THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

Answer all 8 Questions

QUESTION 1 **(9 Marks)**

You have been analysing a converting preference share ("prefs") issued by Davids Ltd. (ASX Code DVDPA). Davids Ltd (not to be confused with David Jones) is a grocery and liquor wholesaler that supplies independent supermarkets and liquor outlets in QLD, NSW, ACT, VIC, and SA.

The main features of this converting preference share issue are :

Maturity date 28 November 2001

Face value of $1.00 for each converting preference share.

Dividends are at 9%pa fully franked payable semi-annually in arrears. The dividends are payable on 30 June and 31 December of each year. On maturity the dividend payable is pro-rata based on the number of days in that half year.

On the maturity date the securities will convert into ordinary shares at a discount of 10% of the "weighted" price of the ordinary shares. This is subject to a minimum of 1 ordinary share and a maximum of 2 ordinary shares. The "weighted" price is based on the trading volume for the 10 trading days on and before the maturity date.

Currently the Davids prefs are trading at 84 cents, and the Davids ordinary shares are trading at 45 cents.

a) A colleague questions your decision to purchase these Davids prefs and says, "I can't believe you are buying those prefs, our retail analyst has a 'sell' on Davids ordinary shares. Surely, this means the prefs are a sell as well. Besides, given the conversion terms, you would have thought that those prefs would normally be trading at 90 cents (2 x 45c) and not 84 cents. That must mean that the market has rated those prefs as a more compelling "sell" than the ordinaries."

Comment on this statement. How could you neutralise the effect of the major embedded "equity" type characteristics of this security? (3 marks)

Question 1 continues over page

Question 1 continued

b) Comment on why you believe the retail analyst has placed a "sell" on Davids Ltd ordinary shares. As stated previously, Davids is a grocery and liquor wholesaler that supplies to independent supermarkets and independent liquor outlets. Your answer should concentrate on the key issues that are affecting the Australian retail sector, especially with regards to supermarket and liquor retailing. Note that the key retail stocks in this part of the market are Woolworths Ltd (WOW) and Coles Myer Ltd (CML). An extract of the financial statements from the latest annual report is reproduced below and over two pages. (6 marks)

Extract of financial statements

Davids Limited

Consolidated Profit & Loss Account

	Current Period **12 months** ending 30/4/2000	Previous Corresponding Period **10 months** ending 30/4/1999
	AUD '000	AUD '000
Sales Revenue	5,147,653	3,372,341
Other Revenue	381,144	261,161
Total Operating Revenue	5,528,811	3,633,076
Operating Profit (Loss) before abnormal items and tax	**40,902**	**28,129**
Abnormal Items before tax#	(16,191)	(7,690)
Operating Profit (Loss) before tax	24,711	20,439
Less tax	23,658* *includes abnormal tax write off of 8,270	11,774
Total Operating Profit after extraordinary items and tax	**1,053**	**8,665**
Retained profits (accumulated losses) at beginning of financial period	(217,648)	(220,644)
Dividends provided for or paid	(16,078)	(6,885)
Retained profits (accumulated losses) at end of financial period	(232,673)	(217,648)

#abnormal items for current period are as follows (AUD '000):

costs associated with exit from retail segment	(5,248)
GST implementation costs	(1,710)
Ongoing Business reorganisation costs	(9,233)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

Consolidated Balance Sheet

	At end of Current Period 30/4/2000	As in last annual report 30/4/1999
	AUD '000	AUD '000
CURRENT ASSETS		
Cash	54,428	16,437
Receivables	468,272	255,163
Inventories	308,138	241,975
Other – Prepayments	9,250	7,773
TOTAL CURRENT ASSETS	**840,088**	**521,348**
NON-CURRENT ASSETS		
Receivables	611	1,661
Investment in Associates	917	14,381
Other Investments	932	890
Other property, plant, equipment (net)	138,584	164,521
Intangibles (net)	288,523	237,928
Other – Future Income Tax Benefit	67,929	85,752
Other – Deferred Costs	14,919	2,731
TOTAL NON-CURRENT ASSETS	**512,415**	**507,864**
TOTAL ASSETS	**1,352,503**	**1,029,212**
CURRENT LIABILITIES		
Accounts payable	678,437	433,967
Borrowings	12,068	19,659
Provisions	48,830	42,783
TOTAL CURRENT LIABILITIES	**739,335**	**496,409**
NON-CURRENT LIABILITIES		
Accounts Payable	1,103	4,532
Borrowings	246,535	142,837
Provisions	23,584	28,462
TOTAL NON-CURRENT LIABILITIES	**271,222**	**175,831**
TOTAL LIABILITIES	**1,010,557**	**672,240**
NET ASSETS	**341,946**	**356,972**

Consolidated Statement of Cash Flows

	Current Period **12 months** ending 30/4/2000	Previous Corresponding Period **10 months** ending 30/4/1999
	AUD '000	AUD '000
CASH FLOWS RELATED TO OPERATING ACTIVITIES		
Receipts from customers	5,422,810	3,595,838
Payments to suppliers and employees	(5,396,795)	(3,626,660)
Dividend received from associates	330	-
Other dividends received	1	81
Interest and other similar items received	563	626
Interest and other costs of finance paid	(15,005)	(9,592)
Income taxes paid	(8,456)	3,945
Net Operating Cash Flows	**3,448**	**(35,762)**
CASH FLOW RELATED TO INVESTING ACTIVITIES		
Payments for purchases of property, plant and equipment	(7,191)	(4,748)
Proceeds from sale of property, plant and equipment	9,900	3,811
Payment for purchases of equity investments	(42)	(48)
Proceeds from sale of equity investments	3	-
Loans to other entities	(906)	(400)
Loans repaid by other entities	150	159
Other – Proceeds on sale of retail stores	43,627	20,697
Payment on Acquisition of Subsidiaries/Business	(31,641)	-
Net Investing Cash Flows	**13,900**	**19,471**

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

QUESTION 2 **(10 Marks)**

You purchase $100,000 of physical Treasury bonds, with coupon 12% and exactly 3 years to maturity. You then write a call option over one SFE 3yr Treasury bond futures contract at a strike price of 90.00. Assume the dollar value of the call option premium is $1000.

a) Sketch the market value / yield graph for the portfolio of physical bonds and for the portfolio of "bond plus option".

(2 marks)

b) Across the possible range of outcomes for the option (ie delta going from 0 to 1), describe the behaviour of the duration and convexity of the "bond plus option" portfolio, and give reasons.

(4 marks)

Now, in addition to writing the call option above, you buy a put option with strike price 86.00. Assume the put option premium is $400.

c) Sketch the market value / yield graph for the portfolio of physical bonds and for the portfolio of "bond plus options".

(2 marks)

d) Name the derivative strategy which when backed by cash produces a payoff equivalent to this "physical bond plus options" portfolio. Show your reasoning.

(2 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

QUESTION 3 **(10 Marks)**

In many of the areas that actuaries advise on asset allocation, the liabilities are long term in nature and linked to price or wage inflation. One would think that inflation linked bonds would receive a greater weighting in the investment portfolio compared to nominal government bonds when setting the asset allocation, but this is rarely the case.

a)

i. Explain why inflation linked bonds are expected to receive a greater weighting relative to nominal bonds. (2 marks)

ii. Explain why this is not currently observed in practice. (3 marks)

b) Explain how a fixed interest portfolio that is “immunised” with a liability portfolio using duration matching might not be fully immunised. (3 marks)

c) You wish to "match" your fixed interest assets with a liability portfolio. Discuss the advantages and disadvantages of using immunisation as compared to using a dedicated bond portfolio. (2 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

QUESTION 4 **(11 Marks)**

You have been appointed as the asset consultant to the XYZ Superannuation Fund. XYZ is a "public offer" fund (in that it is open to anyone) and competes with other funds for members. All members have accumulation style benefits, ie. their benefits are based on the accumulation of member contributions with credited earnings.

The benchmark asset allocation of the Fund is currently:

XYZ benchmark asset allocation	
Australian Shares	30%
International Shares	30%
Listed Property	10%
Australian Bonds	15%
International Bonds	10%
Cash	5%

The Trustee has approached you for advice concerning the degree of currency hedging that is appropriate for the international assets.

a) What issues should the Trustee consider in determining what proportion (if any) of the international assets to hedge back into Australian dollars?

(3 marks)

b) The Trustee requests that you create a model and perform an optimisation to determine the most efficient proportion of assets to be hedged back into Australian dollars. What practical difficulties could make the model's results unreliable?

(4 marks)

c) The Trustee decides that their preferred approach is to passively hedge the currency exposure created by the international bonds back into Australian dollars, and to appoint a specialist currency manager to actively manage the currency exposure created through investing in international equities. The Trustee also determines that the benchmark for the currency manager is to be 0% hedged into Australian dollars. The currency manager is permitted to take positions between 0% hedged into Australian dollars to 100% hedged into Australian dollars. Cross hedging into other currencies is permitted so long as the exposure to any one currency does not exceed 100% of the total value of the international equities held by the Fund. The manager's fees are to be performance based. What problems could arise from this arrangement for the Fund and/or the currency manager?

(4 marks)

QUESTION 5 **(11 Marks)**

You have just been recruited to be the Head of Active Quantitative Equities at a start up operation called Delta Investment Management (Delta). Your brief is to establish an active quantitative process at Delta, which is to have a relatively low tracking error in the order of 2% to 3% pa. In addition, the product is to be marketed as a "style-neutral" product.

(Note: "Active risk" is also known as "tracking error"; "active return" is also known as "alpha" or "excess return")

You now have to build a model that will be the engine of your active quantitative stock selection and portfolio construction process.

a) You have decided that instead of building your own active risk model that you would use an “off-the-shelf” software package. This leaves you to build an active return model.

However, you have never built an active return model before, and you realise that you have to build one from scratch.

After consultations with industry peers you have decided to build your own active return model of the form:

$$r_n = \sum_{k=1}^{K} X_{n,k} \bullet b_k + u_n$$

where: r_n is the expected active return of stock n

$X_{n,k}$ is the exposure of stock n to active return factor k

b_k is the return to active return factor k.

u_n is the residual term for stock n, and has an expected value of zero.

Question 5 continues over page

Question 5 continued

Your next step is to determine which active return factors would be used in your model.

Discuss how you would identify, test and check potential active return factors for possible inclusion in your model. Describe briefly a few key quantitative factors that you might test. Identify some data integrity problems that you are likely to encounter while building this model.

(6 marks)

b) You have completed the design of a simple active return model with 3 key factors, labelled A, B and C. Your manager has been impressed with the test results of your active return model. With the vision of ultimately marketing to institutional clients, he has now given you a test fund with real money to begin trading on.

Your first step was to update for the latest market data and re-run your proprietary active return model to generate excess expected returns for every stock for which you had data. You then applied your off-the-shelf risk model to generate an optimal portfolio. Initially you are applying very minimal risk constraints within the risk model.

The data below relates to the optimal portfolio that has been generated from these models.

Question 5 continues over page

Question 5 continued

i. With brief reasons, explain how well this portfolio's total level of active risk fits with the nature of the proposed product. List some ways in which you could manage this risk better in your portfolio construction process. (3 marks)

ii. List briefly some important reasonableness checks you would make before deciding to implement your final portfolio in the market. In your answer include reference to the portfolio output below. (2 marks)

Benchmark: ASX300
Tracking Error: 13%

Active Weights By Group of Stocks:

Resources	-5%		Large Stocks	-20%
Banks	-10%		Small Stocks	+20%
Cyclicals	-15%			
Growth	+25%			
Other	+5%			

The three largest active positions in the optimal portfolio are:

Stock	Sector	Active Weight	Expected Excess Return	Exposure to Factor			Market Capitalisation ($million)	Marginal Contribution to Active Risk
				A	B	C		
ABC Ltd	Growth	+15%	+4	+1	+4	+2	12	+2%
DEF Ltd	Cyclical	-4%	-2	0	Missing	-1	20,000	-2%
GHI Ltd	Growth	+6%	+2	-1	-1	-1	370	+1%

Expected excess returns and factor exposures have been normalised to N(0,1) distributions, where "+2" for example represents a result which is 2 standard deviations above the mean for all stocks.

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

QUESTION 6 **(13 Marks)**

a) If an actuary does not give investment advice to individuals and only advises companies, why may it be necessary for the actuary to be authorised under a dealers licence or futures advisers licence? (3 marks)

b) What parts of GN151 cover situations where an actuary may have inadequate capacities to do particularly investment work? (3 marks)

c) You are an actuary working for an investment management firm in a client relationship role. One of your clients is a superannuation fund which invests fixed interest with your firm and invests shares with a competitor. The managing director of the client is retiring next month and has asked your advice on how the super fund trustee should liquidate investments to fund the large retirement benefit involved. It is March 2000 and you have suggested that as the All Ords index is at a record high, your client should sell down shares to provide the benefit.

i. How might the advice you have given contravene sections of the Institute's Code of Conduct and GN151? (3 marks)

ii. How might the action you have suggested disadvantage continuing members of the super fund? (2 marks)

iii. Your firm provides derivatives overlay services for clients. Ignoring implementation and transaction costs, what alternative strategy could be used to provide the payment? What authorisations would you need to explain this alternative strategy to the client? (2 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

QUESTION 7 **(16 Marks)**

You are a consulting actuary advising a trustee of a fund which has decided to split its investments between two managers. Your objectives are medium term in nature, with the desire to generate a high return but with moderate volatility.

You have interviewed three balanced managers:

Manager A describes its approach as avoiding asset allocation bets, concentrating instead on stock selection, with a bias to growth stocks.

Manager B states its belief that asset allocation is the key to adding value, and consequently takes significant overweight or underweight positions in individual equity and bond markets, based on valuation criteria. Stock selection is relatively passive.

Manager C asserts that long term success is best achieved by avoiding losses, and uses options extensively to implement this approach. Stock selection has a value bias.

a) Comment on each of these styles in terms of the pattern of returns expected under different market scenarios. (6 marks)

b) Given that you have decided to appoint two of the three, discuss the advantages and disadvantages of each pairing in turn; which two would you recommend as being the most complementary? (7 marks)

c) How would you decide the proportion of the fund to be given to each manager? (3 marks)

THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT

PAPER TWO **2000 EXAMINATIONS**

QUESTION 8 **(20 Marks)**

You are the asset consultant to a large corporate accumulation fund. Member contributions and employer contributions are invested in separate sub-funds. Member -financed benefits are based on the accumulation of member contributions with credited earnings.

The crediting rate applied to member-financed benefits is derived from the actual earning rate on member assets after applying a smoothing mechanism, whose aim is to credit a target rate equal to the rate of increase of CPI plus 3% pa. The precise mechanism is to satisfy as far as possible all the following conditions in decreasing order of priority:

1. The crediting rate cannot be negative.
2. The reserve should not fall below -5% of member assets.
3. The reserve should not exceed 5% of member assets.
4. The crediting rate is calculated by reference to the actual earnings rate i, the target rate t (where t = CPI increase + 3%), and the level of reserve (r) as a percentage of assets as follows:

$$\text{Crediting rate} = i - (5-r)/10 * (i-t) \quad \text{if } i>=t$$
$$= i + (5+r)/10 * (t-i) \quad \text{if } i<t.$$

The trustee has adopted a passive asset allocation for member assets, with the relevant asset classes being equity and debt only. Investments in both these asset classes are made passively. The long term investment objectives relating to member assets as a whole are:

- to achieve a negative actual earnings rate no more than 1 year in 6; and
- to have the crediting rate fall short of the target rate no more than 2 years out of 5.

a) Discuss briefly, with reasons, the advantages and disadvantages of the smoothing mechanism adopted, from the viewpoint of the members and the employer. (5 marks)

b) Outline, in words, the main steps involved in testing whether a given asset allocation meets the investment objectives. (6 marks)

b) Based on the process you have described in part b), explain how you would derive an appropriate asset allocation and under what circumstances this can be achieved. (6 marks)

Question 8 continues over page

Question 8 continued

d) A trustee director suggests that the process you have taken in part b) and part c) does not allow for the duration of the benefit liabilities. Explain how this criticism might be dealt with. (3 marks)

END PAPER TWO