2. Labor markets are typically characterized by large quantities of job creation and job destruction that result in much smaller overall changes in employment. Most unemployed workers find new jobs relatively quickly in the United States, and most unemployment is accounted for by people out of work for long spells.
3. Adverse shocks (like the oil shocks and productivity slowdown of the 1970s) as well as inefficient labor market institutions appear to play important roles in explaining the relatively high unemployment rates and low hours worked in Europe.
4. Because the labor market is so important, problems like unemployment merit serious responses by society. Designing the right safety net requires balancing the needs for social insurance against the disincentives associated with that insurance.
5. Present discounted values help us compare financial payments received at different times.
6. The rising return to a college education is one of the key facts about the labor market. This college wage premium has risen from about 50 percent in 1963 to about 90 percent by 2005. Another way of viewing this fact is that wage inequality between college graduates and high school graduates has increased, mirroring a broader increase in income inequality. Possible explanations include skill-biased technical change and globalization.

KEY CONCEPTS

bathtub model
cyclical unemployment
employment-population ratio
frictional unemployment
globalization
job creation
job destruction
job finding rate
job separation rate
natural rate of unemployment
present discounted value
skill-biased technical change
structural unemployment
unemployment rate
wage rigidity

REVIEW QUESTIONS

1. What explains the general rise in the employment-population ratio in the United States? By how much did the ratio decline around the last recession? How many jobs does this represent?
2. What is the definition of the unemployment rate?
3. What are some examples of changes in the economy that would cause the labor supply curve to shift? What might shift the labor demand curve? How do these changes affect the wage rate and the employment-population ratio?
4. What is the difference between the natural rate of unemployment and cyclical unemployment? How are these related to structural and frictional unemployment?

5. Is the unemployment rate in Europe today higher or lower than in the United States? What about hours worked per person? What are some possible explanations for the differences?
6. Give some examples of economic questions where the concept of present discounted value would be useful.
7. In the past 50 years, both the fraction of hours worked by college graduates and the relative wage of college graduates have gone up. Why?

EXERCISES

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1. **How many missing jobs?** Suppose the U.S. unemployment rate at the start of 2010 had been 6% instead of 9.7%. How many more people would have been working (assuming the labor force remained the same)?
2. **Reducing tax rates:** Suppose the government decides to reform the tax system to reduce the marginal income tax rate across the board. Explain the effect on wages, the employment-population ratio, and unemployment.
3. **A positive oil shock:** Suppose scientists discover a new way to extract oil from deposits that were previously thought to be unrecoverable. The extra supply of oil leads oil prices to decline by $5 per barrel. Explain the effect on wages, the employment-population ratio, and unemployment—all for the overall economy.
4. **Present discounted values (I):** Compute the present discounted value of the following income streams. Assume the interest rate is 3%.
   (a) $50,000, received 1 year from now.
   (b) $50,000, received 10 years from now.
   (c) $100 every year, forever, starting immediately.
   (d) $100 every year, forever, starting 1 year from now.
   (e) $100 every year for the next 50 years, starting immediately.
5. **Present discounted values (II):** Repeat exercise 4 for an interest rate of 1%, then for an interest rate of 5%. Arrange your answers in a table so you can more easily see the difference a change in the interest rate makes.
6. **The value of your human capital:** Review the discussion of the value of a typical worker's human capital in Section 7.5 on pages 184–85.
   (a) Recompute the present discounted value in the following cases: $R = 0.01$, $R = 0.02$; $R = 0.04$, $R = 0.05$.
   (b) What is the economic intuition for why the present discounted value changes when the interest rate changes?
7. **Valuing human capital with wage growth:** To make the calculation of the present discounted value of a worker's human capital more realistic, suppose labor income starts at $50,000 initially, but then grows at a constant rate of 2% per year after that. Let w_t be labor income in year t, so that

$$w_t = \overline{w}_0(1 + \overline{g})^t,$$

where $\overline{w}_0 = \$50{,}000$ and $\overline{g} = 0.02$. The steps below will walk you through the problem.

(a) If the interest rate is R, what is the formula for the present discounted value today (in year 0) of labor income from a particular future year t?

(b) Now add up these terms from $t = 0$ to $t = 45$ to get a formula for the present discounted value of labor income. Your answer should look something like that in equation (7.12).

(c) Write your answer to part (b) so that it takes the form of the geometric series:

$$pdv = \overline{w}_0(1 + a + a^2 + a^3 + \ldots + a^{45}).$$

What is the value of a that you find?

(d) Apply the geometric series formula to compute the present discounted value for the case of $R = 0.04$, $R = 0.03$, and $R = 0.02$. What weird thing happens (and why) when $R = 0.02$?

(e) Comment on your results.

8. **How much is a college education worth?** In the text, we supposed a college education raised a person's wage by \$30,000 per year, from \$40,000 to \$70,000. Assume the interest rate is 3% and there is no growth in wages, then answer the following.

(a) Suppose you are a high school senior deciding whether or not to go to college. What is the present discounted value of your labor income if you forgo college and start work immediately?

(b) As an alternative, you could pay \$20,000 per year in college tuition, attend for 4 years, and then earn \$70,000 per year after you graduate. What is the present discounted value of your labor earnings under this plan? (Compute this value from the point of view of a high school senior.)

(c) Discuss the economic value of a college education.

9. **Explaining the college premium in the 1970s:** As shown in Figure 7.8, the college wage premium declined in the 1970s. Using a supply-and-demand graph, explain why this decline might have occurred.

10. **Optimal unemployment insurance:** Consider the following two proposals to reform unemployment insurance. Explain the arguments for and against each reform.

(a) The insurance payment would be increased so that it replaced 100% of a worker's regular labor income for 26 weeks.

(b) Each worker would be paid a lump sum equal to 10 weeks of his or her labor income at the start of the spell of unemployment. There would then be no other payments.

11. **GDP per hour:** Assume annual hours worked per person aged 16–64 in the United States is equal to 1,000. Using the data from Table 7.2 and the data from the "Country Snapshots" file (snapshots.pdf), compute GDP per hour for the other countries in Table 7.2 for the year 2000. (You can assume that hours worked was the same in 2000 as in 1993–1996.) Comment on what you find.

WORKED EXERCISES

4. Present discounted values (I):

(a) To calculate the present discounted value of \$50,000 received 1 year from now, think about how much money you would have to put in the bank today in order to have \$50,000 in 1 year. The answer—let's call it x—satisfies

$$x(1 + R) = \$50{,}000.$$

Therefore, the present discounted value is

$$x = \frac{\$50{,}000}{1 + R} = \frac{\$50{,}000}{1.03} = \$48{,}544.$$

(b) Similarly, if the \$50,000 is to be received in 10 years,

$$x(1 + R)^{10} = \$50{,}000.$$

So the present discounted value is

$$x = \frac{\$50{,}000}{(1 + R)^{10}} = \frac{\$50{,}000}{(1.03)^{10}} = \$37{,}205.$$

(c) The present discounted value of \$100 every year forever is

$$\begin{aligned} x &= 100 + \frac{100}{1 + R} + \frac{100}{(1 + R)^2} + \frac{100}{(1 + R)^3} + \ldots \\ &= 100 \times \left[1 + \frac{1}{1 + R} + \frac{1}{(1 + R)^2} + \frac{1}{(1 + R)^3} + \ldots\right] \\ &= 100 \times \frac{1}{1 - \frac{1}{1 + R}} \\ &= 100 \times \frac{1 + R}{R} \\ &= 100 \times \frac{1.03}{0.03} = \$3{,}433. \end{aligned}$$

(d) To find the present value of \$100 every year forever, starting 1 year from now, we can use a simple trick: the answer to this question is the same as the answer to (c) except that payment is delayed by 1 year. That is, the answer is

$$\frac{\text{answer to part (c)}}{1 + R}.$$

Now take a look at the answer to part (c) given above, especially in the second-to-last line. Using that result, we see that the present value of \$100 forever, starting 1 year from now, is

$$\frac{1}{1 + R} \times 100 \times \frac{1 + R}{R} = \frac{100}{R}.$$

That is, we get a very elegant answer: we just divide the \$100 by the interest rate. For an interest rate of 3 percent, then, the answer is \$100/0.03 = \$3,333.

(e) To calculate this value if the payments stop after 50 years, we use the formula derived in equation (7.14). In this case, it is

$$x = \$100 \times \frac{1 - \left(\frac{1}{1+R}\right)^{50}}{1 - \frac{1}{1+R}}.$$

With $R = 0.03$, the present discounted value of the first 50 payments is \$2,650.

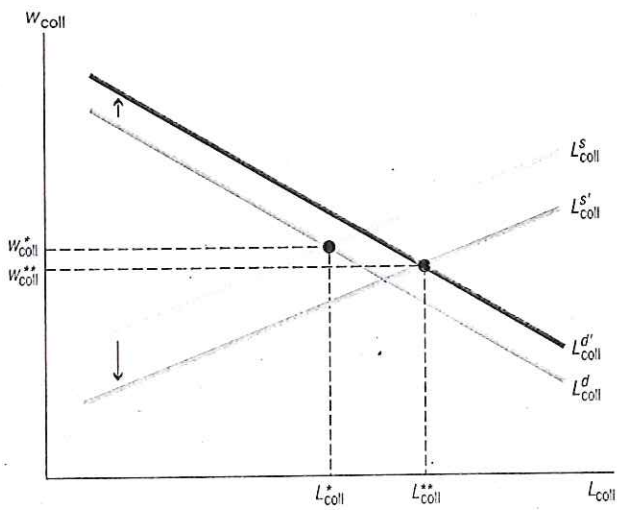
9. **Explaining the college premium in the 1970s:** To answer this question, conduct a supply-and-demand analysis of the labor market, as we did in Figure 7.9. Let's assume the labor market for workers with only a high school education does not change, in order to keep things simple. Instead, focus on the labor market for college-educated workers.

Recall that our basic analysis assumes the labor demand curve for college-educated workers is shifting out rapidly because of technological change. Normally, this would lead the wage premium to rise. How can it decline?

A natural way to explain a decline in the wage premium is to have the labor supply curve shift out by *more* than the labor demand curve, as shown in Figure 7.11. If this supply shift is large enough, the wage premium can decline. What might have caused such a large change in supply? Demographic changes and the Vietnam War are two plausible candidates. The 1970s were a period when

FIGURE 7.11

The Declining College Wage Premium of the 1970s



the baby boomers entered the labor force after college, creating a larger-than-usual increase in the supply of college graduates. In addition, the Vietnam War may have encouraged people to attend college to avoid military service and also created a pool of veterans who returned to college and entered the labor market in the 1970s. The paper by Katz and Murphy cited in footnote 14 (p. 192) discusses these forces in more detail.