vrije Universiteit amsterdam

Faculty of Economics and Business Administration

Exam:	Investments 3.4
Code:	E_BE3_INV
Coordinator:	Dr. Teodor Dyakov
Reviewer:	Dr. Luping Lu
Date:	May 21, 2014
Time:	8.45
Duration:	2 hours and 45 minutes
Calculator allowed:	Yes
Graphical calculator allowed:	Yes
Number of questions:	20 multiple choice questions and 4 open-ended questions
Type of questions:	Open / multiple choice
Answer in:	English

Remarks: Be concise and complete in your answers (including calculations). Always explain your answers, even if not explicitly called for. Use your time efficiently, using the maximum number of points per question as a guideline.

Credit score:	The maximum possible scores for each part and question are indicated. In total, you can earn 100 points. Your final exam grade is determined by dividing the number of points by 10.
Grades:	The grades will be made public on: June 4 2014
Inspection:	Tuesday, June 10 2014 at 13.00 in room 3A-31.
Number of pages:	(12 (including front page))

Good luck!

PART 1 (MULTIPLE CHOICE; 40 points at maximum)

Read the questions and answers carefully and write down your answer on your answer sheet. Your final score is determined as (# correct answers - 2) * 40/18. Negative scores for this part of the exam are set to zero.

You have been given this probability distribution for the holding-period return for KMP stock:

State of the Economy	Probability	HPR
Boom	.30	18%
Normal growth	.50	12%
Recession	.20	- 5%

1. What is the expected holding-period return for KMP stock?
A. 10.40%
B. 9.32%
C. 11.63%
D. 11.54%
E. 10.88%

2. What is the expected standard deviation for KMP stock?
A. 6.91%
B. 8.13%
C. 7.79%
D. 7.25%
E. 8.85%

3. The change from a straight to a kinked capital allocation line is a result of:
A. reward-to-volatility ratio increasing.
B. borrowing rate exceeding lending rate.
C. an investor's risk tolerance decreasing.
D. increase in the portfolio proportion of the risk-free asset.
E. a flawed theory.

4. Assume that stock market returns do follow a single-index structure. An investment fund analyzes 500 stocks in order to construct a mean-variance efficient portfolio constrained by 500 investments. They will need to calculate _____ estimates of firm-specific variances and _____ estimate/estimates for the variance of the macroeconomic factor.
A. 500; 1
B. 500; 500
C. 124,750; 1
D. 124,750; 500
E. 250,000; 500

5. According to the Capital Asset Pricing Model (CAPM), underpriced securities
A. have positive betas.
B. have zero alphas.
C. have negative betas.
D. have positive alphas.
E. have negative alphas.

6. Consider the multifactor APT with two factors. Stock A has an expected return of 17.6%, a beta of 1.45 on factor 1 and a beta of .86 on factor 2. The risk premium on the factor 1 portfolio is 3.2%. The risk-free rate of return is 5%. What is the risk-premium on factor 2 if no arbitrage opportunities exists?
A. 9.26%
B. 3%
C. 4%
D. 7.75%
E. 9.75%

7. Nicholas Manufacturing just announced yesterday that its fourth quarter earnings will be 10% higher than last year's fourth quarter. You observe that Nicholas had an abnormal return of -1.2% yesterday. This suggests that
A. the market is not efficient.
B. Nicholas' stock will probably rise in value tomorrow.
C. investors expected the earnings increase to be larger than what was actually announced.
D. investors expected the earnings increase to be smaller than what was actually announced.
E. earnings are expected to decrease next quarter.

Torque Corporation is expected to pay a dividend of $1.00 in the upcoming year. Dividends are expected to grow at the rate of 6% per year. The risk-free rate of return is 5% and the expected return on the market portfolio is 13%. The stock of Torque Corporation has a beta of 1.2.

8. What is the intrinsic value of Torque's stock?
A. $14.29
B. $14.60
C. $12.33
D. $11.62
E. None of these is correct

9. Suppose two portfolios have the same average return, the same standard deviation of returns, but portfolio A has a lower beta than portfolio B. According to the Treynor measure, the performance of portfolio A _____.
A. is better than the performance of portfolio B
B. is the same as the performance of portfolio B
C. is poorer than the performance of portfolio B
D. cannot be measured as there is no data on the alpha of the portfolio
E. None of these is correct.

10. Suppose the risk-free return is 3%. The beta of a managed portfolio is 1.75, the alpha is 0%, and the average return is 16%. Based on Jensen's measure of portfolio performance, you would calculate the return on the market portfolio as
A. 12.3%
B. 10.4%
C. 15.1%
D. 16.7%
E. None of these is correct

11. Bond analysts might be more interested in a bond's yield to call if
A. the bond's yield to maturity is insufficient.
B. the firm has called some of its bonds in the past.
C. the investor only plans to hold the bond until its first call date.
D. interest rates are expected to rise.
E. interest rates are expected to fall.

12. A zero-coupon bond is one that
A. effectively has a zero percent coupon rate.
B. pays interest to the investor based on the general level of interest rates, rather than at a specified coupon rate.
C. pays interest to the investor without requiring the actual coupon to be mailed to the corporation.
D. is issued by state governments because they don't have to pay interest.
E. is analyzed primarily by focusing ("zeroing in") on the coupon rate.

13. What is the price of a 4-year maturity bond with a 12% coupon rate paid annually? (Par value = $1,000)
A. $742.09
B. $1,222.09
C. $1,000.00
D. $1,141.92
E. None of these is correct.

14. Which of the following combinations will result in a sharply increasing yield curve?
A. Increasing future expected short rates and increasing liquidity premiums
B. Decreasing future expected short rates and increasing liquidity premiums
C. Increasing future expected short rates and decreasing liquidity premiums
D. Increasing future expected short rates and constant liquidity premiums
E. Constant future expected short rates and increasing liquidity premiums

15. Which of the following is **not** true?
A. Holding other things constant, the duration of a bond increases with time to maturity.
B. Given time to maturity, the duration of a zero-coupon decreases with yield to maturity.
C. Given time to maturity and yield to maturity, the duration of a bond is higher when the coupon rate is lower.
D. Duration is a better measure of price sensitivity to interest rate changes than is time to maturity.
E. All of these are correct.

16. According to the put-call parity theorem, the value of a European put option on a non-dividend paying stock is equal to:
A. the call value plus the present value of the exercise price plus the stock price.
B. the call value plus the present value of the exercise price minus the stock price.
C. the present value of the stock price minus the exercise price minus the call price.
D. the present value of the stock price plus the exercise price minus the call price.
E. None of these is correct.

17. All the inputs in the Black-Scholes Option Pricing Model are directly observable **except**
A. the price of the underlying security.
B. the risk free rate of interest.
C. the time to expiration.
D. the variance of returns of the underlying asset return.
E. None of these is correct.

18. Portfolio A consists of 500 shares of stock and 500 calls on that stock. Portfolio B consists of 800 shares of stock. The call delta is 0.6. Which portfolio has a higher dollar exposure to a change in stock price?
A. Portfolio B.
B. Portfolio A.
C. The two portfolios have the same exposure.
D. A if the stock price increases and B if it decreases.
E. B if the stock price decreases and A if it increases.

19. On January 1, the listed spot and futures prices of a Treasury bond were 93.8 and 93.13. You purchased $100,000 par value Treasury bonds and sold one Treasury bond futures contract. One month later, the listed spot price and futures prices were 94 and 94.09, respectively. If you were to liquidate your position, your profits would be
A. $125 loss.
B. $125 profit.
C. $12.50 loss.
D. $1,250 loss.
E. None of these is correct.

20. Suppose that the risk-free rates in the United States and in the United Kingdom are 4% and 6%, respectively. The spot exchange rate between the dollar and the pound is $1.60/BP. What should the futures price of the pound for a one-year contract be to prevent arbitrage opportunities, ignoring transactions costs?
A. $1.60/BP
B. $1.70/BP
C. $1.66/BP
D. $1.63/BP
E. $1.57/BP

PART 2 (OPEN QUESTIONS; 60 points at maximum)

Question 1: Equilibrium Pricing Models (15 points)

Part a: 4 points

Give the formula of the CAPM and explain its notation. What are the assumptions underlying the CAPM? How do they relate to empirical evidence?

Part b: 2 points

Security A has a beta of 1.0 and an expected return of 12%. Security B has a beta of 0.75 and an expected return of 11%. The risk-free rate is 6%. Explain the arbitrage opportunity that exists; explain how an investor can take advantage of it. Give specific details about how to form the portfolio, what to buy and what to sell.

Part c: 4 points

Assume that the CAPM holds. The risk free rate r_f is 5% and the market return r_M is 8%. Consider the following two stocks:

Stocks	β	P/E
A	1.5	14.29
B	0.8	13.51

β - market beta of each stock
P/E – price-earnings ratio

The retention ratio (**b**) for the two stocks is 0.5.

i. Compute the return on equity (ROE) of the two stocks, assuming a constant growth model with endogenous earnings growth (round at the third decimal).

ii. Estimate the growth rate for both firms.

iii. What would the effect on the P/E ratio be if you change the retention ratio of stock B, keeping ROE constant? Why?

Part d: 5 points

Consider the multifactor APT. There are three independent economic factors, F_1, F_2, and F_3.The risk-free rate of return is 5%. The following information is available about three well-diversified portfolios A, B and C:

Portfolio	beta on F1	beta on F2	beta on F3	expected return	variance
A	0.5	1	1	30%	40%
B	0	1	0.5	15%	20%
C	0	0	1	10%	15%

i. Assuming no arbitrage opportunities exist, calculate the risk premia on the three factor Portfolios

ii. Give an expression for the variance of a well-diversified portfolio along the lines of the multifactor APT. Calculate the variance of the two factors, given the data above.

iii. Construct a portfolio of A, B, and C that has exposure of 1 to F1 and 1.5 to F2. What are the weights of the three portfolios A, B, and C? What is its exposure to F3?

Question 2: Portfolio Construction and Performance Measurement (15 points)

Part a: 2 points

Describe how an investor may combine a risk-free asset and one risky asset in order to obtain the optimal portfolio for that investor.

Part b: 5 points

You are evaluating two investment alternatives. One is a passive market portfolio with an expected return of 10% and a standard deviation of 16%. The other is a fund that is actively managed by your broker. This fund has an expected return of 15% and a standard deviation of 20%. The risk-free rate is currently 7%. Answer the questions below based on this information.

i. What is the slope of the Capital Market Line?

ii. What is the slope of the Capital Allocation Line offered by your broker's fund?

iii. Draw the CML and the CAL on one graph.

iv. What is the maximum fee your broker could charge and still leave you as well off as if you had invested in the passive market fund? (Assume that the fee would be a percentage of the investment in the broker's fund, and would be deducted at the end of the year.)

v. How would it affect the graph if the broker were to charge the full amount of the fee?

Part c. (5 points)

You want to evaluate three mutual funds, based on the information below. The market return is 16% and the risk free rate is 6%.

	Average Return	Standard Deviation	Beta
Fund A	0.24	0.3	1.5
Fund B	0.14	0.1	0.5
Fund C	0.22	0.2	1

i. Provide the formulas for the Sharpe Ratio, Treynor measure, and Jensen's alpha.

ii. How are the Sharpe Ratio and Treynor's measure related to Jensen's alpha? Comment briefly.

iii. Calculate the Sharpe Ratio, Treynor measure, and Jensen's alpha. Based on your analysis, which fund performs best?

Part d. (3 points)

Draw a graph of a typical efficient frontier. Explain why the efficient frontier is shaped the way it is.

Question 3: Fixed Income (15 points)

Part a. (3 points)

You hold a $50 million portfolio of par value bonds with a coupon rate of 10 percent paid annually and 15 years to maturity. How many T-bond futures contracts do you need to hedge the portfolio against an unanticipated change in the interest rate of 0.18%? Assume the market interest rate is 10 percent and that T-bond futures contracts call for delivery of an 8 percent coupon (paid annually), 20-year maturity T-bond.

Part b. (3 points)

Why are many bonds callable? What is the disadvantage to the investor of a callable bond? What does the investor receive in exchange for a bond being callable? How are bond valuation calculations affected if bonds are callable?

Part c. (4 points)

Consider the data on the following three coupon bonds:

	Maturity	Coupon	Yield	Face Value
Bond A	2	0.07	0.02	100
Bond B	3	0.05	0.04	100
Bond C	4	0.04	0.03	100

i. Compute the prices, duration and the modified duration of the three bonds.

ii. You have a portfolio consisting of a long position in 4 bonds of type B, 5 bonds of type C, and a short position in 1 bonds of type A. Calculate the duration and the modified duration of the portfolio.

iii. Using duration approximation, what is the change in the value of the portfolio if the yield curve shifts upwards by 100 basis points? And if it shifts upwards by 10 basis points? In which of the two cases the approximation will be more exact and why?

Part d. (3 points)

You hold a bond portfolio with a duration D and convexity C. The current zero curve is flat at 5%. Construct a portfolio of zero coupon bonds with maturities of 1, 2 and 3 years that match the duration and the convexity of your portfolio. Solve analytically for the weights of the new zero coupon bond portfolio.

Part e. (2 points)

Although the expectations of increases in future interest rates can result in an upward sloping yield curve; an upward sloping yield curve does not in and of itself imply the expectations of higher future interest rates. Explain.

Question 4: Option Pricing (15 points)

Part a. (7 points)

You are evaluating a stock that is currently selling for 60 per share. Over the investment period of 1 year you think that the stock price might get as low as 50 or as high as 80. There is a call option available on the stock with an exercise price of 70. The annual interest rate is 8%. Answer the following questions about hedging your position in the stock. Assume that you will buy one share.

i. What is the hedge ratio (Hint: use the option pay-offs and the stock prices for the high and the low scenarios)?

ii. How much would you borrow to purchase the stock? (Hint: make sure the value of your stock portfolio at the end of the holding period is non-negative)

iii. What is the amount of your net investment in the stock?

iv. Complete the table below to show the value of your stock portfolio at the end of the holding period.

	Low Stock Price	**High Stock Price**
Value of Stock at Year End		
Repayment of Loan		
Total		

v. How many call options will you combine with the stock to construct the perfect hedge? Will you buy the calls or sell the calls?

vi. Show the option values in the table below.

	Low Stock Price	**High Stock Price**
Value of Call Position		

vii. Show the net payoff to your portfolio in the table below.

	Low Stock Price	**High Stock Price**
Value of Stock at Year End		
Value of Call Position		
Total		

viii. What must the price of one call option be?

Part b. (3 points)

Discuss the relationship between option prices and time to expiration, volatility of the underlying stocks, and the exercise price.

Part c. (5 points)

Construct an options strategy that allows an investor to benefit from large upward or downward price moves of the underlying asset, while limiting his losses otherwise. Assume that the current price is 40 and that the investor aims at limiting his loss to 2 when the price of the underlying moves by 5% in either direction. For higher price volatility the investor wants to assure an upward potential. The premium for both a put and a call is 1.

What options will you use to construct such a strategy? Specify type and strike price.

Draw a profit diagram of the option strategy, considering the premium paid or received for the options.