business. The big boys also try to earn profits via speculation, buying (selling) a currency when it is low (high), and selling (buying) it when it is high (low). (They also seek out arbitrage opportunities, but those are rare and fleeting.) Each day, over \$1 trillion of wholesale-level (\$1 million plus per transaction) foreign exchange transactions take place.

Before we go any further, a few words of caution. Students sometimes think that a strong currency is always better than a weak one. That undoubtedly stems from the fact that *strong* sounds good and *weak* sounds bad. As noted above, however, a strong (weak) currency is neither good nor bad but rather advantageous (disadvantageous) for imports/consumers and disadvantageous (advantageous) for exports/producers of exportable goods and services. Another thing: *no need to thump your chest patriotically because it takes many units of foreign currencies to buy 1 USD.* That would be like proclaiming that you are “hot” because your temperature is 98.6 degrees Fahrenheit instead of 37 degrees Centigrade (that’s the same temperature, measured two different ways) or that you are 175 centimeters tall instead of 68.9 inches (another equivalent). Most countries have a very small unit of account compared to the United States, that is all. Other countries, like Great Britain, have units of account that are larger than the USD, so it takes more than 1 USD to buy a unit of those currencies. The nominal level of the exchange rate in no way means that one country or economy is better than



another. *Changes in exchange rates, by contrast, have profound consequences, as we have seen. They also have profound causes.*

KEY TAKEAWAYS

- At the wholesale level, the market for foreign exchange is conducted by a few score large international players in huge (> \$1 trillion per day) over-the-counter spot and forward markets.
- Those markets appear to be efficient in the sense that exchange rates follow a random walk and arbitrage opportunities, which appear infrequently, are quickly eliminated.
- In the retail segment of the market, tourists, business travelers, and small-scale investors buy and sell foreign currencies, including physical media of exchange (paper notes and coins), where appropriate.
- Compared to the wholesale (\$1 million plus per transaction) players, retail purchasers of a foreign currency obtain fewer units of the foreign currency, and retail sellers of a foreign currency receive fewer units of their domestic currency.
- The nominal level of exchange rates is essentially arbitrary. Some countries simply chose a smaller unit of account, a smaller amount of value. That's why it often takes over ¥100 to buy 1 USD. But if the United States had chosen a smaller unit of account, like a cent, or if Japan had chosen a larger one (like ¥100 = \$1), the yen and USD (and the euro, as it turns out) would be roughly at parity.
- A strong currency is not necessarily a good thing because it promotes imports over exports (because it makes foreign goods look so cheap and domestic goods look so expensive to foreigners).
- A weak currency, despite the loser-sound to it, means strong exports because domestic goods now look cheap both at home and abroad. Imports will decrease, too, because foreign goods will look more expensive to domestic consumers and businesses.



18.3 Long-Run Determinants of Exchange Rates

LEARNING OBJECTIVES

1. What is purchasing power parity?
2. What are the other long-run determinants of exchange rates?

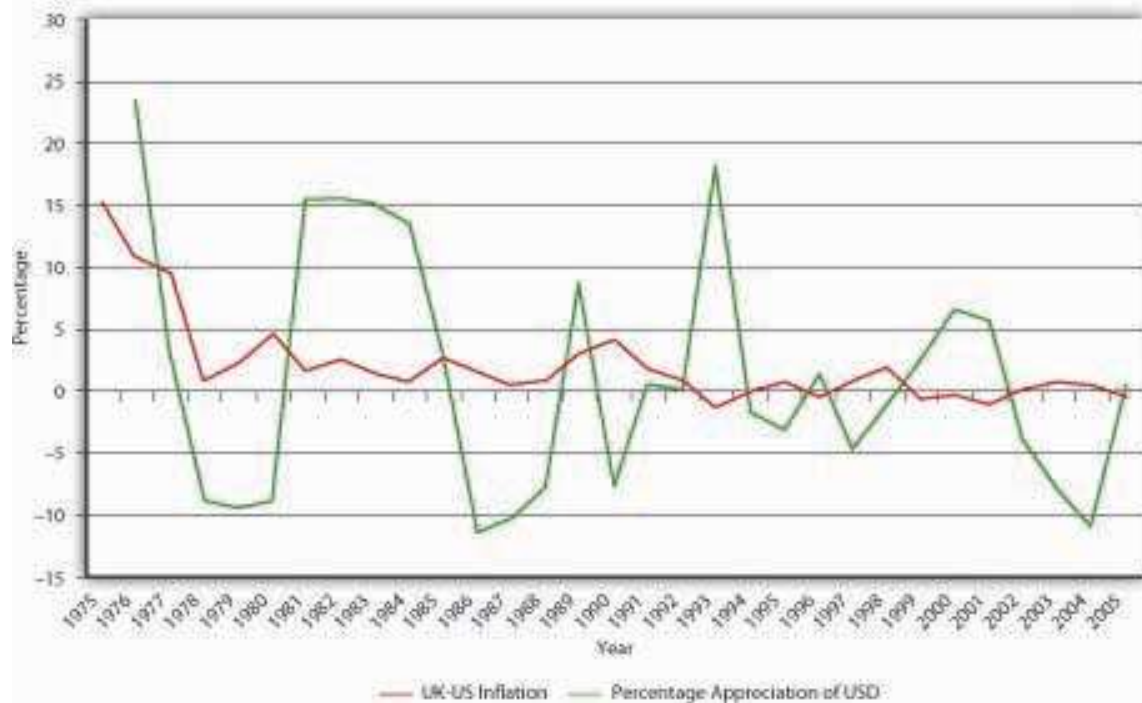
If transaction costs are zero, identical goods should have the same price no matter what unit of account that price is expressed in. Or so says the law of one price. The reason is clear: if they did not, arbitrageurs would buy where the good was cheapest and sell where it was highest until the prices were equalized. Where transaction costs are nontrivial or goods are similar but not identical, we don't expect a single price, but rather a band or range of prices. So if product X cost \$100 in Country Y and \$110 in Country Z, and it costs \$10 to transport X from Y to Z, there would be no arbitrage opportunity and the price differential could persist. If the price of X rose in Z to \$120, we'd expect it to increase in Y to at least \$110, or arbitrageurs would start buying it in Y and selling it in Z until the prices were within \$10 of each other. Similarly, Japanese-style beer is not the same as U.S.-style beer. But it is close enough that we would not expect the prices to vary widely or otherwise consumers would dump Bud, Miller, and Coors in favor of Kirin and Sapporo (or vice versa, as the case may be).

This sort of analysis has led economists to apply the law of one price to entire economies in what they call the theory of *purchasing power parity (PPP)*, which predicts that, in the long run, exchange rates will reflect price level changes. In other words, higher rates of inflation in Country A compared to Country B will cause Country A's currency to depreciate vis-à-vis Country B's currency in the long run. In the short run, however, matters are quite different, as [Figure 18.4 "Purchasing power parity, United Kingdom and United States, 1975–2005"](#) shows. If PPP held in the short run, USD should have appreciated against the pound (the blue line should be above zero) every year in which inflation in the United Kingdom exceeded inflation in the United States (the red line is above zero), and vice versa. Clearly, that was not the case. *But PPP has the long-run right, in sign but not quite in magnitude.* Between 1975 and 2005, prices rose in Great Britain a shade under 205 percent all told. In that same period, they rose just under 142 percent in the United States. In other words, prices rose about 44



percent ($[(205 - 142)/142]$) more in Britain than in the United States. Over that same period, the pound sterling depreciated 22 percent against USD (from £.4505 to £.5495 per USD or from \$2.22 to \$1.82 per £1), just as PPP theory predicts it should have. But why the discrepancy in magnitude?

Figure 18.4 *Purchasing power parity, United Kingdom and United States, 1975–2005*



For starters, not all goods and services are traded internationally. Land and haircuts come immediately to mind, but many other things as well when you think about it hard enough. There is no reason for prices of those goods to be the same or even similar in different countries. Arbitrageurs cannot buy low in one place and sell high in another because transaction costs are simply too high. (For example, you could get a great haircut in Malaysia for fifty cents but it would cost several thousand dollars and several days to get there and back.)

Figure 18.5 *Determinants of exchange rates in the long run*



Variable (Domestic/Foreign)	Change	Domestic Currency
Relative Price Level	Up	Depreciate
Relative Productivity	Up	Appreciate
Relative Trade Barriers	Up	Appreciate
Relative Import Demand	Up	Depreciate
Relative Export Demand	Up	Appreciate

In addition, three other factors affect exchange rates in the long run: relative trade barriers, differential preferences for domestic and foreign goods, and differences in productivity. Tariffs (taxes on imported goods), quotas (caps on the quantity of imported goods), and sundry nontariff barriers (NTBs) to trade^[4] increase demand for domestic over foreign goods, thereby allowing the domestic currency to appreciate without injuring sales of domestic goods. Preferences for domestic goods have the same effect; preferences for foreign goods (French wine, German beer, Japanese automobiles) have the opposite effect, depreciating the domestic currency by maintaining demand for foreign goods even in the face of higher prices. Finally, as a country becomes relatively more productive than other countries, the price of its wares tends to fall. Its currency, therefore, appreciates because it can do so without injuring exports. If a country's productivity lags that of other countries, by contrast, its currency will depreciate. Of course, this is all ceteris paribus. [Figure 18.5 "Determinants of exchange rates in the long run"](#) summarizes the discussion.

KEY TAKEAWAYS

- Purchasing power parity (PPP) is the application of the law of one price to entire economies.
- It predicts that exchange rates will adjust to relative price level changes, to differential inflation rates between two countries. They indeed do, but only in the long run and not to precisely the same degree.
- In the long run, exchange rates are determined by PPP (as described above) and relative differences in productivity, trade barriers, and import and export demand.

- As Country A's price level and import demand increase, and as Country A's productivity, trade barriers, and export demand decrease vis-à-vis another Country B, Country A's currency depreciates and Country B's appreciates.
- Basically, anything that lowers demand for Country A's goods, services, and currency induces the currency to depreciate; anything that increases demand for Country A's stuff induces the currency to appreciate in response.
- Higher inflation relative to Country B makes Country A's stuff look more expensive, lowering demand and inducing depreciation.
- If economic actors in Country A take a fancy to Country B's stuff, they will import it even if Country A's currency weakens, making Country B's stuff more expensive. Reductions in trade barriers (lower tariffs, higher quotas, fewer NTBs) will exacerbate that.
- If, for whatever reason, economic actors in Country B don't like Country A's stuff as much as they used to, they'll buy less of it unless Country A's currency depreciates, making it cheaper.
- Finally, if Country A's productivity slips relative to Country B's, Country A's goods and services will get more expensive than Country B's so it will sell in Country B only if its currency depreciates.

[1] http://www.wto.org/english/thewto_e/whatis_e/tif_e/agrm9_e.htm



18.4 Short-Run Determinants of Exchange Rates

LEARNING OBJECTIVES

1. What are the short-run determinants of exchange rates?
2. What is the interest parity condition and when and why does it hold?

As [Figure 18.6 "South Africa-United States exchange rate, June 2006"](#) shows, exchange rates can be very volatile. In a single month (June 2006), the South African rand depreciated from about 6.6 to 7.4 rand to 1 USD, with various ups and downs along the way. The rand then reversed course and appreciated toward 7.1 rand/USD. Such fluctuations are by no means unusual. Why do exchange rates undergo such gyrations? [Figure 18.7 "Determinants of exchange rates in the short run"](#) summarizes the major factors affecting exchange rates in the short run. *Note that it looks very much like [Figure 18.5 "Determinants of exchange rates in the long run"](#) but with three key differences.* First, instead of actual relative price levels, trade barriers, exports, imports, and productivity driving changes, *expectations of their future direction drive changes.* Given the discussion in [Chapter 7 "Rational Expectations, Efficient Markets, and the Valuation of Corporate Equities"](#), this should not be surprising. Second, two additional variables have entered the equation: foreign and domestic interest rates. The intuition behind the first variables is the same as those discussed above, but in the short run, the mere expectation of a change in a variable moves the market. The intuition behind the interest rates is also straightforward. *If something increases demand for the domestic currency, like domestic interest rates increasing or foreign interest rates decreasing, it will appreciate.* If something reduces demand for the domestic currency, like domestic interest rates decreasing or foreign interest rates increasing, it will depreciate. (If this doesn't make sense to you, review the discussion in [Chapter 5 "The Economics of Interest-Rate Fluctuations"](#) regarding the theory of asset demand.) Because expectations and interest rates change frequently, so, too, do exchange rates under the current floating rate regime.

Figure 18.6 South Africa-United States exchange rate, June 2006



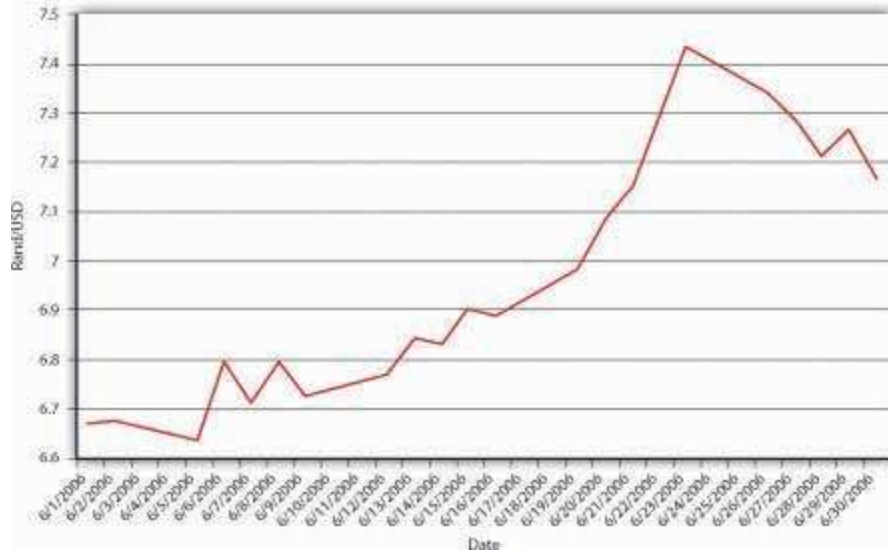


Figure 18.7 *Determinants of exchange rates in the short run*



Variable (Domestic/Foreign) C

Relative Expected Price Level	U
Relative Expected Productivity	U
Relative Expected Trade Barriers	U
Relative Expected Import Demand	U
Relative Expected Export Demand	U
Domestic interest rate	U
Foreign interest rate	U

Stop and Think Box

We learned in [Chapter 4 "Interest Rates"](#) that there is an important distinction between real and nominal interest rates. Through the Fisher Equation, we know that the nominal interest rate equals the real interest rate plus inflation expectations. Is that distinction important when considering foreign exchange markets?

Absolutely, and here is why. An increase in nominal interest rates caused by *a rise in the real interest rate* would leave expectations about future exchange rates unchanged and hence *would cause the domestic currency to appreciate*. An increase in nominal interest rates caused *solely by an increase in inflation expectations*, by contrast, would cause the expected future exchange rate to decrease through the expected and actual price level effects. *So the domestic currency would depreciate instead*.

The third difference between the long and short terms is that, in the short term, the expectation of the future direction of the exchange rate plays an important role. The easiest way to see this is to compare two investments with a one-year time horizon: a domestic (say, USD-denominated) bank account that pays 5 percent per year and a foreign (say, pound-sterling-denominated) account paying 6 percent per year. Before you jump for the sterling ($6 > 5$), you need to consider that, in a year, you're going to want dollars again because you reside in the United States and need USD to buy lunch, pay the rent, and so forth. If the dollar appreciates more than 1 percent over the course of the year, you'd be better off with the dollar deposit. Say that you invest \$10,000 in sterling when the exchange rate is \$1.50/£1 or, in other words, £.6667/\$1. Your investment today would buy $10,000 \times .6667 =$ £6,667. Multiply that by the interest on the sterling deposit (1.06) and you get £7,067.02 in a year. If the exchange rate is unchanged, you're cool because you'll have $7,067.02 \times 1.50 =$ \$10,600.53, which is greater than \$10,000 invested at 5 percent, which equals $10,000 \times 1.05 =$ \$10,500.00. But what if, over the course of that year, the dollar appreciated strongly, to \$1.25 per pound? Then your £7,067.02 would buy you only $7,067.02 \times 1.25 =$ \$8,833.78. You just took a bath, and not the good kind, because you should have invested in the dollar deposit! Of course, if the dollar depreciated to, say, \$1.75, you'll be peeling phat at $7,067.02 \times 1.75 =$ \$12,367.29.

Stop and Think Box



We learned in [Chapter 5 "The Economics of Interest-Rate Fluctuations"](#) that increases in the growth rate of the money supply will eventually cause the price level to increase, but its effect on nominal interest rates in the short term can vary: rates can dip strongly, then rebound but remain permanently lower than the previous level, decrease temporarily before increasing permanently, or increase immediately. What does this mean for the market for foreign exchange?

The fact that a major short-run determinant of the exchange rate, foreign and domestic interest rates, moves around a lot helps to explain why the foreign exchange market is volatile. That market is also volatile because expectations of many things, including future differential price levels, productivity, and trading levels, will affect it via the E^{ef} variable.

As noted above, the markets for foreign exchange and bonds/deposits are highly competitive and efficient, so we wouldn't expect discrepancies in returns to last long. *The law of one price, of course, applies most stringently to financial markets in which international capital mobility is allowed because huge sums of money (deposits) can be sent hither and thither almost immediately and cost-free, ideal conditions for the law of one price to prevail.* So what economists call the interest parity condition often holds (is true). More formally,

$$i^D = i^F - (E^{ef} - E_t) / E_t$$

where:

i^D = domestic interest rate

i^F = foreign interest rate

E^{ef} = expected future exchange rate

E_t = exchange rate today

In plain English, if the so-called interest parity condition holds, *the domestic interest rate should equal the foreign interest rate minus the expected appreciation of the domestic currency.* If i^F is $> i^D$, the domestic currency must be expected to appreciate; otherwise, everyone would sell their domestic deposits to buy the foreign ones. If i^F is $< i^D$, the domestic currency must be expected to depreciate



(have a negative sign, two of which make a positive, augmenting i^F); otherwise, everyone would sell the foreign deposits and buy the domestic ones. If you find this confusing, there is another, more intuitive way of stating it: the domestic interest rate must equal the foreign interest rate plus the expected appreciation of the foreign currency. If i^F is $< i^D$, the expected appreciation of the foreign currency compensates for the lower interest rate, allowing equilibrium. You can practice calculating interest parity in Exercise 1.

EXERCISE

1. Use the interest parity formula ($i^D = i^F - (E^{ef} - E^t)/E^t$) to calculate the following:

Foreign Interest Rate	Expected Future Exchange Rate	Exchange Rate Today	Answer: Domestic Interest Rate
5	1	1	5
5	1.1	1	4.9
5	1.2	1	4.8
5	1.3	1	4.7
5	0.9	1	5.1
5	0.8	1	5.2
5	0.7	1	5.3
6	1	1	6
6	1	1.1	6.090909
6	1	1.2	6.166667
6	1	1.3	6.230769
6	1	0.9	5.888889
6	1	0.8	5.75
6	1	0.7	5.571429
15	1	1	15
15	10	1	6
15	1	10	15.9
Expected Future Exchange Rate	Exchange Rate Today	Domestic Interest Rate	Answer: Foreign Interest Rate
1	1	2	2
1.1	1	2	2.1
1.2	1	2	2.2
1.3	1	2	2.3



Foreign Interest Rate	Expected Future Exchange Rate	Exchange Rate Today	Answer: Domestic Interest Rate
0.9	1	2	1.9
0.8	1	2	1.8
0.7	1	2	1.7
1	1	10	10
1	1.1	10	9.909091
1	1.2	10	9.833333
1	1.3	10	9.769231
1	0.9	10	10.11111
1	0.8	10	10.25
1	0.7	10	10.42857
1	1	0	0
10	1	0	9
1	10	1	0.1

KEY TAKEAWAYS

- Because foreign exchange markets are efficient, in the short run, the mere expectation of changes in relative inflation, exports, imports, trade barriers, and productivity moves the markets.
- Also in the short run, differences in interest rates and expectations of the future exchange rate play key roles in exchange rate determination.
- The interest parity condition equates the domestic interest rate to the foreign interest rate minus the appreciation of the domestic currency. (Or, by rearranging the terms, it equates the foreign interest rate to the domestic interest rate plus the expected appreciation of the domestic currency.)
- The interest parity condition holds whenever there is capital mobility, whenever deposits (units of account) can move freely and cheaply from one country to another.
- It holds under those conditions because if it didn't, an arbitrage condition would exist, inducing arbitrageurs to sell the overvalued deposit (side of the equation) and buy the undervalued one until the equation held.



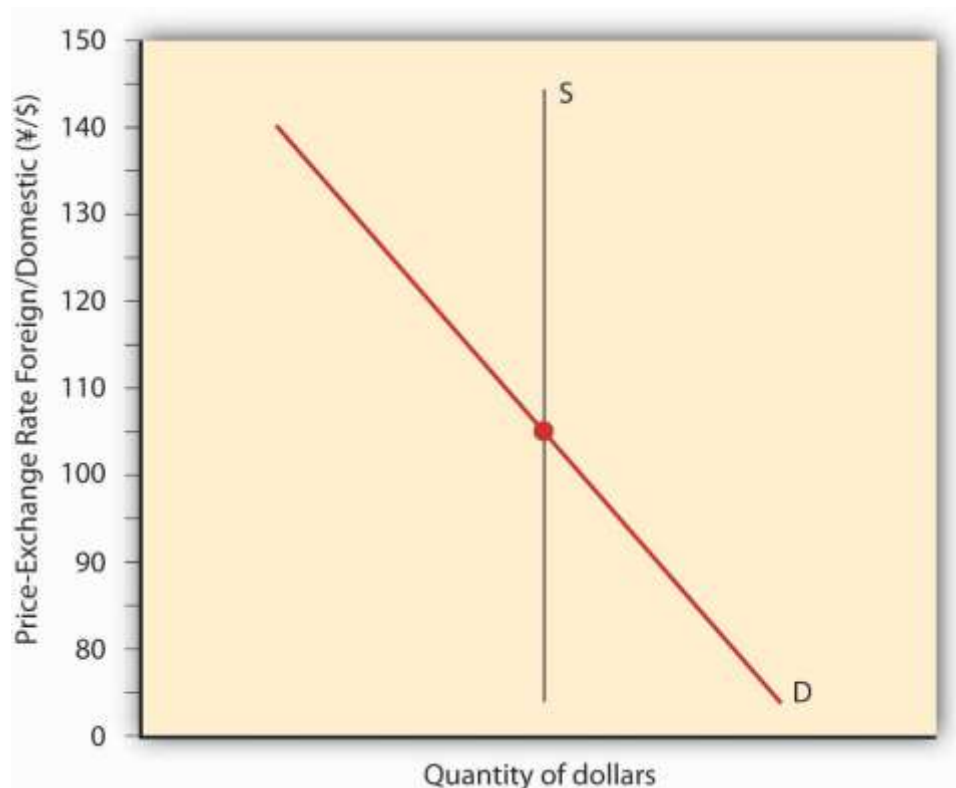
18.5 Modeling the Market for Foreign Exchange

LEARNING OBJECTIVE

1. How can the market for foreign exchange be modeled?

Like other markets, the market for foreign exchange can be graphically modeled to help us visualize the action, as in Figure 18.8 "Equilibrium in the market for USD". There are a number of ways to do this, but perhaps the easiest is to plot the quantity of dollars on the horizontal and the exchange rate, stated in terms of foreign divided by domestic (say, yen or ¥/USD) on the vertical. The supply of dollar assets will be perfectly vertical, unchanged at every exchange rate. The demand for dollars, by contrast, will have the usual downward slope because, at higher exchange rates, fewer dollar assets will be demanded than at lower exchange rates. So at ¥120 to 1 USD, relatively few dollar-denominated assets will be demanded compared to only ¥100 or ¥80 per dollar. The intersection of the supply and demand curves will determine E^* , which in this case is ¥100/\$, and q^* , which in this case is \$100 billion.

Figure 18.8 *Equilibrium in the market for USD*



We can immediately see that, holding all else constant, anything that increases demand for dollar-denominated assets (shifts the demand curve to the right), including an increase in the domestic interest rate, a decrease in the foreign interest rate, or an increase in E^{ef} (for any reason, including the variables in Figure 18.5 "Determinants of exchange rates in the long run"), will cause the dollar to appreciate (E^* to increase when stated in terms of foreign/domestic or in this case ¥/\$). Anything that causes demand for dollar-denominated assets, including a decrease in the domestic interest rate, an increase in the foreign interest rate, or a decrease in E^{ef} , to decrease (shift the demand curve to the left) will cause the dollar to depreciate (E^* to decrease when stated in terms of foreign/domestic).

Stop and Think Box

Post-dict Figure 18.9 "Euro-dollar exchange rate, 2000–2007" using Figure 18.10 "Interest rates in Europe and the United States, 2000–2007" and Figure 18.11 "Differential inflation in the United States and the Euro zone, 2000–2007".

Figure 18.9 Euro-dollar exchange rate, 2000–2007

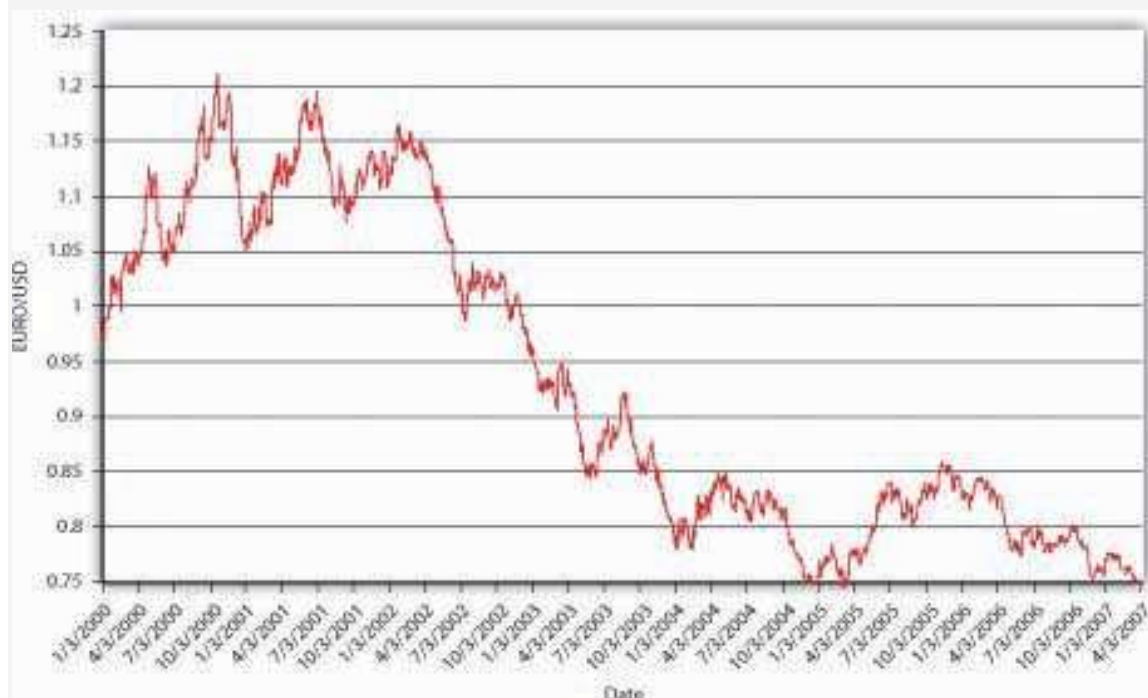


Figure 18.10 Interest rates in Europe and the United States, 2000–2007

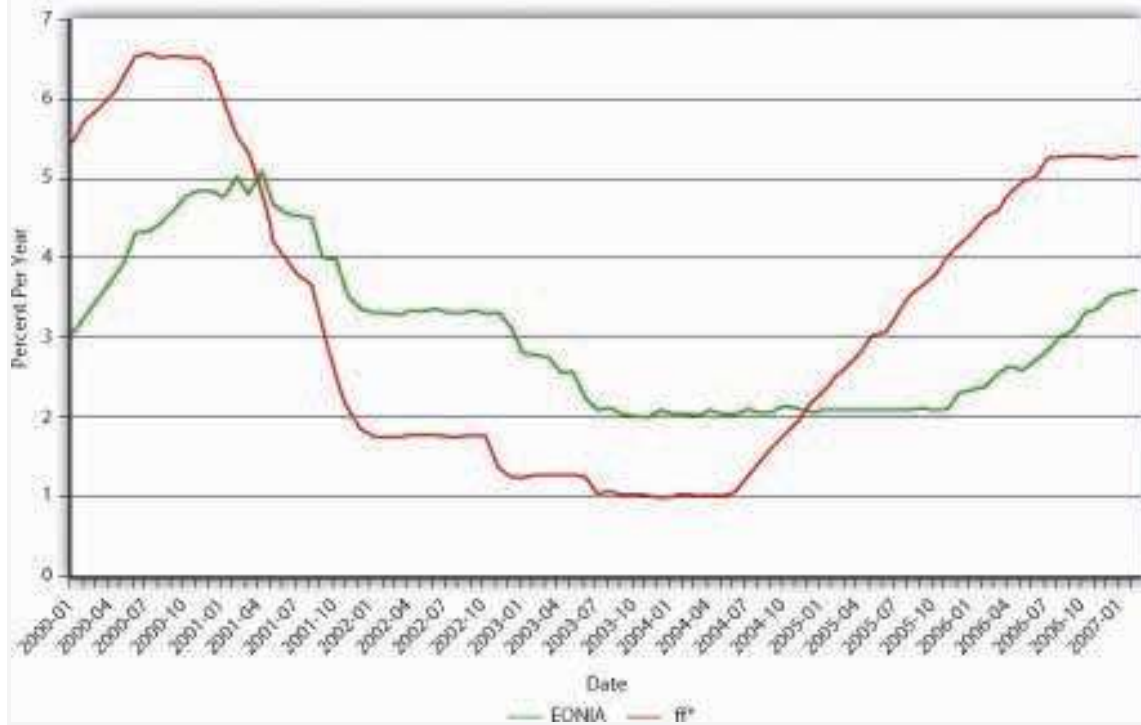
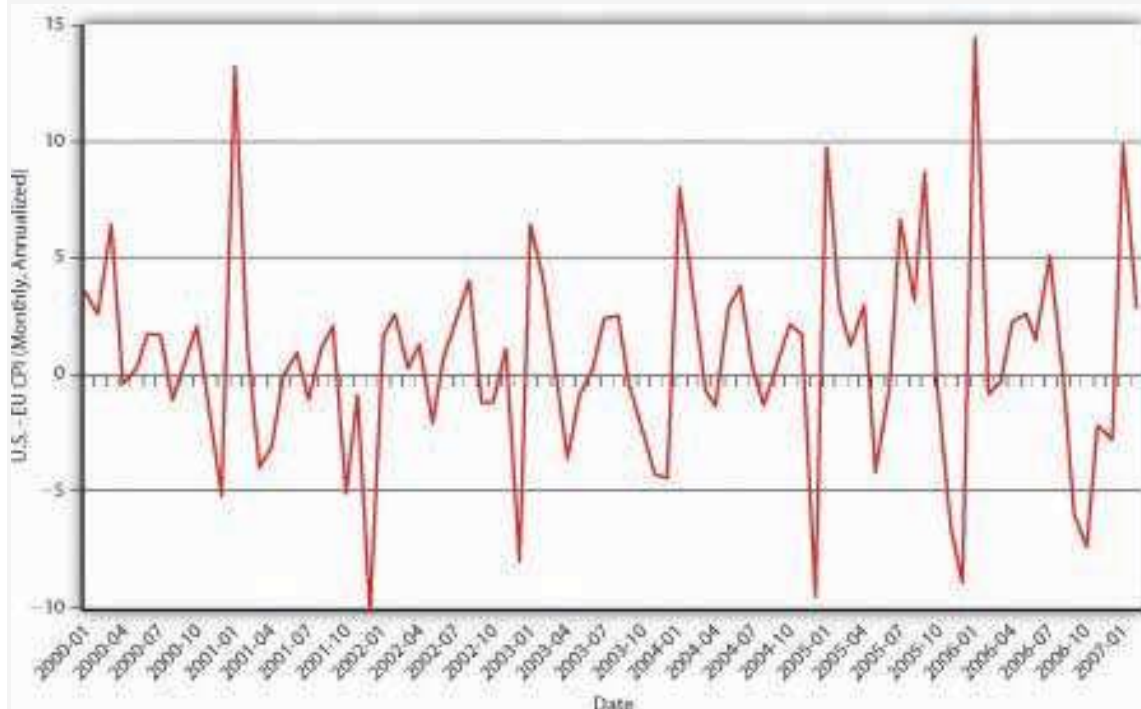


Figure 18.11 Differential inflation in the United States and the Euro zone, 2000–2007



From the beginning of 2000 until early 2002, the dollar appreciated against the euro, moving from rough parity (1 to 1) to €1.10 to €1.20 per USD. This isn't surprising given that U.S. interest rates (proxied here



by the fed funds rate ff^*) were higher than euro zone interest rates (proxied here by EONIA, the ECB's fed funds equivalent). Moreover, except for the spike in early 2001, the price level in the United States did not rise appreciably faster than prices in the euro zone did. Since mid-2002, prices in the United States have risen faster than prices in the euro zone. (There are more periods when the consumer price index [CPI] in the United States was $>$ the CPI in the euro zone, for example, when the red line is above zero.) Since mid-2004, interest rates have risen more quickly in the United States than in the euro zone, but not enough to offset the higher U.S. inflation rate. Fears of a recession in the United States and slowing U.S. productivity also dragged on the dollar.

KEY TAKEAWAYS

- The market for foreign exchange can be modeled in many different ways.
- The easiest way, perhaps, is to think of the price of a domestic currency, say, USD.
- There is a given quantity of USD that is insensitive to the exchange rate.
- Demand for the domestic currency slopes downward for the usual reasons that economic actors demand more of an asset when it is cheaper.
- The intersection of the two lines determines the exchange rate.



18.6 Suggested Reading

Galant, Mark, and Brian Dolan. *Currency Trading for Dummies*. Hoboken, NJ: John Wiley and Sons, 2007.

Shamah, Shani. *A Foreign Exchange Primer*. Hoboken, NJ: John Wiley and Sons, 2009.



Chapter 19

International Monetary Regimes

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Define the impossible trinity, or trilemma, and explain its importance.
2. Identify the four major types of international monetary regimes and describe how they differ.
3. Explain how central banks manage the foreign exchange (FX) rate.
4. Explain the benefits of fixing the FX rate, or keeping it within a narrow band.
5. Explain the costs of fixing the FX rate, or keeping it in a narrow band.



19.1 The Trilemma, or Impossible Trinity

LEARNING OBJECTIVES

1. What is the impossible trinity, or trilemma, and why is it important?
2. What are the four major types of international monetary regimes and how do they differ?

The foreign exchange (forex, or FX) market described in [Chapter 18 "Foreign Exchange"](#) is called the free floating regime because monetary authorities allow world markets (via interest rates, and expectations about relative price, productivity, and trade levels) to determine the prices of different currencies in terms of one another. The free float, as we learned, was characterized by tremendous exchange rate volatility and unfettered international capital mobility. As we learned in [Chapter 13 "Central Bank Form and Function"](#) through [Chapter 17 "Monetary Policy Targets and Goals"](#), it is also characterized by national central banks with tremendous discretion over domestic monetary policy. *The free float is not, however, the only possible international monetary regime. In fact, it has pervaded the world economy only since the early 1970s, and many nations even today do not embrace it.* Between World War II and the early 1970s, much of the world (the so-called first, or free, world) was on a managed, fixed-FX regime called the Bretton Woods System (BWS). Before that, many nations were on the gold standard (GS), as summarized in [Figure 19.1 "The trilemma, or impossible trinity, of international monetary regimes"](#).

Figure 19.1 The trilemma, or impossible trinity, of international monetary regimes

International Monetary Regime	Fixed Exchange Rates?	Domestic Discretionary Monetary Policy?	Capital Mobility?
Specie Standard (from ? to World War II)	Yes	No	Yes
Bretton Woods System (World War II to 1971-73)	Yes	Yes	No
Free Float (1973-present)	No	Yes	Yes
Managed Float (1973-present)	Sometimes	Sometimes	Yes

Note that those were the prevailing regimes. Because nations determine their monetary relationship with the rest of the world individually, some countries have always remained outside the prevailing system, often for strategic reasons. In the nineteenth century, for example, some countries chose a silver rather than a gold standard. Some allowed their currencies to float in wartime. Today, some countries maintain fixed exchange rates (usually against USD) or manage their currencies so their exchange rates stay within a band or range. *But just as no country can do away with scarcity or asymmetric information, none can escape the trilemma (a dilemma with three components), also known as the impossible trinity.*

Figure 19.2 *Strengths and weaknesses of international monetary regimes*

Regime	Strength	Weakness
Specie Standard	FX rate stability	Susceptible to domestic shocks due to the lack of domestic monetary discretion
Managed Fixed Exchange Rate System (Bretton Woods)	FX rate stability	Capital immobility; sudden FX rate devaluations/revaluations
Free Float	Free flow of capital and domestic monetary policy flexibility	FX rate instability; susceptibility to international shocks
Managed Float	Free flow of capital and the ability to switch between domestic monetary policy discretion and fixed FX as desired	Sudden FX rate depreciation, appreciation; loss of international reserves; accumulation of too many such reserves

As Figure 19.1 "The trilemma, or impossible trinity, of international monetary regimes" shows, only two of the three holy grails of international monetary policy, fixed exchanged rates, international financial capital mobility, and domestic monetary policy discretion, can be satisfied at once. Countries can adroitly change regimes when it suits them, but they cannot enjoy capital mobility, fixed exchange rates, and discretionary monetary policy all at once. That is because, to maintain a fixed exchange rate, a monetary authority (like a central bank) has to make that rate its sole

consideration (thus giving up on domestic goals like inflation or employment/gross domestic product [GDP]), or it has to seal off the nation from the international financial system by cutting off capital flows. Each component of the trilemma comes laden with costs and benefits, so each major international policy regime has strengths and weaknesses, as outlined in [Figure 19.2 "Strengths and weaknesses of international monetary regimes"](#).

Stop and Think Box

From 1797 until 1820 or so, Great Britain abandoned the specie standard it had maintained for as long as anyone could remember and allowed the pound sterling to float quite freely. That was a period of almost nonstop warfare known as the Napoleonic Wars. The United States also abandoned its specie standard from 1775 until 1781, from 1814 until 1817, and from 1862 until essentially 1873. Why?

Those were also periods of warfare and their immediate aftermath in the United States—the Revolution, War of 1812, and Civil War, respectively. Apparently during wartime, both countries found the specie standard costly and preferred instead to float with free mobility of financial capital. That allowed them to borrow abroad while simultaneously gaining discretion over domestic monetary policy, essentially allowing them to fund part of the cost of the wars with a currency tax, which is to say, inflation.

KEY TAKEAWAYS

- The impossible trinity, or trilemma, is one of those aspects of the nature of things, like scarcity and asymmetric information, that makes life difficult.
- Specifically, the trilemma means that a country can follow only two of three policies at once: international capital mobility, fixed exchange rates, and discretionary domestic monetary policy.
- To keep exchange rates fixed, the central bank must either restrict capital flows or give up its control over the domestic money supply, interest rates, and price level.
- This means that a country must make difficult decisions about which variables it wants to control and which it wants to give up to outside forces.
- The four major types of international monetary regime are specie standard, managed fixed exchange rate, free float, and managed float.
- They differ in their solution, so to speak, of the impossible trinity.



- Specie standards, like the classical GS, maintained fixed exchange rates and allowed the free flow of financial capital internationally, rendering it impossible to alter domestic money supplies, interest rates, or inflation rates.
- Managed fixed exchange rate regimes like BWS allowed central banks discretion and fixed exchange rates at the cost of restricting international capital flows.
- Under a free float, free capital flows are again allowed, as is domestic discretionary monetary policy, but at the expense of the security and stability of fixed exchange rates.
- With a managed float, that same solution prevails until the FX rate moves to the top or bottom of the desired band, at which point the central bank gives up its domestic discretion so it can concentrate on appreciating or depreciating its currency.



19.2 Two Systems of Fixed Exchange Rates

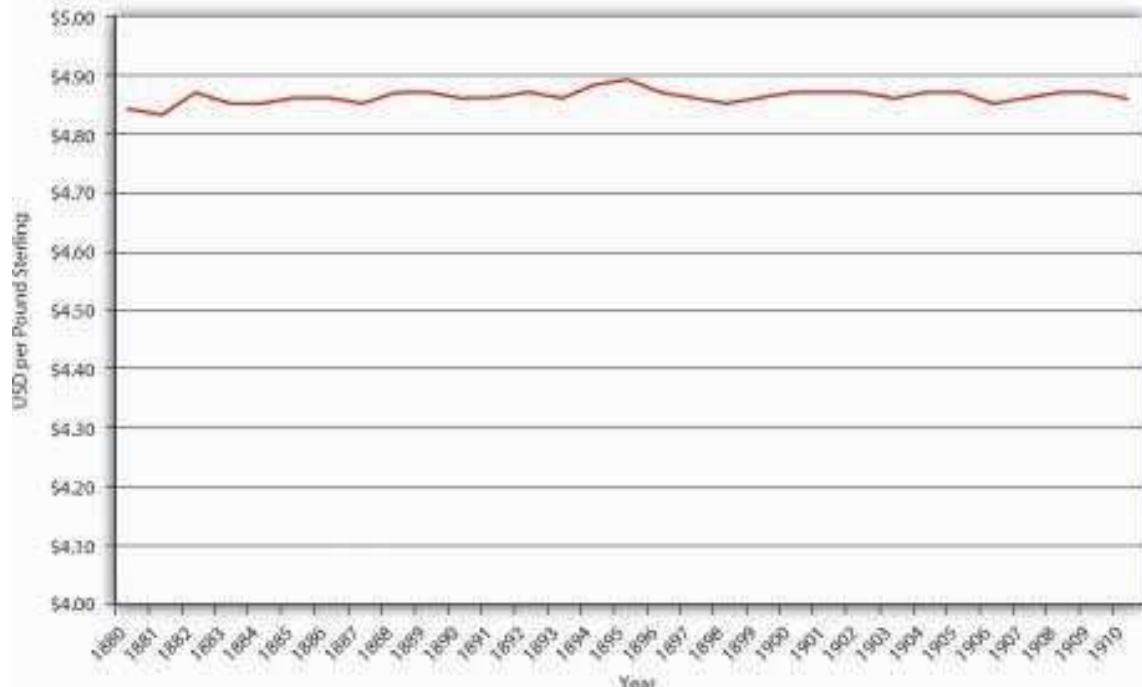
LEARNING OBJECTIVE

1. What were the two major types of fixed exchange rate regimes and how did they differ?

Under the gold standard, nations defined their respective domestic units of account in terms of so much gold (by weight and fineness or purity) and allowed gold and international checks (known as bills of exchange) to flow between nations unfettered. Thanks to arbitrageurs, the spot exchange rate, the market price of bills of exchange, could not stray very far from the exchange rate implied by the definition of each nation's unit of account. For example, the United States and Great Britain defined their units of account roughly as follows: 1 oz. gold = \$20.00; 1 oz. gold = £4. Thus, the implied exchange rate was roughly \$5 = £1 (or £.20 = \$1). It was not costless to send gold across the Atlantic, so Americans who had payments to make in Britain were willing to buy sterling-denominated bills of exchange for something more than \$5 per pound and Americans who owned sterling bills would accept something less than \$5 per pound, as the supply and demand conditions in the sterling bills market dictated. If the dollar depreciated too far, however, people would stop buying bills of exchange and would ship gold to Britain instead. That would decrease the U.S. money supply and appreciate the dollar. If the dollar appreciated too much, people would stop selling bills of exchange and would order gold shipped from Britain instead. That increased the U.S. money supply and depreciated the dollar. *The GS system was self-equilibrating, functioning without government intervention (after their initial definition of the domestic unit of account).*

Figure 19.3 Dollar-sterling exchange during the classical gold standard





As noted in Figure 19.2 "Strengths and weaknesses of international monetary regimes" and shown in Figure 19.3 "Dollar-sterling exchange during the classical gold standard", the great strength of the GS was exchange rate stability. One weakness of the system was that the United States had so little control of its domestic monetary policy that it did not need, or indeed have, a central bank. Other GS countries, too, suffered from their inability to adjust to domestic shocks. Another weakness of the GS was the annoying fact that gold supplies were rarely in synch with the world economy, sometimes lagging it, thereby causing deflation, and sometimes exceeding it, hence inducing inflation.

Stop and Think Box

Why did the United States find it prudent to have a central bank (the B.U.S. [1791–1811] and the S.B.U.S. [1816–1836]) during the late eighteenth and early nineteenth centuries, when it was on a specie standard, but not later in the nineteenth century? (*Hint*: Transatlantic transportation technology improved dramatically beginning in the 1810s.)

As discussed in earlier chapters, the B.U.S. and S.B.U.S. had some control over the domestic money supply by regulating commercial bank reserves via the alacrity of its note and deposit redemption policy. Although the United States was on a de facto specie standard (legally bimetallic but de facto silver, then gold) at the time, the exchange rate bands were quite wide because transportation costs (insurance,

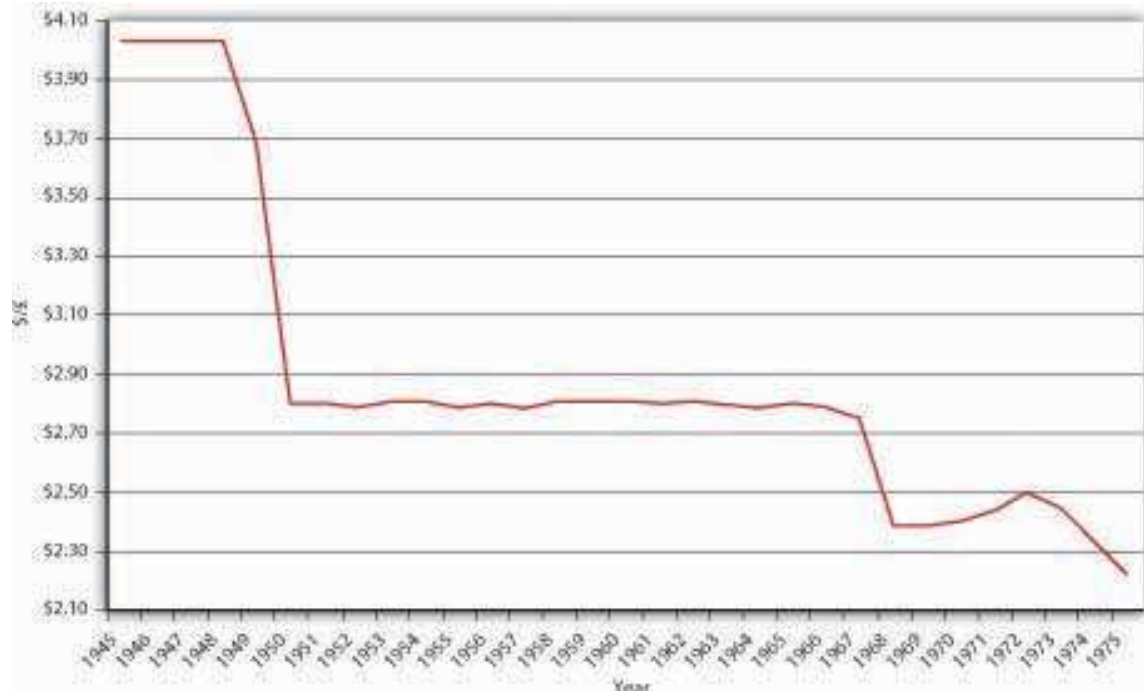
freight, interest lost in transit) were so large compared to later in the century that the U.S. monetary regime was more akin to a modern managed float. In other words, the central bank had discretion to change the money supply and exchange rates within the wide band that the costly state of technology created.

The Bretton Woods System adopted by the first world countries in the final stages of World War II was designed to overcome the flaws of the GS while maintaining the stability of fixed exchange rates. By making the dollar the free world's reserve currency (basically substituting USD for gold), it ensured a more elastic supply of international reserves and also allowed the United States to earn seigniorage to help offset the costs it incurred fighting World War II, the Korean War, and the cold war. The U.S. government promised to convert USD into gold at a fixed rate (\$35 per oz.), essentially rendering the United States the banker to more than half of the world's economy. The other countries in the system maintained fixed exchange rates with the dollar and allowed for domestic monetary policy discretion, so the BWS had to restrict international capital flows. Little wonder that the period after World War II witnessed a massive shrinkage of the international financial system.

Under the BWS, if a country could no longer defend its fixed rate with the dollar, it was allowed to devalue its currency, or in other words, to set a newer, weaker exchange rate. As [Figure 19.4 "Dollar–sterling exchange under BWS"](#) reveals, Great Britain devalued several times, as did other members of the BWS. But what ultimately destroyed the system was the fact that the banker, the United States, kept issuing more USD without increasing its reserve of gold. The international equivalent of a bank run ensued because major countries, led by France, exchanged their USD for gold. Attempts to maintain the BWS in the early 1970s failed. Thereafter, Europe created its own fixed exchange rate system called the exchange rate mechanism (ERM), with the German mark as the reserve currency. That system morphed into the European currency union and adopted a common currency called the euro.

Figure 19.4 Dollar–sterling exchange under BWS





Most countries today allow their currencies to float freely or employ a managed float strategy. With international capital mobility restored in many places after the demise of the BWS, the international financial system has waxed ever stronger since the early 1970s.

KEY TAKEAWAYS

- The two major types of fixed exchange rate regimes were the gold standard and Bretton Woods.
- The gold standard relied on retail convertibility of gold, while the BWS relied on central bank management where the USD stood as a sort of substitute for gold.

19.3 The Managed or Dirty Float

LEARNING OBJECTIVE

1. How can central banks manage the FX rate?

The so-called managed float (aka dirty float) is perhaps the most interesting attempt to, if not eliminate the impossible trinity, at least to blunt its most pernicious characteristic, that of locking countries into the disadvantages outlined in [Figure 19.2 "Strengths and weaknesses of international monetary regimes"](#). *Under a managed float, the central bank allows market forces to determine second-to-second (day-to-day) fluctuations in exchange rates but intervenes if the currency grows too weak or too strong.* In other words, it tries to keep the exchange rate range bound. Those ranges or bands can vary in size from very wide to very narrow and can change levels over time.

Central banks intervene in the foreign exchange markets by exchanging international reserves, assets denominated in foreign currencies, gold, and special drawing rights (SDRs, for domestic currency).

Consider the case of Central Bank selling \$10 billion of international reserves, thereby soaking up \$10 billion of MB (the monetary base, or currency in circulation and/or reserves). The T-account would be:

Central Bank	
Assets	Liabilities
International reserves -\$10 billion	Currency in circulation or reserves -\$10 billion

If it were to buy \$100 million of international reserves, both MB and its holdings of foreign assets would increase:

Central Bank	
Assets	Liabilities
International reserves +\$100 million	Monetary base +\$100 million

Such transactions are known in the biz as *unsterilized foreign exchange interventions* and they influence the FX rate via changes in MB. Recall from [Chapter 18 "Foreign Exchange"](#) that increasing the money supply (MS) causes the domestic currency to depreciate, while decreasing the MS causes



it to appreciate. It does so by influencing both the domestic interest rate (nominal) and expectations about E^e , the future exchange rate, via price level (inflation) expectations. (There is also a direct effect on the MS, but it is too small in most instances to be detectable and so it can be safely ignored. Intuitively, however, increasing the money supply leaves each unit of currency less valuable, while decreasing it renders each unit more valuable.)

Central banks also sometimes engage in so-called sterilized foreign exchange interventions when they offset the purchase or sale of international reserves with a domestic sale or purchase. For example, a central bank might offset or sterilize the purchase of \$100 million of international reserves by selling \$100 million of domestic government bonds, or vice versa. In terms of a T-account:

Central Bank	
Assets	Liabilities
International reserves +\$100 million	Government bonds -\$100 million
Monetary base +\$100 million	Monetary base -\$100 million

Because there is no net change in MB, a sterilized intervention should have no long-term impact on the exchange rate. Apparently, central bankers engage in sterilized interventions as a short-term ruse (where central banks are not transparent, considerable asymmetric information exists between them and the markets) or to signal their desire to the market. *Neither go very far, so for the most part central banks that wish to manage their nation's exchange rate must do so via unsterilized interventions, buying international reserves with domestic currency when they want to depreciate the domestic currency, and selling international reserves for domestic currency when they want the domestic currency to appreciate.*

The degree of float management can range from a hard peg, where a country tries to keep its currency fixed to another, so-called anchor currency, to such wide bands that intervention is rarely undertaken. Figure 19.5 "Thai bhat–USD exchange rate, 1981–2007" clearly shows that Thailand used to maintain a hard peg against the dollar but gave it up during the Southeast Asian financial crisis of 1997. That big spike was not pleasant for Thailand, especially for economic agents within it that had debts denominated in foreign currencies, which suddenly became much more difficult to



repay. (In June 1997, it took only about 25 baht to purchase a dollar. By the end of that year, it took over 50 baht to do so.) Clearly, a major downside of maintaining a hard peg or even a tight band is that it simply is not always possible for the central bank to maintain or defend the peg or band. It can run out of international reserves in a fruitless attempt to prevent a depreciation (cause an appreciation). Or maintenance of the peg might require increasing or decreasing the MB counter to the needs of the domestic economy.

Figure 19.5 *Thai bhat–USD exchange rate, 1981–2007*

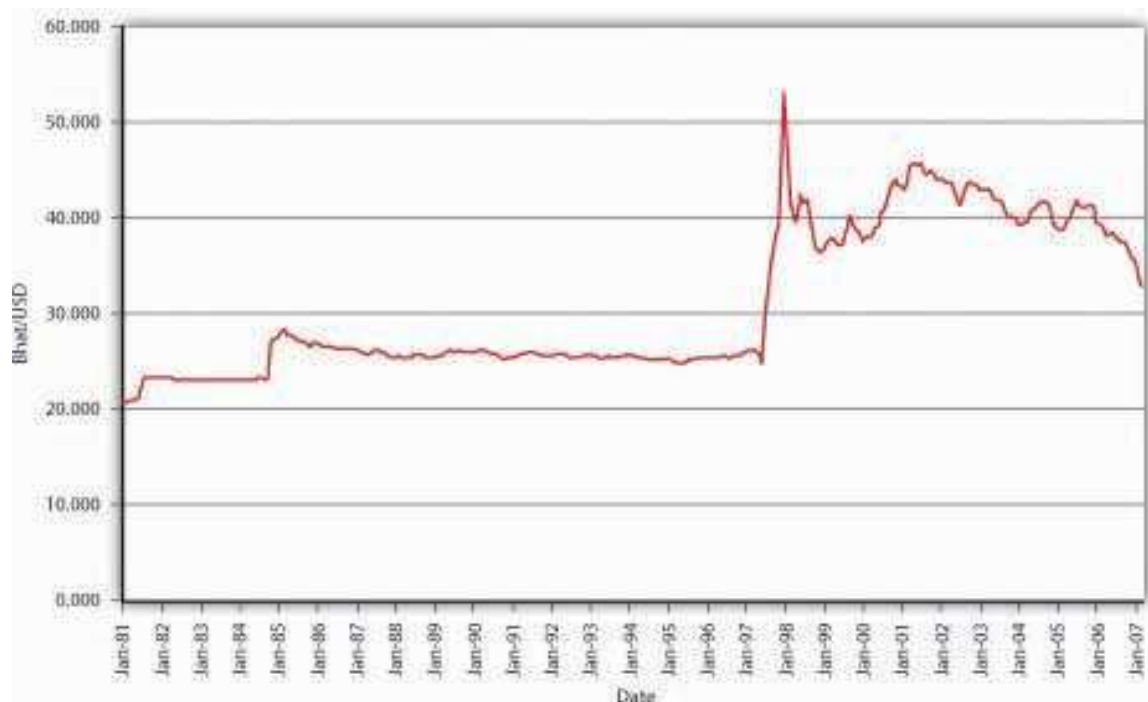
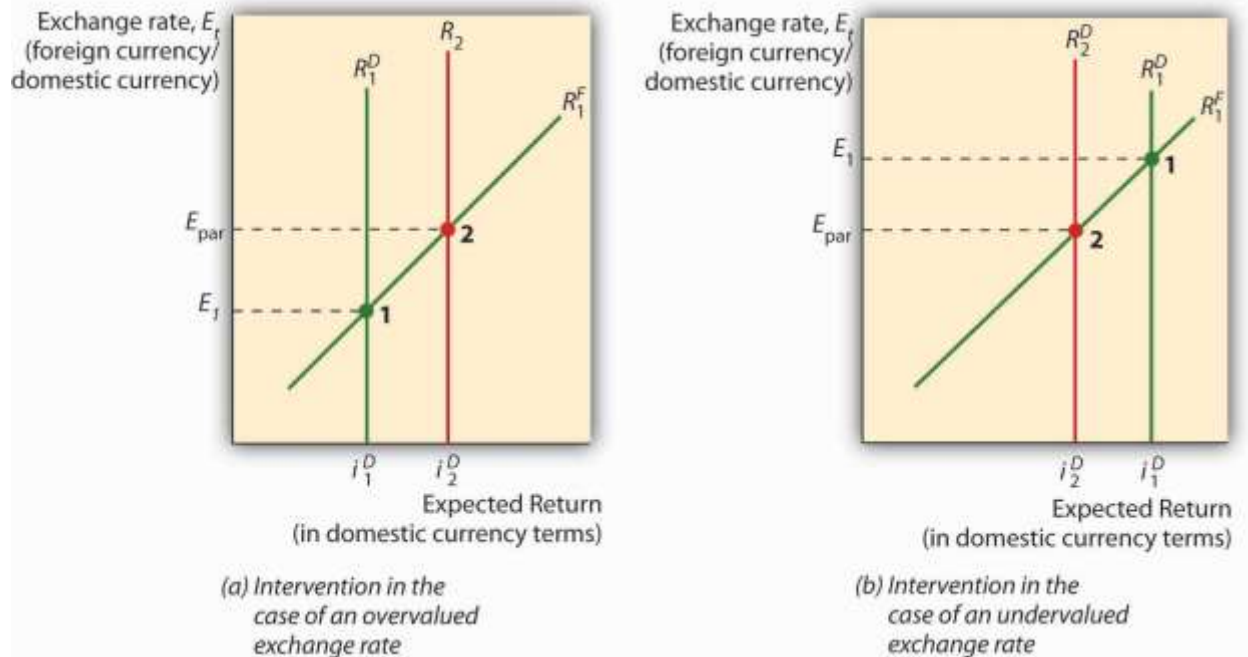


Figure 19.6 *Intervening in the FX market under a fixed exchange rate regime*



A graph, like the one in [Figure 19.6 "Intervening in the FX market under a fixed exchange rate regime"](#), might be useful here. When the market exchange rate (E^*) is equal to the fixed, pegged, or desired central bank rate (E_{peg}) everything is hunky dory. When a currency is overvalued (by the central bank), which is to say that E^* is less than E_{peg} (measuring E as foreign currency/domestic currency), the central bank must soak up domestic currency by selling international reserves (foreign assets). When a currency is undervalued (by the central bank), which is to say that when E^* is higher than E_{peg} , the central bank must sell domestic currency, thereby gaining international reserves.

Stop and Think Box

In 1990, interest rates rose in Germany due to West Germany's reunification with formerly communist East Germany. (Recall from [Chapter 18 "Foreign Exchange"](#) that when exchange rates are fixed, the interest parity condition collapses to $i^D = i^F$ because $E^{ef} = E^t$.) Therefore, interest rates also rose in the other countries in the ERM, including France, leading to a slowing of economic growth there. The same problem could recur in the new European currency union or euro zone if part of the zone needs a high interest rate to stave off inflation while another needs a low interest rate to stoke employment and growth. What does this analysis mean for the likelihood of creating a single world currency?

It means that the creation of a world currency is not likely anytime soon. As the European Union has discovered, a common currency has certain advantages, like the savings from not having to convert one currency into another or worry about the current or future exchange rate (because there is none). At the same time, however, the currency union has reminded the world that there is no such thing as a free lunch, that every benefit comes with a cost. The cost in this case is that the larger the common currency area becomes, the more difficult it is for the central bank to implement policies beneficial to the entire currency union. It was for that very reason that Great Britain opted out of the euro.

KEY TAKEAWAYS

- Central banks influence the FX rate via unsterilized foreign exchange interventions or, more specifically, by buying or selling international reserves (foreign assets) with domestic currency.
- When central banks buy international reserves, they increase MB and hence depreciate their respective currencies by increasing inflation expectations.
- When central banks sell international reserves, they decrease MB and hence appreciate their respective currencies by decreasing inflation expectations.



19.4 The Choice of International Policy Regime

LEARNING OBJECTIVE

1. What are the costs and benefits of fixing the FX rate or keeping it within a narrow band?

Problems ensue when the central bank runs out of reserves, as it did in Thailand in 1997. The International Monetary Fund (IMF) often provides loans to countries attempting to defend the value of their currencies. It doesn't really act as an international lender of last resort, however, because it doesn't follow Hamilton's *née* Bagehot's Law. It simply has no mechanism for adding liquidity quickly, and the longer one waits, the bigger the eventual bill. Moreover, the IMF often forces borrowers to undergo fiscal austerity programs (high government taxes, decreased expenditures, high domestic interest rates, and so forth) that can create as much economic pain as a rapid depreciation would. Finally, it has created a major moral hazard problem, repeatedly lending to the same few countries, which quickly learned that they need not engage in responsible policies in the long run because the IMF would be sure to help out if they got into trouble. Sometimes the medicine is indeed worse than the disease!

Trouble can also arise when a central bank no longer wants to accumulate international reserves (or indeed any assets) because it wants to squelch domestic inflation, as it did in Germany in 1990–1992. Many fear that China, which currently owns over \$1 trillion in international reserves (mostly USD), will find itself in this conundrum soon. The Chinese government accumulated such a huge amount of reserves by fixing its currency (which confusingly goes by two names, the yuan and the renminbi, but one symbol, CNY) at the rate of CNY8.28 per USD. Due to the growth of the Chinese economy relative to the U.S. economy, E^* exceeded E_{peg} , inducing the Chinese, per the analysis above, to sell CNY for international reserves to keep the yuan permanently weak, or undervalued relative to the value the market would have assigned it.

You should recall from [Chapter 18 "Foreign Exchange"](#) that undervaluing the yuan helps Chinese exports by making them appear cheap to foreigners. (If you don't believe me, walk into any Wal-Mart, Target, or other discount store.) *Many people think that China's peg is unfair, a monetary form of dirty pool.* Such folks need to realize that there is no such thing as a free lunch. To maintain its peg,



the Chinese government has severely restricted international capital mobility via currency controls, thereby injuring the efficiency of Chinese financial markets, limiting foreign direct investment, and encouraging mass loophole mining. It is also stuck with a trillion bucks of relatively low-yielding international reserves that will decline in value when the yuan floats (and probably appreciates strongly), as it eventually must. In other words, *China is setting itself up for the exact opposite of the Southeast Asian Crisis of 1997–1998, where the value of its assets will plummet instead of the value of its liabilities skyrocketing.*

In China's defense, many developing countries find it advantageous to peg their exchange rates to the dollar, the yen, the euro, the pound sterling, or a basket of such important currencies. *The peg, which can be thought of as a monetary policy target similar to an inflation or money supply target, allows the developing nation's central bank to figure out whether to increase or decrease MB and by how much. A hard peg or narrow band effectively ties the domestic inflation rate to that of the anchor country,* ^[1] *instilling confidence in the developing country's macroeconomic performance.*

Indeed, in extreme cases, some countries have given up their central bank altogether and have dollarized, adopting USD or other currencies (though the process is still called dollarization) as their own. No international law prevents this, and indeed the country whose currency is adopted earns seigniorage and hence has little grounds for complaint. Countries that want to completely outsource their monetary policy but maintain seigniorage revenue (the profits from the issuance of money) adopt a currency board that issues domestic currency but backs it 100 percent with assets denominated in the anchor currency. (The board invests the reserves in interest-bearing assets, the source of the seigniorage.) Argentina benefited from just such a board during the 1990s, when it pegged its peso one-to-one with the dollar, because it finally got inflation, which often ran over 100 percent per year, under control.

Fixed exchange rates not based on commodities like gold or silver are notoriously fragile, however, because relative macroeconomic changes in interest rates, trade, and productivity can create persistent imbalances over time between the developing and the anchor currencies. Moreover, speculators can force countries to devalue (move E_{peg} down) or revalue (move E_{peg} up) when they hit the bottom or top of a band. They do so by using the derivatives markets to place big bets on the future exchange rate.



Unlike most bets, these are one-sided because the speculators lose little money if the central bank successfully defends the peg, but they win a lot if it fails to. Speculator George Soros, for example, is reported to have made \$1 billion speculating against the pound sterling during the ERM balance of payments crisis in September 1992. Such crises can cause tremendous economic pain, as when Argentina found it necessary to abandon its currency board and one-to-one peg with the dollar in 2001–2002 due to speculative pressures and fundamental macroeconomic misalignment between the Argentine and U.S. economies. (Basically, the United States was booming and Argentina was in a recession. The former needed higher interest rates/slower money growth and the latter needed lower interest rates/higher money growth.)

Developing countries may be best off maintaining what is called a crawling target or crawling peg. Generally, this entails the developing country's central bank allowing its domestic currency to depreciate or appreciate over time, as general macroeconomic conditions (the variables discussed in [Chapter 18 "Foreign Exchange"](#)) dictate. A similar strategy is to recognize imbalances as they occur and change the peg on an ad hoc basis accordingly, perhaps first by allowing the band to widen before permanently moving it. In those ways, developing countries can maintain some FX rate stability, keep inflation in check (though perhaps higher than in the anchor country), and hopefully avoid exchange rate crises.

Stop and Think Box

What sort of international monetary regimes are consistent with [Figure 19.7 "Dollar-yen exchange rate, 1997–2007"](#) and [Figure 19.8 "Hong Kong–USD exchange rate, 1984–2007"](#)?

Figure 19.7 Dollar-yen exchange rate, 1997–2007



Figure 19.8 Hong Kong-USD exchange rate, 1984-2007

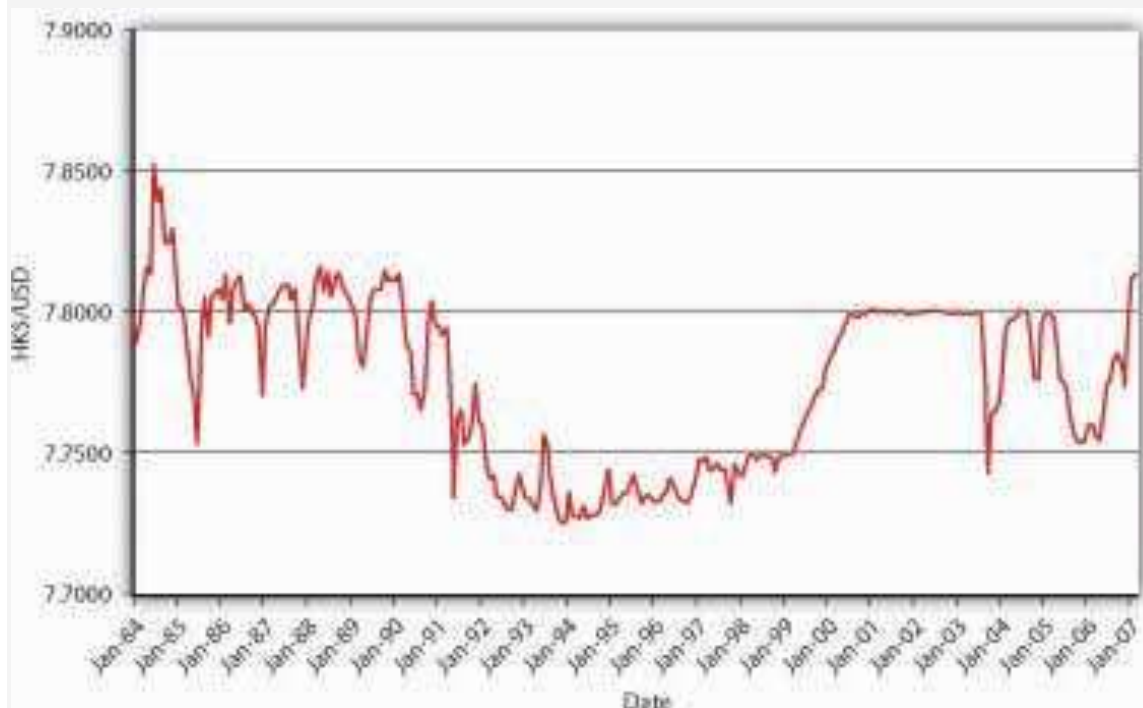


Figure 19.7 "Dollar-yen exchange rate, 1997-2007" certainly is not a fixed exchange rate regime, or a managed float with a tight band. It could be consistent with a fully free float, but it might also represent a managed float with wide bands between about ¥100 to ¥145 per dollar.

It appears highly likely from [Figure 19.8 "Hong Kong–USD exchange rate, 1984–2007"](#) that Hong Kong's monetary authority for most of the period from 1984 to 2007 engaged in a managed float within fairly tight bands bounded by about HK7.725 and HK7.80 to the dollar. Also, for three years early in the new millennium, it pegged the dollar at HK7.80 before returning to a looser but still tight band in 2004.

KEY TAKEAWAYS

- A country with weak institutions (e.g., a dependent central bank that allows rampant inflation) can essentially free-ride on the monetary policy of a developed country by fixing or pegging its currency to the dollar, euro, yen, pound sterling, or other anchoring currency to a greater or lesser degree.
- In fact, in the limit, a country can simply adopt another country's currency as its own in a process called dollarization.
- If it wants to continue earning seigniorage (profits from the issuance of money), it can create a currency board, the function of which is to maintain 100 percent reserves and full convertibility between the domestic currency and the anchor currency.
- At the other extreme, it can create a crawling peg with wide bands, allowing its currency to appreciate or depreciate day to day according to the interaction of supply and demand, slowly adjusting the band and peg in the long term as macroeconomic conditions dictate.
- When a currency is overvalued, which is to say, when the central bank sets E_{peg} higher than E^* (when E is expressed as foreign currency/domestic currency), the central bank must appreciate the currency by selling international reserves for its domestic currency.
- It may run out of reserves before doing so, however, sparking a rapid depreciation that could trigger a financial crisis by rapidly increasing the real value of debts owed by domestic residents but denominated in foreign currencies.
- When a currency is undervalued, which is to say, when the central bank sets E_{peg} below E^* , the central bank must depreciate its domestic currency by exchanging it for international reserves. It may accumulate too many such reserves, which often have low yields and which could quickly lose value if the domestic currency suddenly appreciates, perhaps with the aid of a good push by currency speculators making big one-sided bets.



[1] As noted in [Chapter 18 "Foreign Exchange"](#), however, not all goods and services are traded internationally, so the rates will not be exactly equal.



19.5 Suggested Reading

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Chapter 20

Money Demand

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Describe Friedman's modern quantity theory of money.
2. Describe the classical quantity theory.
3. Describe Keynes's liquidity preference theory and its improvements.
4. Contrast the modern quantity theory with the liquidity preference theory.



20.1 The Quantity Theory

LEARNING OBJECTIVE

1. What is the quantity theory of money and how was it improved by Milton Friedman?

The rest of this book is about *monetary theory*, a daunting-sounding term. It's not the easiest aspect of money and banking, but it isn't terribly taxing either so there is no need to freak out. We're going to take it nice and slow. *And here's a big hint: you already know most of the outcomes because we've discussed them already in more intuitive terms. In the chapters that follow, we're simply going to provide you with more formal ways of thinking about how the money supply determines output (Y^*) and the price level (P^*).*

We've already discussed the money supply at some length in the chapters above, so we'll start our theorizing with the demand for money, specifically John Maynard Keynes's liquidity preference theory and Milton Friedman's modern quantity theory of money. Building on the work of earlier scholars, including Irving Fisher of Fisher Equation fame, the late, great Friedman treats money like any other asset, concluding that economic agents (individuals, firms, governments) want to hold a certain quantity of real, as opposed to nominal, money balances. If inflation erodes the purchasing power of the unit of account, economic agents will want to hold higher nominal balances to compensate, to keep their real money balances constant. The level of those real balances, Friedman argued, was a function of permanent income (the present discounted value of all expected future income), the relative expected return on bonds and stocks versus money, and expected inflation.

More formally,

$$M_d/P: f(Y_p \langle + \rangle, r_b - r_m \langle - \rangle, r_s - r_m \langle - \rangle, \pi_e - r_m \langle - \rangle)$$

where:

M_d/P = demand for real money balances (M_d = money demand; P = price level)

f means "function of" (not equal to)

Y_p = permanent income



$r_b - r_m$ = the expected return on bonds minus the expected return on money

$r_s - r_m$ = the expected return on stocks (equities) minus the expected return on money

$\pi^e - r_m$ = expected inflation minus the expected return on money

<+> = varies directly with

<-> = varies indirectly with

So the demand for real money balances, according to Friedman, increases when permanent income increases and declines when the expected returns on bonds, stocks, or goods increases versus the expected returns on money, which includes both the interest paid on deposits and the services banks provide to depositors.

Stop and Think Box

As noted in the text, money demand is where the action is these days because, as we learned in previous chapters, the central bank determines what the money supply will be, so we can model it as a vertical line. Earlier monetary theorists, however, had no such luxury because, under a specie standard, money was supplied exogenously. What did the supply curve look like before the rise of modern central banking in the twentieth century?

The supply curve sloped upward, as most do. You can think of this in two ways, first, by thinking of interest on the vertical axis. Interest is literally the price of money. When interest is high, more people want to supply money to the system because seigniorage is higher. So more people want to form banks or find other ways of issuing money, extant bankers want to issue more money (notes and/or deposits), and so forth. You can also think of this in terms of the price of gold. When its price is low, there is not much incentive to go out and find more of it because you can earn just as much making cheesecake or whatever. When the price of gold is high, however, everybody wants to go out and prospect for new veins or for new ways of extracting gold atoms from what looks like plain old dirt. The point is that early monetary theorists did not have the luxury of concentrating on the nature of money demand; they also had to worry about the nature of money supply.



This all makes perfectly good sense when you think about it. If people suspect they are permanently more wealthy, they are going to want to hold more money, in real terms, so they can buy caviar and fancy golf clubs and what not. If the return on financial investments decreases vis-à-vis money, they will want to hold more money because its opportunity cost is lower. If inflation expectations increase, but the return on money doesn't, people will want to hold less money, ceteris paribus, because the relative return on goods (land, gold, turnips) will increase. (In other words, expected inflation here proxies the expected return on nonfinancial goods.)

KEY TAKEAWAYS

- According to Milton Friedman, demand for real money balances (M_d/P) is directly related to permanent income (Y_p)—the discounted present value of expected future income—and indirectly related to the expected differential returns from bonds, stocks (equities), and goods vis-à-vis money ($r_b - r_m$, $r_s - r_m$, $\pi^e - r_m$), where inflation (π) proxies the return on goods.
- Because he believed that the return on money would increase (decrease) as returns on bonds, stocks, and goods increased (decreased), Friedman did not think that interest rate changes mattered much.



20.2 Liquidity Preference Theory

LEARNING OBJECTIVE

1. What is the liquidity preference theory and how has it been improved?

The very late and very great John Maynard Keynes (to distinguish him from his father, economist John Neville Keynes) developed the liquidity preference theory in response to the rather *primitive pre-Friedman quantity theory of money*, which was simply an assumption-laden identity called the *equation of exchange*:

$$MV=PY$$

where:

M = money supply

V = velocity

P = price level

Y = output

Nobody doubted the equation itself, which, as an identity (like $x = x$), is undeniable. *But many doubted the way that classical quantity theorists used the equation of exchange as the causal statement: increases in the money supply lead to proportional increases in the price level. The classical quantity theory also suffered by assuming that money velocity, the number of times per year a unit of currency was spent, was constant.* Although a good first approximation of reality, the classical quantity theory, which critics derided as the “naïve quantity theory of money,” was hardly the entire story. In particular, it could not explain why velocity was pro-cyclical, i.e., why it increased during business expansions and decreased during recessions.

To find a better theory, Keynes took a different point of departure, asking in effect, “Why do economic agents hold money?” He came up with three reasons:



1. Transactions: Economic agents need money to make payments. As their incomes rise, so, too, do the number and value of those payments, so *this part of money demand is proportional to income*.
2. Precautions: *S—t happens* was a catch phrase of the 1980s, recalled perhaps most famously in the hit movie *Forrest Gump*. Way back in the 1930s, Keynes already knew that bad stuff happens—and that one defense against it was to keep some spare cash lying around *as a precaution*. It, too, is *indirectly proportional to income*, Keynes believed.
3. Speculations: People will hold more bonds than money when interest rates are high for two reasons. The opportunity cost of holding money (which Keynes assumed has zero return) is higher and the expectation is that interest rates will fall, raising the price of bonds. When interest rates are low, the opportunity cost of holding money is low, and the expectation is that rates will rise, decreasing the price of bonds. So people hold larger money balances when rates are low. *Overall, then, money demand and interest rates are inversely related.*

More formally, Keynes's ideas can be stated as

$$Md/P = f(i \langle - \rangle, Y \langle + \rangle)$$

where:

Md/P = demand for real money balances

f means "function of" (this simplifies the mathematics)

i = interest rate

Y = output (income)

$\langle + \rangle$ = varies directly with

$\langle - \rangle$ = varies indirectly with

An increase in interest rates induces people to decrease real money balances for a given income level, implying that velocity must be higher. *So Keynes's view was superior to the classical quantity theory of money because he showed that velocity is not constant but rather is positively related to interest rates, thereby explaining its pro-cyclical nature.* (Recall from [Chapter 5 "The Economics of Interest-Rate](#)



Fluctuations" that interest rates rise during expansions and fall during recessions.) *Keynes's theory was also fruitful because it induced other scholars to elaborate on it further.*

In the early 1950s, for example, a young Will Baumol ^[1] and James Tobin ^[2] independently showed that money balances, *held for transaction purposes* (not just speculative ones), were sensitive to interest rates, *even if the return on money was zero*. That is because people can hold bonds or other interest-bearing securities until they need to make a payment. When interest rates are high, people will hold as little money for transaction purposes as possible because it will be worth the time and trouble of investing in bonds and then liquidating them when needed. When rates are low, by contrast, people will hold more money for transaction purposes because it isn't worth the hassle and brokerage fees to play with bonds very often. *So transaction demand for money is negatively related to interest rates*. A similar trade-off applies also to precautionary balances. The lure of high interest rates offsets the fear of bad events occurring. When rates are low, better to play it safe and hold more dough. *So the precautionary demand for money is also negatively related to interest rates.*

KEY TAKEAWAYS

- Before Friedman, the quantity theory of money was a much simpler affair based on the so-called equation of exchange—money times velocity equals the price level times output ($MV = PY$)—plus the assumptions that changes in the money supply cause changes in output and prices and that velocity changes so slowly it can be safely treated as a constant. Note that the interest rate is not considered at all in this so-called naïve version.
- Keynes and his followers knew that interest rates were important to money demand and that velocity wasn't a constant, so they created a theory whereby economic actors demand money to engage in transactions (buy and sell goods), as a precaution against unexpected negative shocks, and as a speculation.
- Due to the first two motivations, real money balances increase directly with output.
- Due to the speculative motive, real money balances and interest rates are inversely related. When interest rates are high, so is the opportunity cost of holding money.
- Throw in the expectation that rates will likely fall, causing bond prices to rise, and people are induced to hold less money and more bonds.

- When interest rates are low, by contrast, people expect them to rise, which will hurt bond prices. Moreover, the opportunity cost of holding money to make transactions or as a precaution against shocks is low when interest rates are low, so people will hold more money and fewer bonds when interest rates are low.

[1] <http://pages.stern.nyu.edu/~wbaumol/>

[2] http://nobelprize.org/nobel_prizes/economics/laureates/1981/tobin-autobio.html



20.3 Head to Head: Friedman versus Keynes

LEARNING OBJECTIVE

1. How do the modern quantity theory and the liquidity preference theory compare?

Friedman's elaboration of the quantity theory drew heavily on Keynes's and his followers' insights as well, so it is not surprising that Friedman's view eventually predominated. The modern quantity theory is superior to Keynes's liquidity preference theory because it is more complex, specifying three types of assets (bonds, equities, goods) instead of just one (bonds). It also does not assume that the return on money is zero, or even a constant. In Friedman's theory, velocity is no longer a constant; instead, it is highly predictable and, as in reality and Keynes's formulation, pro-cyclical, rising during expansions and falling during recessions.

Finally, unlike the liquidity preference theory, Friedman's modern quantity theory predicts that interest rate changes should have little effect on money demand. The reason for this is that Friedman believed that the return on bonds, stocks, goods, and money would be positively correlated, leading to little change in $r_b - r_m$, $r_s - r_m$, or $\pi^e - r_m$ because both sides would rise or fall about the same amount. That insight essentially reduces the modern quantity theory to $Md/P = f(Y_p, <+>)$. *Until the 1970s, Friedman was more or less correct.* Interest rates did not strongly affect the demand for money, so velocity was predictable and the quantity of money was closely linked to aggregate output. Except when nominal interest rates hit zero (as in Japan), the demand for money was somewhat sensitive to interest rates, so there was no so-called liquidity trap (where money demand is perfectly horizontal, leaving central bankers impotent). *During the 1970s, however, money demand became more sensitive to interest rate changes, and velocity, output, and inflation became harder to predict.* That's one reason, noted in [Chapter 17 "Monetary Policy Targets and Goals"](#), why central banks in the 1970s found that targeting monetary aggregates did not help them to meet their inflation or output goals.

Stop and Think Box

Stare at [Figure 20.1 "The quarterly volatility of velocity, 1959–2008"](#) for a spell. How is it related to the discussion in this chapter? Then take a gander at [Figure 20.2 "The velocity of money in the United States, 1959–2008"](#). In addition to giving us a new perspective on [Figure 20.1 "The quarterly volatility of velocity,](#)



1959–2008", it shows that the velocity of money (velocity = $GDP/M1$ because $MV = PY$ can be solved for $V: V = PY/M$) has increased considerably since the late 1950s. Why might that be?

Figure 20.1 The quarterly volatility of velocity, 1959–2008

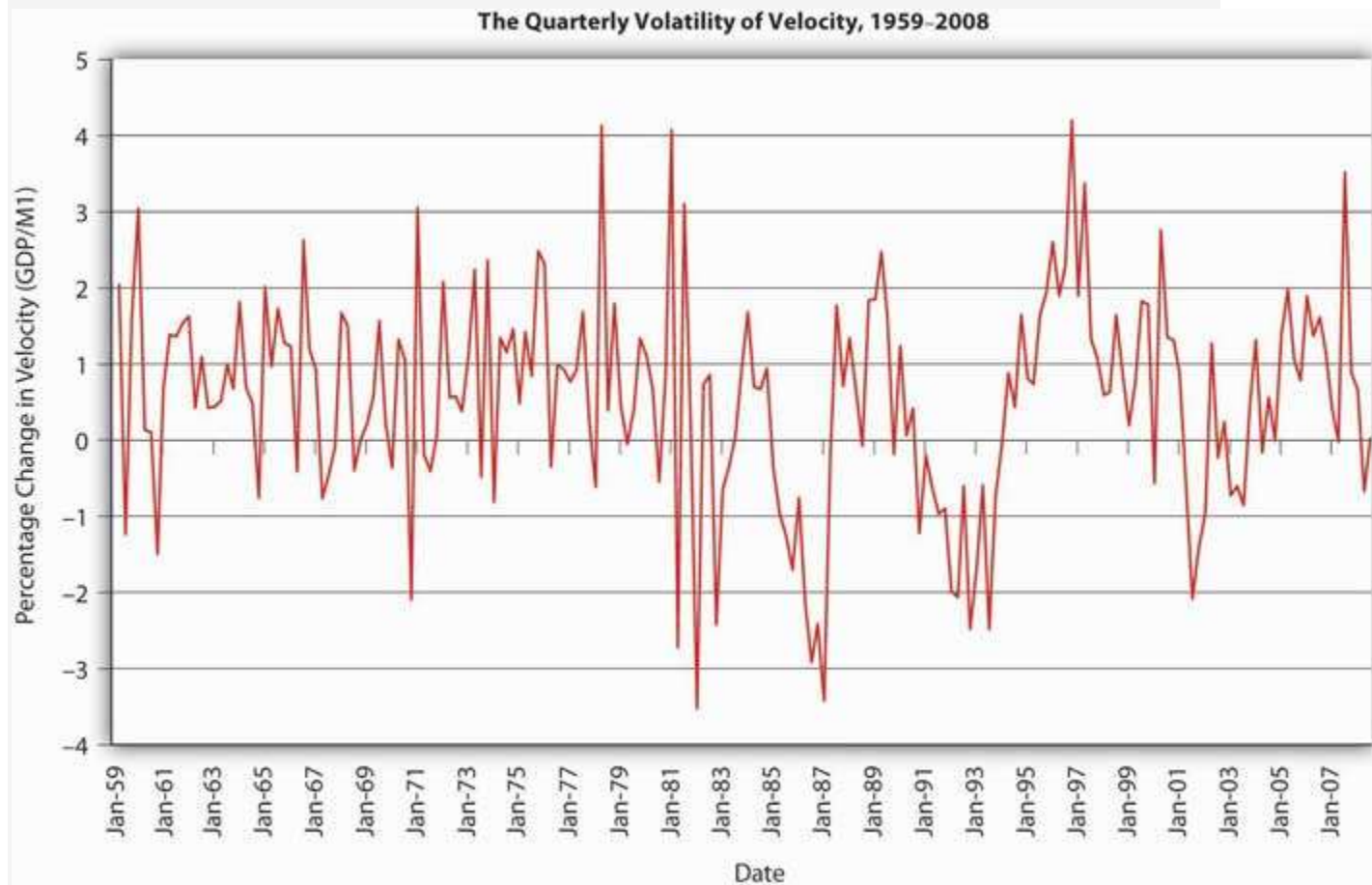
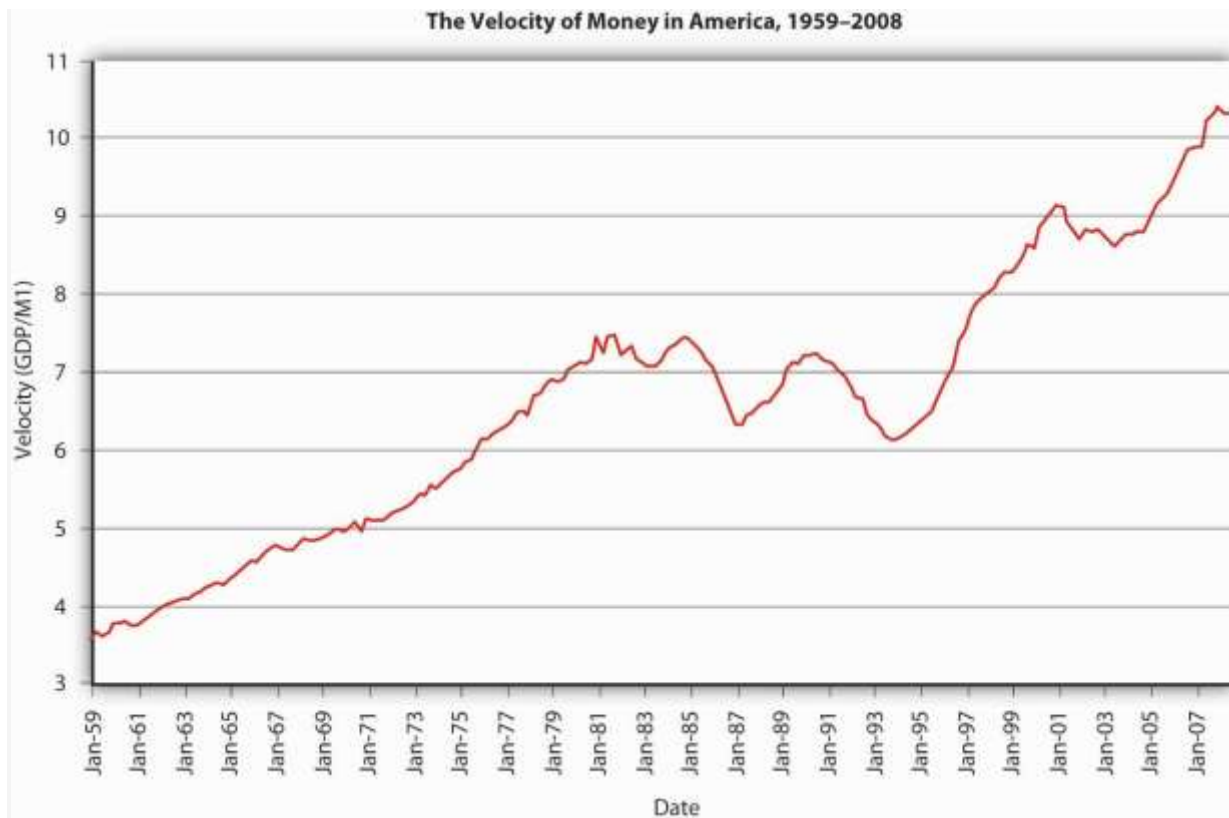


Figure 20.2 The velocity of money in the United States, 1959–2008



The chapter makes the point that velocity became much less stable and much less predictable in the 1970s and thereafter. Figure 20.1 "The quarterly volatility of velocity, 1959–2008" shows that by measuring the quarterly change in velocity. Before 1970, velocity went up and down between -1 and 3 percent in pretty regular cycles. Thereafter, the variance increased to between almost -4 and 4 percent, and the pattern has become much less regular. This is important because it shows why Friedman's modern quantity theory of money lost much of its explanatory power in the 1970s, leading to changes in central bank targeting and monetary theory.

Figure 20.2 "The velocity of money in the United States, 1959–2008" suggests that velocity likely increased in the latter half of the twentieth century due to technological improvements that allowed each unit of currency to be used in more transactions over the course of a year. More efficient payment systems (electronic funds transfer), increased use of credit, lower transaction costs, and financial innovations like cash management accounts have all helped to increase V , to help each dollar move through more hands or the same number of hands in less time.



The breakdown of the quantity theory had severe repercussions for central banking, central bankers, and monetary theorists. That was bad news for them (and for people like Wright who grew up in that awful decade), and it is bad news for us because our exploration of monetary theory must continue. Monetary economists have learned a lot over the last few decades by constantly testing, critiquing, and improving models like those of Keynes and Friedman, and we're going to follow along so you'll know precisely where monetary theory and policy stand at present.

Stop and Think Box

Examine [Figure 20.3 "Velocity of money, 1790–1860"](#), [Figure 20.4 "U.S. national debt, 1790–1860"](#), and [Figure 20.5 "Volume of public securities trading in select U.S. markets, by year, 1790–1834"](#) carefully. Why might velocity have trended upward to approximately 1815 and then fallen? *Hint:* Alexander Hamilton argued in the early 1790s that “in countries in which the national debt is properly funded, and an object of established confidence, it answers most of the purposes of money. Transfers of stock or public debt are there equivalent to payments in specie; or in other words, stock, in the principal transactions of business, passes current as specie. The same thing would, in all probability happen here, under the like circumstances”—if his funding plan was adopted. It was.

Figure 20.3 Velocity of money, 1790–1860

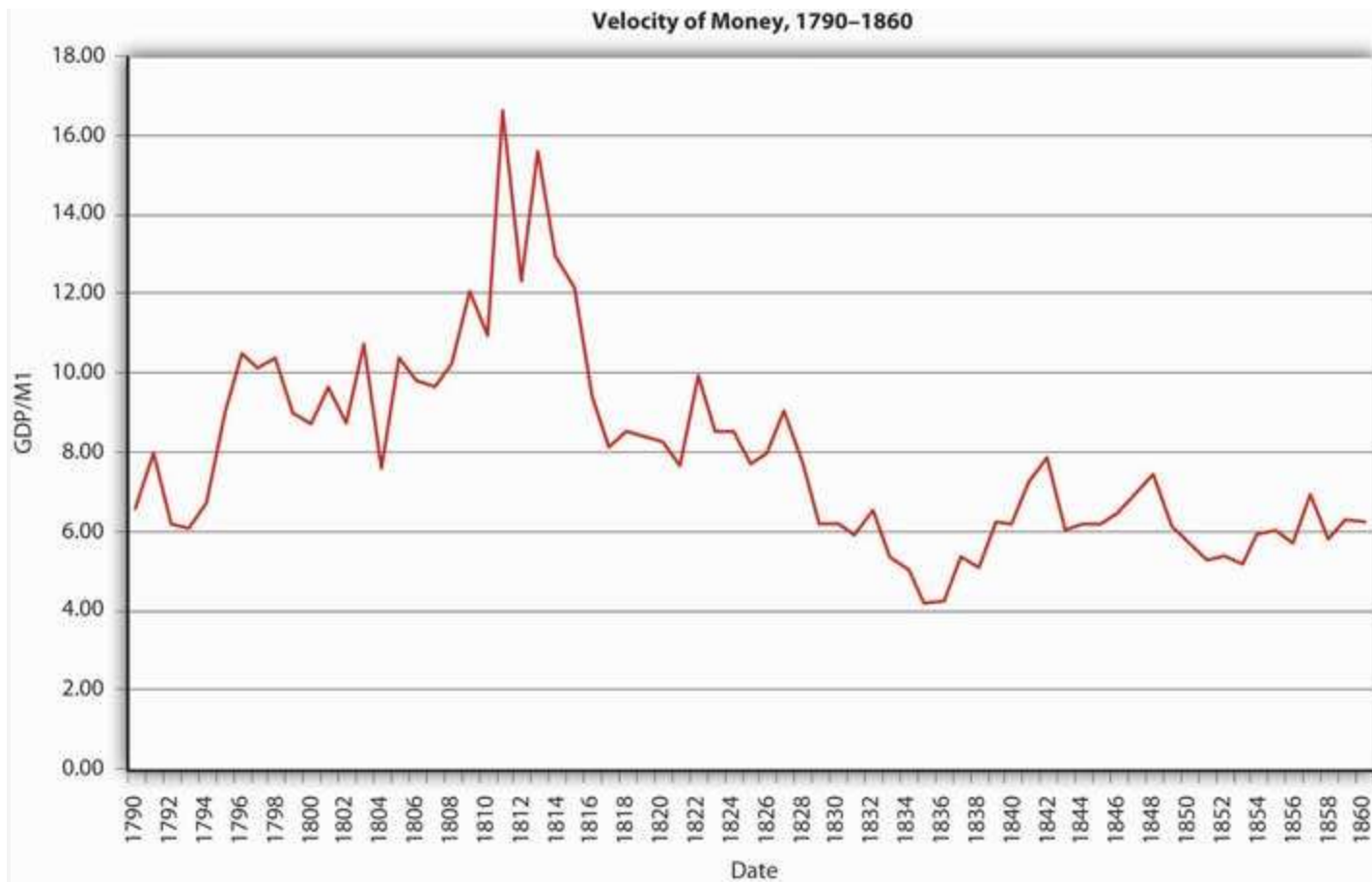


Figure 20.4 U.S. national debt, 1790-1860





Figure 20.5 Volume of public securities trading in select U.S. markets, by year, 1790–1834



Year	Total Volume of Trades (\$)	Total No. of Trades
1790	\$447,857.92	246
1791	7,846,219.00	5,566
1792	7,171,626.47	7,077
1793	2,593,669.39	2,556
1794	1,936,077.64	2,074
1795	2,224,321.83	3,228
1796	1,585,086.93	2,108
1797	1,080,420.78	1,247
1798	1,061,315.79	950
1799	1,019,449.19	1,069
1800	2,970,559.22	2,186
1801	4,176,301.01	2,866
1802	4,353,652.96	3,052
1803	3,934,689.85	2,168
1804	4,194,508.92	2,190
1805	2,968,683.77	1,688
1806	4,381,071.57	2,303
1807	6,453,146.54	2,311
1808	8,933,783.61	1,904
1809	6,065,009.24	2,191
1810–1819	49,503,929.71	9,915
1820–1834	3,316,642.50	1,345
TOTALS	\$128,218,023.84	60,240



Velocity rises when there are money substitutes, highly liquid assets that allow economic agents to earn interest. Apparently Hamilton was right—the national debt answered most of the purposes of money. Ergo, not as much M1 was needed to support the gross domestic product (GDP) and price level, so velocity rose during the period that the debt was large. It then dropped as the government paid off the debt, requiring the use of more M1.

KEY TAKEAWAYS

- Friedman’s modern quantity theory proved itself superior to Keynes’s liquidity preference theory because it was more complex, accounting for equities and goods as well as bonds.
- Friedman allowed the return on money to vary and to increase above zero, making it more realistic than Keynes’s assumption of zero return.
- Money demand was indeed somewhat sensitive to interest rates but velocity, while not constant, was predictable, making the link between money and prices that Friedman predicted a close one.
- Friedman’s reformulation of the quantity theory held up well only until the 1970s, when it cracked asunder because money demand became more sensitive to interest rate changes, thus causing velocity to vacillate unpredictably and breaking the close link between the quantity of money and output and inflation.



20.4 Suggested Reading

Friedman, Milton. *Money Mischief: Episodes in Monetary History*. New York: Harvest, 1994.

Friedman, Milton, and Anna Jacobson. *A Monetary History of the United States, 1867–1960* (Princeton, NJ: Princeton University Press, 1971).

Kindleberger, Charles. *Keynesianism vs. Monetarism and Other Essays in Financial History*. London: George Allen & Unwin, 1985.

Minsky, Hyman. *John Maynard Keynes*. New York: McGraw-Hill, 2008)

Serletis, Apostolos. *The Demand for Money: Theoretical and Empirical Approaches*. New York: Springer, 2007.



Chapter 21

IS-LM

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Explain this equation: $Y = Y_{ad} = C + I + G + NX$.
2. Provide the equation for C and explain its importance.
3. Describe the Keynesian cross diagram and explain its use.
4. Describe the investment-savings (IS) curve and its characteristics.
5. Describe the liquidity preference–money (LM) curve and its characteristics.
6. Explain why equilibrium is achieved in the markets for goods and money.
7. Explain the IS-LM model's biggest drawback.



21.1 Aggregate Output and Keynesian Cross Diagrams

LEARNING OBJECTIVES

1. What does this equation mean: $Y = Y_{ad} = C + I + G + NX$?
2. Why is this equation important?
3. What is the equation for C and why is it important?
4. What is the Keynesian cross diagram and what does it help us to do?

Developed in 1937 by economist and Keynes disciple John Hicks, the IS-LM model is still used today to model aggregate output (gross domestic product [GDP], gross national product [GNP], etc.) and interest rates in the short run.^[1] It begins with John Maynard Keynes's recognition that

$$Y=Y_{ad}=C+I+G+NX$$

where:

Y = aggregate output (supplied)

Y_{ad} = aggregate demand

C = consumer expenditure

I = investment (on new physical capital like computers and factories, and planned inventory)

G = government spending

NX = net exports (exports minus imports)

Keynes further explained that $C = a + (mpc \times Y_d)$

where:

Y_d = disposable income, all that income above a

a = autonomous consumer expenditure (food, clothing, shelter, and other necessities)



mpc = marginal propensity to consume (change in consumer expenditure from an extra dollar of income or “disposable income;” it is a constant bounded by 0 and 1)

Practice calculating C in Exercise 1.

EXERCISES

1. Calculate consumer expenditure using the formula $C = a + (mpc \times Y_d)$.

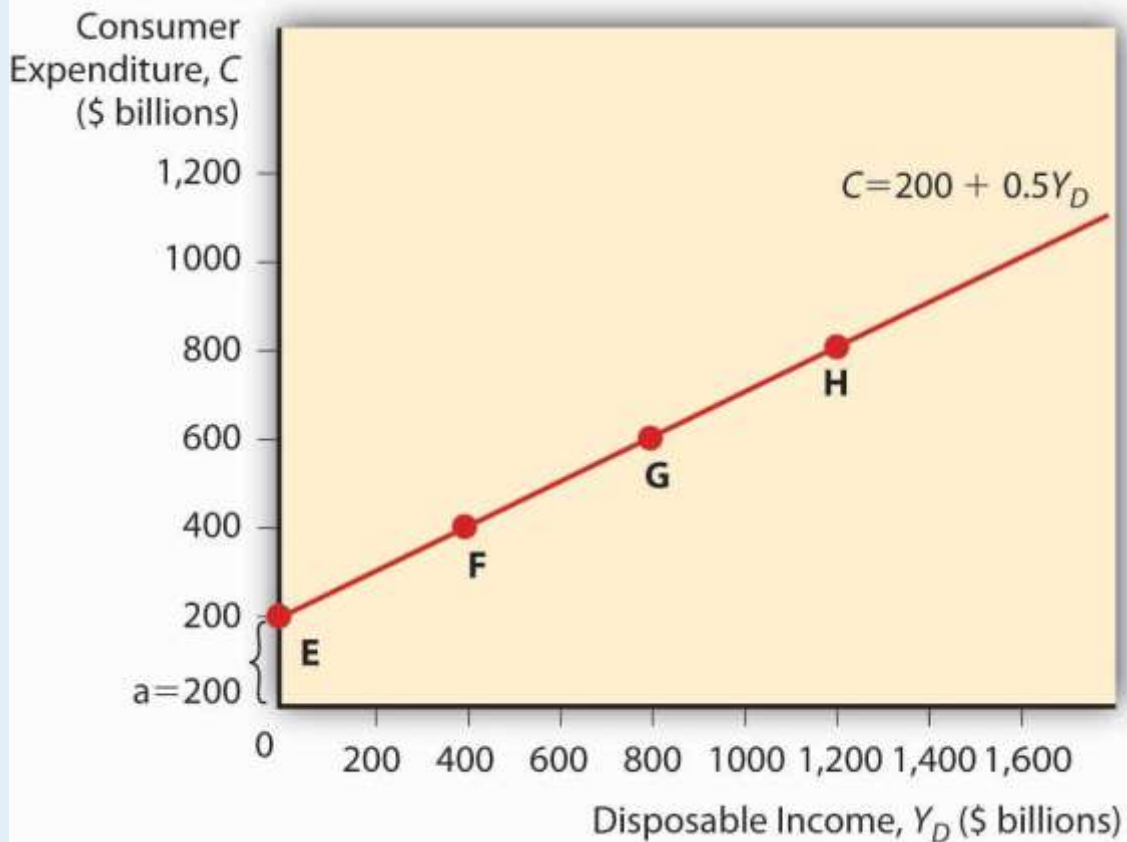
Autonomous Consumer Expenditure	Marginal Propensity to Consume	Disposable Income	Answer: C
200	0.5	0	200
400	0.5	0	400
200	0.5	200	300
200	0.5	300	350
300	0.5	300	450
300	0.75	300	525
300	0.25	300	375
300	0.01	300	303
300	1	300	600
100	0.5	1000	600
100	0.75	1000	850

2. You can plot a consumption function by drawing a graph, as in [Figure 21.1 "A consumption function"](#), with consumer expenditure on the vertical axis and disposable income on the horizontal. (Autonomous consumer expenditure a will be the intercept and $mpc \times Y_d$ will be the slope.)

3. [Figure 21.1A consumption function](#)



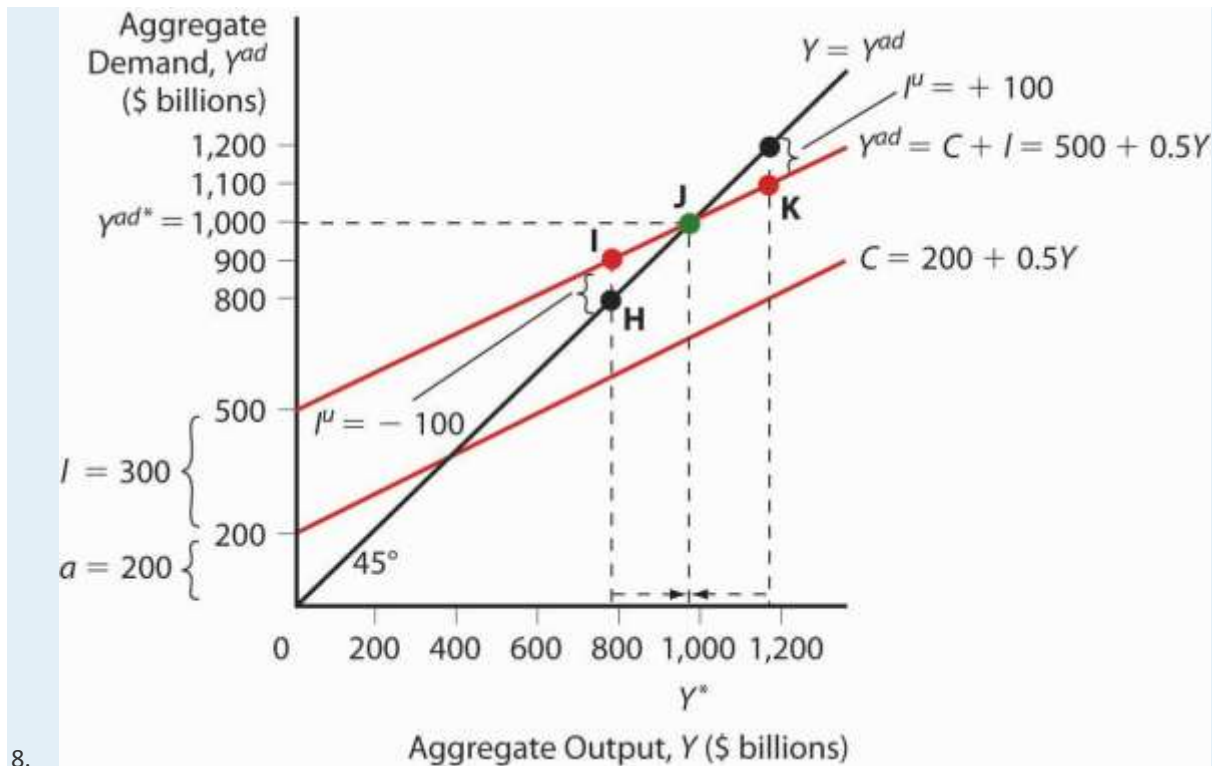
4. A



5. Investment is composed of so-called fixed investment on equipment and structures and planned inventory investment in raw materials, parts, or finished goods.

6. For the present, we will ignore G and NX and, following Keynes, changes in the price level. (Remember, we are talking about the short term here. Remember, too, that Keynes wrote in the context of the gold standard, not an inflationary free floating regime, so he was not concerned with price level changes.) The simple model that results, called a Keynesian cross diagram, looks like the diagram in [Figure 21.2 "A Keynesian cross diagram"](#).

7. *Figure 21.2A Keynesian cross diagram*



8.

9. The 45-degree line simply represents the equilibrium $Y = Y_{ad}$. The other line, the aggregate demand function, is the consumption function line plus planned investment spending I . Equilibrium is reached via inventories (part of I). If $Y > Y_{ad}$, inventory levels will be higher than firms want, so they'll cut production. If $Y < Y_{ad}$, inventories will shrink below desired levels and firms will increase production. We can now predict changes in aggregate output given changes in the level of I and C and the marginal propensity to consume (the slope of the C component of Y_{ad}).

10. Suppose I increases. Due to the upward slope of Y_{ad} , aggregate output will increase more than the increase in I . This is called the expenditure multiplier and it is summed up by the following equation:

$$11. Y = (a + I) \times 1 / (1 - mpc)$$

12. So if a is 200 billion, I is 400 billion, and mpc is .5, Y will be

$$13. Y = 600 \times 1 / .5 = 600 \times 2 = \$1,200 \text{ billion}$$

14. If I increases to 600 billion, $Y = 800 \times 2 = \$1,600$ billion.



15. If the marginal propensity to consume were to increase to .75, Y would increase to

16. $Y = 800 \times 1/.25 = 800 \times 4 = \$3,200$ billion because Y_{ad} would have a much steeper slope. A decline in mpc to .25, by contrast, would flatten Y_{ad} and lead to a lower equilibrium:

17. $Y = 800 \times 1/.75 = 800 \times 1.333 = \$1,066.67$ billion

18. Practice calculating aggregate output in Exercise 2.

19. Calculate aggregate output with the formula: $Y = (a + I) \times 1/(1 - mpc)$

Autonomous Spending	Marginal Propensity to Consume	Investment	Answer: Aggregate Output
200	0.5	500	1400
300	0.5	500	1600
400	0.5	500	1800
500	0.5	500	2000
500	0.6	500	2500
200	0.7	500	2333.33
200	0.8	500	3500
200	0.4	500	1166.67
200	0.3	500	1000
200	0.5	600	1600
200	0.5	700	1800
200	0.5	800	2000
200	0.5	400	1200
200	0.5	300	1000
200	0.5	200	800

Stop and Think Box

During the Great Depression, investment (I) fell from \$232 billion to \$38 billion (in 2000 USD). What happened to aggregate output? How do you know?

Aggregate output fell by more than \$232 billion – \$38 billion = \$194 billion. We know that because investment fell and the marginal propensity to consume was > 0 , so the fall was more than \$194 billion, as expressed by the equation $Y = (a + I) \times 1/(1 - mpc)$.



To make the model more realistic, we can easily add NX to the equation. An increase in exports over imports will increase aggregate output Y by the increase in NX times the expenditure multiplier. Likewise, an increase in imports over exports (a decrease in NX) will decrease Y by the decrease in NX times the multiplier.

Government spending (G) also increases Y . We must realize, however, that some government spending comes from taxes, which consumers view as a reduction in income. With taxation, the consumption function becomes the following:

$$C = a + mpc \times (Y_d - T)$$

T means taxes. The effect of G is always larger than that of T because G expands by the multiplier, which is always > 1 , while T is multiplied by MPC , which never exceeds 1. So increasing G , even if it is totally funded by T , will increase Y . (Remember, this is a short-run analysis.) *Nevertheless, Keynes argued that, to help a country out of recession, government should cut taxes because that will cause Y_d to rise, ceteris paribus. Or, in more extreme cases, it should borrow and spend (rather than tax and spend) so that it can increase G without increasing T and thus decreasing C .*

Stop and Think Box

As noted in [Chapter 11 "The Economics of Financial Regulation"](#), many governments, including that of the United States, responded to the Great Depression by increasing tariffs in what was called a beggar-thy-neighbor policy. Today we know that such policies beggared everyone. What were policymakers thinking?

They were thinking that tariffs would decrease imports and thereby increase NX (exports minus imports) and Y . That would make their trading partner's NX decrease, thus beggaring them by decreasing their Y .

It was a simple idea on paper, but in reality it was dead wrong. For starters, other countries retaliated with tariffs of their own. But even if they did not, it was a losing strategy because by making neighbors (trading partners) poorer, the policy limited their ability to import (i.e., decreased the first country's exports) and thus led to no significant long-term change in NX .

[Figure 21.3 "The determinants of aggregate demand"](#) sums up the discussion of aggregate demand.

Figure 21.3 The determinants of aggregate demand



Variable	Change in Variable	Change in Y
a	Up	Up
I	Up	Up
NX	Up	Up
G	Up	Up
T	Up	Down
Imports	Up	Down
Exports	Up	Up
mpc	Up	Up

KEY TAKEAWAYS

- The equation $Y = Y_d = C + I + G + NX$ tells us that aggregate output (or aggregate income) is equal to aggregate demand, which in turn is equal to consumer expenditure plus investment (planned, physical stuff) plus government spending plus net exports (exports – imports).
- It is important because it allows economists to model aggregate output (to discern why, for example, GDP changes).
- In a taxless Eden, like the Gulf Cooperation Council countries, consumer expenditure equals autonomous consumer expenditure (spending on necessities) (a) plus the marginal propensity to consume (mpc) times disposable income (Y_d), income above a.
- In the rest of the world, $C = a + mpc \times (Y_d - T)$, where T = taxes.
- C, particularly the marginal propensity to consume variable, is important because it gives the aggregate demand curve in a Keynesian cross diagram its upward slope.



- A Keynesian cross diagram is a graph with aggregate demand (Y_{ad}) on the vertical axis and aggregate output (Y) on the horizontal.
- It consists of a 45-degree line where $Y = Y_{ad}$ and a Y_{ad} curve, which plots $C + I + G + NX$ with the slope given by the expenditure multiplier, which is the reciprocal of 1 minus the marginal propensity to consume: $Y = (a + I + NX + G) \times 1/(1 - mpc)$.
- The diagram helps us to see that aggregate output is directly related to a , I , exports, G , and mpc and indirectly related to T and imports.

[1] http://en.wikipedia.org/wiki/John_Hicks



21.2 The IS-LM Model

LEARNING OBJECTIVES

1. What are the IS and LM curves?
2. What are their characteristics?
3. What do we learn when we combine the IS and the LM curves on one graph?
4. Why is equilibrium achieved?
5. What is the IS-LM model's biggest drawback?

The Keynesian cross diagram framework is great, as far as it goes. Note that it has nothing to say about interest rates or money, a major shortcoming for us students of money, banking, and monetary policy! It does, however, help us to build a more powerful model that examines equilibrium in the markets for goods and money, the IS (investment-savings) and the LM (liquidity preference–money) curves, respectively (hence the name of the model).

Interest rates are negatively related to I and to NX . The reasoning here is straightforward. When interest rates (i) are high, companies would rather invest in bonds than in physical plant (because fewer projects are positive net present value or +NPV) or inventory (because it has a high opportunity cost), so I (investment) is low. When rates are low, new physical plant and inventories look cheap and many more projects are +NPV (i has come down in the denominator of the present value formula), so I is high. Similarly, when i is low, as we learned in [Chapter 18 "Foreign Exchange"](#), the domestic currency will be weak, all else equal. Exports will be facilitated and imports will decline because foreign goods will look expensive. Thus, NX will be high (exports > imports). When i is high, by contrast, the domestic currency will be in demand and hence strong. That will hurt exports and increase imports, so NX will drop and perhaps become negative (exports < imports).

Now think of Y_{ad} on a Keynesian cross diagram. As we saw above, aggregate output will rise as I and NX do. So we know that as i increases, Y_{ad} decreases, *ceteris paribus*. *Plotting the interest rate on the vertical axis against aggregate output on the horizontal axis, as below, gives us a downward sloping curve. That's the IS curve!* For each interest rate, it tells us at what point the market for goods (I and NX , get it?) is in equilibrium. For all points to the right of the curve, there is an excess supply of

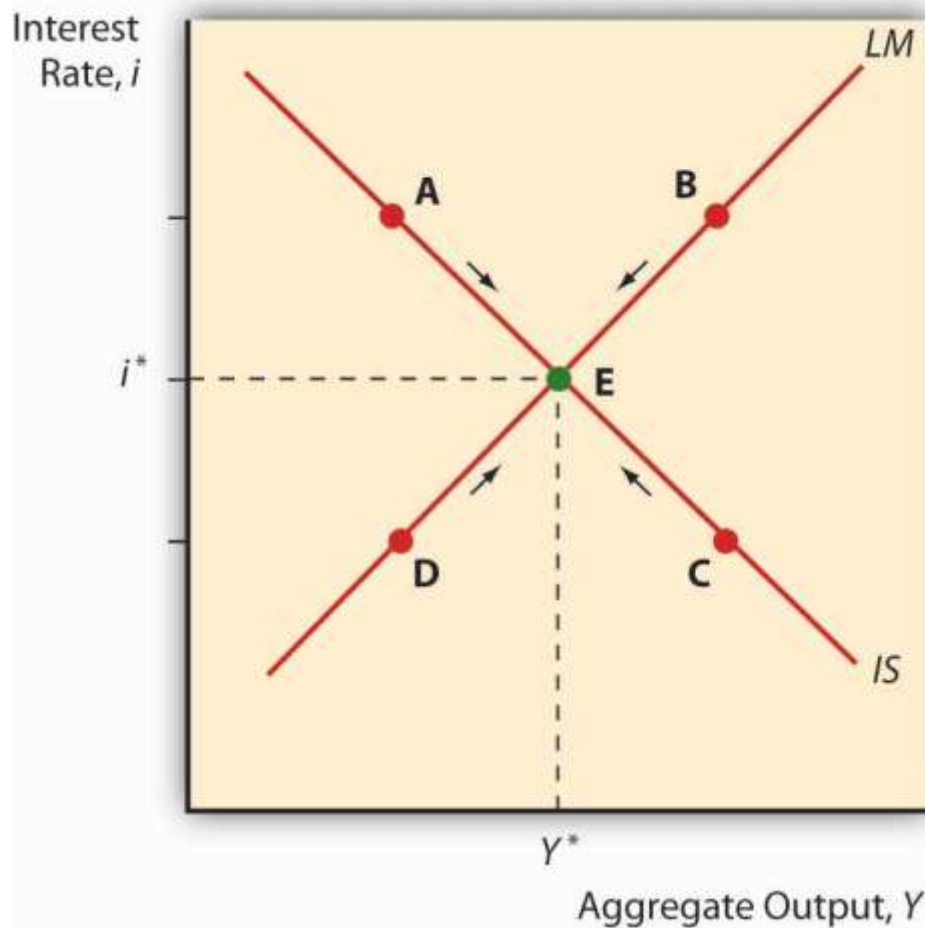


goods for that interest rate, which causes firms to decrease inventories, leading to a fall in output toward the curve. For all points to the left of the IS curve, an excess demand for goods persists, which induces firms to increase inventories, leading to increased output toward the curve.

Obviously, the IS curve alone is as insufficient to determine i or Y as demand alone is to determine prices or quantities in the standard supply and demand microeconomic price model. We need another curve, one that slopes the other way, which is to say, upward. *That curve is called the LM curve and it represents equilibrium points in the market for money.* Recall from our discussions of liquidity preference in [Chapter 5 "The Economics of Interest-Rate Fluctuations"](#) and [Chapter 20 "Money Demand"](#) that the demand for money is positively related to income because more income means more transactions and because more income means more assets, and money is one of those assets. So we can immediately plot an upward sloping LM curve. To the left of the LM curve there is an excess supply of money given the interest rate and the amount of output. That'll cause people to use their money to buy bonds, thus driving bond prices up, and hence i down to the LM curve. To the right of the LM curve, there is an excess demand for money, inducing people to sell bonds for cash, which drives bond prices down and hence i up to the LM curve.

Figure 21.4 IS-LM diagram: equilibrium in the markets for money and goods





When we put the IS and LM curves on the graph at the same time, as in [Figure 21.4 "IS-LM diagram: equilibrium in the markets for money and goods"](#), we immediately see that there is only one point, their intersection, where the markets for both goods and money are in equilibrium. Both the interest rate and aggregate output are determined by that intersection. We can then shift the IS and LM curves around to see how they affect interest rates and output, i^* and Y^* . In the next chapter, we'll see how policymakers manipulate those curves to increase output. *But we still won't be done because, as mentioned above, the IS-LM model has one major drawback: it works only in the short term or when the price level is otherwise fixed.*

Stop and Think Box

Does Figure 21.5 "Real gross private domestic investment, 1925–2007" make sense? Why or why not? What does Figure 21.6 "Net exports, 1945–2007" mean? Why is Figure 21.7 "Federal government expenditures, 1945–2007" not a good representation of G?

Figure 21.5 *Real gross private domestic investment, 1925–2007*

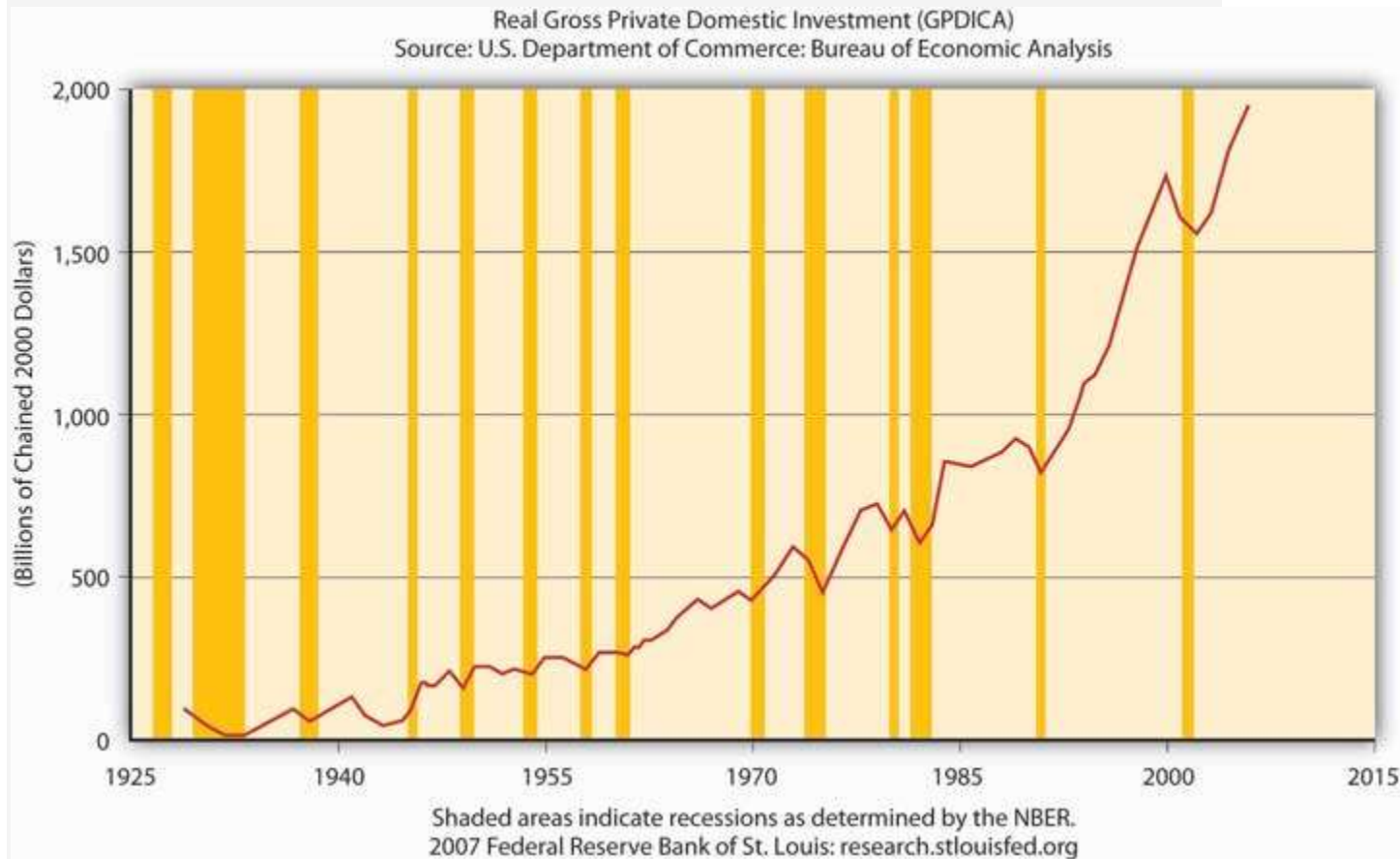


Figure 21.6 *Net exports, 1945–2007*

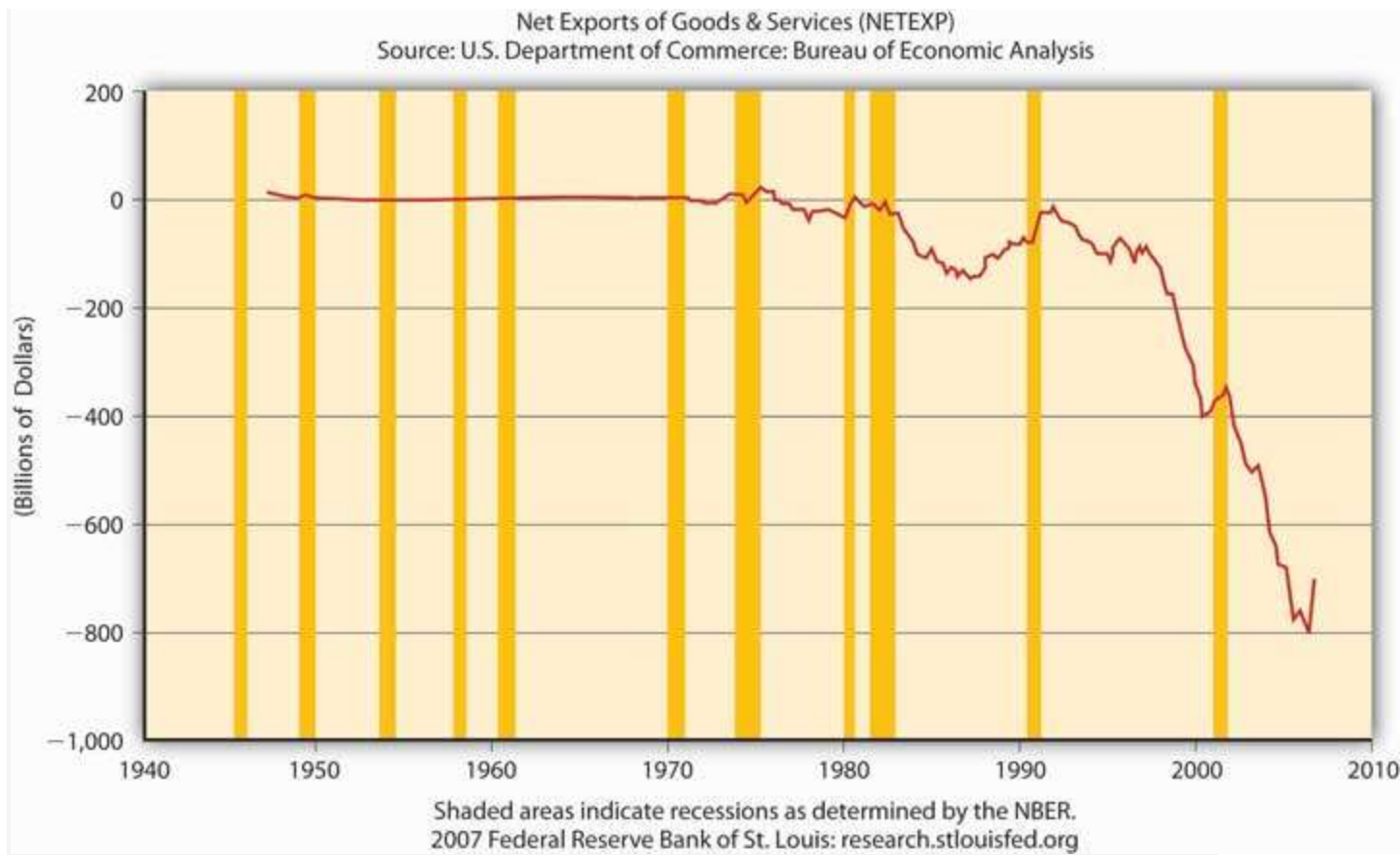


Figure 21.7 *Federal government expenditures, 1945–2007*



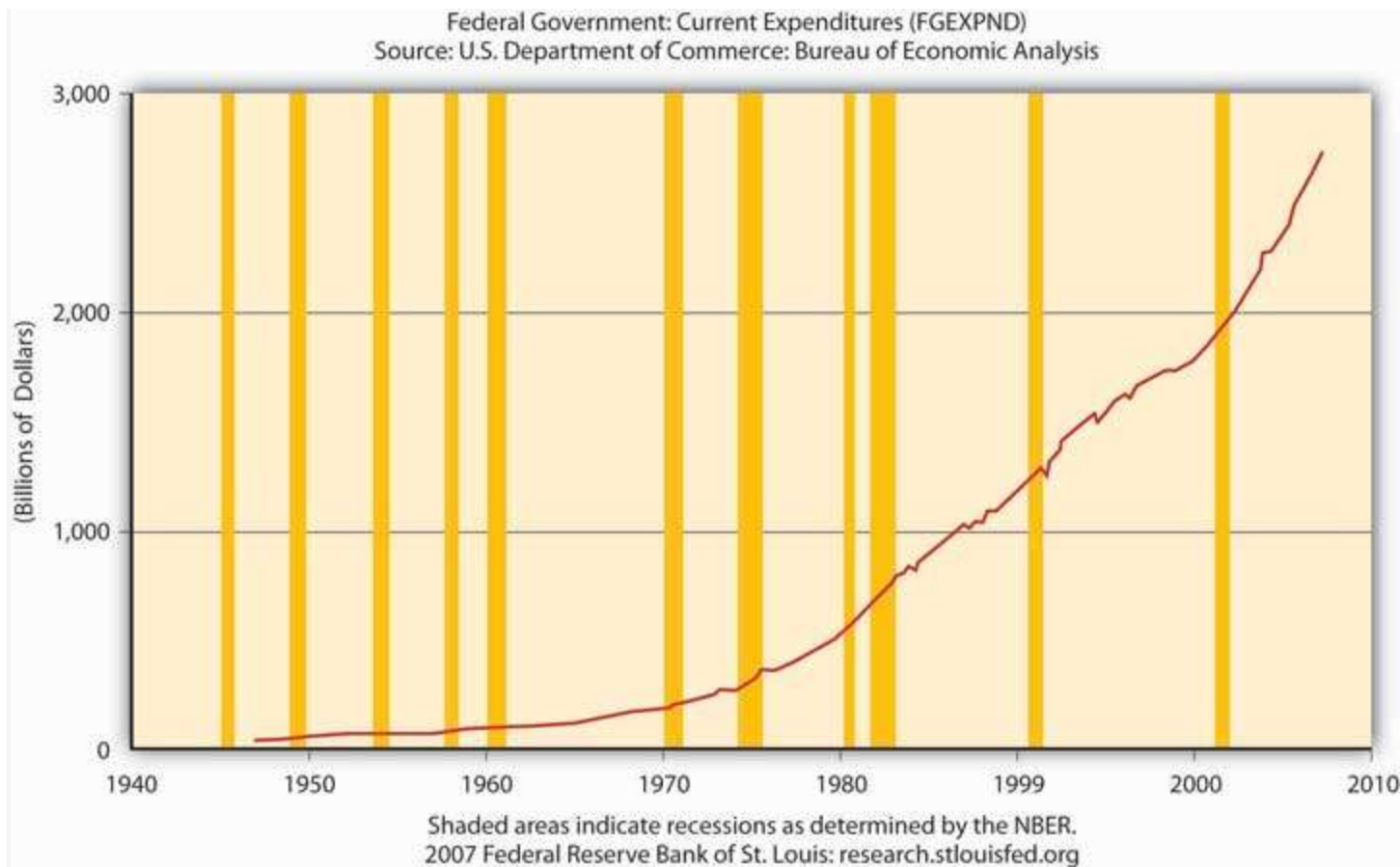
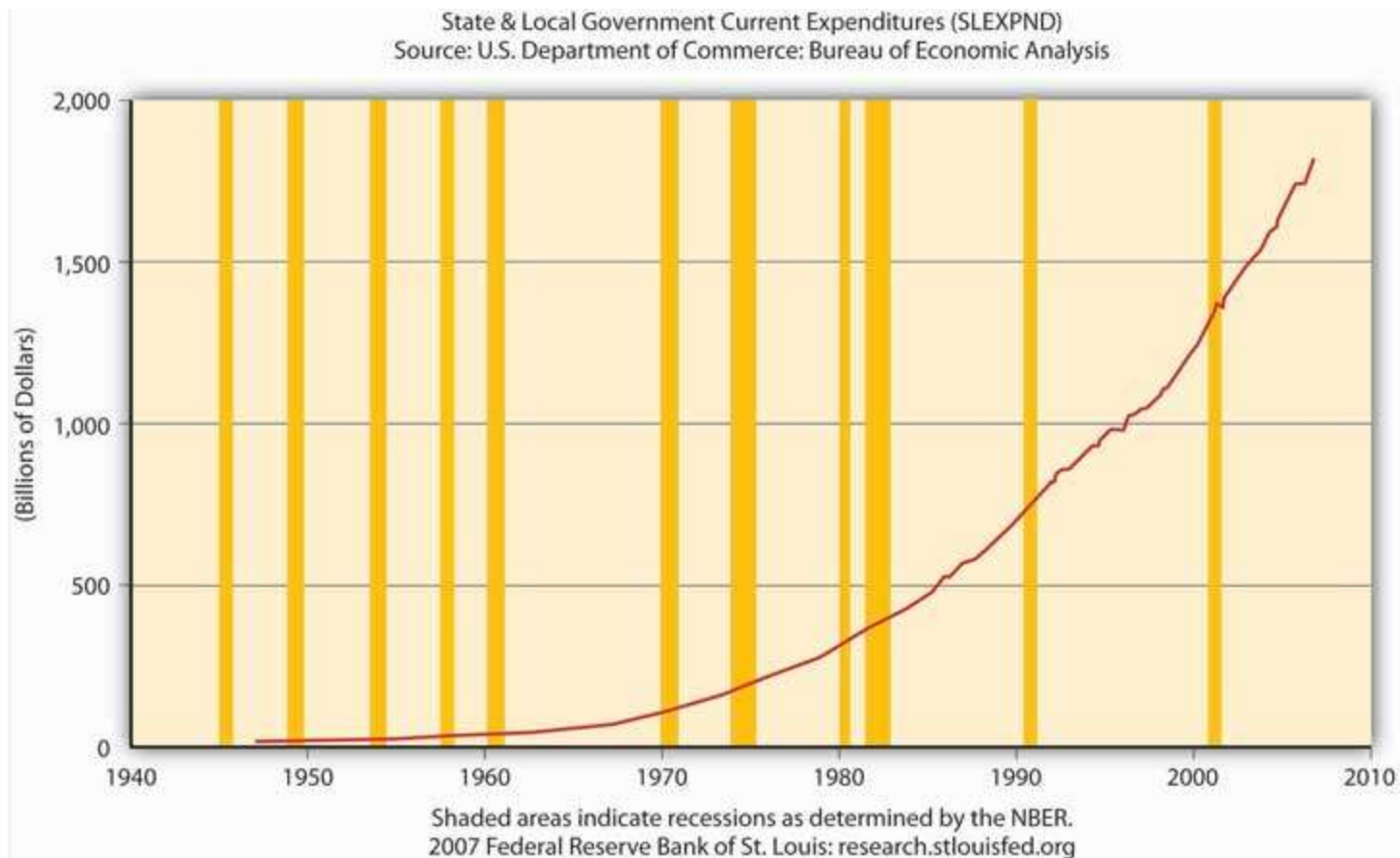


Figure 21.5 "Real gross private domestic investment, 1925–2007" makes perfectly good sense because it depicts I in the equation $Y = Y_{ad} = C + I + G + NX$, and the shaded areas represent recessions, that is, decreases in Y . Note that before almost every recession in the twentieth century, I dropped.

Figure 21.6 "Net exports, 1945–2007" means that NX in the United States is considerably negative, that exports < imports by some \$800 billion, creating a significant drain on Y (GDP).

Figure 21.7 "Federal government expenditures, 1945–2007" is not a good representation of G because it ignores state and local government expenditures, which are significant in the United States, as Figure 21.8 "State and local government expenditures, 1945–2007" shows.

Figure 21.8 State and local government expenditures, 1945–2007



KEY TAKEAWAYS

- The IS curve shows the points at which the quantity of goods supplied equals those demanded.
- On a graph with interest (i) on the vertical axis and aggregate output (Y) on the horizontal axis, the IS curve slopes downward because, as the interest rate increases, key components of Y , I and NX , decrease. That is because as i increases, the opportunity cost of holding inventory increases, so inventory levels fall and +NPV projects involving new physical plant become rarer, and I decreases.
- Also, high i means a strong domestic currency, all else constant, which is bad news for exports and good news for imports, which means NX also falls.
- The LM curve traces the equilibrium points for different interest rates where the quantity of money demanded equals the quantity of money supplied.
- It slopes upward because as Y increases, people want to hold more money, thus driving i up.
- The intersection of the IS and LM curves indicates the macroeconomy's equilibrium interest rate (i^*) and output (Y^*), the point where the market for goods and the market for money are both in equilibrium.



- At all points to the left of the LM curve, an excess supply of money exists, inducing people to give up money for bonds (to buy bonds), thus driving bond prices up and interest rates down toward equilibrium.
- At all points to the right of the LM curve, an excess demand for money exists, inducing people to give up bonds for money (to sell bonds), thus driving bond prices down and interest rates up toward equilibrium.
- At all points to the left of the IS curve, there is an excess demand for goods, causing inventory levels to fall and inducing companies to increase production, thus leading to an increase in output.
- At all points to the right of the IS curve, there is an excess supply of goods, creating an inventory glut that induces firms to cut back on production, thus decreasing Y toward the equilibrium.
- The IS-LM model's biggest drawback is that it doesn't consider changes in the price level, so in most modern situations, it's applicable in the short run only.



21.3 Suggested Reading

Dimand, Robert, Edward Nelson, Robert Lucas, Mauro Boianovsky, David Colander, Warren Young, et al. *The IS-LM Model: Its Rise, Fall, and Strange Persistence*. Raleigh, NC: Duke University Press, 2005.

Young, Warren, and Ben-Zion Zilbeparb. *IS-LM and Modern Macroeconomics*. New York: Springer, 2001.



Chapter 22

IS-LM in Action

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Explain what causes the liquidity preference–money (LM) curve to shift and why.
2. Explain what causes the investment-savings (IS) curve to shift and why.
3. Explain the difference between monetary and fiscal stimulus in the short term and why the difference is important.
4. Explain what happens when the IS-LM model is used to tackle the long term by taking changes in the price level into account.
5. Describe the aggregate demand curve and explain what causes it to shift.



22.1 Shifting Curves: Causes and Effects

LEARNING OBJECTIVE

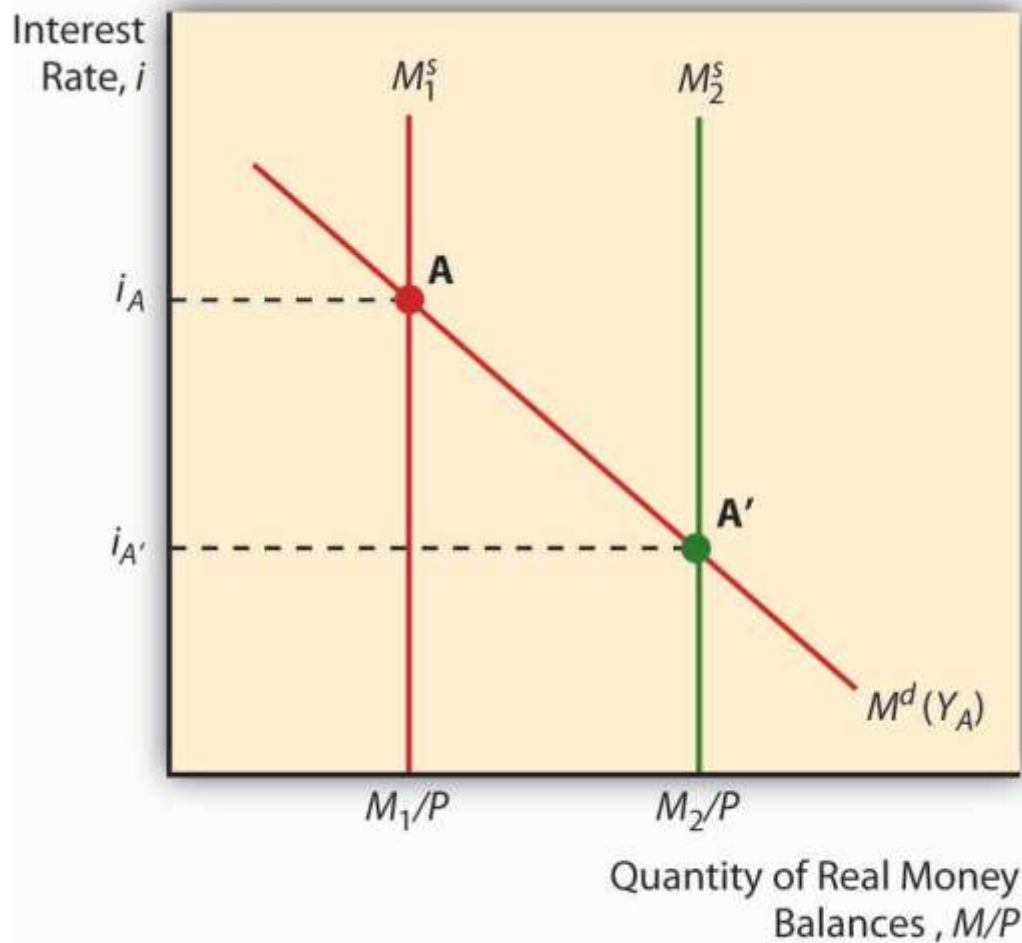
1. What causes the LM and IS curves to shift and why?

Policymakers can use the IS-LM model developed in [Chapter 21 "IS-LM"](#) to help them decide between two major types of policy responses, fiscal (or government expenditure and tax) or monetary (interest rates and money). As you probably noticed when playing around with the IS and LM curves at the end of the previous chapter, their relative positions matter quite a bit for interest rates and aggregate output. Time to investigate this matter further.

The LM curve, the equilibrium points in the market for money, shifts for two reasons: changes in money demand and changes in the money supply. *If the money supply increases (decreases), ceteris paribus, the interest rate is lower (higher) at each level of Y , or in other words, the LM curve shifts right (left).* That is because at any given level of output Y , more money (less money) means a lower (higher) interest rate. (Remember, the price level doesn't change in this model.) To see this, look at [Figure 22.1 "Effect of money on interest rates when output is constant"](#).

Figure 22.1 Effect of money on interest rates when output is constant

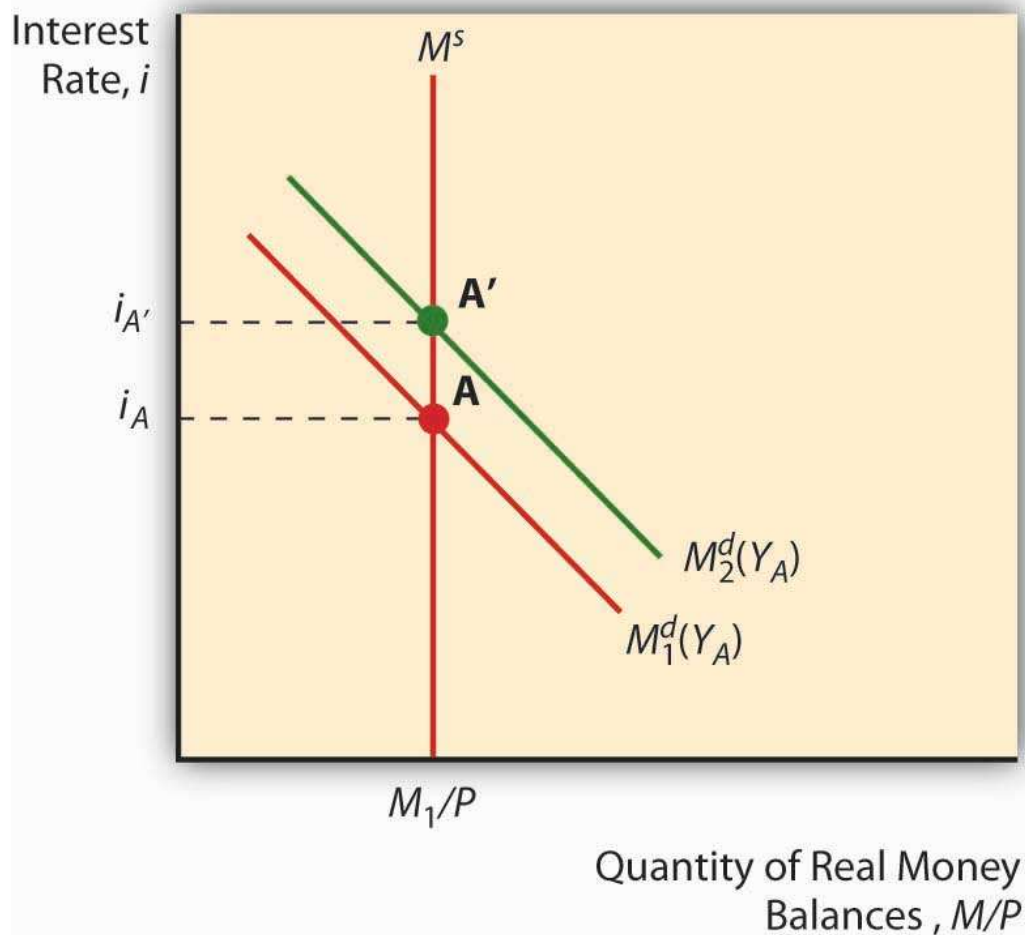




Effect on the market for money when aggregate output is constant at Y_A

An autonomous change in money demand (that is, a change not related to the price level, aggregate output, or i) will also affect the LM curve. Say that stocks get riskier or the transaction costs of trading bonds increases. The theory of asset demand tells us that the demand for money will increase (shift right), thus increasing i . Interest rates could also decrease if money demand shifted left because stock returns increased or bonds became less risky. To see this, examine [Figure 22.2 "Effect of an autonomous change in money demand when output is constant"](#). An increase in autonomous money demand will shift the LM curve left, with higher interest rates at each Y ; a decrease will shift it right, with lower interest rates at each Y .

Figure 22.2 Effect of an autonomous change in money demand when output is constant



Effect on the market for money when aggregate output is constant at Y_A

The IS curve, by contrast, shifts whenever an autonomous (unrelated to Y or i) change occurs in C , I , G , T , or NX . Following the discussion of Keynesian cross diagrams in [Chapter 21 "IS-LM"](#), when C , I , G , or NX increases (decreases), the IS curve shifts right (left). When T increases (decreases), all else constant, the IS curve shifts left (right) because taxes effectively decrease consumption. Again, these are changes that are not related to output or interest rates, which merely indicate movements *along* the IS curve. The discovery of new caches of natural resources (which will increase I), changes in consumer preferences (at home or abroad, which will affect NX), and numerous other “shocks,” positive and negative, will change output at each interest rate, or in other words shift the entire IS curve.

We can now see how government policies can affect output. As noted above, in the short run, an increase in the money supply will shift the LM curve to the right, *thereby lowering interest rates and increasing output*. Decreasing the MS would have precisely the opposite effect. *Fiscal stimulus, that is, decreasing taxes (T) or increasing government expenditures (G), will also increase output but, unlike monetary stimulus (increasing MS), will increase the interest rate*. That is because it works by shifting the IS curve upward rather than shifting the LM curve. Of course, if T increases, the IS curve will shift left, decreasing interest rates but also aggregate output. This is part of the reason why people get hot under the collar about taxes. (Of course, individual considerations are paramount!)

Stop and Think Box

During financial panics, economic agents complain of high interest rates and declining economic output. Use the IS-LM model to describe why panics have those effects.

The LM curve will shift left during panics, raising interest rates and decreasing output, because demand for money increases as economic agents scramble to get liquid in the face of the declining and volatile prices of other assets, particularly financial securities with positive default risk.

Figure 22.3 "Predicted effects of changes in major macroeconomic variables" summarizes.

Figure 22.3 Predicted effects of changes in major macroeconomic variables

Variable	Autonomous Change	Predicted Short-Term Response	Rationale
MS	Up	Y up, i down	i down LM shifts right
M_d	Up	Y up, i up	i up LM shifts left
C	Up	Y up, i up	C up Y_{ad} up IS shifts right
I	Up	Y up, i up	I up Y_{ad} up IS shifts right
NX	Up	Y up, i up	NX up Y_{ad} up IS shifts right
G	Up	Y up, i up	G up Y_{ad} up IS shifts right
T	Up	Y down, i down	T up C down Y_{ad} down IS shifts left

Stop and Think Box

Describe Hamilton's Law (née Bagehot's Law) in terms of the IS-LM model. *Hint:* Hamilton and Bagehot argued that, during a financial panic, the lender of last resort needs to increase the money supply by lending to all comers who present what would be considered adequate collateral in normal times.

During financial panics, the LM curve shifts left as people flee risky assets for money, thereby inducing the interest rate to climb and output to fall. Hamilton and Bagehot argued that monetary authorities should respond by nipping the problem in the bud, so to speak, by increasing MS directly, shifting the LM curve back to somewhere near its pre-panic position.

KEY TAKEAWAYS

- The LM curve shifts right (left) when the money supply (real money balances) increases (decreases).
- It also shifts left (right) when money demand increases (decreases).
- The easiest way to see this is to first imagine a graph where money demand is fixed and the money supply increases (shifts right), leading to a lower interest rate, and vice versa.
- Then imagine a fixed MS and a shift upward in money demand, leading to a higher interest rate, and vice versa.

- The IS curve shifts right (left) when C, I, G, or NX increase (decrease) or T decreases (increases).
- This relates directly to the Keynesian cross diagrams and the equation $Y = C + I + G + NX$ discussed in [Chapter 21 "IS-LM"](#), and also to the analysis of taxes as a decrease in consumption expenditure C.



22.2 Implications for Monetary Policy

LEARNING OBJECTIVES

1. In the short term, what is the difference between monetary and fiscal stimulus and why is it important?
2. What happens when the IS-LM model is used to tackle the long term by taking changes in the price level into account?

The IS-LM model has a major implication for monetary policy: when the IS curve is unstable, a money supply target will lead to greater output stability, and when the LM curve is unstable, an interest rate target will produce greater macro stability. To see this, look at [Figure 22.4 "Effect of IS curve instability"](#) and [Figure 22.5 "Effect of LM curve instability"](#). Note that when LM is fixed and IS moves left and right, an interest rate target will cause Y to vary more than a money supply target will. Note too that when IS is fixed and LM moves left and right, an interest rate target keeps Y stable but a money supply target (shifts in the LM curve) will cause Y to swing wildly. This helps to explain why many central banks abandoned money supply targeting in favor of interest rate targeting in the 1970s and 1980s, a period when autonomous shocks to LM were pervasive due to financial innovation, deregulation, and loophole mining. An important implication of this is that central banks might find it prudent to shift back to targeting monetary aggregates if the IS curve ever again becomes more unstable than the LM curve.

Figure 22.4 Effect of IS curve instability

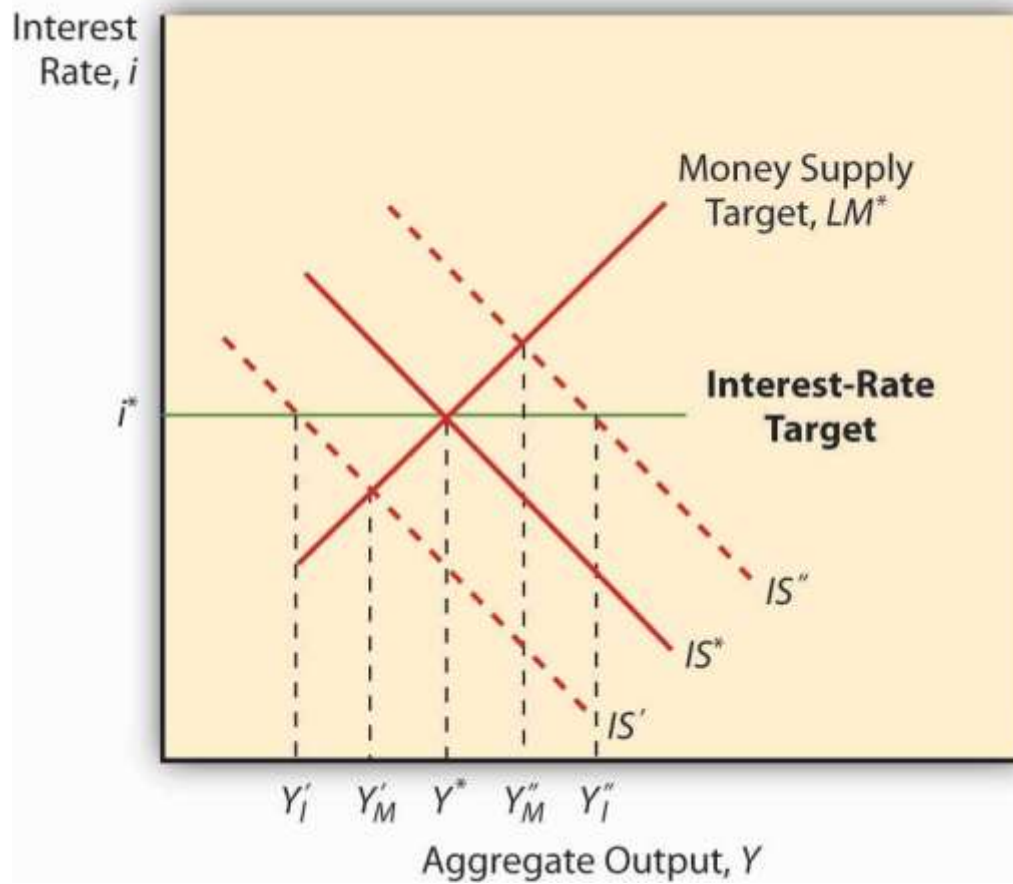
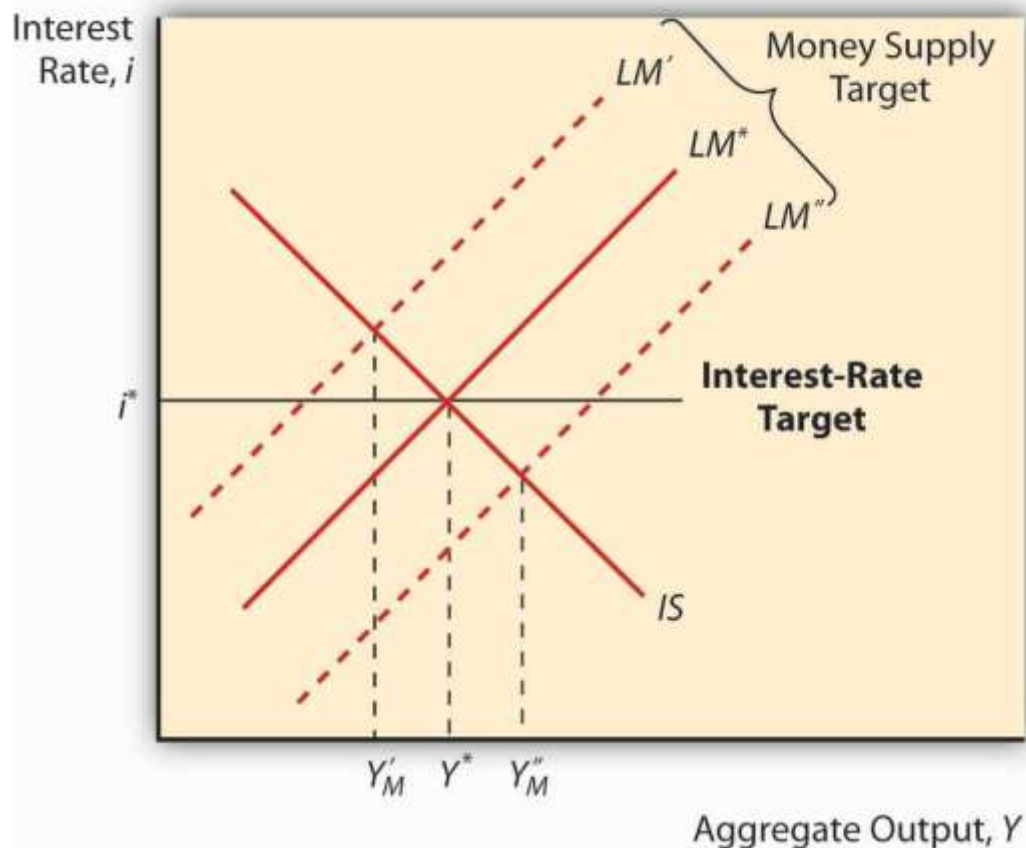


Figure 22.5 Effect of LM curve instability



As noted in [Chapter 21 "IS-LM"](#), the policy power of the IS-LM is severely limited by its short-run assumption that the price level doesn't change. Attempts to tweak the IS-LM model to accommodate price level changes led to the creation of an entirely new model called aggregate demand and supply. The key is the addition of a new concept, called the natural rate level of output, Y_{nr} , the rate of output at which the price level is stable in the long run. When actual output (Y^*) is below the natural rate, prices will fall; when it is above the natural rate, prices will rise.

The IS curve is stated in real terms because it represents equilibrium in the goods market, the real part of the economy. Changes in the price level therefore do not affect C, I, G, T, or NX or the IS curve. The LM curve, however, is affected by changes in the price level, shifting to the left when prices rise and to the right when they fall. This is because, holding the nominal MS constant, rising prices decrease real money balances, which we know shifts the LM curve to the left.

So suppose an economy is in equilibrium at Y_{nr} , when some monetary stimulus in the form of an increased MS shifts the LM curve to the right. As noted above, in the short term, interest rates will

come down and output will increase. But because Y^* is greater than Y_{nr} , prices will rise, shifting the LM curve back to where it started, give or take. *So output and the interest rate are the same but prices are higher. Economists call this long-run monetary neutrality.*

Fiscal stimulus, as we saw above, shifts the IS curve to the right, increasing output but also the interest rate. Because Y^* is greater than Y_{nr} , prices will rise and the LM curve will shift left, reducing output, increasing the interest rate higher still, and raising the price level! *You just can't win in the long run, in the sense that policymakers cannot make Y^* exceed Y_{nr} .* Rendering policymakers impotent did not win the IS-LM model many friends, so researchers began to develop a new model that relates the price level to aggregate output.

Stop and Think Box

As explained in [Chapter 19 "International Monetary Regimes"](#), under the gold standard (GS), money flows in and out of countries automatically, in response to changes in the price of international bills of exchange. From the standpoint of the IS-LM model, what is the problem with that aspect of the GS?

As noted above, decreases in MS lead to a leftward shift of the LM curve, leading to higher interest rates and lower output. Higher interest rates, in turn, could lead to a financial panic or a decrease in C or I, causing a shift left in the IS curve, further reducing output but relieving some of the pressure on i . (Note that NX would not be affected under the GS because the exchange rate was fixed, moving only within very tight bands, so a higher i would not cause the domestic currency to strengthen.)

KEY TAKEAWAYS

- Monetary stimulus, that is, increasing the money supply, causes the LM curve to shift right, resulting in higher output and lower interest rates.
- Fiscal stimulus, that is, increasing government spending and/or decreasing taxes, shifts the IS curve to the right, raising interest rates while increasing output.
- The higher interest rates are problematic because they can crowd out C, I, and NX, moving the IS curve left and reducing output.
- The IS-LM model predicts that, in the long run, policymakers are impotent.



- Policymakers can raise the price level but they can't get Y^* permanently above Y_{nr} or the natural rate level of output.
- That is because whenever Y^* exceeds Y_{nr} , prices rise, shifting the LM curve to the left by reducing real money balances (which happens when there is a higher price level coupled with an unchanged MS).
- That, in turn, eradicates any gains from monetary or fiscal stimulus.



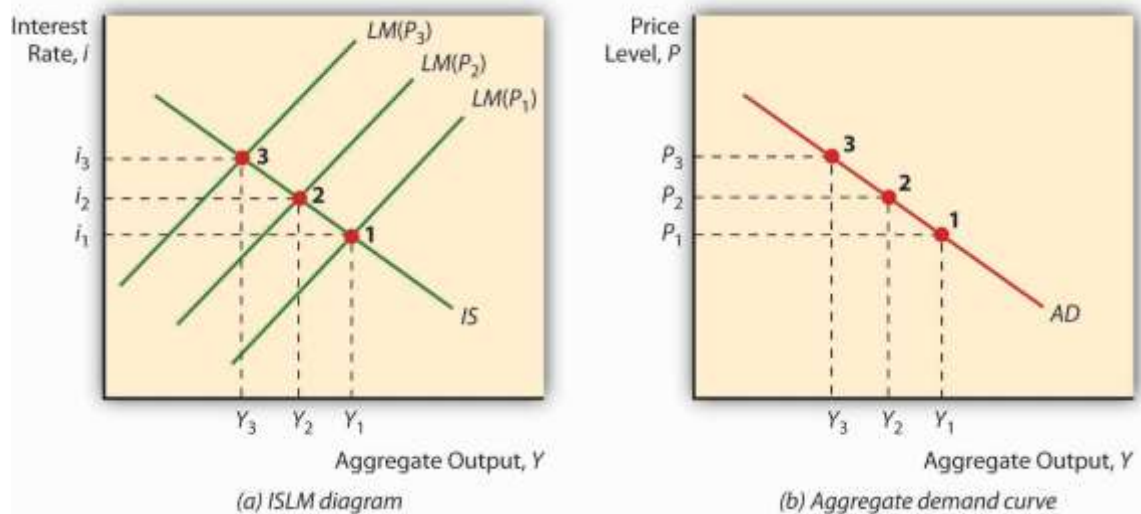
22.3 Aggregate Demand Curve

LEARNING OBJECTIVE

1. What is the aggregate demand (AD) curve and what causes it to shift?

Imagine a fixed IS curve and an LM curve shifting hard left due to increases in the price level, as in Figure 22.6 "Deriving the aggregate demand curve". As prices increase, Y falls and i rises. Now plot that outcome on a new graph, where aggregate output Y remains on the horizontal axis but the vertical axis is replaced by the price level P . The resulting curve, called the aggregate demand (AD) curve, will slope downward, as below. The AD curve is a very powerful tool because it indicates the points at which equilibrium is achieved in the markets for goods and money at a given price level. It slopes downward because a high price level, ceteris paribus, means a small real money supply, high interest rates, and a low level of output, while a low price level, all else constant, is consistent with a larger real money supply, low interest rates, and kickin' output.

Figure 22.6 Deriving the aggregate demand curve



Because the AD curve is essentially just another way of stating the IS-LM model, anything that would change the IS or LM curves will also shift the AD curve. More specifically, *the AD curve shifts in the same direction as the IS curve*, so it shifts right (left) with autonomous increases (decreases) in C , I , G , and NX and decreases (increases) in T . *The AD curve also shifts in the same direction as the LM curve.*

So if M_s increases (decreases), it shifts right (left), and if M_a increases (decreases) it shifts left (right), as in [Figure 22.3 "Predicted effects of changes in major macroeconomic variables"](#).

KEY TAKEAWAYS

- The aggregate demand curve is a downward sloping curve plotted on a graph with Y on the horizontal axis and the price level on the vertical axis.
- The AD curve represents IS-LM equilibrium points, that is, equilibrium in the market for both goods and money.
- It slopes downward because, as the price level increases, the LM curve shifts left as real money balances fall.
- AD shifts in the same direction as the IS or LM curves, so anything that shifts those curves shifts AD in precisely the same direction and for the same reasons.



22.4 Suggested Reading

Dimand, Robert, Edward Nelson, Robert Lucas, Mauro Boianovsky, David Colander, Warren Young, et al. *The IS-LM Model: Its Rise, Fall, and Strange Persistence*. Raleigh, NC: Duke University Press, 2005.

Young, Warren, and Ben-Zion Zilbeparb. *IS-LM and Modern Macroeconomics*. New York: Springer, 2001.



Chapter 23

Aggregate Supply and Demand, the Growth Diamond, and Financial Shocks

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Describe the aggregate demand (AD) curve and explain why it slopes downward.
2. Describe what shifts the AD curve and explain why.
3. Describe the short-run aggregate supply (AS) curve and explain why it slopes upward.
4. Describe what shifts the short-run AS curve and explain why.
5. Describe the long-run aggregate supply (ASL) curve, and explain why it is vertical and what shifts it.
6. Explain the term *long term* and its importance for policymakers.
7. Describe the growth diamond model of economic growth and its importance.
8. Explain how financial shocks affect the real economy.



23.1 Aggregate Demand

LEARNING OBJECTIVES

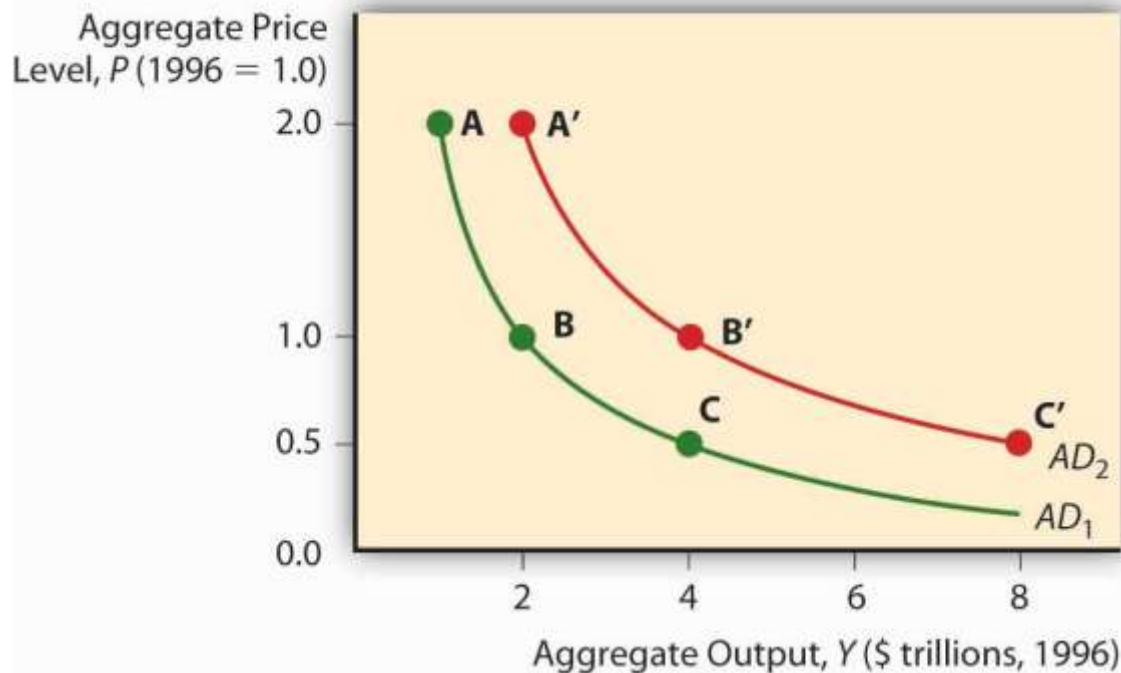
1. What is the AD curve and why does it slope downward?
2. What shifts the AD curve and why?

We learned in [Chapter 22 "IS-LM in Action"](#) that the IS-LM model isn't entirely agreeable to policymakers because it examines only the short term, and when pressed into service for the long-term, or changes in the price level, it suggests that policy initiatives are more likely to mess matters up than to improve them. In response, economists developed a new theory, aggregate demand and supply, that relates the price level to the total final goods and services demanded (aggregate demand [AD]) and the total supplied (aggregate supply [AS]). *This new framework is attractive for several reasons: (1) it can be used to examine both the short and the long run; (2) it takes a form similar to the microeconomic price theory model of supply and demand, so it is familiar; and (3) it gives policymakers some grounds for implementing activist economic policies.* To understand aggregate demand and supply theory, we need to understand how each of the curves is derived.

The aggregate demand curve can be derived three ways, through the IS-LM model as described at the end of [Chapter 22 "IS-LM in Action"](#), with help from the quantity theory of money, or directly from its components. Remember that $Y = C + I + G + NX$. As the price level falls, ceteris paribus, real money balances are higher. That spells a lower interest rate, as we learned in [Chapter 5 "The Economics of Interest-Rate Fluctuations"](#). A lower interest rate, in turn, means an increase in I (and hence Y). A lower interest rate also means a lower exchange rate and, as explained in [Chapter 18 "Foreign Exchange"](#), more exports and fewer imports. So NX also increases. (C might be positively affected by lower i as well.) As the price level increases, the opposite occurs. So the AD curve slopes downward.

Figure 23.1 Aggregate demand curve





The quantity theory of money also shows that the AD curve should slope downward. Remember that the quantity theory ties money to prices and output via velocity, the average number of times annually a unit of currency is spent on final goods and services, in the so-called equation of exchange:

$$MV=PY$$

where

M = money supply

V = velocity of money

P = price level

Y = aggregate output

If M = \$100 billion and V = 3, then PY must be \$300 billion. If we set P, the price level, equal to 1, Y must equal \$300 billion (300/1). If P is 2, then Y is \$150 billion (300/2). If it is .5, then Y is \$600 billion (300/.5). Plot those points and you get a downward sloping curve, as in [Figure 23.1](#)

"Aggregate demand curve". The AD curve shifts right if the MS increases and left if it decreases.



Continuing the example above, if we hold P constant at 1.0 but double M to \$200 billion, then Y will double to \$600 billion (200×3). (Recall that the theory suggests that V changes only slowly.) Cut M in half (\$50 billion) and Y will fall by half, to \$150 billion (50×3).

Figure 23.2 *Factors that shift the aggregate demand curve*

Variable	Change in Variable	Change in AD
C	Up	Right
I	Up	Right
G	Up	Right
T	Up	Left
NX	Up	Right
MS	Up	Right

For a summary of the factors that shift the AD curve, review [Figure 23.2 "Factors that shift the aggregate demand curve"](#).

KEY TAKEAWAYS

- The aggregate demand (AD) curve is the total quantity of final goods and services demanded at different price levels.
- It slopes downward because a lower price level, holding MS constant, means higher real money balances.
- Higher real money balances, in turn, mean lower interest rates, which means more investment (I) due to more +NPV projects and more net exports (NX) due to a weaker domestic currency (exports increase and imports decrease).
- The AD curve is positively related to changes in MS , C , I , G , and NX , and is negatively related to T .



- Those variables shift AD for the same reasons they shift Y_{ad} and the IS curve, as discussed in [Chapter 21 "IS-LM"](#) and [Chapter 22 "IS-LM in Action"](#), because all of them except taxes add to output.
- An increase in the MS increases AD (shifts the AD curve to the right) through the quantity theory of money and the equation of exchange $MV = PY$. Holding velocity and the price level constant, it is clear that increases in M must lead to increases in Y.



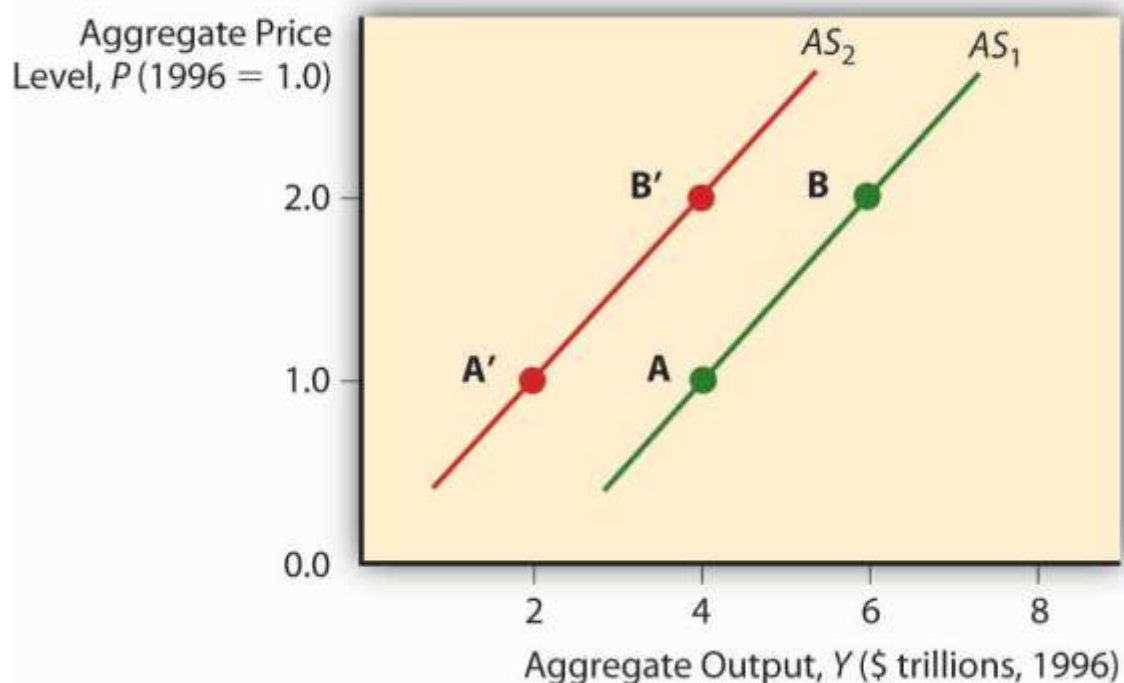
23.2 Aggregate Supply

LEARNING OBJECTIVES

1. What is the short-run AS curve and why does it slope upward?
2. What shifts the short-run AS curve and why?

The aggregate supply curve is a tad trickier because it is believed to change over time. In the long run, it is thought to be vertical at Y_{nr} , the natural rate of output concept introduced in [Chapter 22 "IS-LM in Action"](#). In the long run, the economy can produce only so much given the state of technology, the natural rate of unemployment, and the amount of physical capital devoted to productive uses.

Figure 23.3 *Short-run aggregate supply curve*



In the short run, by contrast, the total value of goods and services supplied to the economy is a function of business profits, meant here simply as the price goods bear in the market minus all the costs of their production, including wages and raw material costs. Prices of final goods and services generally adjust faster than the cost of inputs like labor and raw materials, which are often “sticky” due to long-term contracts fixing their price. *So as the price level rises, ceteris paribus, business profits*

are higher and hence businesses supply a higher quantity to the market. That is why the aggregate supply (AS) curve slopes upward in the short run, as in [Figure 23.3 "Short-run aggregate supply curve"](#).

The short-run AS curve shifts due to changes in costs and hence profits. When the labor market is tight, the wage bill rises, cutting into profits and shifting the AS curve to the left. Any so-called wage push from any source, like unionization, will have the same effect. If economic agents expect the price level to rise, that will also shift the AS curve left because they are going to demand higher wages or higher prices for their wares. Finally, changes in technology and raw materials supplies will shift the AS curve to the right or left, depending on the nature of the shock. Improved productivity (more output from the same input) is a positive shock that moves the AS curve to the right. A shortage due to bad weather, creation of a successful producer monopoly or cartel, and the like, is a negative shock that shifts the AS curve to the left.

Figure 23.4 Factors that shift the short-run aggregate supply curve



Variable	Short-run AS Curve Reaction
Negative Supply Shock	Left
Positive Supply Shock	Right
Wage push	Left
Rise in expected inflation	Left
Decrease in expected inflation	Right
Tight labor market	Left
Loose labor market	Right
$Y > Y_{nrl}$	Left
$Y_{nrl} > Y$	Right

Also, whenever Y exceeds Y_{nrl} , the AS curve shifts left. That is because when Y exceeds Y_{nrl} , the labor market gets tighter and expectations of inflation grow. Reversing that reasoning, the AS curve shifts right whenever Y_{nrl} exceeds Y . Figure 23.4 "Factors that shift the short-run aggregate supply curve" summarizes the discussion of the short-run AS curve.

KEY TAKEAWAYS

- The aggregate supply (AS) curve is the total quantity of final goods and services supplied at different price levels.
- It slopes upward because wages and other costs are sticky in the short run, so higher prices mean more profits (prices minus costs), which means a higher quantity supplied.
- The AS curve shifts left when Y^* exceeds Y_{nrl} , and it shifts right when Y^* is less than Y_{nrl} .
- In other words, Y_{nrl} is achieved via shifts in the AS curve, particularly through labor market "tightness" and inflation expectations.

- When Y^* is $> Y_{nri}$, the labor market is tight, pushing wages up and strengthening inflation expectations; when Y_{nri} is $> Y^*$, the labor market is loose, keeping wages low and inflation expectations weak.
- Supply shocks, both positive and negative, also shift the AS curve.
- Anything (like a so-called wage push or higher raw materials prices) that decreases business profits shifts AS to the left, while anything that increases business profits moves it to the right.



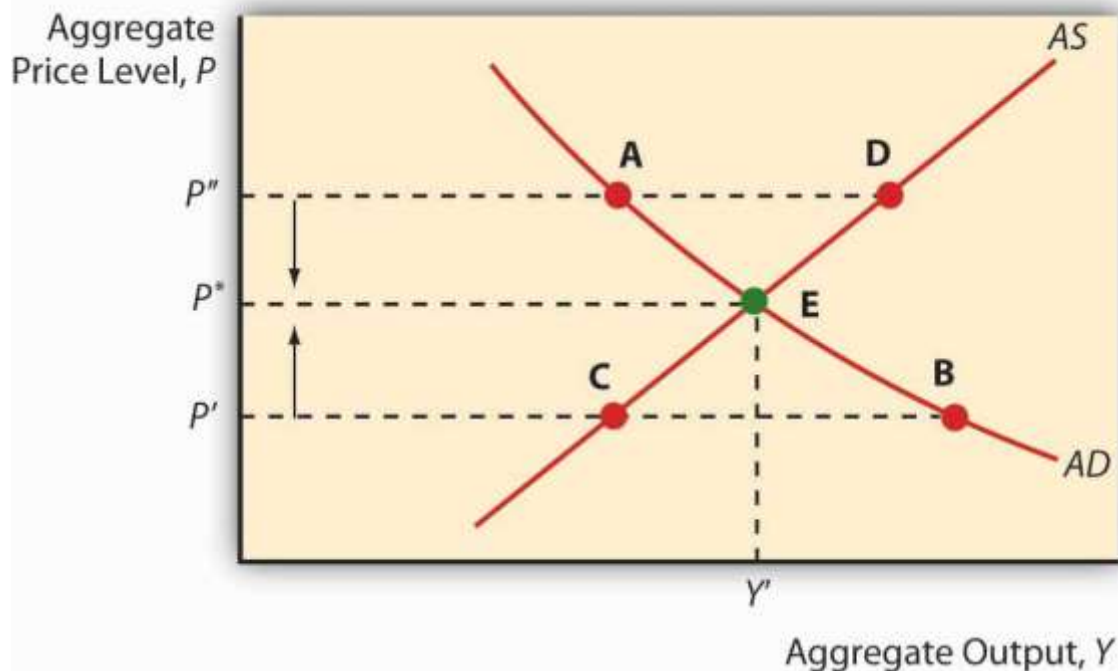
23.3 Equilibrium Analysis

LEARNING OBJECTIVES

1. What is the ASL curve?
2. Why is it vertical, and what shifts it?
3. How long is the long term and why is the answer important for policymakers?

Of course, this is all just a prelude to the main event: slapping these three curves—AD, AS, and ASL—on the same graph at the same time. Let's start, as in [Figure 23.5 "Short-run equilibrium in the macroeconomy"](#), with just the short-run AS and AD curves. Their intersection indicates both the price level P^* (not to be confused with the microeconomic price theory model's p^*) and Y^* (again not to be confused with q^*). Equilibrium is achieved because at any $P > P^*$, there will be a glut (excess supply), so prices (of all goods and services) will fall toward P^* . At any $P < P^*$, there will be excess demand, many bidders for each automobile, sandwich, haircut, and what not, who will bid prices up to P^* . We can also now examine what happens to P^* and Y^* in the short run by moving the curves to and fro.

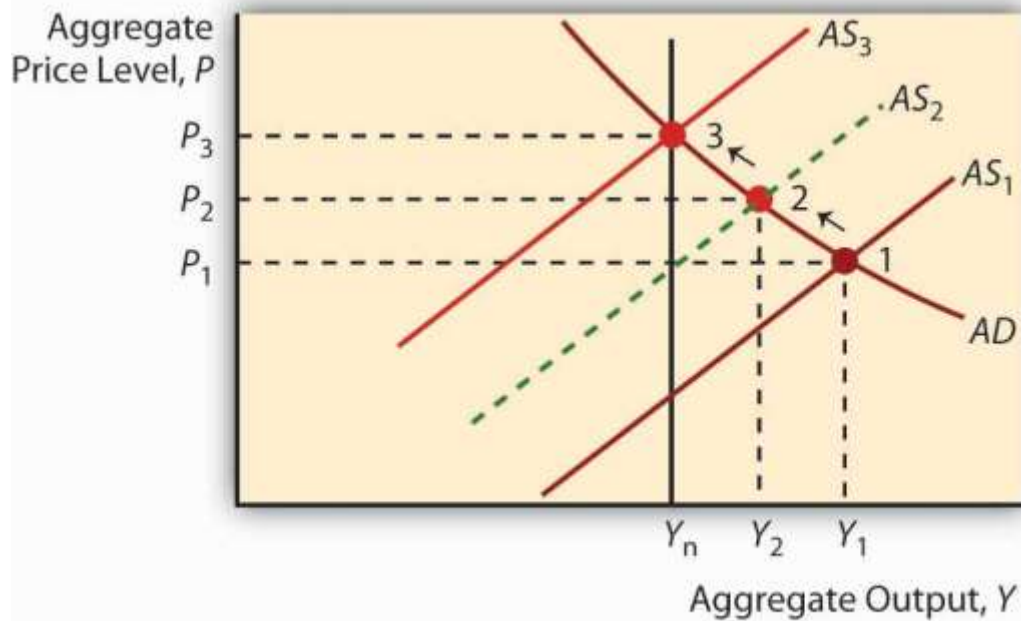
Figure 23.5 Short-run equilibrium in the macroeconomy



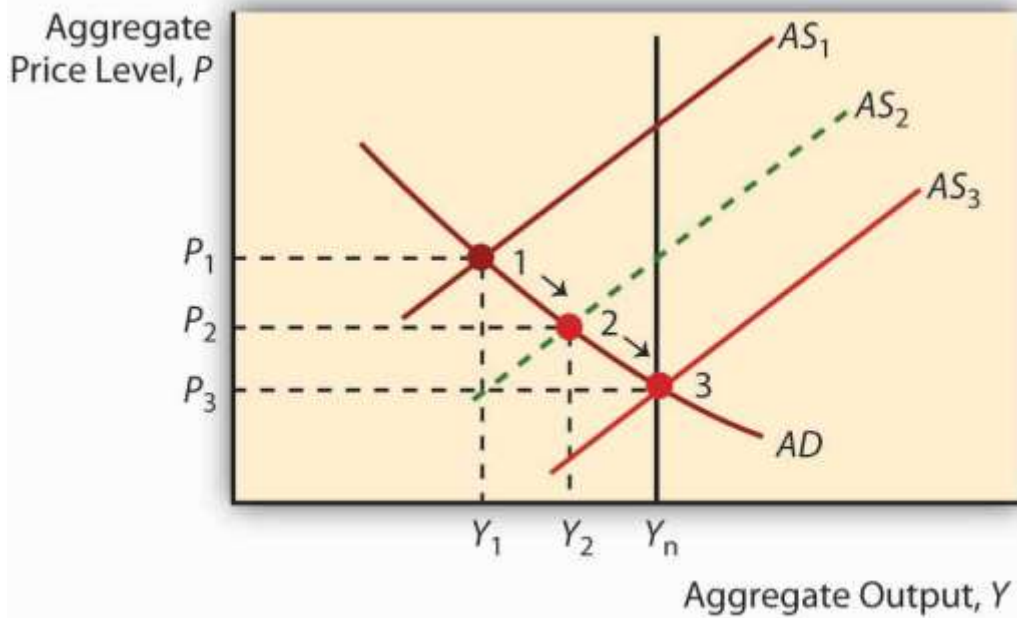
To study long-run changes in the economy, we need to add the vertical long-run aggregate supply curve (ASL), to the graph. As discussed above, if Y^* is $>$ or $<$ Y_{nr} , the AS curve will shift (via the labor market and/or inflation expectations) until it $Y^* = Y_{nr}$, as in [Figure 23.6 "Long-run equilibrium in the macroeconomy"](#). So attempts to increase output above its natural rate will cause inflation and recession. Attempts to keep it below its natural rate will lead to deflation and expansion.

Figure 23.6 Long-run equilibrium in the macroeconomy





(a) Initial equilibrium in which $Y > Y_n$



(b) Initial equilibrium in which $Y < Y_n$

The so-called self-correcting mechanism described above makes many policymakers uneasy, so the most activist among them argue that the long-run analysis holds only over very long periods. In fact, the great granddaddy, intellectually speaking, of today's activist policymakers, John Maynard

Keynes, ^[1] once remarked, “[The l]ong run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is long past the ocean is flat again.” ^[2] Other economists (nonactivists, including monetarists like Milton Friedman) think that the short run is short indeed and the long run is right around the corner. Figuring out how short and long the short and long runs are is important because if the nonactivists are correct, policymakers are wasting their time trying to increase output by shifting AD to the right: the AS curve will soon shift left, leaving the economy with a higher price level but the same level of output. Similarly, policymakers need do nothing in response to a negative supply shock (which, as noted above, shifts AS to the left) because the AS curve will soon shift back to the right on its own, restoring both the price level and output. If the activists are right, on the other hand, policymakers can improve people’s lives by regularly shifting AD to the right and countering the effects of negative supply shocks by helping the AS curve to return to its original position or beyond.

The holy grail of economic growth theory is to figure out how to shift Y_{nr} to the right because, if policymakers can do that, it doesn’t matter how short the long term is. Policymakers can make a difference—and for the better. The real business cycle theory of Edward Prescott suggests that real aggregate supply shocks can affect Y_{nr} . ^[3] This is an active area of research, and not just because Prescott took home the Nobel Prize in 2004 for his contributions to “dynamic macroeconomics: the time consistency of economic policy and the driving forces behind business cycles.” ^[4] Other economists believe that activist policies designed to shift AD to the right can influence Y_{nr} through a process called hysteresis. ^[5] It’s still all very confusing and complicated, so the authors of this book and numerous others prefer bringing an institutional analysis to Y_{nr} , one that concentrates on providing economic actors with incentives to labor, to develop and implement new technologies, and to build new plant and infrastructure.

Stop and Think Box

People often believe that wars induce long-term economic growth; however, they are quite wrong.

Use [Figure 23.7 "Inflation and output during and after two major U.S. wars, the Civil War \(1861–1865\)](#)



and World War I (1917–1918)" and the AS-AD model to explain why people think wars induce growth and why they are wrong.

Figure 23.7 Inflation and output during and after two major U.S. wars, the Civil War (1861–1865) and World War I (1917–1918)

Year	Inflation Rate	Real Per Capita GDP
1860	0	\$2,296
1861	5.96	\$2,277
1862	14.17	\$2,497
1863	24.82	\$2,624
1864	25.14	\$2,592
1865	3.68	\$2,606
1866	-2.53	\$2,430
1867	-6.82	\$2,418
1868	-3.91	\$2,458
1869	-4.14	\$2,473
1870	-4.24	\$2,509
1914	0.94	\$4,948
1915	0.52	\$5,011
1916	9.24	\$5,626
1917	20.49	\$5,418
1918	17.47	\$5,910
1919	14.87	\$5,883
1920	15.84	\$5,721
1921	-10.86	\$5,483
1922	-6.31	\$5,708

w



Y^* often increases during wars because AD shifts right because of increases in G (tanks, guns, ships, etc.) and I (new or improved factories to produce tanks, guns, ships, etc.) that exceed decreases in C (wartime rationing) and possibly NX (trade level decreases and/or subsidies provided to or by allies). Due to the right shift in AD, P^* also rises, perhaps giving the illusion of wealth. After the war, however, two things occur: AD shifts back left as war production ceases and, to the extent that the long run comes home to roost, AS shifts left. Both lower Y^* and the AD leftward shift decreases the price level. Empirically, wars are indeed often followed by recessions and deflation. [Figure 23.7 "Inflation and output during and after two major U.S. wars, the Civil War \(1861–1865\) and World War I \(1917–1918\)"](#) shows what happened to prices and output in the United States during and after the Civil War (1861–1865) and World War I (1914–1918; direct U.S. involvement, 1917–1918), respectively. The last bastion of the warmongers is the claim that, by inducing technological development, wars cause Y_{nrl} to shift right. Wars do indeed *speed* research and development, but getting a few new gizmos a few years sooner is not worth the wartime destruction of great masses of human and physical capital.

KEY TAKEAWAYS

- The ASL is the amount of output that is obtainable in the long run given the available labor, technology, and physical capital set.
- It is vertical because it is insensitive to changes in the price level.
- Economists are not entirely certain why ASL shifts. Some point to hysteresis, others to real business cycles, still others to institutional improvements like the growth diamond.
- Nobody knows how long the long term is, but the answer is important for one's attitude toward economic policymaking.
- Those who favor activist policies think the long term is a long way off indeed, so policymakers can benefit the economy by shifting AD and AS to the right.
- Those who are suspicious of interventionist policies think that the long run will soon be upon us, so interventionist policies cannot help the economy for long because output must soon return to Y_{nrl} .

[1] http://en.wikipedia.org/wiki/John_Maynard_Keynes

[2] <http://www.bartleby.com/66/8/32508.html>



[3] <http://www.minneapolisfed.org/research/prescott/>

[4] http://nobelprize.org/nobel_prizes/economics/laureates/2004/prescott-autobio.html

[5] <http://economics.about.com/library/glossary/bldef-hysteresis.htm>



23.4 The Growth Diamond

LEARNING OBJECTIVE

1. What is the growth diamond and why is it important?

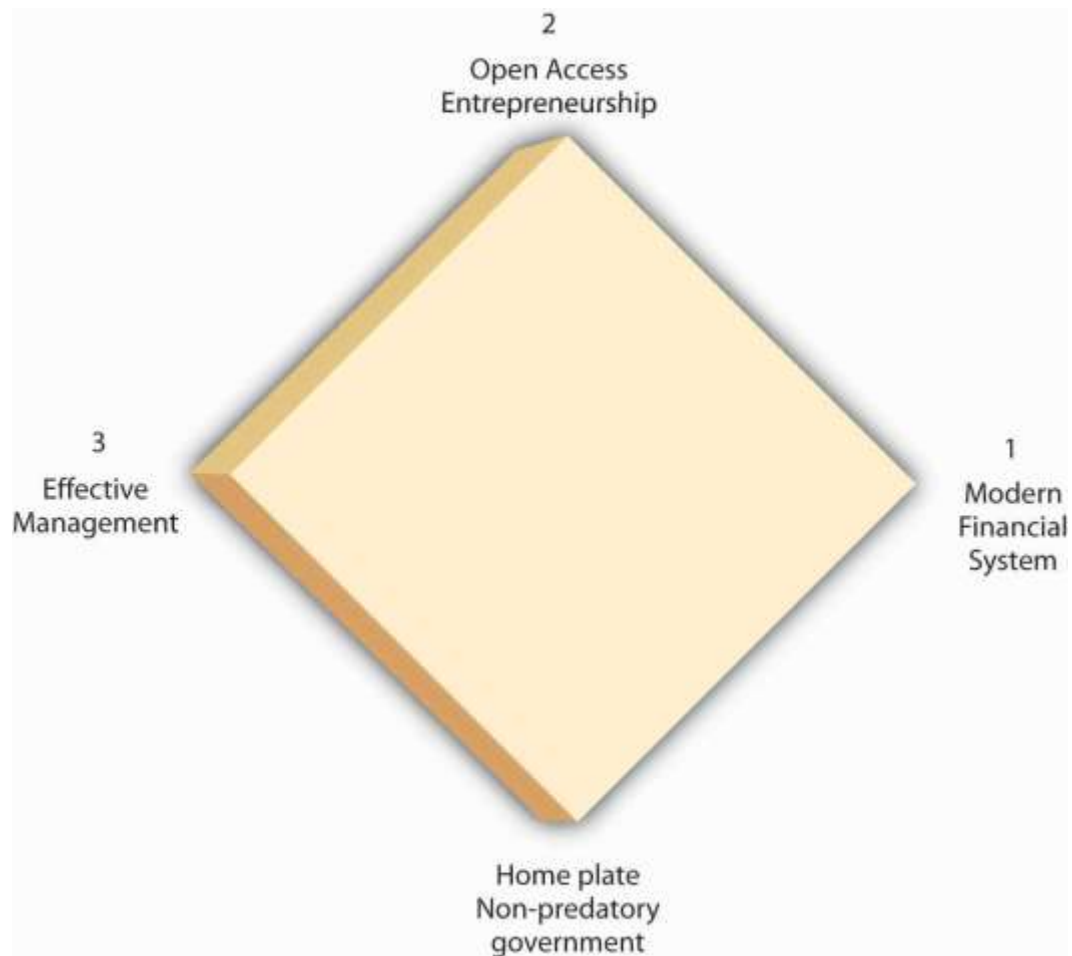
Over the last two decades or so, many scholars, including one of the authors of this textbook (Wright), have examined the link between financial development and economic growth. *They have found that financial repression, severe underdevelopment of financial intermediaries and markets, can stymie growth and that financial development paves the way for growth.* The reason is clear: by reducing asymmetric information and tapping economies of scale (and scope), the financial system efficiently links investors to entrepreneurs, ensuring that society's scarce resources are allocated to their highest valued uses and that innovative ideas get a fair trial.

The research agenda of some of those scholars, including the author of this textbook, has recently broadened to include more of the institutional factors that enhance or reduce economic growth, sustained rightward movements of Y_{nr} . A leading model, set forth by three economic historians who teach economics at New York University's Stern School of Business, ^[1] is called the growth diamond or diamond of sustainable growth. ^[2] Imagine a baseball or softball diamond. At the bottom of the diamond is home plate, the most important base in the game, where the player both begins and, if successful, ends his or her journey. Looking out from home, first base is at the right corner; second base is at the top of the diamond, dead ahead; and third base is at the diamond's left corner. To score a run, a player must return to home plate after touching first, second, and third base, in that order. *Countries are no different than ballplayers in this regard. For a country to get rich, it needs to progress from base to base in the proper order.*

In the growth diamond, home plate is represented by government, first base by the financial system, second base by entrepreneurs, and third base by management. To succeed economically, as depicted in [Figure 23.8 "The growth diamond"](#), a country must first possess a solid home plate, a government that at a minimum protects the lives, liberty, and property of its citizens. Next, it must develop an efficient financial system capable of linking savers/investors to people with good business ideas, the entrepreneurs at second base. The managers at third take over after a product has emerged and matured.



Figure 23.8 *The growth diamond*



The growth diamond is a powerful model because it can be applied to almost every country on earth. The poorest countries never left home plate because their governments killed and robbed their citizens. Poor but not destitute countries never made it to first base, often because their governments, while not outright predatory, restricted economic liberty to the point that financiers and entrepreneurs could not thrive. In many such countries, the financial system is the tool of the government (indeed many banks in poor countries are owned by the state outright), so they allocate resources to political cronies rather than to the best entrepreneurs. Countries with middling income rounded the bases once or twice but found that managers, entrepreneurs, and financiers co-opted the government and implemented self-serving policies that rendered it difficult to score runs frequently. Meanwhile the rich countries continue to rack up the runs, growing stronger as players circle the bases in a virtuous or self-reinforcing cycle.

Stop and Think Box

Saylor URL: <http://www.saylor.org/books>



In the early nineteenth century, Ontario, Canada (then a colony of Great Britain), and New York State (then part of a fledgling but independent United States) enjoyed (perhaps *hated* is a better word here!) a very similar climate, soil type, and flora and fauna (plants and animals). Yet the population density in New York was much higher, farms (*ceteris paribus*) were worth four times more there than on the north side of Lake Ontario, and per capita incomes in New York dwarfed those of Ontario. What explains those differences?

The growth diamond does. By the early 1800s, the United States, of which New York State was a part, had put in place a nonpredatory government and a financial system that, given the technology of the day, was quite efficient at linking investors to entrepreneurs, the activities of whom received governmental sanction and societal support. A nascent management class was even forming. Ontario, by contrast, was a colony ruled by a distant monarch. Canadians had little incentive to work hard or smart, so they didn't, and the economy languished, largely devoid of banks and other financial intermediaries and securities markets. As late as the 1830s, New York was sometimes "a better market for the sale of Canada exchange on London than Canada itself."^[3] Only after they shed their imperial overlords and reformed their domestic governments did Canadians develop an effective financial system and rid themselves of anti-entrepreneurial laws and sentiments. The Canadian economy then grew with rapidity, making Canada one of the world's richest countries.

A narrower and more technical explanation of the higher value of New York farms comparable to Canadian farms in size, soil quality, rainfall, and so forth is that interest rates were much lower in New York. Valuing a farm is like valuing any income-producing asset. All it takes is to discount the farm's expected future income stream. Holding expected income constant, the key to the equation becomes the interest rate, which was about *four times* lower in New York (say, 6 percent per year versus 24 percent). Recall that $PV = FV/(1 + i)$. If FV (next year's income) in both instances is 100, but $i = .24$ in Canada and $.06$ in New York, an investor would be willing to lease the New York farm for a year for $100/1.06 = \$94.34$, but the Canadian farm for only $100/1.24 = \$80.65$. The longer the time frame, the more the higher Canadian interest rate will bite. In the limit, we could price the farms as perpetuities using the equation $PV = FV/i$ from [Chapter 4 "Interest Rates"](#). That means the New York farm would be worth $PV = 100/.06 = \$1,666.67$, while the Canadian farm would be worth a mere $PV = 100/.24 = \$416.67$ (which, of



course, times 4 equals the New York farm price). Canadian land values increased when Canadian interest rates decreased after about 1850.

One important implication of the growth diamond is that emerging (from eons of poverty) or transitioning (from communism) economies that are currently hot, like those of China and India, may begin to falter if they do not strengthen their governance, financial, entrepreneurial, and management systems. Some of today's basket-case economies, including that of Argentina, were once high fliers that ran into an economic brick wall because they inadequately protected property rights, impeded financial development, and squelched entrepreneurship.

Although currently less analytically rigorous than the AS-AD model, the growth diamond is more historically grounded than the AS-AD model or any other macro model and that is important. As storied economist Will Baumol once put it,

We cannot understand current phenomena . . . without systematic examination of earlier events which affect the present and will continue to exercise profound effects tomorrow . . . [T]he long run is important because it is not sensible for economists and policymakers to attempt to discern long-run trends and their outcomes from the flow of short-run developments, which may be dominated by transient conditions. ^[4]

KEY TAKEAWAYS

- The growth diamond is a model of economic growth (increases in real per capita aggregate output) being developed by economic historians at the Stern School of Business.
- It posits that sustained, long-term economic growth is predicated on the existence of a nonpredatory government (home plate), an efficient financial system (first base), entrepreneurs (second base), and modern management (third base).
- It is important because it explains why some countries are very rich and others are desperately poor.
- It also explains why some countries, like Argentina, grew rich, only to fall back into poverty.
- Finally, it warns investors that the growth trends of current high fliers like China could reverse if they do not continue to strengthen their governance, financial, entrepreneurial, and management systems.



[1] http://w4.stern.nyu.edu/economics/facultystaff.cfm?doc_id=1019

[2] http://w4.stern.nyu.edu/sternbusiness/spring_2007/sustainableGrowth.html

[3] (T. R. Preston, *Three Years' Residence in Canada, from 1837 to 1839*, 2 vols., (London: Richard Bentley 1840), 185).

[4] Will Baumol, "Productivity Growth, Convergence, and Welfare: What the Long-Run Data Show," *American Economic Review* 76 (December 1986): 1072–1086, as quoted in Peter L. Bernstein, *Against the Gods: The Remarkable Story of Risk* (New York: John Wiley & Sons, 1996), 181.



23.5 Financial Shocks

LEARNING OBJECTIVE

1. How do financial shocks and crises affect the real economy?

Another important implication of the growth diamond is that financial crises can have extremely negative consequences for economic growth. *Five shocks, alone or in combination, have a strong propensity to initiate financial crises:*

Increases in uncertainty. When companies cannot plan for the future and when investors feel they cannot estimate future corporate earnings or interest, inflation, or default rates, they tend to play it safe. They hold cash instead of investing in a new factory or equipment. That, of course, reduces aggregate economic activity.

Increases in interest rates. Higher interest rates make business projects less profitable and hence less likely to be completed, a direct blow to gross domestic product (GDP). Also, higher interest rates tend to exacerbate adverse selection by discouraging better borrowers but having little or no effect on the borrowing decisions of riskier companies and individuals. As a result, lenders are saddled with higher default rates in high interest-rate environments. So, contrary to what one would think, high rates reduce their desire to lend. To the extent that businesses own government or other bonds, higher interest rates decrease their net worth, leading to balance sheet deterioration, of which we will learn more below. Finally, higher interest rates hurt cash flow (receipts minus expenditures), rendering firms more likely to default.

Government fiscal problems. Governments that expend more than they take in via taxes and other revenues have to borrow. The more they borrow, the harder it is for them to service their loans, raising fears of a default, which decreases the market price of their bonds. That hurts the balance sheets of firms that invest in government bonds and may lead to an exchange rate crisis as investors sell assets denominated in the local currency in a flight to safety. Precipitous declines in the value of local currency causes enormous difficulties for firms that have borrowed in foreign currencies, like dollars, sterling, euro, or yen, because they have to pay more units of local currency than expected for



each unit of foreign currency. Many are unable to do so and they default, increasing uncertainty and asymmetric information.

Balance sheet deterioration. Whenever a firm's balance sheet deteriorates, which is to say, whenever its net worth falls because the value of its assets decreases and/or the value of its liabilities increases, or because stock market participants value the firm less highly, the Cerberus of asymmetric information rears its trio of ugly, fang-infested faces. The company now has less at stake, so it might engage in riskier activities, exacerbating adverse selection. As its net worth declines, moral hazard increases because it grows more likely to default on existing obligations, in turn because it has less at stake. Finally, agency problems become more prevalent as employee bonuses shrink and stock options become valueless. As employees begin to shirk, steal, and look for other work on company time, productivity plummets, and further declines in profitability cannot be far behind. The same negative cycle can also be jump-started by an unanticipated deflation, a decrease in the aggregate price level, because that will make the firm's liabilities (debts) more onerous in real terms (i.e., adjusted for lower prices).

Banking problems and panics. If anything hurts banks' balance sheets (like higher than expected default rates on loans they have made), banks will reduce their lending to avoid going bankrupt and/or incurring the wrath of regulators. As we have seen, banks are the most important source of external finance in most countries, so their decision to curtail will negatively affect the economy by reducing the flow of funds between investors and entrepreneurs. If bank balance sheets are hurt badly enough, some may fail. That may trigger the failure of yet more banks for two reasons. First, banks often owe each other considerable sums. If a big one that owes much to many smaller banks were to fail, it could endanger the solvency of the creditor banks. Second, the failure of a few banks may induce the holders of banks' monetary liabilities (today mostly deposits, but in the past, as we've seen, also bank notes) to run on the bank, to pull their funds out en masse because they can't tell if their bank is a good one or not. The tragic thing about this is that, because all banks engage in fractional reserve banking (which is to say, that no bank keeps enough cash on hand to meet all of its monetary liabilities), runs often become self-fulfilling prophecies, destroying even solvent institutions in a matter of days or even hours. Banking panics and the dead banks they leave in their



wake causes uncertainty, higher interest rates, and balance sheet deterioration, all of which, as we've seen, hurt aggregate economic activity.

A downward spiral often ensues. Interest rate increases, stock market declines, uncertainty, balance sheet deterioration, and fiscal imbalances, as detailed above, all tend to increase asymmetric information. *That, in turn, causes economic activity to decline, triggering more crises, including bank panics and/or foreign exchange crises, which increase asymmetric information yet further.* Economic activity again declines, perhaps triggering more crises or an unanticipated decline in the price level. That is the point, traditionally, where recessions turn into depressions, unusually long and steep economic downturns.

Stop and Think Box

In early 1792, U.S. banks curtailed their lending. That caused a securities speculator and shyster by the name of William Duer to go bankrupt owing large sums of money to hundreds of investors. The uncertainty caused by Duer's sudden failure caused people to panic, inducing them to sell securities, even government bonds, for cash. By mid-summer, though, the economy was again humming along nicely. In 1819, banks again curtailed lending, leading to a rash of mercantile failures. People again panicked, this time running on banks (but clutching their government bonds for dear life). Many banks failed and unemployment soared. Economic activity shrank, and it took years to recover. Why did the economy right itself quickly in 1792 but only slowly in 1819?

In 1792, America's central bank (then the Secretary of the Treasury, Alexander Hamilton, working in conjunction with the Bank of the United States) acted as a lender of last resort. By adding liquidity to the economy, the central bank calmed fears, reduced uncertainty and asymmetric information, and kept interest rates from spiking and balance sheets from deteriorating further. In 1819, the central bank (with a new Treasury secretary and a new bank, the Second Bank of the United States) crawled under a rock, allowing the initial crisis to increase asymmetric information, reduce aggregate output, and ultimately cause an unexpected debt deflation. Since 1819, America has suffered from financial crises on numerous occasions. Sometimes they have ended quickly and quietly, as when Alan Greenspan stymied the stock



market crash of 1987. Other times, like after the stock market crash of 1929, the economy did not fare well at all. ^[1]

Assuming the growth diamond has not been destroyed by the depression, economies will eventually reverse themselves after many companies have gone bankrupt; the balance sheets of surviving firms improve; and uncertainty, asymmetric information, and interest rates decrease (see [Chapter 5 "The Economics of Interest-Rate Fluctuations"](#)). *It is better for everyone, however, if financial crises can be nipped in the bud before they turn ugly.* This, as we learned in [Chapter 17 "Monetary Policy Targets and Goals"](#), is one of the major functions of central banks like the European Central Bank (ECB) and the Fed. Generally, all that the central bank needs to do at the outset of a crisis is to restore confidence, reduce uncertainty, and keep interest rates in line by adding liquidity (cash) to the economy by acting as a lender of last resort, helping out banks and other financial intermediaries with loans and buying government bonds in the open market. As we learned in [Chapter 12 "The Financial Crisis of 2007–2008"](#), however, sometimes a bailout becomes necessary. [Figure 23.9 "Anatomy of a financial crisis and economic decline"](#) summarizes this discussion of the ill consequences of financial shocks.

Figure 23.9 Anatomy of a financial crisis and economic decline

Triggers	Which lead to	Which causes	Which leads to	Which causes	And finally
Uncertainty	Caution and declines in economic activity	Increases in asymmetric information	Generalized panic	Further increases in asymmetric information and further declines in economic activity	Debt deflation and further increase in ai and declines in economic activity
Increases in Interest Rates	Fewer profitable business projects; balance sheet deterioration; cash flow problems; increase in asymmetric information	"	Stagnation and bankruptcies	"	"
Stock Market Decline	Balance sheet deterioration	"	"	"	"
Bank Problems	Loan curtailments; increases in interest rates and uncertainty	"	Bank runs	Bank failures	"
Fiscal Imbalances	Expectations of government default; balance sheet deterioration	"	Exchange Rate Crisis	"	"

Note: At any point the downward spiral can be stopped by adequate central bank intervention.

Source: Text.



But in case you didn't get the memo, nothing is ever really free. (Well, except for free goods.)^[2] When central banks stop financial panics, especially when they do so by bailing out failed companies, they risk creating moral hazard by teaching market participants that they will shield them from risks. That is why some economists, like Allan Meltzer, said "Let 'Em Fail," in the op-ed pages of the *Wall Street Journal*^[3] when some hedge funds ran into trouble due to the unexpected deterioration of the subprime mortgage market in 2007. Hamilton's Law (née Bagehot's Law which, as described in [Chapter 16 "Monetary Policy Tools"](#), urges lenders of last resort to lend at a penalty rate on good security) is so powerful precisely because it minimizes moral hazard by providing relief only to the more prudent and solvent firms while allowing the riskiest ones to go under.

KEY TAKEAWAYS

- Financial shocks and crises affect the real economy by increasing asymmetric information.
- That, in turn, reduces the amount of funds channeled from investors to entrepreneurs.
- Starved of external finance, businesses cut back production, decreasing aggregate economic activity.
- The conduits include rapidly rising interest rates, foreign exchange crises, and bank panics.

[1] <http://www.amatecon.com/gd/gdcandc.html>

[2] http://en.wikipedia.org/wiki/Free_good

[3] July 21, 2007. <http://online.wsj.com/article/SB118498744630073854.html>



23.6 Suggested Reading

Baumol, William, Robert Litan, and Carl Schramm. *Good Capitalism, Bad Capitalism, and the Economics of Growth and Prosperity*. New Haven, CT: Yale University Press, 2007.

Haber, Stephen, Douglass North, and Barry Weingast. *Political Institutions and Financial Development*. Stanford, CA: Stanford University Press, 2008.

Powell, Benjamin. *Making Poor Nations Rich: Entrepreneurship and the Process of Economic Development*. Stanford, CA: Stanford University Press, 2008.

Wright, Robert E. *One Nation Under Debt: Hamilton, Jefferson, and the History of What We Owe*. New York: McGraw-Hill, 2008.



Chapter 24

Monetary Policy Transmission Mechanisms

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Explain why structural models are generally superior to reduced-form models.
2. Describe the types of evidence that can strengthen researchers' conviction that a reduced-form model has the direction of causation right, say, from money (M) to output (Y).
3. Describe the evidence that money matters.
4. List and explain several important monetary policy transmission mechanisms.



24.1 Modeling Reality

LEARNING OBJECTIVE

1. Why are structural models generally superior to reduced-form models?

We've learned in the last few chapters that monetary policy is not the end-all and be-all of the economy or even of policymakers' attempts to manipulate it. But we knew that before. The question before us is, *Given what we know of IS-LM and AS-AD, just how important is monetary policy? And how do we know? We've got theories galore— notions about how changes in sundry variables, like interest rates, create certain outcomes, like changes in prices and aggregate output. But how well do those theories describe reality?* To answer those questions, we need empirical evidence, good hard numbers. We also need to know how scientists and social scientists evaluate such evidence.

Structural models explicitly link variables from initial cause all the way to final effect via every intermediate step along the causal chain. Reduced-form evidence makes assertions only about initial causes and ultimate effects, treating the links in between as an impenetrable black box. The quantity theory makes just such a reduced-form claim when it asserts that, as the money supply increases, so too does output. In other words, the quantity theory is not explicit about the transmission mechanisms of monetary policy. On the other hand, the assertion that increasing the money supply decreases interest rates, which spurs investment, which leads to higher output, *ceteris paribus*, is a structural model. Such a model can be assessed at every link in the chain: MS up, *i* down, I up, Y up. If the relationship between MS and Y begins to break down, economists with a structural model can try to figure out specifically why. Those touting only a reduced-form model will be flummoxed. Structural models also strengthen our confidence that changes in MS *cause* changes in Y.

Because they leave so much out, reduced-form models may point only to variables that are correlated, that rise and fall in tandem over time. *Correlation, alas, is not causation; the link between variables that are only correlated can be easily broken.* All sorts of superstitions are based on mere correlation, as their practitioners eventually discover to their chagrin and loss, ^[1] like those who wear goofy-looking rally caps to win baseball games. ^[2] Reverse causation is also rampant. People who see



a high correlation between X and Y often think that X causes Y when in fact Y causes X. For example, there is a high correlation between fan attendance levels and home team victories. Some superfans ^[3] take this to “prove” that high attendance causes the home team to win by acting as a sixth, tenth, or twelfth player, depending on the sport. Fans have swayed the outcome of a few games, usually by touching baseballs still in play, ^[4] but the causation mostly runs in the other direction—teams that win many games tend to attract more fans.

Omitted variables can also cloud the connections made by reduced-form models. “Caffeine drinkers have higher rates of coronary heart disease (CHD) than people who don’t consume caffeine” is a reduced-form model that probably suffers from omitted variables in the form of selection biases. In other words, caffeine drinkers drink caffeine because they don’t get enough sleep; have hectic, stressful lives; and so forth. It may be that those other factors give them heart attacks, not the caffeine per se. Or the caffeine interacts with those other variables in complex ways that are difficult to unravel without growing human beings in test tubes (even more alarming!).

Stop and Think Box

A recent reduced-form study shows a high degree of correlation between smoking marijuana and bad life outcomes: long stints of unemployment, criminal arrests, higher chance of disability, lower lifetime income, and early death. Does that study effectively condemn pot smoking?

Not nearly as much as it would if it presented a structural model that carefully laid out and tested the precise chain by which marijuana smoking causes those bad outcomes. Omitted variables and even reverse causation can be at play in the reduced-form version. For example, some people smoke pot because they have cancer. Some cancer treatments require nasty doses of chemotherapy, the effect of which is to cause pain and reduce appetite. Taking a toke reduces the pain and restores appetite. Needless to say, such people have lower life expectancies than people without cancer. Therefore, they have lower lifetime income and a higher chance of disability and unemployment. Because not all states have medical marijuana exceptions, they are also more liable to criminal arrest. Similarly, unemployed people might be more likely to take a little Mary Jane after lunch or perhaps down a couple of cannabis brownies for dessert, again reversing the direction of causation. A possible omitted variable is selection bias: people



who smoke pot might be less educated than those who abstain from the weed, and it is the dearth of education that leads to high unemployment, more arrests, and so forth. Unfortunately, bad science like this study pervades public discourse. Of course, this does not mean that you should go get yourself a blunt. Study instead. Correlation studies show that studying

KEY TAKEAWAYS

- Structural models trace the entire causal chain, step by step, allowing researchers to be pretty confident about the direction of causation and to trace any breakdowns in the model to specific relationships.
- Reduced-form models link initial variables to supposed outcomes via an impenetrable black box.
- The problem is that correlation does not always indicate causation. X may increase and decrease with Y, although X does not cause Y because Y may cause X (reverse causation), or Z (an omitted variable) may cause X and Y.
- Reduced-form models can and have led to all sorts of goofy conclusions, like doctors kill people (they seem to be ubiquitous during plagues, accidents, and the like) and police officers cause crime (the number on the streets goes up during crime waves, and they are always at crime scenes—very suspicious). In case you can't tell, I'm being sarcastic.
- On the other hand, reduced-form models are inexpensive compared to structural ones.

[1] <http://www.dallasobserver.com/2005-09-08/dining/tryst-of-fate/>

[2] http://en.wikipedia.org/wiki/Rally_cap

[3] http://en.wikipedia.org/wiki/Bill_Swerski's_Superfans

[4] http://www.usatoday.com/sports/columnist/lopresti/2003-10-15-lopresti_x.htm



24.2 How Important Is Monetary Policy?

LEARNING OBJECTIVES

1. What types of evidence can strengthen researchers' conviction that a reduced-form model has the direction of causation right, say, from M to Y? How?
2. What evidence is there that money matters?

*Early Keynesians believed that monetary policy did not matter at all because they could not find any evidence that interest rates affected planned business investment. Milton Friedman and Anna Schwartz, another monetarist, countered with a huge tome called *A Monetary History of the United States, 1867–1960* which purported to show that the Keynesians had it all wrong, especially their kooky claim that monetary policy during the Great Depression had been easy (low real interest rates and MS growth). Nominal rates on risky securities had in fact soared in 1930–1933, the depths of the depression. Because the price level was falling, real interest rates, via the Fisher Equation, were much *higher* than nominal rates. If you borrowed \$100, you'd have to repay only \$102 in a year, but those 102 smackers could buy a heck of a lot more goods and services a year hence. So real rates were more on the order of 8 to 10 percent, which is pretty darn high. The link between interest rates and investment, the monetarists showed, was between investment and real interest rates, not nominal interest rates.*

As noted above, the early monetarists relied on $MV = PY$, a reduced-form model. *To strengthen their conviction that causation indeed ran from M to Y instead of Y to M or some unknown variables A...Z to M and Y, the monetarists relied on three types of empirical evidence: timing, statistical, and historical. Timing evidence tries to show that increases in M happen before increases in Y, and not vice versa, relying on the commonplace assumption that causes occur before their effects. Friedman and Schwartz showed that money growth slowed before recessions, but the timing was highly variable. Sometimes slowing money growth occurred sixteen months before output turned south; other times, only a few months passed. That is great stuff, but it is hardly foolproof because, as Steve Miller points out, time keeps on slipping, slipping, slipping, into the future.*^[1] Maybe a decline in output caused the decline in the money supply. Changes in M and Y, in other words, could be causing each other in



a sort of virtuous or pernicious cycle or chicken-egg problem. Or again maybe there is a mysterious variable Z running the whole show behind the scenes.

Statistical evidence is subject to the same criticisms plus the old adage that there are three types of untruths (besides Stephen Colbert's truthiness, ^[2] of course): lies, damn lies, and statistics. By changing starting and ending dates, conflating the difference between statistical significance and economic significance, ^[3] manipulating the dates of structural breaks, and introducing who knows how many other subtle little fibs, researchers can make mountains out of molehills, and vice versa. *It's kinda funny that when monetarists used statistical tests, the quantity theory won and money mattered, but when the early Keynesians conducted the tests, the quantity theory looked, if not insane, at least inane.*

But Friedman and Schwartz had an empirical ace up their sleeves: historical evidence from periods in which declines in the money supply appear to be exogenous, by which economists mean “caused by something outside the model,” thus eliminating doubts about omitted variables and reverse causation. White-lab-coat scientists (you know, physicists, chemists, and so forth—“real” scientists) know that variables change exogenously because they are the ones making the changes. They can do this systematically in dozens, hundreds, even thousands of test tubes, Petri dishes, atomic acceleration experiments, and what not, carefully controlling for each variable (making sure that everything is *ceteris paribus*), then measuring and comparing the results. As social scientists, economists cannot run such experiments. *They can and do turn to history, however, for so-called natural experiments.* That's what the monetarists did, and what they found was that exogenous declines in MS led to recessions (lower Y^*) every time. *Economic and financial history wins!* (Disclaimer: One of the authors of this textbook [Wright] is a financial historian.) While they did not abandon the view that C, G, I, NX, and T also affect output, Keynesians now accept money's role in helping to determine Y. (A new group, the real-business-cycle theorists associated with the Minneapolis Fed, has recently challenged the notion that money matters, but those folks haven't made it into the land of undergraduate textbooks quite yet.)

KEY TAKEAWAYS

- Timing, statistical, and historical evidence strengthen researchers' belief in causation.



- Timing evidence attempts to show that changes in M occur before changes in Y.
- Statistical evidence attempts to show that one model's predictions are closer to reality than another's.
- The problem with stats, though, is that those running the tests appear to rig them (consciously or not), so the stats often tell us more about the researcher than they do about reality.
- Historical evidence, particularly so-called natural experiments in which variables change exogenously and hence are analogous to controlled scientific experiments, provide the best sort of evidence on the direction of causation.
- The monetarists showed that there is a strong correlation between changes in the MS and changes in Y and also proffered timing, statistical, and historical evidence of a causal link.
- Historical evidence is the most convincing because it shows that the MS sometimes changed exogenously, that is, for reasons clearly unrelated to Y or other plausible causal variables, and that when it did, Y changed with the expected sign (+ if MS increased, – if it decreased).

[1] http://www.lyricsfreak.com/s/steve+milller/fly+like+an+eagle_20130994.html

[2] <http://en.wikipedia.org/wiki/Truthiness>

[3] http://www.deirdremccloskey.com/articles/stats/preface_ziliak.php



24.3 Transmission Mechanisms

LEARNING OBJECTIVE

1. What are monetary policy transmission mechanisms and why are they important?

Most economists accept the proposition that money matters and have been searching for structural models that delineate the specific transmission mechanisms between MS and Y. The most basic model says the following:

Expansionary monetary policy (EMP), real interest rates down, investment up, aggregate output up

The importance of interest rates for consumer expenditures (especially on durables like autos, refrigerators, and homes) and net exports has also been recognized, leading to the following:

EMP, $i_r \downarrow$, $I + C + NX \uparrow$, $Y \uparrow$

Tobin's q, the market value of companies divided by the replacement cost of physical capital, is clearly analogous to i and related to I . When q is high, firms sell their highly valued stock to raise cash and buy new physical plant and build inventories. When q is low, by contrast, firms don't get much for their stock compared to the cost of physical capital, so they don't sell stock to fund increases in I . By increasing stock prices, the MS may be positively related to q . Thus, another monetary policy transmission mechanism may be the following:

EMP, $P_s \uparrow$, $q \uparrow$, $I \uparrow$, $Y \uparrow$

The wealth effect is a transmission mechanism whereby expansionary monetary policy leads to increases in the prices of stocks, homes, collectibles, and other assets, in other words, an increase in individual wealth. That increase, in turn, induces people to consume more:

EMP, $P_a \uparrow$, wealth \uparrow , $C \uparrow$, $Y \uparrow$

The credit view posits several straightforward transmission mechanisms, including bank loans, asymmetric information, and balance sheets:

EMP, bank deposits \uparrow , bank loans \uparrow , $I \uparrow$, $Y \uparrow$



EMP, net worth ↓, asymmetric information ↓, lending ↑, I + C ↑, Y↑

EMP, i ↓, cash flow ↑, asymmetric information ↓, lending ↑, I + C ↑, Y↑

EMP, unanticipated P^* ↑, real net worth ↑, asymmetric information ↓, lending ↑, I ↑, Y↑

Asymmetric information (that horrible three-headed hound from Hades) is a powerful and important theory, so scholars' confidence in these transmission mechanisms is high.

Stop and Think Box

The Fed thought that it would quickly squelch the recession that began in March 2001, yet the downturn lasted until November of that year. The terrorist attacks that September worsened matters, but the Fed had hoped to reverse the drop in Y^* well before then. Why was the Fed's forecast overly optimistic? (*Hint:* Corporate accounting scandals at Enron, Arthur Andersen, and other firms were part of the mix.)

The Fed might not have counted on some major monetary policy transmission mechanisms, including reductions in asymmetric information, being muted by the accounting scandals. In other words,

EMP, net worth ↑, asymmetric information ↓, lending ↑, I + C ↑, Y↑

EMP, i ↓, cash flow ↑, asymmetric information ↓, lending ↑, I + C ↑, Y↑

EMP, unanticipated P ↑, real net worth ↑, asymmetric information ↓, lending ↑, I ↑, Y↑

became something more akin to the following:

EMP, net worth ↑, asymmetric information — (flat or no change), lending —, I + C —, Y —

EMP, i ↑, cash flow ↑, asymmetric information —, lending —, I + C —, Y —

EMP, unanticipated P ↑, real net worth ↑, asymmetric information —, lending —, I —, Y — because asymmetric information remained high due to the fact that economic agents felt as though they could no longer count on the truthfulness of corporate financial statements.

The takeaway of all this for monetary policymakers, and those interested in their policies (including you, as you know from [Chapter 1 "Money, Banking, and Your World"](#)), is that monetary policy needs



to take more into account than just short-term interest rates. Policymakers need to worry about real interest rates, including long-term rates; unexpected changes in the price level; the interest rates on risky bonds; the prices of other assets, including corporate equities, homes, and the like; the quantity of bank loans; and the bite of adverse selection, moral hazard, and the principal-agent problem.

Stop and Think Box

Japan's economy was going gangbusters until about 1990 or so, when it entered a fifteen-year economic funk. To try to get the Japanese economy moving again, the Bank of Japan lowered short-term interest rates all the way to zero for many years on end, to no avail. Why didn't the Japanese economy revive due to the monetary stimulus? What should the Japanese have done instead?

As it turns out, i_r stayed quite high because the Japanese expected, and received, price deflation. Through the Fisher Equation, we know that $i_r = i - \pi^e$, or real interest rates equal nominal interest rates minus inflation expectations. If π^e is negative, which it is when prices are expected to fall, i_r will be $> i$. So i can be 0 but i_r can be 1, 2, 3 . . . 10 percent per year if prices are expected to decline by that much. So instead of EMP, $i_r - I + C + NX - Y$ the Japanese experienced $i_r - I + C + NX - Y$. Not good. They should have pumped up the MS much faster, driving π^e from negative whatever to zero or even positive, and thus making real interest rates low or negative, and hence a stimulant. The Japanese made other mistakes as well, allowing land and equities prices to plummet, thereby nixing the Tobin's q and wealth effect transmission mechanisms. They also kept some big shaky banks from failing, which kept levels of asymmetric information high and bank loan levels low, squelching the credit channels.

KEY TAKEAWAYS

- Monetary policy transmission mechanisms are essentially structural models that predict the precise chains of causation between expansionary monetary policy (EMP) or tight monetary policy (TMP) and Y .
- They are important because they provide central bankers and other monetary policymakers with a detailed view of how changes in the MS affect Y , allowing them to see why some policies don't work as much or as quickly as anticipated.
- That, in turn, allows them to become better policymakers, to the extent that is possible in a world of rational expectations. (See [Chapter 26 "Rational Expectations Redux: Monetary Policy Implications"](#).)
- Transmission mechanisms include:



- EMP, $i_r \downarrow$, $I + C + NX \uparrow$, $Y \uparrow$, EMP, $q \uparrow$, $I \uparrow$, $Y \uparrow$
- EMP, $P_a \uparrow$, wealth \uparrow , $C \uparrow$, $Y \uparrow$
- EMP, bank deposits \uparrow , bank loans \uparrow , $I \uparrow$, $Y \uparrow$
- EMP, net worth \uparrow , asymmetric information \downarrow , lending \uparrow , $I + C \uparrow$, $Y \uparrow$
- EMP, $i \downarrow$, cash flow \uparrow , asymmetric information \downarrow , lending \uparrow , $I + C \uparrow$, $Y \uparrow$
- EMP, unanticipated $P^* \uparrow$, real net worth \uparrow , asymmetric information \downarrow , lending \uparrow , $I \uparrow$, $Y \uparrow$



24.4 Suggested Reading

Angeloni, Ignazio, Anil Kashyap, and Benoit Mojon. *Monetary Policy Transmission in the Euro Area*. New York: Cambridge University Press, 2004.

Friedman, Milton, and Anna Schwartz. *A Monetary History of the United States, 1867–1960*. Princeton, NJ: Princeton University Press, 1971.

Mahadeva, Lavan, and Peter Sinclair. *Monetary Transmission in Diverse Economies*. New York: Cambridge University Press, 2002.



Chapter 25

Inflation and Money

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Describe the strongest evidence for the reduced-form model that links money supply growth to inflation.
2. Explain what the aggregate supply-aggregate demand (AS-AD) model, a structural model, says about money supply growth and the price level.
3. Explain why central bankers allow inflation to occur year after year.
4. Define lags and explain their importance.



25.1 Empirical Evidence of a Money-Inflation Link

LEARNING OBJECTIVES

1. What is the strongest evidence for the reduced-form model that links money supply growth to inflation?
2. What does the AS-AD model, a structural model, say about money supply growth and the price level?

Milton Friedman claimed that “inflation is always and everywhere a monetary phenomenon.”^[1] We know this isn’t entirely true because, as we saw in [Chapter 23 "Aggregate Supply and Demand, the Growth Diamond, and Financial Shocks"](#), negative aggregate supply shocks and increases in aggregate demand due to fiscal stimulus can also cause the price level to increase. Large, sustained increases in the price level, however, are indeed caused by increases in the money supply and only by increases in the money supply. *The evidence for this is overwhelming: all periods of hyperinflation from the American and French Revolutions to the German hyperinflation following World War I, to more recent episodes in Latin America and Zimbabwe, have been accompanied by high rates of money supply (MS) growth.* Moreover, the MS increases in some circumstances were exogenous, so those episodes were natural experiments that give us confidence that the reduced-form model correctly considers money supply as the causal agent and that reverse causation or omitted variables are unlikely.

Stop and Think Box

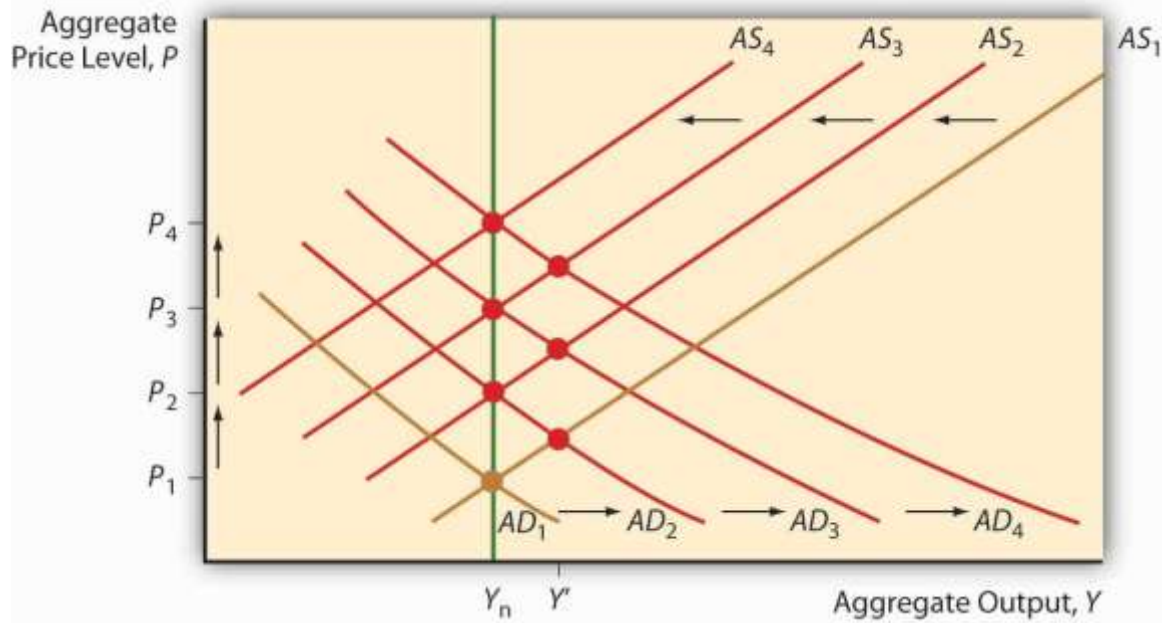
During the American Civil War, the Confederate States of America (CSA, or the South) issued more than \$1 billion of fiat paper currency similar to today’s Federal Reserve notes, far more than the economy could support at the prewar price level. Confederate dollars fell in value from 82.7 cents in specie in 1862 to 29.0 cents in 1863, to 1.7 cents in 1865, a level of currency depreciation (inflation) that some economists think was simply too high to be accounted for by Confederate money supply growth alone. What other factors may have been at play? (*Hint: Over the course of the war, the Union [the North] imposed a blockade of southern trade that increased in efficiency during the course of the war, especially as major Confederate seaports like New Orleans and Norfolk fell under northern control.*)



A negative supply shock, the almost complete cutoff of foreign trade, could well have hit poor Johnny Reb (the South) as well. That would have decreased output and driven prices higher, prices already raised to lofty heights by continual emissions of too much money.

Economists also have a structural model showing a causal link between money supply growth and inflation at their disposal, the AS-AD model. Recall that an increase in MS causes the AD curve to shift right. That, in turn, causes the short-term AS curve to shift left, leading to a return to Y_{nr} but higher prices. If the MS grows and grows, prices will go up and up, as in Figure 25.1 "Inflation as a response to a continually increasing money supply".

Figure 25.1 Inflation as a response to a continually increasing money supply



Nothing else, it turns out, can keep prices rising, rising, ever rising like that because other variables are bounded. An increase in government expenditure G will also cause AD to shift right and AS to shift left, leaving the economy with the same output but higher prices in the long run (whatever that is). But if G stops growing, as it must, then P^* stops rising and inflation (the change in P^*) goes to zero. Ditto with tax cuts, which can't fall below zero (or even get close to it). So fiscal policy alone can't create a sustained rise in prices. (Or a sustained decrease either.)

Negative supply shocks are also one-off events, not the stuff of sustained increases in prices. An oil embargo or a wage push will cause the price level to increase (and output to fall, ouch!) and negative shocks may even follow each other in rapid succession. But once the AS curve is done shifting, that's it— P^* stays put. Moreover, if Y^* falls below Y_{nl} , in the long run (again, whatever that is), increased unemployment and other slack in the economy will cause AS to shift back to the right, restoring both output and the former price level!

So, again, Friedman was right: inflation, in the sense of continual increases in prices, is always a monetary phenomenon and only a monetary phenomenon.^[2]

Stop and Think Box

Figure 25.2 "U.S. M1 and P growth" compares inflation with M1 growth lagged two years. What does the data tell you? Now look at Figure 25.3 "Government debt-to-GDP ratio" and Figure 25.4 "U.S. unemployment rates, 1961–1972". What caused M1 to grow during the 1960s?

Figure 25.2 U.S. M1 and P growth

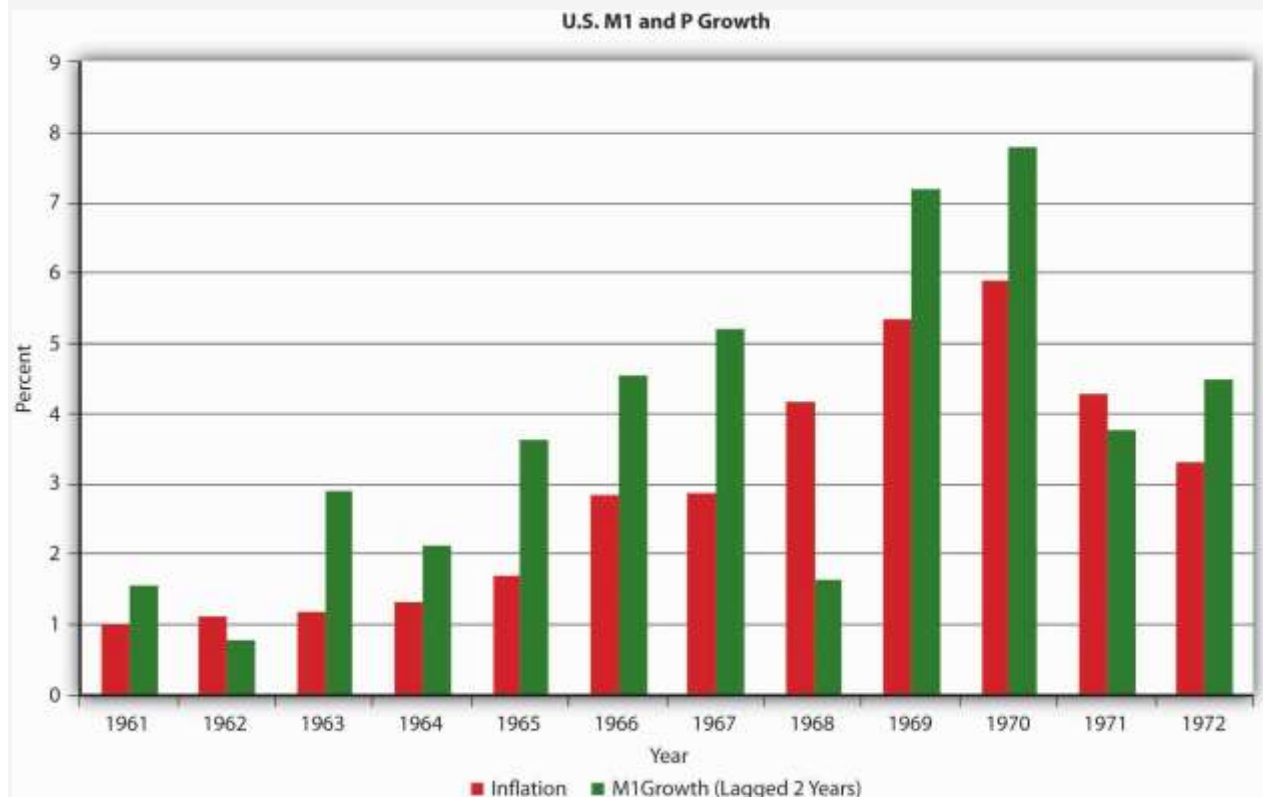


Figure 25.3 *Government debt-to-GDP ratio*

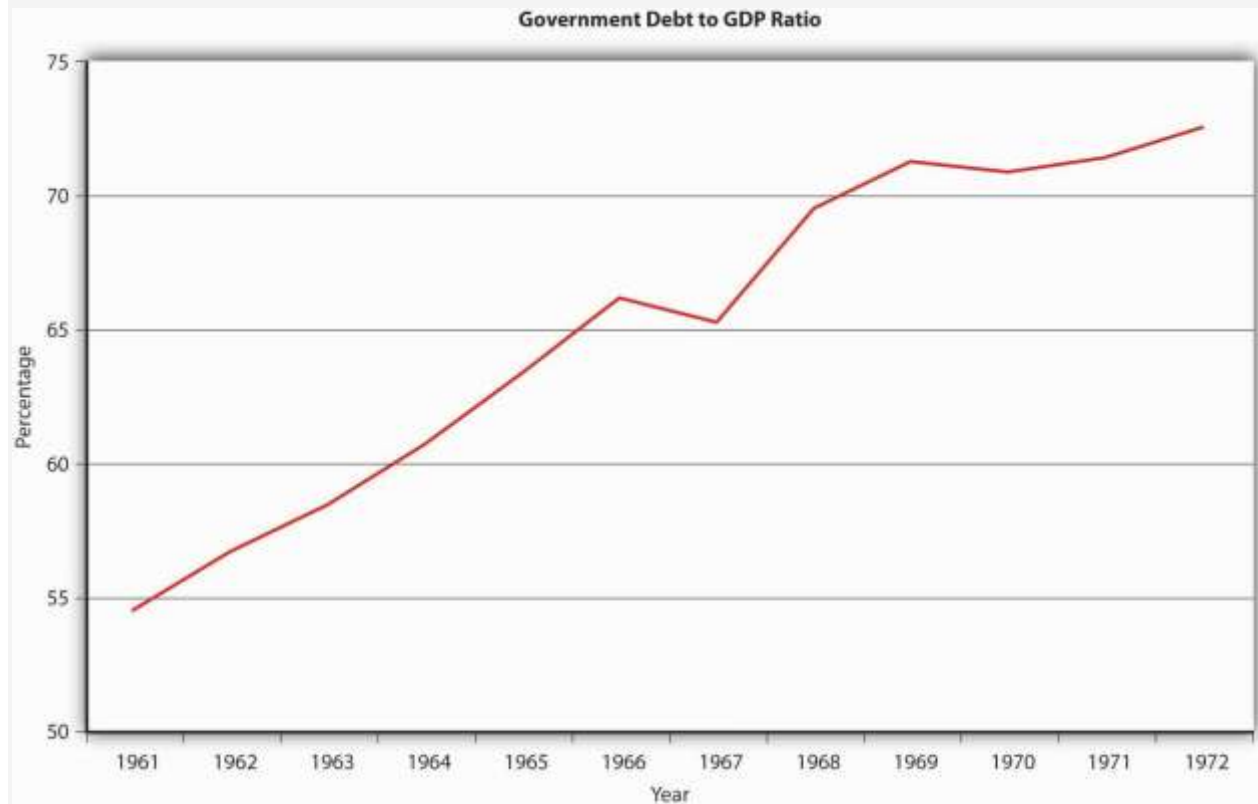


Figure 25.4 *U.S. unemployment rates, 1961–1972*



The data clearly show that M1 was growing over the period and likely causing inflation with a two-year lag. M1 grew partly because federal deficits increased faster than the economy, increasing the debt-to-GDP ratio, leading to debt monetization on the part of the Fed. Also, unemployment rates fell considerably below the natural rate of unemployment, suggesting that demand-pull inflation was taking place as well.

KEY TAKEAWAYS

- Throughout history, exogenous increases in MS have led to increases in P^* . Every hyperinflation has been preceded by rapid increases in money supply growth.
- The AS-AD model shows that money supply growth is the only thing that can lead to inflation, that is, sustained increases in the price level.
- This happens because monetary stimulus in the short term shifts the AD curve to the right, increasing prices but also rendering $Y^* > Y_{nrl}$.
- Unemployment drops, driving up wages, which shifts the AS curve to the left, Y^* back to Y_{nrl} , and P^* yet higher.
- Unlike other variables, the MS can continue to grow, initiating round after round of this dynamic.



- Other variables are bounded and produce only one-off changes in P^* .
- A negative supply shock or wage push, for instance, increases the price level once, but then price increases stop.
- Similarly, increases in government expenditures can cause P^* to rise by shifting AD to the right, but unlike increases in the MS, government expenditures can increase only so far politically and practically (to 100 percent of GDP).

[1] A Monetary History of the United States, 1867–1960.

[2] This is not to say, however, that negative demand shocks might not contribute to a general monetary inflation.



25.2 Why Have Central Bankers So Often Gotten It Wrong?

LEARNING OBJECTIVES

1. Given the analysis in this chapter, why do central bankers sometimes allow inflation to occur year after year?
2. What are lags and why are they important?

If the link between money supply growth and inflation is so clear, and if nobody (except perhaps inveterate debtors) has anything but contempt for inflation, why have central bankers allowed it to occur so frequently? Central bankers might be more privately interested than publicly interested and somehow benefit personally from inflation. (They might score points with politicians for stimulating the economy just before an election or they might take out big loans and repay them after the inflationary period in nearly worthless currency.) Assuming central bankers are publicly interested but far from prescient, what might cause them to err so often? In short, lags and high-employment policies.

A lag is an amount of time that passes between a cause and its eventual effect. Lags in monetary policy, Friedman showed, were “long and variable.” Data lag is the time it takes for policymakers to get important information, like GDP (Y) and unemployment. Recognition lag is the time it takes them to become convinced that the data is accurate and indicative of a trend and not just a random perturbation. Legislative lag is the time it takes legislators to react to economic changes. (This is short for monetary policy, but it can be a year or more for fiscal policy.) Implementation lag refers to the time between policy decision and implementation. (Again, for modern central banks using open market purchases (OMPs), this lag is minimal, but for changes in taxes, it can take a long time indeed.) The most important lag of all is the so-called effectiveness lag, the period between policy implementation and real-world results. All told, lags can add up to years and add considerable complexity to monetary policy analysis because they cloud cause-effect relationships. Lags also put policymakers perpetually behind the eight-ball, constantly playing catch-up. Lags force policymakers to forecast the future with accuracy, something (as we’ve seen) that is not easily done. As noted in earlier chapters, economists don’t even know when the short run becomes the long run!



Consider a case of so-called cost-push inflation brought about by a negative supply shock or wage push. That moves the AS curve to the left, reducing output and raising prices and, in all likelihood, causing unemployment and political angst. Policymakers unable to await the long term (the rightward shift in AS because Y^* has fallen below Y_{nr} , causing unemployment and wages to decline) may well respond with what's called accommodative monetary policy. In other words, they engage in expansionary monetary policies (EMPs), which shift the AD curve to the right, causing output to increase (with a lag) but prices to rise. *Because prices are higher and they've been recently rewarded for their wage push with accommodative monetary policy, workers may well initiate another wage push, starting a vicious cycle of wage pushes followed by increases in P^* and yet more wage pushes.* Monetarists and other nonactivists shake their heads at this dynamic, arguing that if workers' wage pushes were met by periods of higher unemployment, they would soon learn to stop. (After all, even 2-year-olds and rats eventually learn to stop pushing buttons if they are not rewarded for doing so. They learn even faster to stop pushing if they get a little shock.)

An episode of demand-pull inflation can also touch off accommodative monetary policy and a bout of inflation. If the government sets its full employment target too high, above the natural rate, it will always look like there is too much unemployment. That will eventually tempt policymakers into thinking that Y^* is $< Y_{nr}$, inducing them to implement an EMP. Output will rise, temporarily, but so too will prices. Prices will go up again when the AS curve shifts left, back to Y_{nr} , as it will do in a hurry given the low level of unemployment. The shift, however, will again increase unemployment over the government's unreasonably low target, inducing another round of EMP and price increases.

Another source of inflation is government budget deficits. To cover their expenditures, governments can tax, borrow at interest, or borrow for free by issuing money. (Which would you choose?) Taxation is politically costly. Borrowing at interest can be costly too, especially if the government is a default risk. Therefore, many governments pay their bills by printing money or by issuing bonds that their respective central banks then buy with money. Either way, the monetary base increases, leading to some multiple increases in the MS, which leads to inflation. Effectively a tax on money balances called a currency tax, inflation is easier to disguise and much easier to collect than other forms of



taxes. Governments get as addicted to the currency tax as individuals get addicted to crack or meth. This is especially true in developing countries with weak (not independent) central banks.

Stop and Think Box

Why is central bank independence important in keeping inflation at bay?

Independent central banks are better able to withstand political pressures to monetize the debt, to follow accommodative policies, or to respond to (seemingly) “high” levels of unemployment with an EMP. They can also make a more believable or credible commitment to stop inflation, which (as we’ll see in [Chapter 26 "Rational Expectations Redux: Monetary Policy Implications"](#)) is an important consideration as well.

KEY TAKEAWAYS

- Private-interest scenarios aside, publicly interested central bankers might pursue high employment too vigorously, leading to inflation via cost-push and demand-pull mechanisms.
- If workers make a successful wage push, for example, the AS curve will shift left, increasing P^* , decreasing Y^* , and increasing unemployment.
- If policymakers are anxious to get out of recession, they might respond with an expansionary monetary policy (EMP).
- That will increase Y^* but also P^* yet again. Such an accommodative policy might induce workers to try another wage push. The price level is higher after all, and they were rewarded for their last wage push.
- The longer this dynamic occurs, the higher prices will go.
- Policymakers might fall into this trap themselves if they underestimate full employment at, say, 97 percent (3 percent unemployment) when in fact it is 95 percent (5 percent unemployment).
- Therefore, unemployment of 4 percent looks too high and output appears to be $< Y_{nr}$, suggesting that an EMP is in order.
- The rightward shift of the AD curve causes prices and output to rise, but the latter rises only temporarily as the already tight labor market gets tighter, leading to higher wages and a leftward shift of the AS curve, with its concomitant increase in P^* and decrease in Y^* .
- If policymakers’ original and flawed estimate of full employment is maintained, another round of AD is sure to come, as is higher prices.



- Budget deficits can also lead to sustained inflation if the government monetizes its debt directly by printing money (and deposits) or indirectly via central bank open market purchases (OMPs) of government bonds.
- Lags are the amount of time it takes between a change in the economy to take place and policymakers to effectively do something about it.
- That includes lags for gathering data, making sure the data show a trend and are not mere noise, making a legislative decision (if applicable), implementing policy (if applicable), and waiting for the policy to affect the economy.
- Lags are important because they are long and variable, thus complicating monetary policy by making central bankers play constant catch-up and also by clouding cause-effect relationships.



25.3 Suggested Reading

Ball, R. J. *Inflation and the Theory of Money*. Piscataway, NJ: Aldine Transaction, 2007.

Bresciani-Turroni, Costantino. *Economics of Inflation*. Auburn, AL: Ludwig von Mises Institute, 2007.

Samuelson, Robert. *The Great Inflation and Its Aftermath: The Past and Future of American Affluence*. New York: Random House, 2008.



Chapter 26

Rational Expectations Redux: Monetary Policy Implications

CHAPTER OBJECTIVES

By the end of this chapter, students should be able to:

1. Describe how the new classical macroeconomic model differs from the standard, pre-Lucas AS-AD model.
2. Explain what the new classical macroeconomic model suggests regarding the efficacy of activist monetary policy.
3. Explain how the new Keynesian model differs from the new classical macroeconomic model.
4. Assess the extent to which policymakers can improve short-run macroeconomic performance.



26.1 Rational Expectations

LEARNING OBJECTIVES

1. How does the new classical macroeconomic model differ from the standard, pre-Lucas AS-AD model?
2. What does the new classical macroeconomic model suggest regarding the efficacy of activist monetary policy? Why?

It turns out that the theory of rational expectations we learned about in [Chapter 7 "Rational Expectations, Efficient Markets, and the Valuation of Corporate Equities"](#) has important implications for monetary policy. In a quest to understand why policymakers had such a poor record, especially during the 1970s, Len Mirman (University of Virginia), ^[1] Robert Lucas (University of Chicago), ^[2] Thomas Sargent (New York University), ^[3] Bennett McCallum (Carnegie-Mellon), ^[4] Edward Prescott (Arizona State), ^[5] and other *economists of the so-called expectations revolution discovered that expansionary monetary policies cannot be effective if economic agents expect them to be implemented*. Conversely, to thwart inflation as quickly and painlessly as possible, the central bank must be able to make a credible commitment to stop it. In other words, it must convince people that it can and will stop prices from rising.

Stop and Think Box

During the American Revolution, the Continental Congress announced that it would stop printing bills of credit, the major form of money in the economy since 1775–1776, when rebel governments (the Continental Congress and state governments) began financing their little revolution by printing money. The Continental Congress implemented no other policy changes, so everyone knew that its large budget deficits would continue. Prices continued upward. Why?

The Continental Congress did not make a credible commitment to end inflation because its announcement did nothing to end its large and chronic budget deficit. It also did nothing to prevent the states from issuing more bills of credit.

Lucas was among the first to highlight the importance of public expectations in macroeconomic forecasting and policymaking. What matters, he argued, was not what policymakers' models said

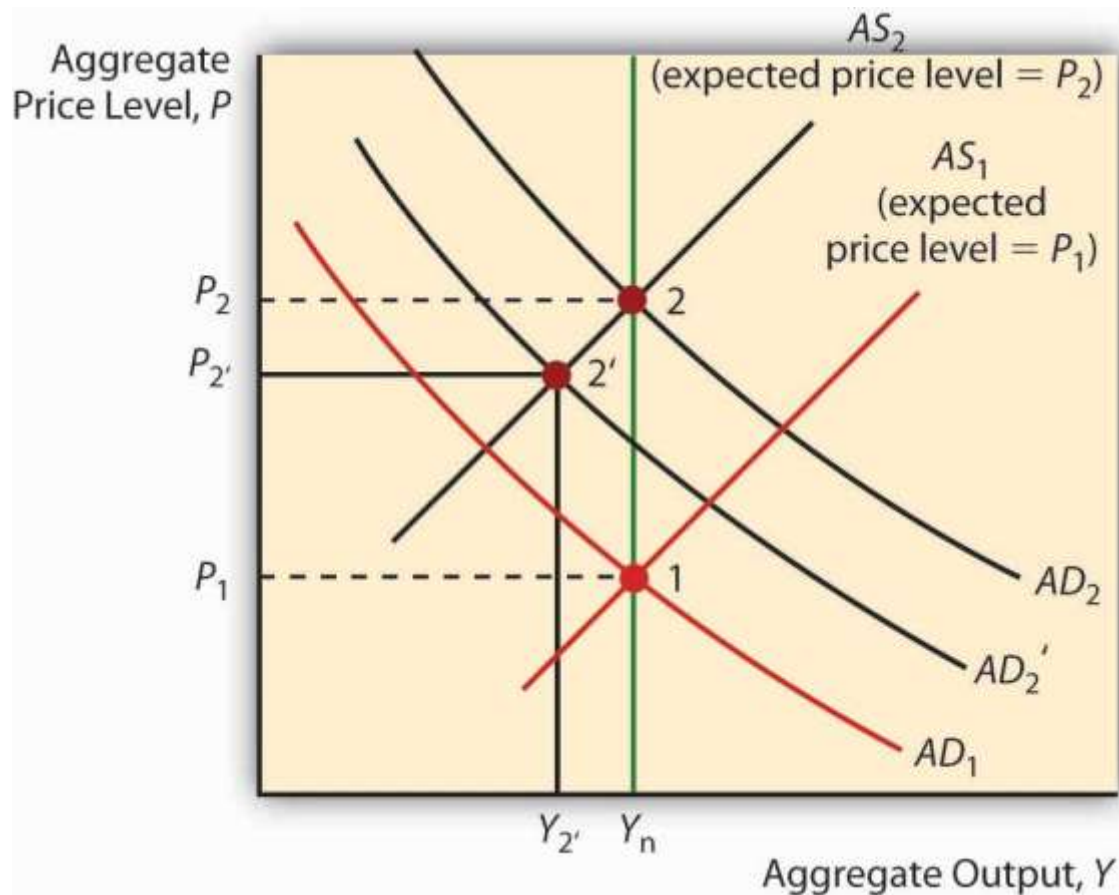


would happen but what economic agents (people, firms, governments) believed would occur. So in one instance, a rise in the fed funds rate might cause long-term interest rates to barely budge, but in another it might cause them to soar. In short, *policymakers can't be certain of the effects of their policies before implementing them.*

Because Keynesian cross diagrams and the IS-LM and AS-AD models did not explicitly take rational expectations into account, Lucas, Sargent, and others had to recast them in what is generally called the new classical macroeconomic model. *That new model uses the AS, ASL, and AD curves but reduces the short run to zero if the policy is expected.* So, for example, an anticipated EMP shifts AD right but immediately shifts AS left as workers spontaneously push for higher wages. The price level rises, but output doesn't budge. *An unanticipated EMP, by contrast, has the same effect as described in earlier chapters—a temporary (but who knows how long?) increase in output (and a rise in P followed by another when the AS curve eventually shifts left).*

Now get this: Y^ can actually decline if an EMP is not as expansionary as expected!* If economic actors expect a big shift in AD, the AS curve will shift hard left to keep Y^* at Y_{nr} , as in [Figure 26.1 "The effect of an unexpectedly weak EMP"](#). If the AD curve does not shift as far right as expected, or indeed if it stays put, prices will rise and output will fall, as in the following graph. *This helps to explain why financial markets sometimes react badly to small decreases in the Fed's fed funds target. They expected more!*

Figure 26.1 The effect of an unexpectedly weak EMP



What this means for policymakers is that they have to know not only how the economy works, which is difficult enough, they also have to know the expectations of economic agents. *Figuring out what those expectations are is quite difficult because economic agents are numerous and often have conflicting expectations, and weighting them by their importance is super-duper-tough. And that is at T_1 . At T_2 , nanoseconds from now, expectations may be very different.*

KEY TAKEAWAYS

- The new classical macroeconomic model takes the theory of rational expectations into account, essentially driving the short run to zero when economic actors successfully predict policy implementation.
- The new classical macroeconomic model draws the efficacy of EMP or expansionary fiscal policy (EFP) into serious doubt because if market participants anticipate it, the AS curve will immediately shift left (workers will demand higher wages and suppliers will demand higher prices in anticipation of inflation), keeping output at Y_n but moving prices significantly higher.

- Stabilization (limiting fluctuations in Y^*) is also difficult because policymakers cannot know with certainty what the public's expectations are at every given moment.
- The good news is that the model suggests that inflation can be ended immediately without putting the economy into recession (decreasing Y^*) if policymakers (central bankers and those in charge of the government's budget) can credibly commit to squelching it.
- That is because workers and others will stop pushing the AS curve to the left as soon as they believe that prices will stay put.

[1] <http://www.virginia.edu/economics/mirman.htm>

[2] <http://home.uchicago.edu/~sogrodow/>

[3] <http://homepages.nyu.edu/~ts43/>

[4] <http://public.tepper.cmu.edu/facultydirectory/FacultyDirectoryProfile.aspx?ID=96>

[5] <http://www.minneapolisfed.org/research/prescott/>



26.2 New Keynesians

LEARNING OBJECTIVE

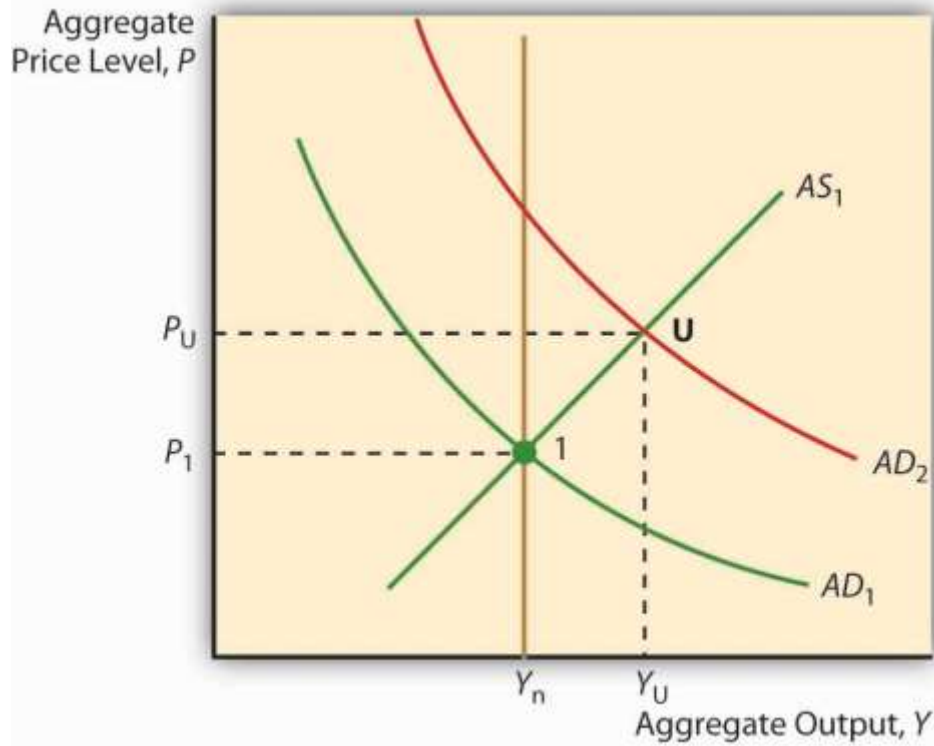
1. How does the new Keynesian model differ from the new classical macroeconomic model?

The new classical macroeconomic model aids the cause of nonactivists, economists who believe that policymakers should have as little discretion as possible, because it suggests that policymakers are more likely to make things (especially P^* and Y^*) worse rather than better. The activists could not stand idly by but neither could they ignore the implications of Lucas's critique of prerational expectations macroeconomic theories. The result was renewed research that led to the development of what is often called the new Keynesian model. That model directly refutes the notion that wages and prices respond immediately and fully to expected changes in P^* . Workers in the first year of a three-year labor contract, for example, can't push their wages higher no matter their expectations. Firms are also reluctant to lower wages even when unemployment is high because doing so may exacerbate the principal-agent problem in the form of labor strife, everything from slacking to theft, to strikes. New hires might be brought in at lower wages, but if turnover is low, that process could take years to play out. Similarly, companies often sign multiyear fixed-price contracts with their suppliers and/or distributors, effectively preventing them from acting on new expectations of P^* . *In short, wages and prices are "sticky" and hence adjustments are slow, not instantaneous as assumed by Lucas and company.*

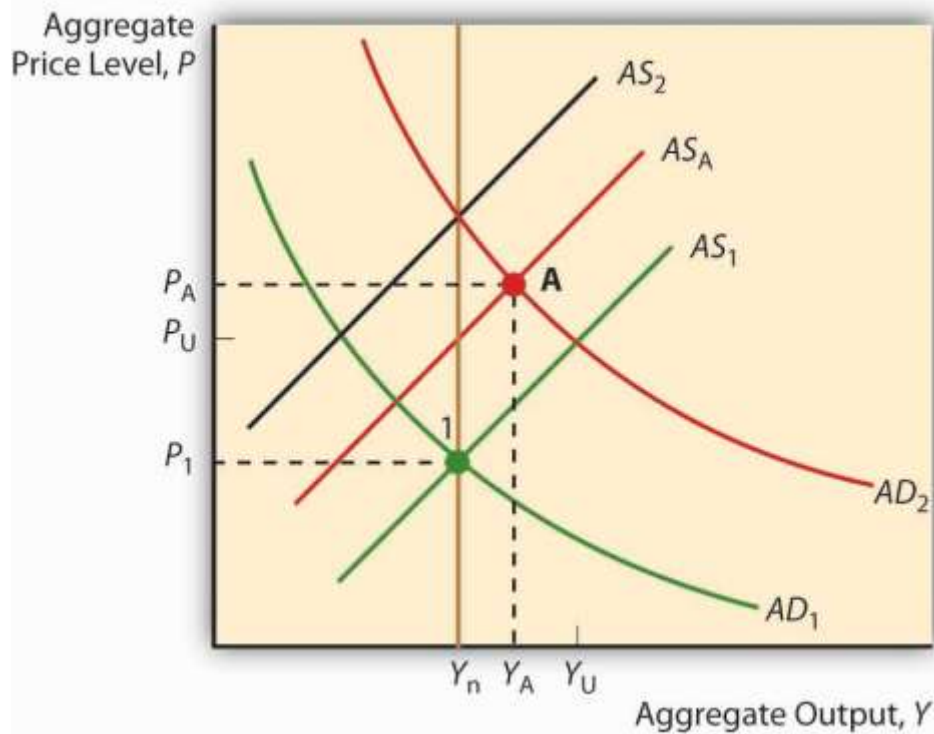
If that is the case, as Figure 26.2 "Effect of an EMP in the new Keynesian model" shows, anticipated policy can and does affect Y^ , although not as much as an unanticipated policy move of the same type, timing, and magnitude would.* The Takeaway is that an EMP, even if it is anticipated, can have positive economic effects ($Y^* > Y_{nr}$ for some period of time), but it is better if the central bank initiates unanticipated policies. And there is still a chance that policies will backfire if wages and prices are not as sticky as people believe, or if expectations and actual policy implementation differ greatly.

Figure 26.2 Effect of an EMP in the new Keynesian model





(a) Responses to an unanticipated expansionary policy



(b) Responses to an anticipated expansionary policy

Adherents of the new classical macroeconomic model believe that stabilization policy, the attempt to keep output fluctuations to a minimum, is likely to aggravate changes in Y^* as policymakers and economic agents attempt to outguess each other—policymakers by initiating unanticipated policies and economic agents by anticipating them! New Keynesians, by contrast, believe that some stabilization is possible because even anticipated policies have some short-run effects due to wage and price stickiness.

Stop and Think Box

In the early 1980s, U.S. President Ronald Reagan and U.K. Prime Minister Margaret Thatcher announced the same set of policies: tax cuts, more defense spending, and anti-inflationary monetary policy. In both countries, sharp recessions with high unemployment occurred, but the inflation beast was eventually slain. Why did that particular outcome occur?

Tax cuts plus increased defense spending meant larger budget deficits, which spells EMP and EFP, that is, large rightward shifts in AD. That, of course, ran directly counter to claims about fighting inflation, which were not credible and hence not anticipated. But the Fed and the Bank of England did get tough by raising overnight interest rates to very high levels (about 20 percent!). As a result, the happy conclusions of the new classical macroeconomic model did not hold. The AS curve shifted hard left, while the AD curve did not shift as far right as expected. The result was that prices went up somewhat while output fell. Eventually market participants figured out what was going on and adjusted their expectations, returning Y^* to Y_{nr} and stopping further big increases in P^* .

KEY TAKEAWAYS

- The new Keynesian model leaves more room for discretionary monetary policy.
- Like the new classical macroeconomic model, it is post-Lucas and hence realizes that expectations are important to policy outcomes.
- Unlike the new classical macroeconomic model, however, it posits significant wage and price stickiness (basically long-term contracts) that prevents the AS curve from shifting immediately and completely, regardless of the expectations of economic actors.
- EMP (and EFP) can therefore increase Y^* over Y_{nr} , although less than if the policy were unanticipated (although, of course, at the cost of higher P^* ; the long-term analysis of the AS-AD model still holds).



Similarly, to the extent that wages and prices are sticky, some stabilization is possible because policymakers can count on some output response to their policies.

- The new Keynesian model is more pessimistic about curbing inflation, however, because the stickiness of the AS curve prevents prices and wages from completely and instantaneously adjusting to a credible commitment.
- Output losses, however, will be smaller than an unanticipated move to squelch inflation. Some economists think it is possible to minimize the output losses further by essentially reducing the stickiness of the AS by credibly committing to slowly reducing inflation.

26.3 Inflation Busting

LEARNING OBJECTIVE

1. Can policymakers improve short-run macroeconomic performance? If so, how?

FIX FIGURE Fighting inflation requires the central bank to hold the line on AD, even in the face of a leftward shift in the AS curve that causes a recession ($Y^* < Y_{nn}$). *The question is, How much will fighting inflation “cost” the economy in terms of lost output? According to the pre-Lucas AS-AD model, about 4 percent per year for each 1 percent shaved from inflation! The new classical macroeconomic model, by contrast, is much more optimistic. If the public knows and believes that the central bank will fight inflation, output won’t fall at all because both the AD and the AS curves will stay put. Workers won’t fight for higher wages because they expect P^* will stay the same. An unanticipated anti-inflation stance, by contrast, will cause a recession. The moral of the story told by the new classical macroeconomic model appears to be that the central bank should be very transparent about fighting inflation but opaque about EMP!*

The new Keynesian model also concludes that an unanticipated anti-inflation policy is worse than an anticipated and credible one, though it suggests that some drop in Y^* should be expected due to stickiness. A possible solution to that problem is to slowly ease money supply growth rather than slamming the brakes on. If the slowing is expected and credible (in other words, if economic agents know the slowing is coming and fully expect it to continue until inflation is history), the AS curve can



be “destickyfied” to some degree. Maybe contracts indexed to inflation will expire and not be renewed, new contracts will build in no or at least lower inflation expectations, or perhaps contracts (for materials or labor) will become shorter term. If that is the case, when money supply growth finally stops, something akin to the unsticky world of the new classical macroeconomic model will hold; the AS curve won’t shift much, if at all; and inflation will cease without a major drop in output.

How can central bankers increase their credibility? One way is to make their central banks more independent. Another is not to repeatedly announce A but do B. A third is to induce the government to decrease or eliminate budget deficits.

Figure 26.3 *The three major macro models compared*

Model	Unanticipated EMP	Anticipated EMP	Activist Policy?	Unanticipated Anti-inflation	Anticipated Anti-inflation	Credibility of the Anti-inflation policy
Traditional AS - AD	Y up, P up	No difference in sign or magnitude as unanticipated policy	Effective	Y down, π down	No difference in sign or magnitude as unanticipated policy	Not important
New Classical Macroeconomic	Y up, P up	Y same, P up	Ineffective or pernicious	Y down, π down	Y unchanged, π down more than when policy is unanticipated	Important
New Keynesian	Y up, P up	Y up more than when anticipated, P up by more	Possibly effective	Y down, π down	Y and π down by less than when policy is	Important

Figure 26.3 "The three major macro models compared" summarizes the differences between the pre-Lucas AS-AD model, the new classical macroeconomic model, and the New Keynesian model.

Stop and Think Box

In Bolivia in the first half of 1985, prices rose by 20,000 percent. Within one month, inflation was almost eliminated at the loss of only 5 percent of gross domestic product (GDP). How did the Bolivians manage that? Which theory does the Bolivian case support?

A new Bolivian government came in and announced that it would end inflation. It made the announcement credible by reducing the government's deficit, the main driver of money expansion, in a very credible way, *by balancing its budget every single day!* This instance, which is not atypical of countries that end hyperinflation, supports the two rational expectation-based models over the pre-Lucas AS-AD model, which predicts 4 percent losses in GDP for every 1 percent decrease in the inflation rate. The fact that output did decline somewhat may mean that the policy was not credible at first or it may mean that the new Keynesian model has it right and the AS curve was a little bit sticky.

KEY TAKEAWAYS

- Whether policymakers can improve short-term macroeconomic performance depends on the degree of wage and price stickiness, that is, how much more realistic the new Keynesian model is than the new classical macroeconomic model.
- If the latter is correct, any attempts at EMP and EFP that are anticipated by economic actors will fail to raise Y^* and, in fact, can reduce Y^* if the stimulus is less than the public expected. The only hope is to implement unanticipated policies, but that is difficult to do because central bankers can never be absolutely sure what expectations are at the time of policy implementation.
- On the other hand, inflation can be squelched relatively easily by simply announcing the policy and taking steps to ensure its credibility.
- If the new Keynesian model is correct, Y^* can be increased over Y_{nr} (in the short term only, of course) because, regardless of expectations, wages and prices cannot rise due to multiyear contractual commitments like labor union contracts and other sources of stickiness.
- Inflation can also be successfully fought by announcing a credible policy, but due to wage and price stickiness, it will take a little time to take hold and output will dip below Y_{nr} , though by much less than the pre-Lucas AS-AD model predicts.



26.4 Suggested Reading

Gali, Jordi. *Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework*. Princeton, NJ: Princeton University Press, 2008.

Lucas, Robert, and Thomas Sargent. *Rational Expectations and Econometric Practice*. Minneapolis: University of Minnesota Press, 1981.

Scheffrin, Steven. *Rational Expectations*. New York: Cambridge University Press, 1996.

