Examination: 1904 – Securities Analysis **Winter Term 2007/2008**

Examiner: Prof. Dr. Peter Reichling

You are welcome to use non-programmable pocket calculators as well as English-language dictionaries without any markings. This examination comprises five problems (on three pages). All of the problems are to be solved. If you are not able to compute any values which are to be used in the following parts of a problem just assume some plausible (!) ones. We will then use your assumed values in correcting your exam. Always show your way of computation. There will be no points given for the pure result without any calculations. **Good luck!**

Examination Questions (Total Number of Points: 120)

Problem 1 (Bond Characteristics and Yields – 34 Points)

(a) Explain briefly the terms "callable bond" and "puttable bond". (4 points)
What is the difference between both kinds? (1 point)

(b) Suppose there are five coupon bonds with identical bond indenture regarding par value, coupon rates, and maturity. Bond 1 is a straight bond, bond 2 is a puttable bond, bond 3 is a subordinated bond, bond 4 is a collaterized bond, and bond 5 is a straight bond with a better rating than bond 1. State and explain briefly the price relation of

(i) bond 1 and bond 3 (3 points)

(ii) bond 1 and bond 4. (3 points)

State and explain briefly the yield relation of

(iii) bond 1 and bond 2 (3 points)

(iv) bond 1 and bond 5. (3 points)

(c) (i) Draw the relationship between interest rate and price of a straight bond in an appropriate diagram. (3 points)

(ii) Draw the interest rate-price-relationship for a bond that is identical to the straight bond but callable (par value 500€; callable at 115% of par value) in the same diagram. (3 points)

(d) Suppose a straight bond has a maturity of 3 years, a coupon rate of 5% p.a., and a par value of 100€. The current spot rates (p.a.) are assumed to be:

year	$t = 1$	$t = 2$	$t = 3$
spot rate	4.5%	4.9%	5.2%

(i) Compute the price of the bond in €. (2 points)

(ii) Write down the equation (with all known values) to calculate the yield to maturity. (You do not have to solve this equation!) (2 points)

(iii) Compute the yield to call if the considered bond is callable after year 2 at 104% of par value (assume that the price of the bond is identical to your result from part (i)). (4 points)

(iv) Explain the critical aspect of the yield to maturity. (3 points)

Problem 2 (Term Structure of Interest Rates, Forward Rates – 20 Points)

Suppose there are four zero-coupon bonds (ZB) on the market with the following characteristics:

ZB	Maturity (in years)	Par Value	Price
ZB1	1	1,000	968.99
ZB2	2	1,000	935.32
ZB3	3	1,000	900.64
ZB4	4	1,000	858.10

(a) Compute the term structure of interest rates (spot rates). (4 points)

(b) Compute the corresponding forward rates. (4 points)

(c) What are the values of the forward rates $f_{1,3}$ and $f_{2,4}$, i.e., the interest rate p.a. (fixed today) for an investment with maturity 2 years that starts in one year and two years, respectively. (4 points)

(d) Now suppose there are two coupon bonds (CB) with semiannual coupon payments and the following characteristics:

CB	Maturity (in years)	Par Value (in €)	Price (in €)	Coupon rate (p.a.)
CB1	1	100	102.70	8%
CB2	1	100	106.55	12%

Compute the forward rates for the first and the second 6-month period. (Hint: It might be helpful to substitute the discount factor $\frac{1}{1+f_{t_i,t_j}}$ by one variable d_{t_i,t_j}.) (8 points)

Problem 3 (Risk, Certainty Equivalent – 13 Points)

Suppose your utility function is $u(w) = \frac{1}{2} \cdot (3 \cdot w - 2)^{\frac{2}{3}}$ with w being a random money amount and the following prospect is offered to you: You can invest 1,000€ for one year in a risky prospect that generates a value of 1,200€ in state "Up" with a probability of prob(Up) = 0.6 and a value of 800€ in state "Down" with a probability of prob(Down) = 1 – prob(Up) = 0.4.

(a) Compute the mean and standard deviation of the prospect. (3 points)

(b) Compute your certainty equivalent and explain briefly whether you are risk averse, risk neutral or a risk lover. (4 points)

(c) Now suppose there is a second prospect available that offers a return of 3.5% p.a. with certainty. Which prospect would you prefer and why? (3 points)

(d) Are there investors (with other utility functions) that would prefer the prospect you have not chosen (in part (c))? If your answer is yes, write down a possible utility function of such an investor, if your answer is no, explain why such an investor does not exist. (3 points)

Problem 4 (Optimal Risky Portfolios – 28 Points)

Consider two stocks with the following characteristics:

Stock	μ_i	σ_i
A	12%	22%
B	9%	17%

Let the correlation coefficient of the returns of stock A and B be $\rho_{A,B} = 0.35$.

(a) Compute the expected return and standard deviation of the minimum variance portfolio (MVP). What are the fractions of the stocks in the MVP? (7 points)

(b) Compute the expected return and standard deviation of the tangent portfolio. Assume the risk-free interest rate for borrowing and lending to be 4%. What are the fractions of the stocks in the tangent portfolio? (21 points)

Problem 5 (Performance Measurement – 25 Points)

You are given the following data:

	January 05	January 06	January 07	January 08
ALL-DIT Stock Fund (prices in €)	76.65	103.91	122.54	129.83
DAX Market Index (prices in €)	4,254.85	5,674.15	6,789.11	7,719.25
12-month EURIBOR (risk-free rate, p.a.)	3.5%	3.5%	3.5%	3.5%

(a) Compute the TREYNOR measure, the SHARPE measure, and JENSEN's alpha for the ALL-DIT stock fund. What kind of fund performance is observed regarding the TREYNOR measure and the SHARPE measure? (21 points)

(b) Write down the formula to compute the appraisal ratio. What happens to the appraisal ratio of the fund when using your results from part (a). Explain the critical aspect of the appraisal ratio concerning rankings of different funds. (4 points)