

# FE312 Investments - Midterm Exam

NAME: \_\_\_\_\_ SECTION: \_\_\_\_\_

1. Please do not open this exam until directed to do so.
2. This exam is 75 minutes long.
3. Please write your name and section number on the front of this exam, and on any examination books you use.
4. Please show all work required to obtain each answer. Answers without justification will receive no credit.
5. State clearly any assumptions you are making.
6. This is a closed book exam. No books or notes are permitted. Calculators are permitted. Laptops are permitted but you are only allowed to use Excel and a blank worksheet.
7. Brevity is strongly encouraged on all questions.
8. The exam is worth 115 points.
9. Relax, and good luck!

## Hints:

1. *Think through problems before you start working. Draw pictures.*
2. *If you get stuck on part of a problem, go on to the next part. You may need to use answers from earlier parts of the question to calculate answers to the later parts. If you weren't able to solve the earlier part, assume something.*
3. *Remember, setting up the problem correctly will get you most of the points.*

## Short questions (40pts)

Assess the validity of the following statements (True, False or Uncertain) and explain your answers. Each question is worth 8pts.

1. Since no investor would bear risk without reward, the CAPM implies that the expected return on any risky asset must be higher than the risk free return.
2. The CAPM implies that all securities should have zero alpha with respect to the S&P 500.

3. Individual securities may lie on the mean-variance frontier as long as they covary negatively with other securities.
  
  
  
  
  
  
  
  
  
  
4. Suppose that small stocks had higher average returns than large stocks. This pattern violates the CAPM.
  
  
  
  
  
  
  
  
  
  
5. The weight individual securities receive in the mean-variance efficient portfolio is directly proportional to their Sharpe Ratio.

## Question 2 (75pts)

For all of the following questions, assume that the CAPM holds, and that the expected return on the market is 9% per year and the annual volatility of the market is 0.108. A risk-free asset exists which is in zero net supply. Assume also that you know that two portfolios A and B on the minimum-variance frontier of risky-assets have annual expected returns and volatilities of

$$\begin{aligned} E(r_A) &= 0.06 & \sigma_A &= 0.15 \\ E(r_B) &= 0.12 & \sigma_B &= 0.20 \end{aligned}$$

Recall that

- portfolios on the minimum-variance frontier are those consisting *only* of risky assets which, for a given level of expected return, achieve the lowest possible level of volatility.
  - any linear combination of portfolios on the frontier is also on the frontier.
1. (15 points) Assume that you want to purchase \$100 million worth of a mean-variance efficient portfolio of risky assets (that is, where none of the \$100 million is invested in the risk-free asset). Assuming you can only trade in the portfolios A and B, How much of A and how much of B should you buy (in dollars)?

2. (15 points) Find the covariance of the returns of the portfolios A and B, and the beta of asset A.

3. (15 points) Calculate the annual return on the risk-free asset. (*Note:* you need the answer from 2 to solve this. If you do not have it, assume something. Also, there is a hard way, and an easy way to solve this problem. Think carefully before you proceed!)

4. (15 points) Suppose that your optimal allocation is to put 70% of your wealth into the mean-variance efficient portfolio and 30% of your wealth into the risk-free asset. What is your coefficient of risk aversion?

5. (15 points) Suppose that there are now a number of new hedge funds that advertise they are “market-neutral,” meaning that they have a beta of zero. The hedge funds charge a fee equal to two percent of asset under management. If these hedge funds really are market-neutral, have no more information than the rest of the market (and the market is efficient), and have zero holdings of the risk-free asset, calculate their post-fee expected return and the lowest possible return variance they could have. Could they have a higher variance than this? (answer yes or no and explain).