vrije Universiteit amsterdam

Faculty of Economics and Business Administration

Exam:	Investments 3.4
Code:	E_BE3_INV
Examinator:	Dr. Teodor Dyakov
Co-reader:	Dr. Katka Lucivjanska
Date:	May 17, 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, May 25 2016.
Inspection:	Friday, May 27 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.

1. The Capital Allocation Line can be described as the
A. investment opportunity set formed with a risky asset and a risk-free asset.
B. investment opportunity set formed with two risky assets.
C. line on which lie all portfolios that offer the same utility to a particular investor.
D. line on which lie all portfolios with the same expected rate of return and different standard deviations.
E. investment opportunity set formed with multiple risky assets.

2. The utility score an investor assigns to a particular portfolio, other things equal,
A. will decrease as the rate of return increases.
B. will decrease as the standard deviation decreases.
C. will decrease as the variance decreases.
D. will increase as the variance increases.
E. will increase as the rate of return increases.

3. Security X has expected return of 14% and standard deviation of 22%. Security Y has expected return of 16% and standard deviation of 28%. If the two securities have a correlation coefficient of 0.8, what is their covariance?
A. 0.038
B. 0.049
C. 0.018
D. 0.013
E. 0.054

4. Consider the single-index model. The alpha of a stock is 0%. The return on the market index is 10%. The risk-free rate of return is 5%. The stock earns a return that exceeds the risk-free rate by 5% and there are no firm-specific events affecting the stock performance. The β of the stock is _____.
A. 0.67
B. 0.75
C. 1.0
D. 1.33
E. 1.50

5. An overpriced security will plot
A. on the Security Market Line.
B. below the Security Market Line.
C. above the Security Market Line.
D. either above or below the Security Market Line depending on its covariance with the market.
E. either above or below the Security Market Line depending on its standard deviation.

6. According to the CAPM, the risk premium a student taking Investments 3.4 expects to receive on any stock or portfolio increases:
A. inversely with beta.
B. inversely with alpha.
C. positively with beta.
D. positively with his/her grade in Investments 3.4.
E. in proportion to the stock's (portfolio's) standard deviation.

7. In a well-diversified portfolio
A. market risk is negligible.
B. systematic risk is negligible.
C. unsystematic risk is negligible.
D. nondiversifiable risk is negligible.
E. risk does not exist.

8. In the APT model, what is the nonsystematic standard deviation of an equally-weighted portfolio that has an average value of $\sigma(ei)$ equal to 25% and 50 securities?
A. 12.5%
B. 625%
C. 0.5%
D. 3.54%
E. 14.59%

9. Company XYZ just announced yesterday that its first quarter sales were 35% higher than last year's first quarter. You observe that XYZ had an abnormal return of -2% yesterday. This suggests that
A. the market is not efficient.
B. XYZ stock will probably rise in value tomorrow.
C. investors expected the sales increase to be larger than what was actually announced.
D. investors expected the sales increase to be smaller than what was actually announced.
E. earnings are expected to decrease next quarter.

10. According to proponents of the efficient market hypothesis, the best strategy for a small investor with a portfolio worth €10,000 is probably to
A. perform fundamental analysis.
B. exploit market anomalies.
C. keep his/her money under the mattress.
D. invest in derivative securities.
E. invest in mutual funds.

11. An example of _____ is that a person may reject an investment when it is posed in terms of risk surrounding potential gains but may accept the same investment if it is posed in terms of risk surrounding potential losses.
A. framing
B. regret avoidance
C. overconfidence
D. conservatism
E. None of these is correct.

12. Tests of multifactor models indicate that
A. the single-factor model has better explanatory power in estimating security returns.
B. macroeconomic variables have no explanatory power in estimating security returns.
C. it may be possible to hedge some economic factors that affect future consumption risk with appropriate portfolios.
D. multifactor models do not work.
E. None of these is correct.

13. Consider the regression equation: $r_i - r_f = g_0 + g_1 b_i + g_2 s^2(e_i) + e_{it}$ where: $r_i - r_t$= the average difference between the monthly return on stock **i** and the monthly risk-free rate; b_i= the beta of stock **I;** $s^2(e_i)$ = a measure of the nonsystematic variance of the stock **i.** If you estimated this regression equation and the CAPM was valid, you would expect the estimated coefficient g_2 to be
A. 0.
B. 1.
C. equal to the risk-free rate of return.
D. equal to the average difference between the monthly return on the market portfolio and the monthly risk-free rate.
E. 3.14.

14. If an investor has a portfolio that has constant proportions in T-bills and the market portfolio, the portfolio's characteristic line will plot as a line with _____; if the investor can time bull markets, the characteristic line will plot as a line with _____.
A. a positive slope; a negative slope
B. a negative slope; a positive slope
C. a constant slope; a negative slope
D. a negative slope; a constant slope
E. a constant slope; a positive slope

15. Hedge fund performance may reflect significant compensation for _____ risk.
A. liquidity
B. systematic
C. unsystematic
D. idiosyncratic
E. human capital

16. A zero-coupon bond has a yield to maturity of 11% and a par value of $1,000. If the bond matures in 27 years, the bond should sell for a price of _____ today.
A. $59.74
B. $501.87
C. $513.16
D. $483.49
E. None of these is correct.

17. What is the relationship between the price of a straight bond and the price of a callable bond?
A. The straight bond's price will be higher than the callable bond's price for low interest rates.
B. The straight bond's price will be lower than the callable bond's price for low interest rates.
C. The straight bond's price will change as interest rates change, but the callable bond's price will stay the same.
D. The straight bond and the callable bond will have the same price.
E. There is no consistent relationship between the two types of bonds.

18. Forward rates _____ future short rates because _____.
A. are equal to; they are both extracted from yields to maturity.
B. are equal to; they are perfect forecasts.
C. differ from; they are imperfect forecasts.
D. differ from; forward rates are estimated from dealer quotes while future short rates are extracted from yields to maturity.
E. are equal to; although they are estimated from different sources they both are used by traders to make purchase decisions.

19. According to the expectations hypothesis, an upward sloping yield curve implies that
A. interest rates are expected to remain stable in the future.
B. interest rates are expected to decline in the future.
C. interest rates are expected to increase in the future.
D. interest rates are expected to decline first, then increase.
E. interest rates are expected to increase first, then decrease.

20. The duration of a bond normally increases with an increase in
A. term to maturity.
B. yield to maturity.
C. coupon rate.
D. All of these are correct.
E. None of these is correct.

21. Holding other factors constant, the interest-rate risk of a coupon bond is lower when the bond's:
A. term-to-maturity is higher.
B. coupon rate is lower.
C. yield to maturity is higher.
D. term-to-maturity is higher and coupon rate is lower.
E. All of these are correct.

22. Holding other factors constant, which one of the following bonds has the smallest price volatility?
A. 20-year, 0% coupon bond
B. 20-year, 6% coupon bond
C. 20 year, 7% coupon bond
D. 20-year, 9% coupon bond
E. Cannot tell from the information given.

23. You took a short position in three S&P 500 futures contracts at a price of 900 (the contract multiplier is 250) and closed the position when the index futures was 885, you incurred:
A. a gain of $11,250.
B. a loss of $11,250.
C. a loss of $3750.
D. a gain of $3750.
E. None of these is correct.

24. One reason swaps are desirable is that
A. they are free of credit risk.
B. they have no transactions costs.
C. they increase interest rate volatility.
D. they increase interest rate risk.
E. they offer participants easy ways to restructure their balance sheets.

25. Before expiration, the time value of a call option is equal to
A. zero.
B. the actual call price minus the intrinsic value of the call.
C. the intrinsic value of the call.
D. the actual call price plus the intrinsic value of the call.
E. None of these is correct.

26. To the option holder, put options are worth _____ when the exercise price is higher; call options are worth _____ when the exercise price is higher.
A. more; more
B. more; less
C. less; more
D. less; less
E. It doesn't matter - they are too risky to be included in a reasonable person's portfolio.

27. The hedge ratio of an option is also called the options _____.
A. alpha
B. beta
C. sigma
D. delta
E. rho

28. The buyer of an American call option on a non-dividend paying stock will
A. always exercise the call as soon as it is in the money.
B. only exercise the call when the stock price exceeds the previous high.
C. never exercise the call early.
D. buy an offsetting put whenever the stock price drops below the strike price.
E. None of these is correct.

29. To hedge a short position in Treasury bonds, an investor most likely would
A. ignore interest rate futures.
B. buy S&P futures.
C. buy interest rate futures.
D. sell Treasury bonds in the spot market.
E. None of these is correct.

30. Who guarantees that a futures contract will be fulfilled?
A. the buyer
B. the seller
C. the broker
D. the clearinghouse
E. nobody

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)

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. (0.3 points)

Consider the multifactor APT. There are two independent economic factors, F1 and F2.The risk-free rate of return is 2%. The following information is available about two well-diversified portfolios A and B:

Portfolio	beta on F1	beta on F2
A	0.8	0.3
B	0	1

In addition, the following information is available for the two independent risk factors F1 and F2

Factors	Expected return	Variance
F1	5%	0.11
F2	4%	0.08

i. Assuming no arbitrage opportunities exist, calculate the expected return of the two portfolios A and B

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 portfolios, given the data above.

iii. Construct a portfolio of A and B that has exposure of 0.5 to F_2. What are the weights of the two portfolios A and B? What is the exposure to F_1 of the newly created portfolio?

Part c. (0.4 points)

Consider the Carhart 4-factor model, which is an extension of the Fama-French 3-factor model:

$$r_i = \alpha_i + \beta_i r_M + \gamma_i SMB + \delta_i HML + \kappa_i MOM + e_i$$

where r_i is the return of a stock i, r_M is the market return, SMB is a factor that proxies for size, HML – for value, and MOM – for momentum. The variances of the four factors are respectively σ^2_M, σ^2_{SMB} , σ^2_{HML}, and σ^2_{MOM} . The variance of the idiosyncratic source of risk is σ^2(e) for all stocks i. Assume that the idiosyncratic sources of risk are uncorrelated, and that the factors are uncorrelated as well.

Now consider three stocks (i={1, 2,3}).

i. Give an expression for the systematic risk of each of the three stocks.

ii. Construct an equally weighted portfolio of the three stocks. What is its non-systematic risk component? Compare it to the non-systematic risk component of the individual stocks.

iii. Construct a portfolio out of the three stocks that has exposure of 1 to the Size factor and an exposure of 0.5 to the Value factor. Provide the system of equations to be used to solve for the weights. You do not need to find the explicit solution for the weights.

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

Part a. (0.3 points)

Discuss the characteristics of indifference curves, and the theoretical value of these curves in the portfolio building process.

Part b. (0.3 points)

Theoretically, the standard deviation of a portfolio consisting of two equities can be reduced to what level? Explain. Realistically, is it possible to reduce the standard deviation to this level? Explain.

Part c. (0.4 points)

You want to evaluate three mutual funds. The market return is 11% and the risk free rate is 3%.

Below is the data for three funds.

Fund	Average Return	Standard Deviation	Beta
A	13%	14%	1.1
B	11%	12%	1
C	8%	9%	0.8

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

ii. As an investor, would you prefer your fund to have higher or lower scores on these three measures? Why?

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

iv. Rank the funds from best performing to worst performing, based on your analysis.

Question 3. Fixed Income (1 point at maximum)

Part a. (0.3 points)

Explain what the following terms mean: spot rate, short rate, and forward rate. Which of these is (are) observable today?

Part b. (0.5 points)

Consider the data on the following three coupon bonds:

Bond	Maturity	Coupon	Yield	Face Value
A	2	0.07	0.02	100
B	3	0.06	0.03	100
C	4	0.04	0.04	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 3 bonds of type A, 4 bonds of type B, 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 downwards by 100 basis points? And if it shifts downwards by 10 basis points? In which of the two cases the approximation will be more exact and why?

Part c. (0.2 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. Derivatives (1 point at maximum)

Part a. (0.2 points)

Discuss the relationship between option prices and a) volatility of the underlying stock, and b) the exercise price.

Part b. (0.3 points)

Consider a stock with a current price of 80 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 2%.

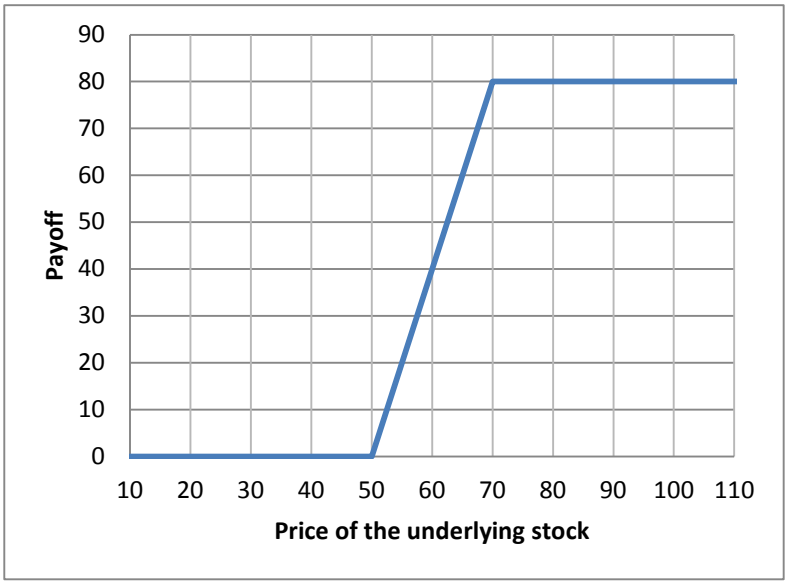
i. Draw the binomial tree for (t=0, t=1, t=2)

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 an **at the money** call option that expires in 1 year. What's the price today of that option?

Part c. (0.5 points)

The payoff of a collar strategy is given below.



Replicate the payoff using:

i. A combination of call options

ii. A combination of a cash account and put options