THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **2002 EXAMINATIONS**
PAPER TWO

Answer all 6 questions.

QUESTION 1 **(20 marks)**

You are the asset consultant to a large accumulation industry superannuation fund. The fund uses a range of specialist investment managers in each of the major asset classes. The fund has no reserves and crediting rates are declared quarterly in arrears. Monthly calculations are not available.

The board has an investment sub-committee that meets once a quarter to review the portfolio. The latest balanced / growth fund investment performance survey from your firm is always tabled and discussed at these meetings.

(a) The committee is meeting to consider the results for the fund year just ended (31 December 2002). The performance and asset allocation surveys on the following pages are tabled along with the latest fund investment summary. The investment committee has noted that results over the last quarter and the last year have been above median. Draft a letter to the committee commenting on known and unknown sources of over performance, providing **approximate** calculations where appropriate.
(12 marks)

(b) The committee feels that their strategy over the last three years has been "low risk" and this should be taken into consideration in reviewing their returns. Describe the calculations you would undertake in order to comment on this issue and outline any other issues you feel should be addressed.
(4 marks)

(c) The committee is particularly concerned over the performance of one of the fund's "boutique" Australian equity managers. When the manager was hired, the following investment philosophy was provided.

"*Boutique Investment Management: At BIM we believe that long term performance comes from identifying and capturing long term opportunities. We are more interested in tomorrow's leaders than today's leaders and we use our extensive professional experience to identify and invest in these companies.*"

The committee has asked you to prepare some tables and charts that they can have on hand when they interview the manager. Describe the tables or charts you would prepare and why you think they would be appropriate for the committee.
(4 marks)

Summary information
Balanced / Growth Investment Performance Survey (Net Tax and Fees); Periods to 31 December 2002

	3 Month Return	1 Year Return	2 Year Return	3 Year Return	3 Year Standard Deviation
Number of managers included in survey	38	38	37	33	33
Average Manager	-0.2%	6.8%	8.3%	9.5%	5.7%
Median Manager	-0.3%	6.8%	8.1%	9.4%	5.5%
S&P/ASX 200	-2.0%	5.2%	10.5%	10.9%	10.9%
MSCI World ex Aust in $A	-8.6%	2.2%	9.4%	16.6%	13.9%
UBSWA Composite	4.6%	12.1%	5.2%	6.6%	3.9%
UBSWA Bank Bill	1.6%	6.3%	5.6%	5.5%	0.2%
Salomon World (ex Aus) GBI (H)	3.9%	10.1%	5.4%	7.0%	2.7%
S&P/ASX 200 Property	6.9%	17.8%	5.8%	9.7%	11.4%
Mercer Direct Property	2.6%	11.3%	10.5%	10.2%	1.8%
AWOTE	0.6%	5.1%	4.0%	4.1%	1.1%
CPI	0.3%	5.8%	3.8%	3.0%	2.0%

Summary information
Balanced / Growth Asset Allocation Survey as at 31 December 2001

	Aust Shares %	Int'l Shares %	Listed Property %	Direct Property %	Aust Fixed Int %	Int'l Fixed Int %	Indexed Bonds %	Cash %	Other %
Overall Average Manager	37.8	20.9	6.3	2.7	17.1	4.4	0.9	9.2	0.7
Overall Asset Weighted Average	37.0	21.5	6.0	2.5	16.0	5.3	1.8	8.8	1.1

Balanced / Growth Asset Allocation Survey as at 31 December 2002

Manager & Fund	Aust Shares %	Int'l Shares %	Listed Property %	Direct Property %	Aust Fixed Int %	Int'l Fixed Int %	Indexed Bonds %	Cash %	Other %
Overall Average Manager	37.3	22.2	7.3	2.0	17.4	5.0	0.7	7.7	0.5
Overall Asset Weighted Average	36.5	23.2	6.7	2.5	15.8	5.9	1.8	6.5	1.1

Quarterly Investment Update – 31 December 2002

Asset Allocation

The table below shows the asset allocation of the Fund compared to its benchmark over the last 12 months. The fund has continued its policy of directing new cash flows to underweight asset classes.

Sector	Benchmark	Bench mark	Dec-01	Mar-02	Jun-02	Sep-02	Dec-02
Australian Shares	S&P/ASX 200	25%	25.8%	24.9%	25.7%	25.3%	24.7%
Venture Capital	S&P/ASX 200	5%	4.8%	5.0%	4.8%	4.9%	4.9%
International Shares	MSCI World Ex Aus in $A	15%	17.1%	17.8%	16.6%	16.9%	15.7%
Listed Property	S&P/ASX 200 Property	5%	4.8%	4.6%	4.6%	4.5%	4.7%
Direct Property	Mercer Direct Property	15%	13.8%	14.2%	14.4%	14.0%	14.7%
Australian Bonds	UBSWA Composite	25%	23.5%	23.7%	24.3%	24.3%	25.3%
International Bonds	Salamons World GBI	5%	4.5%	4.4%	4.3%	4.7%	4.8%
Cash	UBSWA Bank Bill	5%	5.7%	5.4%	5.3%	5.3%	5.2%
TOTAL		100%	100.0%	100.0%	100.0%	100.0%	100.0%

Performance

The table below shows the quarterly Fund crediting rate over the last 12 months.

Period	Crediting Rate
March 2002 Quarter	3.19%
June 2002 Quarter	2.28%
September 2002 Quarter	1.69%
December 2002 Quarter	0.65%
Year to 31 December 2002	8.01%

QUESTION 2 **(9 marks)**

Over recent years the quantum of Australian Commonwealth Government Debt has been reduced by virtue of a succession of Budget surpluses, including the privatisation of Government assets.

This has created issues for the domestic bond market. The reduced availability (and possibly the complete unavailability) of such investments runs contrary to demand from superannuation funds with relatively fixed allocations to fixed interest.

Further concerns have been raised in respect of using Government bond prices to generate the benchmark interest rates used to price corporate bonds.

It has been suggested that the Australian Government could encourage a healthy and liquid bond market by issuing bonds and then investing the proceeds in a portfolio of publicly traded assets, e.g. shares.

Comment on the difficulties inherent in this idea. (9 marks)

QUESTION 3 **(20 marks)**

An Australian superannuation fund is considering an equity investment in an infrastructure asset. The particular investment under consideration is a tollroad in the United States.

This tollroad investment has the following characteristics:

- It involves a concession to operate the tollroad for a fixed period. 60 years of the concession period remain. Thereafter the asset reverts to the government.
- Tolls can be escalated with inflation.
- The tollroad has been operating for several years and has an established record of patronage.
- The purchase of the tollroad was made via a combination of debt and equity financing.

The projected cash flows for the next five years are set out in the table below ($US millions).

Calendar year	**2003**	**2004**	**2005**	**2006**	**2007**
Revenue	100.0	104.0	108.2	112.5	117.0
Operating expenses	(35.0)	(36.1)	(37.1)	(38.2)	(39.4)
Tax	0	(1.0)	(2.0)	(2.0)	(3.0)
Cash flow available for debt service	**65.0**	**67.0**	**69.0**	**72.2**	**74.6**
Interest payable	(65.0)	(65.0)	(65.0)	(65.0)	(65.0)
Cash distributed to equity investors	**0.0**	**1.9**	**4.0**	**7.2**	**9.6**
Debt outstanding	1000.0	1000.0	1000.0	1000.0	1000.0
Interest rate	6.5%	6.5%	6.5%	6.5%	6.5%

As an adviser to the superannuation fund, you have been asked to assist the Trustee in the due diligence process.

(a) What are the particular attractions of tollroad investments for a superannuation fund? (3 marks)

(b) What are the issues particular to <u>this</u> investment in the context of its suitability or otherwise for an Australian superannuation fund? (5 marks)

(c) What Australian dollar value would you place upon the equity in this tollroad? State all assumptions and show all working.

You can assume that all income repatriated to Australia receives a credit for tax paid in the United States, i.e. there is no double taxation.

(9 marks)

(d) What further information would you request from the promoter of this investment before confirming your view as to what constituted a reasonable price for the investment? Explain why you would request each item. (3 marks)

QUESTION 4 **(9 marks)**

You manage a portfolio of commercial properties for a specialist property funds management company (Deal Fever Management Pty Ltd). An opportunity to purchase a small CBD office building at what you consider to be a very reasonable price has arisen. Financing such a purchase, however, is not going to be easy. The trust that you manage is already close to its (admittedly low) gearing covenants, and hence this purchase cannot be funded via a straight debt financing. Further, while your investors have a good deal of confidence in your investment prowess, they are reluctant to commit further funds to your trust at this time, and have asked you to think creatively about how you might find alternative means of funding this purchase.

Not wanting to pass up this opportunity, you ask an investment banking acquaintance for some suggestions as to how one might raise the necessary funds.

She notes that the highest value property amongst your investments provides around 30% of the income of the portfolio. Further, the lease payments for this particular property are contractually fixed for the next 10 years (subject to CPI increases). She suggests that these contracted lease payments could be securitised and sold as a 10-year CPI linked bond. That is, the bondholder would not have security over the property - their recourse would be limited to the lease payments (a general obligation of the party or parties leasing the property).

Assume that securitising the lease payments in this way is both acceptable to your current investor base and complies with the Trust Deed.

(a) What are the risks inherent in the CPI linked security proposed by your investment banker friend – from the perspective of an investor in this security?

(4 marks)

(b) How would raising funds in this way change the nature of your property investment portfolio? What are the primary risks in this approach?

(5 marks)

QUESTION 5 **(23 marks)**

A US fund manager's equity investment approach is based on the following fundamental beliefs:

- **Investment Trends** tend to last for relatively long periods of time, longer in fact than most investors would expect. These trends can be successfully identified, measured and exploited by a quantitative approach to investment management.

- **Positive Business Momentum** and improving fundamentals have been and will be critical indicators of a company's future stock price performance.

- **Market Recognition** is a critical factor in choosing companies to include in a portfolio. Until the market recognises the potential in a company or its valuation it is likely to underperform the rest of the market.

(a) Discuss these beliefs and whether or not you believe that they are likely to hold true for the Australian market.

(6 marks)

The firm has examined a vast amount of data and has arrived at the following stock selection model.

Valuation (26%)	
Price/Free cash flow	Current price divided by cash earnings.
Price/Trailing Earnings	Current price divided by the last four quarter earnings.
Price Reversal	Relative, long term price reversal.
Business Momentum & Earnings Quality (40%)	
Capital Expenditures Intensity	Year on year change in ratio of capital spending to depreciation.
Change in Accruals	Four quarter change in working capital.
Market Recognition (34%)	
Estimate Revision	Direction and magnitude of recent earnings estimate revisions.
Price Momentum	Relative price performance.

(b) Discuss, with reasons, why each of these factors might have been selected for investigation for possible inclusion in the firm's stock selection model.

(7 marks)

(c) Give three other quantitative factors that could also have been back-tested and your reasons as to why they might add value.

(6 marks)

The manager's portfolio is then constructed by the following process.

Once the model has evaluated all individual companies in the S & P 500 on the combined results of the components described above, an overall rank for each stock is developed and expressed on a decile basis. The manager will then purchase approximately 400-440 companies, significantly overweighting well-ranked stocks (top two deciles), equally weighting those stocks in the middle, and underweighting poorly ranked (8th & 9th decile) stocks. Bottom decile stocks are not owned.

The manager's current weighting scheme is as follows:

Decile Rank	Portfolio Weighting (relative to S&P 500 Index)
1	170% Significant Overweight
2	135% Modest Overweight
3-7	100% Equal Weight
8	95% Modest Underweight
9	40% Significant Underweight
10	0 % Not owned

Minimisation of stock specific risk is a function of the following:

- The portfolio holds a large number of stocks (400-440 issues).
- Some 300 of these stocks are essentially market weighted.
- Another 50 stocks (decile 9) are owned (but underweighted relative to the benchmark) even though the model predicts that they are likely to under perform.

This has lead to extremely low levels of tracking error.

(d) If an Australian manager attempted to introduce a similar process for a $2 billion portfolio in the Australian market, what would be the most significant practical problems such a strategy would face?

(2 marks)

(e) Assuming the expected value added of the Australian portfolio is the same as that for the American one, would you expect it to have the same information ratio (give reasons for your answer)? For the purposes of this part of the question you may assume that the quant factors do add value.

(2 marks)

QUESTION 6 **(19 marks)**

Show all working. Unless otherwise stated, calculate all yields to the nearest basis point (0.01%). Ignore transaction costs.

It is roughly 98 years into the future (i.e. 1 January 2100).

Australia and New Zealand remain as separate sovereign nations, each with their own interest rate and currency markets.

All derivatives traded in 2002 remain.

You are the actuary and investment manager for a medium-sized general insurance company.

(a) The Australian short term money market (in the year 2100 this encompasses all maturities less than or equal to one year) is undergoing temporary liquidity problems. Enterprising market players, however, can create synthetic Australian dollar (AUD) deposits using the New Zealand short term money market and various currency contracts. New Zealand has a massive current account surplus and their debt is rated AAA by S&P.

The following forex and bill rates are available for New Zealand.

Days	Bill rate	NZD per AUD 1.00
spot	-	1.400
91	3.25%	1.395
183	3.50%	1.390
274	3.75%	1.385
365	3.99%	1.380

For your portfolio you also decide to employ such methods, creating a synthetic 1-year risk-free deposit by buying New Zealand dollars (NZD), investing in New Zealand T-Notes, and forward selling NZD to convert the maturity proceeds back to AUD.

Calculate the proceeds in 1 year of an AUD 1 million investment and hence the yield on a synthetic 1-year deposit.

(2 marks)

(b) Beyond the short term rates, there is a liquid AUD forward interest rate market for terms out to five years.

n	f(1,n)	f(n-1,n)	z(n)
1			
2	6.00%		
3		6.30%	
4	6.27%		
5		6.60%	

Complete the above table of forward and zero coupon rates for the Australian market. Note that the table above uses the following notation:

- f(i,j) is the per annum interest rate applying from time i years to time j years.
- z(n) is the zero coupon interest rate (per annum) applying over a term of n years from time zero.

(6 marks)

(c) Your boss says: "The yield curve is normal-shaped (upward sloping). We could increase our profit by holding assets longer than the liabilities." Of the hypotheses explaining the shape of yield curves, which one is most supportive of this assertion? Briefly explain.

Why might this approach fail to work in practice?

(3 marks)

(d) Your company has expected outstanding liabilities due as follows (one value to be calculated):

Date	Cashflow ($m)
1/1/2101	10
1/1/2102	10
1/1/2103	10
1/1/2104	e

Your assistant says "By coincidence, the discounted mean term (calculated using NZD cashflow amounts and the NZD yield) Telecom NZ 1/1/2103 6% annual coupon bond [rated A- by S&P] has exactly the same discounted mean term as the liabilities (calculated using the Australian dollar cash flows and Australian interest rates)."

Assuming he is correct, calculate the missing value "e" in the table above, to the nearest $0.1m. The NZD market yield of the Telecom NZ bond is 6.5% p.a.(annual compounding).

(4 marks)

(e) You assistant continues, "Since the NZD tracks the AUD so closely, currency risk is minimal. Let's just immunise the fund with the bond, and collect the yield pick-up as profit."

Briefly discuss 4 investment risks that adopting this suggestion would create, relative to a perfectly matched fund holding risk-free assets. Ignore regulatory and statutory capital issues.

(4 marks)

END OF PAPER TWO