LECTURE NOTES ON
MACROECONOMIC PRINCIPLES

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Ch 23 Measuring a Nation's Income

Introduction

Microeconomics studies how households and firms make decisions and how they interact in markets.

Macroeconomics studies the economy as a whole.

Some questions addressed by macroeconomics:

1. Why is average income high in some countries and low in others?
2. Why do prices rise rapidly in some periods and remain stable in other?
3. Why do production and employment expand in some years and contract in others?
4. What can the government do to promote rapid growth in income, stable prices (low inflation), and high employment?

This chapter focuses on **gross domestic product** or GDP as a measure of economy-wide well-being.

Outline

1. Income and Expenditure
2. Measuring GDP
3. The Components of GDP
4. Real and Nominal GDP
5. GDP and Economic Well-Being

Income and Expenditure

GDP measures two things at once:

1. The total **income** of everyone in the economy.
2. The total **expenditure** on the economy's output of goods and services.

Why? Because for the economy as a whole, income must equal expenditure. "For every buyer there must be a seller."

The **circular flow diagram** (Figure 1) illustrates this:

- In markets for factors of production (inputs):
    - Households sell or rent labor, land, and capital. **Their income equals GDP.**
    - Firms buy or hire labor, land, and capital. Their wages, rent, and profit equal GDP.
- In markets for goods and services (outputs):
    - Firms sell goods and services. Their revenue equals GDP.
    - Households buy goods and services. **Their expenditure equals GDP.**

This diagram ignores the financial sector, the government, and the foreign sector. Later we will expand our analysis to include them, but without changing this basic result that for the economy as a whole, income must equal expenditure.

Measuring GDP

GDP is the market value of all final goods and services produced within a country in a given period of time.

GDP is the market value …

GDP measures all goods in terms of their market value, in the common unit of dollars.

"You can't compare apples and oranges." If an apple costs twice as much as an orange, then it contributes twice as much to GDP.

Non-market activities like leisure, housework, and child care don't contribute to GDP.

… of all …

That last caveat notwithstanding, GDP tries to be comprehensive.

… final …

International Paper makes paper, which is used by Hallmark to make a greeting card.

In this example, paper is an **intermediate good**, since it is used as an input for producing yet another good. The greeting card is a **final good**, since it is sold to and used by and end user.

Since the value of the final good reflects the value of the intermediate good, only the value of the final good is included in GDP to avoid double-counting.

… goods and services …

Goods include cars, food, clothing, etc.

Services include haircuts, medical care, etc.

… produced …

GDP only includes newly produced goods.

Buy a new car, that contributes to GDP. Buy a used car, that does not contribute to GDP.

… within a country …

US GDP counts all goods and services produced in the US.

A Canadian works in the US; her income counts in US GDP.

A US citizen works in Canada; his income does not count in US GDP.

… in a given period of time.

Usually within a quarter (3 months) or a year.

The Components of GDP

GDP can be decomposed into four components: consumption, investment, government purchases, and net exports.

$$Y = C + I + G + NX$$

Consumption

Consumption is spending by households on:

- Durable goods (cars, appliances).
- Nondurable goods (food).
- Services (haircuts).

Investment

Investment is spending by firms on goods that will be used in the future to produce more goods and services:

- Capital equipment (machines and tools).
- Structures (factories, office buildings).
- Inventories (goods produced but not yet sold).

By convention, the purchase of a newly built house is a form of spending by households that is also included in investment.

Note that inventory accumulation is counted as investment:

- If Ford builds a $50,000 car in 2007, but the car sits in inventory through the end of the year, GDP and investment both rise by $50,000 in 2007.
- Then, if the car is sold in 2008, consumption rises by $50,000 but investment falls by $50,000, since Ford's inventory is depleted. GDP remains unchanged.
- The car adds to GDP during the year it is produced, not during the year it is sold.

Note that the term investment as it is used here has a different meaning from a household's purchase of a financial asset like a stock or a bond.

Government Purchases

Government spending includes:

- Purchases of goods and services by federal, state, and local governments.
- Salaries of government workers.

Other forms of government disbursements, like social security payments, are called **transfer payments** and are not counted in GDP.

Net Exports

Net exports equal:

- Exports: purchases of domestically (US) produced goods by foreigners.
- Minus imports: purchases of foreign goods by US households and firms.

Why are *net* exports included in GDP?

- Suppose that Boeing sells $100 million in airplanes to British Airways.
    - Conceptually, we want to include this $100 million in US GDP, since the income is earned by a US firm.
    - And, consistent with this idea, the $100 million in exports get added to US GDP.
- But suppose that you spend $100,000 on a new Porsche.
    - Conceptually, we would *not* want to include this $100,000 in US GDP, since the income is earned by a German firm.
    - And, consistent with this idea:
        - US consumption rises by $100,000, adding $100,000 to GDP.
        - But US imports rise, subtracting $100,000 from net exports and also from US GDP.
        - In the end, US GDP is left unchanged.
- One way of highlighting these ideas is to write out the national income accounting identity in slightly more detail, separating out the contributions of exports and imports:

$$Y = C + I + G + X - M$$

Table 1 shows the breakdown of GDP into its four major components for the US in 2004.

Some Examples

Now let's ask what happens to GDP and its components when …

- Karen pays Doug $10 to mow the lawn.
    - Consumption rises by $10.
    - GDP rises by $10.
- Karen marries Doug – now he mows the lawn for free!
    - Consumption falls by $10.
    - GDP falls by $10.
- Sam the baker buys a $10 bag of flour.
    - GDP does not change, since in this case the flour is an intermediate good.
- I buy a $10 bag of flour to bake cookies at home.
    - GDP rises by $10, since in this case flour is a final good.
    - Consumption rises by $10.

- You spend $25,000 on a new car, built in the US.
    - Consumption rises by $25,000.
    - GDP rises by $25,000.
- You spend $25,000 on a new car, built in Japan.
    - Consumption rises by $25,000.
    - Net exports fall by $25,000.
    - GDP is unchanged.
- You spend $10,000 on a used car.
    - GDP is unchanged.
- General Motors manufactures $100 million worth of cars and sells them in Europe.
    - Net exports rise by $100 million.
    - GDP rises by $100 million.
- General Motors builds a new factory for $100 million.
    - Investment rises by $100 million.
    - GDP rises by $100 million.
- General Motors buys $10 million worth of computer equipment made in Japan.
    - Investment rises by $10 million.
    - Net exports fall by $10 million.
    - GDP is unchanged.
- The Department of Defense buys $500 million of military equipment, manufactured in the US.
    - Government purchases rise by $500 million.
    - GDP rises by $500 million.
- The State of Massachusetts hires a new employee with a $35,000 salary.
    - Government purchases rise by $35,000.
    - GDP rises by $35,000.

Real and Nominal GDP

If GDP rises from one year to the next, then either:

1. The economy is producing more goods and services, or
2. Goods and services are selling at higher prices.

Since what people really care about is the total volume of available goods and services, and not so much the prices at which these goods and services sell, we want to correct GDP for the effects of inflation, that is, for rising prices.

Real GDP makes this correction, by valuing the goods and services produced this year at **constant prices** that prevailed during a **base year.**

Nominal GDP does not make this correction. It values the goods and services produced this year at **current prices** that prevail this year.

The numerical example from Table 2 illustrates the distinction between real and nominal GDP.

The GDP deflator is then calculated as

$$GDP\ Deflator = \frac{Nominal\ GDP}{Real\ GDP} \times 100$$

Now let's ask what happens when …

- The quantities of all goods and services produced rise, but prices stay the same.
  - Real GDP rises.
  - Nominal GDP rises by the same amount.
  - The GDP deflator stays unchanged.
- The prices of all goods and services rise, but quantities produced stay the same.
  - Real GDP says unchanged.
  - Nominal GDP rises.
  - The GDP deflator rises.

The percentage increase in the GDP deflator from one period to the next defines the **rate of inflation**.

Figure 2 shows the evolution of real GDP in the US since 1965:

- Real GDP grows over time: real GDP in 2004 was about 4 times its 1965 level.
- Growth is uneven. Periods in which GDP declines for more than two quarters in a row are called **recessions**.

GDP and Economic Well-Being

GDP measures the level of income and expenditure in the economy.

Since most people would prefer more income and expenditure to less, GDP per person can serve as a measure of economic well-being.

But let's remember that GDP is a measure based on **market value** and therefore does not include:

- Leisure.
- Childcare from a parent.
- Volunteer work.
- Environmental quality.
- Equity in the distribution of income and expenditure.

However, Table 3 reveals that despite these omissions, real GDP per person is highly correlated with other measures of well-being, including life expectancy and adult literacy rates.

Ch 24 Measuring the Cost of Living

Introduction

In 1931, the New York Yankees paid Babe Ruth an annual salary of $80,000.

In 2005, the New York Yankees paid Alex Rodriguez an annual salary of $26 million (and that will amount will go up to $27 million in 2008).

But then again, in 1931 an ice cream cone cost a nickel and a movie ticket cost a quarter. More generally, the cost of living has risen greatly since then.

This chapter focuses on the **consumer price index** or the CPI as a measure of the cost of living.

The **inflation rate** is the percentage rate of change in the CPI.

Once we understand how the CPI is constructed and how it has behaved in the US, we can return to the question: who was really paid more, after adjusting for inflation, Ruth or Rodriguez?

Outline

1. The Consumer Price Index
   A. How the CPI is Measured
   B. Problems in Measuring the Cost of Living
   C. The GDP Deflator and the CPI
2. Correcting Economic Variables for the Effects of Inflation
   A. Dollar Figures at Different Points in Time
   B. Indexation
   C. Real and Nominal Interest Rates

The Consumer Price Index

The CPI is computed by the Bureau of Labor Statistics (BLS), a division of the Department of Labor, to measure the overall cost of goods and services bought by a typical consumer.

How the CPI is Measured

Table 1 highlights the 5 steps involved in measuring the CPI:

1. Survey consumers to determine the relevant “basket of goods.”
2. Record the price of each good in each year.
3. Compute the cost of the basket in each year.
4. Choose a base year and compute the **CPI** for the current year:

$$CPI = \frac{Cost\ of\ the\ Basket\ in\ the\ Current\ Year}{Cost\ of\ the\ Basket\ in\ the\ Base\ Year} \times 100$$

5. Compute the **inflation rate** as the percentage change in the CPI from one year to the next:

$$Inflation\ Rate = \frac{CPI\ in\ Current\ Year - CPI\ in\ Previous\ Year}{CPI\ in\ Previous\ Year} \times 100$$

The example in Table 1 assumes, for simplicity, that the basket includes only two goods. Figure 1 illustrates in more detail what is really in the CPI basket.

In addition to the CPI, the BLS also computes the **producer price index** or the PPI, to measure the cost of goods and services bought by the typical firm.

Problems in Measuring the Cost of Living

Three problems prevent the CPI from being a perfect measure of the cost of living:

1. Substitution bias.
2. The introduction of new goods.
3. Unmeasured quality change.

Substitution bias arises because in any give year the prices of some goods rise faster than others:

- The basket holds the quantity of each good purchased fixed.
- But, in fact, consumers tend to substitute less expensive goods for more expensive goods.

Does substitution bias cause the CPI to overstate or understand the true change in the cost of living?

To answer this question, return to the example from Table 1:

- There, the price of hot dogs rises at a faster rate than the price of hamburgers.
- The CPI holds the number of hot dogs and the number of hamburgers fixed.
- But, in reality, consumers are likely to buy more hamburgers and fewer hot dogs.
- Hence the true, changing basket of goods is less expensive than the fixed basket used in computing the CPI.
- The CPI therefore *overstates* the true change in the cost of living.

When **new goods are introduced**, the true cost of achieving a given level of consumer satisfaction falls. For example, which would you rather have?

- A $100 gift certificate for a small store, with a limited range of choices.
- Or a $90 gift certificate for a large store, with a wide variety of goods.
- The CPI does not account for these effects, so it again *overtstates* the true change in the cost of living.

Unmeasured quality change: many types of goods improve in quality over time.

- A new cellphone purchased today is a lot better than a cellphone purchased two or three years ago, even if it sells at a higher price.
- The BLS tries to correct for this quality change.
- But to the extent that it underestimates the extent of quality change, it again *overstates* the true change in the cost of living.

Many economists believe that the because of the combined effects of these three problems, the inflation rate based on the CPI overstates the true increase in the cost of living by about 0.5 percentage points per year. These effects are important, since for example, Social Security benefits get adjusted upwards automatically in a way that is tied to the CPI inflation rate.

The GDP Deflator and the CPI

Usually, the GDP deflator and the CPI move together, as shown in Figure 2.

One difference, however, arises because:

- The GDP deflator reflects the prices of all goods *produced* domestically.
- Whereas the CPI reflects the prices of all goods *consumed* domestically.

So let's ask: what happens when the price of an imported good rises?

- The CPI increases.
- But the GDP deflator does not.
- This effect is particularly important when the price of imported oil rises.

What happens when the price of a domestically-produced *capital* (investment) good rises?

- The GDP deflator increases.
- But the CPI does not.

A second and more subtle difference arises because:

- The GDP deflator is based on the prices of goods as currently produced.
- Whereas the CPI is based on the prices of a fixed basket of goods.
- So differences arise when the prices of different goods are rising or falling at different rates.

Correcting Economic Variables for the Effects of Inflation

Dollar Figures at Different Points in Time

Let's go back to the question from the beginning: after correcting for inflation, who was paid more, Ruth ($80,000) in 1931 or Rodriguez ($26 million) in 2005?

To answer this question, ask first: how many "baskets" of goods could Ruth buy in 1931?

$$Number\ of\ Baskets\ Bought\ by\ Ruth\ in\ 1931 = \frac{\$80{,}000\ in\ 1931}{Cost\ of\ Each\ Basket\ in\ 1931}$$

Now ask, how much would this same number of baskets have cost in 2005?

$$\begin{aligned} &2005\ Cost\ of\ the\ Baskets\ Bought\ by\ Ruth\ in\ 1931 \\ &\quad = Cost\ of\ Each\ Basket\ in\ 2005\ \times Number\ of\ Baskets\ Bought\ by\ Ruth\ in\ 1931 \\ &\quad = Cost\ of\ Each\ Basket\ in\ 2005 \times \frac{\$80{,}000\ in\ 1931}{Cost\ of\ Each\ Basket\ in\ 1931} \end{aligned}$$

This last formula can be rewritten as:

$$\begin{aligned} &2005\ Cost\ of\ the\ Baskets\ Bought\ by\ Ruth\ in\ 1931 \\ &\quad = \frac{Cost\ of\ Each\ Basket\ in\ 2005}{Cost\ of\ Each\ Basket\ in\ a\ Base\ Year} \times \frac{Cost\ of\ Each\ Basket\ in\ a\ Base\ Year}{Cost\ of\ Each\ Basket\ in\ 1931} \\ &\quad \times \$80{,}000\ in\ 1931 \end{aligned}$$

But now it simplifies to:

$$2005\ Cost\ of\ the\ Baskets\ Bought\ by\ Ruth\ in\ 1931 = \frac{CPI\ in\ 2005}{CPI\ in\ 1931} \times \$80{,}000\ in\ 1931$$

This equation is true more generally:

$$Value\ in\ This\ Year's\ Dollars = Value\ in\ a\ Past\ Year's\ Dollars \times \frac{CPI\ This\ Year}{CPI\ in\ the\ Past\ Year}$$

It turns out that

$$CPI\ (Price\ Level) in\ 1931 = 15.2$$

$$CPI\ (Price\ Level) in\ 2005 = 195$$

And so, doing the math:

$$Value\ of\ Ruth's\ Salary\ in\ 2005\ Dollars = \$80{,}000\ in\ 1931\ dollars \times \frac{195}{15.2} = \$1{,}026{,}315.79$$

Even after adjusting for inflation, Rodriguez's salary is much, much higher!

But, interestingly, President Herbert Hoover's 1931 salary was $75,000. Let's convert that into 2005 dollars in the same way:

$$Value\ of\ Hoover's\ Salary\ in\ 2005\ Dollars = \$75{,}000\ in\ 1931\ dollars\ \times \frac{195}{15.2} = \$962{,}171.05$$

After adjusting for inflation, Hoover's salary is more than twice as large as the $400,000 earned in 2005 by President George W. Bush.

Table 2 does these calculations for box office receipts for movies released in different years.

Indexation

Indexation refers to the automatic correction by law or contract of a dollar amount for the effects of inflation.

As noted above, Social Security benefits are indexed, that is, adjusted every year based on the percentage increase in the CPI.

Union contracts often specify indexed wages that increase each year based on the inflation rate. Such a provision is often referred to as a *cost-of-living allowance* (COLA).

Real and Nominal Interest Rates

Since bank accounts, bonds, automobile loans, and mortgages all make or require dollar payments at different points in time, the interest rates on these investments or loans must also be corrected for the effects of inflation to gauge their true economic significance.

Suppose, for example, that you deposit $1,000 in a bank account that pays interest at a 10% annual rate:

- One year from now, you will have $1,100: your original $1,000 plus $100 interest.
- But let's say that the inflation rate over the next year is 3%.
- You have 10% more dollars, but those dollars buy 3% less.
- Your "real" return is actually 10% - 3% =7%.

In this example, the **nominal interest rate**, that is, the interest rate as it is usually reported without correcting for inflation, is 10%.

But the **real interest rate**, corrected for the effects of inflation, is 7%.

In general:

$$Real\ Interest\ Rate = Nominal\ Interest\ Rate - Inflation\ Rate.$$

Note that the real interest rate can even be negative: if the nominal interest rate on your bank account is 10%, but the inflation rate turns about to be 12%, the real interest rate is 10%-12%=-2%.

Most frequently, prices rise over time, so that the inflation rate is positive. But sometimes, as in the US economy during the Great Depression of the 1930s and in Japan during the last decade, prices actually fall over time, so that the inflation rate is negative. These are periods of *deflation* as opposed to inflation.

Which is bigger: the nominal interest rate or the real interest rate?

- Under inflation, the nominal interest rate is bigger than the real interest rate since the value of dollars is falling over time.
- Under deflation, the real interest rate is bigger than the nominal interest rate since the value of dollars is rising over time.

Figure 3 shows the relationship between nominal and real interest rates in the US:

- During the 1970s, nominal interest rates were high but real interest rates were low. Why? Because inflation was high.
- During the 1980s and 1990s, nominal interest rates were low but real interest rates were high. Why? Because inflation was low.

This is an important lesson for personal finance and investing: when evaluating the payoff on an investment or the interest rate on a loan, you need to make a judgment on what the inflation rate will be over the lifetime of the investment or loan, to convert the nominal interest rate into a real interest rate.

Ch 25 Production and Growth

Introduction

Real GDP per person in the United States, Japan, or Germany is about ten times larger than real GDP in India, Indonesia, or Nigeria. Why?

In the US over the past century, real GDP per person has grown at an average annual rate of 2 percent. This number may seem small, but it implies that the average real income doubles every 35 years, and that average income in the US today, at the beginning of the 21st century, is more than seven times as large as it was a century ago, at the beginning of the 20th century. Why?

In some East Asian countries, such as Singapore, South Korean, and Taiwan, real GDP per person has grown at an average rate of 7 percent in recent decades. This implies that average real income doubles every ten years. Why?

It is no exaggeration to say that these issues, explored in this chapter, are some of the most important in all of economics.

Outline

1. Economic Growth Around the World
2. Productivity: Its Role and Determinants
   A. Why Productivity is So Important
   B. How Productivity is Determined
      i. Physical Capital
      ii. Human Capital
      iii. Natural Resources
      iv. Technological Knowledge
   C. The Aggregate Production Function
3. Economic Growth and Public Policy

Economic Growth Around the World

Table 1 shows data on real GDP per person in 13 countries around the world:

1. Real GDP per person varies widely from country to country:
   a. Income per person in the US is now about 7 times that in China and 13 times that in India.
   b. Average income in India today is less than average income in England in 1870.
2. In the US, real GDP per person has grown at an average annual rate of 1.82% since 1870.
3. Japan's real GDP per person has growth at an average annual rate of 2.79% since 1890:

a. In 1890, average income in Japan was similar to average income in Mexico and Argentina.
b. Today, average income in Japan is similar to average income in Germany and the United Kingdom.

Productivity: Its Role and Determinants

Why Productivity is So Important

Economists studying production and growth often like to start by thinking about Robinson Crusoe, a sailor stranded on a desert island.

Everything Crusoe consumes, he must produce himself.

What determines Crusoe's standard of living? His **productivity**, the quantity of goods and services produced by each unit of labor input. Or, put even more simply: productivity measures output per worker.

This seems obvious – it holds true almost by definition – when thinking about Crusoe, but it also holds true when thinking about GDP – income or expenditure – per person in a real-world economy.

How Productivity is Determined

What determines how many fish Crusoe eats?

His productivity: how many fish he catches.

But what determines his productivity?

1. How many fishing poles does he have?
2. How much training in fishing does he have?
3. How plentiful is the supply of fish near his island?
4. How effective is he in inventing new techniques for catching more fish?

Again, these basic principles extend to real-world economies.

Physical Capital per Worker

Crusoe catches more fish if he has more fishing poles.

Workers are more productive when they have more tools.

Physical capital (or capital) is the stock of equipment and structures that are used to produce goods and services.

A larger stock of physical capital per worker makes an economy more productive.

Recall that capital and labor are inputs or **factors of production**.

But capital is a *produced* factor of production: an output of past production that has now become an input to new production.

Human Capital per Worker

Crusoe catches more fish if he has had better training.

Human capital is the stock of knowledge and skills that workers acquire through education, training, and experience.

A larger stock of human capital per worker makes an economy more productive.

Although human capital is less tangible than physical capital, we can still think of human capital is being itself "produced" in schools, training programs, etc.

Natural Resources per Worker

Crusoe catches more fish if fish are more plentiful in the nearby waters.

Natural resources are the inputs to production that are provided by nature: land, water, mineral deposits, etc.

Natural resources can be:

1. Renewable: forests.
2. Nonrenewable: oil.

A larger stock of natural resources per worker also tends to make an economy more productive.

Although some countries, such as Japan, can be quite productive without having access to a lot of natural resources.

Technological Knowledge

Crusoe catches more fish if he is good at inventing new fishing techniques.

Technological knowledge refers to society's understanding of the best ways to produce goods and services.

Technological knowledge can be:

1. Common knowledge: Henry Ford introduced assembly lines in auto manufacturing, but other companies in other industries followed suit.
2. Proprietary: a pharmaceutical company develops a new drug and patents it, and then has exclusive rights to produce that drug for a period of time.

A larger stock of technological knowledge makes an economy more productive.

Technological knowledge and human capital are closely related, but ultimately distinct:

- Technological knowledge refers to society's understanding of how the world works.

- Human capital refers to each individual worker's ability to use that technological knowledge.
- "Technological knowledge is reflected in textbooks, human capital is reflected in the amount of time each worker has spent reading those textbooks."

Summary

What determines Crusoe's standard of living?	**What determines the US standard of living?**
His productivity (output per worker).	Our productivity (output per worker).
What determines Crusoe's productivity?	**What determines US productivity?**
Number of fishing poles. Amount of training in fishing. Supply of fish. Invention of new fishing techniques.	Amount of physical capital per worker. Amount of human capital per worker. Amount of natural resources per worker. Amount of technological knowledge.

The Aggregate Production Function

These determinants of productivity are often depicted mathematically using an **aggregate production function**.

Let

$$Y = quantity\ of\ output$$

$$L = quantity\ of\ labor\ (number\ of\ workers)$$

$$K = stock\ of\ physical\ capital$$

$$H = stock\ of\ human\ capital$$

$$N = stock\ of\ natural\ resources$$

$$A = stock\ of\ technical\ knowledge$$

Economists often assume that output is related to inputs via an aggregate production function of the form

$$Y = AF(L, K, H, N)$$

This equation assumes that holding other inputs constant, an increase in the stock of technological knowledge leads to a direct increase in output.

Economists also often assume that holding the stock of technological knowledge fixed, the production function exhibits **constant returns to scale**; doubling *L, K, H,* and *N* all at once leads to a doubling of output, so that

$$2Y = AF(2L, 2K, 2H, 2N)$$

Similarly, tripling *L, K, H,* and *N* all at once leads to a tripling of output, so that

$$3Y = AF(3L, 2K, 2H, 2N)$$

Or, for any number *x*:

$$xY = AF(xL, xK, xH, xN)$$

Now set x = *1/L* in this last equation to write

$$\frac{Y}{L} = AF(1, \frac{K}{L}, \frac{H}{L}, \frac{N}{L})$$

This last equation just restates in mathematical terms when we learned in words from Crusoe: that productivity (output per worker) *Y/L* is determined by:

1. Physical capital per worker *K/L.*
2. Human capital per worker *H/L.*
3. Natural resources per worker *N/L.*
4. Technological knowledge *A*.

This production function also highlights that a decrease in natural resources per worker, due to the depletion of nonrenewable resources, will tend to decrease productivity.

This last observation raises the question: can productivity-driven economic growth continue indefinitely, given that natural resources are ultimately limited?

Maybe, but evidence from history suggests not:

- Growth in the stock of technological knowledge makes production processes and goods themselves more resource-efficient.
- Prices of natural resources tend to be volatile, but also have tended to fall over long period of time.
- If we use the price of a good to measure its economic scarcity, the falling historical trend in natural resource prices suggest that while supplies may be falling, demands are declining even more rapidly.

Economic Growth and Public Policy

What can government policies do to increase productivity and thereby raise standards of living?

By adopting policies that lead to larger stocks of

1. Physical capital per person.
2. Human capital per person.
3. Technological knowledge.

Saving and Investment

Since physical capital is a produced factor of production, a larger stock can be accumulated over time.

But this requires that people save and invest more and consume less today.

Chapter 26 takes a more detailed look at how financial markets coordinate saving and investment.

Diminishing Returns and the Catch-Up Effect

Diminishing returns refers to property whereby the benefit from an extra unit of input declines as the quantity of the input increases.

Economists usually assume that capital accumulation is subject to diminishing returns, as illustrated in Figure 1.

The diminishing returns assumption implies that higher savings leads in the long run to higher *levels* of productivity and incomes but not to higher *growth rates* in these variables.

It also implies that poorer countries have more to gain, relatively speaking, from capital accumulation than richer countries. There can be a **catch-up effect**, according to which countries that start off poor tend to grow more rapidly than countries that start off rich.

This catch-up effect seems to have been particularly important in fast-growing East Asian economies.

Investment from Abroad

A country's capital stock can also be augmented by investment from abroad:

1. **Foreign direct investment** occurs when foreigners make capital investments that they own and operate in the domestic economy.
2. **Foreign portfolio investment** occurs when foreigners lend money to domestic corporations that use the funds to acquire more physical capital.

When foreigners invest in a country, they expect to earn a return. But the capital they supply makes domestic workers more productive, increasing the workers' incomes as well.

The **World Bank** raises funds in advanced countries and uses those funds to make loans in developing countries.

Education

Like physical capital, human capital accumulation raises productivity.

But also like physical capital, human capital accumulation has a cost: when students are at school, they forego the wages that they could earn by working instead.

Many economists believe that human capital is even more important than physical capital because of positive *externalities*. Recall that an externality is the impact that one person's actions have on the well-

being of bystanders. If an educated worker comes up with new and better ways of producing goods and services, he or she adds to the stock of technological knowledge that is available to everyone.

Perhaps for this reason, governments are heavily involved in education.

Health and Nutrition

Although human capital is most often associated with education, it applies on an even more basic level to the health of workers.

Economist Robert Fogel argues that improved nutrition and heath accounts for about 30 percent of the growth in GDP per person in Britain between 1790 and 1980. During that time, the average caloric intake in Great Britain rose by 26 percent and the height of the average man rose by 3.6 inches.

Property Rights and Political Stability

A key aspect of both physical and human capital accumulation is an *intertemporal trade-off*:

- Physical capital: consume less and save more today to have more physical capital in the future.
- Human capital: attend school and forgo wages today to have more human capital in the future.

If people are to willingly accept these intertemporal trade-offs, they need to be assured that they will be able to enjoy the future benefits of today's sacrifices.

This requires a stable political and judicial system that respects **property rights**, that is, the ability of people to exercise authority over the resources that they own.

Free Trade

Free trade can help raise productivity by:

1. Allowing a country to specialize in goods that it can produce most efficiently.
2. Allowing a country to import foreign capital.

Research and Development

Research and development leads to increases in the stock of technological knowledge, hence to higher productivity.

Like human capital accumulation, research and development activities yield positive externalities when one person's discoveries can be used by other people in other activities.

For this reason, the National Science Foundation and the National Institute of Health provide research grants to scientists.

The federal government is also a big sponsor of higher education.

Population Growth

Our equation for productivity

$$\frac{Y}{L} = AF(1, \frac{K}{L}, \frac{H}{L}, \frac{N}{L})$$

derived above from the aggregate production function, suggests that population growth (an increase in the number of workers *L*), can decrease productivity by:

1. "Diluting" the stocks of physical and human capital.
2. Stretching natural resources too thin.

On the other hand, increases in population may make technological progress more rapid, since there are more people around to discover and invent.

Which of these effects "wins out" in the end?

Again, it's hard to say for sure, but evidence thus far has not supported the "Malthusian" (named after British economist Thomas Robert Malthus, 1766-1834) view that population growth will ultimately lead to widespread poverty.

Summary

Our equation

$$\frac{Y}{L} = AF(1, \frac{K}{L}, \frac{H}{L}, \frac{N}{L})$$

suggests that productivity improvements can come through policies that work through several channels.

K/L	**H/L**	**A**
Saving and investment	Education	Research and development
Catch-up effect	Health and nutrition	
Investment from abroad		
Free trade		
Property rights and political stability		

Ch 26 Saving, Investment, and the Financial System

Introduction

When a country saves a large fraction of its income, more resources are available for investment in capital, and higher capital raises the economy's productivity, raising living standards still further.

But within that country, at any given point in time, some people will want to save some of their income for the future, while others will want to borrow to finance investments in physical capital.

How are savers and investors coordinated?

The **financial system** consists of those institutions in the economy that help to match one period's savings with another person's investment.

This chapter:

1. Describes the variety of institutions that make up the financial system in the US today.
2. Describes the relationship between the financial system and these key macroeconomic variables: saving and investment.
3. Develops a model that describes how the interest rate adjusts so as to equate the demand for and supply of funds in the financial system and uses this model to show how various government policies affect the interest rate, saving, and investment.

Outline

1. Financial Institutions in the US Economy
   A. Financial Markets
      i. Bond Market
      ii. Stock Market
   B. Financial Intermediaries
      i. Banks
      ii. Mutual Funds
2. Saving and Investment in the National Income Accounts
3. The Market For Loanable Funds
   A. Supply and Demand for Loanable Funds
   B. Public Policies and the Market for Loanable Funds

Financial Institutions in the US Economy

Savers spend less than they earn.

Borrowers spend more than they earn.

The financial system moves funds from savers to borrowers.

Savers supply funds with the expectation that they will get those funds back with interest at a later date.

Borrowers demand funds with the expectation that they will have to repay those funds with interest at a later date.

Financial institutions include:

1. Financial markets.
2. Financial intermediaries.

Financial Markets

Financial markets are institutions through which savers supply funds *directly* to borrowers. Hence, borrowing and lending activity in financial markets is often referred to as **direct finance**.

The two most important financial markets in the US economy are:

1. The bond market.
2. The stock market.

The Bond Market

A **bond** is a certificate of indebtedness that specifies the obligations of the borrower to the holder of the bond.

A bond typically specifies:

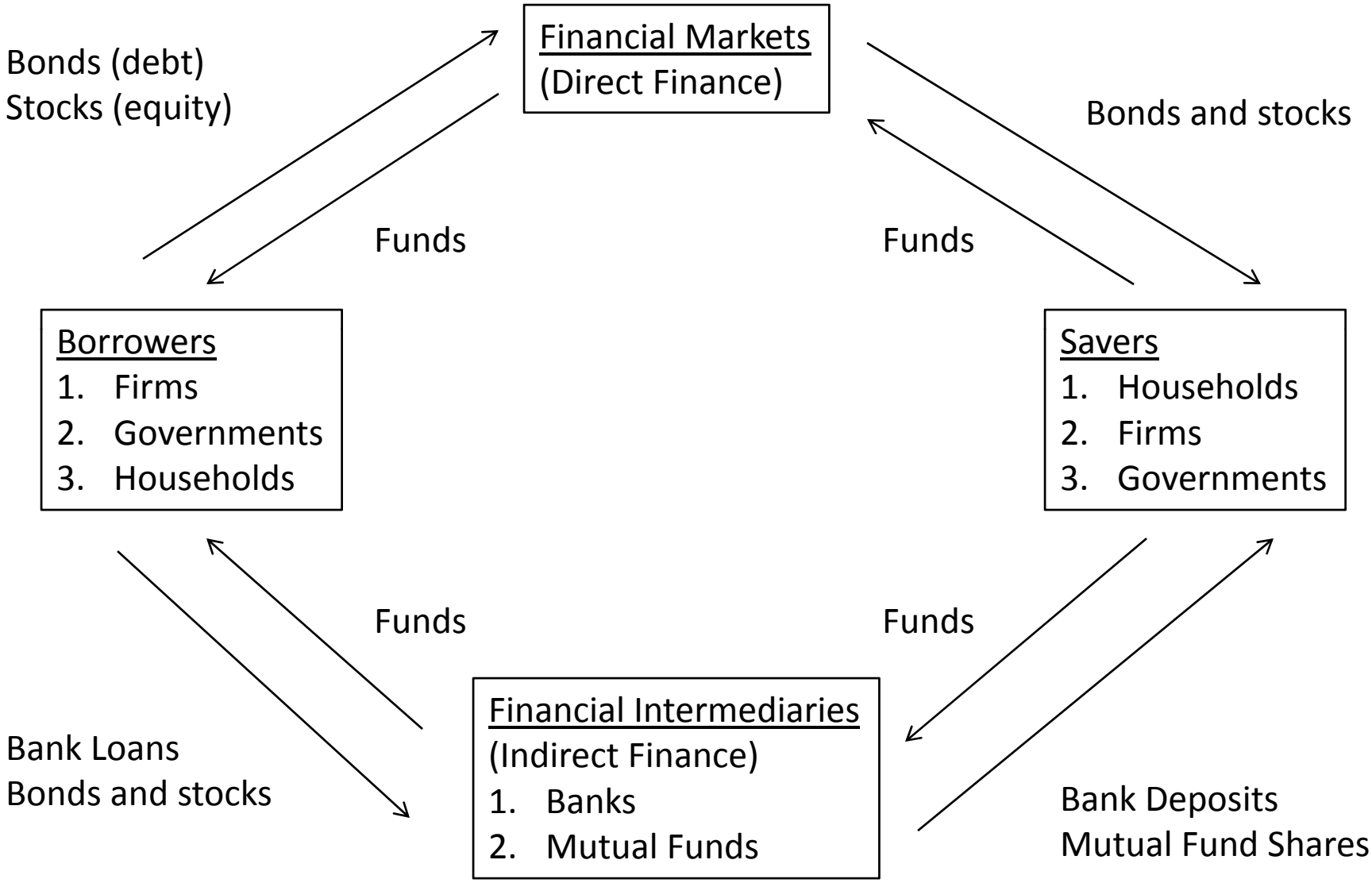
1. The **date of maturity**, when the **principal** or amount borrowed is to be repaid.
2. The rate of interest that will be paid periodically until the date of maturity.

Example: General Motors issues a $1000 bond with a maturity date of December 2028 and a 5% rate of interest. This bond will make annual interest payments of $50 each year until the end 2028, when the final interest payment is made and the $1000 returned.

Three characteristics of bonds:

1. The bond's **term** is the length of time until the bond matures. Some bonds have short terms of only a few months, other bonds have long terms of up to 30 years. Typically, longer term bond pay higher interest rates than shorter terms bonds, to compensate bond holders for having to wait longer to get their principal back.
2. The bond's **credit risk** refers to the probability that the borrower will be unable to make interest payments and/or repay principal. When this happens, the borrower is said to **default** by entering **bankruptcy**. Typically, low risk bonds like those issued by the US Government pay lower interest rates than higher risk bonds issued by corporations: borrowers receive a higher

Financial Institutions in the US Economy



interest rate to compensate them for taking on more risk. **Junk bonds**, issued by financially shaky corporations, pay the highest rates of interest.

3. Bonds also differ in the **tax treatment** of their interest payments. **Municipal bonds**, issued by state and local governments, pay interest that is exempt from the federal income tax. Because of this tax advantage, municipal bonds pay lower interest rates than bonds issued by private corporations or even the US Government.

The Stock Market

A **stock** is a certificate that represents a claim to partial ownership in a firm and hence a share of the profits that the firm makes. The firm pays out some of its profits as **dividends** to its stockholders.

Example: if a corporation issues 1,000,000 shares of stock, then each share represents a claim to 1/1,000,000 of the business.

From the borrower's point of view, the sale of stock to raise money is called **equity finance**, while the sale of bonds to raise money is called **debt finance**.

From the saver's point of view:

- The advantage to buying a bond is that it pays a fixed rate of interest and returns the principal for sure, except in the rare care of bankruptcy.
- The disadvantage to buying a bond is that its payments are fixed, even if the firm earns higher and higher profits.
- The advantage to buying a stock is that its dividends, and therefore its price, will rise when the firm earns higher profits.
- The disadvantage to buying a stock is that its dividends, and therefore its price, will fall when the firm earns lower profits.

Although the US bond market is actually much larger than the US stock market, stock prices get more attention. This is not surprising, in light of the consideration of bonds versus stocks from above, since stock prices are more closely linked to firm profitability and hence to the health of the US economy.

Stock indexes, or averages of stock prices, like the Dow Jones Industrial Average (an average of stock prices for 30 major US corporations) and the Standard & Poor's 500 (an average of stock prices for 500 large US corporations) are closely followed by economists and financial market participants.

Financial Intermediaries

Financial intermediaries are institutions through which savers supply funds *indirectly* to borrowers. Hence, borrowing and lending activity through financial intermediaries is often referred to as **indirect finance**.

Two of the most important financial intermediaries in the US economy are:

1. Banks.
2. Mutual funds.

Banks

Banks:

1. Accept **deposits** from savers.
2. Make **loans** to borrowers.

Banks cover their costs and make profits by charging a higher interest rate on their loans than they pay on their deposits.

Banks are also special, in that they allow savers to write checks on some types of deposits. That is, bank deposits serve as a *medium of exchange* as well as a *store of value*.

Mutual Funds

Mutual funds:

1. Sell shares to savers.
2. Use the proceeds to buy a collection or *portfolio* of stocks and/or bonds.

Why don't savers just buy the stocks and bonds themselves?

Mutual funds help with **diversification:** by investing in many stocks and bonds, a sharp decline in the price of any one stock or a default on any one bond becomes less important.

Mutual funds also allow savers to delegate stock and bond selection to a professional money manager.

Saving and Investment in the National Income Accounts

Recall that GDP can be broken down into four components: consumption, investment, government purchases, and net exports:

$$Y = C + I + G + NX$$

This equation is an *identity*: it always holds true, given how the variables are defined.

A *closed economy* is one that does not trade with the rest of the world. An *open economy* is one that does trade with the rest of the world.

For now, let's simplify the analysis by considering a closed economy in which, by assumption, *NX* = 0 and so

$$Y = C + I + G$$

Again, this equation is an identity: it just says that each unit of output is either consumed, invested, or purchased by the government.

Rearrange the equation as

$$Y - C - G = I$$

The amount on the left-hand side equals **national saving**, the amount of income that is not consumed by households or purchased by the government:

$$S = Y - C - G$$

Therefore, in a closed economy, saving must always equal investment:

$$S = I$$

Next, let *T* denote the amount of tax revenue the government receives, net of transfer payments (like Social Security) that it returns to households. Then the equation for national saving

$$S = Y - C - G$$

can be rewritten as

$$S = (Y - T - C) + (T - G)$$

Which divides national saving into two components:

$$Private\ Saving = Y - T - C$$

$$Public\ Saving = T - G$$

Private saving is the income that households have left after paying for taxes and consumption.

Public saving is the amount of tax revenue that the government has left after paying for its purchases:

- If $T - G > 0$, then the government is running a **budget surplus**, an excess of tax revenue over government spending.
- If $T - G < 0$, then the government is running a **budget deficit**, a shortfall of tax revenue compared to government spending.

Now suppose that:

- GDP equals $15 billion.
- Consumption equals $9 billion.
- Government purchases equal $1.5 billion.
- Tax revenue equal $1 billion.

Let's assume that we're in a closed economy, and find investment, national saving, private saving, and public saving.

To find investment:

$$Y = C + I + G$$

$$I = Y - C - G = \$15 - 9 - 1.5 = \$4.5\ billion$$

To find saving:

$$S = I = Y - C - G = \$4.5\ billion$$

To find private saving:

$$Private\ Saving = Y - T - C = \$15 - \$1 - \$9 = \$5\ billion$$

To find public saving:

$$Public\ Saving = T - G = \$1 - 1.5 = -\$0.5\ billion$$

In this (unfortunately realistic) case, the government is running a budget deficit.

The Market for Loanable Funds

Something curious:

- In the first part of this chapter, we looked at how some people save by spending less than they earn and how others borrow by spending more than they earn. What's more, some borrowers use the proceeds to invest, that is, to purchase capital goods. So for any one individual, saving need not equal investment.
- In the second part of the chapter, however, we looked at how, for a closed economy as a whole, saving must always equal investment.
- How can we reconcile what is possible at the level of each individual with what must hold true for the economy as a whole?
- What mechanism coordinates individual decisions, so that saving always equals investment?

To answer these questions, we need to develop a model of what happens in the market for **loanable funds**, that is, the market in which individual savers supply funds and individual borrowers demand funds.

Supply and Demand for Loanable Funds

Like any other market, an analysis of the market for loanable funds revolves around supply and demand.

The **supply of loanable funds** comes from individuals who have saved and want to lend the funds out, either directly in the stock and bond markets or indirectly through a bank or mutual fund.

When the interest rate rises, saving becomes more attractive, so the supply of loanable funds goes up.

Hence, in Figure 1, the supply curve for loanable funds slopes up.

The **demand for loanable funds** comes from individuals who need funds and want to invest (to purchase a house, for example) and firms who need funds and want to invest (to purchase capital equipment, for example).

When the interest rate rises, borrowing becomes less attractive, so the demand for loanable funds goes down.

Hence, in Figure 1, the supply curve for loanable funds slopes down.

The economy's interest rate must adjust to balance the supply and demand for loanable funds. In Figure 1, this happens when the interest rate equals 5%.

What would happen if, instead, the interest rate was below its equilibrium level, say, at 3%? Then the demand for loanable funds would exceed the supply. That is, too many people would want to borrow. The resulting shortage of loanable funds would place upward pressure on the interest rate, encouraging saving and discouraging borrowing until the interest rate returns to 5%.

What would happen if the interest rate was above its equilibrium level, say at 7%? Then the supply of loanable funds would excend the demand. That is, too many people would want to save. The resulting glut of loanable funds would place downward pressure on the interest rate, discouraging saving and encouraging borrowing until the interest rate returns to 5%.

In this way, the "invisible hand" of the market for loanable funds coordinates the decisions of individuals who want to save (and hence supply loanable funds) and individuals who want to invest (and hence demand loanable funds).

With the loanable funds framework in hand, we can consider the impact of various government policies on saving and investment by asking:

1. Does the policy shift the demand curve or the supply curve in the market for loanable funds?
2. Which way does the curve shift?
3. What happens to the equilibrium?

Policy 1: Saving Incentives

What happens if the government increases the amount of income that individuals can allocate to Individual Retirement Accounts and other tax advantaged accounts?

This policy would increase the after-tax interest return that individuals would receive on their saving.

1. It would therefore shift the supply curve for loanable funds.
2. Because savers would supply more loanable funds at any given interest rate, the supply curve would shift to the right.
3. Hence, as shown in Figure 2, the equilibrium interest rate falls and the equilibrium quantity of loanable funds rises.

Policy 2: Investment Incentives

Suppose that Congress institutes an investment tax credit, giving a tax advantage to any firm that builds a new factory or purchases new capital equipment.

1. This policy would shift the demand curve for loanable funds.

2. Because borrowers would demand more loanable funds at any given interest rate, the demand curve would shift to the right.
3. Hence, as shown in Figure 3, the equilibrium interest rate rises and the equilibrium quantity of loanable funds rises.

Policy 3: Government Budget Deficits and Surpluses

A **budget deficit** results when government spending exceeds tax revenue.

The government borrows by issuing bonds. The entire amount of government bonds outstanding, representing the accumulation of past government deficits, is the **government debt**.

A budget surplus can be used to retire (repay) existing government debt.

If the government's spending exactly equals tax revenue, then the government has a **balanced budget**.

Suppose that the government starts out with a balanced budget, but then either cuts taxes or raises spending, so that it now runs a budget deficit.

1. Recall that national saving consists of private saving plus public saving. When the government's budget swings to a deficit, that subtracts from national saving, shifting the supply curve for loanable funds.
2. The supply curve shifts to the left, since now there is a reduced supply of loanable funds at any given interest rate.
3. Hence, as shown in Figure 4, the equilibrium interest rate rises and the equilibrium quantity of loanable funds falls.

When the equilibrium interest rate rises, fewer families buy new homes and fewer firms buy new capital equipment. This reduction in investment because of government borrowing is called **crowding out**.

The History of US Government Debt

Figure 5 shows the amount of US government debt outstanding, expressed as a fraction of GDP.

Historically, the level of government debt has risen during wars, when the government runs a deficit to finance higher military spending.

But once the wars end, the government runs a budget surplus to pay down the debt.

An exception to this general pattern: government debt began rising again after President Reagan's tax cuts in 1981 and even now shows little sign of returning to zero.

Conclusion

This chapter shows how:

1. Financial institutions in the US economy allow some agents to save and others to borrow and invest.

2. In the economy as a whole, however, saving must equal investment.
3. The market for loanable funds coordinates individuals decisions so that saving and investment are always equal in the aggregate.

Ch 27 The Basic Tools of Finance

Introduction

The previous chapter considered how the financial system coordinates saving and investment decisions made by individual agents.

This chapter focuses on those individual decisions in more detail.

When individuals participate in financial markets, they must make decisions involving time and risk:

- When you use your saving to buy a stock, you need to be concerned about the uncertain future return you will earn on that stock.
- Similarly, when a firm borrows to build a new factory, it must be concerned about the uncertain future revenues it will earn from that factory.

The field of **finance** studies how people make decisions regarding the allocation of resources over time and the handling of risk.

Outline

1. Present Value: Measuring the Time Value of Money
2. Managing Risk
3. Asset Valuation

Present Value: Measuring the Time Value of Money

Consider this first choice:

- Get paid $100 today.
- Get paid $100 10 years from now.

Which would you take? The answer is easy: take $100 today, since even if you don't want to spend the money right away, you can always put it in the bank, earn interest, and have more than $100 10 years from now.

But consider this second choice:

- Get paid $100 today.
- Get paid $200 10 years from now.

Which would you take? This time it's not so clear. But following along the same line of thought used before, it would seem to depend on how much you could earn in interest by putting the money in the bank.

The idea of **present value** formalizes this basic idea of comparing amounts of money received at different points in time using interest rates.

The present value of any future amount of money is the amount of money today that would be needed, at current interest rates, to produce that future amount of money.

To see how the concept works, let's consider some examples.

Suppose you receive $100 today, put it in the bank, and leave it there for a period of years. Suppose, too, that the interest rate is 5%, and that you leave the interest in the bank as well, to earn interest on the interest, a process known as **compounding**.

At the end of one year you'd have

$$\$100 + \$100 \times 0.05 = \$100 + \$5 = \$105 = \$100 \times (1 + 0.05)$$

At the end of two years you'd have

$$\$105 + \$105 \times 0.05 = \$105 \times (1 + 0.05) = \$100 \times (1 + 0.05) \times (1 + 0.05) = \$100 \times (1 + 0.05)^2 = \$110.25$$

At the end of three years you'd have

$$\$100 \times (1 + 0.05)^2 + \$100 \times (1 + 0.05)^2 \times 0.05 = \$100 \times (1 + 0.05)^2 \times (1 + 0.05) = \$100 \times (1 + 0.05)^3 = \$115.76$$

And at the end of ten years you'd have

$$\$100 \times (1 + 0.05)^{10} = \$162.89$$

Now consider the second choice again:

- Get paid $100 today.
- Get paid $200 10 years from now.

Would you still take the $100 today? Not if the interest rate is only 5%.

Then again, maybe you would take the $100 if the interest rate was higher.

So now let's generalize the example, to apply to any interest rate *r*, where *r* = 0.05 for a 5% interest rate, *r* = 0.10 for a 10% interest rate, and so on.

At the end of one year you'd have

$$\$100 + \$100 \times r = \$100 \times (1 + r)$$

At the end of two years you'd have

$$\$100 \times (1 + r) + \$100 \times (1 + r) \times r = \$100 \times (1 + r) \times (1 + r) = \$100 \times (1 + r)^2$$

At the end of three years you'd have

$$\$100 \times (1+r)^2 + \$100 \times (1+r)^2 \times r = \$100 \times (1+r)^2 \times (1+r) = \$100 \times (1+r)^3$$

At the end of ten years you'd have

$$\$100 \times (1+r)^{10}$$

At the end of *N* years you'd have

$$\$100 \times (1+r)^N$$

This last equation provides the general formula for the **future value** $100 received *N* years from now. It is the amount of money that $100 today will yield *N* years from now, given the prevailing interest rate *r*.

Just for the sake of it, let suppose that *r* = 0.10 and consider the second choice again:

- Get paid $100 today.
- Get paid $200 10 years from now.

With *r* = 0.10,

$$\$100 \times (1+r)^{10} = \$100 \times (1+0.10)^{10} = \$259.37$$

so that with the higher interest rate, it's better to take the $100 now. That is, with *r* = 0.10, the future value of $100 10 years from now is larger than $200.

Now, let's work backwards, still considering the general case where the interest rate is given by *r*.

$$\$100 \; today \; is \; worth \; \$100 \times (1+r) \; one \; year \; from \; now$$

$$\frac{\$100}{1+r} \; received \; today \; is \; worth \; \frac{\$100}{1+r} \times (1+r) = \$100 \; received \; one \; year \; from \; now$$

$$\$100 \; received \; one \; year \; from \; now \; is \; worth \; \frac{\$100}{1+r} \; received \; today$$

$$\$100 \; received \; today \; is \; worth \; \$100 \times (1+r)^2 \; two \; years \; from \; now$$

$$\frac{\$100}{(1+r)^2} \; received \; today \; is \; worth \; \frac{\$100}{(1+r)^2} \times (1+r)^2 = \$100 \; received \; two \; years \; from \; now$$

$$\$100 \; received \; two \; years \; from \; now \; is \; worth \; \frac{\$100}{(1+r)^2} \; received \; today$$

The same reasoning says that

$$\$100\ received\ N\ years\ from\ now\ is\ worth\ \frac{\$100}{(1+r)^N}\ received\ today$$

This last equation provides the general formula for the **present value** $100 received *N* years from now. The present value is the amount of money today that would be needed, at current interest rates, to produce that future amount of money.

The most general equation says that if *r* is the interest rate, then an amount *X* to be received *N* years from now has present value

$$\frac{X}{(1+r)^N}$$

Note that since *r* is a positive number, 1+*r* is a number greater than one, and so

$$PV\ of\ X\ received\ N\ years\ from\ now = \frac{X}{(1+r)^N} < X$$

For this reason, the process of finding a present value is called **discounting**.

Let's see how we can use the concept of present value to make managerial decisions.

Suppose that General Motors can build a factory for $100 million today that will yield the company a payoff of $200 million 10 years from now. Suppose that the interest rate is *r* = 0.05. Should GM build the factory?

With a 5% interest rate, the present value of $200 million received 10 years from now is

$$\frac{\$200\ million}{(1+0.05)^{10}} = \$122.78\ million$$

The value of the future payoff today is larger than the $100 million cost today. The investment is worthwhile.

But with a 10% interest rate, the present value of $200 million received 10 years from now is

$$\frac{\$200\ million}{(1+0.10)^{10}} = \$77.11\ million$$

The value of the future payoff today is smaller than the $100 million cost today. The investment is not worthwhile.

Going back to our loanable funds model, what does this example tell you about the demand curve for loanable funds? It slopes *down*, since when interest rates rise, more investment projects go unfunded.

Managing Risk

Most people are **risk averse**, that is, they dislike risk.

Figure 1 helps formalize the source of risk aversion, using the concept of **utility** as a subjective measure of well-being. The figure shows that utility rises as wealth increases, but at a slower and slower rate. This is the property of **diminishing marginal utility**, and it implies that, for example, the utility loss from losing a $1,000 bet is larger than the utility gain from winning a $1,000 bet. Hence, a person with this utility function would be risk averse: he or she would not accept a coin flip for $1,000.

Betting on a coin flip is a source of uncertainty that is easy to avoid: just don't place the bet.

But other gambles are forced upon us. For example, if you drive a car there's always a chance of getting into an accident. If you own a home, there's always the chance of fire. People buy **insurance** to reduce these risks.

If you buy an insurance policy:

- You pay a premium to the insurance company, and most of the time you get nothing in return.
- But if you sustain a loss, the insurance company compensates you.
- Again, the property of diminishing marginal utility explains why people buy insurance.

But why do firms sell insurance?

- Suppose that one out of every 10,000 homes get damaged by fire.
- If an insurance company sells 100,000 policies, it can be pretty sure that it will have to compensate about 10 homeowners.
- But it can pay these homeowners out of the funds it receives from premiums.
- In other words, it's easier for an insurance company to bear the risk of fire across many homes than it is for a single household to bear the risk of fire in one home.

Markets for insurance face two types of problems:

1. **Adverse selection** arises because high-risk people are more likely than low risk people to buy insurance.
2. **Moral hazard** arises because once somebody has insurance, he or she will be less careful.

Insurance companies profit from **diversification**, the reduction in risk achieved by replacing a single risk with a large number of smaller unrelated risks.

Individuals can benefit from diversification, as well, when they use their savings to buy financial assets.

- Buying stock in only one company leaves an individual investor open to **firm-specific risk**: if the single firm does poorly, the investor will earn a low return or perhaps even suffer a loss.
- By buying stocks in many companies, the investor can eliminate firm-specific risk across all of his or her investments: some companies may do poorly but others will do well so that on average, risk is reduced.
- Figure 2 illustrates this benefit of diversification in helping to reduce firm-specific risk.

- But the investor will still be subject to **market risk**: the risk that because of poor economic conditions economy-wide, all firms will suffer.
- Figure 2 also illustrates this property: that market risk remains even when an individual holds a large number of stocks.
- Hence, as Figure 3 suggests and as discussed previously in Chapter 26, individuals face a trade-off between risk and return when they choose to allocate their savings to stocks instead of bonds.

Asset Valuation

Since a firm can pay larger dividends to its stockholders when its profits are high, the price of a share of stock in that firm will rise when the firm's profit outlook improves.

Fundamental analysis refers to the detailed analysis of a company's business outlook, applied to determine the value of its stock.

The efficient markets hypothesis asserts that the price of a stock will reflect all publically available information about the company's prospects:

- Those companies that are likely to earn higher profits will have shares that sell at a higher price.
- Those companies that are likely to earn lower profits will have shares that sell at a lower price.
- The price of an individual firm's shares will change, but only when new information becomes available.
- One implication of the efficient markets hypothesis, therefore, is that the price of a stock should follow a **random walk**: its changes should be impossible to predict.
- A related implication is that there is little point in trying to outsmart the market by buying individual stocks. The best an individual investor can do is to hold a diversified portfolio of stocks, so as to eliminate firm-specific risk.

Evidence to support the efficient markets hypothesis comes from the fact that *actively managed* mutual funds, that pick individual stocks in an attempt to provide higher returns, tend to perform no better (and often worse than) *index* funds that simply hold all of the stocks in a broad index or average, like the Standard and Poor's 500.

Some economists and financial market participants argue, however, that stock prices can deviate from their true underlying value due to **market irrationality**, that is, waves of optimism and pessimism that have little to do with the underlying prospects of the firms themselves:

- One implication of market irrationality is that stock prices can sometimes move even in the absence of new information relating to firms' profits.
- A related implication is that individual investors can earn higher returns by buying *undervalued* stocks that sell at a price that is lower than their intrinsic value and avoiding *overvalued* stocks that sell at a price that is higher than their intrinsic value.

Ch 28 Unemployment

Introduction

Like GDP, unemployment ranks high as an indicator of economic well being. This chapter starts by describing how unemployment is measured and, related to this measurement issue, why unemployment can sometimes be a misleading indicator of the true health of the economy.

Note, for instance, that there is unemployment even during normal or good economic times.

Partly for this reason, economists distinguish between two types of unemployment:

1. The **natural rate of unemployment** is the rate of unemployment that the economy experiences even during normal times, that is, even when the economy is not in a recession.
2. **Cyclical unemployment** refers to the additional unemployment that occurs during recessions.

Alternatively, we can think about the natural rate of unemployment as the economy's long-run rate of unemployment and cyclical unemployment as the shorter-run fluctuations around the natural rate.

This chapter focuses mainly on the determinants of the natural rate of unemployment, leaving an analysis of cyclical unemployment for later. In particular, the chapter continues by describing four types of theories or sets of considerations that economists use to explain the economy's natural rate of unemployment: job search, minimum-wage laws, unions, and efficiency wages.

Outline

1. Identifying Unemployment
2. Job Search
3. Minimum-Wage Laws
4. Unions
5. Efficiency Wages

Identifying Unemployment

Data on unemployment in the US economy are assembled by the Bureau of Labor Statistics (BLS), which is part of the Department of Labor.

Each month, the BLS compiles these data from a survey of about 60,000 households called the *Current Population Survey*.

Based on responses to survey questions, the BLS puts each adult aged 16 and over into one of three categories:

1. **Employed**. This category includes paid employees, people who worked in their own business, and those who were temporarily absent from work because of illness or vacation.
2. **Unemployed**. This category includes people who were not employed, were available for work, and had tried to find a job within the previous 4 weeks, as well as those who were temporarily laid off and waiting to be recalled.
3. **Not in the Labor Force**. This category includes everyone else: students, homemakers, retired people.

Figure 1 shows the breakdown of the US population in 2004 into these three categories.

The BLS then defines the **labor force** as the total number of workers, both employed and unemployed,

$$Labor\ Force = Number\ of\ Employed + Number\ of\ Unemployed$$

the **unemployment rate** as the percentage of the labor force that is employed,

$$Unemployment\ Rate = \frac{Number\ of\ Unemployed}{Labor\ Force} \times 100$$

and the **labor force participation rate** as the percentage of the total adult population that is in the labor force,

$$Labor\ Force\ Participation\ Rate = \frac{Labor\ Force}{Adult\ Population} \times 100$$

Let's use the numbers from Figure 1 to compute these statistics for 2004:

- Number of employed = 139.3 million.
- Number of unemployed = 8.1 million.
- Not in the labor force = 76.0 million.
- Labor force = 139.3 + 8.1 = 147.4 million.
- Unemployment rate = 8.1/147.7 x 100 = 5.5 percent.
- Labor force participation rate = (139.3+8.1)/(139.3+8.1+76) = 147.4/223.4 = 66 percent.

Table 1 shows how the unemployment and labor force participation rates varied across demographic groups in 2004. Figure 3 shows how labor force participation rates have varied over time for men and women.

What factors might explain women's rising labor force participation? What factors might explain men's falling labor force participation?

Figure 2 shows how the unemployment rate fluctuates about a long-run average, or natural, rate, of slightly more than 5.2 percent. Even during good economic times, there is some unemployment in the US economy. It is this natural rate of unemployment that the theories described in this chapter seek to explain.

The most difficult part of measuring the unemployment rate entails determining who is unemployed versus who is out of the labor force:

Suppose an employed worked loses his or her job, and starts looking for a new one. What happens to the unemployment rate? It rises, since the number of unemployed workers goes up while the labor force stays the same.

But suppose that after awhile, that same person becomes a **discouraged worker**: someone who would like to work but has given up looking for a job. Maybe that person decides to go back to school or maybe he or she just stays at home and doesn't bother looking for a job. Either way, the number of unemployment workers goes down, and while the labor force goes down as well, the net effect is to decrease the rate of unemployment.

Symmetrically, what happens if the economy starts to look better, so that a discouraged worked starts to look for a job? Now the number of unemployed workers rises, and while the labor force also gets bigger, the net effect is to increase the unemployment rate.

So changes in the unemployment rate don't always accurately reflect whether economic conditions are improving or deteriorating.

Another set of facts pertains to the duration of unemployment spells: most spells of unemployment are short, even though most unemployment observed at any given point in time is long term.

How can both of these facts hold true? A simple example shows how:

- Suppose that 55 people each year are unemployed.
- Each week, one person loses his or her job, but finds a new job at the end of that week.
- But three workers lose their jobs at the beginning of the year and stay unemployment for the full year.
- Then 52 out of 55 unemployment spells last only one week.
- But, at any given point in time, three out of the four unemployed workers has a spell that lasts for one full year.

What explains the natural rate of unemployment? In other words, why are their unemployed workers even during good times?

- One explanation is that it takes time for workers to find jobs that are best-suited for them. This type of unemployment is often called **frictional unemployment**.
- A second set of explanations focus on why there might not be enough jobs to employ everyone who wants one. This type of unemployment is often called **structural unemployment**.
- So the essence of frictional unemployment is that there are jobs out there, it just takes time and effort for workers to find them. The essence of structural unemployment is that there are just not enough jobs out there for everyone who wants one.

Job Search

Job search is the process by which workers find appropriate jobs given their tastes and skills.

The process of job search can explain why there is always some frictional unemployment:

- Suppose that Hewlett Packard takes market share away from Dell. Dell lays off workers; HP hires new ones. In the interim there is a period of unemployment in the industry.
- Similarly, if the price of oil rises, energy exploration companies hire more workers, while auto manufacturers and airlines lay off workers. Because of these *sectoral shifts*, unemployment arises.

A certain amount of frictional unemployment is inevitable, simply because the economy is always changing.

However, government training and re-training programs can help reduce the amount of frictional unemployment.

Through **unemployment insurance** programs, the government partially protects workers' incomes when they become unemployment.

Just like automobile and home-owners insurance, unemployment insurance makes risk-averse workers better off.

But it can also lead to higher levels of frictional unemployment, by making it possible for unemployed workers to search longer for the right job.

Minimum Wage Laws

Figure 4 illustrates how unemployment results from minimum wage laws.

This type of unemployment is **structural** as opposed to frictional, in that there are workers who want to work at the minimum wage, but who will not be able to find those jobs even after extensive search.

This type of unemployment affects low-wage workers, particularly teenagers.

But the same line of reasoning illustrated in Figure 4 implies that any factor or set of factors that raises the actual wage above the equilibrium wage that would equate supply and demand will cause structural unemployment.

Unions and Collective Bargaining

A **labor union** is an association of workers that bargains with employers over wages, benefits, and working conditions through a process of **collective bargaining**. If the two sides can't agree, the union can organize a **strike**, the organized withdrawal of labor from the firm.

In the 1940s and 1950s, about one third of US workers were unionized. Now, that number is only about 13 percent.

Studies show that through collective bargaining, unions can increase the wages that their members receive by 10 to 20 percent.

The overall effects of unions on wages and unemployment therefore resemble the effects of minimum wage laws:

- **Insiders**, or union members, benefit from the higher wages.
- But **outsiders** are hurt because at higher wages, fewer workers are hired.

The Theory of Efficiency Wages

Like minimum wage laws and union collective bargaining, the theory of **efficiency wages** explains structural unemployment by appealing to wages that are above the level that equates supply and demand.

But whereas the "above equilibrium" wage resulting from minimum wage laws comes from government actions, and the above market equilibrium resulting from unions comes from workers' collective action, efficiency wage theory stresses that employers themselves might want to pay their workers above equilibrium wages to raise worker productivity?

Why might an employer voluntarily want to pay above equilibrium wages? Why might higher wages raise worker productivity?

1. **Worker Health**. Better paid workers will be healthier and therefore more productive. This factor is probably not relevant in the United States, but certainly could be in developing countries.
2. **Worker Turnover**. It's costly for the firm to hire and train new workers; hence it's in a firm's interest to try to retain its existing workers. It can do this by paying them wages that are higher than they can get elsewhere.
3. **Worker Quality**. Suppose that a firm wants to fill an open job and advertises a lower wage. Since the only people who will apply are those who can't earn a higher wage elsewhere, it runs the risk of having to hire someone with less experience or lower skills. Conversely, by offering a higher wage, the firm can attract even the very best applicants.
4. **Worker Effort**. If a firm's workers are happy because they feel that they are well treated, they will be willing to work harder. Also, if they know that they won't be able to find as good a job elsewhere, they will work harder to keep their existing job.

In 1914, Henry Ford offered his workers $5 per day, about twice what they could get at other jobs. Worker turnover and absenteeism fell. Ford called the decision to raise wages "one of the finest cost cutting moves we ever made."

Conclusion

After discussing how the unemployment rate is actually measured, this chapter goes on to identify a number of explanations for the **natural rate of unemployment**, that is, the long-run rate of unemployment that prevails even outside of recessions.

These explanations fall under two broad headings: theories that explain **frictional unemployment** and theories that explain **structural unemployment**.

Before closing, let's ask:

1. The government raises the minimum wage. What does this do to the natural rate of unemployment? Do these effects arise by changing the amount of frictional unemployment or by changing the amount of structural unemployment?
2. The internet makes it easier for firms to advertise job openings and makes it easier for workers to find job openings. What does this do to the natural rate of unemployment? Do these effects arise by changing the amount of frictional unemployment or by changing the amount of structural unemployment?
3. Unions in the US have become considerably weaker and less prevalent since the 1950s. What did this do to the natural rate of unemployment? Did these effects arise by changing the amount of frictional unemployment or by changing the amount of structural unemployment?
4. Music downloading puts traditional cd stores out of business. What does this do to the natural rate of unemployment? Do these effects arise by changing the amount of frictional unemployment or by changing the amount of structural unemployment?

Ch 29 The Monetary System

Introduction

In the absence of money, people would have to exchange goods and services through *barter*.

The problem with barter lies in finding a *double coincidence of wants*: a successful trade requires (i) you to want what your trading partner has and (ii) your trading partner to want what you have.

Money overcomes this problem, since everyone will accept it in exchange for goods and services.

But how exactly is money defined? What are its functions? How does the government control the supply of money? And what role do banks play in the money supply process?

These questions are the focus of this chapter.

The next chapter will then begin to relate changes in the supply of money to changes in other key economic variables.

Outline

1. The Meaning of Money
2. The Federal Reserve System
3. Banks and the Money Supply
4. The Fed's Tools of Monetary Control
5. Two Final Points
   A. Bank Runs and the Money Supply
   B. The Federal Funds Rate

The Meaning of Money

Sometimes people will say, "Bill Gates has a lot of money." But what they really mean is that Bill Gates has a lot of *wealth*.

Economists use the term "money" in a more specific sense, to refer to the set of assets that people use regularly to buy goods and services from other people.

Functions of Money

1. Money is a **medium of exchange**, that is, an item that buyers give to sellers in exchange for goods and services.
2. Money is a **unit of account**, that is, the units in which prices are measured.
3. Money is a **store of value**, that is, an object that people can use to carry wealth from the present into the future.

Closely associated with the concept of money is that of **liquidity**: the ease with which an asset can be converted into the economy's medium of exchange.

- By definition, money is the most liquid asset.
- Stocks and bonds are pretty easy to buy and sell. They are highly liquid assets.
- Houses, valuable paintings, and antiques take more time and effort to sell. They are less liquid.

Notice that the first two items on this list highlight a trade-off. Money is the most liquid asset, but currency does not pay interest. Bonds are less liquid, but pay interest. This trade-off will become important later on in our analysis of how changes in the money supply affect the economy as a whole.

Kinds of Money

Historically, gold or gold coins served as money. This type of money, that takes the form of a commodity with intrinsic value, is called **commodity money**.

US dollar bills have value, but that value is not based on the intrinsic value of the paper and ink themselves. Money without intrinsic value is called **fiat money**, since it is used as money because of government decree.

Money in the US Economy

The **money stock** is the total quantity of money circulating in the economy.

Suppose we want to measure the money stock for the US. What assets would we include in our measure?

1. Certainly **currency**, the paper bills and coins in the hands of the public.
2. Probably checks as well. **Demand deposits** is the official name given to bank deposits that customers can access on demand by writing a check.
3. Maybe **savings deposits**. Bank's won't let customers write checks on savings deposits, but they still can withdraw the funds anytime.
4. Maybe also **money market mutual funds**, some of which offer limited check-writing privileges.
5. Maybe also **time deposits** (also called **CD's** or **certificates of deposit**). Here, the funds can't be withdrawn without penalty for a fixed amount of time, but that amount of time tends to be short – three to six months – so these assets, too, are fairly liquid.

Evidently, the choice of what to include is not entirely clear-cut. For this reason, there are several official measures of the US money stock. Two of the most widely used are:

- **M1**. Includes only those assets that are clearly used as a medium of exchange: currency, demand deposits, traveler's checks, and "other checkable deposits" which is the official term for interest-earning checking deposits.
- **M2**. Includes everything in M1, plus other highly liquid assets: savings deposits, money market mutual funds, and small (under $100,000) time deposits.

Figure 1 shows some data on M1 and M2 in 2004. Which measure is bigger? Why?

What about credit cards? Credit cards are clearly used to make purchases. Why aren't they included in M1? The reason is that credit cards are a means for *deferring* payments as opposed to *making* payments. At the end of the month, when you pay your credit card bill with a check, you are using the medium of change to finally pay for what you purchased earlier.

But while credit card balances are not included in M1, they clearly influence the level of M1. Before credit cards use became widespread, people had to hold a lot more currency.

Here's one other puzzle.

- In 2004 the stock of US currency in circulation was $699 billion.
- In 2004, there were 223 million adults in the US.
- $699 billion/223 people = $3,135 per person!
- A lot of this currency is held overseas, as a store of value in countries with unstable political or economic systems.
- Undoubtedly, some of this currency is also held by drug dealers and other criminals.

The Federal Reserve System

The **Federal Reserve** (Fed) is the **central bank** of the US: the institution responsible for overseeing the banking system and regulating the quantity of money in the economy.

The Federal Reserve System consists of:

- The Board of Governors in Washington DC
    - Seven Board Members, called "Governors," with 14-year terms.
    - Including the Chairperson of the Federal Reserve System: formerly Alan Greenspan and now Ben Bernanke.
- Twelve Federal Reserve Banks
    - Located in major cities, including Boston and New York.

As a central bank, the Fed has two jobs:

1. It regulates banks, assists in check processing (clearing), and acts as a bank for banks – taking their deposits and, when other sources of credit dry up, making loans to banks. In this last role, the Fed is said to be the **lender of last resort**.
2. It regulates the **money supply**: the quantity of money in the economy. That is, it conducts **monetary policy**.

The monetary policymaking committee at the Fed is called the **Federal Open Market Committee** (FOMC). The FOMC meets every six weeks and consists of the seven Governors plus the 12 Reserve Bank Presidents. All seven Governors vote on Committee decisions; a rotating group of 5 Reserve Bank Presidents vote as well, with the President of the New York Fed always a voting member.

But exactly how does the Fed regulate the supply of money? By conducting **open market operations**, that is, by buying and selling US Government bonds. Loosely speaking:

- The Fed increases the money supply by using newly-created money to buy US Government bonds held by private investors.
- And decreases the money supply by selling US Government Bonds to private investors.

Banks and the Money Supply

Because even the narrowest measure of money, M1, includes both currency and demand deposits, banks play a key role, together with the Fed, in the money supply process. But how exactly do banks participate in this process?

The Simple Case of 100 Percent Reserve Banking

Start by considering an economy without banks, where all money consists of currency.

Suppose for simplicity that the total quantity of currency in circulation is $100.

Now suppose that someone opens up a bank: call it the First National Bank.

But instead of making loans, all this bank does is to safeguard people's money: it accepts deposits, and keeps the currency in its vault until the depositor either asks for the currency back or writes a check against his or her balance.

Deposits that the bank receives but does not loan out are called **reserves**. So this simple form of banking without loans is called **100-percent-reserve banking**, for the obviously reason that 100 percent of all deposits are held as reserves.

We can use a **T-account** (a simplified balance sheet), to show what happens if the entire $100 of currency in circulation is deposited in the bank:

First National Bank

Assets	Liabilities
Reserves $100	Deposits $100

What has happened to the M1 money supply as a result of this transaction?

- Nothing!
- Currency in circulation declines by $100.
- But demand deposits rise by $100.

This first example illustrates that in an economy with 100-precent-reserve banking, banks do not influence the money supply.

Money Creation with Fractional Reserve Banking

Now suppose that the managers of the First National Bank notice that not all of the bank's depositors ask for the money back on any given day. In fact, most customers are content to leave their money in the bank. What if the bank lends out some of the money it receives from deposits?

Now we'll consider a **fractional-reserve banking** system, in which banks hold only a fraction of the funds they receive from depositors as reserves.

The **reserve ratio** measures the fraction of deposits that banks hold as reserves.

Although banks want to lend funds out, in order to earn interest, they will always hold at least some reserves:

- Partly because they are required to by law. The Fed sets a minimum reserve ratio that each bank must maintain. Reserves held to satisfy this legal requirement are called **required reserves**.
- But banks will also hold **excess reserves** above what is legally required to cope with depositors' requests for withdrawals.

Let's suppose that First National Bank decides on a reserve ratio of 10 percent. Then it holds $10 (or 10 percent) of its deposits as reserves and lends the rest out. The T-account now becomes

First National Bank

Assets	Liabilities
Reserves $10 Loans $90	Deposits $100

What's happened to the money supply as a result of this transaction?

- It has increased!
- Depositors still hold $100 in demand deposits.
- But now the people who receive the loans hold $90 in currency.
- The total money supply is $190.

This second example illustrates that in a fractional reserve system, banks can create money.

Notice, however, that while the money supply has gone up because of this transaction, people aren't really wealthier:

- The depositors have $100 in deposits, just as before.
- The borrowers have $90 in currency, but now they owe that $90 to the bank. So that balances out too.

Another way to think about this is that people aren't wealthier, but they are more liquid.

The Money Multiplier

In an economy with a fractional reserve banking system, however, the action does not really stop at the end of this second example.

Now the First National Bank's borrower has $90 in currency. Presumably, that borrower wanted the funds in order to buy something: a consumption good or an investment good.

But then the seller of this good gets the $90. Let's suppose that he or she then takes that currency, and deposits it in his or her bank: the Second National Bank.

If the Second National Bank also chooses a 10 percent reserve ratio, it will take the $90 in currency, hold $9 (10 percent) as reserves, and lend the remaining $81 out. Its T-account appears as

Second National Bank

Assets	Liabilities
Reserves $9 Loans $81	Deposits $90

What does this do to the money supply?

- The First National Bank's customers have $100 in deposits.
- The Second National Bank's customers have $90 in deposits.
- The Second National Bank's borrower has $81 in currency.
- Now the money supply is $100+90+81 = $271!

But now the Second National Bank's borrower uses the $81 in currency to buy something. The seller takes the $81 and deposits it in his or her account at the Third National Bank.

The Third National Bank, if it also chooses a 10 percent reserve ratio, holds $8.10 (10 percent) of the $81 as reserves, and lends the remaining $72.90 out. Its T-account appears as

Third National Bank

Assets	Liabilities
Reserves $8.10 Loans $72.90	Deposits $81

What's the money supply now?

- The First National Bank's customers have $100 in deposits.
- The Second National Bank's customers have $90 in deposits.
- The Third National Bank's customers have $81 in deposits.
- The Third National Bank's borrower has $72.90 in currency.
- Now the money supply is $343.90.

We could go on and on, repeating this forever. The Third National Bank's borrower buys something, the seller deposits the funds in the Fourth National Bank, which keeps 10 percent as reserves and lends the rest out ….

But notice that in each step, the additions to the money supply get smaller and smaller. So eventually the process will converge. Use a calculator or better yet a computer spreadsheet to do the endless repetitions and what you will find is that when the banking system finally holds the entire $100 as reserves, the money supply is $1000.

In this case, the **money multiplier** – the amount of money that the banking system generates per dollar of reserves – is $1000/$100 = 10.

In this example, where all banks choose a reserve ratio of **10 percent**, is it an accident that the money multiplier is **10**? No!

In general, if

$$R = \text{the reserve ratio}$$

then

$$1/R = \text{the money multiplier}$$

So if as in our example R = 0.10 or 10 percent, then the money multiplier is $1/R = 1/0.10 = 10$.

To see why this *reciprocal formula* must be true, remember that the reserve ratio measures the fraction of deposits that banks hold as reserves:

$$R = \text{Reserves/Deposits}$$

or

$$\text{Deposits} = (1/R) \times \text{Reserves}$$

In our example, everyone deposits all of their money, so

$$\text{Money Supply} = \text{Deposits} = (1/R) \times \text{Reserves}$$

But now remember that the money multiplier is defined as

$$\text{Money Multiplier} = \text{Money Supply/Reserves} = 1/R$$

This last set of calculations reveals two important assumptions that are built into our second example:

1. All banks have the same reserve ratio R.
2. All bank customers hold all of their money as deposits.

What happens when the first assumption is violated, say because some banks choose to hold more reserves?

- The money multiplier goes down, because when some banks hold more reserves, they make smaller loans, so the process of monetary expansion is curtailed.

What happens when the second assumption is violated, say because some people choose to hold some currency as well as deposits?

- Again, the money multiplier goes down, because when some people hold some currency, they deposit less, and again the process of monetary expansion is curtailed.

The Fed's Tools of Monetary Control

But, as long as banks do not hold all of their deposits as reserves, and as long as people don't hold all of their money as currency, the fractional reserve system allows banks to play a key role in the money supply process.

The Fed must take banks' role into account when making monetary policy decisions.

Open Market Operations

Recall that **open market operations** occur when the Fed buys or sells US Government bonds from or to private investors.

When the Fed buys US Government bonds, each newly-created dollar held as currency increases the money supply by $1. But each newly-created dollar held as a deposit increases the money supply by even more, because of the money multiplier.

And when the Fed sells US Government bonds, if the seller pays for the bond with currency, the money supply decreases by $1. But if the seller pays for the bond using funds from a bank deposit, the money supply decreases by even more, as the process of multiple deposit creation works in reverse.

Open market operations are easy for the Fed to execute. There is a trading desk at the Federal Reserve Bank of New York that links the Fed to the US Government bond market. The Fed can trade in this market just like all other financial institutions and individual investors.

Open market operations can also be used to change the money supply by large or small amounts.

Because of these advantages, open market operations are the Fed's most frequently-used policy tool.

Reserve Requirements

Reserve requirements are the legally-imposed minimum amount of reserves that banks must hold against their deposits.

We've already seen that a higher reserve ratio leads to a smaller money multiplier.

The same reasoning implies that when the Fed increases reserve requirements, the money supply will fall.

But changes in reserve requirements disrupt bank business. To avoid these disruptions, the Fed rarely uses changes in reserve requirements to affect the money supply.

The Discount Rate

The Fed also acts as a **lender of last resort** for banks that cannot obtain funds through other sources.

The **discount rate** is the interest rate that Fed charges on its loans to banks.

When the Fed makes a loan to a bank, in effect it lends newly-created money to that bank. The bank has more reserves, some of which it can lend out. Through the process of multiple deposit creation, the money supply will rise.

Hence, when the Fed lowers the discount rate, inducing more banks to borrow from the Fed, the money supply will rise.

But the Fed rarely uses discount lending to control the money supply. Instead, it uses its role as lender of last resort to help banks when they are in financial trouble.

Problems in Controlling the Money Supply

All of this discussion highlights that the Fed cannot perfectly control the money supply.

It cannot control how much money people hold as currency as opposed to depositing in banks.

And it cannot control how much banks hold in reserves as opposed to making loans.

In practice, therefore, Federal Reserve analysts need to constantly monitor the behavior of banks and their depositors, to keep the money supply on track.

Two Final Points

Bank Runs and the Money Supply

Note that in a fractional reserve banking system, if all depositors attempt to withdraw their money at once, there will not be enough reserves to satisfy them all.

In a bank run or panic, depositors rush to withdraw their funds, not wanting to be the ones who lose out.

This actually happened during the Great Depression of the 1930s. Many banks had to close until enough loans were repaid to allow them to satisfy all of the withdrawal requests.

The problems were magnified by the fact that this experience made people lost their trust in banks, and hold more money as currency. The decline in the money multiplier then led to a large decline in the money supply, which many economists blame for making the Depression more severe.

Today, the Federal Deposit Insurance Corporation guarantees the safety of most bank deposits. So it is unlikely that bank runs or panics will happen again.

The Federal Funds Rate

What's the connection between this analysis of reserves, the money multiplier, and the money supply, and the more common way of talking about monetary policy, where changes in Federal Reserve policy are always described as changes in the federal funds rate?

The **federal funds rate** is the interest rate that banks charge each other on short-term loans of reserves, or federal funds.

Just like, previously, we traced out a downward-sloping demand curve for loanable funds in the economy as a whole, we can trace out a downward-sloping demand curve for federal funds in the interbank loan market.

In Graph 1, the Federal Reserve sets a target *R** for reserves, and conducts open market operations so as to hit this target:

- In this case, the supply curve for reserves is vertical, or *perfectly inelastic*.
- The market for interbank loans then clears with the federal funds rate at *F**.
- If the federal funds rate were below *F**, the demand for loans of federal funds would be greater than the supply. Upward pressure on the federal funds rate would result, until the funds rate rises to *F**.
- If the federal funds rate were above *F**, the demand for loans of federal funds would be smaller than the supply. Downward pressure on the federal funds rate would result, until the funds rate falls to *F**.

Graph 1 illustrates the workings of monetary policy as we've envisioned it so far.

Alternatively, though, we could think of the Federal Reserve as setting a target *F** for the federal funds rate:

- In this situation, illustrated in Graph 2, the supply curve for reserves becomes horizontal, or *perfectly elastic*.
- The Federal Reserve must conduct open market operations so that it is supplying *R** in reserves.

Comparing Graphs 1 and 2 suggests that there's not too much difference between these two monetary policy strategies:

1. Setting a target *R** for reserves, and accepting the equilibrium funds rate *F**.
2. Setting a target *F** for the funds rate, and supplying *R** in reserves to hit that target.

Either way, the outcome is the same: reserves are *R** and the federal funds rate is *F**.

But things change when we allow the demand curve for reserves to shift.

Why might the demand curve for reserves shift?

- Perhaps banks' lending opportunities change, so that they want to hold larger or smaller stocks of reserves at any given interest rate.
- Perhaps depositors' behavior changes, so that they provide banks with more or less currency to hold as reserves.

In Graph 3, the Fed sets a target *R** for reserves, and the demand curve for reserves shifts. As a consequence, the equilibrium funds rate rises from *F** to *F***.

This graph implies that if the demand curve for reserves were subject to ongoing shifts, a policy strategy of targeting reserves would lead to volatility in the federal funds rate.

In Graph 4, the Fed sets a target *F** for the federal funds rate, and the demand curve for reserve shifts. The Fed must conduct open market operations so that the equilibrium quantity of reserves rises from *R** to *R***. But, by doing so, it can stabilize the funds rate in the face of ongoing shifts in the demand for reserves.

In practice, the Federal Reserve conducts monetary policy by setting a target for the federal funds rate as opposed to a target for reserves.

That is why *changes* in Federal Reserve policy are always described as *changes in the federal funds rate target*.

But note that in order to implement a strategy of federal funds rate targeting, the Fed must constantly be engaging in open market operations, adding or withdrawing reserves from the banking system to stabilize the funds rate in the fact of shifts to the demand curve for reserves.

Why, in practice, does the Fed choose to conduct policy in this way, with a target for the funds rate as opposed to a target for reserves?

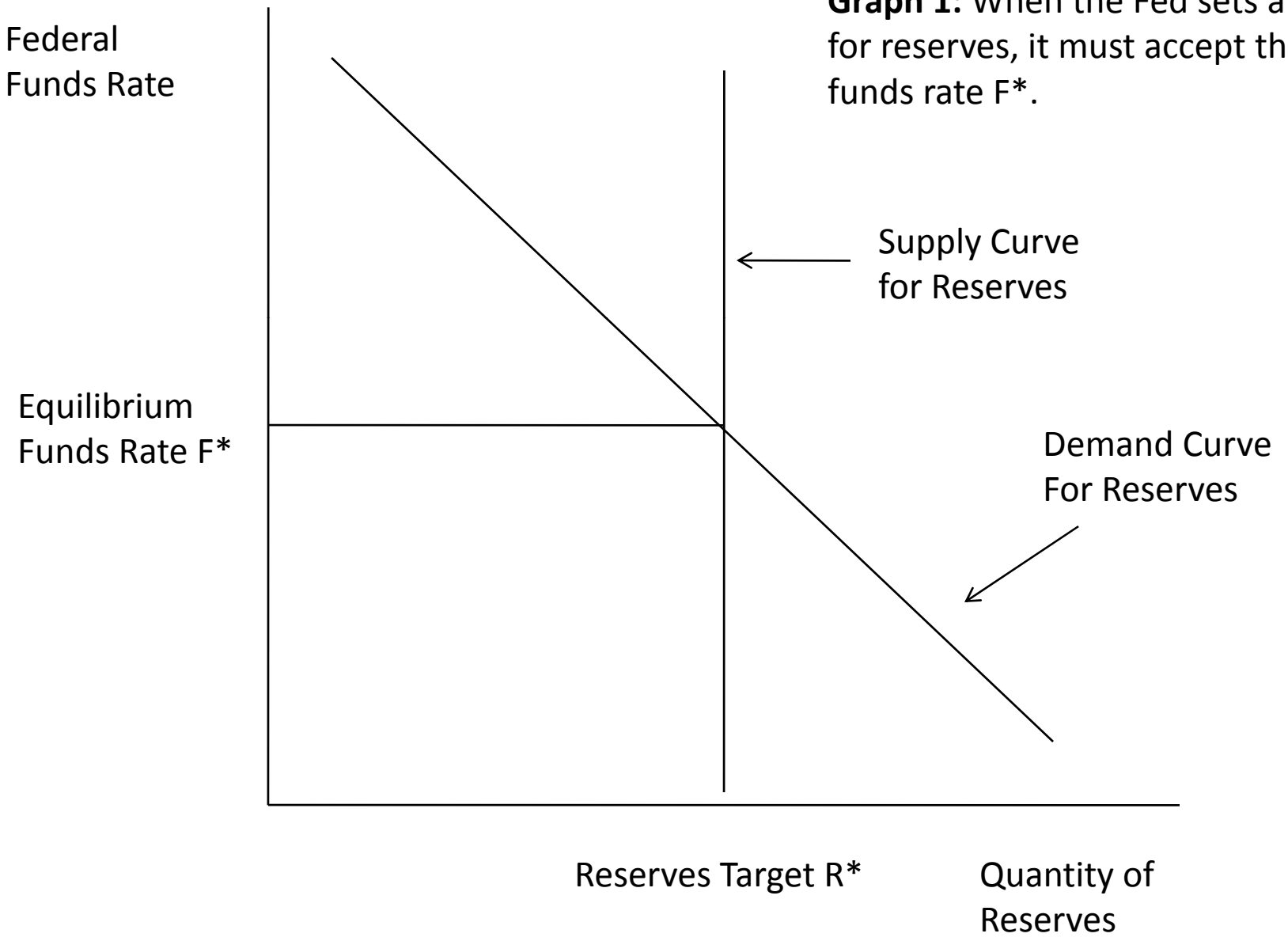
1. It believes that the demand curve for reserves is unstable, exhibiting continual shifts. Thus, it believes that a reserves-targeting strategy would lead to excessive volatility in the federal funds rate and possible instability in the banking system.
2. It also believes that instability in the federal funds rate would spill over into other financial markets as well, leading to more volatile interest rates economy-wide.

Finally, Graph 5 illustrates what happens when the Fed raises its federal funds rate target. To raise the target from *F** to *F***, the Fed must use open market operations to drain reserves from the banking system, specifically, to lower the quantity of reserves from *R** to *R***. Through the money multiplier, the money supply will also contract. Monetary policy becomes "tighter" or "more restrictive."

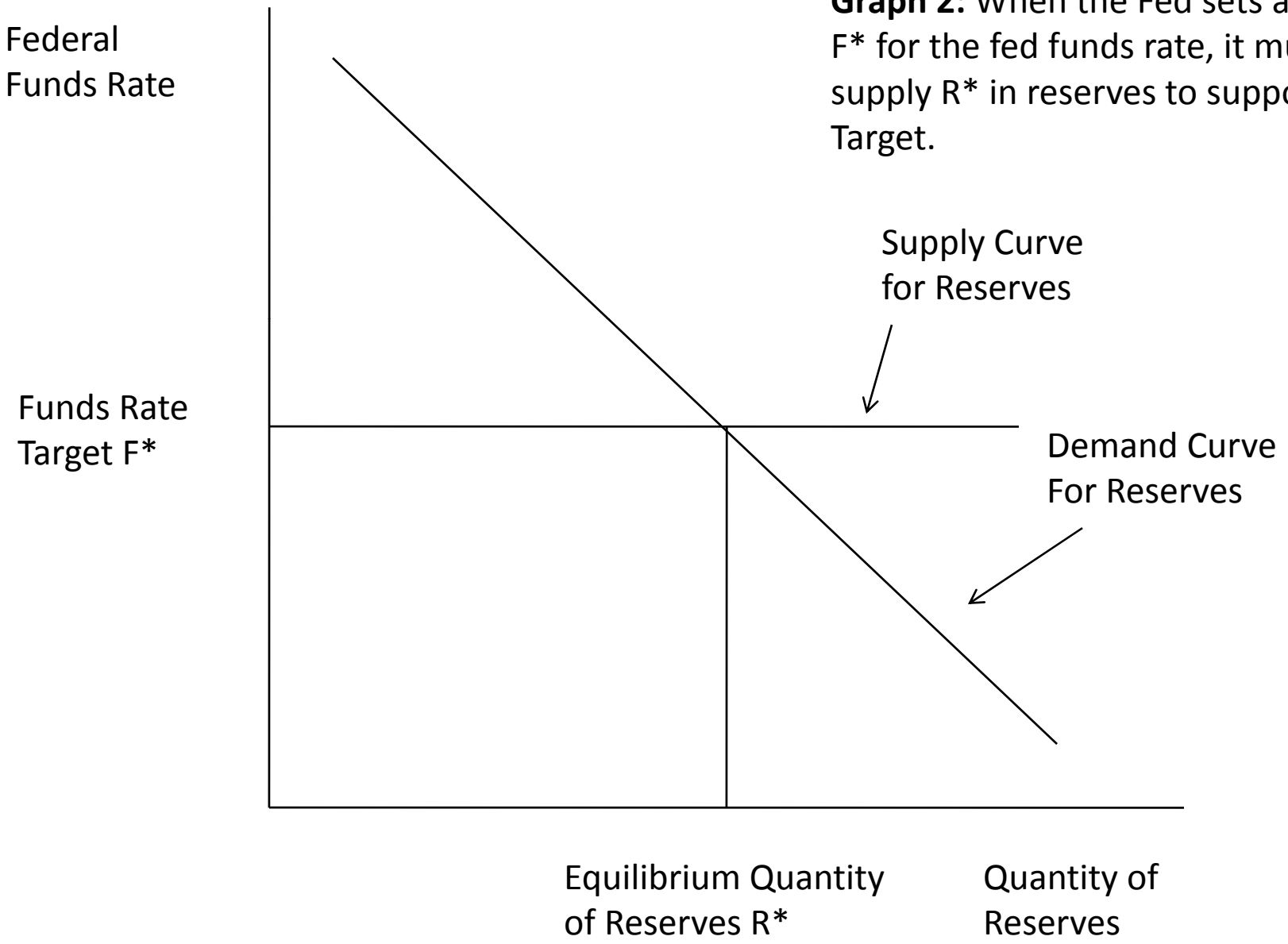
Symmetrically, Graph 6 shows that when the Fed lowers its funds rate target, it must use open market operations to add reserves to the bank system. And, through the money multiplier, the money supply will also expand. Monetary policy becomes “looser” or “more accommodative.”

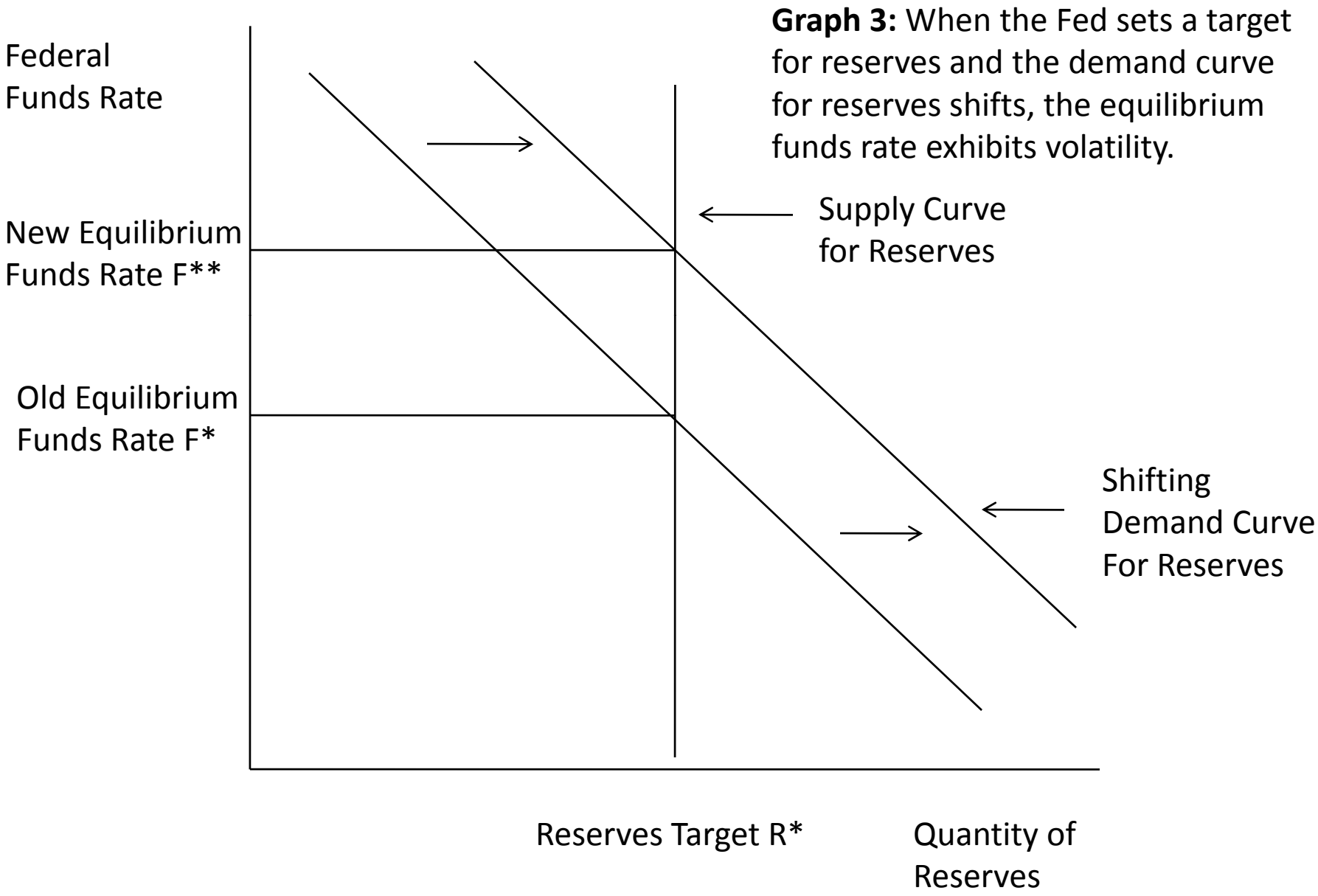
These last two graphs highlight how reserves, open market operations, the money multiplier, and the money supply all continue to work just as in the textbook, even under the Fed’s current operation procedures, which focus most of the immediate attention on the federal funds rate.

Graph 1: When the Fed sets a target for reserves, it must accept the fed funds rate F*.



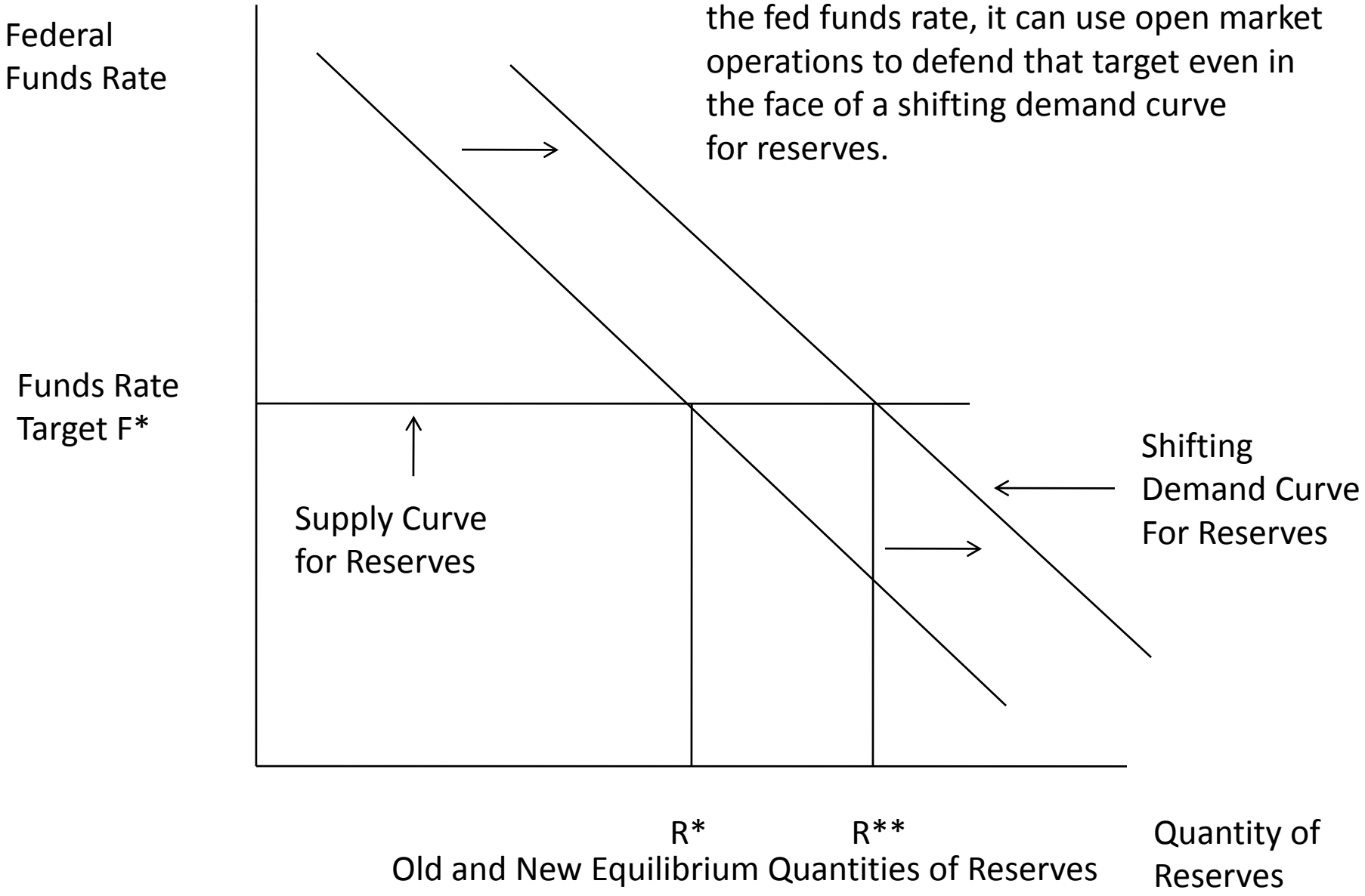
Graph 2: When the Fed sets a target F* for the fed funds rate, it must supply R* in reserves to support that Target.



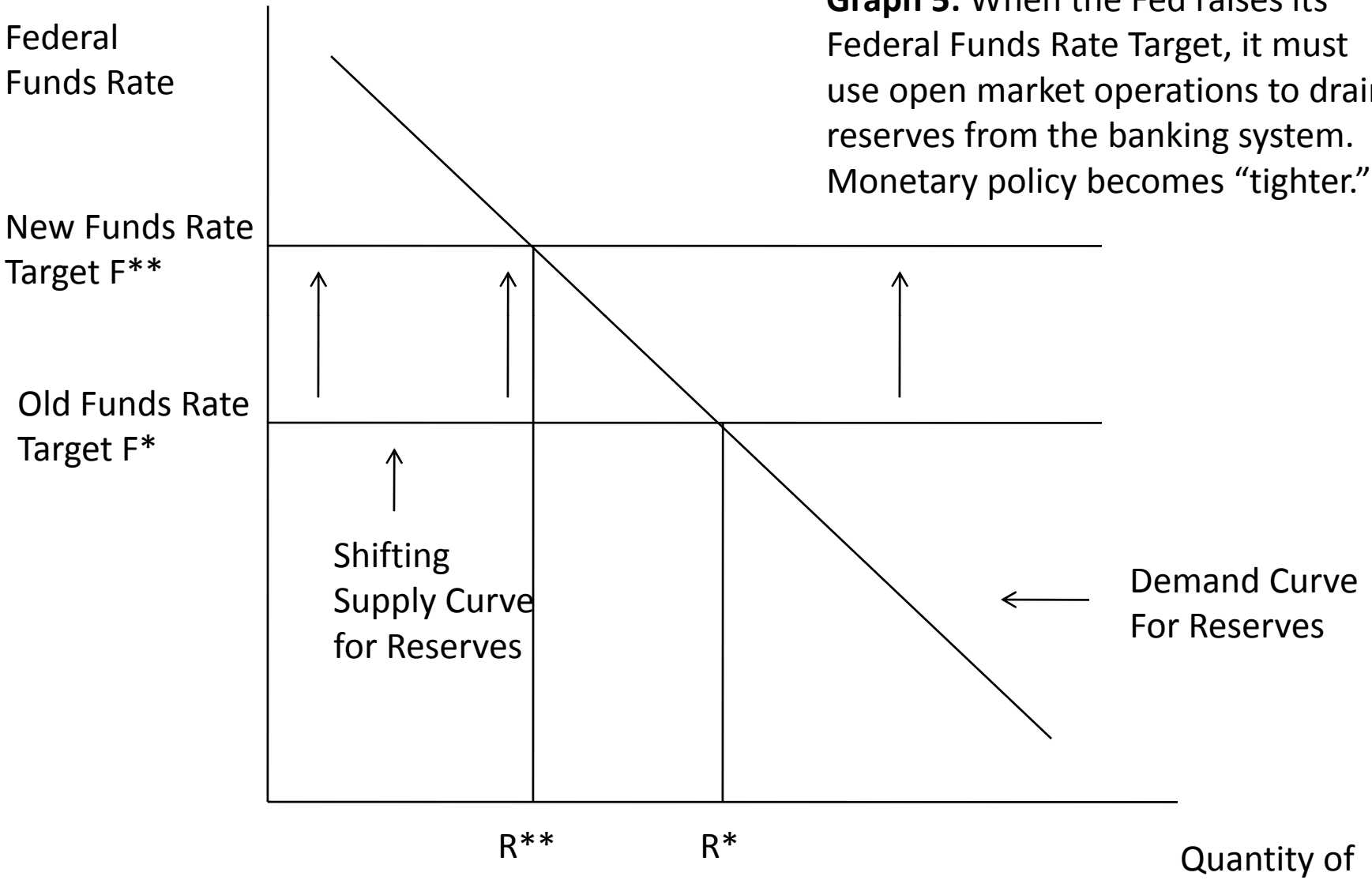


Graph 3: When the Fed sets a target for reserves and the demand curve for reserves shifts, the equilibrium funds rate exhibits volatility.

Graph 4: When the Fed sets a target the fed funds rate, it can use open market operations to defend that target even in the face of a shifting demand curve for reserves.

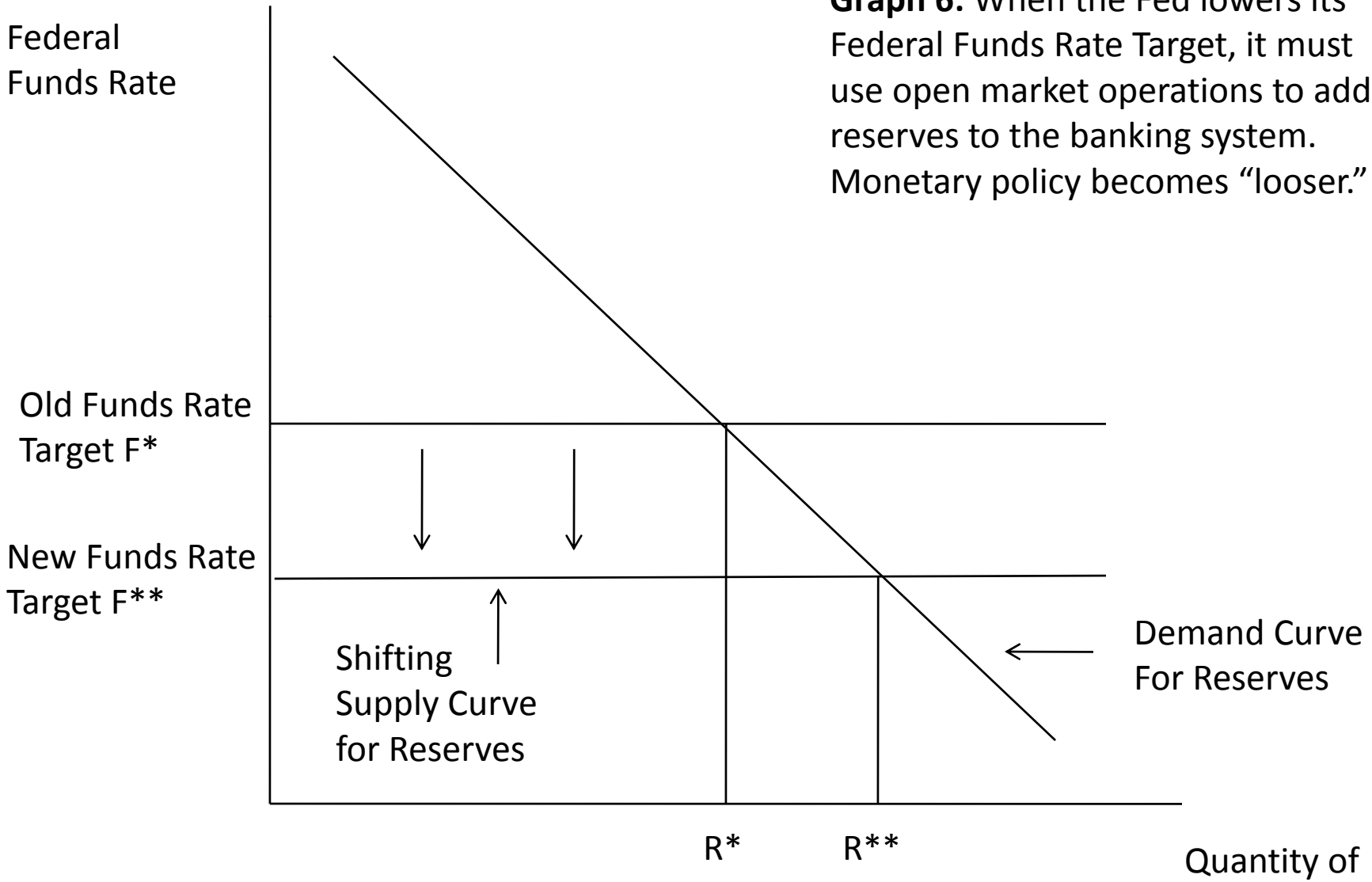


Graph 5: When the Fed raises its Federal Funds Rate Target, it must use open market operations to drain reserves from the banking system. Monetary policy becomes "tighter."



Old and New Equilibrium Quantities of Reserves

Graph 6: When the Fed lowers its Federal Funds Rate Target, it must use open market operations to add reserves to the banking system. Monetary policy becomes "looser."



Old and New Equilibrium Quantities of Reserves

Ch 30 Money Growth and Inflation

Introduction

Remember our previous example from Chapter 23, "Measuring the Cost of Living." In 1931, the Yankees paid Babe Ruth an annual salary of $80,000. But then again, in 1931, an ice cream cone cost a nickel and a movie ticket cost a quarter.

The overall increase in the level of prices, as measured by the CPI or the GDP deflator, is called **inflation**.

Although at least some inflation seems inevitable today, in the 19th century many economies experienced long periods of falling prices, or **deflation**.

And even in the more recent past, there have been wide variations in the inflation rate: from rates exceeding 7 percent per year in the 1970s to the current rate of about 2 percent per year.

Also, in some countries during some periods, extremely high rates of inflation have been experienced. In Germany after World War I, for instance, the price of a newspaper rose from 0.3 marks in January 1921 to 70,000,000 marks less than two years later. These episodes of extremely high inflation are called **hyperinflations**.

But exactly what economic forces produce inflation, and lead to variations in the rate of inflation?

An economic theory called the **quantity theory of money** indicates that excess money creation is the underlying cause of inflation. Interestingly, the 18th century Scottish philosopher David Hume was one of the first to formulate a version of the quantity theory of money. A more recent proponent was Milton Friedman.

After developing the quantity theory of money to explain inflation, this chapter goes on to identify the costs that inflation, particularly very high rates of inflation, impose on the economy.

Outline

1. The Classical Theory of Inflation
   A. The Level of Prices and the Value of Money
   B. Money Supply, Money Demand, and Monetary Equilibrium
   C. The Effects of a Monetary Injection
   D. A Brief Look at the Adjustment Process
   E. The Classical Dichotomy and Monetary Neutrality
   F. Velocity and the Quantity Equation
   G. The Inflation Tax
   H. The Fisher Effect
2. The Costs of Inflation

A. A Fall in Purchasing Power?
B. Shoeleather Costs
C. Menu Costs
D. Relative Price Variability
E. Inflation-Induced Tax Distortions
F. Confusion and Inconvenience
G. Arbitrary Redistributions of Wealth

The Classical Theory of Inflation

The quantity theory is often called the **classical theory of inflation**, because it can be traced back to Hume and other early writers on economics.

The Level of Prices and the Value of Money

We've already observed that, for example, an ice cream cone costs a lot more today than it did in the 1930s:

- Is this because ice cream cones are so much better today, that people are willing to pay more for them? Probably not.
- More likely, the rise in the price of an ice cream cone indicates that dollars have become less valuable, not that ice cream cones have become more valuable.
- In essence, that's what the quantity theory is all about: the value of money as opposed to the value of goods.

To make this idea concrete, let *P* denote the price level, as measured by the CPI or the GDP deflator:

P = number of dollars needed to purchase a basket of goods and services

$$P = \frac{dollars}{baskets\ of\ goods}$$

Now flip the reasoning around:

$$\frac{1}{P} = \frac{baskets\ of\ goods}{dollars}$$

1/*P* = number of baskets of goods required to "purchase" a dollar

This last equation highlights that inflation, an increase in *P*, represents a *decline* in the value of money.

Another way to think about this idea:

- *P* is the "dollar price of goods"
- 1/*P* is the "goods price of a dollar"

Money Supply, Money Demand, and Monetary Equilibrium

Let's build on this idea that 1/*P* measures the goods price of a dollar.

Figure 1 applies standard microeconomic supply-and-demand theory to money:

- The quantity of the good – in this case money – appears on the horizontal axis.
- The price of the good – in this case 1/*P* – appears on the vertical axis.
- The money demand curve slopes downward. There are two ways to think about this:
    - When the price of money rises, the demand for money falls.
    - When the goods price of money 1/*P* rises, the dollar price of goods *P* falls. Since fewer dollars are needed to buy the same number of goods, the demand for money falls.
- The money supply curve is vertical, as the money stock is determined by Federal Reserve policy (and by the response of banks to that policy).
- The goods price of money 1/*P* is determined by the intersection between demand and supply.
- When the goods price of money is below its equilibrium value, there is excess demand for money, putting upward pressure on the goods price of money until equilibrium is restored.
- When the goods price of money is above its equilibrium value, there is excess supply of money, putting downward pressure on the goods price of money until equilibrium is restored.
- Translate the goods price of money 1/*P* back into the money price of goods *P*, and the same theory determines the price level.

The Effects of a Monetary Injection

Figure 2 illustrates what happens when the Fed acts to increase the money supply, either by

- Using open market operations to increase the supply of reserves to the banking system, which then increases the money supply working through the money multiplier, or
- Lowering its target for the federal funds rate, which requires it to use open market operations to increase the supply of reserves to the banking system.

When the supply curve shifts, a new equilibrium occurs at a lower goods price of money 1/*P* and hence a higher price level *P*.

The upshot is that inflation, a rising price level, is associated with a policy of money creation.

This theory is called the **quantity theory of money**, as it asserts that the quantity of money available determines the price level and the growth rate of money available determines the inflation rate.

A Brief Look at the Adjustment Process

Figure 2 can also be used to think about the process through which money creation leads to a higher level of prices.

Suppose again that the money supply curve shifts, reflecting an increase in the money supply.

- If 1/*P* does not change, there is an excess supply of money. In other words, people find themselves with more money than they need.

- Some people will use the extra money to buy more goods and services. This causes the money price of goods *P* to increase, and the goods price of money 1/*P* to fall.
- Other people will deposit the extra money in the bank. But then the bank will lend the money to a borrower who wants to buy more goods and services. Again, *P* will rise and 1/*P* will fall.
- This process will continue until monetary equilibrium is restored at a higher price level.

The Classical Dichotomy and Monetary Neutrality

The quantity theory of money describes how changes in the money supply affect the price level. But how do those changes affect other economic variables, like GDP, unemployment, and interest rates?

David Hume and his contemporaries suggested that economic variables be divided into two groups.

1. **Nominal variables** that are measured in units of money (monetary units).
2. **Real variables** that are measured in units of goods (physical units).

According to this classification, for example:

- Nominal GDP is a nominal variable because it measures the dollar value of an economy's output of goods and services.
- Real GDP is a real variable because it measures the value of an economy's output of goods and services correcting for inflation, that is, eliminating the effects of changes in the value of money.
- The CPI is a nominal variable because it measures the number of dollars that are required to purchase a basket of goods and services.
- The unemployment rate is a real variable because it measures the percentage of the labor force that is unemployed.

This theoretical separation of nominal and real variables is called the **classical dichotomy**.

The quantity theory of money implies that changes in the money supply affect nominal variables.

The theory of **monetary neutrality** goes a step further, and says that changes in the money supply do *not* affect real variables.

Hume's thought experiment:

- Suppose that the money supply doubles from $100 million to $200 million.
- Everybody has twice as much money, but the ability to produce goods and services has not changed.
- Introspection suggests that the overall price level *P* should double, leaving output and all other real variables unchanged.
- An analogy: suppose that the definition of a foot was changed from 12 inches to 6 inches. Would this make everyone twice as tall? No! Everyone would physically be the same height as before, but their height when measured in feet would be twice as big.
- Similarly, when the government doubles the money supply, the physical quantity of goods produced would be the same as before, but prices measured in dollars would all be twice as big.

Hume conceded that it might take time for the price level to fully adjust to a change in the money supply. Today, most economists agree that the adjustment process takes time.

But Hume and most economists today also agree that in the long run, monetary neutrality holds true.

Velocity and the Quantity Equation

A complementary perspective on the quantity theory of money builds on the idea of the **velocity of money**, defined as the rate at which money changes hands, as measured by the number of times each dollar in the economy gets spent during a year.

Mathematically, the velocity of money *V* is defined as

$$V = (P \times Y)/M$$

Where *Y* is real GDP, *P* is the GDP deflator, *P* x *Y* is nominal GDP – recall that nominal GDP measures the dollar value of expenditures in the economy as a whole, and *M* is the quantity of money.

Example:

- Suppose that an economy produces only a single good, pizza.
- The economy produces 100 pizzas per year, so that *Y* = 100.
- Each pizza costs $10, so that *P* = 10.
- The quantity of money is $50, so that *P* = 50.
- In math, *V* = (*P* x *Y*)/*M* = (10 x 100)/50 = 1000/50 = 20.
- In words, total spending is $10 x 100 = $1000. But the money is $50. So each dollar has to be spent 1000/50 = 20 times.

Rearranging the equation defining the velocity of money leads to the so-called **quantity equation**:

$$M \times V = P \times Y$$

Figure 3 plots the money supply *M*, nominal GDP *P* x *Y*, and velocity *V* in the US since 1960:

- Velocity *V* has remained relatively stable.
- Hence, long-run increase in *M* has been paralleled by a long-run increase in nominal GDP.

In terms of the quantity equation, the quantity theory of money and the closely related idea of monetary neutrality can be stated as:

1. The velocity of money *V* is relatively stable over time.
2. Because velocity is stable, an increase in the money supply *M* leads to an increase in nominal GDP *P* x *Y*.
3. The increase in *M* does not affect real GDP *Y* in the long run, because the economy's output of goods and services *Y* is primarily determined by the availability of factors of production (labor, physical capital, human capital, and natural resources) and by the stock of technological knowledge (recall our analysis from Chapter 24).

4. Hence, in the long run, the increase in nominal GDP brought about by an increase in the quantity of money is reflected in the price level *P* rather than real output *Y*.
5. And so, when the central bank increases the money supply, the result is inflation.

Figure 4 shows the behavior of money supplies and inflation rates during four periods of hyperinflation.

- In all four cases, price levels rose dramatically in tandem with money supplies.
- And in all four cases, when the extreme growth in the money supply ended, so did the hyperinflation.
- Analysis of these extreme historical cases bolstered economists' confidence in the quantity theory of money.

The Inflation Tax

Why do some economies experience hyperinflation?

Almost always, it is because the government needs to raise revenue to finance spending, but for political reasons cannot obtain that revenue through standard income taxation. Hence, it must pay for the goods and services it purchases not with existing money collected through taxes, but instead using newly-created money.

Since money creation leads to inflation, the **inflation tax** refers to the revenue that the government raises through money creation.

Historically, many cases of hyperinflation occur during or after a war, when the government is in need of large amounts of revenue to finance high levels of spending, and may not have the ability to raise this revenue through standard income taxation. All of the hyperinflations shown in Figure 4, for example, occurred in the aftermath of World War I.

The Fisher Effect

Another application of the classical dichotomy is to interest rates:

- The **nominal interest rate** is the interest rate measured without correcting for inflation.
- The **real interest rate** is the interest rate measured after correction for inflation.

Recall from Chapter 24 that mathematically,

Real Interest Rate = Nominal Interest rate – Inflation Rate

Example:

- A bank pays interest at the rate of 7 percent per year.
- You deposit $100 today, and have $107 at the end of one year.
- But the inflation rate is 3 percent, so your money next year buys 3 percent less.
- Your real, or inflation-adjusted, return, is 7 percent – 3 percent = 4 percent.

We can rearrange this equation to read

Nominal Interest Rate = Real Interest Rate + Inflation Rate

Under monetary neutrality, an increase in the rate of money growth will increase the rate of inflation, but leave the real interest rate unchanged.

Hence, under monetary neutrality, an increase in the rate of money growth will lead to a higher nominal interest rate as well as a higher rate of inflation.

This application of monetary neutrality to interest rates is associated with the economist Irving Fisher, and the predicted association of the nominal interest rate and the inflation rate is called the **Fisher effect**.

Figure 5 plots the inflation rate and the nominal interest rate in the US economy since 1960. Note that these two variables move together, providing evidence for the Fisher effect.

The Costs of Inflation

Generally, economists and non-economists alike believe that inflation is costly for the economy. But why?

A Fall in Purchasing Power?

Many people dislike inflation because they believe it erodes the purchasing power of their income.

What this argument fails to recognize is that while inflation leads to an increase in the dollar prices of goods and services, it also leads to an increase in nominal (dollar-denominated) wages and incomes.

Real (inflation-adjusted) wages and incomes should, according to the principle of monetary neutrality, remain unaffected.

This argument would appear to be a fallacy, so long as monetary neutrality holds.

Shoeleather Costs

But inflation does erode the value of money that each person holds in his or her wallet.

Thus, when inflation rises, people make greater efforts to reduce the amounts of money that they hold, for example, by going to the bank or the ATM more often, but withdrawing smaller amounts each time.

The costs that are associated with these efforts are called **shoeleather costs**, based on the imagery of someone wearing out his or her shoes walking to the bank more often.

Generally, under moderate rates of inflation like those currently prevailing in the US, shoeleather costs appear small – maybe even trivial.

But these costs can be substantial during episodes of hyperinflation.

- During the Bolivian hyperinflation of 1985, prices rose at an annual rate of 38,000 percent.

- This translates into a *daily* rate of inflation of about 1.65 percent. Over the course of a week, money loses 12 percent of its value.
- As soon as people received their paychecks, they rushed to either spend the money or convert pesos into US dollars.

Menu Costs

Menu costs refer to the costs that firms incur when changing their prices, based on the imagery of a restaurant having to print up new menus.

Again, these costs appear quite small under modest rates of inflation, but get much bigger as inflation rises.

Relative Price Variability and the Misallocation of Resources

Building on the menu cost story, suppose that a restaurant prints new menus with new prices once per year, while the economy experiences continual inflation throughout the year.

At the beginning of the year, just after the new menus have been printed, the restaurant's prices are high relative to the overall price level. But, as the price level rises because of inflation, the restaurant's relative prices decline.

But these changes in prices have nothing to do with changes in the costs of preparing and serving food.

In this example, inflation interferes with the market's ability to use prices to efficiently allocate scarce resources.

Inflation Induced Tax Distortions

While all of the costs mentioned so far appear to be minor in a low-inflation economy like the US, costs relating to the operation of the tax system may be more important.

Table 1 illustrates an example of how inflation interacts with the tax system.

- Consider two economies, one in which the inflation rate is zero and the other in which the inflation rate is 8 percent.
- In both economies, the real interest rate is 4 percent.
- The differences in interest rates lead, through the Fisher effect, to differences in nominal interest rates. With zero inflation, the nominal interest rate is 4 percent, but with 8 percent inflation, the nominal interest rate is 12 percent.
- Suppose that interest income is taxed at the rate of 25 percent.
    - This means that with a 4 percent *before tax* interest rate, the saver pays 1 percent in taxes.
    - But with a 12 percent *before tax* interest rate, the saver pays 3 percent in taxes.
- With zero inflation, the *after tax* real return to saving is 3 percent.
- But with 8 percent inflation, the *after tax* return is just 1 percent.

Hence, saving may be much lower in the economy with 8 percent inflation.

Confusion and Inconvenience

Recall the analogy used earlier in our discussion of monetary neutrality: in a sense, a doubling of the money supply and a corresponding doubling of the price level is like changing the definition of a foot from 12 inches to 6 inches.

If the definition of a foot, or a pound, or a mile were continually changed, it would be confusing and inconvenient to make comparisons over time.

Extending the analogy, the same might be said about the effects of inflation.

Arbitrary Redistributions of Wealth

Suppose that you take out a 30-year mortgage at 7 percent interest, expecting the inflation rate to be 3 percent.

The real interest rate that you are paying is 4 percent.

But now suppose that unexpectedly, inflation turns out to be 1 percent.

Now the real interest rate that you are paying is 6 percent – considerably higher. The bank wins, but you lose.

On the other hand, if inflation turns out to be 5 percent, the real interest rate you pay is only 2 percent. You win, but the bank loses.

Unexpected changes in inflation lead to redistributions of wealth across borrowers and lenders. On net the effects cancel out, but before knowing who wins and who loses, everyone might object to the arbitrariness of these potential redistributions.

Conclusions

Both theory and evidence points to excessive money growth as the principal cause of inflation.

Many sources of the costs of inflation appear trivial when inflation is low, but become much more significant when inflation is much higher.

However, even at modest rates of inflation, interactions between inflation and the tax code can have negative effects of saving. And even small changes in inflation, if unexpected, can lead to large and arbitrary redistributions of wealth across borrowers and lenders.

Ch 33 Aggregate Demand and Aggregate Supply

Introduction

Typically, increases in the labor force, increases in the capital stock, and advances in technological knowledge allow the economy to produce more and more over time.

But in some years, this normal growth does not occur. These periods of declining incomes and rising unemployment are called **recessions** when they are relatively minor and **depressions** when they are more severe. What causes these short-run fluctuations in economic activity?

This chapter starts by presenting some facts about short-run economic fluctuations and then develops the model of **aggregate demand and aggregate supply** to help explain and understand those facts.

Outline

1. Three Key Facts About Economic Fluctuations
2. Explaining Short-Run Fluctuations
3. The Aggregate Demand Curve
   A. Why the Aggregate Demand Curve Slopes Downward
   B. Why the Aggregate Demand Curve Might Shift
4. The Aggregate Supply Curve
   A. Why the Aggregate Supply Curve is Vertical in the Long Run
   B. Why the Long-Run Aggregate Supply Curve Might Shift
   C. Using Aggregate Demand and Long-Run Aggregate Supply to Depict Long-Run Growth and Inflation
   D. Why the Aggregate Supply Slopes Upward in the Short Run
   E. Why the Short-Run Aggregate Supply Curve Might Shift
5. Two Causes of Economic Fluctuations
   A. The Effects of a Shift in Aggregate Demand
   B. The Effects of a Shift in Aggregate Supply

Three Key Facts About Economic Fluctuations

Fact 1: Economic Fluctuations are Irregular and Unpredictable

Fluctuations in economic activity are often called the **business cycle**. But this term is somewhat misleading, since these fluctuations do not follow a regular and predictable pattern.

Panel (a) of Figure 1 shows that recessions are sometimes close together, as in 1980 and 1982, but sometimes farther apart, as with 1991 and 2001.

Fact 2: Most Macroeconomic Quantities Fluctuate Together

Although real GDP is the variable that is most commonly used to monitor the economy, other variables also fluctuate along with GDP: corporate profits, investment, consumption, retail sales, home sales, etc.

But some variables fluctuate more than others. Panel (b) of Figure 1 shows that investment spending, in particular, tends to fluctuate widely. Even though investment averages only about one-seventh of GDP, its fluctuations account for about two-thirds of the decline in GDP that takes place during recessions.

Fact 3: As Output Falls, Unemployment Rises

Panel (c) of Figure 1 shows that the unemployment rate rises considerably during recessions.

When the recession ends and real GDP begins to grow again, the unemployment declines.

But notice that the unemployment rate never falls to zero; instead, it fluctuates around its natural rate of 5 or 6 percent.

Explaining Short-Run Economic Fluctuations

The Assumptions of Classical Economics

Recall that the **classical dichotomy** is the separation of economic variables into **real variables**, which are measured in units of physical quantities, and **nominal variables**, which are measured in units of money.

According to classical macroeconomic theory, changes in the money supply affect nominal variables but not real variables.

The classical idea of monetary neutrality allows us to study the determination of real variables, like output and unemployment, separately from the determination of nominal variables, like inflation.

The Reality of Short-Run Fluctuations

Most economists believe that monetary neutrality holds in the long run but not in the short run, and hence that changes in the money supply do have short-run effects.

Even the classical economists, like David Hume, observed that changes in the money supply appear to affect output and employment in the short run.

The Model of Aggregate Demand and Supply

The model of **aggregate demand and aggregate supply** is used by economists to explain short-run fluctuations in economic activity around its long-run trend.

The model focuses on the behavior of two variables:

- The economy's quantity of output, which can be measured by real GDP.

- The economy's price level, which can be measured by the CPI or the GDP deflator.

Since the first of these two variables is a real variable and the second a nominal variable, the model departs from the classical assumptions that allow these variables to be considered separately.

Figure 2 illustrates the model.

- The downward-sloping **aggregate demand curve** shows the quantity of goods and services that households, firms, the government, and customers abroad want to buy at each price level.
- The upward-sloping **aggregate supply curve** shows the quantity of goods and services that firms choose to produce at each price level.

But where do these curves come from, and why do they have the slopes shown in Figure 2?

The Aggregate Demand Curve

In figure 2 and again in figure 3, the aggregate demand curve slopes down, indicating that as the price level falls, the quantity of goods and services demand rises.

Why the Aggregate Demand Curve Slopes Downward

Recall that an economy's GDP (*Y*) can be decomposed into four components: consumption (*C*), investment (*I*), government purchases (*G*), and net exports (*NX*):

$$Y = C + I + G + NX$$

For now, let's take *G* as being fixed by government policy, independent of the price level.

Why might the demand for consumption, investment, and net exports fall as the price level rises?

The Price Level and Consumption: The Wealth Effect

Some of the wealth that individuals possess is held in nominal form: as money in their wallets or in the bank.

When the price level falls, the real value of this wealth – that is, its value in terms of the goods it can purchase – rises. This increase in wealth increases consumer spending, and hence also increases the quantity of goods and services demanded.

Conversely, when the price level rises, the real value of monetary wealth falls, leading to a decrease in consumer spending and the quantity of goods and services demanded.

The Price Level and Investment: The Interest Rate Effect

When the price level falls, the real value of each consumer's money holdings rises.

In response, some consumers will attempt to reduce their money holdings by purchasing more bonds.

As they do so, the interest rate on these bonds will fall.

And when interest rates fall, firms will become more willing to borrow to finance new investment projects.

Conversely, when the price level rises, the real value of each consumer's money holdings falls. In response, some households will try to acquire more money by selling bonds. As they do, the interest rate of these bonds will rise. And, as the interest rate rises, firms will become less willing to borrow to finance new investment projects.

Hence, as the price level falls, the demand for investment goods rises; and as the price level rises, the demand for investment goods falls.

Note, too, that this interest effect can also impact on household's purchases of consumer durables, which may be bought on credit.

The Price Level and Net Exports: The Exchange Rate Effect

When the price level falls in the US, the US interest rate falls as well.

This makes US bonds less attractive to investors, both in the US and overseas. As these investors turn to other countries' bonds as alternative, higher-yielding investments, they will sell dollars and buy foreign currencies.

As a result, the US dollar **depreciates**, that is, its value in terms of foreign currencies falls. Since each dollar buys fewer units of foreign currencies, foreign goods become more expensive than US goods.

This change in relative prices affects spending both in the US and abroad. US consumers buy fewer goods from abroad, and foreign consumers buy more US goods.

Both of these changes cause net exports to rise.

Conversely, when the US price level rises, the US interest rate rises as well. Since US bonds become more attractive to international investors, they buy dollars and sell foreign currencies. Hence, the US dollar **appreciates**, that is, its value in terms of foreign currencies rises. Since each dollar buys more units of foreign currencies, foreign goods become less expensive than US goods. This change in relative prices makes US consumers buy more goods from abroad and foreign consumers buy fewer US goods. Both of these changes cause net exports to fall.

Hence, as the price level falls, net exports rise; and as the price level rises, net exports fall.

Why the Aggregate Demand Curve Might Shift

Shifts Arising from Changes in Consumption

If consumers become more concerned about saving for retirement, they will reduce their demand for goods and services at any given price level. The aggregate demand curve shifts left.

If consumers feel wealthier because the stock market rises, they will increase their demand for goods and services at any given price level. The aggregate demand curve shifts right.

When the government cuts taxes, consumers have more after-tax income to spend. They will increase their demand for goods and services at any given price level. The aggregate demand curve shifts right.

Shifts Arising from Changes in Investment

If firms become more optimistic about future business conditions, they will want to invest more at any given price level. The aggregate demand curve shifts right.

An investment tax credit, that is a tax rebate that is tied to firms' investment decisions, will also make firms want to invest more at any given price level. Again, the aggregate demand curve will shift right.

As we will see in the next chapter, an increase in the money supply tends to lower the interest rate, again making firms want to invest more at any given price level and shifting the aggregate demand curve to the right.

Conversely, a decrease in the money supply raises the interest rate, making firms want to invest less at any given price level and shifting the aggregate demand curve to the left.

Shifts Arising from Changes in Government Purchases

The most direct way for government policy to shift the aggregate demand curve is simply by changing government purchases: an increase in government purchases shifts the aggregate demand curve to the right, and a decrease in government purchases shifts the aggregate demand curve to the left.

Shifts Arising from Changes in Net Exports

When Europe experiences an economic boom, its demand for US exports rises at any given price level. Net exports rise, shifting the aggregate demand curve to the right.

Conversely, when Europe (or any other foreign economy) experiences a recession, the demand for US exports falls, shifting the aggregate demand curve left.

Net exports can also change because of exchange rate movements. Suppose, for instance, that speculators lost confidence in foreign currencies, and purchase US dollars instead. This leads to an appreciation of the dollar, which in turn makes US goods more expensive relative to foreign goods. This depresses net exports and causes a leftward shift in the aggregate demand curve.

The Aggregate Supply Curve

Unlike the aggregate demand curve, which always slopes downward, the aggregate supply curve describes a relationship between output and the price level that depends crucially on the time horizon being considered.

In the long run, the aggregate supply curve is vertical, whereas in the short run, it slopes upward.

Why the Aggregate Supply Curve is Vertical in the Long Run

In the long run, an economy's production of goods and services depends on its supplies of capital, labor, and natural resources as well as its stock of technological knowledge. The long-run neutrality of money

implies that if two countries are identical except that one has a money supply that is twice as large, then the price level in that economy will be twice as large too, but the output of goods and services will be the same.

The way of depicting the classical dichotomy and the neutrality of money in the aggregate demand-aggregate supply model is to draw the aggregate supply curve as vertical in the long run, as shown in figure 4.

Why the Long-Run Aggregate Supply Curve Might Shift

The position of the vertical long-run aggregate supply curve is often called **potential output**, **full employment output**, or the **natural rate of output**. The last term captures the idea that this is the level of output that results when the unemployment rate is at its natural rate, or normal level.

And just as the unemployment rate tends to gravitate towards its natural rate over time, so too will the level of output tend to gravitate towards its natural rate.

Then what causes the aggregate supply curve to shift? Anything that would cause the natural rate of output to change, including:

1. Changes in the supply of labor, due to immigration.
2. Changes in natural rate of unemployment, due to changes in minimum wages, changes in unionization, etc.
3. Changes in the stock of capital, physical or human.
4. Discoveries or depletion of stocks of natural resources.
5. Changes in technological knowledge.

Using Aggregate Demand and Aggregate Supply to Depict Long-Run Growth and Inflation

Figure 5 uses the aggregate demand and aggregate supply model to describe the behavior of output and prices over long periods of time.

The initial aggregate demand curve is downward sloping. The aggregate supply curve is vertical, as the graph focuses on the long run.

In the long run, growth in the labor force and, more importantly, growth in the stocks of capital and technological knowledge shift the aggregate supply curve to the right, as the natural rate of output rises.

If the Federal Reserve keeps the money supply constant, this long-run economic growth will tend to reduce the price level , that is, cause deflation.

But, historically, the Federal Reserve has acted to increase the money supply over long periods of time. This increase in the money supply has shifted the aggregate demand curve to the right, too. Indeed, the money supply has grown at a rate that has caused the aggregate demand curve to shift rightward at a pace that is associated with inflation.

Why the Aggregate Supply Curve Slopes Upward in the Short Run

Most economists believe in the long-run neutrality of money, but also believe that changes in money or other nominal variables are associated with changes in output, employment, and other real variables in the short run.

That is, most economists believe that while the long-run aggregate supply curve is vertical, the short-run aggregate supply curve is upward sloping, as shown in figure 6.

The upward-sloping short-run aggregate supply curve implies that the quantity of output supplied deviates from its natural rate when the actual price level in the economy deviates from the price level that most people expect to prevail:

- When prices rise above the level that people expect, output rises above its natural rate.
- When prices fall below the level that people expect, output falls below its natural rate.

Economists have devised several explanations for the upward-sloping short-run aggregate supply curve.

Sticky Wage Theory

As its name suggests, sticky wage theory posits that wages are slow to adjust to changing economic conditions, either because workers and firms sign long-term contracts or because wage-setting conventions make it difficult for firms to rapidly adjust the wages they pay.

An example best illustrates how the theory works:

- Suppose that one year ago, a firm expected the price level *P* to equal 100, and based on this expectation, agreed to pay its workers $20 per hour.
- Now suppose that, instead, the price level turns out to be *P* = 105.
- In the long run, the firm will have to pay its workers higher wages to compensate them for the higher cost of living, but in the short run the wages it pays are, in real terms (that is, in units of output), “too low.”
- Since the firm can hire workers at relatively low wages, it hires more and produces more output.
- The unexpectedly high price level leads to an increase in output above its natural rate.
- And the same story works in reverse: if the price level turns out to be unexpectedly low, real wages rise in the short run, leading firms to hire fewer workers and produce less.

Sticky Price Theory

Sticky price theory emphasizes, instead, that the prices of certain goods and services are slow to adjust to changing economic conditions.

This theory uses the metaphor of **menu costs:** a restaurant may print up new menus, with new prices, only once or twice per year. In the short run, its prices are fixed even if economic conditions change.

Menus and mail order catalogs provide literal examples of menu costs to changing prices. But other prices may be slow to change because of managerial costs. For example, executives at Dunkin Donuts

may decide at the beginning of the year that $1.49 is the "right price" to charge for a cup of coffee. They may meet again later in the year to reconsider the pricing decision, but until then the price stays fixed.

So suppose that Dunkin Donuts sets its price at $1.49 but the price level, reflecting mainly the prices of other goods and services, turns out to be unexpectedly high. A cup of coffee now looks "cheap" to consumers. More will visit Dunkin Donuts and buy coffee. Dunkin Donuts will hire more workers and produce more output. Hence, the unexpectedly high price level leads to an increase in output above its natural rate.

And the same story works in reverse: if the price level turns out to be unexpectedly low, a cup of coffee with a "sticky" price of $1.49 will look expensive. People will buy less; Dunkin Donuts will hire fewer workers and produce less. The unexpectedly low price level leads to a decrease in output below its natural rate.

But, like sticky wage theory, sticky price theory also suggests that in the long run, prices will adjust and output will return to its natural rate.

Misperceptions Theory

A third story to explain the upward-sloping short-run aggregate supply curve is the misperceptions theory.

Another example illustrates how this theory works:

- Suppose, at the beginning of the year, everyone expects the price level *P* to equal 100.
- But instead, the price level rises to *P* = 110.
- This means that, on average, the prices of *all* goods and services have risen by 10 percent.
- In the short-run, however, individual firms may mistakenly believe that it is really just the price of their particular good that is rising.
- Believing that it is an especially good time to produce, those firms will hire more workers.
- As a result, the unexpectedly high price level will lead to an increase in output above its natural rate.
- Conversely, if the price level unexpected falls, each individual firm might mistakenly believe that it is really just the price of its own output that is falling. The firm will hire fewer workers. The unexpectedly low price will lead to a decrease in output below its natural rate.

Summary

Although some economists debate over which of these three theories – sticky wages, sticky prices, or misperceptions – comes closest to describing actual economies, there is probably an element of truth in each of them. And they are not mutually inconsistent, that is, they could all work together to describe why the aggregate supply curve slopes upward.

And all three imply a short-run relationship of the form:

$$Quantity\ of\ Output\ Supplied = Natural\ Rate\ of\ Output + a(Actual\ Price\ Level - Expected\ Price\ Level)$$

Where *a* is a number that governs the extent to which actual output responds to unexpected changes in the price level.

Note that this same equation – and each of the three theories – also captures the idea that in the long run, after expectations have shifted to recognize actual changes in the price level, the long-run aggregate supply curve is vertical.

Why the Short-Run Aggregate Supply Curve Might Shift

The equation from above also allows us to identify factors that will shift the short-run aggregate supply curve:

1. Anything that shifts the natural rate of output (and hence the long-run aggregate supply curve).
2. Changes in the expected price level.

The equation indicates that an increase in the expected price level causes the quantity of output supplied at any given actual price level to decrease. How?

Consider the answer given by sticky wage theory:

- If the expected price level increases, firms will set higher wages to compensate workers for the higher cost of living.
- But, if the actual price level is held constant, this means higher real wages.
- Firms will hire fewer workers, and produce less output, at the given price level.
- The short-run aggregate supply curve shifts to the left.
- Conversely, if the expected price level falls, firms will be able to set lower wages, hire more workers, and produce more output, all at any given price level. The short-run aggregate supply curve shifts to the right.

Can you give the answers as they would be provided by the sticky price and misperceptions theories?

Two Causes of Economic Fluctuations

Figure 7 depicts in the economy in its long-run equilibrium:

- Aggregate demand intersects with long-run aggregate supply, determining output and the price level.
- But here, the short-run aggregate supply passes through the equilibrium point as well, indicating that the expected price level has adjusted to this long-run equilibrium as well.

From this starting point, we can consider the effects of forces that shift either aggregate demand or aggregate supply, according to these four steps:

1. Decide whether the event shifts the aggregate demand curve, the aggregate supply curve, or both.
2. Decide in which direction the curve shifts.

3. Use the aggregate demand and aggregate supply diagram to see how output and the price level change in the short run.
4. Use the same diagram to see how output and the price level change in the long run.

The Effects of a Shift in Aggregate Demand

Let's consider a specific example: a wave of pessimism hits the economy, because of a political scandal or a stock market crash. What happens to the economy as a result?

1. Since the wave of pessimism affects spending plans, it shifts the aggregate demand curve.
2. Because households and firms want to buy a smaller quantity of goods at a given price level, the aggregate demand curve shifts left.
3. Figure 8 shows that in the short run this leftward shift of aggregate demand causes output to fall below its natural rate. The price level falls as well. (Can you tell the specific stories implied by sticky wage, sticky price, and misperceptions theories?) We have now moved from point A to point B in figure 8.
4. As time passes, however, the expected price level will also fall. This shifts the aggregate supply curve to the right (again, can you tell the specific stories implied by sticky wage, sticky price, and misperceptions theories?). Now we move to point C in figure 8: the price level falls still further, but output returns to its natural rate.

In this example, we implicitly assumed that the government does not respond to any of these events. Another possibility is that the Federal Reserve could respond to the initial fall in aggregate demand by increasing the money supply:

- As discussed earlier, and in more detail in the next chapter, an increase in the money supply will shift the aggregate demand curve to the right, offsetting the initial leftward shift.
- In this case, the economy can move back to its initial long-run equilibrium point A without a shift in the expected price level and without a shift in aggregate supply.

Figure 9 shows changes in real GDP in the US since 1900. Two large swings stand out: the decline in GDP during the Great Depression and the growth in GDP during World War II.

Most economists now blame the Great Depression on a large decline in the money supply.

- From 1929 to 1933, the money supply fell by 28 percent.
- To a large extent, this decline in the money supply was the result of bank failures, which lead to a contraction of the money multiplier.
- A decline in the money supply causes the aggregate demand curve to shift to the left.
- In the short run, output falls as does the price level.
- Eventually, expectations adjust to the lower price level. The aggregate supply curve shifts to the right. The price level falls further, but output returns to its natural rate.

During World War II, government (military) spending rose dramatically.

- An increase in government purchases causes the aggregate demand curve to shift to the right.

- In the short run, output rises as does the price level.
- In the long run, the expected price level also rises. The aggregate supply curve shifts to the left. The price level rises further, but output returns to its natural rate.

The US economy also experienced a recession during 2001, most likely due to shifts in aggregate demand:

- Between August 2000 and August 2001, stock prices fell by about 25 percent.
- A fall in stock prices shifts aggregate demand to the left.
- Then in September 2001, terrorist attacks hit New York and Washington.
- Increased pessimism and uncertainty brought about by the attacks also shift the aggregate demand curve to the left.
- But the Federal Reserve responded by cutting interest rates, which as we discussed previously involves an increase in the money supply. Also, Congress responded by cutting taxes. All of these policy decisions work to shift aggregate demand back to the right.

Let's consider one final example. What happens when the Federal Reserve just decides to increase the money supply?

- Again, an increase in the money supply will shift the aggregate demand curve to right.
- Output increases in the short run, as does the price level.
- But, in the long run, the expected price level will rise as well, shifting the aggregate supply curve to the left. Output returns to its natural rate, but the price level is permanently higher.
- This example illustrates how the aggregate demand and aggregate supply model reconciles the short and long-run effects of monetary policy.

The Effects of a Shift in Aggregate Supply

Let's suppose again that the economy starts out in its long run equilibrium, in which aggregate demand, long-run aggregate supply, and short-run aggregate supply all intersect.

Now suppose that there is a disruption to worldwide oil supplies. What happens to the economy as a result?

1. Because the availability of natural resources affects firms' ability to produce goods, the aggregate supply curve shifts.
2. Because the reduction in oil supplies makes it more difficult and costly for firms to produce goods, the aggregate supply curve shifts to the left.
3. Figure 10 shows that in the short run, output falls and the price level rises. The economy experiences **stagflation**: stagnation of economic growth and inflation.
4. Assuming that oil supplies are eventually restored in full, however, the long-run aggregate supply curve remains fixed. Instead, as oil supplies come back, the short-run aggregate supply curve will shift back to its original position.

This example assumes that government policymakers do not respond to the oil supply shock.

- Figure 11 shows what happens when, instead, the Federal Reserve expands the money supply or Congress increases government spending in an attempt to counteract the short-run decline in output.
- Now, in the short run, the aggregate demand curves to the right. If the monetary and/or fiscal stimulus to demand is sufficiently strong, the government can bring output back to its natural rate even in the short run.
- But, as the figure shows, this comes at the cost of making the inflation even worse.
- In cases like this one, the government is said to **accommodate** the shift in aggregate supply, accepting a permanently higher price level in order to insulate output and employment from the effects of the shift in aggregate supply.

Ch 34 The Influence of Monetary and Fiscal Policy on Aggregate Demand

Introduction

We've already considered several examples in which monetary policy (changes in the money supply) or fiscal policy (changes in government spending or tax rates) have been used to affect aggregate demand.

This chapter considers the effects of monetary and fiscal policy on aggregate demand in more detail:

1. It presents the theory of **liquidity preference**, to explain in more detail how changes in the money supply affect aggregate demand.
2. It then discusses the **multiplier effect** and the **crowding out effect**, which describe in more detail how changes in government purchases affect aggregate demand.
3. Finally, it considers some arguments for and against using monetary and fiscal policies as tools to stabilize the economy, that is, to counteract business cycle fluctuations.

Outline

1. How Monetary Policy Influences Aggregate Demand
2. How Fiscal Policy Influences Aggregate Demand
3. Using Policy to Stabilize the Economy

How Monetary Policy Influences Aggregate Demand

Recall that there are three reasons why the aggregate demand curve slopes downward:

1. The **wealth effect**, through which a lower price level increases the real value of households' money holdings, raising wealth and therefore consumer spending.
2. The **interest rate effect**, through which, after a decline in the price level, some consumers use their excess real money holdings to buy more bonds, putting downward pressure on interest rates and stimulating investment.
3. The **exchange rate effect**, through which the lower interest rate induces international investors to move funds from US bonds into foreign bonds. As they do so, they sell dollars and buy foreign currencies, causing the dollar to depreciate. Since the weaker dollar makes US produced goods less expensive than foreign goods, net exports rise.

Most economists believe that of these three effects:

1. The wealth effect is small, because money holdings are only a small component of household wealth.

2. The exchange rate effect is more significant, but still small, because exports and imports represent a relatively small fraction of US GDP.
3. Hence, the interest rate effect is the most important.

The **theory of liquidity preference** sheds additional light on how the interest rate effect works and also how, in particular, an increase in the money supply causes the interest rate to fall, shifting the aggregate demand curve.

The Theory of Liquidity Preference

The theory of liquidity preference was developed by the economist John Maynard Keynes in order to understand how the economy's interest rate is determined.

In particular, Keynes' theory explains how the interest rate gets determined to balance the supply of and demand for money.

Recall from our previous analyses that the real and nominal interest rates are related via

$$Real\ Interest\ Rate = Nominal\ Interest\ Rate - Inflation\ Rate$$

Keynes' theory assumes that the inflation rate is held constant. It thereby serves to explain movements in both real and nominal interest rates.

Money Supply

Previously, we discussed how Federal Reserve policy influences the money supply by conducting open market operations. In practice,

- The Fed may set a target for reserves, and use open market operations to hit that target, in which case the money supply then gets determined via the money multiplier.
- Or the Fed may set a target for the federal funds rate, in which case it must use open market operations so that the quantity of reserves is consistent with its funds rate target. Then, in this case too, the money supply gets determined via the money multiplier.

Now, for simplicity, let's abstract from these complications and just assume that the Fed controls the money supply directly.

Under this assumption, the money supply curve is vertical in figure 1.

Money Demand

Recall that **liquidity** refers to the ease with which any given asset can be converted into the economy's medium of exchange.

By definition, then, money is the most liquid asset.

But, money held as currency does not pay interest.

And money held as checking deposits may pay interest, but at a low rate.

Government and corporate bonds, by contrast, are less liquid but pay interest at higher rates.

Hence, when the interest rate rises, consumers want to hold less of their wealth as money and more of their wealth as bonds: the money demand curve slopes downward in figure 1.

Equilibrium in the Money Market

In figure 1, the equilibrium interest rate gets determined by the intersection of the money supply and money demand curves.

If the interest rate is above the equilibrium rate, there is an excess supply of money. As people try to use their excess money to buy more bonds, they put downward pressure on the interest rate.

If the interest rate is below the equilibrium rate, there is an excess demand for money. As people try to accumulate more money by selling bonds, they put upward pressure on the interest rate.

Either way, the interest rate gravitates towards its equilibrium level.

The Downward Slope of the Aggregate Demand Curve

Liquidity preference theory can also be used to help explain why the aggregate demand curve slopes down.

Figure 2 shows what happens in the money market when the price level rises:

- The money supply remains fixed by Federal Reserve policy.
- But money demand increases at any given interest rate, since the higher price level implies that consumers need more money to purchase the same amount of goods and services. That is, the money demand curve shifts to the right.
- Hence, the equilibrium interest rate rises.

When the interest rate rises, consumers borrow less to buy new houses and firms borrow less to buy new capital equipment. Aggregate demand falls when the price level rises.

Changes in the Money Supply

Liquidity preference theory can also be used to help explain why the aggregate demand curve shifts when the Federal Reserve changes the money supply.

Figure 3 shows what happens when, at a given price level, the Fed increases the money supply:

- The money demand curve remains fixed.
- But the money supply curve shifts to the right.
- The equilibrium interest rate falls.
- When the interest rate falls, consumers borrow more to buy new houses and firms borrow more to buy new capital equipment.
- *At the given price level*, aggregate demand increases. That is, the aggregate demand curve shifts to the right.

Interest Rates and Federal Reserve Policy

Previously, we discussed how in practice, Federal Reserve policy sets a target for the federal funds rate.

When the Fed lowers its target for the federal funds rate, it must conduct open market operations to increase the quantity of reserves. Then, via the money multiplier, the money supply increases.

Liquidity preference theory then implies that when the money supply increases, other interest rates in the economy fall as well.

Through these channels, we see that when the Fed lowers its target for the federal funds rate, all other interest rates in the economy tend to fall as well.

Conversely, when the Fed raises its target for the federal funds rate, all other interest rates in the economy tend to rise as well.

Finally, bring in the theory of aggregate demand and aggregate supply:

- When the Fed lowers its target for the federal funds rate, the money supply increases.
- Hence, the interest rate falls, leading to a rightward shift in the aggregate demand curve.
- In the short run, output increases, as does the price level.
- In the long run, the expected price level also increases, leading the short-run aggregate supply curve to shift to the left.
- Hence, in the long run, output returns to its natural rate, but the price level is higher.
- The “easing” of monetary policy increases output in the short run, but leads only to higher prices in the long run.

How Fiscal Policy Influences Aggregate Demand

Fiscal policy refers to the government’s choices for the level of government spending and taxation.

Changes in Government Purchases

When the government changes the money supply or the level of taxes, it affects aggregate demand indirectly by influencing the spending decisions of consumers and firms.

But when the government changes the level of government purchases, it shifts the aggregate demand curve directly.

Suppose that the government increases spending by $20 billion. By how much does aggregate demand increase?

- The **multiplier effect** suggests that aggregate demand might increase by more than $20 billion.
- But the **crowding-out effect** suggests that aggregate demand might increase by less than $20 billion.

The Multiplier Effect

Suppose that the government decides to buy $20 billion worth of new airplanes from Boeing.

By itself, the increase in government purchases increases aggregate demand by $20 billion.

But that increase in government purchases also raises employment and profits at Boeing.

The newly employed workers may increase their spending, adding to the increase in aggregate demand.

The **multiplier effect** comes from the additional shifts in aggregate demand that result when an increase in government spending increases consumers' incomes and thereby increases consumers' spending.

A Formula for the Spending Multiplier

A key element in tracing out the full implications of the multiplier effect is the **marginal propensity to consume (MPC)**, which measures the fraction of extra income that each household consumers rather than saves.

If, for example, the MPC = ¾, then for every additional dollar it receives as income, a household will spend $0.75 and save $0.25.

To continue the example, suppose that the MPC is ¾ and the government buys $20 billion worth of new airplanes from Boeing:

- The change in government purchases is $20 billion.
- But now the owners and workers of Boeing have $20 billion in additional income. If the MPC is ¾ then they spend $15 billion more.
- But now the owners and workers of the companies from which Boeing's owners and employees buy the goods have $15 billion in additional income. If the MPC is ¾ then they spend $11.25 billion more.
- These feedback effects go on and on.

More generally, consider an increase in government purchases of $G:

Initial change in government purchases =	$G
First round multiplier effect =	MPC x $G
Second round multiplier effect =	MPC x MPC x $G = MPC^2 x $G
Third round multiplier effect =	MPC^3 x $G
and so on …	
Total change in aggregate demand =	(1+MPC+ MPC^2+ MPC^3 …)x $G

Hence

$$Multiplier = \frac{Total\ Change\ in\ Aggregate\ Demand}{Initial\ Change\ in\ Government\ Purchases} = 1 + MPC + MPC^2 + MPC^3 + \cdots$$
$$= \frac{1}{1 - MPC}$$

So if the MPC = ¾, then

$$Multiplier = \frac{1}{1 - 3/4} = \frac{1}{1/4} = 4$$

Implying that the $20 billion increase in government purchases will result in an $80 billion increase in aggregate demand.

Note that the multiplier increases when the MPC goes up. Why?

The logic of the multiplier effect can also apply to other types of changes in aggregate demand.

- For instance, if net exports rise by $10 billion because an economic boom in Europe causes European consumers to demand $10 billion more of US produced goods, then the initial impact on aggregate demand is $10 billion.
- But, the owners and workers at the exporting firms will have $10 billion more in income, of which they will spend MPC x $10 billion.
- And so on ….

The Crowding-Out Effect

The multiplier effect suggests that even modest changes in government spending can have big effects on aggregate demand.

There is, however, and offsetting effect: the **crowding-out effect**.

The crowding-out effect occurs because the owners and workers who receive more income as a result of the initial increase in government spending and the subsequent multiplier effects will also demand more money in order to purchase more goods and services.

Figure 5 shows what happens in the money market as a result:

- The money supply is fixed.
- But the demand for money at any given interest rate goes up, shifting the money demand curve to the right.
- As a result, the interest rate rises.
- If this increase in the interest rate reduces, or “crowds out,” investment, it will partially offset the increase in aggregate demand brought about by the increase in government spending and the subsequent multiplier effects.

The upshot is that when the government increases purchases by $20 billion, aggregate demand could increase by more or less than $20 billion, depending on the relative strengths of the multiplier and crowding-out effects.

Changes in Taxes

The government's other fiscal policy tool, besides government spending, is taxation.

When the government cuts personal income taxes, consumers' demand for goods and services rises at any given price level. The aggregate demand curve shifts right.

An important determinant of the size of the effect of a tax cut on aggregate demand is whether consumers believe that the tax cut is temporary or permanent.

- In general, if consumers believe that the tax cut is permanent, then they will feel much wealthier, and the effect on aggregate demand will be large.
- But if consumers believe that the tax cut will be quickly reversed, then they may increase spending by only a small amount.
- An extreme case in point came in 1992, when the first President Bush reduced the amount of federal payroll taxes that the government withheld from workers' paychecks. But this "tax cut" was short-lived, because the tax rates themselves did not change: instead of paying taxes out of their regular paychecks, workers would owe more on April 15, 1993. Consumer spending hardly changed at all in response.

Finally, it is worth noting that changes in taxes may also work to shift the aggregate supply curve.

- "Supply-side" economists believe that the most important affect of a tax cut is that workers who previously may have been out of the labor force (in school or at home) will rejoin when tax rates fall and that similarly, employed workers will work more hours when tax rates fall.
- As a result, the supply of labor increases when tax rates fall. The natural rate of output rises, so the long-run aggregate supply curve shifts to the right.

Using Policy to Stabilize the Economy

The Employment Act of 1946 states that "it is the continuing policy and responsibility of the federal government to promote full employment and production."

The most obvious implication of the Employment Act is that the government should avoid being a *cause* of economic fluctuations. That is, the Federal Reserve should avoid large and sudden changes in monetary policy and Congress should avoid large and sudden changes in spending and tax rates.

A further and more ambitious implication is that the Federal Reserve and Congress should try to use monetary and fiscal policies to offset the effects that other disturbances have on the economy.

And, in practice, both the Fed and Congress do take such actions. For example, during the 2001 recession, which was probably caused by adverse shifts in aggregate demand stemming first from the

decline in the stock market and then later from the September 11 attacks, the Federal Reserve lowered interest rates and at President Bush's urging, Congress cut taxes.

Some economists caution, however, that this second type of stabilization policy – "fine tuning" – may not be feasible and may in fact be counterproductive.

- Suppose policymakers see the economy heading into recession.
- The Fed may lower interest rates and increase the money supply. But because the interest rate effect works mainly through investment, and because firms must plan investment projects well in advance, it can take 6 to 12 months before the effects of the policy action take hold. By then, the economy may be recovering on its own.
- For fiscal policy, the problems can be worse. Politics make it difficult for legislation on spending and tax rates to make it through both the Congress and the Senate quickly. By the time a new spending or tax bill finally passes, again, the need to the fiscal stimulus may be gone.

Automatic stabilizers – changes in fiscal policy that stimulate aggregate demand when the economy goes into recession, but without requiring deliberate action by Congress – can overcome some of these problems:

- One example of an automatic stabilizer is the progressive tax system. One purpose of the progressive tax system, according to which the tax rate increases as each individual's income rises, is to make sure that wealthier individuals pay more taxes, since they can afford it. But another purpose is that when *everyone's* income falls because the economy goes into recession, everyone's tax rate also falls, providing an offsetting boost to aggregate demand.
- Another automatic stabilizer is the unemployment insurance system. This system helps unemployed workers during both good and bad economic times. But it also means that government spending rises automatically during recessions, when many people are unemployed.

Ch 35 The Short-Run Trade-off Between Inflation and Unemployment

Introduction

In the long run, the classical dichotomy and the neutrality of money imply that

1. Output, as a real variable, is determined by the availability of capital, labor, and natural resources as well as the stock of technological knowledge. Unemployment, as another real variable, is determined by features of the labor market such as minimum wage laws, the power of unions, the role of efficiency wages, and the effectiveness of job search. In the long run, neither of these variables depends on the money supply.
2. Inflation, as a nominal variable, is determined by the growth rate of the money supply.

Most economists agree that these propositions hold in the long run. Most economists also agree, however, that in the short run real and nominal variables are more closely related.

The aggregate demand and aggregate supply model explains the links between output and inflation in the short run, while at the same time being consistent with the long-run neutrality of money.

The **Phillips curve** extends this analysis to account for the short-run relationship between inflation and unemployment.

This chapter:

1. Shows how the Phillips curve can be derived as an extension and further refinement of the aggregate demand and aggregate supply model.
2. Describes how the Phillips curve has been a central issue in the development of macroeconomics over the past 50 years.
3. Describes how actual economic events in the US economy have helped shape economists' views of the Phillips curve over that same 50-year period.

Thus, a look at the Phillips curve usefully culminates our own analysis of macroeconomics, and not coincidently, the Phillips curve remains at center stage in macroeconomic research and policymaking today.

Outline

1. The Phillips Curve
2. Shifts in the Phillips Curve: The Role of Expectations
3. Shifts in the Phillips Curve: The Role of Supply Shocks
4. The Cost of Reducing Inflation

The Phillips Curve

The **Phillips curve** describes the short-run relationship between inflation and unemployment.

Origins of the Phillips Curve

In 1958, the British economist A.W. Phillips published an article documenting a systematic negative association between UK inflation and unemployment, with higher rates of inflation coinciding with lower rates of unemployment and vice versa. Figure 1 illustrates this type of negative relationship.

Two years later, MIT economists Paul Samuelson and Robert Solow – both Nobel Prize winners – showed that the same relationship appeared in the US data, which they named the Phillips curve to recognize its original discoverer. Samuelson and Solow associated this curve with the aggregate demand and aggregate supply theory, which we will now do as well.

Aggregate Demand, Aggregate Supply, and the Phillips Curve

Recall that an increase in aggregate demand leads, in the short run, to an increase in output and an increase in the price level.

The increase in output will require an increase in employment and, therefore, a decrease in the rate of unemployment.

Meanwhile, for a given initial price level, the increase in the price level also implies an increase in the rate of inflation.

Hence, a Phillips curve relation is directly implied by the aggregate demand and aggregate supply model.

Figure 2 illustrates a specific example.

- Suppose that the economy starts with a price level of $P = 100$.
- Suppose that there are two possible outcomes:
    - One with low aggregate demand, which leads to output of 7,500, unemployment of 7% and a new price level of $P = 102$.
    - The other with high aggregate demand, which leads to output of 8,000, unemployment of 4%, and a new price level of $P = 106$.
- Then the model implies that unemployment is 7% if inflation is 2%, and unemployment is 4% if inflation is 6%.
- The Phillips curve in this example looks much like the one in figure 1.

Moreover, since policymakers can shift the aggregate demand curve using either monetary or fiscal policy, in the short run they can essentially choose where they want the economy to be along the Phillips curve.

Shifts in the Phillips Curve: The Role of Expectations

Samuelson and Solow's analysis did not make a distinction between the short and long run, and therefore gave the impression that the Phillips curve offers policymakers a stable trade-off between inflation and unemployment on which they can rely.

In the last 1960s, however, Milton Friedman and Edmund Phelps – also both Nobel Prize winners – published papers emphasizing that the long-run neutrality of money implies that the long-run Phillips curve is vertical, as shown in figure 3.

Friedman and Phelps also developed the idea of the natural rate of unemployment, as the long-run rate around which the actual unemployment rate tends to fluctuate. It is worth emphasizing once again that the term "natural rate" when applied to either output or unemployment refers to the long-run values of these variables that is determined, in the case of output, by the availability of capital and labor inputs and the stock of technological knowledge and, in the case of unemployment, by the workings of the labor market. There is no presumption that these "natural" rates are socially desirable, only that policies directed at influencing aggregate demand cannot change them.

Figure 4 shows how the vertical long-run Phillips can be derived from the vertical long-run aggregate supply curve.

Finally, Friedman and Phelps reconciled the short-run downward-sloping Phillips curve with the vertical long-run Phillips curve by introducing a new variable – expected inflation – into the Phillips curve, as summarized by the equation:

$$Unemployment\ Rate = Natural\ Rate\ of\ Unemployment - a(Actual\ Inflation - Expected\ Inflation)$$

which, again not coincidently, just recasts our earlier aggregate supply relationship in terms of unemployment as opposed to output.

Figure 5 shows how expected inflation shifts the Phillips curve:

- Initially, expectations of inflation are fixed, and get reflected in "sticky wages" or "sticky prices."
- Hence, when inflation turns out to be unexpectedly high, the short-run Phillips curve implies that unemployment will fall below the natural rate.
- But, eventually, expected inflation will rise. As these new expectations get built into newly-set wages and prices, the unemployment rate gravitates back to the natural rate, while inflation remains high.
- Hence, the long-run Phillips curve is vertical.

Friedman and Phelps' view of the Phillips curve is called the **natural rate hypothesis**, since it implies that unemployment eventually returns to its normal or natural rate, regardless of the rate of inflation.

In fact, actual events in the US economy would soon provide support for Friedman and Phelps' natural rate hypothesis:

- Figure 6 shows that US data from 1961 – 1968 trace out a nicely downward-sloping Phillips curve: as inflation rose during this period, unemployment fell.
- But, figure 7 shows that in the late 1960s and early 1970s, unemployment rose again, back to the rates seen at the beginning of the 1960s. Meanwhile, inflation remained high.
- It does appear that the long-run Phillips curve is vertical.

Shifts in the Phillips Curve: The Role of Supply Shocks

The next big event in US economic history was the rise of the OPEC oil cartel in the early-to-mid 1970s. During that time, the OPEC cartel successfully limited oil supplies, causing the world price of oil to rise sharply.

A rise in the price of oil is a leading example of a **supply shock**: an event that directly alters firms' costs of production, shifting the aggregate supply curve and, therefore, the Phillips curve as well.

Figure 8 illustrates what happens when the world price of oil rises sharply:

- The aggregate supply curve shifts to the left, since firms supply less output at any given price level.
- Hence, the economy experiences **stagflation**, the combination of rising prices and falling output.
- Translating these changes to the Phillips curve, the curve shifts outward, giving policymakers a less favorable short-run trade-off between inflation and unemployment.

Figure 8 assumes that aggregate demand stays fixed. In this case, when the price of oil returns to normal levels, the aggregate supply curve shifts back to its initial position and there are no lasting effects on inflation, output, or unemployment.

But, in fact, the Federal Reserve acted in the 1970s to **accommodate** the oil price shocks. That is, the Fed increased the growth rate of the money supply.

This helped to insulate output and employment from the full negative effects of the oil price shocks, but left inflation higher in the long run.

Hence, figure 9 shows that inflation remained high throughout the late 1970s and into the early 1980s.

The Cost of Reducing Inflation

Finally, deciding that inflation has risen too high, President Carter appointed Paul Volcker as Federal Reserve Chairman in late 1979.

Volcker took the job, knowing that his first and most important task would be to adopt a policy of **disinflation**, that is, of bringing about a long-run decline in inflation.

The Sacrifice Ratio

Again, the neutrality of money and the closely-related natural rate hypothesis suggest that in the long run, monetary policy can be used to lower the rate of inflation with no lasting effects on unemployment.

Volcker's problem, however, is that in the short run, the downward sloping Phillips curve implies that unemployment will rise when inflation is reduced.

Figure 10 illustrates this transition from the short run to the long run.

The short-run costs of disinflation can be expressed in terms of the **sacrifice ratio**: the number of percentage points of annual output lost in the process of reducing inflation by 1 percentage point.

For example, suppose that the Fed decides to lower the inflation rate from 5 to 4 percent by lowering the rate of money growth. In terms of aggregate demand and aggregate supply:

- The aggregate demand curve shifts to the left, causing output to fall below its natural rate.
- But gradually, expectations of lower prices cause the short-run aggregate supply curve to shift as well.
- Output returns to its natural rate, but inflation remains lower.

Suppose that in particular:

- Output falls 3 percent below its natural rate in the first year after the Fed decides to lower the rate of money growth.
- Output continues to be 1.5 percent below its natural rate in the second year.
- Output continues to be 0.5 percent below its natural rate in the third year.
- Finally, output returns to its natural rate in the fourth year.
- Then the one-percentage-point reduction in inflation involves total annual output losses of 3 + 1.5 + 0.5 = 5 percentage points.
- The sacrifice ratio equals 5.

US inflation was running at about 10 percent per year when Volcker took over as Federal Reserve Chairman. If the sacrifice ratio was really 5, then his task of reducing inflation to a more modest rate, say, of 4 percent per year, would cost (10 - 4) x 5 = 6 x 5 = 30 annual percentage points of output!

Rational Expectations and the Possibility of Costless Disinflation

Just as Volcker was appointed and began the task of disinflation, another group of economists including Nobel Prize winner Robert Lucas and Thomas Sargent developed the theory of **rational expectations**, which assumes that consumers and firms efficiently gather and use information about government policies to forecast the future, so that their expectations adjust quickly to changes in the economy.

Lucas and Sargent applied the theory of rational expectations to the Phillips curve proposed earlier by Friedman and Phelps:

$$Unemployment\ Rate = Natural\ Rate\ of\ Unemployment - a(Actual\ Inflation - Expected\ Inflation)$$

In particular, they argued that if Volcker could take actions to make expected inflation fall as rapidly as actual inflation, then the disinflation would not necessarily require a short-run increase in unemployment.

Unfortunately for Volcker, although he did announce that his plan was to reduce inflation, many people did not believe him.

- Expected inflation declined, but at a slower rate than actual inflation.
- Hence, the US economy experienced a severe recession in 1981 – 1983.

But figure 11 shows that once again, the data are consistent with a vertical long-run Phillips curve.

- Although unemployment rose sharply when Volcker began his disinflation, by the mid-1980s the unemployment rate appeared to have returned to its natural rate.
- And inflation was much lower.

The Greenspan Era

Alan Greenspan took over from Volcker as Federal Reserve Chairman in 1987, and continued in that role until the end of January 2006.

Greenspan's term as Federal Reserve Chairman was marked by a combination of low inflation *and* low unemployment – exactly the opposite of what the Phillips curve predicts!

How was this feasible?

1. First and foremost, Greenspan had learned the lessons from the mistakes of the 1970s. Instead of deliberately using monetary policy to lower unemployment at the cost of higher inflation, Greenspan's policy was to keep inflation low.
2. But, also, Greenspan benefited in the early years of his term by the weakening of the OPEC cartel and the resulting decline in oil prices. The decline in oil prices shifted the aggregate supply curve to the right. The price level, and hence inflation, fell, even as output increased.
3. Then, in the 1990s, the US economy experienced a period of unusually rapid technological change. The rightward shift in the long-run aggregate supply curve also worked to increase output and decrease inflation.

So Greenspan's success as Federal Reserve Chairman is partly attributable to skill and partly to good luck.

In February 2006, Ben Bernanke took over as Federal Reserve Chairman. Bernanke has not been nearly as lucky as Greenspan: his first challenge was to respond to another period of rising oil prices, then a serious slowdown in overall economic activity and problems in the financial markets brought about by declining housing prices.