## Question #1 of 109

Question ID: 1210583

Which of the following is the *best* approximation of the gamma of an option if its delta is equal to 0.6 when the price of the underlying security is 100 and 0.7 when the price of the underlying security is 110?

**A)** 0.01.

**B)** 1.00.

**C)** 0.10.

**Explanation**

The gamma of an option is computed as follows:

Gamma = change in delta/change in the price of the underlying = (0.7 – 0.6)/(110 – 100) = 0.01

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

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## Question #2 of 109

Question ID: 1210580

For a change in which of the following inputs into the Black-Scholes-Merton option pricing model will the direction of the change in a put's value and the direction of the change in a call's value be the same?

**A)** Volatility.

**B)** Risk-free rate.

**C)** Exercise price.

**Explanation**

A decrease/increase in the volatility of the price of the underlying asset will decrease/increase both put values and call values. A change in the values of the other inputs will have opposite effects on the values of puts and calls.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

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## Question #3 of 109

Question ID: 1210579

The value of a European call option on an asset with no cash flows is positively related to all of the following EXCEPT:

**A)** exercise price.

**B)** time to exercise.

**C)** risk-free rate.

**Explanation**

The value of a call option decreases as the exercise price increases.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

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## Question #4 of 109

Question ID: 1210617

Two call options have the same delta but option A has a higher gamma than option B. When the price of the underlying asset increases, the number of option A calls necessary to hedge the price risk in 100 shares of stock, compared to the number of option B calls, is a:

**A)** larger positive number.

**B)** larger (negative) number.

**C)** smaller (negative) number.

**Explanation**

For call options larger gamma means that as the asset price increases, the delta of option A increases more than the delta of option B. Since the number of calls to hedge is (–1/delta)x(number of shares), the number of calls necessary for the hedge is a smaller (negative) number for option A than for option B.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #5 of 109

Question ID: 1210627

Which of the following *best* describes the implied volatility method for estimated volatility inputs for the Black-Scholes model? Implied volatility is found:

**A)** using the most current stock price data.

**B)** using historical stock price data.

**C)** by solving the Black-Scholes model for the volatility using market values for the stock price, exercise price, interest rate, time until expiration, and option price.

**Explanation**

Implied volatility is found by "backing out" the volatility estimate using the current option price and all other values in the Black-Scholes model.

(Study Session 14, Module 38.7, LOS 38.n)

**Related Material**

SchweserNotes - Book 4

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## Question #6 of 109

Question ID: 1210510

Referring to put-call parity, which one of the following alternatives would allow you to create a synthetic stock position?

**A)** Buy a European call option; buy a European put option; invest the present value of the exercise price in a riskless pure-discount bond.

**B)** Sell a European call option; buy a European put option; short the present value of the exercise price worth of a riskless pure-discount bond.

**C)** Buy a European call option; short a European put option; invest the present value of the exercise price in a riskless pure-discount bond.

**Explanation**

According to put-call parity we can write a stock position as: $S_0 = C_0 - P_0 + X/(1+R_f)^T$

We can then read off the right-hand side of the equation to create a synthetic position in the stock. We would need to buy the European call, sell the European put, and invest the present value of the exercise price in a riskless pure-discount bond.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

SchweserNotes - Book 4

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## Question #7 of 109

Question ID: 1210561

Which of the following *best* describes an interest rate cap? An interest rate cap is a package or portfolio of interest rate options that provide a positive payoff to the buyer if the:

**A)** T-Bond futures exceeds the strike price. ✗

**B)** reference rate exceeds the strike rate. ✓

**C)** reference rate is below the strike rate. ✗

**Explanation**

An interest rate cap is a package of European-type call options (called caplets) on a reference interest rate.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

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## Question #8 of 109

Question ID: 1210534

In order to form a dynamic hedge using stock and calls with a delta of 0.2, an investor could buy 10,000 shares of stock and:

**A)** write 2,000 calls. ✗

**B)** write 50,000 calls. ✓

**C)** buy 50,000 calls. ✗

**Explanation**

Each call will increase in price by $0.20 for each $1 increase in the stock price. The hedge ratio is –1/delta or –5. A short position of 50,000 calls will offset the risk of 10,000 shares of stock over the next instant.

(Study Session 14, Module 38.4, LOS 38.l)

**Related Material**

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## Question #9 of 109

Question ID: 1210556

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The writer of a receiver swaption has:

**A)** an obligation to enter a swap in the future as the fixed-rate payer.

**B)** an obligation to enter a swap in the future as the floating-rate payer.

**C)** the right to enter a swap in the future as the floating-rate payer.

**Explanation**

A receiver swaption gives its owner the right to receive fixed, the writer has an obligation to pay fixed.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

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Frank Potter, CFA, a financial adviser for Star Financial, LLC has been hired by John Williamson, a recently retired executive from Reston Industries. Over the years Williamson has accumulated $10 million worth of Reston stock and another $2 million in a cash savings account. Potter has a number of unconventional investment strategies for Williamson's portfolio; many of the strategies include the use of various equity derivatives.

Potter's first recommendation involves the use of a total return equity swap. Potter outlines the characteristics of the swap in Table 1. In addition to the equity swap, Potter explains to Williamson that there are numerous options available for him to obtain almost any risk return profile he might need. Potter suggest that Williamson consider options on both Reston stock and the S&P 500. Potter collects the information needed to evaluate options for each security. These results are presented in Table 2.

**Table 1: Specification of Equity Swap**

| | |
|---|---|
| Term | 3 years |
| Notional principal | $10 million |
| Settlement frequency | Annual, commencing at end of year 1 |
| Fairfax pays to broker | Total return on Reston Industries stock |
| Broker pays to Fairfax | Total return on S&P 500 Stock Index |

**Table 2: Option Characteristics**

| | **Reston** | **S&P 500** |
|---|---|---|
| Stock price | $50.00 | $1,400.00 |
| Strike price | $50.00 | $1,400.00 |

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| | | |
|---|---|---|
| Interest rate | 6.00% | 6.00% |
| Dividend yield | 0.00% | 0.00% |
| Time to expiration (years) | 0.5 | 0.5 |
| Volatility | 40.00% | 17.00% |
| Beta Coefficient | 1.23 | 1 |
| Correlation | 0.4 | |

**Table 3: Regular and Exotic Options (Option Values)**

| | **Reston** | **S&P 500** |
|---|---|---|
| European call | $6.31 | $6.31 |
| European put | $4.83 | $4.83 |
| American call | $6.28 | $6.28 |
| American put | $4.96 | $4.96 |

**Table 4: Reston Stock Option Sensitivities**

| | **Delta** |
|---|---|
| European call | 0.5977 |
| European put | -0.4023 |
| American call | 0.5973 |
| American put | -0.4258 |

**Table 5: S&P 500 Option Sensitivities**

| | **Delta** |
|---|---|
| European call | 0.622 |
| European put | -0.378 |
| American call | 0.621 |
| American put | -0.441 |

Potter has also been asked to evaluate the interest rate risk of an intermediate size bank. The bank has a large floating rate liability of $100,000,000 on which it pays the London Inter Bank Offered Rate (LIBOR) on a quarterly basis. Potter is concerned about the significant interest rate risk the bank incurs because of this liability: since most of the bank's assets are invested in fixed rate instruments there is a considerable duration mismatch. Some of the bank's assets are floating rate notes tied to LIBOR, however, the total par value of these securities is significantly less than the liability position.

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Potter considers both swaps and interest rate options. The interest rate options are 2-year caps and floors with quarterly exercise dates. Potter wishes to hedge the entire liability.

Potter has obtained the prices for an at-the-money 6 month cap and floor with quarterly exercise. These are shown in Table 6.

**Table 6: At-the-Money 0.5 year Cap and Floor Values**

| | |
|---|---|
| Price of at-the-money Cap | $133,377 |
| Price of at-the-money Floor | $258,510 |

## Question #10 - 14 of 109

Question ID: 1210619

Williamson would like to consider neutralizing his Reston equity position from changes in Reston's stock price. Using the information in Tables 3 and 4 how many standard Reston European options would have to be bought/sold in order to create a delta neutral portfolio?

**A)** Buy 497,141 put options.

**B)** Sell 370,300 call options.

**C)** Sell 497,141 put options.

**Explanation**

Number of put options = (Reston Portfolio Value / Stock Price$_{Reston}$) / −DeltaPut

Number of put options = ($10,000,000 / $50.00) / −0.4023 = −497,141 meaning buy 497,141 put options.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #11 - 14 of 109

Question ID: 1210620

Williamson is very interested in the total return swap. He asks Potter how much it would cost to enter into this transaction. Which of the following is the *most likely* cost of the swap at inception?

**A)** $45,007.

**B)** $340,885.

**C)** $0.

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**Explanation**

Swaps are priced so that their value at inception is zero.

(Study Session 14, Module 37.9, LOS 37.c)

**Related Material**

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## Question #12 - 14 of 109

Question ID: 1210621

Williamson likes the characteristics of the swap arrangement in Table 1 but would like to consider the options in Table 3 before making an investment decision. Given Williamson's current situation which of the following option trades makes the *most* sense in the short-term (all options are on Reston stock)?

**A)** Buy out-of-the-money call options.

**B)** Sell at-the-money-call options.

**C)** Buy at-the-money put options.

**Explanation**

Buying at the money put options greatly reduces Williamson's downside risk. Selling call options yields an option premium to the seller but does not deliver any downside protection and limits the upside potential of the portfolio.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

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## Question #13 - 14 of 109

Question ID: 1210622

Potter analyzes alternative hedging strategies to address the risk of the bank's large floating-rate liability. Which of the following is the *most appropriate* transaction to efficiently hedge the interest rate risk for the floating rate liability without sacrificing potential gains from interest rate decreases?

**A)** Sell an interest rate cap.

**B)** Buy an interest rate collar.

**C)** Buy an interest rate cap.

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**Explanation**

Buying a cap, combined with a floating rate liability, limits the exposure to interest rate increases (i.e. no exposure to interest rate increases above strike rate). The floating rate borrower will still benefit from interest rate decreases.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #14 - 14 of 109

Question ID: 1210623

Potter is now considering some of the bank's floating rate assets. Which of the following transactions is the *most appropriate* to minimize the interest rate risk of these assets without sacrificing upside gains?

**A)** Buy a collar. ✗

**B)** Buy a cap. ✗

**C)** Buy a floor. ✓

**Explanation**

Buying a floor combined with a floating rate assets limits the exposure to interest rate decreases (i.e. no exposure to interest rate decreases below strike rate) while the floating rate holder is still able to benefit from interest rate increases. Ideally, Potter should consider matching the bank's asset position against the bank's liability position.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #15 of 109

Question ID: 1210545

Which of the following is NOT one of the assumptions of the Black-Scholes-Merton (BSM) option-pricing model?

**A)** There are no taxes. ✗

**B)** Any dividends are paid at a continuously compounded rate. ✓

**C)** Options valued are European style. ✗

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**Explanation**

The BSM model assumes there are no cash flows on the underlying asset.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

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Max Perrot, CFA, works for WWF, a mortgage banking company which originates residential mortgage loans. On a monthly basis, WWF issues agency mortgage-backed securities (MBS) backed by their loans. WWF sells the MBS in the open market soon after securitization, but retains the servicing rights to the loans. WWF currently owns the third largest mortgage servicing portfolio in the U.S. Perrot has recently been promoted to Senior Vice President of Asset and Liability Management for WWF. Perrot's new responsibilities encompass hedging WWF's newly created MBS prior to their sale, as well as managing the interest rate exposure on the servicing portfolio. Both types of assets are extremely sensitive to changes in interest rates, though not necessarily in the same manner.

Although WWF has retained all of the servicing rights of its loans in the past, they are not opposed to the selling of portions of the portfolio if market conditions are right. WWF's management wants Perrot in his new position to focus primarily on preserving the value of the servicing portfolio through hedging strategies that are cost effective to execute. Also, any hedge strategy used by Perrot must be extremely liquid in the event that a portion of the servicing portfolio is sold and the hedge needs to be unwound. The upper management of WWF anticipates a period of volatility in interest rates, and they have asked Perrot to project expected returns of a hedged position under a variety of interest rates scenarios.

Perrot's predecessor lacked experience in hedging with swaps and futures contracts, but he had used them periodically with lackluster results. Through his inaction, he had exposed the firm to significant asset and liability mismatch, which had increased dramatically over the past two years as both production and the servicing portfolio had grown. Perrot, on the other hand, had extensive experience with hedging with derivatives in his prior job. He is familiar with executing hedging strategies utilizing not only swap and futures, but also with options such as caps and floors. He decides that before he presents any potential hedging strategy to WWF's management, he would first like to bring them up to speed on the basic hedging concepts. He prepares a brief presentation on the relationships between interest rates and options, and outlines some basic hedging strategies. He anticipates many questions that may arise from his presentation, and prepares a handout in a question and answer format.

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## Question #16 - 21 of 109

Question ID: 1210571

Which of the following *best* explains the relationship between interest rate swaps and forward contracts? Interest rate swaps:

**A)** are equivalent to a series of forward contracts.

**B)** have the same payoff as a package of forward contracts but not the same value.

**C)** are equivalent to forward contracts.

**Explanation**

A swap agreement is equivalent to a series of forward contracts. As long as the underlying details are the same, an interest rate swap will have the same payoff and the same value as a series of forward contracts.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #17 - 21 of 109

Question ID: 1210572

Which of the following *most* accurately describes the relationship between an interest rate floor and a bond option? Buying an interest rate floor is equivalent to:

**A)** buying a portfolio of call options on a bond.

**B)** selling a portfolio of put options on a bond.

**C)** buying a portfolio of put options on a bond.

**Explanation**

For a call option on a fixed-income instrument, if interest rates decrease, the fixed-income instrument's price increases. So the call option value increases. This is the same payoff structure as an interest rate floor, which provides a positive payoff if the interest rate is below the strike rate.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #18 - 21 of 109

Question ID: 1210573

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Assume that a three-year semi-annually settled floor with a strike rate of 8% and a notional amount of $100 million is being analyzed. The reference rate is six-month London Interbank Offered Rate (LIBOR). Suppose that LIBOR for the next four semi-annual periods is as follows:

| Period | LIBOR |
|---|---|
| 1 | 7.5% |
| 2 | 8.2% |
| 3 | 8.1% |
| 4 | 8.7% |

What is the payoff for the floor for period 1?

**A)** $500,000.

**B)** $0.

**C)** $250,000.

**Explanation**

The payoff for each semi-annual period is computed as follows:

Payoff = notional amount × (floor rate − six-month LIBOR) / 2

so for period 1:

= $100 million × (8.0% − 7.5%) / 2 = $250,000

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #19 - 21 of 109

Question ID: 1210574

Which of the following *best* explains the difference between an interest rate put option and a put option on a fixed income security? The interest rate put option value:

**A)** decreases if interest rates increase just as the value of a put option on a fixed income security decreases.

**B)** increases if interest rates increase just as the value of a put option on a fixed income security increases.

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**C)** decreases if interest rates increase while the value of a put option on a fixed income security increases if interest rates increase.

**Explanation**

An interest rate put option pays off the difference between the strike rate and the current interest rate if that difference is positive. So the value of the interest rate option will be high if interest rates decrease below the strike rate. In contrast, a put option on a fixed income security has a high value if interest rates increase because then the fixed-income security's price decreases below the value based strike price.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #20 - 21 of 109

Question ID: 1210575

A LIBOR based floating rate bond combined with a LIBOR based collar (a short position in an interest rate cap and a long position in an interest rate floor both at the same strike rate) is equivalent to a:

**A)** call option on a bond.

**B)** pay-fixed swap position.

**C)** fixed-rate bond.

**Explanation**

The effective rate above the cap strike and below the floor strike, when combined with the floating rate on a bond, is constant.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #21 - 21 of 109

Question ID: 1210576

Which of the following is *most likely* a reason why dynamic riskless arbitrage is difficult in real markets?

**A)** Short sale constraints exist.

**B)** Securities are subject to insider trading.

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**C)** Continuous rebalancing.

**Explanation**

The continuous rebalancing required with dynamic riskless arbitrage is not practical. For one thing, it leads to significant transaction costs.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #22 of 109

Question ID: 1210550

Pete Jenkins makes the following statement about options:

"$N(d_2)$ is interpreted as the risk-neutral probability that a call option will expire in the money. Similarly, $N(-d_2)$ is the risk-neutral probability that a put option will expire in the money."

Jenkins is *most likely*:

**A)** incorrect about the risk-neutral probability of put option expiring in the money.

**B)** correct.

**C)** incorrect about the risk-neutral probability of call option expiring in the money.

**Explanation**

Jenkins is correct about both probabilities.

(Study Session 14, Module 38.6, LOS 38.g)

**Related Material**

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Gina Davalos, CFA is a portfolio manager for the Herron Investments. She is interested in hedging the equity risk of one of her clients, Lou Gier. Gier has 200,000 shares of a stock with the symbol QJX that he believes could take a dive in the next 9 months. Davalos gathers the following information to suggest potential strategies to offset the potential loss. Each option contract is for 100 options.

General Information:

| | |
|---|---|
| QJX Current Stock Price | $100.00 |
| Risk-free rate | 5.0% |

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| | |
|---|---|
| QJX Dividend Yield | 0.0% |
| Time to Maturity (years) | 0.75 |

Option Information:

| | |
|---|---|
| Strike Price | $100.00 |
| Value of Call | $12.09 |
| Delta on Call Option | 0.6081 |
| Value of Put (years) | $8.41 |

Equity Swap Information:

| | |
|---|---|
| Terms | 9 months |
| Settlement frequency | Quarterly |
| Fixed rate | 6.0% |
| Return on QJX | Variable |

Futures Information:

| | |
|---|---|
| Terms | 9 months |
| Current Futures Price | $105.50 |

## Question #23 - 28 of 109

Question ID: 1210604

The number of call option contracts that Davalos would need to trade to create a delta neutral hedge is *closest* to:

**A)** 328,920 contracts.

**B)** 3,289 contracts.

**C)** 2,000 contracts.

**Explanation**

The number of call options needed is 200,000 / 0.6081 = 328,920 options or approximately 3,289 contracts of 100 shares. Since Gier is long the stock, Davalos should short the calls.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #24 - 28 of 109

Question ID: 1210605

In order to create a delta-neutral hedge using put option contracts, Davalos would *most accurately* need to:

**A)** Buy 5,103 contracts.

**B)** Sell 510,271 contracts.

**C)** Buy 2,000 contracts.

**Explanation**

The delta of a put option is the delta of the corresponding call option minus- 1. The delta of a QJX put option is thus -0.3919. The number of put options needed is 200,000 / -0.3909 = -510,271 options or approximately 5,103 contracts per 100 shares. Gier is long the stock, to hedge with puts Davalos should also take a long position in the puts.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #25 - 28 of 109

Question ID: 1210606

When a delta neutral hedge has been established using call options, which of the following statements is *most* accurate? As the price of the underlying stock:

**A)** changes, no changes are needed in the number of call options purchased.

**B)** increases, some option contracts would need to be sold in order to retain the delta neutral position.

**C)** increases, some option contracts would need to be repurchased in order to retain the delta neutral position.

**Explanation**

The initial delta hedge is established by selling call options (i.e. taking a short position in calls). As the stock price increases, the delta of the call option increases as well, requiring fewer (short) option contracts to hedge against the underlying stock price movements. Therefore, some options contracts must be repurchased in order to maintain the hedge. (Purchasing option contracts will decrease the number of call options that we are short.)

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #26 - 28 of 109

Question ID: 1210607

An equity swap to hedge the equity risk for Gier would result in receipt of a:

**A)** variable rate based on the total return of QJX stock.

**B)** fixed rate of 4.5% for the year.

**C)** fixed rate of 1.5% per quarter.

**Explanation**

To offset the equity risk, Gier would pay a variable rate based on the total return of QJX and receive a fixed rate. The quoted rate is an annualized rate and since the swap is for three quarters or nine months, the full 6.0% will not be realized. The 6.0% annualized rate is equivalent to 1.5% per quarter.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #27 - 28 of 109

Question ID: 1210608

If the equity swap is implemented and after 3 months the stock price has increased to $106.00, the net cash flow for the swap is:

**A)** zero.

**B)** a loss of $900,000.

**C)** a gain of $900,000.

**Explanation**

The equity swap requires Gier to pay a variable rate of total return on QJX and receive a fixed rate. If the stock appreciates, the swap results in a positive cash flow of 6.0%/4 × $20,000,000 = $300,000 and a negative cash flow of $20,000,000 × ($106/$100 – 1) = $1,200,000, summing to a net of outflow of $900,000. The swap plus the equity position result in an overall gain, as the gain on the stock more than offsets the loss on the equity swap.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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Question #28 - 28 of 109

## Question #28 - 28 of 109

Question ID: 1210609

Based on the futures information, an arbitrage opportunity can be exploited by:

**A)** Buying the futures and buying the stock QJX.

**B)** Buying the stock QJX, and selling the futures.

**C)** Selling the stock QJX and buying the futures.

**Explanation**

The calculated fair value of the futures contract is $\$100 \times (1+0.05)^{0.75} = \$103.73$. The asset is relatively underpriced and the futures contract is overpriced. By buying the stock and selling the futures we can lock in a profit greater than the risk-free rate with no risk.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #29 of 109

Question ID: 1210548

Which of the following is NOT one of the assumptions of the Black-Scholes-Merton option-pricing model?

**A)** The yield curve for risk-free assets is fixed over the term of the option.

**B)** There are no taxes and transactions costs are zero for options and arbitrage portfolios.

**C)** There are no cash flows over the term of the options.

**Explanation**

The yield curve is assumed to be flat so that the risk-free rate of interest is known and *constant* over the term of the option. Having a fixed yield curve does not necessarily imply that the yield curve is flat.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

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## Question #30 of 109

Question ID: 1210511

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Referring to put-call parity, which one of the following alternatives would allow you to create a synthetic riskless pure-discount bond?

**A)** Buy a European put option; buy the same stock; sell a European call option.

**B)** Sell a European put option; sell the same stock; buy a European call option.

**C)** Buy a European put option; sell the same stock; sell a European call option.

**Explanation**

According to put-call parity we can write a riskless pure-discount bond position as:

$$X/(1+R_f)^T = P_0 + S_0 - C_0$$

We can then read off the right-hand side of the equation to create a synthetic position in the riskless pure-discount bond. We would need to buy the European put, buy the same underlying stock, and sell the European call.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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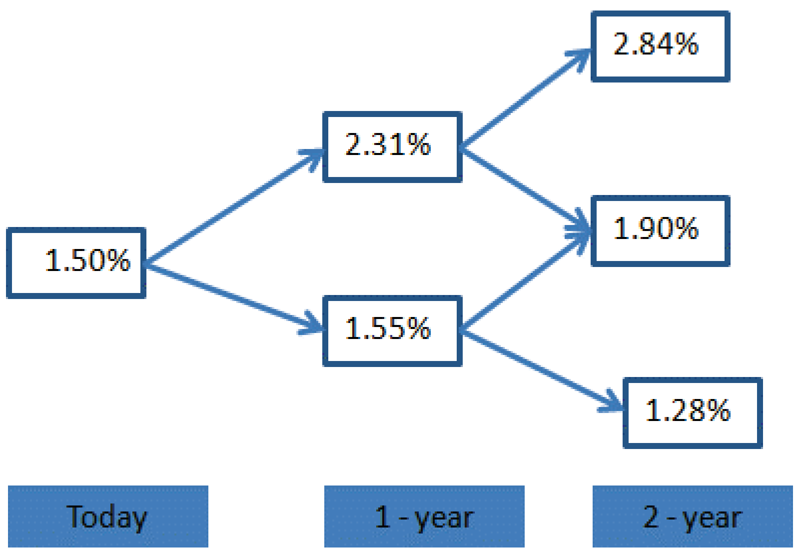
## Question #31 of 109

Question ID: 1210535

Given the following interest rate tree:

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The value of a 2-period European call option with strike rate of 2% and notional principal of $1 million is closest to:

**A)** \$2,022

**B)** \$4,122

**C)** \$3,549

**Explanation**

Given the exercise rate of 2.00%, the call option has a positive payoff for node $C^{++}$ only.

The payoff at node $C^{++}$ can be calculated as:

[Max (0, 0.0284 – 0.02)] × \$ 1,000,000 = \$ 8,400.

Value at node $C^{+}$ = [(0.5 × 8,400) + (0.5 × 0)] / (1.0231) = \$4,105

Value at node $C^{-}$ = 0

And the value at node C = [(0.5 × 4,105) + (0.5 × 0)] / (1.015) = \$2,022

(Study Session 14, Module 38.5, LOS 38.d)

**Related Material**

SchweserNotes - Book 4

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## Question #32 of 109

Question ID: 1210512

Referring to put-call parity, which one of the following alternatives would allow you to create a synthetic European call option?

**A)** Sell the stock; buy a European put option on the same stock with the same exercise price and the same maturity; invest an amount equal to the present

**B)** Buy the stock; buy a European put option on the same stock with the same exercise price and the same maturity; short an amount equal to the present

**C)** Buy the stock; sell a European put option on the same stock with the same exercise price and the same maturity; short an amount equal to the present

**Explanation**

According to put-call parity we can write a European call as: $C_0 = P_0 + S_0 – X/(1+R_f)^T$

We can then read off the right-hand side of the equation to create a synthetic position in the call. We would need to buy the European put, buy the stock, and short or issue a riskless pure-discount bond equal in value to the present value of the exercise price.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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Mark Washington, CFA, is an analyst with BIC, a Bermuda-based investment company that does business primarily in the U.S. and Canada. BIC has approximately $200 million of assets under management, the bulk of which is invested in U.S. equities. BIC has outperformed its target benchmark for eight of the past ten years, and has consistently been in the top quartile of performance when compared with its peer investment companies. Washington is a part of the Liability Management group that is responsible for hedging the equity portfolios under management. The Liability Management group has been authorized to use calls or puts on the underlying equities in the portfolio when appropriate, in order to minimize their exposure to market volatility. They also may utilize an options strategy in order to generate additional returns.

One year ago, BIC analysts predicted that the U.S. equity market would most likely experience a slight downturn due to inflationary pressures. The analysts forecast a decrease in equity values of between 3 to 5% over the upcoming year and one-half. Based upon that prediction, the Liability Management group was instructed to utilize calls and puts to construct a delta-neutral portfolio. Washington immediately established option positions that he believed would hedge the underlying portfolio against the impending market decline.

As predicted, the U.S. equity markets did indeed experience a downturn of approximately 4% over a twelve-month period. However, portfolio performance for BIC during those twelve months was disappointing. The performance of the BIC portfolio lagged that of its peer group by nearly 10%. Upper management believes that a major factor in the portfolio's underperformance was the option strategy utilized by Washington and the Liability Management group. Management has decided that the Liability Management group did not properly execute a delta-neutral strategy. Washington and his group have been told to review their options strategy to determine why the hedged portfolio did not perform as expected. Washington has decided to undertake a review of the most basic option concepts, and explore such elementary topics as option valuation, an option's delta, and the expected performance of options under varying scenarios. He is going to examine all facets of a delta-neutral portfolio: how to construct one, how to determine the expected results, and when to use one. Management has given Washington and his group one week to immerse themselves in options theory, review the basic concepts, and then to present their findings as to why the portfolio did not perform as expected.

## Question #33 - 38 of 109

Question ID: 1210590

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Which of the following *best* explains a delta-neutral portfolio? A delta-neutral portfolio is perfectly hedged against:

**A)** small price decreases in the underlying asset.

**B)** all price changes in the underlying asset.

**C)** small price changes in the underlying asset.

**Explanation**

A delta-neutral portfolio is perfectly hedged against small price changes in the underlying asset. This is true both for price increases and decreases. That is, the portfolio value will not change significantly if the asset price changes by a small amount. However, large changes in the underlying will cause the hedge to become imperfect. This means that overall portfolio value can change by a significant amount if the price change in the underlying asset is large.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #34 - 38 of 109

Question ID: 1210591

After discussing the concept of a delta-neutral portfolio, Washington determines that he needs to further explain the concept of delta. Washington draws the payoff diagram for an option as a function of the underlying stock price. Using this diagram, how is delta interpreted? Delta is the:

**A)** curvature of the option price graph.

**B)** level in the option price diagram.

**C)** slope in the option price diagram.

**Explanation**

Delta is the change in the option price for a given instantaneous change in the stock price. The change is equal to the slope of the option price diagram.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #35 - 38 of 109

Question ID: 1210592

Washington considers a put option that has a delta of −0.65. If the price of the underlying asset decreases by $6, then which of the following is the *best* estimate of the change in option price?

**A)** −$6.50.

**B)** +$3.90.

**C)** −$3.90.

**Explanation**

The estimated change in the price of the option is:

Change in asset price × delta = −$6 × (−0.65) = $3.90

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #36 - 38 of 109

Question ID: 1210593

Washington is trying to determine the value of a call option. When the slope of the at expiration curve is close to zero, the call option is:

**A)** out-of-the-money.

**B)** in-the-money.

**C)** at-the-money.

**Explanation**

When a call option is deep out-of-the-money, the slope of the at expiration curve is close to zero, which means the delta will be close to zero.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #37 - 38 of 109

Question ID: 1210594

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BIC owns 51,750 shares of Smith & Oates. The shares are currently priced at \$69. A call option on Smith & Oates with a strike price of \$70 is selling at \$3.50, and has a delta of 0.69 What is the number of call options necessary to create a delta-neutral hedge?

**A)** 75,000.

**B)** 14,785.

**C)** 0

**Explanation**

The number of call options necessary to delta hedge is = 51,750 / 0.69 = 75,000 options or 750 option contracts, each covering 100 shares. Since these are call options, the options should be sold short.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #38 - 38 of 109

Question ID: 1210595

Which of the following statements regarding the goal of a delta-neutral portfolio is *most* accurate? One example of a delta-neutral portfolio is to combine a:

**A)** long position in a stock with a short position in call options so that the value of the portfolio does not change with changes in the value of the stock.

**B)** long position in a stock with a long position in call options so that the value of the portfolio does not change with changes in the value of the stock.

**C)** long position in a stock with a short position in a call option so that the value of the portfolio changes with changes in the value of the stock.

**Explanation**

A delta-neutral portfolio can be created with any of the following combinations: long stock and short calls, long stock and long puts, short stock and long calls, and short stock and short puts.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #39 of 109

Question ID: 1210588

The price of a June call option with an exercise price of $50 falls by $0.50 when the underlying non-dividend paying stock price falls by $2.00. The delta of a June put option with an exercise price of $50 *closest* to:

**A)** 0.25.

**B)** –0.25.

**C)** –0.75.

**Explanation**

The call option delta is:

$$\text{delta}_{\text{call}} = \frac{\$0.50}{\$2.00} = 0.25$$

The put option delta is 0.25 – 1 = –0.75.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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Joel Franklin, CFA, has recently been promoted to junior portfolio manager for a large equity portfolio at Davidson Sherman (DS), a large multinational investment banking firm. The portfolio is subdivided into several smaller portfolios. In general, the portfolios are composed of U.S. based equities, ranging from medium to large-cap stocks. Currently, DS is not involved in any foreign markets. In his new position, he will now be responsible for the development of a new investment strategy that DS wants all of its equity portfolios to implement. The strategy involves overlaying option strategies on its equity portfolios. Recent performance of many of their equity portfolios has been poor relative to their peer group. The upper management at DS views the new option strategies as an opportunity to either add value or reduce risk.

Franklin recognizes that the behavior of an option's value is dependent upon many variables and decides to spend some time closely analyzing this behavior. He took an options strategies class in graduate school a few years ago, and feels that he is fairly knowledgeable about the valuation of options using the Black-Scholes model. Franklin understands that the volatility of the underlying asset returns is one of the most important contributors to option value. Therefore, he would like to know when the volatility has the largest effect on option value. Upper management at DS has also requested that he further explore the concept of a delta neutral portfolio. He must determine how to create a delta neutral portfolio, and how it would be expected to perform under a variety of scenarios. Franklin is also examining the change in the call option's delta as the underlying equity value changes. He also wants to

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determine the minimum and maximum bounds on the call option delta. Franklin has been authorized to purchase calls or puts on the equities in the portfolio. He may not, however, establish any uncovered or "naked" option positions. His analysis has resulted in the information shown in Exhibit 1 and Exhibit 2 for European style options.

**Exhibit 1**

| Input for European Options | |
|---|---|
| Stock Price (S) | 100 |
| Strike Price (X) | 100 |
| Interest Rate (r) | 0.07 |
| Dividend Yield (q) | 0 |
| Time to Maturity (years) (t) | 1 |
| Volatility (Std. Dev.) (sigma) | 0.2 |
| Black-Scholes Put Option Value | $4.7809 |

**Exhibit 2**

| European Option Sensitivities | | |
|---|---|---|
| **Sensitivity** | **Call** | **Put** |
| Delta | 0.6736 | −0.3264 |
| Gamma | 0.0180 | 0.0180 |
| Theta | −3.9797 | 2.5470 |
| Vega | 36.0527 | 36.0527 |
| Rho | 55.8230 | −37.4164 |

## Question #40 - 45 of 109

Question ID: 1210597

What does it mean to make an options portfolio delta neutral? The option portfolio:

**A)** moves exactly in line with the stock price.

**B)** moves exactly in the opposite direction with the stock price.

**C)** is insensitive to price changes in the underlying security.

**Explanation**

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The delta of the option portfolio is the change in value of the portfolio if the underlying stock price changes. A delta neutral option portfolio has a delta of zero.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #41 - 45 of 109

Question ID: 1210598

Which of the following *most* accurately describes the sensitivity of the call option's delta to changes in the underlying asset's price? The sensitivity to changes in the price of the underlying is the greatest when the call option is:

**A)** in the money.

**B)** it depends on the other inputs.

**C)** at the money.

**Explanation**

When the option is at the money, delta is most sensitive to changes in the underlying asset's price.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #42 - 45 of 109

Question ID: 1210599

Which of the following *most* accurately describes when the call option delta reaches its minimum bound? The call option reaches its minimum bound when call option is:

**A)** at the money.

**B)** the option's delta has no minimum bound.

**C)** far out of the money.

**Explanation**

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When a call option is far out of the money its value is insensitive to changes in value of the underlying. This is because the chances that it is going to end up in the money at expiration are very small.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #43 - 45 of 109

Question ID: 1210600

If the portfolio has 10,000 shares of the underlying stock and he wants to completely hedge the price risk using options, what kind of options should Franklin buy?

**A)** Call options.

**B)** Call and put options.

**C)** Put options.

**Explanation**

Buying put options will allow Franklin to completely hedge the stock price risk.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

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## Question #44 - 45 of 109

Question ID: 1210601

Compute the number of shares of stock necessary to create a delta neutral portfolio consisting of 100 long put options in Exhibit 2 and the stock.

**A)** −32.64.

**B)** 67.36.

**C)** 32.64.

**Explanation**

This is simply −100 times the put option delta. Since each share has a delta of 1, we only need 32.64 shares (long) to create a delta neutral portfolio.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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## Question #45 - 45 of 109

Question ID: 1210602

Compute the number of shares of stock necessary to create a delta neutral portfolio consisting of 100 long call options in Exhibit 2 and the stock.

**A)** −32.64.

**B)** 67.36.

**C)** −67.36.

**Explanation**

This is simply −100 times the call option delta. Since each share has a delta of 1, we only need −67.36 (short) shares to create a delta neutral portfolio.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

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Al Bingly, CFA, is a derivatives specialist who attempts to identify and make short-term gains from trading mispriced options. One of the strategies that Bingly uses is to look for arbitrage opportunities in the market for European options. This strategy involves creating a synthetic call from other instruments at a cost less than the market value of the call itself, and then selling the call. During the course of his research, he observes that Hilland Corporation's stock is currently priced at $56, while a European-style put option with a strike price of $55 is trading at $0.40 and a European-style call option with the same strike price is trading at $2.50. Both options have 6 months remaining until expiration. The risk-free rate is currently 4 percent.

Bingly often uses the binomial model to estimate the fair price of an option. He then compares his estimated price to the market price. He observes that Dale Corporation's stock has a current market price of $200, and he predicts that its price will either be $166.67 or $240 in one year. The risk-free rate is currently 4 percent. He also observes that the price of a one-year call with a $220 strike price is $11.11.

Bingly also uses the Black-Scholes-Merton model to price options. His stated rationale for using this model is that he believes the prices of the stocks he analyzes follow a lognormal distribution, and because the model allows for a varying risk-free rate over the life of the option. His plan is to use a statistical technique to estimate the volatility of a stock, enter it

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into the Black-Scholes-Merton model, and see if the associated price is higher or lower than the observed market price of the options on the stock.

Bingly wishes to apply the Black-Scholes-Merton model to both non-dividend paying and dividend paying stocks. He investigates how the presence of dividends will affect the estimated call and put price.

## Question #46 - 51 of 109

Question ID: 1210539

In the case of the options on Hilland Corporation's stock, if Bingly were to establish a long protective put position, he could:

**A)** earn an arbitrage profit of $0.30 per share by selling the call and lending $57.20 at the risk-free rate.

**B)** earn an arbitrage profit of $0.03 per share by selling the call and borrowing the remaining funds needed for the position at the risk-free rate.

**C)** not earn an arbitrage profit because he should short the protective put position.

**Explanation**

Under put-call parity, the value of the call = put + stock – PV(exercise price). Therefore, the equilibrium value of the call = $0.40 + $56 - $55/(1.04$^{0.5}$) = $2.47. Thus, the call is overpriced, and arbitrage is available. If Bingly sells the call for $2.50 and borrows $53.93= $55/(1.04$^{0.5}$), he will have $56.43 > $56.40 (= $56 + $0.40), which is the price he would pay for the protective put position. The arbitrage profit is the difference ($0.03 = $56.43 - $56.40).

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

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## Question #47 - 51 of 109

Question ID: 1210540

The one-year call option on Dale Corporation:

**A)** is underpriced.

**B)** is overpriced.

**C)** may be over or underpriced. The given information is not sufficient to give an answer.

**Explanation**

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The up movement parameter U=1.20, and the down movement parameter D=0.833. We calculate the probability of an up move $\pi_U$ = (1 + 0.04 – 0.833)/(1.2 – 0.833) = 0.564. The call is out of the money in the event of a down movement, and has an intrinsic value of $20 in the event of an up movement. Therefore, the estimated value of the call is C = (0.564) × $20 / (1.04) = $10.85. Thus, the price of $11.11 is too high and the call is overpriced.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

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## Question #48 - 51 of 109

Question ID: 1210541

Bingly's sentiments towards the Black-Scholes-Merton (BSM) model regarding a lognormal distribution of prices and a variable risk-free rate are:

**A)** incorrect for both reasons.

**B)** correct for both reasons.

**C)** correct concerning the distribution of stocks but incorrect concerning the risk-free rate.

**Explanation**

The model requires many assumptions, e.g., the distribution of stock prices is lognormal and the risk-free rate is known and *constant*. Other assumptions are frictionless markets, the options are European, and the volatility is known and constant.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

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## Question #49 - 51 of 109

Question ID: 1210542

Which of the following is *least* accurate regarding the limitations of the BSM model?

**A)** The BSM is designed to price American options but not European options.

**B)** The BSM is not useful in pricing options on bonds and interest rates.

**C)** The BSM is not useful in situations where the volatility of the underlying asset changes over time.

**Explanation**

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The following are limitations of the BSM:

1. The assumption of a known and constant risk free rate means the BSM is not useful for pricing options on bond prices and interest rates.
2. The assumption of a known and constant asset return volatility makes the BSM not useful in situations where the volatility is not constant which occurs much of the time.
3. The assumption of no taxes and transaction costs makes the BSM less useful.
4. The BSM is designed to price European options and not American options.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

SchweserNotes - Book 4

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## Question #50 - 51 of 109

Question ID: 1210543

If Bingly forecasts the volatility for a stock and find that it is significantly greater than that implied by the prices of the puts and calls of the stock, he would conclude that:

**A)** puts and calls are underpriced.

**B)** puts and calls are overpriced.

**C)** the puts are overpriced and the calls are underpriced.

**Explanation**

There is a positive relationship between the volatility of the stock and the price of both puts and calls. A higher estimate of volatility implies that the prices of both puts and calls should be higher.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

SchweserNotes - Book 4

## Question #51 - 51 of 109

Question ID: 1210544

All else being equal, the greater the dividend paid by a stock the:

**A)** lower the call price and the higher the put price.

**B)** higher the call price and the lower the put price.

**C)** lower the call price and the lower the put price.

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**Explanation**

When dividend payments occur during the life of the option, the price of the underlying stock is reduced (on the ex-dividend date). All else being equal, the lower price reduces the value of call options and increases the value of put options.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

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## Question #52 of 109

Question ID: 1210554

Early exercise of in-the-money American options on:

**A)** forwards is sometimes worthwhile but never is for options on futures.

**B)** futures is sometimes worthwhile but never is for options on forwards.

**C)** both futures and forwards is sometimes worthwhile.

**Explanation**

Early exercise of in-the-money American options on futures is sometimes worthwhile because the immediate mark to market upon exercise will generate funds that can earn interest. It is never worthwhile for options on forwards because no funds are generated until the settlement date of the forward contract.

(Study Session 14, Module 38.6, LOS 38.i)

**Related Material**

SchweserNotes - Book 4

## Question #53 of 109

Question ID: 1210577

The value of a put option is positively related to all of the following EXCEPT:

**A)** time to maturity.

**B)** risk-free rate.

**C)** exercise price.

**Explanation**

The value of a put option is negatively related to increases in the risk-free rate.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

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## Question #54 of 109

Question ID: 1210551

Compared to the value of a call option on a stock with no dividends, a call option on an identical stock expected to pay a dividend during the term of the option will have a:

**A)** lower value only if it is an American style option.

**B)** lower value in all cases.

**C)** higher value only if it is an American style option.

**Explanation**

An expected dividend during the term of an option will decrease the value of a call option.

(Study Session 14, Module 38.6, LOS 38.h)

**Related Material**

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## Question #55 of 109

Question ID: 1210626

Which of the following *best* explains the sensitivity of a call option's value to volatility? Call option values:

**A)** are not affected by changes in the volatility of the underlying asset.

**B)** increase as the volatility of the underlying asset increases because investors are risk seekers.

**C)** increase as the volatility of the underlying asset increases because call options have limited risk but unlimited upside potential.

**Explanation**

A higher volatility makes it more likely that options end up in the money and can be exercised profitably, while the down side risk is strictly limited to the option premium.

(Study Session 14, Module 38.7, LOS 38.n)

**Related Material**

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## Question #56 of 109

Question ID: 1210555

Suppose a forward rate agreement (FRA) requires us to exchange six-month LIBOR one year from now for a fixed rate of interest of 8%. In other words, we will pay floating and receive fixed. Which of the following structures is *equivalent* to this FRA? A long:

**A)** put and a short call on LIBOR with a strike rate of 8% and twelve months to expiration.

**B)** call and a short put on LIBOR with a strike rate of 8% and twelve months to expiration.

**C)** call and a short put on LIBOR with a strike rate of 8% and six months to expiration.

**Explanation**

Interest rate swaps can be replicated with a series of put and call positions with expiration dates on the payment dates of the swap. For a receiver swap (where we pay floating and receive fixed), we need an option position that pays when floating rates fall and that requires a payment to be made when rates increase. A long interest rate put plus a short interest rate call would accomplish this. The strike rate of the options corresponds to the fixed rate of the FRA. The expiration of the option coincides with the LIBOR determination date.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #57 of 109

Question ID: 1210537

Dividends on a stock can be incorporated into the valuation model of an option on the stock by:

**A)** adding the present value of the dividend to the current stock price.

**B)** subtracting the future value of the dividend from the current stock price.

**C)** subtracting the present value of the dividend from the current stock price.

**Explanation**

The option pricing formulas can be adjusted for dividends by subtracting the present value of the expected dividend(s) from the current asset price.

(Study Session 14, Module 38, LOS 38.e)

**Related Material**

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## Question #58 of 109

Question ID: 1210557

A payer swaption gives its holder:

**A)** an obligation to enter a swap in the future as the fixed-rate payer.

**B)** the right to enter a swap in the future as the floating-rate payer.

**C)** the right to enter a swap in the future as the fixed-rate payer.

**Explanation**

A payer swaption give its holder the right to enter a swap in the future as the fixed-rate payer.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #59 of 109

Question ID: 1210568

To the issuer of a floating rate note, a cap is equivalent to:

**A)** owning a series of interest rate calls.

**B)** owning a series of calls on a fixed income security.

**C)** writing a series of interest rate calls.

**Explanation**

The issuer of the note is borrowing at a floating rate, and will have higher interest expenses if rates increase. A cap is equivalent to owning a series of interest rate calls at the cap rate that will pay the difference between the market rate and the cap rate. If interest rates increase, the payoff from the calls will compensate the borrower for the higher interest expenses.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #60 of 109

Question ID: 1210559

Cal Smart wrote a 90-day receiver swaption on a 1-year LIBOR-based semiannual-pay $10 million swap with an exercise rate of 3.8%. At expiration, the market rate and LIBOR yield curve are:

Fixed rate 3.763%

180-days 3.6%

360-days 3.8%

The payoff to the writer of the receiver swaption at expiration is *closest* to:

**A)** $0.

**B)** $3,600.

**C)** -$3,600.

**Explanation**

At expiration, the fixed rate is 3.763% which is below the exercise rate of 3.8%. The purchaser of the receiver swaption will exercise the option which allows them to receive a fixed rate of 3.8% from the writer of the option and pay the current rate of 3.763%.

The equivalent of two payments of (0.038 - 0.03763) × (180/360) × (10,000,000) will be made to the receiver swaption. One payment would have been received in 6 months and will be discounted back to the present at the 6-month rate. One payment would have been received in 12 months and will be discounted back to the present at the 12-month rate

The first payment, discounted to the present is (0.038 - 0.03763) × (180/360) × (10,000,000) × ( 1/1.018) = $1,817.28.

The second payment, discounted to the present is (0.038 - 0.03763) × (180/360) × (10,000,000) × ( 1/1.038) = $1,782.27

The total payoff for the writer is -$3,599.55.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #61 of 109

Question ID: 1210527

A stock is priced at 38 and the periodic risk-free rate of interest is 6%. What is the value of a two-period European put option with a strike price of 35 on a share of stock using a binomial model with an up factor of 1.15, a down factor of 0.87 and a risk-neutral probability of 68%?

**A)** $0.64.

**B)** $2.58.

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**C)** \$0.57.

**Explanation**

Two down moves produce a stock price of 38 × $0.87^2$ = 28.73 and a put value at the end of two periods of 6.27. An up and a down move, as well as two up moves leave the put option out of the money. You are directly given the probability of up = 0.68. Hence, the down probability = 0.32. The value of the put option is [$0.32^2$ × 6.27] / $1.06^2$ = \$0.57.

(Study Session 14, Module 38.2, LOS 38.b)

**Related Material**

SchweserNotes - Book 4

## Question #62 of 109

Question ID: 1210532

DTK Inc stock (current price \$55) has 1-year call options with an exercise price of \$55 trading at \$4.92. The stock can increase by 20% or decrease by 15% over the next year and the risk-free rate is 5%. Arbitrage profits are *most likely*:

**A)** not possible.

**B)** possible by purchasing 100 calls and short selling 57 shares.

**C)** possible by purchasing 57 shares and writing 100 calls.

**Explanation**

$S^+$ = 55(1.20) = 66; S- = 55 (0.85) = 46.75. $C^+$ = 66 – 55 = 11, $C^-$ = 0.

H = (11 – 0) / (66 – 46.75) = 0.5714

$$C_0 = hS_0 + \frac{(-hS^+ + C^+)}{(1+R_f)}$$

= (0.571×55) + [ ((-0.571×66) + 11) / 1.05 ] = 5.99

Since the call price of \$4.92 < \$5.99, an arbitrage profit can be earned by buying calls and short selling 0.571 shares per call bought.

(Study Session 14, Module 38.4, LOS 38.c)

**Related Material**

SchweserNotes - Book 4

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## Question #63 of 109

Question ID: 1210530

To create a synthetic short position in a stock, an investor can buy:

**A)** both a call option on the stock and a put option on the stock.

**B)** a put option on the stock and sell a call option on the stock.

**C)** a call option on the stock and sell a put option on the stock.

**Explanation**

Buying a put option and writing a call option results in a payoff pattern similar to that of a short position in the underlying stock.

(Study Session 14, Module 38.2, LOS 38.c)

**Related Material**

SchweserNotes - Book 4

## Question #64 of 109

Question ID: 1210586

Which of the following statements regarding an option's price is CORRECT? An option's price is:

**A)** a decreasing function of the underlying asset's volatility.

**B)** an increasing function of the underlying asset's volatility.

**C)** a decreasing function of the underlying asset's volatility when it has a long time remaining until expiration and an increasing function of its volatility if the option

**Explanation**

Since an option has limited risk but significant upside potential, its value always increases when the volatility of the underlying asset increases.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

## Question #65 of 109

Question ID: 1210585

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Which of the following statements concerning vega is *most* accurate? Vega is greatest when an option is:

**A)** at the money.

**B)** far out of the money.

**C)** far in the money.

**Explanation**

When the option is at the money, changes in volatility will have the greatest affect on the option value.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

John Fairfax is a recently retired executive from Reston Industries. Over the years he has accumulated $10 million worth of Reston stock and another $2 million in a cash savings account. He hires Richard Potter, CFA, a financial adviser from Stan Morgan, LLC, to help him develop investment strategies. Potter suggests a number of interesting investment strategies for Fairfax's portfolio. Many of the strategies include the use of various equity derivatives. Potter's first recommendation includes the use of a total return equity swap. Potter outlines the characteristics of the swap in Table 1. In addition to the equity swap, Potter explains to Fairfax that there are numerous options available for him to obtain almost any risk return profile he might need. Potter suggests that Fairfax consider options on both Reston stock and the S&P 500. Potter collects the information needed to evaluate options for each security. These results are presented in Table 2.

**Table 1: Specification of Equity Swap**

| | |
|---|---|
| Term | 3 years |
| Notional principal | $10 million |
| Settlement frequency | Annual, commencing at end of year 1 |
| Fairfax pays to broker | Total return on Reston Industries stock |
| Broker pays to Fairfax | Total return on S&P 500 Stock Index |

**Table 2: Option Characteristics**

| | **Reston** | **S&P 500** |
|---|---|---|
| Stock price | $50.00 | $1,400.00 |
| Strike price | $50.00 | $1,400.00 |
| Interest rate | 6.00% | 6.00% |
| Dividend yield | 0.00% | 0.00% |
| Time to expiration (years) | 0.5 | 0.5 |

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| | | |
|---|---|---|
| Volatility | 40.00% | 17.00% |
| Beta Coefficient | 1.23 | 1 |
| Correlation | 0.4 | |

Potter presents Fairfax with the prices of various options as shown in Table 3. Table 3 details standard European calls and put options. Potter presents the option sensitivities in Potter presents Fairfax with the prices of various options as shown in Table 4 and Potter presents Fairfax with the prices of various options as shown in Table 5.

**Table 3: Regular and Options (Option Values)**

| | **Reston** | **S&P 500** |
|---|---|---|
| European call | $6.31 | $6.31 |
| European put | $4.83 | $4.83 |
| American call | $6.28 | $6.28 |
| American put | $4.96 | $4.96 |

**Table 4: Reston Stock Option Sensitivities**

| | **Delta** |
|---|---|
| European call | 0.5977 |
| European put | −0.4023 |
| American call | 0.5973 |
| American put | −0.4258 |

**Table 5: S&P 500 Option Sensitivities**

| | **Delta** |
|---|---|
| European call | 0.622 |
| European put | −0.378 |
| American call | 0.621 |
| American put | −0.441 |

## Question #66 - 71 of 109

Question ID: 1210611

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Given the information regarding the various Reston stock options, which option will increase the *most* relative to an increase in the underlying Reston stock price?

**A)** European call.

**B)** American call.

**C)** American put.

**Explanation**

Using its delta in Potter presents Fairfax with the prices of various options as shown in Table 4, if the Reston stock increases by a dollar the European call on the stock will increase by 0.5977.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

## Question #67 - 71 of 109

Question ID: 1210612

Fairfax is very interested in the total return swap and asks Potter how much it would cost to enter into this transaction. Which of the following is the cost of the swap at inception?

**A)** $0.

**B)** $45,007.

**C)** $340,885.

**Explanation**

Swaps are always priced so that their value at inception is zero.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

## Question #68 - 71 of 109

Question ID: 1210613

Fairfax would like to consider neutralizing his Reston equity position from changes in the stock price of Reston. Using the information in Table 4 how many standard Reston European options would have to be either bought or sold in order to create a delta neutral portfolio?

**A)** Buy 300,703 put options.

**B)** Sell 334,616 put options.

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**C)** Sell 334,616 call options.

**Explanation**

Number of call options = (Reston Portfolio Value / Stock PriceReston)(1 / Deltacall).

Number of call options = ($10,000,000 / $50.00/sh)(1 / 0.5977) = 334,616.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

## Question #69 - 71 of 109

Question ID: 1210614

Fairfax remembers Potter explaining something about how options are not like futures and swaps because their risk-return profiles are non-linear. Which of the following option sensitivity measures does Fairfax need to consider to completely hedge his equity position in Reston from changes in the price of Reston stock?

**A)** Delta and Gamma.

**B)** Delta and Vega.

**C)** Gamma and Theta.

**Explanation**

Vega measures the sensitivity relative to changes in volatility. Theta measures sensitivity relative to changes in time to expiration.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

## Question #70 - 71 of 109

Question ID: 1210615

Fairfax has heard people talking about "making a portfolio delta neutral." What does it mean to make a portfolio delta neutral? The portfolio:

**A)** is insensitive to stock price changes.

**B)** is insensitive to volatility changes in the returns on the underlying equity.

**C)** is insensitive to interest rate changes.

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**Explanation**

The delta of the option portfolio is the change in value of the portfolio if the stock price changes. A delta neutral option portfolio has a delta of zero.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

## Question #71 - 71 of 109

Question ID: 1210616

After discussing the various equity swap options with Fairfax, Potter checks his e-mail and reads a message from Clark Ali, a client of Potter and the treasurer of a firm that issued floating rate debt denominated in euros at London Interbank Offered Rate (LIBOR) + 125 basis points. Now Ali is concerned that LIBOR will rise in the future and wants to convert this into synthetic fixed rate debt. Potter recommends that Ali:

**A)** take a short position in Eurodollar futures.

**B)** enter into a pay-fixed swap.

**C)** enter into a receive-fixed swap.

**Explanation**

The floating-rate debt will be effectively converted into fixed rate debt if he entered into a pay-fixed swap. A short position in Eurodollar futures would create a hedge, but in the wrong currency.

(Study Session 14, Module 38.7, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

Jacob Bower is a bond strategist who would like to begin using fixed-income derivatives in his strategies. Bower has a firm understanding of the properties fixed-income securities. However, his understanding of interest rate derivatives is not nearly as strong. He decides to train himself on the valuation and sensitivity of interest rate derivatives using various interest rate scenarios. He considers the forward London Interbank Offered Rate (LIBOR) interest rate environment shown in Table 1. Using a rounded daycount (i.e., 0.25 years for each quarter) he has also computed the corresponding implied spot rates resulting from these LIBOR forward rates. These are included in Table 1.

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**Table 1 90-Day LIBOR Forward Rates and Implied Spot Rates**

| Period (in months) | LIBOR Forward Rates | Implied Spot Rates |
|---|---|---|
| 0 × 3 | 5.500% | 5.5000% |
| 3 × 6 | 5.750% | 5.6250% |
| 6 × 9 | 6.000% | 5.7499% |
| 9 × 12 | 6.250% | 5.8749% |
| 12 × 15 | 7.000% | 6.0997% |
| 15 × 18 | 7.000% | 6.2496% |

Bower has also estimated the LIBOR forward rate volatilities to be 20%. The particular fixed instruments that Bower would like to examine are shown in Table 2. He also wants to analyze the strategy shown in Table 3.

**Table 2 Interest Rate Instruments**

| | |
|---|---|
| Dollar Amount of Floating Rate Bond | $42,000,000 |
| Floating Rate Bond paying LIBOR + | 0.25% |
| Time to Maturity (years) | 8 |
| Cap Strike Rate | 7.00% |
| Floor Strike Rate | 6.00% |
| Interest Payments | quarterly |

**Table 3 Initial Position in 90-day LIBOR Eurodollar Contracts**

| Contract Month (from now) | Strategy A (contracts) | Strategy B (contracts) |
|---|---|---|
| 3 months | 300 | 100 |
| 6 months | 0 | 100 |
| 9 months | 0 | 100 |

## Question #72 - 75 of 109

Question ID: 1210564

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Bower is a bit puzzled about how to use caps and floors. He wonders how he could benefit both from increasing and decreasing interest rates. Which of the following trades would *most likely* profit from this interest rate scenario?

**A)** Buy at the money cap and at the money floor.

**B)** Buy at the money cap and sell at the money floor.

**C)** Sell at the money cap and at the money floor.

**Explanation**

This is a straddle on interest rates. The cap provides a positive payoff when interest rates rise and the floor provides a positive payoff when interest rates fall.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #73 - 75 of 109

Question ID: 1210565

Bower has studied swaps extensively. However, he is not sure which of the following is the swap fixed rate for a one-year interest rate swap based on 90-day LIBOR with quarterly payments. Using the information in Table 1 and the formula below, what is the *most* appropriate swap fixed rate for this swap?

$$\mathrm{C}=\frac{1-\mathrm{Z}_4}{\mathrm{Z}_1+\mathrm{Z}_2+\mathrm{Z}_3+\mathrm{Z}_4}$$

where

$$\mathrm{Z}_{\mathrm{n}}=\frac{1}{1+\mathrm{R}_{\mathrm{N}}}\ \text{price of n} - \text{zero} - \text{coupon bond per \$ of principal}$$

**A)** 5.75%.

**B)** 6.01%.

**C)** 5.65%.

**Explanation**

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The swap fixed rate is computed as follows:

$$Z_{90-\text{day}} = \frac{1}{1+(0.055\times 90/360)}$$

$$= 0.98644$$

$$Z_{180-\text{day}} = \frac{1}{1+(0.05625\times 180/360)}$$

$$= 0.97264$$

$$Z_{270-\text{day}} = \frac{1}{1+(0.57499\times 270/360)}$$

$$= 0.95866$$

$$Z_{360-\text{day}} = \frac{1}{1+(0.058749\times 360/360)}$$

$$= 0.94451$$

$$\text{The quarterly fixed rate on the swap} = \frac{1-0.94451}{0.98644+0.97264+0.95866+0.94451}$$

$$= 0.05549/3.86225 = 0.01437 = 1.437\%$$

The fixed rate on the swap in annual terms is:

1.437% × 360 / 90 = 5.75%

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #74 - 75 of 109

Question ID: 1210566

Bower computes the implied volatility of a one year caplet on the 90-day LIBOR forward rates to be 18.5%. Using the given information what does this mean for the caplet's market price relative to its theoretical price? The caplet's market price is:

**A)** undervalued.

**B)** overvalued.

**C)** undervalued or overvalued.

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**Explanation**

Volatility and option prices are always positively related. Therefore, since the option implied volatility is lower than the estimated volatility, this implies that the caplet is undervalued relative to its theoretical value.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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## Question #75 - 75 of 109

Question ID: 1210567

For this question only, assume Bower expects the currently positively sloped LIBOR curve to shift upward in a parallel manner. Using a plain vanilla interest rate swap, which of the following will allow Bower to best take advantage of his expectations? Purchase a:

**A)** pay fixed interest rate swap.

**B)** receive fixed interest rate swap.

**C)** floating rate bond and enter into a receive fixed swap.

**Explanation**

Since the interest rates are expected to rise for all maturities, one can benefit from this rise by receiving a floating rate (LIBOR) and borrowing at a fixed rate (i.e. a pay fixed swap).

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #76 of 109

Question ID: 1210529

Combining a short position in a stock with a long position in a call option on the stock will produce a payoff pattern equivalent to a:

**A)** long position in a put option on the stock.

**B)** risk-free security.

**C)** short position in a put option on the stock.

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**Explanation**

The combined payoff pattern of a short position in a stock and a long call option on the stock is the same as the payoff pattern of a long put option on the stock.

(Study Session 14, Module 38.2, LOS 38.c)

**Related Material**

SchweserNotes - Book 4

## Question #77 of 109

Question ID: 1210528

A stock is priced at 40 and the periodic risk-free rate of interest is 8%. The value of a two-period European call option with a strike price of 37 on a share of stock using a binomial model with an up factor of 1.20 and down factor of 0833 is *closest* to:

**A)** $9.25.

**B)** $3.57.

**C)** $9.13.

**Explanation**

First, calculate the probability of an up move or a down move:

$P_u$ = (1 + 0.08 − 0.833) / (1.20 − 0.833) = 0.673

$P_d$ = 1 − 0.673 = 0.327

Two up moves produce a stock price of 40 × 1.44 = 57.60 and a call value at the end of two periods of 20.60. An up and a down move leave the stock price unchanged at 40 and produce a call value of 3. Two down moves result in the option being out of the money. The value of the call option is discounted back one year and then discounted back again to today. The calculations are as follows:

$C^+$ = [20.6(0.673) + 3(0.327)] / 1.08 = 13.745

$C^-$ = [3(0.673) + 0 (0.327)] / 1.08 = 1.869

Call value today = [13.745(0.673) + 1.869(0.327)] / 1.08 = 9.13

(Study Session 14, Module 38.2, LOS 38.b)

**Related Material**

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## Question #78 of 109

Question ID: 1210581

The delta of an option is equal to the:

**A)** percentage change in option price divided by the percentage change in the asset price.

**B)** dollar change in the option price divided by the dollar change in the stock price.

**C)** dollar change in the stock price divided by the dollar change in the option price.

**Explanation**

The delta of an option is the dollar change in option price per $1 change in the price of the underlying asset.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

## Question #79 of 109

Question ID: 1210533

An instantaneously riskless hedged portfolio has a delta of:

**A)** anything; gamma determines the instantaneous risk of a hedge portfolio.

**B)** 1

**C)** 0.

**Explanation**

A riskless portfolio is delta neutral; the delta is zero.

(Study Session 14, Module 38.4, LOS 38.l)

**Related Material**

SchweserNotes - Book 4

## Question #80 of 109

Question ID: 1210547

A bond analyst decides to use the BSM model to price options on bond prices. This model will *most likely* be inadequate because:

**A)** BSM cannot be modified to deal with cash flows like coupon payments.

**B)** the price of the underlying asset follows a lognormal distribution.

**C)** the risk free rate must be constant and known.

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**Explanation**

The BSM model is not useful for pricing options on bond prices and interest rates. In those cases, interest rate volatility is a key factor in determining the value of the option. BSM can be modified to deal with cash flows like coupon payments. The assumption that "the price of the underlying asset follows a lognormal distribution" is not applicable.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

SchweserNotes - Book 4

## Question #81 of 109

Question ID: 1210582

How is the gamma of an option defined? Gamma is the change in the:

**A)** vega as the option price changes.

**B)** option price as the underlying security changes.

**C)** delta as the price of the underlying security changes.

**Explanation**

Gamma is the rate of change in delta. It measures how fast the price sensitivity changes as the underlying asset price changes.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

## Question #82 of 109

Question ID: 1210531

Zetion Inc stock (current price $28) has 1-year call options with an exercise price of $30 trading at $2.07. The stock can increase by 15% or decrease by 13% over the next year and the risk-free rate is 3%. Arbitrage profits are *most likely*:

**A)** possible by purchasing 28 shares and writing 100 calls.

**B)** not possible.

**C)** possible by purchasing 100 calls and short selling 28 shares.

**Explanation**

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$S^+ = 28(1.15) = 32.20$; $S^- = 28(0.87) = 24.36$. $C^+ = 32.20 – 30 = 2.20$, $C^- = 0$.

H = (2.20 – 0) / (32.20 – 24.36) = 0.281

$$C_0 = hS_0 + \frac{(-hS^+ + C^+)}{(1+R_f)}$$

= 0.281 x 28 + [ (- 0.281 x 32.20 + 2.20) / 1.03] = 1.22

Since the call price of \$2.07 > 1.22, an arbitrage profit can be earned by writing calls and purchasing 0.281 shares per call written.

(Study Session 14, Module 38.4, LOS 38.c)

**Related Material**

SchweserNotes - Book 4

## Question #83 of 109

Question ID: 1210625

If we use four of the inputs into the Black-Scholes-Merton option-pricing model and solve for the asset price volatility that will make the model price equal to the market price of the option, we have found the:

**A)** option volatility. ✗

**B)** implied volatility. ✓

**C)** historical volatility. ✗

**Explanation**

The question describes the process for finding the expected volatility implied by the market price of the option.

(Study Session 14, Module 38.7, LOS 38.n)

**Related Material**

SchweserNotes - Book 4

## Question #84 of 109

Question ID: 1210628

In order to compute the implied asset price volatility for a particular option, an investor:

**A)** must have a series of asset prices. ✗

**B)** must have the market price of the option. ✓

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**C)** does not need to know the risk-free rate.

**Explanation**

In order to compute the implied volatility we need the risk-free rate, the current asset price, the time to expiration, the exercise price, and the market price of the option.

(Study Session 14, Module 38.7, LOS 38.n)

**Related Material**

SchweserNotes - Book 4

## Question #85 of 109

Question ID: 1210624

When an option's gamma is higher:

**A)** a delta hedge will be more effective.

**B)** a delta hedge will perform more poorly over time.

**C)** delta will be higher.

**Explanation**

Gamma measures the *rate of change* of delta (a high gamma could mean that delta will be higher or lower) as the asset price changes and, graphically, is the curvature of the option price as a function of the stock price. Delta measures the slope of the function at a point. The greater gamma is (the more delta changes as the asset price changes), the worse a delta hedge will perform over time.

(Study Session 14, Module 38.7, LOS 38.m)

**Related Material**

SchweserNotes - Book 4

## Question #86 of 109

Question ID: 1210584

The value of a put option will be higher if, all else equal, the:

**A)** underlying asset has less volatility.

**B)** underlying asset has positive cash flows.

**C)** exercise price is lower.

**Explanation**

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Positive cash flows in the form of dividends will lower the price of the stock making it closer to being "in the money" which increases the value of the option as the stock price gets closer to the strike price.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

## Question #87 of 109

Question ID: 1210549

Bob Dilla, CFA makes the following statement about call options:

" Call options on stock can be thought of as leveraged stock investment where $N(d_1)$ units of stock is purchased using $e^{-rT}XN(-d_2)$ of borrowed funds.

Dilla is *most likely*:

**A)** correct.

**B)** incorrect about use of $e^{-rT}XN(-d_2)$ borrowed funds.

**C)** incorrect about $N(d_1)$ units of stock.

**Explanation**

Dilla is correct about calls being similar to a leveraged investment in $N(d_1)$ units of stock but is incorrect about the quantity of borrowed funds. It should be $e^{-rT}XN(d_2)$.

(Study Session 14, Module 38.6, LOS 38.g)

**Related Material**

SchweserNotes - Book 4

## Question #88 of 109

Question ID: 1210546

Which of the following is *least likely* one of the assumptions of the Black-Scholes-Merton option pricing model?

**A)** There are no cash flows on the underlying asset.

**B)** The risk-free rate of interest is known and does not change over the term of the option.

**C)** Changes in volatility are known and predictable.

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**Explanation**

The BSM model assumes that volatility is known and *constant*. The term predictable would allow for non-constant changes in volatility.

(Study Session 14, Module 38.6, LOS 38.f)

**Related Material**

SchweserNotes - Book 4

## Question #89 of 109

Question ID: 1210569

Which of the following *best* represents an interest floor?

**A)** A portfolio of put options on an interest rate. ✓

**B)** A put option on an interest rate. ✗

**C)** A portfolio of call options on an interest rate. ✗

**Explanation**

A long floor (floor buyer) has the same general expiration-date payoff diagram as that for long interest rate put position.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #90 of 109

Question ID: 1210562

A cap on a floating rate note, from the bondholder's perspective, is equivalent to:

**A)** writing a series of puts on fixed income securities. ✓

**B)** writing a series of interest rate puts. ✗

**C)** owning a series of calls on fixed income securities. ✗

**Explanation**

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For a bondholder, a cap, which puts a maximum on floating rate interest payments, is equivalent to writing a series of puts on fixed income securities. These would require the buyer to pay when rates rise and bond prices fall, negating interest rate increases above the cap rate. Writing a series of interest rate calls, not puts, would be an equivalent strategy. Calls on fixed income securities would pay when rates decrease, not when they increase.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #91 of 109

Question ID: 1210552

Which of the following statements is *most* accurate?

**A)** American options on forwards are more valuable than comparable European options on forwards.

**B)** American options on futures are more valuable than comparable European options on futures.

**C)** European options on futures are more valuable than comparable American options on futures.

**Explanation**

Because of the mark-to-market feature of futures contracts, American options on futures are more valuable than comparable European options. The value of American and European options on forwards are the same.

(Study Session 14, Module 38.6, LOS 38.i)

**Related Material**

SchweserNotes - Book 4

Ronald Franklin, CFA, has recently been promoted to junior portfolio manager for a large equity portfolio at Davidson-Sherman (DS), a large multinational investment-banking firm. He is specifically responsible for the development of a new investment strategy that DS wants all equity portfolio managers to implement. Upper management at DS has instructed its portfolio managers to begin overlaying option strategies on all equity portfolios. The relatively poor performance of many of their equity portfolios has been the main factor behind this decision. Prior to this new mandate, DS portfolio managers had been allowed to use options at their own discretion, and the results were somewhat inconsistent. Some portfolio managers were not comfortable with the most basic concepts of option valuation

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and their expected return profiles, and simply did not utilize options at all. Upper management of DS wants Franklin to develop an option strategy that would be applicable to all DS portfolios regardless of their underlying investment composition. Management views this new implementation of option strategies as an opportunity to either add value or reduce the risk of the portfolio.

Franklin gained experience with basic options strategies at his previous job. As an exercise, he decides to review the fundamentals of option valuation using a simple example. Franklin recognizes that the behavior of an option's value is dependent on many variables and decides to spend some time closely analyzing this behavior. His analysis has resulted in the information shown in Exhibit 1 and Exhibit 2 for European style options.

**Exhibit 1: Input for European Options**

**Exhibit 1: Input for European Options**

| | |
|---|---|
| Stock Price (S) | 100 |
| Strike Price (X) | 100 |
| Interest Rate (r) | 0.07 |
| Dividend Yield (q) | 0.00 |
| Time to Maturity (years) (t) | 1.00 |
| Volatility (Std. Dev.)(Sigma) | 0.20 |
| Black-Scholes Put Option Value | $4.7809 |

**Exhibit 2: European Option Sensitivities**

**Exhibit 2: European Option Sensitivities**

| Sensitivity | Call | Put |
|---|---|---|
| Delta | 0.6736 | -0.3264 |
| Gamma | 0.0180 | 0.0180 |
| Theta | -3.9797 | 2.5470 |
| Vega | 36.0527 | 36.0527 |
| Rho | 55.8230 | -37.4164 |

## Question #92 - 97 of 109

Question ID: 1210514

Using the information in Exhibit 1, Franklin wants to compute the value of the corresponding European call option. Which of the following is the *closest* to Franklin's answer?

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**A)** \$5.55.

**B)** \$4.78.

**C)** \$11.54.

**Explanation**

This result can be obtained using put-call parity in the following way:

$$\text{Call Value} = \text{Put Value} - Xe^{-rt} + S = \$4.78 - \$100.00e^{(-0.07 \times 1.0)} + 100 = \$11.54$$

The incorrect value of \$4.78 does not discount the strike price in the put-call parity formula.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

SchweserNotes - Book 4

## Question #93 - 97 of 109

Question ID: 1210515

Franklin is interested in the sensitivity of the European call option to changes in the volatility of the underlying equity's returns. What happens to the value of the call option if the volatility of the underlying equity's returns *decreases*? The call option value:

**A)** increases.

**B)** increases or decreases.

**C)** decreases.

**Explanation**

Due to the limited potential downside loss, changes in volatility directly effect option value. Vega measures the option's sensitivity relative to volatility changes.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #94 - 97 of 109

Question ID: 1210516

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Franklin is interested in the sensitivity of the European put option to changes in the volatility of the underlying equity's returns. What happens to the value of the put option if the volatility of the underlying equity's returns *increases*? The put option value:

**A)** increases.

**B)** increases or decreases.

**C)** decreases.

**Explanation**

Due to the limited potential downside loss, changes in volatility directly effect option value. Vega measures the option price sensitivity relative to the volatility of the underlying stock.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

SchweserNotes - Book 4

## Question #95 - 97 of 109

Question ID: 1210517

Franklin wants to know how the put option in Exhibit 1 behaves when all the parameters are held constant except the delta. Which of the following is the *best* estimate of the change in the put option's price when the underlying equity increases by $1?

**A)** −$0.33.

**B)** −$3.61.

**C)** −$0.37.

**Explanation**

The correct value is simply the delta of the put option in Exhibit 2.

The incorrect value −$3.61 represents the change due to the volatility divided by 10 multiplied by −1.

The incorrect value −$0.37 calculates the change by dividing the short-term interest rate divided by 100.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #96 - 97 of 109

Question ID: 1210518

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Franklin computes the rate of change in the European put option delta value, given a $1 increase in the underlying equity. Using the information in Exhibit 1 and Exhibit 2, which of the following is the *closest* to Franklin's answer?

**A)** 0.6736.

**B)** −0.3264.

**C)** 0.0180.

**Explanation**

The correct value 0.0180 is referred to as the put option's Gamma.

The incorrect value −0.3264 is the delta of the put option.

The incorrect value 0.6736 is the call option's delta.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

SchweserNotes - Book 4

## Question #97 - 97 of 109

Question ID: 1210519

Franklin wants to know if the option sensitivities shown in Exhibit 2 have minimum or maximum bounds. Which of the following are the minimum and maximum bounds, respectively, for the put option delta?

**A)** There are no minimum or maximum bounds.

**B)** −1 and 1.

**C)** −1 and 0.

**Explanation**

The lower bound is achieved when the put option is far in the money so that it moves exactly in the opposite direction as the stock price. When the put option is far out of the money, the option delta is zero. Thus, the option price does not move even if the stock price moves since there is almost no chance that the option is going to be worth something at expiration.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

SchweserNotes - Book 4

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## Question #98 of 109

Question ID: 1210578

Which of the following option sensitivities measures the change in the price of the option with respect to a decrease in the time to expiration?

**A)** Theta.

**B)** Delta.

**C)** Gamma.

**Explanation**

Theta describes the change in option price in response to the passage of time. Since option holders would prefer that value not decay too quickly, an option with a low theta value is desirable.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

SchweserNotes - Book 4

## Question #99 of 109

Question ID: 1210587

Compared to the delta of a long position in a stock, the delta of an at-the-money call option on the stock is *most likely* to be:

**A)** less.

**B)** greater.

**C)** the same.

**Explanation**

The delta of an at-the-money call option is typically close to 0.5. The delta of a long position in the underlying stock is 1.0 by definition.

(Study Session 14, Module 38.7, LOS 38.k)

**Related Material**

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## Question #100 of 109

Question ID: 1210553

Regarding options on a stock without dividends, it is:

**A)** sometimes worthwhile to exercise calls early but not puts.

**B)** never worthwhile to exercise puts or calls early.

**C)** sometimes worthwhile to exercise puts early but not calls.

**Explanation**

After early exercise of a put, and in particular a deep in-the-money put, the sale proceeds can be invested at the risk-free rate and may earn interest worth more than the time value of the put option. The same is not true for call options: early exercise of call options on non-dividend-paying stock is never optimal.

(Study Session 14, Module 38.6, LOS 38.i)

**Related Material**

SchweserNotes - Book 4

## Question #101 of 109

Question ID: 1210558

Mark Roberts anticipates utilizing a floating rate line of credit in 90 days to purchase $10 million of raw materials. To get protection against any increase in the expected London Interbank Offered Rate (LIBOR) yield curve, Roberts should:

**A)** buy a receiver swaption.

**B)** write a receiver swaption.

**C)** buy a payer swaption.

**Explanation**

A payer swaption will give Roberts the right to pay a fixed rate below market if rates rise.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

SchweserNotes - Book 4

## Question #102 of 109

Question ID: 1210536

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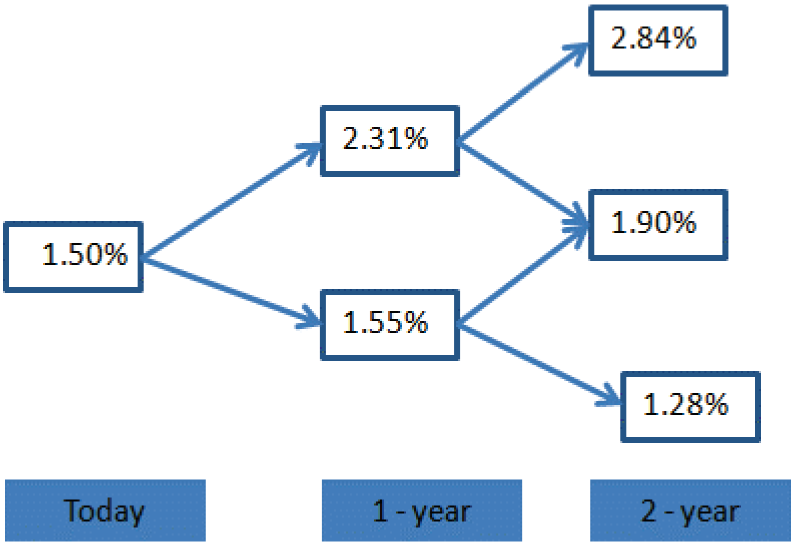
Given the following interest rate tree:




The value of a 2-period European put option with strike rate of 2% and notional principal of $1 million is *closest* to:

**A)** $2,230

**B)** $2,020

**C)** $3,109

**Explanation**

Given the exercise rate of 2.00%, the put option has a positive payoff for nodes $P^{--}$ and $P^{-+}$.

The payoff at node $P^{--}$ can be calculated as:

[Max (0, 0.02 – 0.0128)] × $ 1,000,000 = $7,200.

The payoff at node $P^{-+}$ can be calculated as:

[Max (0, 0.02 – 0.019)] × $ 1,000,000 = $ 1,000.

Value at node $C^-$ = [(0.5 × 7,200) + (0.5 × 1,000)] / (1.0155) = $4,037

Value at node $C^+$ = [(0.5 × 0) + (0.5 × 1,000)] / (1.0231) = $489

And the value at node C = [(0.5 × 4,037) + (0.5 × 489)] / (1.015) = $2,230.

(Study Session 14, Module 38.5, LOS 38.d)

**Related Material**

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## Question #103 of 109

Question ID: 1210560

A floor on a floating rate note, from the bondholder's perspective, is equivalent to:

**A)** writing a series of interest rate puts.

**B)** owning a series of puts on fixed income securities.

**C)** owning a series of calls on fixed income securities.

**Explanation**

A floor, which puts a minimum on floating rate interest payments is equivalent to owning calls on fixed income securities which will pay when interest rates fall. Owning interest rate puts, rather than writing them, would be equivalent to the floor. Puts on fixed income securities pay when interest rates increase.

(Study Session 14, Module 38.6, LOS 38.j)

**Related Material**

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Rachel Barlow is a recent graduate of Columbia University with a Bachelor's degree in finance. She has accepted a position at a large investment bank, but first must complete an intensive training program to gain experience in several of the investment bank's areas of operations. Currently, she is spending three months at her firm's Derivatives Trading desk. One of the traders, Jason Coleman, CFA, is acting as her mentor, and will be giving her various assignments over the three month period.

One of the first projects Coleman asks Barlow to do is to compare different option trading strategies. Coleman would like Barlow to pay particular attention to strategy costs and their potential payoffs. Barlow is not very comfortable with option models, and knows she needs to be able to fully understand the most basic concepts in order to move on. She decides that she must first investigate how to properly price European and American style equity options. Coleman has given Barlow software that provides a variety of analytical information using three valuation approaches: the Black-Scholes model, the Binomial model, and Monte Carlo simulation. Barlow has decided to begin her analysis using a variety of different scenarios to evaluate option behavior. The data she will be using in her scenarios is provided in Exhibits 1 and 2. Note that all of the rates and yields are on a continuous compounding basis.

**Exhibit 1**

| | |
|---|---|
| Stock Price (S) | $100.00 |
| Strike Price (X) | $100.00 |
| Interest Rate (r) | 7.0% |

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| | |
|---|---|
| Dividend Yield (q) | 0.0% |
| Time to Maturity (years) | 0.5 |
| Volatility (Std. Dev.) | 20.0% |
| Value of Put | $3.9890 |

**Exhibit 2**

| | |
|---|---|
| Stock Price (S) | $110.00 |
| Strike Price (X) | $100.00 |
| Interest Rate (r) | 7.0% |
| Dividend Yield (q) | 0.0% |
| Time to Maturity (years) | 0.5 |
| Volatility (Std. Dev.) | 20.0% |
| Value of Call | $14.8445 |
| $N(d_1)$ | 0.8394 |
| $N(d_2)$ | 0.8025 |

**Exhibit 3**

| | |
|---|---|
| Stock Price (S) | $115.00 |
| Strike Price (X) | $100.00 |
| Interest Rate (r) | 7.0% |
| Dividend Yield (q) | 0.0% |
| Time to Maturity (years) | 0.5 |
| Volatility (Std. Dev.) | 20.0% |
| Value of Call | $19.2147 |
| Value of Put | $0.7753 |

## Question #104 - 109 of 109

Question ID: 1210521

Barlow notices that the stock in Exhibit 1 does not pay dividends. If the stock begins to pay a dividend, how will the price of a call option on that stock be affected? The price of the call option:

**A)** may either increase or decrease.

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**B)** will increase.

**C)** will decrease.

**Explanation**

The call option value will decrease since the payment of dividends reduces the value of the underlying, and the value of a call is positively related to the value of the underlying.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #105 - 109 of 109

Question ID: 1210522

Barlow calculated the value of an American call option on the stock shown in Exhibit 2. Which of the following is *closest* to the value of this call option?

**A)** \$15.41.

**B)** \$14.84.

**C)** \$15.12.

**Explanation**

The value of the American-style call option is the same as the value of the equivalent European-style call option. Since the underlying stock does not pay a dividend, it is never optimal to exercise the American option early. Hence the early-exercise option iembedded in the American-style call has no value in this case. This makes the American option worth exactly the same as the European option.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #106 - 109 of 109

Question ID: 1210523

Using the information in Exhibit 2, Barlow computes the value of a European put option. Which of the following is *closest* to the value of this option?

**A)** \$4.84.

**B)** \$1.41.

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**C)** $1.97.

**Explanation**

Using the information in Exhibit 2, this value can be determined from put-call parity as follows:

$$\text{Put} = \text{Call} + Xe^{-rt} - S$$

So we have Put = $14.8445 + $100.00$e^{(-7.00\% \times 0.5)}$ – $110.00 = $1.4050

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #107 - 109 of 109

Question ID: 1210524

Barlow notices that the stock in Exhibit 2 does not pay dividends. If the stock starts to pay a dividend, how will the price of a put option on that stock be affected?

**A)** Increase or decrease.

**B)** Increase.

**C)** Decrease.

**Explanation**

The put option value will increase since the payment of dividends reduces the value of the underlying, and the value of a put is negatively related to the value of the underlying.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #108 - 109 of 109

Question ID: 1210525

If the price of the underlying stock increases from the $110.00 price showing in Exhibit 2 to $115.00, the approximate price change as predicted by delta using the data from Exhibit 2 is:

**A)** more than the actual $19.2147 value of the call because of gamma.

**B)** less than the actual $19.2147 value of the call because of gamma.

**C)** is precisely the actual $19.2147 value of the call because of gamma.

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**Explanation**

The approximate change in value using delta for \$1.00 of change is $N(d_1)$ = 0.8394. For an increase of \$5.00 in the stock, the approximate value is: 5 × 0.8394 = \$4.1972. Add this to the value of the call of \$14.8445 gives = \$19.0416. This value is less than the actual value of \$19.2147 shown in Exhibit 3. The change in delta, (gamma, effects) have increased the value of the call greater than the estimated change.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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## Question #109 - 109 of 109

Question ID: 1210526

If the market price of all calls and puts are greater than the predicated option prices, the implied volatility is:

**A)** less than the current standard deviation of 20.0%. ✗

**B)** greater than the current standard deviation of 20.0%. ✓

**C)** calculated from historical volatility. ✗

**Explanation**

Both calls and puts have higher values when expected volatility is higher. Vega, the change in option price relative to change in volatility, is positive for both calls and puts. As standard deviation increases, call and put prices increase. If the market values both calls and puts higher than our calculated values, the market-implied volatility must be higher than the values we are using in our calculations. Historical standard deviation as estimated may be higher or lower than the implied volatility.

(Study Session 14, Module 38.1, LOS 38.a)

**Related Material**

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