FINC460 - Spring 2009 Final Exam

NAME: _____ SECTION: _____

1. Please do not open this exam until directed to do so.

2. This exam is 3 hours 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 only a blank worksheet. You are not allowed to use other spreadsheets with pre-entered formulas.

7. Brevity is strongly encouraged on all questions.

8. The exam is worth 200 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 (25 points)

Assess the validity of the following statements (True, False or Uncertain) and explain your answers.

1. The CAPM implies that investors require a higher return to hold highly volatile securities.

2. In the CAPM, all portfolios on the minimum-variance frontier of risky assets carry zero risk that is uncorrelated with the market, that is in a regression of

$$R_{p,t} = a_i + \beta_i R_{m,t} + e_{i,t}$$

the R^2 is equal to 1 and $e_{i,t} = 0$ for all t.

3. The evidence for long-run return predictability, say over a 5 year horizon, is that winners underperform losers. This is evidence that the market is efficient in the long-run.

4. In the APT, absence of arbitrage implies that all factors have the same risk premium.

5. If market-makers were perfectly competitive, bid-ask spreads for all securities would be zero.

Question 1 (125 points)

The data below applies to all questions:

- A three-factor APT describes the returns of all well-diversified portfolios. The three factors are unexpected changes in production (factor 1), an inflation factor (factor 2), and an oil price change factor (factor 3).

- Over the next year, the market expects production to grow at 5%, inflation to be 2%, and oil prices to grow by 7%.

- The prices of all well diversified portfolios are set so that their expected returns over the next year are given by:

$$E(\tilde{r}_i) = 0.05 + 0.08 \ b_{i,1} - 0.06 \ b_{i,2},$$

  where $b_{i,k}$ denotes portfolio i's loading on the k'th factor. Notice that the coefficient on $b_{i,3}$ is zero in this equation.

- The market believes that the standard deviations of $\tilde{f}_1$, $\tilde{f}_2$, and $\tilde{f}_3$ over the next year are all 0.10 (10%), and that the three factors are uncorrelated.

- All investors in this economy (including you) can borrow and lend at a risk-free rate of 5%/year.

- The return generating process for portfolio A over the next year is:

$$\tilde{r}_A = E(\tilde{r}_A) + 0.7\tilde{f}_1 - 0.5\tilde{f}_2 - 0.8\tilde{f}_3.$$

Based on this scenario, answer the following questions:

1. (5 points) Find the expected return of portfolio A.

2. (5 points) Find the return standard deviation of portfolio A.

3. (10 points) If both production and oil prices grow by 10% over the next year, and inflation is exactly what the market expects, what will the return on portfolio A be?

4. (25 points) The first factor here is an industrial production factor. Give an economic rationale for why the factor risk premium for this production factor should be positive or negative. Specifically, answer the following questions. *All explanations should* very *brief.*

(a) Assume that a portfolio B has a positive loading on this factor (*i.e.*, $b_{B,1} > 0$). Will the return on B be unexpectedly high or low when production is higher or lower than expected?

(b) Based on this, would you think that B would have a higher or lower expected return than a portfolio C with $b_{C,1} < 0$? Explain.

(c) Based on this, explain why λ_1 should be positive or negative.

5. (25 points) Assume that you have no more information than the market. You have $1 million to invest. Your goal in investing is to maximize the expected return of your portfolio, for a given level of return variance (our usual assumption) Also, your coefficient of risk aversion is $A = 5$. Finally, suppose that you can create factor-mimicking portfolios for factors 1, 2 and 3.

   (a) How much should you invest in the three factor mimicking portfolios, and in the risk-free asset? (*i.e.*, what are w_{FM1}, w_{FM2}, w_{FM3}, and w_{Rf}?)

   (b) What is the Sharpe-Ratio of your portfolio?

6. (30 points) Now suppose that all assets in the economy can either be classified as "large" or "small" stocks. A value-weighted portfolio of all large stocks will have a return over the next year given by:

$$\tilde{r}_L = E(\tilde{r}_L) + 1.0\tilde{f}_1 - 0.4\tilde{f}_2 - 0.4\tilde{f}_3$$

while the value-weighted portfolio of all small stocks will have a return over the next year given by:

$$\tilde{r}_S = E(\tilde{r}_S) + 1.1\tilde{f}_1 - \tilde{f}_2 + 0.2\tilde{f}_3.$$

Finally, the sum of the market capitalizations of all of the small stocks is currently \$2 trillion, and the sum of the market cap of all large stocks is currently \$4 trillion.

Based on this information:

(a) What is the expected excess return and standard deviation of the market portfolio?

(b) Does the CAPM hold for all well diversified portfolios?

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7. (25 points) For this part only, assume the APT properly prices all assets based on publicly available information only. However, your analyst has chosen three fund managers for you who, he assures you, are very capable at stock picking, and thus might be able to generate abnormal returns according to the APT. Your analyst supplies you with the following data on the three funds, and on the risk-free asset. The expected returns are all post-expense returns.

Security	Expected Return	b_1	b_2	b_3	Standard Deviation
Risk-Free Asset	5%	-	-	-	-
Fund A	9%	0.5	-0.2	0.0	11.4%
Fund B	13%	1.0	0.5	-0.2	18.8%
Fund C	15%	1.2	-0.5	0.7	15.6%

(a) If you could hold one of the funds in combination with the risk-free asset, which would you choose? Explain.

(b) Now assume that you can combine just one of the funds with the portfolio you constructed in part 5. Which should you choose? What is the highest Sharpe ratio you could achieve?

(c) Now suppose that the managers of fund B decides to up the fee that is charged to investors. It is currently 2%/year. How much can the fee be raised?

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Question 2 (50 points)

For this question, assume that the CAPM properly prices all assets. The risk-free rate is 3%. You know the expected returns and standard deviations of two portfolios: the market portfolio (M) and a portfolio of automobile firms (A):

Security	Expected Return	Standard Deviation
Risk-Free Asset	3%	-
Market Portfolio (M)	9%	15%
Automobile (A)	9%	20%

- (10 points) Draw the minimum-variance frontier of risky assets, along with the Capital Allocation Line and the location of the two portfolios, A and M.

- Suppose that you run a regression of portfolio A's excess return on excess return on the market portfolio

$$R_{A,t} - r_f = \alpha + \beta(R_{m,t} - r_f) + \epsilon_t$$

What will be the values of

1. (10 points) α
2. (10 points) β
3. (10 points) σ_ϵ
4. (10 points) R^2

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