QUESTIONS FOR REVIEW

1. What were Keynes's three conjectures about the consumption function?
2. Describe the evidence that was consistent with Keynes's conjectures and the evidence that was inconsistent with them.
3. How do the life-cycle and permanent-income hypotheses resolve the seemingly contradictory pieces of evidence regarding consumption behavior?
4. Use Fisher's model of consumption to analyze an increase in second-period income. Compare the case in which the consumer faces a binding borrowing constraint and the case in which he does not.
5. Explain why changes in consumption are unpredictable if consumers obey the permanent-income hypothesis and have rational expectations.
6. Give an example in which someone might exhibit time-inconsistent preferences.

PROBLEMS AND APPLICATIONS

1. The chapter uses the Fisher model to discuss a change in the interest rate for a consumer who saves some of his first-period income. Suppose, instead, that the consumer is a borrower. How does that alter the analysis? Discuss the income and substitution effects on consumption in both periods.
2. Gabe and Gita both obey the two-period Fisher model of consumption. Gabe earns \$100 in the first period and \$100 in the second period. Gita earns nothing in the first period and \$210 in the second period. Both of them can borrow or lend at the interest rate r.
   a. You observe both Gabe and Gita consuming \$100 in the first period and \$100 in the second period. What is the interest rate r?
   b. Suppose the interest rate increases. What will happen to Gabe's consumption in the first period? Is Gabe better off or worse off than before the interest rate rise?
   c. What will happen to Gita's consumption in the first period when the interest rate increases? Is Gita better off or worse off than before the interest rate increase?
3. The chapter analyzes Fisher's model for the case in which the consumer can save or borrow at an interest rate of r and for the case in which the consumer can save at this rate but cannot borrow at all. Consider now the intermediate case in which the consumer can save at rate r_s and borrow at rate r_b, where $r_s < r_b$.
   a. What is the consumer's budget constraint in the case in which he consumes less than his income in period one? Answer in the form of an equation.
   b. What is the consumer's budget constraint in the case in which he consumes more than his income in period one? Answer in the form of an equation.
   c. On a single graph, show the two budget constraints from parts (a) and (b). Shade the area that represents the combination of first-period and second-period consumption the consumer can choose.
   d. Now add to your graph the consumer's indifference curves. Show three possible outcomes: one in which the consumer saves, one in which he borrows, and one in which he neither saves nor borrows.
   e. What determines first-period consumption in each of the three cases?
4. Explain whether borrowing constraints increase or decrease the potency of fiscal policy to influence aggregate demand in each of the following cases.
   a. A temporary tax cut
   b. An announced future tax cut

5. Albert and Franco both follow the life-cycle hypothesis: they smooth consumption as much as possible. They each live for five periods, the last two of which are retirement. Here are their incomes earned during each period:

Period	Albert	Franco
1	$100,000	$40,000
2	100,000	100,000
3	100,000	160,000
4	0	0
5	0	0

They both die at the beginning of period six. To keep things simple, assume that the interest rate is zero for both saving and borrowing and that the life span is perfectly predictable.

   a. For each individual, compute consumption and saving in each period of life.

   b. Compute their wealth (that is, their accumulated saving) at the beginning of each period, including period six.

   c. Graph consumption, income, and wealth for each of them, with the period on the horizontal axis. Compare your graph to Figure 16-12.

   d. Suppose now that consumers cannot borrow, so wealth cannot be negative. How does that change your answers above? Draw a new graph for part (c) if necessary.

6. Demographers predict that the fraction of the population that is elderly will increase over the next 20 years. What does the life-cycle model predict for the influence of this demographic change on the national saving rate?

7. A Case Study in the chapter indicates that the elderly do not dissave as much as the life-cycle model predicts.

   a. Describe the two possible explanations for this phenomenon.

   b. One study found that the elderly who do not have children dissave at about the same rate as the elderly who do have children. What might this finding imply about the validity of the two explanations? Why might it be inconclusive?

8. Consider two savings accounts that pay the same interest rate. One account lets you take your money out on demand. The second requires that you give 30-day advance notification before withdrawals.

   a. Which account would you prefer? Why?

   b. Can you imagine a person who might make the opposite choice? Explain.

   c. What do these choices say about the theories of the consumption function discussed in this chapter?

9. This problem uses calculus to compare two scenarios of consumer optimization.

   a. Nina has the following utility function:

$$U = \ln(C_1) + \ln(C_2) + \ln(C_3).$$

   She starts with wealth of $120,000, earns no additional income, and faces a zero interest rate. How much does she consume in each of the three periods? (*Hint:* The marginal rate of substitution between consumption in any two periods is the ratio of marginal utilities.)

   b. David is just like Nina, except he always gets extra utility from present consumption. From the perspective of period one, his utility function is

$$U = 2\ln(C_1) + \ln(C_2) + \ln(C_3).$$

   In period one, how much does David decide to consume in each of the three periods? How much wealth does he have left after period one?

   c. When David enters period two, his utility function is

$$U = \ln(C_1) + 2\ln(C_2) + \ln(C_3).$$

   How much does he consume in periods two and three? How does your answer here compare to David's decision in part (b)?

   d. If, in period one, David were able to constrain the choices he can make in period two, what would he do? Relate this example to one of the theories of consumption discussed in the chapter.

KEY CONCEPTS

Business fixed investment
Residential investment
Inventory investment
Neoclassical model of investment
Depreciation
Real cost of capital
Net investment
Corporate income tax
Investment tax credit
Stock
Stock market
Tobin's q
Efficient markets hypothesis
Financing constraints
Production smoothing
Inventories as a factor of production
Stock-out avoidance
Work in process

QUESTIONS FOR REVIEW

1. In the neoclassical model of business fixed investment, under what conditions will firms find it profitable to add to their capital stock?
2. What is Tobin's q, and what does it have to do with investment?
3. Explain why an increase in the interest rate reduces the amount of residential investment.
4. List four reasons firms might hold inventories.

PROBLEMS AND APPLICATIONS

1. Use the neoclassical model of investment to explain the impact of each of the following on the rental price of capital, the cost of capital, and investment.
   a. Anti-inflationary monetary policy raises the real interest rate.
   b. An earthquake destroys part of the capital stock.
   c. Immigration of foreign workers increases the size of the labor force.
   d. Advances in computer technology make production more efficient.
2. Suppose that the government levies a tax on oil companies equal to a proportion of the value of the company's oil reserves. (The government assures the firms that the tax is for one time only.) According to the neoclassical model, what effect will the tax have on business fixed investment by these firms? What if these firms face financing constraints?
3. The *IS–LM* model developed in Chapters 11 and 12 assumes that investment depends only on the interest rate. Yet our theories of investment suggest that investment might also depend on national income: higher income might induce firms to invest more.
   a. Explain why investment might depend on national income.
   b. Suppose that investment is determined by
   $$I = \bar{I} + aY,$$
   where a is a parameter between zero and one, which measures the influence of national income on investment. With investment set this way, what are the fiscal-policy multipliers in the Keynesian-cross model? Explain.
   c. Suppose that investment depends on both income and the interest rate. That is, the investment function is
   $$I = \bar{I} + aY - br,$$
   where a is a parameter between zero and one that measures the influence of national income on investment and b is a parameter greater than zero that measures the influence of the

interest rate on investment. Use the *IS–LM* model to consider the short-run impact of an increase in government purchases on national income Y, the interest rate r, consumption C, and investment I. How might this investment function alter the conclusions implied by the basic *IS–LM* model?

4. When the stock market crashes, what influence does it have on investment, consumption, and aggregate demand? Why? How should the Federal Reserve respond? Why?

5. It is an election year, and the economy is in a recession. The opposition candidate campaigns on a platform of passing an investment tax credit, which would be effective next year after she takes office. What impact does this campaign promise have on economic conditions during the current year?

6. The United States experienced a large increase in the number of births in the 1950s. People in this baby-boom generation reached adulthood and started forming their own households in the 1970s.

   a. Use the model of residential investment to predict the impact of this event on housing prices and residential investment.

   b. Go to the Federal Reserve Economic Data (FRED) Web site to find data. For the years 1970 and 1980, compute the real price of housing, measured as the residential investment deflator divided by the GDP deflator. What do you find? Is this finding consistent with the model?

7. U.S. tax laws encourage investment in housing (such as through the deductibility of mortgage interest for purposes of computing taxable income) and discourage investment in business capital (such as through the corporate income tax). What are the long-run effects of this policy? (*Hint:* Think about the labor market.)

PROBLEMS AND APPLICATIONS

1. Suppose that the tradeoff between unemployment and inflation is determined by the Phillips curve:

$$u = u^n - \alpha(\pi - E\pi),$$

where u denotes the unemployment rate, u^n the natural rate, π the rate of inflation, and $E\pi$ the expected rate of inflation. In addition, suppose that the Left Party always follows a policy of high money growth and the Right Party always follows a policy of low money growth. What "political business cycle" pattern of inflation and unemployment would you predict under the following conditions?

   a. Every four years, one of the parties takes control based on a random flip of a coin. (*Hint*: What will expected inflation be prior to the election?)

   b. The two parties take turns.

   c. Do your answers above support the conclusion that monetary policy should be set by an independent central bank?

2. When cities pass laws limiting the rent landlords can charge on apartments, the laws usually apply to existing buildings and exempt any buildings not yet built. Advocates of rent control argue that this exemption ensures that rent control does not discourage the construction of new housing. Evaluate this argument in light of the time-inconsistency problem.

3. A central bank has decided to adopt inflation targeting and is now debating whether to target 5 percent inflation or zero inflation. The economy is described by the following Phillips curve:

$$u = 5 - 0.5\,(\pi - E\pi),$$

where u and π are the unemployment rate and inflation rate measured in percentage points. The social cost of unemployment and inflation is described by the following loss function:

$$L = u + 0.05\,\pi^2.$$

The central bank would like this loss to be as small as possible.

   a. If the central bank commits to targeting 5 percent inflation, what is expected inflation? If the central bank follows through, what is the unemployment rate? What is the loss from inflation and unemployment?

   b. If the central bank commits to targeting zero inflation, what is expected inflation? If the central bank follows through, what is the unemployment rate? What is the loss from inflation and unemployment?

   c. Based on your answers to parts (a) and (b), which inflation target would you recommend? Why?

   d. Suppose the central bank chooses to target zero inflation, and expected inflation is zero. Suddenly, however, the central bank surprises people with 5 percent inflation. What is unemployment in this period of unexpected inflation? What is the loss from inflation and unemployment?

   e. What problem does your answer to part (d) illustrate?

4. After every policy meeting, the Federal Reserve issues a statement (sometimes called the press release), which you can find on the Fed's Web site (http://www.federalreserve.gov/monetarypolicy/fomccalendars.htm). Read the most recent statement. What does it say? What is the Fed doing? Why? What do you think about the Fed's recent policy decisions?

game against private decisionmakers who have rational expectations. Unless it is committed to a fixed rule of zero inflation, the Fed cannot get private agents to expect zero inflation.

Suppose, for example, that the Fed simply announces that it will follow a zero-inflation policy. Such an announcement by itself cannot be credible. After private agents have formed their expectations of inflation, the Fed has the incentive to renege on its announcement in order to decrease unemployment. [As we have just seen, once expectations are determined, the Fed's optimal policy is to set inflation at $\pi = \alpha/(2\gamma)$, regardless of $E\pi$.] Private agents understand the incentive to renege and therefore do not believe the announcement in the first place.

This theory of monetary policy has an important corollary. Under one circumstance, the Fed with discretion achieves the same outcome as the Fed committed to a fixed rule of zero inflation. If the Fed dislikes inflation much more than it dislikes unemployment (so that γ is very large), inflation under discretion is near zero, because the Fed has little incentive to inflate. This finding provides some guidance to those who have the job of appointing central bankers. An alternative to imposing a fixed rule is to appoint an individual with a fervent distaste for inflation. Perhaps this is why even liberal politicians (Jimmy Carter, Bill Clinton) who are more concerned about unemployment than inflation sometimes appoint conservative central bankers (Paul Volcker, Alan Greenspan) who are more concerned about inflation.[10]

MORE PROBLEMS AND APPLICATIONS

1. In the 1970s in the United States, the inflation rate and the natural rate of unemployment both rose. Let's use this model of time inconsistency to examine this phenomenon. Assume that policy is discretionary.
   a. In the model as developed so far, what happens to the inflation rate when the natural rate of unemployment rises?
   b. Let's now change the model slightly by supposing that the Fed's loss function is quadratic in both inflation and unemployment. That is,

$$L(u, \pi) = u^2 + \gamma\pi^2.$$

   Follow steps similar to those in the text to solve for the inflation rate under discretionary policy.
   c. Now what happens to the inflation rate when the natural rate of unemployment rises?
   d. In 1979, President Jimmy Carter appointed the central banker Paul Volcker to head the Federal Reserve. Volcker had a strong distaste for inflation. According to this model, what should have happened to inflation and unemployment? Compare the model's prediction to what actually happened.

[10]This corollary is based on Kenneth Rogoff, "The Optimal Degree of Commitment to an Intermediate Target," *Quarterly Journal of Economics* 100 (1985): 1169–1190.

QUESTIONS FOR REVIEW

1. What was unusual about U.S. fiscal policy from 1980 to 1995?
2. Why do many economists project increasing budget deficits and government debt over the next several decades?
3. Describe four problems affecting measurement of the government budget deficit.
4. According to the traditional view of government debt, how does a debt-financed tax cut affect public saving, private saving, and national saving?
5. According to the Ricardian view of government debt, how does a debt-financed tax cut affect public saving, private saving, and national saving?
6. Do you find the traditional or the Ricardian view of government debt more credible? Why?
7. Give three reasons that a budget deficit might be a good policy choice.
8. Why might the level of government debt affect the government's incentives regarding money creation?

PROBLEMS AND APPLICATIONS

1. On April 1, 1996, Taco Bell, the fast-food chain, ran a full-page ad in the *New York Times* with this news: "In an effort to help the national debt, Taco Bell is pleased to announce that we have agreed to purchase the Liberty Bell, one of our country's most historic treasures. It will now be called the *Taco Liberty Bell* and will still be accessible to the American public for viewing. We hope our move will prompt other corporations to take similar action to do their part to reduce the country's debt." Would such actions by U.S. corporations actually reduce the national debt as it is now measured? How would your answer change if the U.S. government adopted capital budgeting? Do you think these actions represent a true reduction in the government's indebtedness? Do you think Taco Bell was serious about this plan? (*Hint:* Note the date.) Be sure to explain your answers.
2. Draft a letter to the senator described in Section 19-3, explaining the logic of the Ricardian view of government debt and evaluating its practical relevance.
3. The Social Security system levies a tax on workers and pays benefits to the elderly. Suppose that Congress increases both the tax and the benefits. For simplicity, assume that Congress announces that the increases will last for only one year.
   a. How do you suppose this change would affect the economy? (*Hint:* Think about the marginal propensities to consume of the young and the old.)
   b. Does your answer depend on whether generations are altruistically linked?
4. Some economists have proposed the rule that the cyclically adjusted budget always be balanced. Compare this proposal to a strict balanced-budget rule. Which is preferable? What problems do you see with the rule requiring a balanced cyclically adjusted budget?
5. Find some recent projections for the future path of the U.S. government debt as a percentage of GDP. What assumptions are made about government spending, taxes, and economic growth? Do you think these assumptions are reasonable? If the United States experiences a productivity slowdown, how will reality differ from this projection? (*Hint:* A good place to look is http://www.cbo.gov.)

PROBLEMS AND APPLICATIONS

1. In each of the following cases, identify whether the problem is adverse selection or moral hazard, and explain your answer. How might the problem be dealt with?
   a. Rick has gotten a large advance to write a textbook. With the money in hand, he prefers spending his time sailing rather than sitting in his office working on the book.
   b. Justin is trying to get a large advance to write a textbook. He knows, but publishers don't, that he did poorly on the writing portion of the SAT.
   c. Mai is buying a life insurance policy. She knows that members of her family tend to die young.
   d. Erich, who has a large life insurance policy, spends his vacation pursuing his favorite hobbies: skydiving, bungee jumping, and bullfighting.
2. Nation A has a well-developed financial system, where resources flow to the capital investments with the highest marginal product. Nation B has a less-developed financial system from which some would-be investors are excluded.
   a. Which nation would you expect to have a higher level of total factor productivity? Explain. (*Hint*: See the appendix to Chapter 9 for the definition of *total factor productivity*.)
   b. Suppose that the two nations have the same saving rate, depreciation rate, and rate of technological progress. According to the Solow growth model, how does output per worker, capital per worker, and the capital–output ratio compare in the two countries?
   c. Assume the production function is Cobb–Douglas. Compare the real wage and the real rental price of capital in the two countries.
   d. Who benefits from having a better-developed financial system?
3. Some commentators argue that when a financial firm is rescued by the government in the midst of a financial crisis, the firm's equity holders should be wiped out, but the firm's creditors should be protected. Does this solve the moral hazard problem? Why or why not?
4. In recent years, as described in this chapter, both the United States and Greece have experienced increases in government debt and a significant economic downturn. In what ways were the two situations similar? In what ways were they different? Why did the two nations have different policy options at their disposal?