31 VALUATION OF CONTINGENT CLAIMS

1. A bond analyst decides to use the BSM model to price options on bond prices. This model will most likely be inadequate because:
   (A) the risk free rate must be constant and known.
   (B) BSM cannot be modified to deal with cash flows like coupon payments.
   (C) the price of the underlying asset follows a lognormal distribution.

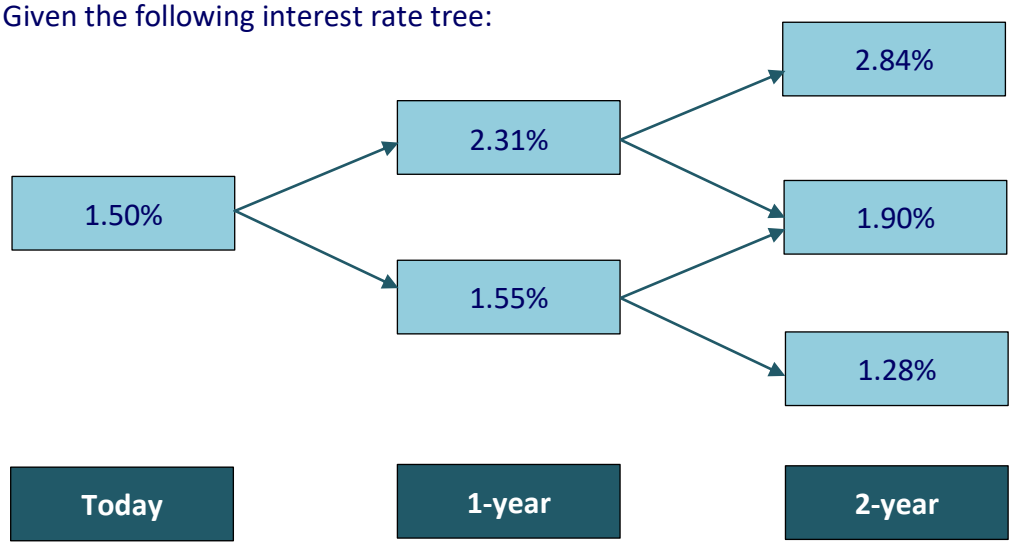
2. Which of the following is the best approximation of the gamma of an option if its delta is equal to 0.6 when the price of the underlying security is 100 and 0.7 when the price of the underlying security is 110?
   (A) 1.00.
   (B) 0.10.
   (C) 0.01.

3. In order to compute the implied asset price volatility for a particular option, an investor:
   (A) does not need to know the risk-free rate.
   (B) must have a series of asset prices.
   (C) must have the market price of the option.

4. 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) reference rate exceeds the strike rate.
   (B) reference rate is below the strike rate.
   (C) T-Bond futures exceeds the strike price.

5. Dividends on a stock can be incorporated into the valuation model of an option on the stock by:
   (A) subtracting the future value of the dividend from the current stock price.
   (B) subtracting the present value of the dividend from the current stock price.
   (C) adding the present value of the dividend to the current stock price.

6. Given the following interest rate tree:



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

(A) $3,549
(B) $2,022
(C) $4,122

7. The delta of an option is equal to the:

(A) dollar change in the stock price divided by the dollar change in the option price.
(B) dollar change in the option price divided by the dollar change in the stock price.
(C) percentage change in option price divided by the percentage change in the asset price.

8. 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) historical volatility.
(B) implied volatility.
(C) option volatility.

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

(A) a call option on the stock and sell a put option on the stock.
(B) a put option on the stock and sell a call option on the stock.
(C) both a call option on the stock and a put option on the stock.

10. 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) the same.
(C) greater.

Susan Smith is analyzing the stock of FDL Inc. She has found the following quotations (all prices in dollars per share) on 91-day European options:

Exhibit 1

Option Strike Price	Call Premium	Put Premium
50	5.28	1.54
55	2.64	3.33
60	1.14	X
Other Information		
Risk-free interest rates	6%	
Annual volatility	30%	
FDL Inc share price	$53	

*FDL Inc currently does not pay dividends

Smith wants to value the equity call options of FDL Inc. using the Black-Scholes-Merton (BSM) model. She wants to understand the assumptions and the limitations of the model and asks David Wang for help. Wang provides the information shown in Exhibits 2 and 3.

Exhibit 2

Assumptions of BSM Model
Assumption 1
The underlying asset returns follow a normal distribution
Assumption 1
Options are European style

Exhibit 3

Assumptions of BSM Model	Implications
The risk-free rate is known and constant over the options life	**Implication 1** Useful for pricing options on bond prices and interest rates
The continuously compounded yield on the asset is constant	**Implication 2** BSM model can be modified to account for cash flows on the underlying.

11. 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.

12. 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) Early exercise is not allowed.

13. A payer swaption gives its holder:

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

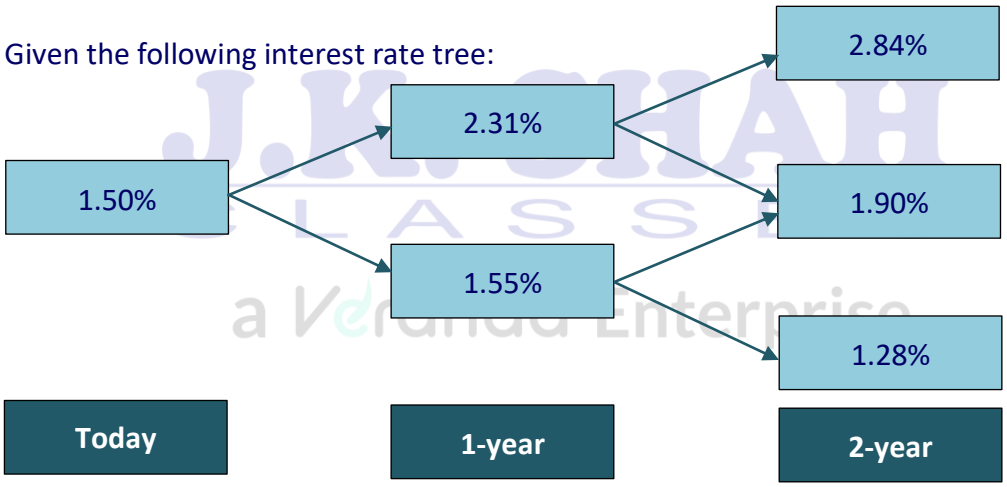
14. Which of the following is least likely one of the assumptions of the Black-Scholes-Merton option pricing model?

(A) The options are European.

(B) Changes in volatility are known and predictable.

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

15. 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

16. Using information in Exhibit 1, the value of $60 strike put option is closest to:

(A) $4.99.

(B) $5.86.

(C) $7.27.

17. Susan discovers that the fair value for the $55 strike put is in fact $3.85. Which of the following is the most appropriate set of transactions to exploit the mispricing (ignore

transaction costs)?

(A) Write a call option, buy a put option, buy one share, borrow the PV of strike.

(B) Buy a call option, write a put option, buy one share, borrow the PV of strike.

(C) Buy a call option, write a put option, sell short one share, put on deposit the PV of strike.

18. Using information in Exhibit 2, which of the following statements about assumptions 1 and 2 is most accurate?

(A) Both assumptions are correct.

(B) Only one of the two assumptions is correct.

(C) Both assumptions are incorrect.

19. Using Exhibit 3, which of the following statements about implications 1 and 2 is most accurate?

(A) Both implications are correct.

(B) Both implications are incorrect.

(C) Only one of the two implications is correct.

20. Regarding options on a stock without dividends, it is:

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

(B) sometimes worthwhile to exercise puts early but not calls.

(C) never worthwhile to exercise puts or calls early.

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

(A) far out of the money.

(B) at the money.

(C) far in the money.

22. 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) Exercise price.

(B) Volatility.

(C) Risk-free rate.

23. 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.

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

(A) owning a series of calls on fixed income securities.
(B) writing a series of interest rate puts.
(C) writing a series of puts on fixed income securities.

25. Early exercise of in-the-money American options on:
(A) both futures and forwards is sometimes worthwhile.
(B) futures is sometimes worthwhile but never is for options on forwards.
(C) forwards is sometimes worthwhile but never is for options on futures.

26. A non-dividend-paying option on a stock is most likely to be exercised early if the option is a(n):
(A) European option.
(B) call option.
(C) put option.

You are interested in derivative products, particularly with a view to identifying arbitrage opportunities. You start with bond futures:

- The cheapest to deliver (CTD) bond underlying the T-bond futures contract maturing in five months is a 4.6% T-Bond currently priced at $1,002.33 (full price) per $1,000 par. The CTD paid its last coupon four months ago, and its conversion factor is 1.13. The risk free rate is 2.99%.

Peter Wang, one of your colleague, knew of your interest in derivative products advises you to consider interest rate options and swaptions. Wang makes the following comments:

Comment 1:	An investor having a long position in a call option on a bond has the same position as if he is long an interest rate floor.
Comment 2:	A borrower of a floating rate loan can create an interest rate collar by buying an interest rate cap and selling an interest rate floor and the cap sets the maximum interest rate payable by the borrower.
Comment 3:	A payer swaption is the right to enter into a specific swap at some date in the future as the fixed-rate payer. A payer swaption becomes more valuable if an equivalent swap at the market rate is higher than the strike rate.

27. Which of the following is closest to the no-arbitrage price of the 5-month T-Bond futures contract?

(A) $867.20.
(B) $877.47.
(C) $976.02.

28. Comment 1 is best described as:
(A) correct.
(B) incorrect as long an interest rate floor should be short an interest rate floor.
(C) incorrect as long an interest rate floor should be long an interest rate cap.

29. Comment 2 is best described as:
(A) correct.
(B) incorrect as it should be buying an interest rate floor and selling an interest rate cap.
(C) incorrect as it should be the floor that sets the maximum interest rate payable by the borrower.

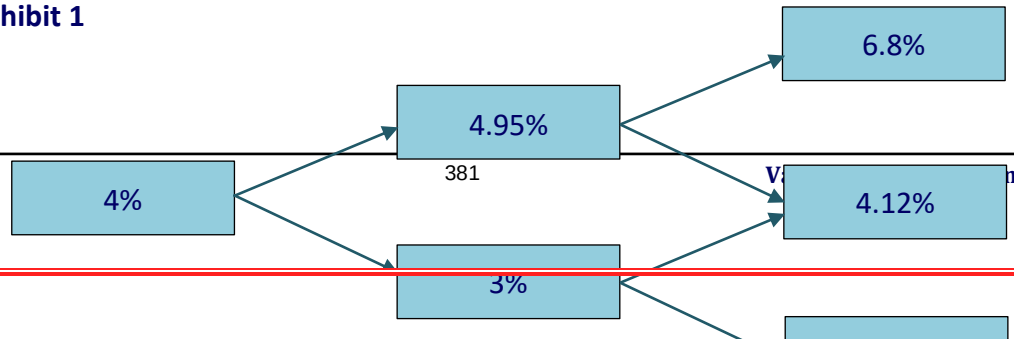
30. Comment 3 can be best described as:
(A) correct.
(B) incorrect as it is describing a receiver swaption, not a payer swaption.
(C) incorrect as a payer swaption is more valuable if an equivalent swap at the market rate is lower than the strike rate.

31. 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.

32. The value of a put option will be higher if, all else equal, the:
(A) exercise price is lower.
(B) underlying asset has less volatility.
(C) underlying asset has positive cash flows.

Lowell Wood is using the binomial option-pricing model to price interest rate options. She has obtained the following 2-year, annual rate tree (based on an assumed volatility of interest rates of 25%).

Exhibit 1



Wood has been asked help a colleague with the valuation of an interest rate put. The interest rate put option has 2 years to maturity and a strike price of 4.5% and is based on 360 day MRR. The option has a notional principal of $10m.

Wood has discovered that the Black model may be used to price options on interest rates by viewing the interest rate option as an option on a FRA. She is currently writing a research note for her team and makes the following three notes regarding the Black model:

Note 1:	"When using the Black model care needs to be taken to ensure that the payoff is discounted from the end of the borrowing and lending period (i.e., the maturity of the rate underlying the FRA), rather than the exercise date of the option."
Note 2:	"Given an interest rate option is an option on a FRA, call options will gain in value when interest rates rise and put options will fall in value."
Note 3:	"The accrual period needs to be factored in when valuing the option. This is because quoted rates are annual rates but in reality, the time between the FRA expiration and the maturity of borrowing and lending may not be one year. The accrual period can be viewed as a fraction of a year."

Wood asks for information about interest rate caps and floors. Newman makes the following comments:

Comment 1:	"A long FRA can be viewed as equivalent to a long interest rate call and a short interest rate put with the same strike and time to expiration."
Comment 2:	"Given a cap is a series of interest rate call options with identical strike prices and a floor is a series of interest rate put options also with identical strike prices, a short cap and long floor with identical strike prices would create a pay fixed receive floating interest rate swap."

33. Using the information about the interest rate put and the spot and forward rates in Exhibit 1, which of the following is closest to the value of the put? Assume that the option cash settle at time 2.

(A) $44,250.

(B) $64,250.

(C) $84,250.

34. How many of Wood's notes regarding the Black model used to value interest options are correct?
(A) All three notes are correct.
(B) Only two of the notes are correct.
(C) Only one of the notes is correct.

35. Newman's Comment 1 is best described as:
(A) correct.
(B) incorrect as to the strike price of the options.
(C) incorrect as to the equivalence to a long FRA.

36. Newman's Comment 2 is best described as:
(A) correct.
(B) incorrect as buying a floor is not equivalent to buying interest rate put options.
(C) incorrect as long floor, short cap would create a pay floating, receive fixed interest rate swap.

37. 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 MRR yield curve, Roberts should:
(A) write a receiver swaption.
(B) buy a receiver swaption.
(C) buy a payer swaption.

38. 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 (negative) number.
(B) larger positive number.
(C) smaller (negative) number.

Nathan Detroit, a speculator, has come to you for technical advice regarding the pricing of swaps. He hopes to make big money in the swaps market from the exploitation of pricing discrepancies, but lacks an understanding of the principles underlying the pricing of swaps.

He asks you to consider a two-year, fixed-for-fixed, currency swap with semiannual payments. The domestic currency is the U.S. dollar and the foreign currency is the U.K. pound. The current exchange rate is $1.60 per pound. You forecast that the exchange rate would be $1.41 on the first settlement date. The notional principal of the swap is set at $10 million. The USD and £ term structure are shown in Exhibits 1 and 2 below.

Exhibit 1: Current USD Term Structure

Number of Days	MRR	Present Value Factor
180	0.0585	0.9716
360	0.0605	0.9430
540	0.0596	0.9179
720	0.0665	0.8826

Exhibit 2: Current £ Term Structure

Number of Days	MRR	Present Value Factor
180	0.0493	0.9759
360	0.0450	0.9569
540	0.0519	0.9278
720	0.0551	0.9007

Detroit has heard about the European put-call parity theorem and believes a synthetic call can be created through the use of a European put with the same strike as the call, a zero coupon bond with a face value equal to the strike price of the put and an underlying asset relating to the put and the call.

Detroit makes two comments regarding the BSM model and the Black model as follows:

Comment 1:	$N(d_1)$ in the BSM is the probability that the option will expire in the money.
Comment 2:	The probability that a receiver swaption will expire in the money is $N(-d_2)$.

39. Calculate the USD swap fixed rate.
    (A) 3.16%.
    (B) 6.20%.
    (C) 6.32%.

40. Using the information in Exhibits 1 and 2, which of the following is closest to the amount of the British pound paid on the first settlement date?
    (A) £165,000.
    (B) £187,234.
    (C) £264,000.

41. Which of the following would create a synthetic call?
    (A) Buy the put and the underlying.

(B) Sell the put, buy the underlying.
(C) Sell the put and the underlying.

42. How many of Nathan's comments are correct?
(A) Neither comment is correct.
(B) Only one statement is correct.
(C) Both statements are correct.

43. 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) possible by purchasing 100 calls and short selling 28 shares.
(C) not possible.

44. 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.

45. Suppose a forward rate agreement (FRA) requires us to exchange six-month MRR 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) call and a short put on MRR with a strike rate of 8% and six months to expiration.
(B) put and a short call on MRR with a strike rate of 8% and twelve months to expiration.
(C) call and a short put on MRR with a strike rate of 8% and twelve months to expiration.

46. Combining a short position in a stock with a long position in a call option on the stock will produce a produce a payoff pattern equivalent to a:
(A) short position in a put option on the stock.
(B) risk-free security.
(C) long position in a put option on the stock.

47. 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 $e^{-rT} X N(-d_2)$ of borrowed funds."
Dilla is most likely:
(A) incorrect about $N(d_1)$ units of stock.

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

(C) correct.

48. 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) possible by purchasing 57 shares and writing 100 calls.

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

(C) not possible.

49. 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.

50. 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 is close to expiration.

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

(A) owning a series of calls on fixed income securities.

(B) writing a series of interest rate puts.

(C) owning a series of put on fixed income securities.

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

(A) writing a series of interest rate calls.

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

(C) owning a series of interest rate calls.

53. The writer of a receiver swaption has:

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

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

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

54. 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.

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

(A) risk-free rate.

(B) exercise price.

(C) time to exercise.

56. 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.

57. 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) Gamma.

(B) Delta.

(C) Theta.

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

(A) Sell a European put option; sell the same stock; buy a European call option.

(B) Buy a European put option; sell the same stock; sell a European call option.

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

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

(A) 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 value of the exercise price worth of a pure-discount riskless bond.

(B) 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 value of the exercise price in a pure-discount riskless bond.

(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 value of the exercise price worth of a pure-discount riskless bond.

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
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 MRR 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 MRR, however, the total par value of these securities is significantly less than the liability position.

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

60. 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) Sell 370,300 call options.
    (B) Buy 497,141 put options.
    (C) Sell 497,141 put options.

61. With regards to Lucy's comments regarding the PVA in the Black model and the offsetting of floating rates at expiry of the swaption, which of the following is most accurate?
    (A) Lucy is correct about the definition of the PVA and the offsetting of floating rates.
    (B) Lucy is correct about the offsetting of the floating rates but not the PVA.
    (C) Lucy is correct about the PVA but not the offsetting of floating rates.

62. Which of the following comments relating to the Black model valuation of a swaption is the most accurate?
    (A) SFR in the formula identified by Lucy is the market swap fixed rate at the expiration of the swaption.
    (B) $N(d_2)$ is likely to be greater than $N(d_1)$.
    (C) A payer swaption will only be exercised in the market swap fixed rate at expiry is greater than the swaption's strike price.

63. Which of the following is NOT one of the assumptions of the Black-Scholes-Merton (BSM) option-pricing model?
    (A) The options valued are European style (early exercise is not allowed).
    (B) There are no transaction costs, regulatory constraints, or taxes.
    (C) The yield on the underlying has a known and constant volatility.

64. 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 up probability of 68%?
    (A) $0.57.
    (B) $2.58.
    (C) $0.64.

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

(C) correct.

66. 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) $340,885.

(B) $0.

(C) $45,007.

67. 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) Buy an interest rate cap.

(B) Sell an interest rate floor and buy an interest rate cap.

(C) Sell an interest rate cap.

68. 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.

69. 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) $3.57.

(B) $9.13.

(C) $9.25.

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

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

(A) delta as the price of the underlying security changes.

(B) vega as the option price changes.

(C) option price as the underlying security changes.

72. Suppose a forward rate agreement (FRA) calls for us to receive the six-month MRR two years from now for a payment of a fixed rate of interest of 6%. Which of the following structures is equivalent to this long FRA? A long:

(A) put and a short call on MRR with a strike rate of 6% and two years to expiration.

(B) call on MRR with a strike rate of 6% and eighteen months to expiration.

(C) call and a short put on MRR with a strike rate of 6% and two years to expiration.

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

(A) 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.

(B) Buy a European call option; buy a European put option; invest the present value of the exercise price in 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.

Lucy Wang is the Chief Financial Officer of Sam Corporation. Sam Corporation has floating rate liabilities and wants to hedge against the possibility of rising interest rates. Wang is looking into using swaptions to hedge against interest rate risk.

The board of Sam Corporation are not familiar with both swaps and swaptions. To explain the characteristics of swaps, Wang explains to the board that swaps are similar to interest rate options.

Wang decides to use a swaption to hedge against interest rate risk. She knows that there are two types of swaptions just like there are both call and put options, and that the cash flows on swaps can be replicated using swaptions.

Lucy is very interested in the application of the Black model in pricing swaptions. After a quick search online she has found the following:

pay = $(AP)PVA[SFRxN(d_1) - XxN(d_2)]xNP$

where:

pay = value of the payer swaption

AP = 1 / number of settlement periods per year in the underlying swap

X = exercise rate specified in the swaption

NP = notional principal

Lucy is confused regarding what the notation PVA stands for and states:

"There are multiple payoffs on a swaption, each being the difference between the market swap rate at expiration and the exercise rate at each settlement date, over the swaps life. Given each payoff arises at a different point in time over the swaps life, each must be discounted back to the current period using discount rate specific to when it occurs. The PVA therefore must be an annuity factor summing all these specific discount rates."

Lucy also states:

"A payer swaption is right to enter a swap with a fixed rate equal to the strike price at the options maturity. The payoffs will therefore represent the difference in the swaptions strike price and the fixed market swap rate at the time of option expiry. Given we are comparing the payer swap underlying the swaption, versus the market rate of a payer swap at the option maturity, the floating payments can be ignored as they will offset. This is why the Black model only includes values for the current market swap fixed rate and fixed rate of the swap underlying the swaption (i.e., the strike)."

74. Which of the following best describes how a payer swap could be replicated using a package of interest rate options?

(A) The swap can be replicated by buying a package of interest rate call options and selling a package of interest rate put options at different strikes.

(B) The swap can be replicated by selling a package of interest rate call options and buying a package of interest rate put options at the same strikes.

(C) The swap can be replicated by buying a package of interest rate call options and selling a package of interest rate put options at the same strikes.

75. Which of the following best describes how a payer swap could be replicated using interest rate swaptions?

(A) The swap can be replicated by selling a payer swaption and buying a receiver swaption at the same strike.

(B) The swap can be replicated by buying a payer swaption and selling a receiver swaption at the same strike.

(C) The swap can be replicated by buying a payer swaption and selling a receiver swaption at different strikes.