

Management V/Financial Management

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Final Exam – (11065)

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Solve 2 out of the 3 problems below. Each problem is worth up to 30 points.

If you solve more than 2 problems, the first two which appear on your answer sheets will be graded (so make sure to delete clearly and unambiguously what you don't want to be graded). The bold figures (in parentheses) indicate the maximum points per question.

The usage of textbooks, lecture notes, dictionaries, or programmable pocket calculators is not permitted. Notes on this exercise sheet will be disregarded during the grading. Give answers exclusively in your working sheets; leave a margin of 3cm.

Undecipherable scribbling will not be graded. Use the terminology and the mathematical tools presented in the lecture and the tutorial; make clear how you derive your results.

1. Suppose there are three equally likely scenarios for the economy: a recession, normal growth, and a boom. Consider an investment into a stock A (automotive) that yields a rate of return of -8% in a recession, 5% in a normal period, and 18% in a boom year. Consider as well an investment into stock B (gold) that provides a rate of return of 20% in a recession, 3% in a normal period, and -20% in a boom year. Assume a rational and risk-averse investor.

- Which of the two stocks is pro-cyclical, which is counter-cyclical? (1)
- Compare both investments in terms of average return and risk! (10)
- Is one of the stocks dominating the other? Why? (1)
- Suppose for now the probability of the recession or boom is 0.3, while the probability of a normal period is 0.4. Compute the variance of the returns of stock A and interpret the result. (4)
- Assume equal probabilities again. Suppose you invest 75% of your portfolio in automobiles and 25% in gold. Compute expected return and risk of this partially diversified portfolio, and compare it with your results under b)! (10)
- Assume the possibility to include a third stock into your portfolio. Which action would probably do the most to reduce portfolio risk: diversification into silver mining stocks, into car glass manufacturing stocks, or into pharmaceutical stocks? Why? (4)

2. The standard deviation of American Petroleum (AP) stock has been 25% over the last few years. AP's beta has been 0.8 (measured against FTSE stock market index in London). The corresponding risk measures for Morocco Airways (MA) amounted to 57% and 2.12.

- Which stock was riskier for an undiversified investor, and why? (4)
- Which stock was riskier for a diversified investor, and why? (4)

Assume a diversified investor owns a portfolio the beta of which amounts to 1.0, and is optimistic about MA's prospects. He has available €50,000 in cash, and wants to keep his portfolio beta at its current value. Thus, he invests the €50,000 in a combination of MA shares and secure Treasury bills.

- How much should he invest in MA shares? (6)

Assume now that €50,000 have already been invested in MA stock, which has an expected return of 9%. The market portfolio has an expected return of 10% and a standard deviation of 45%. Assume a risk-free interest rate of 4%.

- Write down the equation of the security market line. (8)
- Derive, under the assumptions of CAPM, the expected return and standard deviation of the best portfolio that has the same expected return as MA stock. (4)
- Derive, under the assumptions of CAPM, the expected return and standard deviation of the best portfolio that has the same volatility as MA stock. (4)

3. Today's price of stock X amounts to €50. The price in a year from now is predicted to be either €80 or €40. A stock option allows you to buy then at today's price. The interest rate for a one-year loan is $r=20\%$.

- What type of option is this? (2)
- Explain under which condition such an option will not be exercised. (2)
- Set up a table that shows the state-contingent payoffs for the stock and for the option. (4)
- Explain the idea of a "levered hedging portfolio" (LHP). (4)
- Use the state contingent payoffs to set up two equations that allow you to derive the LHP for the above option. (4)
- Derive the amount of stock needed for the LHP. (6)
- Derive the amount of credit that completes the LHP. (4)
- What is the option value today according to this method? (2)
- Why is it impossible to apply the net present value method here? (2)