FIM/MA/ECG 528 Final Exam Review Sheet

This review sheet is a cumulative summary of our semester. It will give you an overview of everything we did that could possibly be on the final. However, **to gain the necessary depth of understanding on each topic, you must study the homeworks!**

Chapter 1

1. A trader enters into a one-year short forward contract to sell an asset for $60 when the spot price is $58. The spot price in one year proves to be $63. What is the trader's gain or loss? Show a dollar amount and indicate whether it is a gain or a loss.

2. The price of a stock is $36 and the price of a three-month call option on the stock with a strike price of $36 is $3.60. Suppose a trader has $3,600 to invest and is trying to choose between buying 1,000 options and 100 shares of stock. How high does the stock price have to rise for an investment in options to lead to the same profit as an investment in the stock?

Chapter 2

1. Which of the following is true (circle one)
    a. Both forward and futures contracts are traded on exchanges.
    b. Forward contracts are traded on exchanges, but futures contracts are not.
    c. Futures contracts are traded on exchanges, but forward contracts are not.
    d. Neither futures contracts nor forward contracts are traded on exchanges.

2. A company enters into a long futures contract to buy 1,000 barrels of oil for $60 per barrel. The initial margin is $6,000 and the maintenance margin is $4,000. What oil futures price will allow $2,000 to be withdrawn from the margin account?

3. You sell one December gold futures contracts when the futures price is $1,010 per ounce. Each contract is on 100 ounces of gold and the initial margin per contract that you provide is $2,000. The maintenance margin per contract is $1,500. During the next day the futures price rises to $1,012 per ounce. What is the balance of your margin account at the end of the day?

Chapter 3

1. On March 1 the price of oil is $60 and the July futures price is $59. On June 1 the price of oil is $64 and the July futures price is $63.50. A company entered into a futures contracts on March 1 to hedge the purchase of oil on June 1. It closed out its position on June 1. After taking account of the cost of hedging, what is the effective price paid by the company for the oil?

2. Suppose that the standard deviation of monthly changes in the price of commodity A is $2. The standard deviation of monthly changes in a futures price for a contract on commodity B (which is similar to commodity A) is $3. The correlation between the

futures price and the commodity price is 0.9. What hedge ratio should be used when hedging a one month exposure to the price of commodity A?

3. Futures contracts trade with every month as a delivery month. A company is hedging the purchase of the underlying asset on June 15. Which futures contract should it use (circle one)
    (a) The June contract
    (b) The July contract
    (c) The May contract
    (d) The August contract

Chapter 4

1. An interest rate is 8% per annum when expressed with continuous compounding. What is the equivalent rate with semiannual compounding? Answer as a percent with two decimal place accuracy

2. The six-month zero rate is 8% with semiannual compounding. The price of a one-year bond that provides a coupon of 6% per annum semiannually is 97. What is the one-year continuously compounded zero rate? Answer as a percent with two decimal place accuracy

3. The yield curve is flat at 6% per annum with semiannual compounding. What (to the nearest cent) is the value of an FRA where the holder receives interest at the rate of 8% per annum for a six-month period on a principal of $1,000 starting in two years?

4. Under liquidity preference theory, which of the following is always true (circle one)
    a. The forward rate is higher than the spot rate when both have the same maturity.
    b. Forward rates are unbiased predictors of expected future spot rates.
    c. The spot rate for a certain maturity is higher than the par yield for that maturity.
    d. Forward rates are higher than expected future spot rates.

5. When the zero curve is upward sloping, which **two** of the following is true? (circle two)
    a. The one-year zero rate is always greater than the forward rate for the period between 1 year and 1.5 years.
    b. The one-year zero rate is always less than the forward rate for the period between 1 year and 1.5 years.
    c. The one-year par yield is always greater than the one-year zero rate.
    d. The one-year par yield is always less than the one-year zero rate.

Chapter 5

1. The spot price of an investment asset that provides no income is $30 and the risk-free rate for all maturities (with continuous compounding) is 10%. What, to the nearest cent, is the three-year forward price?

2. A short forward contract that was negotiated some time ago will expire in three months

and has a delivery price of $40. The current forward price for three-month forward contract is $42. The three month risk-free interest rate (with continuous compounding) is 8%. What to the nearest cent is the value of the short forward contract?

3. The spot price of an asset is positively correlated with the market. Which of the following would you expect to be true (circle one)
    a. The forward price equals the expected future spot price.
    b. The forward price is greater than the expected future spot price.
    c. The forward price is less than the expected future spot price.
    d. The forward price is sometimes greater and sometimes less than the expected future spot price.

4. Which of the following is a consumption asset (circle one)
    a. The S&P 500 index
    b. The Canadian dollar
    c. Copper
    d. IBM shares

Chapter 7

1. Suppose that the yield curve is flat at 5% per annum with continuous compounding. A swap with a notional principal of $100 million in which 6% is received and six-month LIBOR is paid will last another 15 months. Payments are exchanged every six months. The six-month LIBOR rate at the last reset date (three months ago) was 7%. Answer in millions of dollars to two decimal places.

    a. What is the value of the fixed-rate bond underlying the swap?
    b. What is the value of the floating-rate bond underlying the swap?
    c. What is the value of the payment that will be exchanged in 3 months?
    d. What is the value of the payment that will be exchanged in 9 months?
    e. What is the value of the payment that will be exchanged in 15 months?
    f. What is the value of the swap?

2. A company can invest funds for five years at LIBOR minus 30 basis points. The five-year swap rate is 3%. What fixed rate of interest can the company earn? Ignore day count issues

3. Suppose you enter into an interest rate swap where you are receiving floating and paying fixed. Which two of the following is true? (circle two)
    a. Your credit risk is greater when the term structure is upward sloping than when it is downward sloping.
    b. Your credit risk is greater when the term structure is downward sloping than when it is upward sloping.
    c. Your credit risk exposure increases when interest rates decline unexpectedly.
    d. Your credit risk exposure increases when interest rates increase unexpectedly.

Chapter 11

1. What, to the nearest cent, is the lower bound for the price of a two-year European call option on a stock when the stock price is $20, the strike price is $15, and the risk-free interest rate with continuous compounding is 5% and there are no dividends?

2. A call and a put on a stock have the same strike price and time to maturity. At 10:00am on a certain day, the price of the call is $3 and the price of the put is $4. At 10:01am news reaches the market that has no effect on the stock price or interest rates, but increases volatilities. As a result the price of the call changes to $4.50. What would you expect the price of the put to change to?

Chapter 12

1. Six-month call options with strike prices of $35 and $40 cost $6 and $4, respectively.
   (i) What is the maximum gain when a bull spread is created from the calls?
   (ii) What is the maximum loss when a bull spread is created from the calls?
   (iii) What is the maximum gain when a bear spread is created from the calls?
   (iv) What is the maximum loss when a bear spread is created from the calls?

2. Three-month European put options with strike prices of $50, $55, and $60 cost $2, $4, and $7, respectively.
   (i) What is the maximum gain when a butterfly spread is created from the put options?
   (ii) What is the maximum loss when a butterfly spread is created from the put options?
   (iii) For what two values of the stock price in three months does the holder of the butterfly spread breakeven with a profit of zero?

3. A three-month call with a strike price of $25 costs $2. A three-month put with a strike price of $20 and costs $3. A trader uses the options to create a strangle. For what two values of the stock price in three months does the trader breakeven with a profit of zero?

Chapter 13

1. In a Cox-Ross-Rubinstein binomial tree the formula for the proportional up-movement, *u*, is with the book's notation, (circle one)
   (a) $u = e^{r\Delta t}$
   (b) $u = e^{r\sqrt{\Delta t}}$
   (c) $u = e^{\sigma\Delta t}$
   (d) $u = e^{\sigma\sqrt{\Delta t}}$

2. American options can be valued using a binomial tree by (circle one)

(a) Checking whether early exercise is optimal at all nodes where the option is in-the-money
(b) Checking whether early exercise is optimal at the final nodes
(c) Checking whether early exercise is optimal at the penultimate nodes and the final nodes
(d) Increasing the number of time steps on the tree

3. The current price of a non-dividend-paying stock is $30. Over the next six months it is expected to rise to $36 or fall to $26. Assume the risk-free rate is zero
   (i) What long position in the stock is necessary to hedge a short call option when the strike price is $32? Give the number of shares purchased as a percentage of the number of options that have been sold
   (ii) What is the value the call option
   (iii) What long position in the stock is necessary to hedge a long put option when the strike price is $32. Give the number of shares purchased as a percentage of the number of options purchased option
   (iv) What is the value of the put option
   (v) What is the risk neutral probability of the stock price moving up

Chapter 14

1. A variable, x, starts at 10 and follows a generalized Wiener process

$$dX_t = a\,dt + b\,dW_t$$

where $a = 2$, $b = 3$, and W_t is a Wiener process.
   a. What is the mean value of the variable after three years?
   b. What is the standard deviation of the value of the variable after three years?
   c. What is the mean value of the variable after six months?
   d. What is the standard deviation of the value of the variable after six months?
2. A stock price has a expected return of 12% per annum and a volatility of 25% per annum. Currently the stock price is $40. Assume 252 days per year.
   a. What is the standard deviation of the stock price at the end of one day?
   b. What is the width of the 95% confidence interval for the stock price at the end of one day?
3. If S follows the geometric Brownian motion process

$$dS_t = \mu S_t\,dt + \sigma S_t dW_t$$

what is the process followed by
   a. $Y_t = 2S_t$
   b. $Y_t = S_t^2$
   c. $Y_t = e^{S_t}$
   d. $Y_t = \frac{e^{r(T-t)}}{S_t}$

Chapter 15

1. Assume the price of a stock follows a Geometric Brownian motion,

$$dS_t = (\mu - \delta)S_t dt + \sigma S_t dW_t$$

where W_t is a standard Brownian motion, μ is the growth rate of equity, δ is the dividend rate, and σ is the volatility. Assume there is a risk-free bank account that pays rate $r > 0$. Use continuous-time delta hedging to derive a partial differential equation for a call option that with maturity T and strike K.

2. What is the price of a European put option on a non-dividend-paying stock when the stock price is \$69, the strike price is \$70, the risk-free interest rate is 5% per annum, the volatility is 35% per annum, and the time to maturity is 6 months?

3. Using the pricing notation of the Black-Scholes formula, what is the probability that a European put option is exercise?

Chapter 17

1. To create a range forward contract in order to hedge foreign currency that will be received a company should (Circle one)
    a. Buy a put and sell a call on the currency with the strike price of the put higher than that of the call
    b. Buy a put and sell a call on the currency with the strike price of the put lower than that of the call
    c. Buy a call and sell a put on the currency with the strike price of the put higher than that of the call
    d. Buy a call and sell a put on the currency with the strike price of the put lower than that of the call

2. To create a range forward contract in order to hedge foreign currency that will be paid a company should (Circle one)
    a. Buy a put and sell a call on the currency with the strike price of the put higher than that of the call
    b. Buy a put and sell a call on the currency with the strike price of the put lower than that of the call
    c. Buy a call and sell a put on the currency with the strike price of the put higher than that of the call
    d. Buy a call and sell a put on the currency with the strike price of the put lower than that of the call

3. Consider a European put option on an index. The index level is 1,000, the strike price is 1050, the time to maturity is six months, the risk-free rate is 4% per annum, and the dividend yield on the index is 2% per annum. What is a lower bound to the option price?

(Give two decimal places.)

4. Consider a European call option on a currency. The exchange rate is 1.0000, the strike price is 0.9100, the time to maturity is one year, the domestic risk-free rate is 5% per annum, and the foreign risk-free rate is 3% per annum. What is a lower bound to the option price? (Give four decimal places.)

5. Options on an exchange rate can be valued using the formula for an option of a stock paying a continuous dividend yield where the dividend yield is replaced by (Circle one)
    a. the domestic risk-free rate
    b. the foreign risk-free rate
    c. the foreign risk-free rate minus the domestic risk-free rate
    d. none of the above

Chapter 19

1. A call option on an asset has a delta of 0.4. A trader has sold 2000 options and wants to create a delta-neutral position
    a. Should the trader take a long or short position in the asset_ _ _ _ _ _
    b. How many units of the asset should be bought or sold_ _ _ _ _ _

2. A portfolio of derivatives on a stock has a delta of 2400 and a gamma of –100. An option on the stock with a delta of 0.6 and a gamma of 0.04 can be traded.

3. A financial institution has just sold 1,000 7-month European call options on the Japanese yen. Suppose that the spot exchange rate is 0.80 cent per yen, the exercise price is 0.81 cent per yen, the risk-free interest rate in the United States is 8% per annum, the risk-free interest rate in Japan is 5% per annum, and the volatility of the yen is 15% per annum. Calculate the delta, gamma, vega, theta, and rho of the financial institution's position. Interpret each number.

4. Theta measures (circle one)
    a. The rate of change of delta with the asset price
    b. The rate of change of the portfolio value with the passage of time
    c. The sensitivity of a portfolio value to interest rate changes
    d. None of the above

5. Gamma measures (circle one)
    a. The rate of change of delta with the asset price
    b. The rate of change of the portfolio value with the passage of time
    c. The sensitivity of the portfolio value to interest rate changes
    d. None of the above

6. Vega measures (circle one)
    a. The rate of change of delta with the asset price
    b. The rate of change of the portfolio value with the passage of time
    c. The sensitivity of the portfolio value to interest rate changes
    d. None of the above

7. A European call and European put have the same strike price and time to maturity Which two of the following are true (**circle two**)
    a. The gamma of a call is the same as the gamma of a put
    b. The delta of a call is the same as the delta of a put
    c. The vega of a call is the same as the vega of a put
    d. The theta of a call is the same as the theta of a put

8. A trader uses a stop–loss strategy to hedge a short position in a three-month call option with a strike price of 0.7000 on an exchange rate. The trader covers the option when the exchange rate is 0.7005 and assumes a naked position when the exchange rate is 0.6995. The value of the option is 0.1. Estimate the expected number of times the trader covers the position during the life of the option _ _ _ _ _ _