SOLUTIONS TO TEXT PROBLEMS:

Quick Quizzes

1. The present value of $150 to be received in 10 years if the interest rate is 7 percent is $150 / (1.07)^{10} = $76.25.

2. There are three ways in which a risk-averse person may reduce the risk she faces: (1) purchase insurance, (2) diversify her portfolio, or (3) choose safer alternatives by accepting a lower rate of return.

3. No. According to the efficient markets hypothesis, the price of a share of stock should reflect all available information about its value. Thus, the stocks on this list should perform no better on average than other stocks listed on the stock exchange.

Questions for Review

1. If the interest rate is 7%, the present value of $200 to be received in 10 years is $200 / (1.07)^{10} = $101.67. If the interest rate is 7%, the present value of $300 to be received 20 years from now is $300 / (1.07)^{20} = $77.53. Given the choice between the two options, $200 to be received in 10 years is preferred to $300 to be received in 20 years.

2. Purchasing insurance allows an individual to reduce the level of risk he faces. Two problems that impede the insurance market from working correctly are adverse selection and moral hazard. Adverse selection occurs because a high-risk person is more likely to apply for insurance than a low-risk person is. Moral hazard occurs because people have less incentive to be careful about their risky behavior after they purchase insurance.

3. Diversification is the reduction of risk achieved by replacing a single risk with a large number of smaller unrelated risks. A stockholder will get a greater benefit from diversification going from 1 to 10 stocks than from 100 to 120 stocks.

4. Stocks have more risk because their value depends on the future value of the firm. Because of its higher risk, shareholders will demand a higher return than bondholders. There is a positive relationship between risk and return.
5. A stock analyst will consider the future profitability of a firm when determining the value of the stock.

6. The efficient markets hypothesis suggests that stock prices reflect all available information. This means that we cannot use current information to predict future changes in stock prices. One piece of evidence that supports this theory is the fact that many index funds outperform mutual funds that are actively managed by a professional portfolio manager.

7. Economists who are skeptical of the efficient markets hypothesis believe that fluctuations in stock prices are partly psychological. People may in fact be willing to purchase a stock that is overvalued if they believe that someone will be willing to pay even more in the future. This means that the stock price may not be a rational valuation of the firm.

Quick Check Multiple Choice
1. b
2. d
3. b
4. c
5. c
6. a

Problems and Applications

1. The future value of $24 invested for 400 years at an interest rate of 7% is $(1.07)^{400} \times 24 = 13,600,000,000,000 = 13.6$ trillion.

2. a. The present value of $15 million to be received in four years at an interest rate of 11% is $15 \frac{\text{million}}{(1.11)^4} = 9.88$ million. Because the present value of the payoff is less than the cost, the project should not be undertaken.

   The present value of $15 million to be received in four years at an interest rate of 10% is $15 \frac{\text{million}}{(1.10)^4} = 10.25$ million. Because the present value of the payoff is greater than the cost, the project should be undertaken.

   The present value of $15 million to be received in four years at an interest rate of 9% is $15 \frac{\text{million}}{(1.09)^4} = 10.63$ million. Because the present value of the payoff is greater than the cost, the project should be undertaken.

   The present value of $15 million to be received in four years at an interest rate of 8% is $15 \frac{\text{million}}{(1.08)^4} = 11.03$ million. Because the present value of the payoff is greater than the cost, the project should be undertaken.

b. The exact cutoff for the interest rate between profitability and nonprofitability is the interest rate that will equate the present value of receiving $15 million in four years with the current cost of the project ($10 million):

   $10 = 15/(1 + x)^4$

   $10(1 + x)^4 = 15$

   $(1 + x)^4 = 1.5$
1 + \(x = (1.5)^{0.25}\)
\[
1 + x = 1.10668 \\
x = 0.10668
\]

Therefore, an interest rate of 10.668% would be the cutoff between profitability and non-profitability.

3. a. Using the rule of 70, when the interest rate is 3.5 percent, the value of the bond will double in approximately \((70/3.5 = )\) 20 years. Therefore, the value today of Bond A, which matures in 20 years, is approximately $4,000 because its value will double once in 20 years. The value today of Bond B, which matures in 40 years, is approximately $2,000 because its value will double twice in 40 years to $8,000. (More specifically, its value today is $2,000 and its value will double to $4,000 in 20 years and will double again to the $8,000 maturity value in 20 more years.)

b. Using the rule of 70, when the interest rate is 7 percent the value of the bond will double in approximately \((70/7 = )\) 10 years. Therefore, the value today of Bond A, which matures in 20 years, is approximately $2,000 because its value will double twice in 20 years. Today's value of Bond B, which matures in 40 years, is approximately $500 because its value will double 4 times in 40 years.

The percentage change in value for Bond A: \((2000-4000)/4000 \times 100 = -50\%\)
The percentage change in value for Bond B: \((500-2000)/2000 \times 100 = -75\%\).

c. The value of a bond falls when the interest rate increases, and bonds with a longer time to maturity are more sensitive to changes in the interest rate.

4. The value of the stock is equal to the present value of its dividends and its final sale price. This is equal to 
\[
\frac{5}{1.08} + \frac{5}{(1.08)^2} + \frac{5 + 120}{(1.08)^3} = \frac{4.63 + 4.29 + 99.23}{1.08} = 108.15.\]
Since this is lower than the initial selling price of $110, XYZ stock is not a good investment.

5. a. A sick person is more likely to apply for health insurance than a well person is. This is adverse selection. Once a person has health insurance, he may be less likely to take good care of himself. This is moral hazard.

b. A risky driver is more likely than a safe driver to apply for car insurance. This is adverse selection. Once a driver has insurance, he may drive more recklessly. This is adverse selection.

6. A stock that is very sensitive to economic conditions will have more risk associated with it. Thus, we would expect that stock to pay a higher return. To get stockholders to be willing to accept the risk, the expected return must be larger than the return on a less-risky asset.

7. Shareholders will likely demand a higher return due to the stock's firm-specific risk. Firm-specific risk is risk that affects only that particular stock. All stocks in the economy are subject to market risk.

8. a. Answers will vary, but may include things like information on new products under development or information concerning future government regulations that will affect the profitability of the firm.
b. The fact that those who trade stocks based on inside information earn very high rates of return does not violate the efficient markets hypothesis. The efficient market hypothesis suggests that the price of a stock reflects all available information concerning the future profitability of the firm. Inside information is not readily available to the public and thus is not reflected in the stock’s price.

c. Insider trading is illegal because it gives some buyers or sellers an unfair advantage in the stock market.

9. a. Yes, Jamal is risk averse. The marginal utility of an additional dollar of wealth is diminishing. Figure 1 shows Jamal’s utility function.

![Utility vs. Wealth Graph]

**Figure 1**

b. The expected value of option A = \( U(W = $4 \text{ million}) = 2,000 \).

The expected value of option B = \( (0.6) \times U(W = $1 \text{ million}) + 0.4 \times U(W = $9 \text{ million}) = (0.6) \times 1,000 + (0.4) \times 3,000 = 600 + 1,200 = 1,800 \).

Jamal should choose option A.