Schweser Printable Answers - Session Asset Valuation: Derivative Investments: Options, Swaps, Interet Rate Derivatives, and Other Embedded Derivatives

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Question 1 - #10465

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 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 Exhibits 1 and 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

Part 1)
What does it mean to make an options portfolio delta neutral? The option portfolio:

A) moves exactly in line with the stock price.

B) is insensitive to volatility changes in the returns on the stock.

C) moves exactly in the opposite direction with the stock price.

D) is insensitive to price changes in the underlying security.

Your answer: A was incorrect. The correct answer was D) is insensitive to price changes in the underlying security.

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.

Part 2)
Which of the following most accurately describes the sensitivity of the call option value to changes the underlying asset's volatility? The sensitivity to changes in the volatility of the underlying is the greatest when the call option is:

A) in the money.

B) out of the money.

C) it depends on the other inputs.

D) at the money.

Your answer: A was incorrect. The correct answer was D) at the money.

When the option is at the money it is most sensitive to changes in the underlying stock's price volatility.

Part 3)
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) far in the money.

C) far out of the money.

D) the option's delta has no minimum bound.

Your answer: A was incorrect. The correct answer was C) far out of the money.

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.

Part 4)
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 or put options.

C) Put options.

D) Call and put options.

Your answer: A was incorrect. The correct answer was C) Put options.

Buying 10,000 put options will allow Franklin to completely hedge the stock price risk.

Part 5)
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) 67.36.

B) -67.36.

C) -32.64.

D) 32.64.

Your answer: A was incorrect. The correct answer was D) 32.64.

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.

Part 6)
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) -67.36.
B) -32.64.
C) 32.64.
D) 67.36.

Your answer: A was incorrect. The correct answer was A) -67.36.

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.

Question 2 - #10494

June Klein, CFA, is an options sensitivity and hedging specialist. She currently manages a $100 million (market value) U.S. government bond portfolio for a large institution. Klein anticipates that a 10 basis point parallel shift will occur in U.S. Treasury yield curve in the next several months and wants to fully hedge the portfolio against any such change. After evaluatiing several strategies, she decides to utilize the T-bond futures contract to implement the hedge. She tabulates some essential information about her portfolio and the corresponding futures contract. The results are shown in Table 1.

Table 1: Portfolio and Treasury Bond Futures Contract Characteristics

Value of Portfolio:	$100,000,000
Modified Duration of Portfolio (in years):	8.88438
Mar -05 Futures:	94.15625
Settlement Date:	02/17/05
Final Delivery Date:	03/31/05
First Delivery Date:	03/01/05

Although she is experienced in using options to hedge a portfolio, Klein is not as comfortable with the mechanics of the T-bond futures contract as she would like to be. Consequently, she decides to familiarize herself with the characteristics of the futures contract and its associated delivery process. She proceeds to collect data on all of the deliverable bonds for the futures contract.

Klein's broker supplies the characteristics of the Treasury bond that is currently the cheapest-to-deliver bond, as shown in Table 2.

Table 2: Cheapest-to-Deliver Treasury Bond

Coupon	*Maturity or first call date*	*Price (flat)*	*Accrued interest*	*YTM/YTC*	*PVBP Per $100 par*	*Modified duration in years*	*Conversion factor*	*Cost of delivery*
13.250%	11/15/22	135.4375	3.4217	9.166%	0.111	7.99429	1.4899	-4.8502

As she is going through the calculations necessary to carry out a hedge, Klein also considers a hypothetical Treasury bond that is deliverable on the futures contract. This bond is shown in Table 3.

Table 3: Hypothetical Example of a Deliverable Bond

Coupon	13.50%
Maturity Date	11/15/22
Price	135.4375
Accrued Interest	3.48626
YTM	9.3627%

PVBP per $100 par	0.110
Modified Duration	7.89667
Conversion Factor	1.513277
Cost of Delivery	-7.046975

Use the information in these three tables to answer the first three questions.

Part 1)
Klein considers a new portfolio composed of only the bond in Table 3. She reconsiders the question of whether the hedge position has to be adjusted continually in order to be fully hedged against her interest rate expectations. With this new portfolio which of the following *best* addresses this concern?

A) It will have to be rebalanced only if another T-bond becomes the cheapest to deliver.
B) No updating necessary, it is a static hedge.
C) Continuous updating required as interest rates change.
D) Cannot be determined at this time since it depends on the specific circumstances.

Your answer: A was incorrect. The correct answer was A)

It will have to be rebalanced only if another T-bond becomes the cheapest to deliver.

It will have to be rebalanced only if another T-bond becomes the cheapest to deliver.

Part 2)
Klein now considers the use of options on futures instead of futures contracts to hedge her portfolio. She wonders about the specific characteristics of the calls and puts necessary to implement the hedging strategy. Which of the following *most accurately*
describes the appropriate options on futures necessary for her hedging strategy?

A) Calls and puts with the same exercise price and different expiration dates.
B) The calls should have a higher exercise price than the puts.
C) Calls and puts with the same exercise price and the same expiration date.
D) The puts should have a higher exercise price than the calls.

Your answer: A was incorrect. The correct answer was C)

Calls and puts with the same exercise price and the same expiration date.

Buying puts and calls with the same exercise price and expiration date is equivalent to shorting (selling) futures contracts.

Part 3)
Klein also considers using options to hedge her portfolio against interest rate risk. Which of the following could also be a zero duration hedging strategy using her bond portfolio and options on U.S. Treasury bond futures contracts?

A) Sell put options and buy call options.
B) Sell call options and buy put options.
C) Buy call and put options.
D) Sell call and put options.

Your answer: A was incorrect. The correct answer was B)

Sell call options and buy put options.

This synthetically replicates the futures position if the correct strike and expiration are used. The short call position would create a negative cash flow if rates were to decline but the long put position would create a positive cash flow if rates were to increase. This fully hedges the portfolio.

Part 4)

After Klein deals with the government bond portfolio, she has to leave for an evening appointment. She packs her briefcase and heads off to the Metro. During the ride, she values a put option using the binomial model, reviews the Merton model in relation to futures options, and reads about the effect of dividends on option prices.

The European put option has the following inputs:

Stock price = $100
Exercise price = $110
Interest rate = 5%
Volatility = 25%
Dividend yield = 0%
Time until expiration = one year
Size of the up move = 1.284

Using a one-period binomial model, the put option value is *closest* to:

A) $8.42.
B) $9.44.
C) $11.33.
D) $14.07.

Your answer: A was incorrect. The correct answer was D)

$14.07.

The binomial stock price tree is as follows:

	128.40
100.00	
	77.88

$U = e^{0.25\sqrt{1}} = 1.2840$
$D = 1/U = 1/1.284 = 0.7788$

Therefore the upper price is found by 100 x 1.284 = 128.4.
The lower price is 100 x 0.7788 = 77.88.

The Option price tree is as follows:

	0.00
14.07	
	32.12

Since the exercise price is $110, the upper price of $128.40 is out of the money and the option is worth $0 in the upper state and worth $110 – 77.88 = $32.12 in the lower state.

The option price at the current time is computed as follows:

$c = (Prob_{up} * Node_{up} + (1 - Prob_{up}) * Node_{down}) * e^{-rate * time\ step}$, where $Prob_U = (R-D)/(U-D)$

$R = e^{r\Delta t} = e^{0.05 * 1} = 1.0513$

$Prob_U = (1.0513 - 0.7788)/(1.2840 - 0.7788) = 0.2725/0.5052 = 0.5394$

$= (0.5394 * \$0.00 + (1 - 0.5394) * \$32.12) * e^{-0.05 * 1} = \$14.07$

Part 5)
Next, Klein needs to evaluate a futures option. How can she adapt the Black-Scholes-Merton (BSM) model to evaluate futures options?

A) Set the dividend yield equal to zero.

B) Use the risk-free rate and the futures price in place of the asset price.

C) Replace the dividend yield with the convenience yield.

D) Adjust the risk-free interest rate for domestic inflation.

Your answer: A was incorrect. The correct answer was B)

Use the risk-free rate and the futures price in place of the asset price.

To adjust the BSM model for pricing futures options use the Black model which replaces the stock price with the futures price, the risk free rate, and the time to maturity.

Part 6)
Which of the following statements about the effect of dividends on option prices is **FALSE**?

A) The assumption of a continuous dividend payment in the Black-Scholes-Merton model is well-suited to pricing many different types of options, including stock indexes, currency values, options on individual stocks, and futures options.

B) If you own the option, you do not earn the dividend.

C) The value of a call option will fall upon the payment of a dividend due to the drop in the underlying stock price.

D) We can adjust for known dividends via the Black-Scholes-Merton model by using the current stock price minus the present value of the expected dividend that will occur during the life of the option.

Your answer: A was incorrect. The correct answer was A)

The assumption of a continuous dividend payment in the Black-Scholes-Merton model is well-suited to pricing many different types of options, including stock indexes, currency values, options on individual stocks, and futures options.

For individual stocks, the assumption of a continuous dividend is a poor assumption, since most stocks pay dividends on a quarterly or semiannual basis. The other statements are true.

Question 3 - #10464

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 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 Exhibits 1 and 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)	0.00
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		
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

Part 1)
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?

A) $11.54.
B) $4.78.
C) $5.55.
D) $12.07.

Your answer: A was incorrect. The correct answer was A) $11.54.

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

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

The incorrect value of $4.78 does not discount the strike price in the put-call parity formula. The value $12.07 results from using the binomial model.

Part 2)
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) decreases.
C) stays the same.
D) increases or decreases.

Your answer: A was incorrect. The correct answer was B) decreases.

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

Part 3)
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) decreases.
B) increases.
C) stays the same.
D) increases or decreases.

Your answer: A was incorrect. The correct answer was B) increases.

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.

Part 4)
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 delta when the underlying equity increases by $1?

A) -$3.61.
B) -$0.37.
C) -$0.33.
D) $0.67.

Your answer: A was incorrect. The correct answer was C) -$0.33.

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.
The incorrect value $0.67 represents the change in the *call* option.

Part 5)
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 Exhibits 1 and 2, which of the following is the *closest* to Franklin's answer?

A) -0.3264.
B) 0.6736.
C) 36.0527.
D) 0.0180.

Your answer: A was incorrect. The correct answer was D) 0.0180.

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.
The incorrect value 36.0527 is the put option's Vega.

Part 6)
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) -1 and 1.
B) -1 and no maximum bound.
C) -1 and 0.
D) There are no minimum or maximum bounds.

Your answer: A was incorrect. The correct answer was C) -1 and 0.

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.

Question 4 - #10440

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 percent 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 percent 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 percent. 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.

Part 1)
Which of the following *best*
explains a delta-neutral portfolio? A delta-neutral portfolio is perfectly hedged against:

A) small price changes in the underlying asset.
B) all price changes in the underlying asset.
C) small price increases in the underlying asset.
D) small price decreases in the underlying asset.

Your answer: A was incorrect. The correct answer was A) small price changes in the underlying asset.

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.

Part 2)
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) level in the option price diagram.
B) curvature of the option price graph.
C) slope in the option price diagram.
D) negative of the level in the option price diagram

Your answer: A was incorrect. The correct answer was C) slope in the option price diagram.

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.

Part 3)
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.
D) +$6.50.

Your answer: A was incorrect. The correct answer was B) +$3.90.

The estimated change in the price of the option is:

Change in asset price * delta = -$6 * (-0.65) = $3.90

Part 4)
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.
D) equal to the exercise price.

Your answer: A was incorrect. The correct answer was A) out-of-the-money.

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.

Part 5)
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) 0.
B) 14,785.
C) 75,000.
D) 70,000.

Your answer: A was incorrect. The correct answer was C) 75,000.

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.

Part 6)
Which of the following statements regarding the goal of a delta-neutral portfolio is **TRUE**? One example of a delta-neutral portfolio is to combine a:

A) 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.
B) 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.
C) long position in a stock with a short position in put options so that the value of the portfolio does not change with changes in the value of the stock.
D) 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.

Your answer: A was incorrect. The correct answer was D) 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.

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.

Question 5 - #10506

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.

Table 1 *90-Day LIBOR Forward Rates and Implied Spot Rates*		
Period (in months)	*LIBOR Forward Rates*	*Implied Spot Rates*
0 x 3	5.500%	5.5000%
3 x 6	5.750%	5.6250%
6 x 9	6.000%	5.7499%
9 x 12	6.250%	5.8749%
12 x 15	7.000%	6.0997%
15 x 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

Part 1)
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 profit the *most* from this interest rate scenario?

A) Sell 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 buy at the money floor.
D) Buy at the money cap and at the money floor.

Your answer: A was incorrect. The correct answer was D) Buy at the money cap and at the money floor.

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.

Part 2)
Bower shorts the floating rate bond given in Table 2. Which of the following will *best* reduce Bower's interest rate risk?

A) Buying an interest rate floor.

B) Shorting Eurodollar futures.

C) Shorting an interest rate cap.

D) Shorting an interest rate floor.

Your answer: A was incorrect. The correct answer was B) Shorting Eurodollar futures.

If he adds a short position in Eurodollar futures to the existing liability in the correct amount, he is able to lock in a specific interest rate.

Part 3)
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 what is the *appropriate* swap fixed rate for this swap?

A) 5.65%.

B) 6.77%.

C) 6.01%.

D) 5.75%.

Your answer: A was incorrect. The correct answer was D) 5.75%.

The swap fixed rate is computed as follows:

$$Z_{90\text{-day}} = \frac{1}{1 + (.055 \times 90/360)}$$

$$= .98644$$

$$Z_{180\text{-day}} = \frac{1}{1 + (.05625 \times 180/360)}$$

$$= .97264$$

$$Z_{270\text{-day}} = \frac{1}{1 + (.057499 \times 270/360)}$$

$$= .95866$$

$$Z_{360\text{-day}} = \frac{1}{1 + (.058749 \times 360/360)}$$

$$= .94451$$

$$\text{The quarterly fixed rate on the swap} = \frac{1 - .94451}{.98644 + .97264 + .95866 + .94451}$$

$$= .05549 / 3.86225 = 0.01437 = 1.437\%$$

The fixed rate on the swap in annual terms is:

$$1.437\% \times 360/90 = 5.75\%$$

Part 4)
Bower would like to perform some sensitivity analysis on a one year collar to changes in LIBOR. Specifically, he wonders how the price of a collar (buying a cap and selling a floor) is affected by an increase in the LIBOR forward rate volatility. Using the information in Tables 1 and 2 which of the following is **CORRECT**? The price of the collar will:

A) increase.

B) stay the same.

C) increase or decrease.

D) decrease.

Your answer: A was incorrect. The correct answer was D) decrease.

The price of the floor will increase more than the price of the cap since the floor is closer to being at the money than the cap. Therefore, the floor price is more sensitive to volatility changes in the LIBOR forward rate. Since the price of the collar is equal to the price of the cap minus the price of the floor, the net effect is a price decrease for the collar.

Part 5)
Bower computes the implied volatility of a one year caplet on the 90-day LIBOR forward rates to be 18.5 percent. 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) overvalued.
B) undervalued.
C) correctly valued.
D) undervalued or overvalued.

Your answer: A was incorrect. The correct answer was B) undervalued.

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.

Part 6)
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) fixed rate bond and enter into a receive fixed swap.
D) floating rate bond and enter into a receive fixed swap.

Your answer: A was incorrect. The correct answer was A) pay fixed interest rate swap.

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).

Question 6 - #10461

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
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 Tables 4 and 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

Part 1)
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) American put.

B) American call.

C) European call.

D) European put.

Your answer: A was incorrect. The correct answer was C)

European call.

Using its delta in Table 4, if the Reston stock increases by a dollar the European call on the stock will increase by 0.5977.

Part 2)
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) $45,007.

B) $340,885.

C) $1,200,460.

D) $0.

Your answer: A was incorrect. The correct answer was D)

$0.

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

Part 3)
Fairfax would like to consider neutralizing his Reston equity position from changes in the stock price of Reston. Using the information in Tables 3 and 4 how many standard Reston European options would have to be either bought or sold in order to create a delta neutral portfolio?

A) Sell 4,972 put options.
B) Buy 3,703 call options.
C) Sell 3,703 call options.
D) Buy 4,972 put options.

Your answer: A was incorrect. The correct answer was D)

Buy 4,972 put options.

Number of put options = Reston Portfolio Value/(Exchange multiplier * Stock PriceReston * (-DeltaPut)).
Number of put options = $10,000,000/(100 * $50.00 * (-(-0.4023))) = 4,972 (subject to rounding error).

Part 4)
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) Gamma and Theta.
B) Delta and Vega.
C) Vega and Theta.
D) Delta and Gamma.

Your answer: A was incorrect. The correct answer was D)

Delta and Gamma.

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

Part 5)
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 interest rate changes.
B) is insensitive to stock price changes.
C) moves exactly in line with the stock price.
D) is insensitive to volatility changes in the returns on the underlying equity.

Your answer: A was incorrect. The correct answer was B)

is insensitive to stock price changes.

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.

Part 6)
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 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) enter into a receive-fixed swap.

B) take a short position in U.S. Treasury futures.
C) enter into a pay-fixed swap.
D) take a short position in Eurodollar futures.

Your answer: A was incorrect. The correct answer was C)

enter into a pay-fixed swap.

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

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