vrije Universiteit amsterdam

School of Business and Economics

Exam:	Investments
Code:	E_EBE3_INVES
Examinator:	Dr. Teodor Dyakov
Co-reader:	Dr. Jan Wrampelmeyer
Date:	05 July 2018
Time:	12:00
Duration:	2 hours and 45 minutes
Calculator allowed:	Yes
Graphical calculator allowed:	Yes
Number of questions:	20 multiple choice ones and 3 open-ended ones
Type of questions:	Open/ multiple choice
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:	3 points for the multiple-choice part and 4 points for the open-ended part
Grades:	The grades will be made public on: July 19
Inspection:	Friday, July 20 at 9.00. Room: TBA
Number of pages:	13 (including front page)

Good luck!

PART 1 (MULTIPLE CHOICE QUESTIONS; 20 questions providing 3 points at maximum)

Read the questions carefully and write down the answers on your answer sheet. Your final score is determined as (number of correct answers - 3)*3/17. Negative scores for this part of the exam are set to zero.

1. The measure of risk in a Markowitz efficient frontier is:
A. specific risk.
B. standard deviation of returns.
C. reinvestment risk.
D. beta.
E. unique risk.

Markowitz was interested in eliminating diversifiable risk (and thus lessening total risk) and thus was interested in decreasing the standard deviation of the returns of the portfolio.

2. Kurtosis is a measure of _____.
A. how fat the tails of a distribution are
B. the downside risk of a distribution
C. auto-correlation of returns
D. the dividend yield of the distribution
E. semi-strong form of market efficiency

3. If a portfolio had a return of 12%, the risk free asset return was 4%, and the standard deviation of the portfolio's excess returns was 25%, the Sharpe measure would be _____.
A. 0.12
B. 0.04
C. 0.32
D. 0.16
E. 0.25

(12-4)/25 = 0.32

4. Assume that a security is fairly priced according to the CAPM and has an expected rate of return of 17%. The market expected rate of return is 11% and the risk-free rate is 4%. The beta of the stock is ___.
A. 1.25.
B. 1.86.
C. 1.
D. 0.95.
E. 2.04.

17% = [4% +β(11% - 4%)]; 13% = β(7%); β = 1.86

5. Consider the Arbitrage Pricing Theory. If arbitrage opportunities are to be ruled out, each well-diversified portfolio's expected **excess** return must be
A. inversely proportional to the risk-free rate.
B. inversely proportional to its standard deviation.
C. proportional to its weight in the market portfolio.
D. proportional to its standard deviation.
E. proportional to its beta coefficient.

For each well-diversified portfolio (P and Q, for example), it must be true that $[E(r_p)-r_f]/\beta_p = [E(r_Q)-r_f]/\beta_Q$

6. Which of the following factors was NOT used by Fama and French in their three-factor model?
A. Excess return on the market.
B. Excess return of small stocks over large stocks.
C. Excess return of high book-to-market stocks over low book-to-market stocks.
D. Excess return of illiquid stocks over liquid stocks.
E. None of these factors were included in their model.

Fama and French included all three of the factors listed.

7. If you believe in the _____ form of the EMH, you believe that stock prices reflect all available information, including information that is available only to insiders.
A. semistrong
B. strong
C. weak
D. semistrong, strong, and weak
E. None of these are correct.

The strong form includes all public and private information.

8. According to Roll, the only testable hypothesis associated with the CAPM is
A. the number of ex post mean-variance efficient portfolios.
B. the exact composition of the market portfolio.
C. whether the market portfolio is mean-variance efficient.
D. the number of students that passed the retake exam of Investments 3.5
E. None of these is correct.

According to Roll, the only testable hypothesis about the CAPM is that the market portfolio is mean-variance efficient.

9. Studies of style analysis have found that _____ of fund returns can be explained by asset allocation alone.
A. between 50% and 70%
B. less than 10%
C. between 40 and 50%
D. between 75% and 90%
E. over 90%

Studies found that style explained 91.5% and as much as 97% of fund returns.

10. When testing whether the CAPM holds, one way to overcome the problem of measurement error is to:
A. group securities into portfolios.
B. use a three-stage regression methodology.
C. reduce the precision of beta estimates.
D. set alpha equal to one.
E. None of these is correct.

Black, Jensen and Scholes, in their landmark study, found that grouping securities into well-diversified portfolios significantly reduced measurement error.

11. When computing yield to maturity, the implicit reinvestment assumption is that the interest payments are reinvested at the:
A. Coupon rate.
B. Current yield.
C. Yield to maturity at the time of the investment.
D. Prevailing yield to maturity at the time interest payments are received.
E. The average yield to maturity throughout the investment period.

In order to earn the yield to maturity quoted at the time of the investment, coupons must be reinvested at that rate.

12. Given the yield on a 3-year zero-coupon bond is 7% and forward rates of 6% for year 1 and 6.5% for year 2, what must the forward rate for year 3 be?
A. 7.2%
B. 8.6%
C. 8.5%
D. 6.9%
E. None of these is correct.

$f3 = (1.07)^3/[(1.06)\ (1.065)] - 1 = 8.5\%$

13. Par value bond F has a modified duration of 9 and a price of €1000. Which one of the following statements regarding the bond is **true**?

A. If the market yield increases by 1% the bond's price will decrease by €90.
B. If the market yield increases by 1% the bond's price will increase by €90.
C. If the market yield increases by 1% the bond's price will decrease by €9.
D. If the market yield increases by 1% the bond's price will increase by €9.
E. None of these is true.

$\Delta P/P = -D^*\Delta y$; -€90 = -9(0.01) X €1,000

14. The intrinsic value of an in-the-money call option is equal to

A. the call premium.
B. zero.
C. the stock price minus the exercise price.
D. the strike price.
E. None of these is correct.

The fact that the owner of the option can buy the stock at a price less than the market price gives the contract a positive intrinsic value.

15. A portfolio consists of 225 shares of stock and 300 calls on that stock. If the hedge ratio for the call is 0.4, what would be the euro change in the value of the portfolio in response to a one euro decline in the stock price?

A. -€345
B. +€500
C. -€580
D. -€520
E. None of these is correct

-€225 + [-€300(0.4)] = -€345.

16. The price of a stock put option is _____ correlated with the stock price and _____ correlated with the striking price.

A. positively, positively
B. negatively, positively
C. negatively, negatively
D. positively, negatively
E. not, not

The lower the stock price, the more valuable the put option. The higher the striking price, the more valuable the put option.

17. If the company unexpectedly announces it will pay its first-ever dividend 3 months from today, you would expect that
A. the call price would increase.
B. the call price would decrease.
C. the call price would not change.
D. the put price would decrease.
E. the put price would not change.

As an approximation, subtract the present value of the dividend from the stock price and recompute the option value with this adjusted stock price. Since the stock price is lower, the option value will be lower.

18. With regard to futures contracts, what does the word "margin" mean?
A. It is the amount of the money borrowed from the broker when you buy the contract.
B. It is the maximum percentage that the price of the contract can change before it is marked to market.
C. It is the maximum percentage that the price of the underlying asset can change before it is marked to market.
D. It is a deposit made at the time of the contract purchase or sale.
E. It is an amount of money completely unrelated to the future's price at the time of purchase or sale.

The exchange guarantees the performance of each party, so it requires a good-faith deposit. This helps avoid the cost of credit checks.

19. If a trader holding a long position in corn futures fails to meet the obligations of a futures contract, the party that is hurt by the failure is
A. the offsetting short trader.
B. the corn farmer.
C. the clearinghouse.
D. the broker.
E. the commodities dealer.

The clearinghouse acts as a middle party to every transaction, and bears any losses arising from failure to meet contractual obligations.

20. Normal backwardation
A. maintains that for most commodities, there are no natural hedgers who desire to shed risk.
B. maintains that speculators will enter the short side of the contract only if the futures price is below the expected spot price.
C. assumes that risk premiums in the futures markets are based on systematic risk.
D. maintains that for most commodities, there are natural hedgers who desire to shed risk by entering a short position
E. has the same predictions regarding expected spot prices as Contango

PART 2 (OPEN QUESTIONS; 3 questions providing 4 points at maximum)

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

Question 1: Portfolio Construction and Asset Pricing (1.4 points)

Part a. (0.6 points)

You want to perform a performance attribution study on an actively managed fund. You select a benchmark portfolio, invested in three asset classes – equities, bonds, and cash (money market). Below are the weights and returns of the three asset classes in the benchmark portfolio:

Asset Class	Benchmark Weights	Return
Equities	0.7	7.00%
Bonds	0.2	5.00%
Cash	0.1	2.00%

Below are the actual allocations of the actively managed fund across the three asset classes, together with the fund's performance in each asset class:

Asset Class	Fund Weights	Return
Equities	0.8	7.00%
Bonds	0.2	6.00%
Cash	0.0	2.00%

i. Does your fund outperform or underperform the benchmark? If so, by how much?

Your portfolio outperforms the benchmark by 0.70%. See the answers to the two sub questions below for how the number is obtained.

ii. What is the contribution from asset allocation to the (excess) performance of the active fund? Explain how you obtain your answer.

The contribution amounts to 0.50%

Market	Actual Weight in Market	Benchmark Weight in Market	Active (Excess) Weight	Market Return	Contribution to Performance
Equities	0.8	0.7	0.1	7.00%	0.70%
Bonds	0.2	0.2	0	5.00%	0.00%
Cash	0	0.1	-0.1	2.00%	-0.20%
					0.50%

iii. What is the contribution from security selection to the (excess) performance of the active fund? Explain how you obtain your answer.

The contribution amounts to 0.20%

Market	Fund Perfomrnace	Index Performance	Excess Performance	Portfolio Weight	Contribution
Equities	0.07	7.00%	0.00%	0.80	0.00%
Bonds	0.06	5.00%	1.00%	0.20	0.20%
Cash	0.02	2.00%	0.00%	0.00	0.00%
					0.20%

Part b. (0.4 points)

Your boss asks you to create a portfolio that combines a mutual fund and investment in the safest government bonds. Assume the bond is risk-free. Describe the steps necessary to obtain the optional portfolio.

The investor may combine a risk-free asset (government bills or a money market mutual fund) and a risky asset, such as an indexed mutual fund in the proper portions to obtain the desired risk-return relationship for that investor. The investor must realize that the risk-return relationship is a linear one, and that in order to earn a higher return, the investor must be willing to assume more risk. The investor must first determine the amount of risk that he or she can tolerate (in terms of the standard deviation of the total portfolio, which is the product of the proportion of total assets invested in the risky asset and the standard deviation of the risky asset). One minus this weight is the proportion of total assets to be invested in the risk-free asset. The portfolio return is the weighted averages of the returns on the two respective assets. Such an asset allocation plan is probably the easiest, most efficient, and least expensive for the individual investor to build an optimal portfolio. A more concise explanation could also bring all points.

Part c. (0.4 points)

What is the problem with using the Sharpe measure for evaluation of an active portfolio management strategy?

The Sharpe measure penalizes for portfolio variance. If a portfolio is actively managed, the variance of returns is likely to vary considerably over any time period, thus reflecting poor performance as indicated by the Sharpe measure (unless the portfolio returns are much higher as a result of the active management). Another way to answer this question is by realizing that the denominator in the Sharpe ratio is portfolio's volatility, which is an imperfect description of risk when returns are not normally distributed.

Question 2: Fixed Income Securities (1.2 points)

Part a. (0.4 points)

Suppose that the term structure is upward sloping. One explanation relates to investors' expectation about future interest rates. However, an upward sloping yield curve does not in and of itself imply the expectations of higher future interest rates. What could then drive the shape of the term structure? Explain.

The effects of possible liquidity premiums confound any simple attempt to extract expectation from the term structure. That is, the upward sloping yield curve may be due to expectations of interest rate increases, or due to the requirement of a liquidity premium, or both. The liquidity premium could more than offset expectations of decreased interest rates, and an upward sloping yield would result.

Part b. (0.4 points)

Consider the data on the following two coupon bonds:

Bond	Maturity	Coupon	Yield	Face Value
A	2	5%	4%	1000
B	3	6%	8%	1000

Further assume that coupons are paid annually.

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

For bond A:

P_A = 5/1.04 + 1050/1.04^2 =1018.86
D_A = 1*50/1.07/1018.86 + 2*1050/1.07^2/1018.86 = 1.95
D_A* = 1.95/(1+0.07) = 1.88

You can easily follow the steps for the other two bonds

	Price	Duration	Modified Duration
Bond A	1018.86	1.95	1.88
Bond B	948.46	2.83	2.62

ii. Which of the two bonds is a premium bond, and which is a discount bond? Why?

Bond A is a premium bond as it trades above par, and bond B is a discount bond as it trades below par.

iii. Which of the two bonds is more sensitive to changes in interest rates?

Bond B as it has a higher duration.

Part c. (0.4 points)

Continue using the data from Question 2, Part b.

i. You have a portfolio consisting of a long position in 2 bonds of type A and 3 bonds of type B. Calculate the value, the duration, and the modified duration of the portfolio.

Value of the portfolio: 2*Pa+3*Pb = 4883.10
Weights of the portfolio: w_A = 2*Pa/4883.10= 0.42.

	Position	weights
Bond A	2	0.42
Bond B	3	0.58

Portfolio duration=wa*Da + wb*Db =2.46
Portfolio modified duration: D* = wa*D*a + wb*D*b =2.31

ii. 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 will the approximation be more exact and why?

100bp: deltaP/P = -2.31*0.01 = -0.23
10bp: deltaP/P = -0.02 (more exact as smaller yield change).

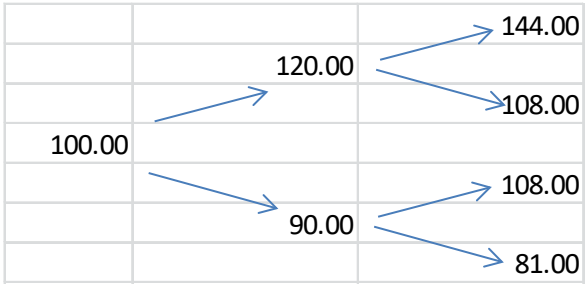
Question 3: Derivatives (1.4 points)

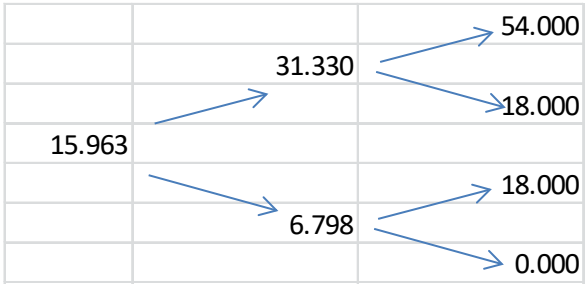
Part a. (0.5 points)

Consider a stock with a current price of 100 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). The stock does not pay any dividends. At each nod, the price can go up by a factor of 1.2, or go down by a factor of 0.9. The **annual** risk free rate is 3%.

i. You consider buying a European call option on the stock with a strike price of 90. Report the risk-neutral probabilities necessary to construct the value of the call today. Further calculate the price of the call.

Q=0.38





ii. Does the calculation of the value of the call require any information about the "true" probabilities of an upward or downward move of the underlying? Why?

No. Whatever the "true" probabilities are, we always replicate the payoff of the option. Thus, we don't require the knowledge of those true probabilities.

Part b. (0.4 points)

What is meant by implied volatility in the context of the Black-Scholes formulas? Why do implied volatilities from options on the same index, but different strike prices, exhibit a shape often called the *option smirk*?

Implied volatility is volatility in the Black-Scholes model for which the Black-Scholes model provides the same option price as the observed one. The option smirk appears when implied volatilities of options are decreasing with an increase in the exercise price. This is explained because large downward moves are more likely than what is implied by a normal distribution.

Part c. (0.5 points)

Explain how a firm that has issued €1 million of long-term bonds with a fixed 6% interest rate can convert its fixed-rate debt into floating-rate debt. Give two numerical examples of the floating rate that show the possible outcomes, one favorable and one unfavorable.

The firm can enter a swap arrangement, committing to pay .06*€1 million=€60,000 in exchange for receiving payments equal to €1 million times the EURIBOR rate (for instance). If the EURIBOR rate is 5, the cash outflow would be €1 million*.05=€50,000. The net cash flow would be €10,000 in this case, which is favorable. If the EURIBOR rate is 8%, the firm will have a cash outflow of €1million*.08=€80,000. The net cash flow in this case is -€20,000, which is unfavorable.