PART II **(SECOND AND FINAL YEAR)**

ACCOUNTING AND FINANCE

AcF 321 **INVESTMENTS**

(2 hours + 15 minutes reading time)

Answer any **THREE** questions.

The use of standard calculators with scientific, and standard arithmetic and statistical functions, is permitted.

QUESTION 1

a. A trader has purchased 200 shares of a stock at £100 per share on margin. The terms of the loan obtained from the trader's broker are as follows. The initial margin is 50%, the interest rate on the loan is 8%, and the trader has agreed to maintain a margin of 20%. How low the price can drop in a year before the trader receives a margin call?

[6 marks]

b. State the assumptions and implications of the two-fund separation theorem

[5 marks]

c. Consider two stocks A and B. Both have an expected return of 10%, their standard deviations are 18% and 16% respectively, and their correlation is 0.35. Finally, the risk-free rate of return is 3%. Assuming all the assumptions of the one-fund theorem hold true,

Required:

i. Identify the composition of the minimum variance portfolio, and calculate its expected return and standard deviation.

[12 marks]

ii. Identify the composition of the tangency portfolio, and calculate its expected return and standard deviation.

[4 marks]

iii. Calculate the volatility of the efficient portfolio that would be expected to generate 12.1%

[6 marks]

QUESTION 2

a. An analyst is interested in testing whether liquidity risk is priced in addition to the market factor (Market) that is considered in CAPM. The analyst has decided to employ the Fama-McBeth two-stage procedure.

Required:

i. Explain how you would measure a stock's liquidity.
[2 marks]

ii. Briefly explain how you would construct a portfolio to mimic the liquidity factor.
[3 marks]

iii. Explain the first-stage of the regression analysis you would employ.
[5 marks]

iv. What would the dependent and independent variables in the second stage of the analysis be? [5 marks]

v. What would the results be in a CAPM world? [6 marks]

b. Discuss the different interpretations of the SMB and HML factors in Fama-French 3-factor model?
[6 marks]

c. Explain how the 'Joint Hypothesis' problem would affect your interpretation of the empirical evidence relating to market efficiency.
[6 marks]

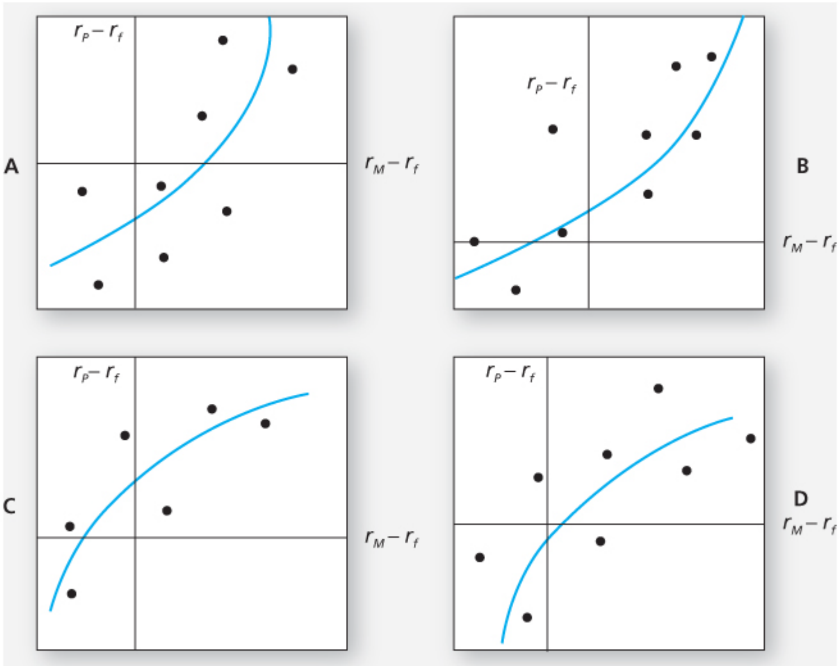
QUESTION 3

a. Show that combining an actively managed portfolio with a holding of risk-free bonds will not change the actively managed portfolio's Treynor measure.

[6 marks]

b. Evaluate the market timing and security selection abilities of four managers whose performances are plotted in the accompanying diagrams.

[12 marks]



c. Consider the two (excess return, r_p-r_f) index-model regression results for stocks *A* and *B*. 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. Which stock is the best choice under the following circumstances?

	Stock A	Stock B
Index Model regression estimates	$1\%+1.2(r_m-r_f)$	$2\%+.8(r_m-r_f)$
R-square	0.576	0.436
Residual standard deviation σ (e)	10.30%	19.10%
Standard deviation of excess returns	21.60%	24.90%

Required:

i. This is the only risky asset to be held by the investor

[5 marks]

ii. This stock will be mixed with the rest of the investor's portfolio, currently composed solely of holdings in the market index fund.

[5 marks]

iii. This is one of many stocks that the investor is analyzing to form an actively managed stock portfolio

[5 marks]

QUESTION 4

a. Firm XYZ is required to make a $10M payment in 2 years and another $10M payment in 4 years. The yield curve is flat at 10% with semi-annual compounding. Firm XYZ wants to form a portfolio using a 1-year floating rate note (FRN) and a 5-year U.S. strip to fund the payments.

Required:

i. What is the present value of the liabilities? [4 marks]

ii. What is the (modified) duration of the liabilities? [5 marks]

iii. What are the (modified) durations of the assets? [4 marks]

iv. How much of each bond must the portfolio contain for it to still be able to fund the payments after a small shift in the yield curve? [7 marks]

b. The current yield curve for default-free zero-coupon bonds are as follows:

Maturity (Years)	YTM (%)
1	5%
2	6%
3	7%
4	8%

Required:

i. What are the implied 1-year forward rates?

[6 marks]

ii. Assume that the pure expectations hypothesis of the term structure is correct and that the face value of all bonds is $1,000. If market expectations are accurate, what will be the pure yield curve next year?

[7 marks]

QUESTION 5

a. You have been researching an AAA (ie very low risk of default) 10-year corporate bond which you believe is trading cheaply. You expect the bond to have a return of 8% per annum, while the comparable 10-year Treasury bond has an expected return of 5%. The annual volatility of the corporate bond is 5% and that of the Treasury bond is 3%; the correlation between them is 0.95. You can borrow or lend short term at the Treasury bill rate of 3%.

Required:

i. Supposing that you want to construct a levered portfolio consisting of the corporate bond and the treasury bond, design the portfolio that has an expected return of 30% and minimum risk.

[15 marks]

ii. What is the volatility of the optimal portfolio?

[3 marks]

iii. If the correlation between the corporate and treasury bonds turns out to be 0.8 rather than the 0.95 you had assumed, and the portfolio composition is as estimated in (i), would you expect the volatility of the portfolio to be different from your answer in (ii)? Explain briefly.

[5 marks]

b. Explain the five major differences between hedge funds and mutual funds.

[10 marks]

AcF. 321 – Formula Sheet

- $\mu = \frac{1}{T}\sum_{t=1}^{T} r_t$
- $\sigma = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(r_t - \mu)^2}$
- $Cov[R,S] = \sigma_{RS} = \frac{1}{N-1}\sum_{t=1}^{T}(r_t - \mu_R)\,(s_t - \mu_S)$
- $\rho_{RS} = \frac{\sigma_{RS}}{\sigma_R \sigma_S}$
- Portfolio expected return and variance (2 assets):

  $\mu_P = \alpha_1 \mu_1 + \alpha_2 \mu_2.$

$$\begin{aligned} \sigma_P^2 &= \alpha_1^2 \sigma_{11} + 2\alpha_1 \alpha_2 \sigma_{12} + \alpha_2^2 \sigma_{22} \\ &= \alpha_1^2 \sigma_1^2 + 2\alpha_1 \alpha_2 \rho_{12} \sigma_1 \sigma_2 + \alpha_2^2 \sigma_2^2. \end{aligned}$$

- Portfolio expected return and variance (N assets):

$$\mu_P = \sum_{i=1}^{N} \alpha_i \mu_i.$$

$$\sigma_P^2 = \sum_{i=1}^{N}\sum_{j=1}^{N} \alpha_i \alpha_j \sigma_{ij} = \sum_{i=1}^{N}\sum_{j=1}^{N} \alpha_i \alpha_j \rho_{ij} \sigma_i \sigma_j.$$

- If all equities have volatility of σ and a correlation with every other equity of ρ, an equally weighted portfolio of N shares has volatility:

$$\sigma_P^2 = \frac{1}{N}\sigma^2 + \frac{N-1}{N}\rho\sigma^2$$

- CAPM: $E[r_Y] = r_f + \beta_y(E[r_M] - r_f)$; where $\beta_Y = \frac{Cov(r_y, r_m)}{Var(r_m)}$

$$\sigma_Y^2 = \beta^2 \sigma_m^2 + \sigma_\varepsilon^2$$

- Fama and French Three-Factor model:

$$E[R_I] = \beta_M E[R_M] + \beta_{SMB} E[R_{SMB}] + \beta_{HML} E[R_{HML}]$$

- Carhart Four-Factor Model:

$$E[R_I] = \beta_M E[R_M] + \beta_{SMB} E[R_{SMB}] + \beta_{HML} E[R_{HML}] + \beta_{MOM} E[R_{MOM}]$$

- Time-weighted average rate of return over T years is $\{(1+r_1)(1+r_2)\ldots(1+r_T)\}^{1/T}$

- Jensen's measure: $J_P = r_P - r_F - \beta_P[r_M - r_F]$

- Treynor's measure: $T_P = \frac{r_P - r_F}{\beta_P}$

- Fama's measure: $F_P = r_P - r_F - \frac{\sigma_P}{\sigma_M}(r_M - r_F)$

- Sharpe's measure: $S_P = \frac{r_P - r_F}{\sigma_P}$

- Appraisal ratio: $A_P = \frac{J_P}{\sigma_{\varepsilon_P}}$

- Bond Valuation Formula (annual coupons):

$$P_0 = \frac{C}{r} \times \left[1 - \frac{1}{(1+r)^n}\right] + \frac{F}{(1+r)^n}$$

- Bond Valuation Formula (semi-annual coupons):

$$P_0 = \frac{\frac{C}{2}}{\frac{r}{2}} \times \left[1 - \frac{1}{(1+\frac{r}{2})^{2*n}}\right] + \frac{F}{(1+\frac{r}{2})^{2*n}}$$

- Forward Rate:

$$(1 + y_n)^n = (1 + y_{n-1})^{n-1}(1 + f_{n-1})$$

- Duration (D):

$\frac{dP}{P} = -(D) * \frac{dy}{(1+y)}$ where

$$D = \left\{\frac{\frac{X_1}{1+y} + \frac{2X_2}{(1+y)^2} + \ldots + \frac{TX_T}{(1+y)^T}}{\frac{X_1}{1+y} + \frac{X_2}{(1+y)^2} + \ldots + \frac{X_T}{(1+y)^T}}\right\}$$

$\frac{dP}{P} = -(Modified\ Duration) * \ dy;$ *where Modified Duration = D/(1+y)*

with yield compounded n times per year, modified duration is D/(1 + y/n)

- $Convexity = \frac{1}{P \times (1+y)^2} \sum_{t=1}^{n} \left[\frac{CF_t}{(1+y)^t}(t^2 + t)\right]$

- Correction for Convexity: $\frac{dP}{P} = -D^{Modified} * dy + \frac{1}{2}[Convexity \times (dy)^2]$

END OF PAPER