



# Private Banking

## Mock Exam

Name: \_\_\_\_\_

Student ID number: \_\_\_\_\_

Signature: \_\_\_\_\_

- Write down your name and your student ID number on this cover page and sign.
- Check that your exam contains 7 numbered pages (including this cover page).
- You have 60 minutes to answer the following questions. You can receive up to 60 points, i.e., on average you should spend about 1 minute per point.
- You may answer all questions either in English or in German. Within each of the main questions, you should not switch languages.
- Use the indicated space to answer the questions. Write in a legible way and leave a margin of 3 cm. Raise your hand if you need additional answer sheets. Write down your name and your student ID number on all additional answer sheets.
- Only write on the front sides of the sheets. **Answers on the back sides will not be graded.**
- **Hand in all question and answer sheets** after the exam. If only parts of the question and answer sheets are submitted, this will be treated as an attempt of deception.
- You may use a **non-programmable pocket calculator** without a text memory function.
- Calculate with **4 digits after the decimal point** (including intermediate results).
- You are not allowed to carry **cell phones, smart phones, or other mobile devices** with you during the exam. Any device that you carry with you (no matter whether switched on or off) will be treated as an **attempt of deception**.

Good luck!

# 1 Performance Measurement and the CAPM (10 points)

(a) Assume you are asked to choose between an investment in Portfolio A and Portfolio B.

Portfolio	Observed $r$	Observed $\sigma$
A	0.65	0.35
B	0.50	0.25

- (i) Which portfolio would you choose based on the *Sharpe ratio*? Explain your answer. (2 points)
- (ii) Which portfolio would you choose based on the *differential return*? Explain your answer. (2 points)

Please make the following assumptions regarding the risk-free rate ( $r_f$ ), the expected return of the market portfolio ( $E[r_m]$ ), and the volatility of the market portfolio ( $\sigma_m$ ):

- $r_f = 0.05$
- $E[r_m] = 0.12$
- $\sigma_m = 0.2$

- (b) Briefly describe two approaches to measure the market risk premium in practice. (3 points)
- (c) Briefly discuss whether the relative ranking of different investment alternatives can be affected by the choice of the performance measure with which they are evaluated. (3 points)

## 2 Index Concepts and Index Calculation (15 points)

- (a) Briefly define *all share indices* and *selection indices*. To which of these do the DAX, the MDAX, and the SDAX belong? (5 points)
- (b) Assume the Share Index (SI) is formed by the three stocks X, Y, and Z. The respective weight of one share is calculated with regard to its relative market capitalization. Unlike the DAX calculation, there is no upper limit for the weights. Apart from that, the index is calculated according to the same rules that apply to the DAX. The base date of the index is  $t = 0$  with a base value of 1,000 points. At the last chaining date in  $t = 3$ , a chaining value of  $K_3 = 1.4$  has been calculated. Since then, neither dividend payments nor price-relevant capital adjustments have taken place.

Calculate the index value of the SI at the end of  $t = 4$  using the table stated below. Make sure to show how you arrive at your result, including all relevant steps. (10 points)

	X	Y	Z
Closing price before index inclusion in $t = 0$	€ 20.00	€ 15.00	€ 12.00
Number of shares before index inclusion in $t = 0$	300,000	400,000	200,000
Number of shares in $t = 3$	300,000	400,000	200,000
Number of free float shares in $t = 3$	150,000	200,000	100,000
Closing price in $t = 4$	€ 25.00	€ 20.00	€ 15.00

You are provided with the following formulas:

$$Index_t = K_T \cdot \frac{\sum_{i=1}^n (p_{i,t} \cdot ff_{i,T} \cdot q_{i,T} \cdot c_{i,t})}{\sum_{i=1}^n (p_{i,0} \cdot q_{i,0})} \cdot 1,000$$

$$Index_t = \frac{\sum_{i=1}^n p_{i,t} \cdot F_i}{A} \cdot 1,000$$

$$\text{with } A = \frac{\sum_{i=1}^n p_{i,0} \cdot q_{i,0} \cdot 100}{\sum_{i=1}^n q_{i,0}}$$

$$\text{and } F_i = K_T \cdot \frac{ff_{i,T} \cdot q_{i,T}}{\sum_{i=1}^n q_{i,0}} \cdot 100 \cdot c_{i,t}$$

$$K_{T+1} = \frac{Index_t}{Interim}$$

$$\text{with } Interim = \frac{\sum_{i=1}^n p_{i,t} \cdot ff_{i,T+1} \cdot q_{i,T+1}}{\sum_{i=1}^n p_{i,0} \cdot q_{i,0}} \cdot 1,000$$

$$c_{i,t} = \frac{p_{i,t-1}}{p_{i,t-1} - D_{i,t}} \cdot c_{i,t-1}$$

$$c_{i,t} = \frac{N_{i,t-1}}{N_{i,t}} \cdot c_{i,t-1}$$

$$c_{i,t} = \frac{p_{i,t-1}}{p_{i,t-1} - BR_{i,t-1}} \cdot c_{i,t-1}$$

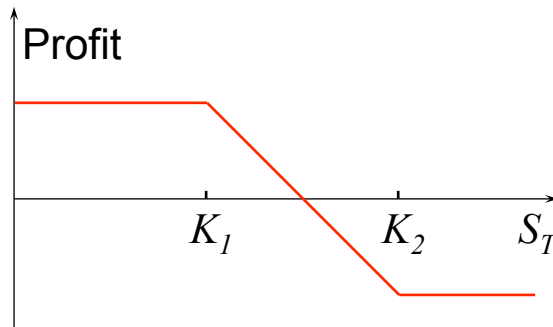
$$\text{with } BR_{i,t-1} = \frac{p_{i,t-1} - p_B - DN}{BV + 1}$$

$$c_{i,t} = \frac{1}{V_{i,t}} \cdot c_{i,t-1}$$

### 3 Financial Engineering

(15 points)

(a) Assume you are provided with the following profit diagram of a trading strategy.



- (i) Which trading strategy is represented by the profit diagram? Hint: Two put options are used for the construction of the product. (2 points)
  - (ii) Please calculate the payoffs of the two options and the resulting total profit when the price of the underlying at maturity ( $S_T$ ) is below  $K_1$ , between  $K_1$  and  $K_2$ , and higher than  $K_2$ . (6 points)
  - (iii) Which development of the underlying's price does an investor expect when purchasing this product? (2 points)
- (b) A call option with a strike price of \$60 costs \$6. A put option with the same strike price and expiration date costs \$4. Please calculate the profit (including costs) from a straddle when  $S_T > \$60$  and when  $S_T < \$60$ , where  $S_T$  is the price of the underlying stock at maturity. For what range of stock prices would the straddle lead to a loss? (5 points)



## 4 Private Banking in Practice

**(8 points)**

- (a) Briefly discuss why the currently low interest rate level puts private banks under strong margin pressure. (4 points)
- (b) Briefly discuss why the provision of private banking services has become increasingly costly over the last years. (4 points)

*Note: The questions above cover the content of a guest lecture. Guest lectures are relevant for the exam and change from year to year.*

## 5 Behavioral Finance

(12 points)

- (a) Briefly describe the *endowment effect*. How can prospect theory be used to explain the effect? (4 points)
- (b) Briefly describe the *availability bias*. What are the implications of the bias for the stock market? (4 points)
- (c) Using the following table, briefly describe the goal and the concept of *lifestyle funds* in the context of the asset allocation of retirement plan participants and discuss the empirical success of the concept. (4 points)

**Allocation of Contributions for a Plan Offering a Mix of Lifestyle Funds and Core Funds**

	<i>Participants in the Conservative Lifestyle Fund</i>	<i>Participants in the Moderate Lifestyle Fund</i>	<i>Participants in the Aggressive Lifestyle Fund</i>	<i>Participants NOT in any lifestyle fund</i>
Core funds	66%	55%	54%	100%
Conservative Lifestyle Fund	31	1	0	N.A.
Moderate Lifestyle Fund	3	42	4	N.A.
Aggressive Lifestyle Fund	0	2	42	N.A.
Total equity exposure (%)	77	80	89	78

*Note:* The table displays investment elections made by employees at a large 401(k) plan offering a choice among pre-mixed model portfolios (Conservative, Moderate, and Aggressive Lifestyle funds) and core funds (for example, an equity index fund). The table describes the average allocations of future contributions among the model portfolios and the core funds. The table also provides the total equity allocations for those investing in the various model portfolios as well as those not investing in any of the model portfolios.

Source: Benartzi and Thaler (2007)