INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 1 INVESTMENTS
MAY 2005 EXAMINATIONS

Answer all 6 questions

QUESTION 1 **(10 Marks)**

As advisers working in an investment bank, you are discussing with a US colleague the major structural differences for investment in the USA compared with in Australia.

(a) Explain the terms *market structure* and *institutional structure* in relation to a free-market economy such as Australia's. (2 marks)

(b) Describe the institutions which regulate, or significantly affect, the operation of the following markets in Australia, indicating at least one piece of supervisory legislation and its scope per market: (5 marks)

- Goods and services
- Capital
- Money

(c) Explain *briefly* the importance of the markets listed in (b) to the main forms of investment in Australia. (3 marks)

QUESTION 2 **(15 marks)**

You are the investment adviser to a large Japanese bank considering investing its reserves in Australian debt markets. As part of its standard submission on its management practices (the *IFSA questionnaire*), a major reputable debt manager has provided the following information on its approach:

Source of Value-added	Expected Contribution to Performance (%)
Asset Allocation – Bonds/Indexed Bonds	-
Duration Selection	60
Yield Curve Analysis – Maturity distribution based on current or forecast shape of yield curve	10
Sector Selection – Government bonds, semi-government bonds, corporate etc.	5
Issue Selection (Including Credit Analysis)	20
Arbitrage and spread anomaly using forwards, swaps etc.	5
Technical Analysis	-
TOTAL	100

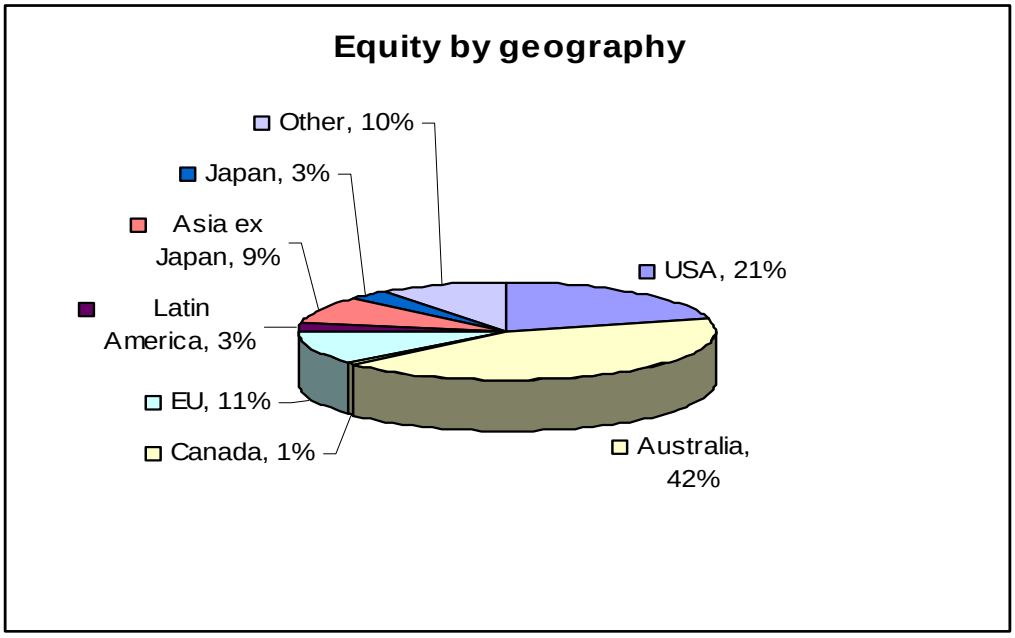
(a) List the drivers for each of the 7 sources of potential value-added in the table above, and the expertise you consider necessary to add value through each source. (7 marks)

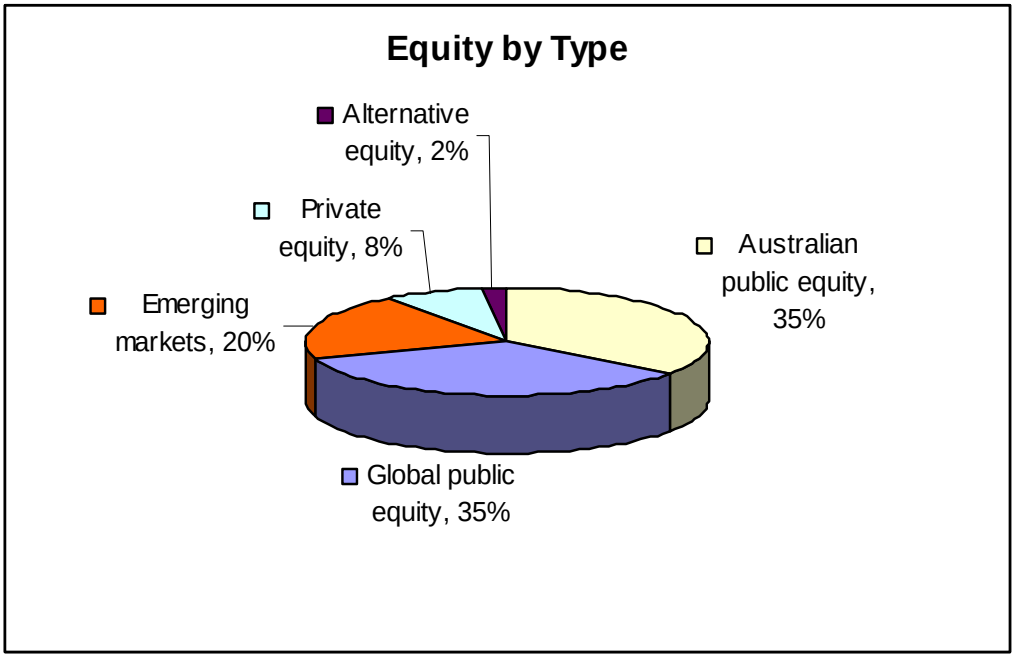
(b) Using the table above, suggest any advantages that might result from the debt manager's position in the market. How would you go about assessing the extent of those advantages? (2 marks)

(c) You have been asked to design an investment mandate for the Japanese bank. List any special features that you would include in the mandate. How would you deal with each feature? (6 marks)

QUESTION 3 **(16 marks)**

You are the Chief Investment Officer (CIO) of a large Australian corporation, whose superannuation plan has equity assets diversified in terms of both type and geography as follows:





The equity assets cover public equity, private equity and emerging markets and also include a limited exposure to infrastructure and hedge funds. The exposure to private equity is through limited partnerships. The management of each equity type is contracted out to a number of investment managers that each adopt a different investment approach.

You are concerned, not with the merits of the various equity classes/types, but with *the management time and effort required in monitoring the many investment approaches adopted.* You consider it worthwhile to rationalise the approaches taken in the light of these concerns.

(a) Outline the main alternative management approaches for each of the (four) equity classes listed above (ie Alternative equity, Private equity, Emerging markets and Public equity). Your answer should cover: (4 marks)

- The issues associated with active management.
- The alternative styles for stock selection.

(b) List the advantages and disadvantages of investing in: (4 marks)

- a fund-of-funds, and
- a limited partnership.

(c) For each of the (four) equity classes listed above (ie Alternative equity, Private equity, Emerging markets and Public equity) discuss: (8 marks)

- the benefits and limitations to the superannuation plan, and
- *your* plan *for applying* a uniform approach

in terms of (i) the reliance to be placed on active management and (ii) the styles to be adopted for stock selection.

QUESTION 4 **(22 marks)**

As actuary to the employer and trustee of a large defined benefit superannuation fund in Australia, you have been consulted on the introduction of a new accounting standard (*AASB 119*) for employer superannuation costs.

The new standard will have the effect of including a significant element of the fund's asset return in any year as part of the employer's revenue for that year. At the same time the standard will bring to account the change in the discounted value of accrued benefit liabilities during the year, with discounting at a rate related to current bond yields.

You have been asked to review the fund's investment strategy in the light of your employer's concerns about the standard's effect on both short and long term revenue. A stochastic asset/liability model is to be applied. As a first step, you are required to produce an outline of your approach as follows:

Model Specifications

(a) Discuss how the asset model will be used as well as the key economic variables that are to be modelled. (4 marks)

(b) Describe the main features of the liability model that you would give particular attention to. You are not required to give details of benefit projections. (3 marks)

Inputs:

(c) In calibrating the asset model, list the current economic/financial parameters you see as critical and discuss how you would source those parameters. (5 marks)

Outputs:

(d) List the outputs of your asset and liability model. How would you use the outputs in formulating an investment strategy? (5 marks)

(e) One of the company directors, who is also a trustee director of the fund, expresses concern that the fund's primary objectives are based on solvency and may differ from those of the employer. Explain how your asset liability modelling will change if you were to pursue both sets of objectives in formulating an investment strategy, ie ensuring fund solvency and employer cost minimisation. (5 marks)

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QUESTION 5 **(15 marks)**

As an adviser within the hedging section of a trading bank, you are assisting the risk manager of a major manufacturing company producing hardware supplies. The risk manager's usual responsibilities relate to the cash and currency exposures of the company, but in recent times his responsibilities have broadened to cover other risk factors, as well as the use of derivative instruments.

The company is vertically diversified and wholly owns several subsidiaries in various industries that it is now looking to divest.

(a) Suggest other risks that the company may face. (3 marks)

(b) The manager understands that (economic) exposures relating to futures and options on an underlying physical asset S are given as follows: (3 marks)

- For a bought futures position on asset S, exposure = S
- For a call option on asset S, exposure = Δ.S where Δ is the current delta of the option.

Set out the general definition (formula) of economic exposure for any derivative instrument based on the asset S associated with a given single risk factor. Explain (using formulas) how this definition results in the exposures for futures and option positions as given by the manager.

(c) Explain the change in exposure arising from entering a swap between fixed and floating interest rates. (2 marks)

(d) The company is looking to sell in 12 months time a small subsidiary operating in the materials industry, currently valued at $8.2 million. It wishes to hedge the price to be achieved on this divestiture in terms of its current valuation. The manager estimates that the performance of the materials industry follows the following historical relationship: (3 marks)

$$R = 0.2R_f + 0.7R_m$$

where R, R_f, R_m are returns on the industry index, the return on cash, and the return on the S&P/ASX 200 index, respectively.

Explain how you would hedge the sale price by means of the SPI 200 futures contract, given the following information:

- The SPI contract is based on an exposure of $25 for every point in the S&P/ASX 200 index;
- The current level of the S&P/ASX 200 index is 4,100 points.

(e) Explain the term *basis risk* in relation to the hedge in (d) and how you would estimate it. Suggest other ways of hedging that might reduce the basis risk.

(4 marks)

QUESTION 6 **(22 marks)**

As the asset consultant to a large industry superannuation fund, you have just presented to the Board of Trustees the performance results for the fourth quarter in relation to each of the fund's investment choices. The choices relate to units in:

- Australian equity;
- Australian debt;
- Australian direct property;
- Alternative investments;
- Cash.

These choices are managed by specialist managers. Managers have limited discretion to vary from their sectoral benchmarks in terms of industries or other sub-sectoral groupings.

The default choice is a balanced investment unit, invested across the asset classes listed above and managed by the superannuation fund's own staff. Derivatives are used to help adjust the exposures of the balanced unit to the asset classes. You assist from time to time in this respect.

After your presentation, you are approached by a new trustee director who is not familiar with the benchmarking and performance measures you have presented.

(a) Explain the purpose of performance benchmarks in relation to the investment choices.
(3 marks)

(b) Set out the criteria you would use for choosing an appropriate benchmark and discuss how you would determine the benchmark for the default choice.
(4 marks)

(c) For each investment choice and each period, you have decomposed the manager's actual return into the weighted sum of sub-sectoral returns $r^A = \sum_i w_i^A r_i^A$ and similarly for the benchmark return $r^B = \sum_i w_i^B r_i^B$.

In attributing performance between sub-sectoral allocation and stock selection, explain how you would deal with the compounding effects that arise in attribution over many periods. (6 marks)

(d) At the start of a particular year, the balanced investment unit has exposure to three other units, representing equity, debt and property in equal proportions. The expected returns and covariance matrix for these asset classes are as follows:

$$E(\mathbf{r}) = [9,5,7]^T$$

$$\text{cov}(\mathbf{r}) = \begin{bmatrix} 400 & 20 & 24 \\ 20 & 25 & 0 \\ 24 & 0 & 64 \end{bmatrix}$$

where $\mathbf{r}$ is the vector of equity, debt and property returns in that order, expressed as a percentage per annum. In addition, the current cash rate is 4.5% pa.

Show how the expected return and volatility for the balanced unit would vary if the exposure to equity were doubled by means of a futures contract. You may ignore dividend effects and assume that performance on the futures contract matches exactly that of the equity unit. (6 marks)

(e) The benchmark for the default choice is a static weighted sum of the benchmarks for the other specific choices. Discuss how you would assess the performance of the fund's management of this choice. (3 marks)

END OF PAPER