2017 EXAMINATIONS

Lancaster University

PART II (SECOND AND FINAL YEAR)

ACCOUNTING AND FINANCE

AcF 321 INVESTMENTS

(2 hours + 15 minutes reading time)

INSTRUCTIONS TO INVIGILATORS:

- Students should be provided with this exam paper plus an answer booklet.
- Writing is NOT permitted during reading time.
- Please check that the library card number is recorded correctly on the answer booklet.
- This exam paper is to be COLLECTED at the end of the exam with the answer booklet.

INSTRUCTIONS TO STUDENTS:

- Answer ALL questions in Section A (40 marks), and TWO questions from Section B (30+30=60 marks).
- Please write your library card number and your name in the correct place on the answer booklet.
- Writing is NOT permitted during reading time.
- This exam paper is to be COLLECTED at the end of the exam.
- Non-programmable calculators are permitted. Calculators with the ability to enter and/or retrieve text are NOT permitted.

SECTION A (40 Marks)

Question 1:

a) A mutual fund manager is considering two risky mutual funds. The probability distribution of the risky fund is as follows:

	Expected return	Standard deviation
Fund A	20%	30%
Fund B	12%	15%

The correlation between fund A and B is 0.10.

What are the investment proportions in the minimum variance portfolio of funds A and B?

(4 marks)

b) Consider the following multifactor arbitrage pricing theory (APT) model of security returns for a particular stock.

Factor	Factor Beta	Factor Risk Premium
Inflation	1.2	6%
Industrial production	0.5	8%
Oil Prices	0.3	3%

(i) If T-bills currently offer a 6% yield, find the expected rate of return on this stock if the market views the stock as fairly priced.

(3 marks)

(ii) Suppose that the market expected the values for the three macro variables given in column 1 of the table below, but the actual values turn out as given in column 2. Calculate the revised expectations for the rate of return on the stock once the "surprises" become known.

Factor	(1) Expected Rate of Change	(2) Actual Rate of Change
Inflation	5%	4%
Industrial	3%	6%
Oil Prices	2%	0%

(5 marks)

c) The Fama and French three-factor model can be written as:

$$E(R_{i,t}) - R_{f,t} = \beta_i(E(R_{M,t}) - R_{f,t}) + s_i SMB_t + h_i HML_t$$

(i) What do the factor exposures (i.e., β_i, s_i, h_i) stand for?

(3 marks)

(ii) How are the SMB and HML zero-investment portfolios defined?

(3 marks)

(iii) How well does the Fama and French model perform in asset pricing tests?

(3 marks)

Question 2:

a) Discuss the major differences between arbitrage pricing theory and capital asset pricing model.

(10 marks)

b) What is an event study? Use an example to illustrate how to conduct an event study.

(9 marks)

(Total 40 marks)

SECTION B (60 marks)

Answer TWO questions out of three in this section.

Question 3: Answer all subparts for the question.

a) Answer the following questions about portfolio performance evaluation. Consider the one (excess return) index-model regression results for stock Apex. The risk free rate over the period was 6%, and the market's average return was 14%. Performance is measured using an index model regression on excess returns.

	Stock Apex
Index model regression estimates	$1\% + 1.2\,(r_M - r_f)$
R-square	0.576
Residual standard deviation, $\sigma(e)$	10.3%
Standard deviation of excess returns	21.6%

(i) Calculate Jensen's alpha, the information ratio, the Sharpe measure and the Treynor measure of portfolio performance for stock Apex.

(10 marks)

(ii) Discuss why M^2 is an improvement over the Sharpe measure using an appropriate diagram.

(6 marks)

(iii) Discuss the situations in which the Sharpe, Treynor, and Jensen measures are the most appropriate measures.

(6 marks)

b) Discuss four major differences between mutual funds and hedge funds.

(8 marks)

(Total 30 marks)

Question 4: Answer all subparts for the question.

a) The following table is taken from the seminal study of Fama and French (1992). It reports the results of five cross-sectional regressions of returns on market beta (β), market capitalization (ln(ME)), book-to-market ratio (ln(BE/ME)), asset-to-market ratio(ln(A/ME)). *t*-statistics are reported in parentheses.

$$r_i - r_f = \gamma_1 + \gamma_2 \beta_i + \gamma_3 \ln(ME_i) + \gamma_4 \ln(BE_i / ME_i) + \gamma_5 \ln(A_i / ME_i) + \gamma_6 \ln(A_i / BE_i) + \varepsilon$$

What are the main implications of five cross-sectional regression results for asset pricing theory? i.e., what does the table imply about the performance of the CAPM? What does the table imply about the performance of the Fama-French three-factor model?

Cross-sectional regression	β	ln(ME)	ln(BE/ME)	ln(A/ME)	ln(A/BE)
(1)	0.15				
	(0.46)				
(2)		-0.15			
		(-2.58)			
(3)	-0.37	-0.17			
	(-1.21)	(-3.41)			
(4)			0.50		
			(5.71)		
(5)				0.50	-0.57
				(5.69)	(-5.34)

(9 marks)

b) Here are some well diversified funds that trade assets on London Stock Exchange. Assume a single-factor arbitrage pricing theory (APT) correctly prices all securities.

Asset	Expected Return	Factor Beta
Value Mid-cap Fund	9%	0.6
Flawless Fund	3%	0.0

(i) What is the riskless rate?

(2 marks)

(ii) What is the expected return on the factor portfolio?

(4 marks)

(iii) Suppose Growth Large-cap Fund becomes available, with factor beta 0.9, and expected return of 10%. Show that there is an arbitrage opportunity.

(9 marks)

(iv) Assume the single factor is the market factor. Draw the security market line and allocate Value Mid-cap Fund and Growth Large-Cap Fund.

(6 marks)

(Total 30 marks)

Question 5: Answer all subparts for the question.

a) Explain the Fama and MacBeth two-stage cross-sectional regression analysis of the capital asset pricing model, including the hypotheses and empirical methods.

(8 marks)

b) The following table reports the regression results of monthly returns of stock ABC against the S&P 500 index. A hedge fund manager believes that stock ABC is underpriced, with an alpha of 1% over the coming month.

Beta	R-square	Standard Deviation of Residuals
0.8	75%	6% monthly

(i) If the hedge fund manager holds a $2.5 million portfolio of stock ABC, and wishes to hedge market exposure for the next month using 1-month maturity S&P future contracts, how many contracts should he enter? Should he buy or sell contracts? The S&P 500 currently is at 1,000 and the contract multiplier is $250. What is the standard deviation of the monthly return of the hedged portfolio?

(4 marks)

Now suppose that the manager misestimates the beta of ABC stock, believing it to be 0.6 instead of 0.8. The standard deviation of the monthly market rate of return is 10%.

(ii) What is the standard deviation of the (now improperly) hedged portfolio?

(3 marks)

(iii) What is the expected return for the (now improperly) hedged portfolio?

(9 marks)

c) Discuss two speculative tools that hedge funds employ to achieve a conservative form of investing.

(6 marks)

(Total 30 marks)

Formula Sheet

$$E(r_P) = w_D E(r_D) + w_E E(r_E)$$
$$E(r) = \sum_s p(s) r(s)$$
$$E(r_c) = yE(r_p) + (1-y) r_f$$
$$\sigma = \sqrt{\sum_s p(s)\left[r(s) - E(r)\right]^2}$$
$$\text{cov}(r_i, r_j) = \sum_s p(s)\left[r_i(s) - E(r_i)\right]\left[r_j(s) - E(r_j)\right]$$
$$\sigma_P^2 = w_D^2 \sigma_D^2 + w_E^2 \sigma_E^2 + 2 w_D w_E Cov(r_D, r_E)$$
$$\rho = \frac{Cov(r_D, r_E)}{\sigma_D \sigma_E}$$
$$Max U = E(r) - \tfrac{1}{2} A\sigma^2 = r_f + y[E(r_p) - r_f] - \tfrac{1}{2} A y^2 \sigma_P^2$$
$$y^* = \frac{E(r_p) - r_f}{A\sigma_P^2}$$
$$w_{Min}(D) = \frac{\sigma_E^2 - \text{cov}(r_D, r_E)}{\sigma_E^2 + \sigma_D^2 - 2\,\text{cov}(r_D, r_E)}$$
$$w_{Min}(E) = 1 - w_{Min}(D)$$
$$w_D = \frac{\left(E(r_D) - r_f\right)\sigma_E^2 - \left(E(r_E) - r_f\right)Cov(r_D, r_E)}{\left(E(r_D) - r_f\right)\sigma_E^2 + \left(E(r_E) - r_f\right)\sigma_D^2 - \left(E(r_D) - r_f + E(r_E) - r_f\right)Cov(r_D, r_E)}$$
$$w_E = 1 - w_D$$
$$\frac{E[r_M] - r_f}{\sigma_M^2}$$
$$\frac{E(r_M) - r_f}{\sigma_M}$$
$$\frac{E(r_i) - r_f}{\sigma_i}$$
$$E(r_i) = r_f + \beta_i [E(r_M) - r_f]$$
$$\beta_i = \frac{\text{cov}(r_i, r_M)}{\sigma_M^2} = \frac{\rho_{i,M}\sigma_i}{\sigma_M}$$
$$R^2 = \rho_{i,M}^2$$
$$r_i = E(r_i) + e_i$$
$$\sigma_i^2 = \sigma_m^2 + \sigma^2(e_i)$$

$$Cov(r_i, r_j) = Cov(m + e_i, m + e_j) = \sigma_m^2$$

$$r_i = E(r_i) + \beta_i m + e_i$$

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma^2(e_i)$$
$$Cov(r_i, r_j) = Cov(\beta_i m + e_i, \beta_j m + e_j) = \beta_i \beta_j \sigma_m^2$$

$$R_i = r_i - r_f$$
$$R_M = r_M - r_f$$
$$R_i(t) = \alpha_i + \beta_i R_M(t) + e_i(t)$$

$$R_P = \alpha_P + \beta_P R_M + e_P$$
$$\beta_P = \frac{1}{N}\sum_{i=1}^{N} \beta_i$$
$$\alpha_P = \frac{1}{N}\sum_{i=1}^{N} \alpha_i$$
$$e_P = \frac{1}{N}\sum_{i=1}^{N} e_i$$
$$\sigma_P^2 = \beta_P^2 \sigma_M^2 + \sigma^2(e_P)$$
$$\sigma^2(e_P) = \frac{1}{n}\overline{\sigma}^2(e_i)$$

$$M^2 = [1 - \frac{\sigma_M}{\sigma_p}]\overline{r}_F + \frac{\sigma_M}{\sigma_p}\overline{r}_p - \overline{r}_M$$

$$IR = \frac{\alpha_P}{\sigma(e_P)}$$

$$\begin{aligned}\alpha_P &= \overline{r}_P - \overline{r}_f - \beta_P\left(\overline{r}_M - \overline{r}_f\right)\\ &= \overline{r}_P - \left[\overline{r}_f + \beta_P\left(\overline{r}_M - \overline{r}_f\right)\right]\end{aligned}$$

$$T = \frac{\overline{r_p} - \overline{r_f}}{\beta_P}$$

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