THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **1999 EXAMINATIONS**
PAPER TWO

Answer all 5 Questions

QUESTION 1 **(10 Marks)**

You have been asked to provide a valuation for a parcel of shares in a company, based primarily on the capitalisation of maintainable earnings. You have been provided with the company's latest annual reports.

(a) Explain the method of share valuation based on capitalisation of maintainable earnings. (2 marks)

(b) Explain, with reasons, how would you allow for the following:

(i) The valuation is for a controlling parcel of shares (1 mark)

(ii) The company has convertible notes on issue (2 marks)

(iii) The company had held a significant unhedged currency position that resulted in a currency translation profit (2 marks)

(iv) The company had reduced its provision for doubtful debts during the year (1 mark)

(v) The holding company consisted of three distinct businesses, one of which had been trading at a loss (2 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **1999 EXAMINATIONS**
PAPER TWO

QUESTION 2 **(12 Marks)**

(a) Bond A, Bond B and Bond C all have the same maturity date and coupon.

The current yield of Bond A is 0.20% higher than Bond C, and the yield of Bond B is 0.50% higher than Bond C.

You have made the following forecasts for the relative yields of the three bonds:

	Bond A yield less Bond C yield	Bond B yield less Bond C yield
Current	0.20%	0.50%
3 months' time	0.20%	0.60%
12 months' time	0.20%	0.65%

The following table sets out the forecast modified duration of Bond C (assuming its current yield).

Maturity	Modified Duration
Current	2.23
3 months' time	1.99
12 months' time	1.40

Using the information above, determine the (approximate) expected relative performance over both the next quarter and the next year for Bonds A,B and C.

(4 marks)

Question 2 continues over page

Question 2 continued

(b) You are the manager of a fixed interest fund (PMFIF), the performance of which is measured against the WDR Australian Composite Bond index (formerly known as the "SBC Warburg Composite Bond Index").

Under the investment policy of the fund, the minimum credit rating your fund can hold is "A-". If a security is down-graded to "BBB+" or below, then it must be sold within 5 working days.

The fund currently has AUD$3 billion invested 30% in Commonwealth Government securities (CGS), 35% in Semi Governments bonds (Semis), and 35% in corporate bonds. This compares to the index weightings of 50% for CGS, 33% for Semis, and 17% for corporates.

It has now been suggested to you that PMFIF sell some of its CGS to buy either or both of two corporate bonds. The details of the proposed trades are as follows:

<u>Opportunity A</u>

- Sell a 5 year CGS bond and buy a 5 year bond to be issued that day by ABC Ltd. Size of transaction AUD$150 million (face value). Pick up 0.50% in yield
- ABC Ltd is an overseas bank rated "AA-" (stable outlook) by Standard & Poors, and this will be its first issue into the Australian market. The issue size will be AUD$500 million.

<u>Opportunity B</u>

- Sell a 2 year CGS bond, and buy AUD$10 million (face value) of a bond issued several months ago by XYZ Ltd. Size of transaction AUD$10 million. Pick up 2.00% in yield.
- XYZ Ltd is an Australian corporation rated "A-" (stable outlook) by Standard & Poors. The issue size is $AUD70 million.

Taking into consideration the current position of the fund, discuss the relative risks involved in taking up one or both opportunities, assuming an investment horizon of 1 year. (8 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **1999 EXAMINATIONS**
PAPER TWO

QUESTION 3 **(25 Marks)**

(a) Throughout most of the 1990s, corporate bonds formed considerably less than 10% of the total domestic fixed interest market. Over the past year, the corporate bond market has increased rapidly as a proportion of total domestic fixed interest on issue, and now approaches 20% of the market. Discuss the reasons why this has occurred. (5 marks)

(b) Since late 1995, interest rates have been generally lower and more stable than in previous decades. Discuss the reasons why this has occurred. (3 marks)

(c) You are an asset consultant. The trustee of a superannuation fund is reviewing the management of their fixed interest exposure. The current fixed interest fund manager has a mandate for active fund management.

The trustee notes recent articles in a respected superannuation publication which state that:

- Many active Australian equity fund managers have been able to consistently add value during the 1990s.
- However, in the three years to October 1998 and the five years to October 1998, most active Australian fixed interest fund managers have (after allowing for fees) either not added value or lost value relative to their passive counterparts. Also, managers who took on more risk tended to perform worse.

Also, the trustee notes that the existing fixed interest manager's return over the past 3 years placed it in the bottom quartile of fixed interest fund managers.

As a result, the trustee has asked your advice as to whether the management of the fixed interest exposure should be given to a passive (index) fund manager.

Draft a report to the trustee outlining the main issues. Include in your report:

(i) Discuss the advantages and disadvantages of active versus passive fixed interest management. (6 marks)

(ii) Discuss (with reasons) how much emphasis should be placed on the recent performance in assessing the relative merits of fund managers. (3 marks)

Question 3 continues over page

Question 3 continued

(iii) Discuss why you believe active equity fund managers may have been more successful in adding value than fixed interest fund managers in recent years. (4 marks)

(iv) Discuss whether you expect the interest rate market in the next four years will be more or less conducive to out-performance by active fixed interest fund managers than the period 1995-98. (4 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **1999 EXAMINATIONS**
PAPER TWO

QUESTION 4 **(25 Marks)**

Within PMA, a large life office, you are the actuary responsible for the asset-liability management of a block of corporate superannuation capital guaranteed investment account business. The product has a long stable history of maintaining the following characteristics:

- An asset mix close to 35% equities, 40% bonds, 25% cash.
- A heavily smoothed crediting rate.
- Policy termination values range from 95% to 100% of account balance, based on a formula which is a function of prevailing cash rates and policy duration.
- Profit margins are 15% of the cost of crediting.

The product requires capital to be held within the life office Statutory Fund.

The product's contribution to the Statutory Fund's regulatory Capital Adequacy Requirement is effectively the sum of the account balances plus a regulatory resilience reserve. The regulatory resilience reserve is a function of the asset mix of the product, prevailing equity dividend and bond yields, and assumed product discretions.

The assets attributed to the product for the purposes of product management are equal to the sum of the regulatory capital adequacy requirement and a capital buffer determined by you.

The Chief Financial Officer of that company has written the following in a memorandum to you:

"I would prefer not to use asset-liability modelling in the determination of capital requirements as, despite its apparent mathematical sophistication, it has severe limitations in terms of both results and interpretation. For example:

- In a paper published in 1995 ("A Comparison of Stochastic Asset Models for Long Term Studies"), the author compared four stochastic models that could be used for Australian asset-liabilities studies. The author used these models in a study of investment account business, and found that the reserve required to meet the capital guarantees over a three year period on the basis of a "5% probability of ruin" was anywhere from 30% to 44%, depending on the model used.
- Asset models typically used to determine reserves have been shown to be poor predictors of asset returns over the short term.

Question 4 continues over page

Question 4 continued

- The interpretation of probability statements is very subjective. How are we to judge the desirability or otherwise of particular probabilities? For example, is it appropriate to aim for say a 5% probability of failure to meet a particular target or a 1% or even 0.1% probability? The choice of probability level has a large impact on the results.
- In any case, the results of a stochastic model are no more than the outcome of lots of random guesses of the future."

In the 1995 paper referred above, the following models were tested :

- a Random Walk model;
- The 1992 Capital Adequacy Sub-Committee Model;
- The Australian Wilkie model; and
- A model created by the author, which was a type of "Conditional Heteroscedasticity" model

The model produced by the author performed satisfactorily when tested "out-of-sample", and when tested for the randomness of residuals.

(a) Explain what is meant by the following terms:

(i) Random walk (2 marks)

(ii) Testing "out-of-sample" (2 marks)

(iii) Conditional heteroscedasticity (2 marks)

(b) Why are testing "out-of-sample" and testing of the randomness of residuals important in assessing the desirability of a stochastic model? (4 marks)

Question 4 continues over page

Question 4 continued

(c) You have an asset-liability model that you have used to determine the expected variability of profit outcomes for PMA. In the model, the asset price for each asset class is modelled independently as a random walk. Explain why this model may not be appropriate for determining capital requirements. (2 marks)

(d) Draft a letter to the Chief Financial Officer which first addresses his comments. Follow this by a description of how you would determine the capital buffer you believe to be appropriate, justifying your suggested approach. (10 marks)

(e) What specific elements of your liability model would you expect to require feedback from your asset model? (3 marks)

QUESTION 5 **(28 Marks)**

A converting preference share (CPS) has the following details :

Prior to 30 September 2003, the preference share will pay a fully-franked dividend of 7% p.a. (payable semi-annually), based on a face value of $10.

On 30 September 2003, the preference share will convert into ordinary shares, the number of which will be determined by the following method :

- $10 / (P x 0.9), where "P" is the ordinary share price on 30 September 2003
- subject to a minimum of one share, and a maximum of four shares.

Assume that the company tax rate is 36%, and that all imputation credits can be used. The current ordinary share price is $5, and you have determined that the present value of ordinary share dividends to be received between now and 30 September 2003 is $0.60.

(a) Show how that CPS can be described as a bond + 2 vanilla options. Draw the pay-off diagram for the two options, and give the following details for the options :

- long or short
- put or call
- American or European
- Strike price
- Expiry date

Give the following details for the bond :

- maturity date
- face value
- effective coupon rate (allowing for franking credits) (10 marks)

Question 5 continues over page

Question 5 continued

(b) You have decided to use the Black-Scholes approach to value the options.

The Black-Scholes formula for a call option is :

$SN(d_1)-Xe^{-rt} N(d_2)$

What value for "S" would you use in that equation ? (2 marks)

(c) You are an analyst working for an equity fund manager. The fund manager has suggested to you that converting preference shares can trade at significant margins above or below fair value, due to their complex nature.

You have been asked to set up a "fair value" model for convertible preference shares, to assist an equity fund manager to make investment decisions on those instruments. The model will produce an estimate of the "fair value" of each convertible preference share, based on reasonable assumptions for volatility and yield.

(i) Why do preference shares trade at a higher yield than bonds (6 marks)

(ii) Describe the various methods by which you could determine "fair value" assumptions for the implied volatility and yield for the various securities.

(10 marks)

END PAPER TWO