

Chapter 4 Problems and Solutions

1) Compute the future value of \$100 at an 8 percent interest rate five, ten and fifteen years into the future.

Answer:

$$\text{Future value in 5 years} = \$100 \cdot (1.08)^5 = \$146.93$$

$$\text{Future value in 10 years} = \$100 \cdot (1.08)^{10} = \$215.89$$

$$\text{Future value in 15 years} = \$100 \cdot (1.08)^{15} = \$317.22$$

5) You have purchased a \$1000 certificate of deposit (CD) that matures in 10 years. Assuming that interest is paid annually and reinvested, what will be the value of the CD at maturity if the interest rate is 5 percent? What if the interest rate were 10 percent?

Answer:

$$\text{If } i=5\%, \text{ Future Value} = \$1000 \cdot (1.05)^{10} = \$1628.89$$

$$\text{If } i=10\%, \text{ Future Value} = \$1000 \cdot (1.10)^{10} = \$2593.74$$

9) You are a manager in charge of a factory that makes automobile tires. A new production process has been invented, and you want to purchase new machines to take advantage of it.

- a. Describe how you would convince your company's president to purchase the machines.
- b. At the end of the discussion, you conclude that the real rate of return on the investment is 10 percent, so it is worth undertaking. The president responds that in the current financial environment, he cannot borrow for less than 12 percent, so he can't justify the investment. How would you counter this argument?

Answer:

- a. The new machines will allow the company to produce tires more cheaply; the future revenue from the machines will exceed the cost of purchasing the machines.
- b. In general, an investment is profitable if the internal rate of return exceeds the cost of borrowing, so the president may be right. However, using the new machines could allow the company to save on labor costs, maintenance costs, etc.—if those costs are large enough, the investment could still be worthwhile.

11) A company offers you a job and tells you that you may choose either a \$100,000 signing bonus plus a \$90,000 salary or a \$110,000 salary. If the interest rate is 6 percent, how many years will you need to work for the company in order to justify taking the higher salary?

Answer: You need to find the number of years that equates the present value of both options. You can do this using spreadsheet software. The answer is 6+ years.

Year	PV of \$100,000 + \$90,000 salary	PV of \$110,000 salary
1	184905.6604	103773.5849
2	265005.34	201673.1933
3	340571.0755	294031.3144
4	411859.5051	381161.6174
5	479112.7407	463360.0164
6	542559.1893	540905.6759
7	602414.3296	614061.9584
8	658881.443	683077.3192
9	712152.3047	748186.1502
10	762407.8346	809609.5757
11	809818.7119	867556.2034
12	854545.9546	922222.8334
13	896741.4666	973795.1259
14	936548.5534	1022448.232
15	974102.4089	1068347.389
16	1009530.574	1111648.48
17	1042953.372	1152498.566
18	1074484.313	1191036.383
19	1104230.484	1227392.814
20	1132292.91	1261691.334

Chapter 5 Problems and Solutions

- 1) Consider a game in which a coin will be flipped three times. For each heads you will be paid \$100. Assume that the coin has a two-thirds probability of coming up heads.
- Construct a table of the possibilities and probabilities in this game.
 - Compute the expected value of the game.
 - How much would you be willing to pay to play this game?
 - Consider the effect of a change in the game so that if tails comes up twice in a row, you get nothing. How would your answers to the first three parts of this question change?

Answer:

a.

Possibilities	Probability	Outcome
1	1/27	0 heads, 3 tails
2	2/9	1 head, 2 tails
3	4/9	2 heads, 1 tail
4	8/27	3 heads, 0 tails

b. Expected Value = $1/27(\$0) + 2/9(\$100) + 4/9(\$200) + 8/27(\$300) = \$200$

c. A person who is risk-averse will want to pay less than \$200; a person who is risk neutral will be willing to pay \$200.

d.

Possibilities	Probability	Outcome	Payoff
1	1/27	3 tails	\$0
2	2/27	Tails, heads, tails	\$100
3	2/27	Tails, tails, heads	\$0
4	2/27	Heads, tails, tails	\$0
5	4/9	2 heads, 1 tails	\$200
6	8/27	3 heads, 0 tails	\$300

Expected Value = $1/27(\$0) + 2/27(\$100) + 2/27(\$0) + 2/27(\$0) + 4/9(\$200) + 8/27(\$300)$
 = \$185

A person who is risk-averse will want to pay less than \$185; a person who is risk neutral will be willing to pay \$185.

5) Assume that the economy can experience high growth, normal growth, or recession. You expect the following stock-market returns for the coming year under these conditions:

State of the Economy	Probability	Return
High Growth	0.2	+30%
Normal Growth	0.7	+12%
Recession	0.1	-15%

- e. Compute the expected value of a \$1000 investment both in dollars and as a percentage over the coming year.
- f. Compute the standard deviation of the return as a percentage over the coming year.
- g. If the risk-free return is 7 percent, what is the risk premium for a stock market investment?

Answer:

- a. $\text{Expected Value} = 0.2(\$1000)(1+30\%) + 0.7(\$1000)(1+12\%) + 0.1(\$1000)(1-15\%) = \$1129$
 $\text{Expected Return} = 0.2(30\%) + 0.7(12\%) + 0.1(-15\%) = 12.9\%$
 - b. $\text{Standard Deviation}$
 $= \sqrt{0.2(30 - 12.9\%)^2 + 0.7(12 - 12.9\%)^2 + 0.1(-15 - 12.9\%)^2} = 11.7\%$
 - c. $\text{Risk Premium} = 12.9\% - 7\% = 5.9\%$
- 6) You can save \$5000 per year from your salary, and currently have \$15,000 in savings. One year from now you hope to purchase a house for \$100,000. To obtain a mortgage you can afford, you will need a down payment equal to 20 percent of the purchase price of the house. You have two possible investments available to you. The first is a risk-free bond that pays 5 percent, while the second is the stock-market investment described in problem 5. How would you decide which investment to make?

Answer: In one year, you will need \$20,000 to purchase the home. You will have \$5000 from your salary that year as well as your savings. If you use your savings to purchase a risk-free bond, in one year you will have \$15750 in savings and \$20,750 total. If you invest in the stock market and lose any money, you will not be able to buy the home. In the stock market investment from problem 5, there is a 10 percent chance that the value of your investment will fall; there is also a 90 percent chance that your investment will grow by at least 12 percent. You will need to decide if the potential gains from investing in the stock market instead of in the risk-free bond are worth the 10 percent risk that you will lose the house.

Chapter 6 Problems and Solutions

- 1) Consider a U.S. Treasury Bill with 270 days to maturity. If the annual yield is 3.8 percent, what is the price?

$$\text{Answer: } P = \frac{\$100}{(1 + 0.038)^{9/12}} = \$97.24$$

- 7) A 10-year zero-coupon bond has a yield of 6 percent. Through a series of unfortunate circumstances, expected inflation rises from 2 percent to 3 percent.
- Compute the change in the price of the bond.
 - Suppose that expected inflation is still 2 percent, but the probability that it will move to 3 percent has risen. Describe the consequences for the price of the bond.

Answer:

- Price (with 2% expected inflation) = $100/(1.06)^{10} = \$55.84$
Price (with 3% expected inflation) = $100/(1.07)^{10} = \$50.83$
The price has fallen by \$5.01

- There is increased inflation risk. Investors will require compensation for taking on additional risk, so the price will fall and the yield will rise.

- 8) Assume that forecasts for the U.S. economy have taken a sudden turn for the worse. Everyone had expected healthy growth of 3-4 percent in the coming year, but now a recession is predicted, with output contracting by as much as 2 percent. Officials expect unemployment to rise and corporate profits to plummet. Describe the consequences for prices and interest rates for both government and private-sector bonds. Consider both the supply and demand effects. Use graphs to support your answer.

Answer: Corporations will be more likely to default during the impending recession, so the perceived riskiness of corporate bonds relative to government bonds has increased and demand for corporate bonds will shift left. It will also become more difficult for corporations to borrow, shifting the supply of corporate bonds to the left. This combination could cause prices of corporate bonds to increase or decrease.

Because the perceived riskiness of corporate bonds has increased, demand for low-risk government bonds will increase, which will cause prices of government bonds to rise and prices to fall.

- 9) What impact would a stock-market collapse have on bonds? Why?

Answer: The perceived riskiness of bonds relative to stocks would fall and investors would shift their money into bonds. Demand for bonds would shift right, causing prices to rise and yields to fall.

Chapter 7 Problems and Solutions

1) During a recession, all businesses encounter difficulties at the same time. What would you expect to happen to bond ratings during such an episode?

Answer: Many bonds will be downgraded.

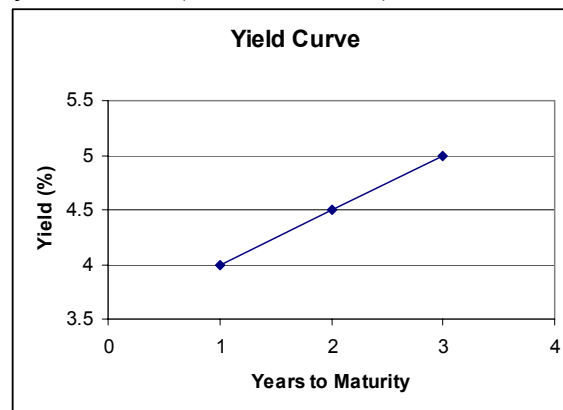
5) Suppose that the interest rate on one-year bonds is 4 percent today, and is expected to be 5 percent one year from now and 6 percent two years from now. Using the expectations hypothesis, compute the yield curve for the next three years.

Answer:

Yield for one-year bond = 4%

Yield for two-year bond = $(4\% + 5\%)/2 = 4.5\%$

Yield for three-year bond = $(4\% + 5\% + 6\%)/3 = 5\%$



15) Go to the Federal Reserve Board's web site (www.federalreserve.gov), and click first on Research and Data, then on Statistical Data and Releases. Compute the spread between the yield on three-month commercial paper and three-month Treasury bills sold on the secondary market. Looking at the data for the last few years, can you infer anything interesting from the movements in the spread?

Answer: If the T-bills rates are unavailable there, go to the FRED St. Louis Federal Reserve Data base. For example, for the week ending May 21, 2004, the rate for 3-month commercial paper was 1.09% and the rate for a 3-month T-bill was 1.03%. The spread was 0.06%. The spread has fallen over the past few years; this suggests an improvement in overall economic conditions.