## Short-Answer

1. Is the payoff to stockholders most similar to the payoff on a long put, a long call, a short put, a short call or some combination of these options?

   Long call

2. eBay's current stock price is $30.89 per share and a call that expires in July with a strike price of $32.50 has a bid price of $1.42 and an ask price of $1.55. An equivalent put has a bid price of $2.96 and an ask price of $3.05. What would be your cash flow today from purchasing 2 put contracts on eBay (that expire in July with a strike of $32.50)? Note: purchasing puts would create a long position in the puts.

   -2 x 100 x 3.05

3. Assume you have purchased a risk-free bond that will pay you $100 a year from today and a call (so that you have a long call position) on CIT Group with a strike price of $100. Sketch a graph of the payoff on your portfolio as a function of CIT's stock price one month from today when the bond matures and the option expires. Note: be sure to label the bond, the call, and the portfolio.
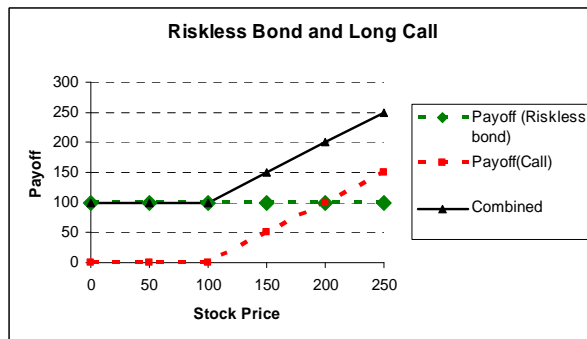
4. Assume you have purchased a put on Boeing with a strike price of $70 for $12.20. What will be your payoff on this put if Boeing's stock price falls from its current $78.50 per share to $68.50 per share by the time the option expires?
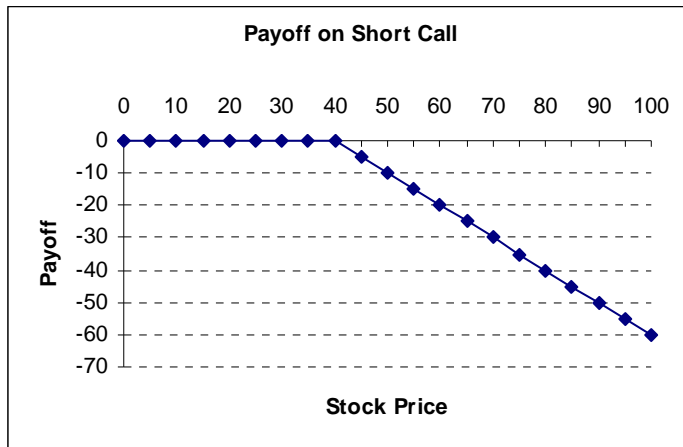
   $\text{Max}(70 - 68.50, 0) = 70 - 68.50$

5. HP's current stock price is $56.75 per share. Puts on HP that expire in June with a strike price of $50 per share have a bid price of $1.25 and an ask price of $1.40. Equivalent calls have a bid price of $8.00 and an ask price of $8.20. What will be your proceeds if you sell three put contracts on HP? Note: selling puts will create a short position in the puts.

   + 3 x 100 x 1.25

6. Assume that Exxon Mobil's current stock price is $94.40 per share and that a call with a $95 strike price that expires on Friday, May 16 (21 days from now) has a price of $2.10. According to put-call parity, what is the value of an equivalent put if the return on a T-bill that expires on Thursday, May 15th is 1.2%?

$$P = 2.10 - 94.40 + \frac{95}{(1.012)^{21/365}}$$

7. AT&T has a current stock price of $37.75 per share. Sketch a graph of the potential payoffs on a short call as a function of the stock price when the call expires 1 months from today. Assume that the strike price on the option is $40 per share.

Payoff on Short Call

| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

Payoff axis: 0, -10, -20, -30, -40, -50, -60, -70

Stock Price

8. What can we conclude about the beta of a call if the call is on a stock that has a beta of +1.2?

> 1.2

9. Assume you are considering buying puts on Kimberly-Clark that expire in July. Kimberly-Clark's current stock price is $64.37 per share and you can purchase puts with strike prices of $55, $60, $65, $70, $75, $80, or $85. For which put would you expect the highest volatility of returns?

55

10. Detroit Motors had outstanding debt that matures 2 years from today for $5 million. Assume that you create a portfolio that is equivalent to this debt by purchasing a risk-free bond and creating an option on the firm's assets. Calculate the payoff on your portfolio if Detroit's assets end up being worth $3 million two years from today. Be sure to identify the payoff on each part of the equivalent portfolio.

Risk-free bond = $5, Short put = – max (5 – 3, 0) = -$2; Net = $3

11. Detroit Motors had outstanding debt that matures 2 years from today for $5 million. Assume that you create a portfolio that is equivalent to this debt by buying the firm's assets and creating an option on the firm's assets. Calculate the payoff on your portfolio if Detroit's assets end up being worth $9 million two years from today. Be sure to identify the payoff on each part of the equivalent portfolio.

Assets = $9, Short call = – max(9 – 5, 0) = – $4; Net = $5

12. How does an increase in the volatility of a stock impact the value of a call on the stock?

Increases

13. Assume you have created a short put on Auto Zone with a strike price of $130. Calculate your payoff if at expiration of the puts if Auto Zone's stock price has risen from $127 to $135 and Auto Zone's stock price has fallen from $127 to $120.

135 = 0; 120 = – (130 – 120)

14. Assume you want to replicate the payoff on a put by taking a position in the stock and risk-free bonds. Which would you buy and which would you short-sell?

    Short-sell stock, buy bond. (Note: must also buy a call).

15. Assume you buy a call on Ford with a strike (exercise) price of $8 that expires in January 2010. Given the following information, calculate your profit or loss from buying two call contracts if Ford's stock price rises from its current $8.90 per share to $9.75 per share on January 18 (when the option expires).

Expiration	Strike	Bid	Ask
Dec 09	8	1.21	1.25
Dec 09	9	0.81	0.84
Jan 10	8	1.34	1.38
Jan 10	9	0.60	0.63
Mar 10	8	1.56	1.61
Mar 10	9	1.16	1.21

    $2(100)(9.75 - 8 - 1.38)$

16. If nothing else changes, what happens to the value of an American option as it approaches expiration?

    falls

17. You are considering buying calls on Citigroup that expire in January. If Citigroup's stock price is currently $4 per share, should you expect the most volatile return on a call with a strike price of $1, $2, $3, $4, or $5?

    $5

18. Assume you buy a call on GM with a strike (exercise) price of $5 that expires in January 2009. Given the following information, calculate your profit or loss (assuming a 0% interest rate) from buying five call contracts if GM's stock price rises from its current $4.08 per share to $5.75 per share on January 16 (when the option expires).

| Expiration	Strike	Bid	Ask
Dec 08	4	.70	.75
Dec 08	5	.40	.43
Jan 09	4	.92	.95
Jan 09	5	.61	.66
Mar 09	4	1.13	1.23
Mar 09	5	0.91	0.98

    $5(100)(5.75 - 5 - 0.66)$

19. A bond by Excess Company matures in two years for $15 million. What type of short or long position in options and in risk-free bonds will provide the same payoff as this bond issued by Excess? Calculate the payoff on the option portion of your portfolio if the value of firm equals $10 million when the debt matures.

    Buy risk-free bond that matures in two years and create short put with strike of $15 million that expires in two years
    $\text{Payoff} = -\max(15 - 10,0) = -5$

20. Assume you own 100 shares of Dell and also own a put with a $25 strike price that expires 2 months from today. Sketch a graph of your payoff two months from today as a function of stock price.
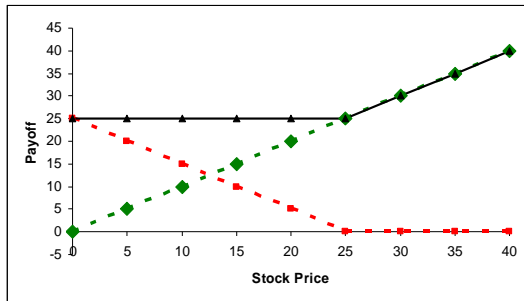
Problems

1. Assume that Next Sprinter Inc.'s current stock price is $32 per share. Assume also that a call on Next Sprinter with a strike price of $35 has a current market price of $2. At current interest rates, the present value of this strike price is $34.79. Finally, assume that an identical put (same strike price and expiration) on Next Sprinter has a current market price of $6. Note: in answering all parts, use a "+" for inflows and a "-" for outflows.

   a. Given this information, what set of transactions today will generate an arbitrage profit? What is your profit today from these transactions?

   b. Show that the conditions of arbitrage are met if Next Sprinter's stock price has fallen to $29 when the options expire.

   c. Show that the conditions of arbitrage are met if Next Sprinter's stock price has risen to $40 when the options expire.

   a. $S + P = PV(K) + C$
      => $32 + 6 \neq 34.79 + 2$
      => short put, short-sell stock, buy risk-free bond, and buy call
      Arbitrage profit = $+32 + 6 - 34.79 - 2 = +1.21$
   b. $S = 29$: $CF = - \max(35 - 29,0) + \max(29 - 35, 0) - 29 + 35 = 0$
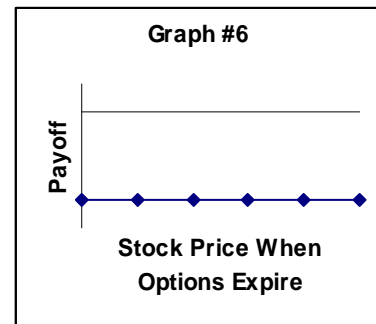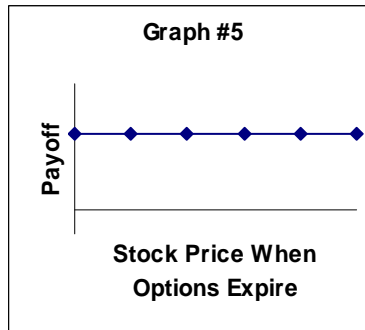   c. $S = 40$: $CF = - \max(35 - 40, 0) + \max(40 - 35, 0) - 40 + 35 = 0$

Multiple-Choice
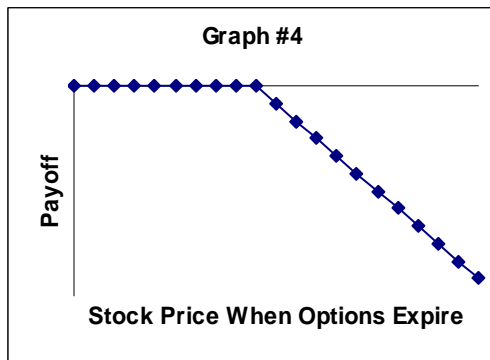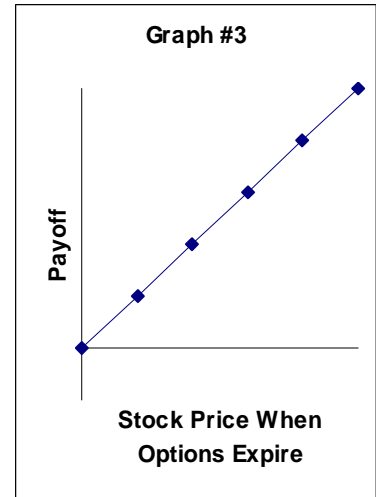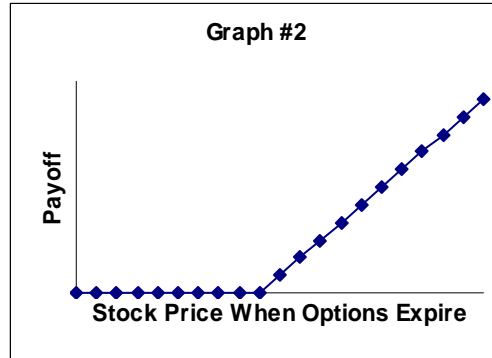
1. Which of the following calls on Dell that expire in 2 months will have the most volatile returns?

    a. strike price of $25
    b. strike price of $20
    C. strike price of $30
    d. strike price of $15
    e. unclear with the given information

2. Assume that a call on Apple that expires in 22 days with a strike price of $130 has a current price of $3. Assuming that Apple's stock price is currently $121.50 and rises to $135 by the time the option expires, calculate your overall profit (or loss) if you sell (short) the call today and that the buyer of the option behaves rationally at the option's expiration.

    a. profit of $3
    b. loss of $5
    c. profit of $5
    D. loss of $2
    e. profit of $2

3. Given that stock can be viewed as a call on the firm's assets, which of the following will lead to a higher value for a firm's stock?

    a. lower volatility of the firm's assets
    b. a lower value of the firm's assets
    c. a shorter time before the bonds mature
    D. a lower amount owed the bondholders when the debt matures
    e. two of the above

4. The graphs below show the payoffs on various positions (long or short) in options, stock, and risk-free bonds. What combination of these graphs will create a combined payoff that is the same payoff as a long put? Note: the lines with diamonds are the payoffs and the solid lines are the axes.

Graph #1

Payoff

Stock Price When
Options Expire

Graph #2

Payoff

Stock Price When Options Expire

Graph #3

Payoff

Stock Price When
Options Expire

Graph #4

Payoff

Stock Price When Options Expire

Graph #5

Payoff

Stock Price When
Options Expire

Graph #6

Payoff

Stock Price When
Options Expire

a. 1 + 4 + 5
b. 1 + 2 + 6
C. 1 + 2 + 5
d. 2 + 3 + 6
e. 3 + 4 + 6

5. If you have a long American put on Citigroup with a $5 strike price, then on or before expiration

a. you may purchase Citigroup stock for $5 if you want
b. you may be required to sell Citigroup stock for $5
C. you may sell Citigroup stock for $5 if you want
d. you may be required to purchase Citigroup stock for $5
e. two of the above

6. The payoff on a risky bond issued by a firm can be duplicated by owning the firm's assets and buying or selling an option on the firm's assets. If the maturity value of the firm's bonds is $400,000 and the value of the firm's assets equals $500,000 when the debt matures, what combination of payoffs creates the same payoff as if you had purchased the firm's bond?

   A. the payoff from owning the firm plus the payoff from a short call on the firm's assets
   b. the payoff from owning the firm plus the payoff from a short put on the firm's assets
   c. only the payoff from owning the firm
   d. the payoff from owning the firm plus the payoff from a long call on the firm's assets
   e. the payoff from owning the firm plus the payoff from a long put on the firm's assets

7. Assume that a put on Apple that expires in 57 days with a strike price of $115 has a current price of $6.25. Assuming that Apple's stock price is currently $121.50 and falls to $116 by the time the option expires, calculate your overall profit (or loss) if you sell (short) the put today and that the buyer of the option behaves rationally at the option's expiration.

   a. loss of $6.25
   b. loss of $7.25
   c. profit of $5.25
   D. profit of $6.25
   e. loss of $5.25