CHAPTER 24
Option Valuation

I. DEFINITIONS

PROTECTIVE PUT

c 1. The purchase of both a stock and a put option on the stock to limit the downside risk associated with the stock is a strategy called the:
   a. put-call parity relation.
   b. covered call.
   c. protective put.
   d. straddle.
   e. strangle.

PUT-CALL PARITY

a 2. The relationship between the prices of the underlying stock, a call option, a put option, and a riskless asset is referred to as the _____ relationship.
   a. put-call parity
   b. covered call
   c. protective put
   d. straddle
   e. strangle

OPTION DELTA

d 3. The effect on an option's value of a small change in the value of the underlying asset is called the option:
   a. theta.
   b. vega.
   c. rho.
   d. delta.
   e. gamma.

OPTION THETA

a 4. The sensitivity of an option's value to a change in the option's time to expiration is called the option:
   a. theta.
   b. vega.
   c. rho.
   d. delta.
   e. gamma.

OPTION VEGA

b 5. The sensitivity of an option's value to a change in the standard deviation of the return on the underlying asset is called the option:
   a. theta.
   b. vega.
   c. rho.
   d. delta.
   e. gamma.

OPTION RHO

c 6. The sensitivity of an option's value to a change in the risk-free rate is called the option:
   a. theta.
   b. vega.
   c. rho.
   d. delta.
   e. gamma.

IMPLIED STANDARD DEVIATION

e 7. An estimate of the future standard deviation of the return on an asset obtained from the Black-Scholes Option Pricing Model is called a(n):
   a. residual error.
   b. asset mean return.
   c. derived case volatility (DCV).
   d. forecast rho.
   e. implied standard deviation (ISD).

II. CONCEPTS

PUT OPTION

d 8. An option that grants the right, but not the obligation, to sell shares of the underlying asset on a particular date at a specified price is called:
   a. either an American or a European option.
   b. an American call.
   c. an American put.
   d. a European put.
   e. a European call.

PUT OPTION

c 9. Which one of the following provides the option of selling a stock anytime during the option period at a specified price even if the market price of the stock declines to zero?
   a. American call
   b. European call
   c. American put
   d. European put
   e. either an American or a European put

PROTECTIVE PUT

c 10. The primary purpose of a protective put is to:
   a. increase the maximum potential return on a stock.
   b. offset an equivalent call option.
   c. limit the downside risk of stock ownership.
   d. lock in a risk-free rate of return on an individual stock.
   e. increase the upside potential return on a stock.

PROTECTIVE PUT

c 11. Which one of the following acts like an insurance policy should the price of a stock you own suddenly decrease in value?
   a. purchase of a European call option
   b. sale of an American put option
   c. protective put
   d. protective call
   e. sale of an American call combined with the purchase of a European call

PUT-CALL PARITY

e 12. Given an exercise price E, time to maturity T and European put-call parity, the present value of the strike price E plus the call option is equal to:
   a. the current market value of the stock.
   b. the present value of the stock minus a put option.
   c. a put option minus the market value of the share of stock.
   d. the value of a U.S. Treasury bill.
   e. the share of stock plus the put option.

PUT-CALL PARITY

c 13. You can realize the same value as that derived from stock ownership if you:
   a. sell a put option and invest at the risk-free rate of return.
   b. buy a call option and write a put option on a stock and also lend out funds at the risk-free rate.
   c. sell a put and buy a call on a stock as well as invest at the risk-free rate of return.
   d. lend out funds at the risk-free rate of return and sell a put option on the stock.
   e. borrow funds at the risk-free rate of return and invest the proceeds in equivalent amounts of put and call options.

PUT-CALL PARITY

d 14. Under European put-call parity, the present value of the strike price is equivalent to:
   a. the current value of the stock minus the call premium.
   b. the market value of the stock plus the put premium.
   c. the present value of a government coupon bond with a face value equal to the strike price.
   d. a U.S. Treasury bill with a face value equal to the strike price.
   e. a risk-free security with a face value equal to the strike price and a coupon rate equal to the risk-free rate of return.

CONTINUOUS COMPOUNDING

e 15. Assume that you want to have $1,000 five years from now. The annual percentage rate applicable to this investment is 6 percent. Which one of the following methods of compounding interest will allow you to deposit the least amount possible today?
   a. annual
   b. daily
   c. quarterly
   d. monthly
   e. continuous

CALL OPTION

a 16. The buyer of a European call option has the:
   a. right but not the obligation to buy a stock at a specified price on a specified date.
   b. right but not the obligation to buy a stock at a specified price during a specified period of time.
   c. obligation to buy a stock on a specified date but only at the specified price.
   d. obligation to buy a stock sometime during a specified period of time at the specified price.
   e. obligation to buy a stock at the lower of the exercise price or the market price on the expiration date.

CALL OPTION PRICING

e 17. In the Black-Scholes option pricing formula, $N(d_1)$ is the probability that a standardized, normally distributed random variable is:
   a. less than or equal to $N(d_2)$.
   b. less than one.
   c. equal to one.
   d. equal to d_1.
   e. less than or equal to d_1.

PUT OPTION PRICING

b 18. To compute the value of a put using the Black-Scholes option pricing model, you:
   a. first have to apply the put-call parity relationship.
   b. first have to compute the value of the put as if it is a call.
   c. compute the value of an equivalent call and then subtract that value from one.
   d. compute the value of an equivalent call and then subtract that value from the market price of the stock.
   e. compute the value of an equivalent call and then multiply that value by e^{-RT}.

PUT OPTION PRICING

e 19. Which one of the following statements is correct?
   a. The price of an American put is equal to the stock price minus the exercise price according to the Black-Scholes option pricing model.
   b. The value of a European put is greater than the value of a comparable American put.
   c. The value of a put is equal to one minus the value of an equivalent call.
   d. The value of a put minus the value of a comparable call is equal to the value of the stock minus the exercise price.
   e. The value of an American put will equal or exceed the value of a European put.

BLACK-SCHOLES MODEL

b 20. The Black-Scholes Option Pricing Model can be used for:

a. American options but not European options.
b. European options but not American options.
c. call options but not put options.
d put options but not call options.
e. both zero coupon bonds and coupon bonds.

BLACK-SCHOLES MODEL

d 21. Which of the following variables are included in the Black-Scholes call option pricing formula?
I. stock price
II. stock beta
III. exercise price
IV. standard deviation of the return on a stock
a. I and III only
b. I, II, and IV only
c. II, III, and IV only
d. I, III, and IV only
e. I, II, III, and IV

OPTION DELTA

a 22. The value of a call option delta is:
a. between zero and one.
b. less than or equal to one.
c. greater than zero.
d. greater than or equal to zero.
e. less than or equal to one.

OPTION THETA

c 23. Which of the following statements are correct?
I. Vega measures the sensitivity of an option's value to the passage of time.
II. Theta measures the sensitivity of an option's value to the passage of time.
III. Call options tend to be more sensitive to the passage of time than are put options.
IV. An increase in time increases the value of a call option.
a. I and III only
b. II and IV only
c. II, III, and IV only
d. I, III, and IV only
e. I, II, III, and IV

OPTION VEGA

d 24. Which of the following statements are correct?

I. As the standard deviation of the returns on a stock increase, the value of a put option decreases.

II. The value of a call option decreases as the standard deviation of the returns on the underlying stock increase.

III. The sensitivity of an option's value to the volatility of the underlying asset is referred to as an option's vega.

IV. Any change in the volatility of the underlying asset can have a significant impact on the value of an option.

a. I and III only
b. II and IV only
c. I and II only
d. III and IV only
e. I, II, and III only

OPTION RHO

e 25. The effect that an increase in interest rates has on the value of an option is:

a. more significant than the effect created by a change in the volatility of the underlying asset.
b. negative if the option is a call option.
c. referred to as the option delta.
d. expressed in terms of theta.
e. negative if the option is a put.

IMPLIED STANDARD DEVIATION

a 26. Of the various factors that are included in the Black-Scholes option pricing model, the one that can not be directly observed is the:

a. standard deviation.
b. risk-free rate.
c. life of the option.
d. strike price.
e. stock price.

IMPLIED STANDARD DEVIATION

c 27. The implied standard deviation is derived by:

a. averaging the standard deviations of the returns over the past year.
b. taking the square root of the directly observed variances in the return on the stock.
c. using the Black-Scholes option pricing model and the market value of the option.
d. taking the square root of the option value and subtracting that amount from one.
e. taking the square root of the expiration value of an option.

IMPLIED STANDARD DEVIATION

b 28. The implied standard deviation used in the Black-Scholes option pricing model is:
   a. based on historical performance.
   b. a prediction of the volatility of the return on the underlying asset over the life of the option.
   c. a measure of the time decay of an option.
   d. an estimate of the future value of an option given a strike price E.
   e. a measure of the historical intrinsic value of an option.

OPTION VALUE

b 29. The value of an option is equal to the:
   a. intrinsic value minus the time premium.
   b. time premium plus the intrinsic value.
   c. implied standard deviation plus the intrinsic value.
   d. summation of the intrinsic value, the time premium and the implied standard deviation.
   e. summation of delta, theta, vega, and rho.

EQUITY VALUE OF A FIRM

b 30. For the equity of a firm to be considered a call option on the firm's assets, the firm must:
   a. be in default.
   b. be leveraged.
   c. pay dividends.
   d. have a negative cash flow from operations.
   e. have a negative cash flow from assets.

EQUITY VALUE OF A FIRM

d 31. If you consider the equity of a firm to be an option on the firm's assets then the act of paying off debt is comparable to _____ on the assets of the firm.
   a. purchasing a put option
   b. purchasing a call option
   c. exercising an in-the-money put option
   d. exercising an in-the-money call option
   e. selling a call option

EQUITY VALUE OF A FIRM

a 32. For every positive net present value project that a firm undertakes, the equity in the firm will increase the most if the delta of the call option on the firm's assets is:
   a. equal to one.
   b. between zero and one.
   c. equal to zero.
   d. between zero and minus one.
   e. equal to minus one.

VALUE OF A FIRM'S DEBT

e 33. The value of the risky debt of a firm is equal to the value of:
   a. a call option plus the value of a risk-free bond.
   b. a risk-free bond plus a put option.
   c. the equity of the firm minus a put.
   d. the equity of the firm plus a call option.
   e. a risk-free bond minus a put option.

OPTIONS AND MERGERS

c 34. Pure financial mergers:
   a. are beneficial to stockholders.
   b. are beneficial to both stockholders and bondholders.
   c. are detrimental to stockholders.
   d. add value to both the total assets and the total equity of a firm.
   e. reduce both the total assets and the total equity of a firm.

OPTIONS AND MERGERS

c 35. A purely financial merger:
   a. increases the risk that the firm will default on its debt obligations.
   b. has no effect on the riskiness of the firm's debt.
   c. reduces the value of the option to go bankrupt.
   d. has no effect on the equity value of a firm.
   e. reduces the risk level of the firm and increases the value of the firm's equity.

OPTIONS AND CAPITAL BUDGETING

a 36. Shareholders in a leveraged firm might wish to accept a negative net present value project if:
   a. it increases the standard deviation of the returns on the firm's assets.
   b. it lowers the variance of the returns on the firm's assets.
   c. it lowers the risk level of the firm.
   d. it diversifies the cash flows of the firm.
   e. it decreases the risk that a firm will default on its debt.

III. PROBLEMS

PROTECTIVE PUT STRATEGY

c 37. You recently purchased a share of ABC stock at a cost of $23. Assume that you simultaneously purchased a put on one share of ABC stock at a cost of $1 and a strike price of $20. The put was for a period of one year. How much profit will you earn if the stock is worth $32 at the end of the one-year period?
   a. $6
   b. $7
   c. $8
   d. $9
   e. $10

PROTECTIVE PUT STRATEGY

c 38. Today you purchased one share of XYZ stock at a market price of $42 along with a put on that one share of stock. The put is for one year, has a strike price of $40 and has an option premium of $.50. What is the maximum amount you can lose over the next year?

a. -$3.50
b. -$3.00
c. -$2.50
d. -$2.00
e. -$1.50

RISK-FREE ASSET PLUS CALL

d 39. Today, you are buying a one-year call on JKL stock with a strike price of $40 along with a one-year risk-free asset which pays 6 percent interest. The cost of the call is $2.40 and the amount invested in the risk-free asset is $37.74. How much profit will you earn if the stock has a market price of $44 one year from now?

a. -$0.14
b. $1.60
c. $3.20
d. $3.86
e. $4.00

RISK-FREE ASSET PLUS CALL

d 40. Today, you are buying a one-year call on SLO stock with a strike price of $50 along with a one-year risk-free asset that pays 4 percent interest. The cost of the call is $3.20 and the amount invested in the risk-free asset is $48.08. What is the most you can lose over the next year?

a. -$3.33
b. -$3.20
c. -$3.08
d. -$1.28
e. -$0.72

PUT-CALL PARITY

d 41. Tru-U stock is selling for $36 a share. A 3-month call on Tru-U stock with a strike price of $40 is priced at $1. Risk-free assets are currently returning 0.25 percent per month. What is the price of a 3-month put on Tru-U stock with a strike price of $40?

a. $2.98
b. $3.00
c. $4.03
d. $4.70
e. $4.90

PUT-CALL PARITY

e 42. HCI, Inc. stock has a current market price of $40 a share. The one-year call on HCI stock with a strike price of $40 is priced at $2 while the one-year put with a strike price of $40 is priced at $1. What is the risk-free rate of return?

a. 2.39 percent
b. 2.44 percent
c. 2.49 percent
d. 2.52 percent
e. 2.56 percent

PUT-CALL PARITY

d 43. GS, Inc. stock is selling for $28 a share. A 3-month call on GS stock with a strike price of $30 is priced at $1.50. Risk-free assets are currently returning 0.3 percent per month. What is the price of a 3-month put on GS stock with a strike price of $30?

a. $.50
b. $2.02
c. $2.73
d. $3.23
e. $4.02

PUT-CALL PARITY

c 44. J&L, Inc. stock has a current market price of $55 a share. The one-year call on J&L stock with a strike price of $55 is priced at $2.50 while the one-year put with a strike price of $55 is priced at $1. What is the risk-free rate of return?

a. 2.71 percent
b. 2.76 percent
c. 2.80 percent
d. 2.84 percent
e. 2.87 percent

CONTINUOUS COMPOUNDING

d 45. If you invest $5,000 today at 8 percent , compounded continuously, how much will you have in four years?

a. $6,802
b. $6,809
c. $6,818
d. $6,886
e. $6,889

CONTINUOUS COMPOUNDING

b 46. Tom invested $3,600 in an account today at 12 percent compounded continuously. How much will he have in his account if he leaves his money invested for five years?

a. $6,542
b. $6,560
c. $6,567
d. $6,606
e. $6,632

CONTINUOUSLY COMPOUNDED R_f RATE

b 47. The stock of Rock Land, Inc. is selling for $60 a share. The six-month 55 call on Rock Land stock is selling for $7 while the six-month 55 put is priced at $1. What is the continuously compounded risk-free rate of return?

a. 3.33 percent
b. 3.67 percent
c. 4.09 percent
d. 4.83 percent
e. 9.17 percent

CONTINUOUSLY COMPOUNDED R_f RATE

e 48. The stock of Dyblo, Inc. has a current market value of $28 a share. The 3-month call with a strike price of $25 is selling for $4 while the 3-month put with a strike price of $25 is priced at $.50. What is the continuously compounded risk-free rate of return?

a. 6.14 percent
b. 6.98 percent
c. 7.33 percent
d. 7.49 percent
e. 8.08 percent

BLACK-SCHOLES OPTION PRICING MODEL

b 49. What is the value of d_2 given the following information on a stock?

Stock price	$63
Exercise price	$60
Time to expiration	.50
Risk-free rate	6%
Standard deviation	20%
d_1	.627841

a. .3133
b. .4864
c. .5460
d. .6867
e. .7349

BLACK-SCHOLES OPTION PRICING MODEL

b 50. Given the following information, what is the value of d_2 as it is used in the Black-Scholes Option Pricing Model?

Stock price	$42
Time to expiration	.25
Risk-free rate	.055
Standard deviation	.50
d_1	.375161

a. .021608
b. .125161
c. .175608
d. .200161
e. .250161

BLACK-SCHOLES OPTION PRICING MODEL

c 51. What is the value of a 9-month call with a strike price of $45 given the Black-Scholes Option Pricing Model and the following information?

Stock price	$48
Exercise price	$45
Time to expiration	.75
Risk-free rate	.05
$N(d_1)$	.718891
$N(d_2)$	.641713

a. $2.03
b. $4.86
c. $6.69
d. $8.81
e. $9.27

BLACK-SCHOLES OPTION PRICING MODEL

a 52. What is the value of a 3-month put with a strike price of $40 given the Black-Scholes Option Pricing Model and the following information?

Stock price	$42
Exercise price	$40
Time to expiration	.25
Risk-free rate	.055
$N(d_1)$	.646229
$N(d_2)$	.549802
3-month 40 call	$5.449884

a. $2.90
b. $3.35
c. $3.75
d. $4.00
e. $4.35

CALL OPTION DELTA

e 53. A stock is currently selling for $36 a share. The risk-free rate is 5 percent and the standard deviation is 20 percent. What is the value of d_1 of a 3-month call option with a strike price of $35?

a. .3398
b. .3402
c. .3888
d. .4232
e. .4567

PUT OPTION DELTA

a 54. KLN stock is currently priced at $54 a share. The standard deviation is 10 percent, N(d1) is .920226 and U.S. Treasury bills are yielding 4 percent. What is the delta of a 6-month put option with an exercise price of $50?

a. -.0798
b. -.0813
c. -.0824
d. -.0839
e. -.0856

MARKET VALUE OF EQUITY

b 55. Assume that the delta of a call option on a firm's assets is .792. This means that a $50,000 project will increase the value of equity by:
   a. $27,902.
   b. $39,600.
   c. $43,820.
   d. $63,131.
   e. $89,600.

MARKET VALUE OF EQUITY

a 56. The current market value of the assets of Bigelow, Inc. is $86 million, with a standard deviation of 15 percent per year. The firm has zero-coupon bonds outstanding with a total face value of $45 million. These bonds mature in 2 years. The risk-free rate is 4 percent per year compounded continuously. What is the value of d_1?
   a. 3.54
   b. 3.62
   c. 3.68
   d. 3.71
   e. 3.75

MARKET VALUE OF EQUITY

d 57. The current market value of the assets of J&J's, Inc. is $62 million. The firm has zero coupon bonds outstanding with a total face value of $36 million. The bonds mature five years from now. $N(d_1)$ is equal to .86 and $N(d_2)$ is equal to .77. The risk-free rate is 6 percent compounded continuously. What is the market value of the firm's equity?
   a. $26.83 million
   b. $28.11 million
   c. $30.05 million
   d. $32.78 million
   e. $34.18 million

MARKET VALUE OF DEBT

a 58. The current market value of the assets of Ditto Inc. is $63.26 million. The market value of the equity is $42.18 million. What is the market value of the firm's debt?
   a. $21.08 million
   b. $42.16 million
   c. $52.72 million
   d. $77.78 million
   e. $105.44 million

MARKET VALUE OF DEBT

c 59. The current market value of the assets of ABC, Inc. is $86 million. The market value of the equity is $43.28 million. What is the market value of the firm's debt?
   a. cannot be determined from the information given
   b. $21.36 million
   c. $42.72 million
   d. $64.08 million
   e. $129.28 million

IV. ESSAYS

OPTION MODEL OF THE FIRM

60. Explain the interpretation of equity ownership as being equivalent to owning a call option on the assets of the firm.

    Equity is equal to asset minus liabilities. This relationship reflects the residual ownership feature of equity. Because of the limited liability feature of equity ownership in a corporation, the equity must always be non-negative in value, even if the debts of the firm exceed the value of the assets and the firm is in technical (if not outright) bankruptcy. Thus, the equity = max(A – D,0), which is akin to a call option on the assets of the firm with a strike price equal to the face value of the firm's debt.

OPTION MODEL OF THE FIRM

61. Explain how option pricing theory can be used to argue that acquisitive firms pursuing conglomerate mergers are not acting in the shareholders' best interest.

    Because equity can be viewed as a call option on the assets of the firm, the Black-Scholes option pricing model tells us that equity value will increase if the standard deviation of the firm's assets increases. To the extent that conglomerate mergers create a more diversified business model for the acquiring firm, the standard deviation of the assets will actually decrease, which is counter to the shareholders' interest in maximizing the value of the firm. The shareholders would prefer that managers seek out maximum risk in their business activities.