vrije Universiteit amsterdam

Faculty of Economics and Business Administration

Exam:	Investments 3.4
Code:	E_BE3_INV
Examinator:	Dr. Teodor Dyakov
Co-reader:	Dr. Tanja Artiga Gonzalez
Date:	March 21, 2016
Time:	8.45
Duration:	2 hours and 45 minutes
Calculator allowed:	Yes
Graphical calculator allowed:	Yes
Number of questions:	30 multiple choice questions and 4 open-ended questions
Type of questions:	Open questions / multiple choice questions
Answer in:	English

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

Credit score:	You can receive between 0 and 9 points for the exam.
Grades:	The grades will be made public on: Wednesday, March 30 2016.
Inspection:	Friday, April 1 2016 at 09.00. Room number: to be announced on bb.
Number of pages:	12 (including front page)

Good luck!

PART 1 (MULTIPLE CHOICE QUESTIONS; 30 questions providing 5 points at maximum)

Read the questions and answers carefully and write down your answer on your answer sheet. Your final score is determined as (number of correct answers - 4)*5/26. Negative scores for this part of the exam are set to zero.

PART 2 (OPEN QUESTIONS; 4 questions providing 4 points at maximum)

1. When a distribution is negatively skewed, _____.
A. standard deviation overestimates risk
B. standard deviation correctly estimates risk
C. standard deviation underestimates risk
D. the tails are fatter than in a normal distribution
E. the tails are skinnier than in a normal distribution

2. A reward-to-volatility ratio is useful in:
A. measuring the standard deviation of returns.
B. understanding how returns increase relative to risk increases.
C. analyzing returns on variable rate bonds.
D. assessing the effects of inflation.
E. None of these is correct.

3. When borrowing and lending at a risk-free rate are allowed, which Capital Allocation Line (CAL) should the investor choose to combine with the efficient frontier?
I) The one with the highest reward-to-variability ratio.
II) The one that will maximize his utility.
III) The one with the steepest slope.
IV) The one with the lowest slope.
A. I and III
B. I and IV
C. II and IV
D. I only
E. I, II, and III

4. The standard deviation of a two-asset portfolio is a linear function of the assets' weights when
A. the assets have a correlation coefficient less than zero.
B. the assets have a correlation coefficient equal to zero.
C. the assets have a correlation coefficient greater than zero.
D. the assets have a correlation coefficient equal to one.
E. the assets have a correlation coefficient less than one.

5. The index model has been estimated for stocks A and B with the following results:
$R_A = 0.01 + 0.8R_M + e_A$
$R_B = 0.02 + 1.1R_M + e_B$
$\sigma_M = 0.30$ $\sigma(e_A) = 0.20$ $\sigma(e_B) = 0.10$
The covariance between the returns on stocks A and B is _____.
A. 0.0384
B. 0.0406
C. 0.1920
D. 0.0050
E. 0.0792

6. Your opinion is that security A has an expected rate of return of 0.145. It has a beta of 1.5. The risk-free rate is 0.04 and the market expected rate of return is 0.11. According to the Capital Asset Pricing Model, this security is
A. underpriced.
B. overpriced by more than 2%.
C. fairly priced.
D. cannot be determined from data provided.
E. overpriced by less than 2%.

7. The CAPM applies to
A. portfolios of securities only.
B. individual securities only.
C. efficient portfolios of securities only.
D. efficient portfolios and efficient individual securities only.
E. all portfolios and individual securities.

8. In the APT model, what is the nonsystematic standard deviation of an equally-weighted portfolio that has an average value of $\sigma(e_i)$ equal to 20% and 20 securities?
A. 12.5%
B. 625%
C. 4.47%
D. 3.54%
E. 14.59%

9. Google has a beta of 1.0. The annualized market return yesterday was 11%, and the risk-free rate is currently 5%. You observe that Google had an annualized return yesterday of 14%. Assuming that markets are efficient, this suggests that
A. bad news about Google was announced yesterday.
B. good news about Google was announced yesterday.
C. no news about Google was announced yesterday.
D. interest rates rose yesterday.
E. interest rates fell yesterday.

10. Errors in information processing can lead investors to misestimate _____.
A. true probabilities of possible events and associated rates of return
B. only occurrences of possible events
C. only possible rates of return
D. the effect of accounting manipulation
E. fraud

11. Tests of the CAPM that use regression techniques are subject to inaccuracies because
A. the statistical results used are almost always incorrect.
B. the slope coefficient of the regression equation is biased downward.
C. the slope coefficient of the regression equation is biased upward.
D. the intercept of the regression equation is biased downward.
E. the intercept of the regression equation is equal to the risk-free rate.

The following data are available relating to the performance of Long Horn Stock Fund and the market portfolio:

	Long Horn	Market Portfolio
Average Return	19%	12%
Standard Deviation of Returns	35%	15%
Beta	1.5	1.0
Residual standard deviation	3.0%	0.0%

The risk-free return during the sample period was 6%.

12. What is the Treynor measure of performance evaluation for Long Horn Stock Fund?
A. 1.33%
B. 4.00%
C. 8.67%
D. 31.43%
E. 37.14%

13. Calculate the information ratio for Long Horn Stock Fund.
A. 1.33
B. 4.00
C. 8.67
D. 31.43
E. 37.14

14. _____ uses quantitative techniques and often automated trading systems to seek out many temporary misalignments among securities.
A. Covered interest arbitrage
B. Locational arbitrage
C. Triangular arbitrage
D. Statistical arbitrage
E. All arbitrage

15. The yield to maturity on a bond is _____.
A. below the coupon rate when the bond sells at a discount, and equal to the coupon rate when the bond sells at a premium
B. the discount rate that will set the present value of the payments equal to the bond price
C. based on the assumption that any payments received are reinvested at the coupon rate
D. None of these are correct.
E. the discount rate that will set the present value of the payments equal to the bond price, and based on the assumption that any payments received are reinvested at the coupon rate.

16. Consider a 5-year bond with a 10% coupon that has a present yield to maturity of 8%. If interest rates remain constant, one year from now the price of this bond will be _____.
A. higher
B. lower
C. the same
D. cannot be determined
E. $1,000

Par Value	$1,000
Time to Maturity	18 years
Coupon	9% (paid annually)
Current Price	$917.99
Yield to Maturity	10%

17. Given the bond described above, if interest were paid semi-annually (rather than annually), and the bond continued to be priced at $917.99, the resulting effective annual yield to maturity would be:
A. Less than 10%
B. More than 10%
C. 10%
D. Cannot be determined
E. None of these is correct.

18. An inverted yield curve is one
A. with a hump in the middle.
B. constructed by using convertible bonds.
C. that is relatively flat.
D. that plots the inverse relationship between bond prices and bond yields.
E. that slopes downward.

The following is a list of prices for zero coupon bonds with different maturities and par value of $1,000.

Maturity (Years)	Price
1	$925.16
2	$862.57
3	$788.66
4	$711.00

19. What is the price of a 4-year maturity bond with a 10% coupon rate paid annually? (Par value = $1,000)
A. $742.09
B. $1,222.09
C. $1,035.66
D. $1,141.84
E. None of these is correct.

20. The duration of a 20-year zero-coupon bond is
A. equal to 20.
B. larger than 20.
C. smaller than 20.
D. equal to that of a 20-year 10% coupon bond.
E. None of these is correct.

21. Which of the following bonds has the longest duration?
A. A 12-year maturity, 0% coupon bond.
B. A 12-year maturity, 8% coupon bond.
C. A 4-year maturity, 8% coupon bond.
D. A 4-year maturity, 0% coupon bond.
E. Cannot tell from the information given.

22. One of the problems with immunization are
A. duration assumes that the yield curve is not flat.
B. duration assumes that if shifts in the yield curve occur, these shifts are parallel.
C. immunization is valid for multiple interest rate changes.
D. durations and horizon dates do not change by the same amounts with the passage of time.
E. duration assumes that students taking Investments 3.4 will all receive a grade of 10.

23. Speculators buying put options anticipate the value of the underlying asset will _____ and speculators selling call options anticipate the value of the underlying asset will _____.
A. increase; increase
B. decrease; increase
C. increase; decrease
D. decrease; decrease
E. cannot tell without further information

24. A collar with a net outlay of approximately zero is an options strategy that
A. combines a put and a call to lock in a price range for a security.
B. uses the gains from sale of a call to purchase a put.
C. uses the gains from sale of a put to purchase a call.
D. combines a put and a call to lock in a price range for a security and uses the gains from sale of a call to purchase a put.
E. combines a put and a call to lock in a price range for a security and uses the gains from sale of a put to purchase a call.

25. If the hedge ratio for a stock call is 0.70, the hedge ratio for a put with the same expiration date and exercise price as the call would be _____.
A. 0.70
B. 0.30
C. -0.70
D. -0.30
E. -.17

26. The intrinsic value of an out-of-the-money call option is equal to
A. the call premium.
B. zero.
C. the stock price minus the exercise price.
D. the striking price.
E. None of these is correct.

27. The Black-Scholes formula assumes that
I) the risk-free interest rate is constant over the life of the option.
II) the stock price volatility is constant over the life of the option.
III) the expected rate of return on the stock is constant over the life of the option.
IV) there will be no sudden extreme jumps in stock prices.
A. I and II
B. I and III
C. II and II
D. I, II and IV
E. I, II, III, and IV

28. Which of the following is **true** about profits from futures contracts?
A. The person with the long position gets to decide whether to exercise the futures contract and will only do so if there is a profit to be made.
B. It is possible for both the holder of the long position and the holder of the short position to earn a profit.
C. The clearinghouse makes most of the profit.
D. The amount that the holder of the long position gains must equal the amount that the holder of the short position loses.
E. Holders of short positions can recognize profits by making delivery early.

29. Suppose that the risk-free rates in the United States and in the Canada are 5% and 3%, respectively. The spot exchange rate between the dollar and the Canadian dollar (C$) is $0.80/C$. What should the futures price of the C$ for a one-year contract be to prevent arbitrage opportunities, ignoring transactions costs.
A. $1.00/ C$
B. $0.82/ C$
C. $0.88/ C$
D. $0.78/ C$
E. $1.22/ C$

30. Credit risk in the swap market
A. is extensive.
B. is limited to the difference between the values of the fixed rate and floating rate obligations.
C. is equal to the total value of the payments that the floating rate payer was obligated to make.
D. is extensive and is equal to the total value of the payments that the floating rate payer was obligated to make.
E. None of these is correct.

PART 2 (OPEN QUESTIONS; 4 questions providing 4 points at maximum)

Read the questions and answers carefully and write down your answer on your answer sheet.

Question 1. Equilibrium Pricing Models (1 point at maximum)

Part a. (0.3 points)

You have a sample of n stocks with returns $r_{\{i,t\}}$ and the periodic risk free rate is given by $r_{\{f,t\}}$. You want to test some of the implications of the CAPM using the following regression:

$$\widehat{r_i - r_f} = \gamma_0 + \gamma_1 * \beta_i + \gamma_2 * \sigma^2(\epsilon_i)$$

where $i = 1, \dots, n$ and $\widehat{r_i - r_f}$ is the average excess return on stock i, β_i is stock i's beta coefficient, and $\sigma^2(\epsilon_i)$ is the variance of stock i's non-systematic component.

i. The above equation is known as a second-pass regression equation. Give the equation of the first-pass regression. Is the first pass-regression run per stock (one time-series regression per stock), or is it run over all stocks (one panel regression using the information for all stocks? Which of the output from the first-pass regression is used for the second-pass regression given above?

ii. State the hypotheses concerning the gamma coefficients if the CAPM is valid. Explain.

Part b. (0.3 points)

Discuss the similarities and the differences between the CAPM and the APT with regard to the following factors: capital market equilibrium, assumptions about risk aversion, risk-return dominance, and the number of investors required to restore equilibrium.

Part c. (0.4 points)

Consider the multifactor APT. There are two independent economic factors, F1 and F2.The risk-free rate of return is 3%. The following information is available about two well-diversified portfolios A and B:

Portfolio	beta on F1	beta on F2	expected return	variance
A	1	0.5	7%	13%
B	0	1	6%	12%

i. Assuming no arbitrage opportunities exist, calculate the risk premia on the two 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 and B that has exposure of 0.7 to F2. What are the weights of the two portfolios A and B? What is the exposure to F1 of the newly created portfolio?

Question 2. Portfolio Construction and Performance Measurement (1 point at maximum)

Part a. (0.3 points)

You solve a portfolio allocation problem, including a number of risky assets and a risk-free rate. You've found the optimal mix of risky assets. Further, you've showed the optimal proportion of the portfolio of risky assets in the complete portfolio is given by the equation:

$$w^* = \frac{E[r_E] - r_f}{A\sigma_E^2}$$

For each of the variables on the right side of the equation, discuss the impact of the variable's effect on w* and why the nature of the relationship makes sense intuitively. Assume the investor is risk averse.

Part b. (0.3 points)

You are evaluating the market timing ability of a portfolio manager. In order to do so, you use the following regression equation:

$$r_P - r_f = a + b\left(r_M - r_f\right) + c\left(r_M - r_f\right)^2 + e_P$$

where r_p is the return of the portfolio, r_f is the risk-free rate, r_m is the market return and e_p is the error term.

i. How would you test for the market timing ability of the manager, using the above regression equation? Provide a graphical interpretation.

ii. How would you define an ideal situation of perfect foresight, (using a graphical interpretation). Hint: think of a derivative instrument.

Part c. (0.4 points)

Consider two perfectly negatively correlated risky securities X and Z. X has an expected rate of return of 10% and a standard deviation of 15%, and Z has an expected return of 5% and a standard deviation of 7%. You want to construct a portfolio out of the two securities that has as small variance as possible.

i. What is the formula for the variance of the portfolio?

ii. What is the variance of the portfolio?

iii. What proportions of X and Z should you hold in the portfolio?

iv. What is the expected return of the portfolio?

Question 3. Fixed Income (1 point at maximum)

Part a. (0.3 points)

Consider the following forward rates: $f_1 = 1\%$, $f_2 = 2\%$, and $f_3 = 3\%$.

i. Express the prices of zero-coupon bonds with maturities of 1, 2, and 3 years using the forward rates. The face value of each bond is 1000 euro. Solve for them.
ii. Explain how you can obtain the zero-yield curve, using the forward rates. That is, provide the formulas for computing the yields of zero-coupon bonds with maturities 1, 2, 3.

iii. Calculate the yield curve

iv. Comment on the shape of the derived yield curve. Based on the expectations and liquidity preference theories, do you expect an increase in interest rates?

Part b. (0.4 points)

Continue using the data provided in Part a. You are now offered to enter in the following agreement: lend 20000 euro to a financial company at the start of year 3 at 5% interest rate for a period of 1 year.

i. What is the value of the agreement today? How do you obtain the value?

ii. What are the cash-flows of the agreement (now (beginning of year 1), at the end of year 1, 2 and 3)? How can you hedge this agreement today? (Hint: use zero-coupon bonds). Give the portfolio for the hedging strategy and its cash-flows.

Part c. (0.3 points)

What does credit risk mean in the context of bond pricing? Which agencies assess the credit risk of bond issuers? Explain briefly the rating scheme employed by those agencies.

Question 4. Derivatives (1 point at maximum)

Part a. (0.3 points)

State the put-call parity. Why is it called in such a way? Derive the put-call parity, using two options strategies that provide the same payoffs.

Part b. (0.4 points)

You hold a portfolio of 56 million euro with a beta of 0.75 on the AEX. You expect that the AEX will drop by 2.5% over the next one year. You decide to hedge the AEX exposure of your portfolio with index futures with expiration of one year. The contract multiplier is 200 and the current value of the AEX is 420.

i. Do you buy or sell index futures in order to hedge your position?

ii. What is the projected loss on your portfolio (in euro), if you do not hedge?

iii. How much would each index future contract change in value for the projected 2.5% drop in the AEX?

iv. What is the hedge ratio, i.e. how many future contracts do you need for a perfect hedge?

Part c. (0.3 points)

Consider a stock with a current price of 120 euro. Further, consider a binomial tree for the evolution of the price of the stock over the period of 1 year, assuming two steps (t=0, t=1, t=2). At each nod, the price can go up by a factor of 1.1, or go down by a factor of 0.95. The **annual** risk free rate is 1%.

i. Draw the binomial tree for (t=0, t=1, t=2)

ii. Calculate the risk-neutral probabilities of an upward movement and that of a downward movement. Do they differ at each nod of the tree and why?

iii. Suppose you consider buying plain vanilla in the money call options that expire in 1 year. Compute the price of such an option with a strike price of 110 euro.