Summary

1. Gross domestic product (GDP) measures the income of everyone in the economy and, equivalently, the total expenditure on the economy's output of goods and services.
2. Nominal GDP values goods and services at current prices. Real GDP values goods and services at constant prices. Real GDP rises only when the amount of goods and services has increased, whereas nominal GDP can rise either because output has increased or because prices have increased. The GDP deflator is the ratio of nominal to real GDP and measures the overall level of prices.
3. GDP is the sum of four categories of expenditure: consumption, investment, government purchases, and net exports. This relationship is called the national income accounts identity.
4. The consumer price index (CPI) measures the price of a fixed basket of goods and services purchased by a typical consumer relative to the same basket in a base year. Like the GDP deflator and the personal consumption expenditure (PCE) deflator, the CPI measures the overall level of prices, but unlike the deflators, it does not allow the basket of goods and services to change over time as consumers respond to changes in relative prices.
5. The labor-force participation rate shows the fraction of adults who are working or want to work. The unemployment rate shows the fraction of those in the labor force who do not have a job.

KEY CONCEPTS

Gross domestic product (GDP)
National income accounting
Stocks and flows
Value added
Imputed value
Nominal versus real GDP
GDP deflator
National income accounts identity
Consumption
Investment
Government purchases
Net exports
Consumer price index (CPI)
PCE deflator
Labor force
Unemployment rate
Labor-force participation rate

QUESTIONS FOR REVIEW

1. List the two things that GDP measures. How can GDP measure two things at once?
2. What are the four components of GDP? Give an example of each.
3. What does the consumer price index measure? List three ways in which it differs from the GDP deflator.
4. How are the CPI and the PCE deflator similar, and how are they different?
5. List the three categories used by the Bureau of Labor Statistics to classify everyone in the economy. How does the BLS compute the unemployment rate?
6. Describe the two ways the BLS measures total employment.

PROBLEMS AND APPLICATIONS

1. Go to the website of the Bureau of Economic Analysis and find the growth rate of real GDP for the most recent quarter. Go to the website of the Bureau of Labor Statistics and find the inflation rate over the past year and the unemployment rate for the most recent month. How do you interpret these data?
2. A farmer grows a bushel of wheat and sells it to a miller for $1. The miller turns the wheat into flour and then sells the flour to a baker for $3. The baker uses the flour to make bread and sells the bread to an engineer for $6. The engineer eats the bread. What is the value added by each person? What is the bread's contribution to GDP?
3. Suppose a woman marries her butler. After they are married, her husband continues to wait on her as before, and she continues to support him as before (but as a husband rather than as an employee). How does the marriage affect GDP? How do you think it should affect GDP?
4. Place each of the following transactions in one of the four components of expenditure: consumption, investment, government purchases, and net exports.
   a. Boeing sells an airplane to the U.S. Air Force.
   b. Boeing sells an airplane to American Airlines.
   c. Boeing sells an airplane to Air France.
   d. Boeing sells an airplane to Amelia Earhart.
   e. Boeing builds an airplane to be sold next year.
5. Find data on GDP and its components, and compute the percentage of GDP for the following components for 1950, 1980, and the most recent year available.
   a. Personal consumption expenditures
   b. Gross private domestic investment
   c. Government purchases
   d. Net exports
   e. National defense purchases
   f. Imports

   Do you see any stable relationships in the data? Do you see any trends? (*Hint:* You can find the data at http://www.bea.gov, which is the Web site of the Bureau of Economic Analysis.)
6. LaunchPad • Tina is the sole owner of Tina's Lawn Mowing, Incorporated (TLM). In one year, TLM collects $1,000,000 from customers to mow their lawns. TLM's equipment depreciates in value by $125,000. TLM pays $600,000 to its workers, who pay $140,000 in taxes on this income. TLM pays $50,000 in corporate income taxes and pays Tina a dividend of $150,000. Tina pays taxes of $60,000 on this dividend income. TLM retains $75,000 of earnings in the business to finance future expansion. How much does this economic activity contribute to each of the following?
   a. GDP
   b. NNP
   c. National income
   d. Compensation of employees
   e. Proprietors' income
   f. Corporate profits
   g. Personal income
   h. Disposable personal income
7. LaunchPad • Consider an economy that produces and consumes hot dogs and hamburgers. In the following table are data for two different years.

	2010		2015	
Good	Quantity	Price	Quantity	Price
Hot dogs	200	$2	250	$4
Hamburgers	200	$3	500	$4

   a. Using 2010 as the base year, compute the following statistics for each year: nominal GDP, real GDP, the implicit price deflator for GDP, and a fixed-weight price index such as the CPI.
   b. By what percentage did prices rise between 2010 and 2015? Give the answer for each good and also for the two measures of the overall price level. Compare the answers given by the Laspeyres and Paasche price indexes. Explain the difference.

8. Abby consumes only apples. In year 1, red apples cost $1 each, green apples cost $2 each, and Abby buys 10 red apples. In year 2, red apples cost $2, green apples cost $1, and Abby buys 10 green apples.
   a. Compute a consumer price index for apples for each year. Assume that year 1 is the base year in which the consumer basket is fixed. How does your index change from year 1 to year 2?
   b. Compute Abby's nominal spending on apples in each year. How does it change from year 1 to year 2?
   c. Using year 1 as the base year, compute Abby's real spending on apples in each year. How does it change from year 1 to year 2?
   d. Defining the implicit price deflator as nominal spending divided by real spending, compute the deflator for each year. How does the deflator change from year 1 to year 2?
   e. Suppose that Abby is equally happy eating red or green apples. How much has the true cost of living increased for Abby? Compare this answer to your answers to parts (a) and (d). What does this example tell you about the Laspeyres and Paasche price indexes?

9. LaunchPad • An economy has 100 people divided among the following groups: 25 have full-time jobs, 20 have one part-time job, 5 have two part-time jobs, 10 would like to work and are looking for jobs, 10 would like to work but are so discouraged they have given up looking, 10 are running their own businesses, 10 are retired, and 10 are small children.
   a. Calculate the labor force and the labor-force participation rate.
   b. Calculate the number of unemployed and the unemployment rate.
   c. Calculate total employment in two ways: as measured by the household survey and as measured by the establishment survey.

10. In a speech that Senator Robert Kennedy gave when he was running for president in 1968, he said the following about GDP:

> [It] does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages, the intelligence of our public debate or the integrity of our public officials. It measures neither our courage, nor our wisdom, nor our devotion to our country. It measures everything, in short, except that which makes life worthwhile, and it can tell us everything about America except why we are proud that we are Americans.

   Was Robert Kennedy right? If so, why do we care about GDP?

11. Consider whether each of the following events is likely to increase or decrease real GDP. In each case, do you think the well-being of the average person in society most likely changes in the same direction as real GDP? Why or why not?
   a. A hurricane in Florida forces Disney World to shut down for a month.
   b. The discovery of a new, easy-to-grow strain of wheat increases farm harvests.
   c. Increased hostility between unions and management sparks a rash of strikes.
   d. Firms throughout the economy experience falling demand, causing them to lay off workers.
   e. Congress passes new environmental laws that prohibit firms from using production methods that emit large quantities of pollution.
   f. More high school students drop out of school to take jobs mowing lawns.
   g. Fathers around the country reduce their workweeks to spend more time with their children.

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marginal product of capital equals the real rental price. Therefore, each factor of production is paid its marginal product. If the production function has constant returns to scale, then according to Euler's theorem, all output is used to compensate the inputs.

3. The economy's output is used for consumption, investment, and government purchases. Consumption depends positively on disposable income. Investment depends negatively on the real interest rate. Government purchases and taxes are the exogenous variables of fiscal policy.
4. The real interest rate adjusts to equilibrate the supply and demand for the economy's output—or, equivalently, the supply of loanable funds (saving) and the demand for loanable funds (investment). A decrease in national saving, perhaps because of an increase in government purchases or a decrease in taxes, decreases the supply of loanable funds, reduces the equilibrium amount of investment, and raises the interest rate. An increase in investment demand, perhaps because of a technological innovation or a tax incentive for investment, increases the demand for loanable funds and also raises the interest rate. An increase in investment demand increases the quantity of investment only if a higher interest rate stimulates additional saving.

KEY CONCEPTS

Factors of production
Production function
Constant returns to scale
Factor prices
Competitive firm
Profit
Marginal product of labor (*MPL*)
Diminishing marginal product
Real wage
Marginal product of capital (*MPK*)
Real rental price of capital
Economic profit versus accounting profit
Cobb–Douglas production function
Disposable income
Consumption function
Marginal propensity to consume (*MPC*)
Interest rate
Nominal interest rate
Real interest rate
National saving (saving)
Private saving
Public saving
Loanable funds
Crowding out

QUESTIONS FOR REVIEW

1. What determines the amount of output an economy produces?
2. Explain how a competitive, profit-maximizing firm decides how much of each factor of production to demand.
3. What is the role of constant returns to scale in the distribution of income?
4. Write a Cobb–Douglas production function for which capital earns one-fourth of total income.
5. What determines consumption and investment?
6. Explain the difference between government purchases and transfer payments. Give two examples of each.

7. What makes the demand for the economy's output of goods and services equal the supply?

8. Explain what happens to consumption, investment, and the interest rate when the government increases taxes.

PROBLEMS AND APPLICATIONS

1. Use the neoclassical theory of distribution to predict the impact on the real wage and the real rental price of capital of each of the following events:
   a. A wave of immigration increases the labor force.
   b. An earthquake destroys some of the capital stock.
   c. A technological advance improves the production function.
   d. High inflation doubles the prices of all factors and outputs in the economy.

2. LaunchPad • Suppose the production function in medieval Europe is $Y = K^{0.5}L^{0.5}$, where K is the amount of land and L is the amount of labor. The economy begins with 100 units of land and 100 units of labor. Use a calculator and equations in the chapter to find a numerical answer to each of the following questions.
   a. How much output does the economy produce?
   b. What are the wage and the rental price of land?
   c. What share of output does labor receive?
   d. If a plague kills half the population, what is the new level of output?
   e. What is the new wage and rental price of land?
   f. What share of output does labor receive now?

3. If a 10 percent increase in both capital and labor causes output to increase by less than 10 percent, the production function is said to exhibit *decreasing returns to scale*. If it causes output to increase by more than 10 percent, the production function is said to exhibit *increasing returns to scale*. Why might a production function exhibit decreasing or increasing returns to scale?

4. Suppose that an economy's production function is Cobb–Douglas with parameter $\alpha = 0.3$.
   a. What fractions of income do capital and labor receive?
   b. Suppose that immigration increases the labor force by 10 percent. What happens to total output (in percent)? The rental price of capital? The real wage?
   c. Suppose that a gift of capital from abroad raises the capital stock by 10 percent. What happens to total output (in percent)? The rental price of capital? The real wage?
   d. Suppose that a technological advance raises the value of the parameter A by 10 percent. What happens to total output (in percent)? The rental price of capital? The real wage?

5. Figure 3-5 shows that in U.S. data, labor's share of total income is approximately a constant over time. Table 3-1 shows that the trend in the real wage closely tracks the trend in labor productivity. How are these facts related? Could the first fact be true without the second also being true? Use the mathematical expression for labor's share to justify your answer.

6. According to the neoclassical theory of distribution, a worker's real wage reflects her productivity. Let's use this insight to examine the incomes of two groups of workers: farmers and barbers. Let W_f and W_b be the nominal wages of farmers and barbers, P_f and P_b be the prices of food and haircuts, and A_f and A_b be the marginal productivity of farmers and barbers.
   a. For each of the six variables defined above, state as precisely as you can the units in which they are measured. (*Hint*: Each answer takes the form "X per unit of Y.")
   b. Over the past century, the productivity of farmers A_f has risen substantially because of technological progress. According to the neoclassical theory, what should have happened to farmers' real wage, W_f/P_f? In what units is this real wage measured?
   c. Over the same period, the productivity of barbers A_b has remained constant. What should have happened to barbers' real wage, W_b/P_b? In what units is this real wage measured?

d. Suppose that, in the long run, workers can move freely between being farmers and being barbers. What does this mobility imply for the nominal wages of farmers and barbers, W_f and W_b?

e. What do your previous answers imply for the price of haircuts relative to the price of food, P_b/P_f?

f. Suppose that barbers and farmers consume the same basket of goods and services. Who benefits more from technological progress in farming—farmers or barbers? Explain how your answer is consistent with the results on real wages in parts (b) and (c).

7. (This problem requires the use of calculus.) Consider a Cobb–Douglas production function with three inputs. K is capital (the number of machines), L is labor (the number of workers), and H is human capital (the number of college degrees among the workers). The production function is

$$Y = K^{1/3} L^{1/3} H^{1/3}.$$

a. Derive an expression for the marginal product of labor. How does an increase in the amount of human capital affect the marginal product of labor?

b. Derive an expression for the marginal product of human capital. How does an increase in the amount of human capital affect the marginal product of human capital?

c. What is the income share paid to labor? What is the income share paid to human capital? In the national income accounts of this economy, what share of total income do you think workers would appear to receive? (*Hint*: Consider where the return to human capital shows up.)

d. An unskilled worker earns the marginal product of labor, whereas a skilled worker earns the marginal product of labor plus the marginal product of human capital. Using your answers to parts (a) and (b), find the ratio of the skilled wage to the unskilled wage. How does an increase in the amount of human capital affect this ratio? Explain.

e. Some people advocate government funding of college scholarships as a way of creating a more egalitarian society. Others argue that scholarships help only those who are able to go to college. Do your answers to the preceding questions shed light on this debate?

8. The government raises taxes by \$100 billion. If the marginal propensity to consume is 0.6, what happens to the following? Do they rise or fall? By what amounts?

a. Public saving

b. Private saving

c. National saving

d. Investment

9. Suppose that an increase in consumer confidence raises consumers' expectations about their future income and thus increases the amount they want to consume today. This might be interpreted as an upward shift in the consumption function. How does this shift affect investment and the interest rate?

10. LaunchPad • Consider an economy described as follows:

$$Y = C + I + G.$$

$$Y = 8{,}000.$$

$$G = 2{,}500.$$

$$T = 2{,}000.$$

$$C = 1000 + 2/3(Y - T).$$

$$I = 1{,}200 - 100r.$$

a. In this economy, compute private saving, public saving, and national saving.

b. Find the equilibrium interest rate.

c. Now suppose that G is reduced by 500. Compute private saving, public saving, and national saving.

d. Find the new equilibrium interest rate.

11. Suppose that the government increases taxes and government purchases by equal amounts. What happens to the interest rate and investment in response to this balanced-budget change? Explain how your answer depends on the marginal propensity to consume.

12. When the government subsidizes investment, such as with an investment tax credit, the subsidy often applies to only some types of investment. This question asks you to consider the effect of such a change. Suppose there are two types of investment in the economy: business investment and residential investment. The interest rate adjusts to equilibrate national saving and total investment, which is the sum of business investment and residential investment. Now suppose that the government institutes an investment tax credit only for business investment.
    a. How does this policy affect the demand curve for business investment? The demand curve for residential investment?
    b. Draw the economy's supply and demand curves for loanable funds. How does this policy affect the supply and demand for loanable funds? What happens to the equilibrium interest rate?
    c. Compare the old and the new equilibria. How does this policy affect the total quantity of investment? The quantity of business investment? The quantity of residential investment?
13. Suppose that consumption depends on the interest rate. How, if at all, does this alter the conclusions reached in the chapter about the impact of an increase in government purchases on investment, consumption, national saving, and the interest rate?
14. Macroeconomic data do not show a strong correlation between investment and interest rates. Let's examine why this might be so. Use our model in which the interest rate adjusts to equilibrate the supply of loanable funds (which is upward sloping) and the demand for loanable funds (which is downward sloping).
    a. Suppose the demand for loanable funds is stable but the supply fluctuates from year to year. What might cause these fluctuations in supply? In this case, what correlation between investment and interest rates would you find?
    b. Suppose the supply of loanable funds is stable but the demand fluctuates from year to year. What might cause these fluctuations in demand? In this case, what correlation between investment and interest rates would you find now?
    c. Suppose that both supply and demand in this market fluctuate over time. If you were to construct a scatterplot of investment and the interest rate, what would you find?
    d. Which of the above three cases seems most empirically realistic to you? Why?

QUESTIONS FOR REVIEW

1. Describe the functions of money.
2. What is fiat money? What is commodity money?
3. What are open-market operations, and how do they influence the money supply?
4. Explain how banks create money.
5. What are the various ways in which the Federal Reserve can influence the money supply?
6. Why might a banking crisis lead to a fall in the money supply?

PROBLEMS AND APPLICATIONS

1. What are the three functions of money? Which of the functions do the following items satisfy? Which do they not satisfy?
   a. A credit card
   b. A painting by Rembrandt
   c. A subway token
2. Explain how each of the following events affects the monetary base, the money multiplier, and the money supply.
   a. The Federal Reserve buys bonds in an open-market operation.
   b. The Fed increases the interest rate it pays banks for holding reserves.
   c. The Fed reduces its lending to banks through its Term Auction Facility.
   d. Rumors about a computer virus attack on ATM machines increase the amount of money people hold as currency rather than demand deposits.
   e. The Fed flies a helicopter over 5th Avenue in New York City and drops newly printed $100 bills.
3. An economy has a monetary base of 1,000 $1 bills. Calculate the money supply in scenarios (a)–(d) and then answer part (e).
   a. All money is held as currency.
   b. All money is held as demand deposits. Banks hold 100 percent of deposits as reserves.
   c. All money is held as demand deposits. Banks hold 20 percent of deposits as reserves.
   d. People hold equal amounts of currency and demand deposits. Banks hold 20 percent of deposits as reserves.
   e. The central bank decides to increase the money supply by 10 percent. In each of the above four scenarios, how much should it increase the monetary base?
4. LaunchPad • In the nation of Wiknam, people hold $1,000 of currency and $4,000 of demand deposits in the only bank, Wikbank. The reserve–deposit ratio is 0.25.
   a. What are the money supply, the monetary base, and the money multiplier?
   b. Assume that Wikbank is a simple bank: it takes in deposits, makes loans, and has no capital. Show Wikbank's balance sheet. What value of loans does the bank have outstanding?
   c. Wiknam's central bank wants to increase the money supply by 10 percent. Should it buy or sell government bonds in open-market operations? Assuming no change in the money multiplier, calculate, in dollars, how much central bank needs to transact.
5. LaunchPad • In the economy of Panicia, the monetary base is $1,000. People hold a third of their money in the form of currency (and thus two-thirds as bank deposits). Banks hold a third of their deposits in reserve.
   a. What are the reserve–deposit ratio, the currency–deposit ratio, the money multiplier, and the money supply?
   b. One day, fear about the banking system strikes the population, and people now want to hold half their money in the form of currency. If the central bank does nothing, what is the new money supply?
   c. If, in the face of this panic, the central bank wants to conduct an open-market operation

to keep the money supply at its original level, does it buy or sell government bonds? Calculate, in dollars, how much the central bank needs to transact.

6. As a Case Study in the chapter discusses, the money supply fell from 1929 to 1933 because both the currency–deposit ratio and the reserve–deposit ratio increased. Use the model of the money supply and the data in Table 4-2 to answer the following hypothetical questions about this episode.
   a. What would have happened to the money supply if the currency–deposit ratio had risen but the reserve–deposit ratio had remained the same?
   b. What would have happened to the money supply if the reserve–deposit ratio had risen but the currency–deposit ratio had remained the same?
   c. Which of the two changes was more responsible for the fall in the money supply?
7. To increase tax revenue, the U.S. government in 1932 imposed a 2-cent tax on checks written on bank account deposits. (In today's dollars, this tax would amount to about 34 cents per check.)
   a. How do you think the check tax affected the currency–deposit ratio? Explain.
   b. Use the model of the money supply under fractional-reserve banking to discuss how this tax affected the money supply.
   c. Many economists believe that a falling money supply was in part responsible for the severity of the Great Depression of the 1930s. From this perspective, was the check tax a good policy to implement in the middle of the Great Depression?
8. Give an example of a bank balance sheet with a leverage ratio of 20. If the value of the bank's assets rises by 2 percent, what happens to the value of the owners' equity in this bank? How large a decline in the value of bank assets would it take to reduce this bank's capital to zero?
9. LaunchPad • Jimmy Paul Miller starts his own bank, called JPM. As owner, Jimmy puts in $2,000 of his own money. JPM then borrows $4,000 in a long-term loan from Jimmy's uncle, accepts $14,000 in demand deposits from his neighbors, buys $7,000 of U.S. Treasury bonds, lends $10,000 to local businesses to finance new investments, and keeps the remainder of the bank's assets as reserves at the Fed.
   a. Show JPM's balance sheet. What is JPM's leverage ratio?
   b. An economic downturn causes 5 percent of the local businesses to declare bankruptcy and default on their loans. Show JPM's new balance sheet. By what percentage does the value of JPM's assets fall? By what percentage does JPM's capital fall?

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QUESTIONS FOR REVIEW

1. Write the quantity equation and explain it.
2. What does the assumption of constant velocity imply?
3. Who pays the inflation tax?
4. If inflation rises from 6 to 8 percent, what happens to real and nominal interest rates according to the Fisher effect?
5. List all the costs of inflation you can think of, and rank them according to how important you think they are.
6. Explain the roles of monetary and fiscal policy in causing and ending hyperinflations.
7. Define the terms *real variable* and *nominal variable*, and give an example of each.

PROBLEMS AND APPLICATIONS

1. LaunchPad • In the country of Wiknam, the velocity of money is constant. Real GDP grows by 3 percent per year, the money stock grows by 8 percent per year, and the nominal interest rate is 9 percent. What is
   a. the growth rate of nominal GDP?
   b. the inflation rate?
   c. the real interest rate?
2. Suppose a country has a money demand function $(M/P)^d = kY$, where k is a constant parameter. The money supply grows by 12 percent per year, and real income grows by 4 percent per year.
   a. What is the average inflation rate?
   b. How would inflation be different if real income growth were higher? Explain.
   c. How do you interpret the parameter k? What is its relationship to the velocity of money?
   d. Suppose, instead of a constant money demand function, the velocity of money in this economy was growing steadily because of financial innovation. How would that affect the inflation rate? Explain.
3. LaunchPad • An economy has the following money demand function: $(M/P)^d = .2Y/i^{1/2}$.
   a. Derive an expression for the velocity of money. What does velocity depend on? Explain why this dependency may occur.
   b. Calculate velocity if the nominal interest rate i is 4 percent.
   c. If output Y is 1,000 units and the money supply M is \$1,200, what is the price level P?
   d. Suppose the announcement of a new head of the central bank, with a reputation of being soft on inflation, increases expected inflation by 5 percentage points. According to the Fisher effect, what is the new nominal interest rate?
   e. Calculate the new velocity of money.
   f. If, in the aftermath of the announcement, both the economy's output and the current money supply are unchanged, what happens to the price level? Explain why this occurs.
   g. If the new central banker wants to keep the price level the same after the announcement, at what level should she set the money supply?
4. Suppose that the money demand function takes the form

$$(M/P)^d = L(i, Y) = Y/(5i)$$

   a. If output grows at rate g and the nominal interest rate is constant, at what rate will the demand for real balances grow?
   b. What is the velocity of money in this economy?
   c. If inflation and nominal interest rates are constant, at what rate, if any, will velocity grow?
   d. How will a permanent (once-and-for-all) increase in the level of interest rates affect the level of velocity? How will it affect the subsequent growth rate of velocity?
   e. If the central bank wants to achieve a long-run target inflation rate of π, at what rate should the money supply grow?

5. A newspaper article once reported that the U.S. economy was experiencing a low rate of inflation. It said that "low inflation has a downside: 45 million recipients of Social Security and other benefits will see their checks go up by just 2.8 percent next year."
   a. Why would policymakers link increases in Social Security and other benefits to inflation?
   b. Is the small increase in benefits a "downside" of low inflation, as the article suggests? Why or why not?
6. During World War II, both Germany and England had plans for a paper weapon: they each printed the other's currency, with the intention of dropping large quantities by airplane. Why might this have been an effective weapon?
7. In each of the following scenarios, explain and categorize the cost of inflation.
   a. Because inflation has risen, the J. Crew clothing company decides to issue a new catalog monthly rather than quarterly.
   b. Grandpa buys an annuity for $100,000 from an insurance company, which promises to pay him $10,000 a year for the rest of his life. After buying it, he is surprised that high inflation triples the price level over the next few years.
   c. Maria lives in an economy with hyperinflation. Each day after being paid, she runs to the store as quickly as possible so she can spend her money before it loses value.
   d. Gita lives in an economy with an inflation rate of 10 percent. Over the past year, she earned a return of $50,000 on her million-dollar portfolio of stocks and bonds. Because her tax rate is 20 percent, she paid $10,000 to the government.
   e. Your father tells you that when he was your age, he worked for only $4 an hour. He suggests that you are lucky to have a job that pays $9 an hour.
8. Some economic historians have noted that during the period of the gold standard, gold discoveries were most likely to occur after a long deflation. (The discoveries of 1896 are an example.) Why might this be true?

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expected future money, inflation depends on both current and expected future money growth. Therefore, to end high inflation, both money growth and expected money growth must fall. Expectations, in turn, depend on credibility—the perception that the central bank is committed to a new, more stable policy.

How can a central bank achieve credibility in the midst of hyperinflation? Credibility is often achieved by removing the underlying cause of the hyperinflation—the need for seigniorage. Thus, a credible fiscal reform is often necessary for a credible change in monetary policy. This fiscal reform might take the form of reducing government spending and making the central bank more independent from the government. Reduced spending decreases the need for seigniorage, while increased independence allows the central bank to resist government demands for seigniorage.

MORE PROBLEMS AND APPLICATIONS

1. In the Cagan model, if the money supply is expected to grow at some constant rate μ (so that $Em_{t+s} = m_t + s\mu$), then Equation A9 can be shown to imply that $p_t = m_t + \gamma\mu$.

a. Interpret this result.

b. What happens to the price level p_t when the money supply m_t changes, holding the money growth rate μ constant?

c. What happens to the price level p_t when the money growth rate μ changes, holding the current money supply m_t constant?

d. If a central bank is about to reduce the rate of money growth μ but wants to hold the price level p_t constant, what should it do with m_t? Can you see any practical problems that might arise in following such a policy?

e. How do your previous answers change in the special case where money demand does not depend on the expected rate of inflation (so that $\gamma = 0$)?

KEY CONCEPTS

Net exports
Trade balance
Net capital outflow
Trade surplus and trade deficit
Balanced trade
Small open economy
World interest rate
Nominal exchange rate
Real exchange rate
Purchasing-power parity

QUESTIONS FOR REVIEW

1. What are the net capital outflow and the trade balance? Explain how they are related.
2. Define the nominal exchange rate and the real exchange rate.
3. If a small open economy cuts defense spending, what happens to saving, investment, the trade balance, the interest rate, and the exchange rate?
4. If a small open economy bans the import of Japanese video game systems, what happens to saving, investment, the trade balance, the interest rate, and the exchange rate?
5. According to the theory of purchasing-power parity, if Japan has low inflation and Mexico has high inflation, what will happen to the exchange rate between the Japanese yen and the Mexican peso?

PROBLEMS AND APPLICATIONS

1. Use the model of the small open economy to predict what would happen to the trade balance, the real exchange rate, and the nominal exchange rate in response to each of the following events.
   a. A fall in consumer confidence about the future induces consumers to spend less and save more.
   b. A tax reform increases the incentive for businesses to build new factories.
   c. The introduction of a stylish line of Toyotas makes some consumers prefer foreign cars over domestic cars.
   d. The central bank doubles the money supply.
   e. New regulations restricting the use of credit cards increase the demand for money.
2. LaunchPad • Consider an economy described by the following equations:

$$\begin{aligned} Y &= C + I + G + NX, \\ Y &= 8{,}000, \\ G &= 2{,}500, \\ T &= 2{,}000, \\ C &= 500 + 2/3\,(Y - T), \\ I &= 900 - 50r, \\ NX &= 1{,}500 - 250\epsilon, \\ r &= r^* = 8. \end{aligned}$$

   a. In this economy, solve for private saving, public saving, national saving, investment, the trade balance, and the equilibrium exchange rate.
   b. Suppose now that G is cut to 2,000. Solve for private saving, public saving, national saving, investment, the trade balance, and the equilibrium exchange rate. Explain what you find.
   c. Now suppose that the world interest rate falls from 8 to 3 percent. (G is again 2,500.) Solve for private saving, public saving, national saving, investment, the trade balance, and the equilibrium exchange rate. Explain what you find.
3. The country of Leverett is a small open economy. Suddenly, a change in world fashions makes the exports of Leverett unpopular.
   a. What happens in Leverett to saving, investment, net exports, the interest rate, and the exchange rate?
   b. The citizens of Leverett like to travel abroad. How will this change in the exchange rate affect them?
   c. The fiscal policymakers of Leverett want to adjust taxes to maintain the exchange rate at its previous level. What should they do? If they do this, what are the overall effects on saving, investment, net exports, and the interest rate?

4. What will happen to the trade balance and the real exchange rate of a small open economy when government purchases increase, such as during a war? Does your answer depend on whether this is a local war or a world war?

5. A Case Study in this chapter concludes that if poor nations offered better production efficiency and legal protections, the trade balance in rich nations such as the United States would move toward surplus. Let's consider why this might be the case.

   a. If the world's poor nations offer better production efficiency and legal protection, what would happen to the investment demand function in those countries?

   b. How would the change you describe in part (1) affect the demand for loanable funds in world financial markets?

   c. How would the change you describe in part (2) affect the world interest rate?

   d. How would the change you describe in part (3) affect the trade balance in rich nations?

6. The president is considering placing a tariff on the import of Japanese luxury cars. Using the model presented in this chapter, discuss the economics and politics of such a policy. In particular, how would the policy affect the U.S. trade deficit? How would it affect the exchange rate? Who would be hurt by such a policy? Who would benefit?

7. LaunchPad • Here is a table similar to Table 6-2 (but in alphabetical order) for the currencies of four imaginary nations. Use the theory of purchasing-power parity to fill in the blanks with a number or "NA" if the figure is not ascertainable from the information given. Explain your answers.

			Exchange rate (per Hagrid fluffy)	
Country	Currency	Price of Butterbeer	Predicted	Actual
Hagrid	Fluffy	5	____	____
Hermionia	Galleon	____	80	70
Potterstan	Sickle	60	____	10
Ronland	Knut	100	20	____

8. Suppose China exports TVs and uses the yuan as its currency, whereas Russia exports vodka and uses the ruble. China has a stable money supply and slow, steady technological progress in TV production, while Russia has very rapid growth in the money supply and no technological progress in vodka production. On the basis of this information, what would you predict for the real exchange rate (measured as bottles of vodka per TV) and the nominal exchange rate (measured as rubles per yuan)? Explain your reasoning. (*Hint*: For the real exchange rate, think about the link between scarcity and relative prices.)

9. Oceania is a small open economy. Suppose that a large number of foreign countries begin to subsidize investment by instituting an investment tax credit (while adjusting other taxes to hold their tax revenue constant), but Oceania does not institute such an investment subsidy.

   a. What happens to world investment demand as a function of the world interest rate?

   b. What happens to the world interest rate?

   c. What happens to investment in Oceania?

   d. What happens to Oceania's trade balance?

   e. What happens to Oceania's real exchange rate?

10. "Traveling in Mexico is much cheaper now than it was ten years ago," says a friend. "Ten years ago, a dollar bought 10 pesos; this year, a dollar buys 15 pesos." Is your friend right or wrong? Given that total inflation over this period was 25 percent in the United States and 100 percent in Mexico, has it become more or less expensive to travel in Mexico? Write your answer using a concrete example—such as an American hot dog versus a Mexican taco—that will convince your friend.

11. You read on a financial Web site that the nominal interest rate is 12 percent per year in Canada and 8 percent per year in the United States. Suppose that international capital flows equalize the real interest rates in the two countries and that purchasing-power parity holds.

a. Using the Fisher equation (discussed in Chapter 5), what can you infer about expected inflation in Canada and in the United States?

b. What can you infer about the expected change in the exchange rate between the Canadian dollar and the U.S. dollar?

c. A friend proposes a get-rich-quick scheme: borrow from a U.S. bank at 8 percent, deposit the money in a Canadian bank at 12 percent, and make a 4 percent profit. What's wrong with this scheme?

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MORE PROBLEMS AND APPLICATIONS

1. If a war broke out abroad, it would affect the U.S. economy in many ways. Use the model of the large open economy to examine each of the following effects of such a war. What happens in the United States to saving, investment, the trade balance, the interest rate, and the exchange rate? (To keep things simple, consider each of the following effects separately.)
   - **a.** The U.S. government, fearing it may need to enter the war, increases its purchases of military equipment.
   - **b.** Other countries raise their demand for high-tech weapons, a major export of the United States.
   - **c.** The war makes U.S. firms uncertain about the future, and the firms delay some investment projects.
   - **d.** The war makes U.S. consumers uncertain about the future, and the consumers save more in response.
   - **e.** Americans become apprehensive about traveling abroad, so more of them spend their vacations in the United States.
   - **f.** Foreign investors seek a safe haven for their portfolios in the United States.
2. On September 21, 1995, "House Speaker Newt Gingrich threatened to send the United States into default on its debt for the first time in the nation's history, to force the Clinton Administration to balance the budget on Republican terms" (*New York Times*, September 22, 1995, p. A1). That same day, the interest rate on 30-year U.S. government bonds rose from 6.46 to 6.55 percent, and the dollar fell in value from 102.7 to 99.0 yen. Use the model of the large open economy to explain this event.

QUESTIONS FOR REVIEW

1. What determines the natural rate of unemployment?
2. Describe the difference between frictional unemployment and structural unemployment.
3. Give three explanations of why the real wage may remain above the level that equilibrates labor supply and labor demand.
4. Is most unemployment long-term or short-term? Explain your answer.
5. Do Europeans work more or fewer hours than Americans? List three hypotheses that have been suggested to explain the difference.

PROBLEMS AND APPLICATIONS

1. Answer the following questions about your own experience in the labor force.
   a. When you or one of your friends is looking for a part-time job, how many weeks does it typically take? After you find a job, how many weeks does it typically last?
   b. From your estimates, calculate (in a rate per week) your rate of job finding f and your rate of job separation s. (*Hint:* If f is the rate of job finding, then the average spell of unemployment is $1/f$.)
   c. What is the natural rate of unemployment for the population you represent?
2. LaunchPad • The residents of a certain dormitory have collected the following data: people who live in the dorm can be classified as either involved in a relationship or uninvolved. Among involved people, 10 percent experience a breakup of their relationship every month. Among uninvolved people, 5 percent enter into a relationship every month. What is the steady-state fraction of residents who are uninvolved?
3. In this chapter we saw that the steady-state rate of unemployment is $U/L = s/(s + f)$. Suppose that the unemployment rate does not begin at this level. Show that unemployment will evolve over time and reach this steady state. (*Hint:* Express the change in the number of unemployed as a function of s, f, and U. Then show that if unemployment is above the natural rate, unemployment falls, and if unemployment is below the natural rate, unemployment rises.)
4. Suppose that Congress passes legislation making it more difficult for firms to fire workers. (An example is a law requiring severance pay for fired workers.) If this legislation reduces the rate of job separation without affecting the rate of job finding, how would the natural rate of unemployment change? Do you think it is plausible that the legislation would not affect the rate of job finding? Why or why not?
5. LaunchPad • Consider an economy with the following Cobb–Douglas production function:

$$Y = 5K^{1/3}L^{2/3}.$$

   a. Derive the equation describing labor demand in this economy as a function of the real wage and the capital stock. (*Hint:* Review Chapter 3.)
   b. The economy has 27,000 units of capital and a labor force of 1,000 workers. Assuming that factor prices adjust to equilibrate supply and demand, calculate the real wage, total output, and the total amount earned by workers.
   c. Now suppose that Congress, concerned about the welfare of the working class, passes a law setting a minimum wage that is 10 percent above the equilibrium wage you derived in part (b). Assuming that Congress cannot dictate how many workers are hired at the mandated wage, what are the effects of this law? Specifically, calculate what happens to the real wage, employment, output, and the total amount earned by workers.

d. Does Congress succeed in its goal of helping the working class? Explain.

e. Do you think that this analysis provides a good way of thinking about a minimum-wage law? Why or why not?

6. Suppose that a country experiences a reduction in productivity—that is, an adverse shock to the production function.

a. What happens to the labor demand curve?

b. How would this change in productivity affect the labor market—that is, employment, unemployment, and real wages—if the labor market is always in equilibrium?

c. How would this change in productivity affect the labor market if unions prevent real wages from falling?

7. LaunchPad • Consider an economy with two sectors: manufacturing and services. Demand for labor in manufacturing and services are described by these equations:

$$L_m = 200 - 6W_m$$

$$L_s = 100 - 4W_s$$

where L is labor (in number of workers), W is the wage (in dollars), and the subscripts denote the sectors. The economy has 100 workers who are willing and able to work in either sector.

a. If workers are free to move between sectors, what relationship will there be between W_m and W_s?

b. Suppose that the condition in part (a) holds and wages adjust to equilibrate labor supply and labor demand. Calculate the wage and employment in each sector.

c. Suppose a union establishes itself in manufacturing and pushes the manufacturing wage to \$25. Calculate employment in manufacturing.

d. In the aftermath of the unionization of manufacturing, all workers who cannot get the highly paid union jobs move to the service sector. Calculate the wage and employment in services.

e. Now suppose that workers have a *reservation wage* of \$15—that is, rather than taking a job at a wage below \$15, they would rather wait for a \$25 union job to open up. Calculate the wage and employment in each sector. What is the economy's unemployment rate?

8. When workers' wages rise, their decision about how much time to spend working is affected in two conflicting ways—as you may have learned in courses in microeconomics. The *income effect* is the impulse to work less, because greater incomes mean workers can afford to consume more leisure. The *substitution effect* is the impulse to work more, because the reward for working an additional hour has risen (equivalently, the opportunity cost of leisure has gone up). Apply these concepts to Blanchard's hypothesis about American and European tastes for leisure. On which side of the Atlantic do income effects appear larger than substitution effects? On which side do the two effects approximately cancel? Do you think it is a reasonable hypothesis that tastes for leisure vary by geography? Why or why not?

9. In any city at any time, some of the stock of usable office space is vacant. This vacant office space is unemployed capital. How would you explain this phenomenon? In particular, which approach to explaining unemployed labor applies best to unemployed capital? Do you think unemployed capital is a social problem? Explain your answer.

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