INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 1 INVESTMENTS
SEMESTER TWO 2005 EXAMINATIONS

MARKING GUIDE

Level of Difficulty

Question	Syllabus Topic	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1a	2,2	1,2	3			3
1b	2,2	1,2	3			3
1c	2,2	1,2		4		4
1d	2,2	1,2		2		2
2a	2	2		5		5
2b	2	2			4	4
2c	2,7	2,6			5	5
3a	3,3	2,6		3		3
3b	3	6			7	7
3c	3	6		5		5
3d	2	7	1	3		4
4a	2	5		2		2
4b	1	4		6		6
4c	2	4			5	5
4d	2	4			5	5
4e	5	5	2			2
5a	5	2	4			4
5b	5	2		5		5
5c	5	2		4		4
5d	5	2			3	3
6a	1	8	4			4
6b	1	8	1.5	1.5	2	5
6c	1	8			6	6
6d	4	2	4			4
TOTAL			**22.5**	**40.5**	**37**	**100**

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QUESTION 1 **(12 marks)**

As the adviser to the investment committee of a major Australian insurer, you assist in developing economic forecasts to determine asset allocation. You have been asked to explain the overall objectives of the Reserve Bank of Australia (RBA). Of particular interest to the committee is the independence between the RBA's policies and the Government's fiscal policies.

(a) **List the main objectives of the RBA.** **(3 marks)**

(b) **Describe the main activities the RBA undertakes in achieving its objectives.** **(3 marks)**

(c) **Explain how the RBA's operations affect short and long term interest rates in Australia.** **(4 marks)**

(d) **Discuss how the RBA's independence from the Government might assist in achieving its objectives.** **(2 marks)**

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QUESTION 1: SOLUTION **(12 marks)**

(a) The RBA's main objectives are to:

- manage domestic inflation (currently to a band of 2%-3% pa) (1 mark)
- ensure stability of the financial system (1 mark)
- ensure integrity of the payments system. (1 mark)

(b) The main activities the RBA undertakes to achieve its objectives are:

- Setting monetary policy – the setting of domestic cash rates through open market operations (1 mark)
- Monitoring financial stability and development of policies, including acting as lender of last resort to APRA-supervised institutions (1 mark)
- Supervision and regulation of payments clearing and settlement. (1 mark)

(c) The RBA manages cash rates by controlling the money supply for banks' settlement of transactions. (1 mark)

Thus the RBA directly impacts short-term interest rates through setting the cash rate (ie the shortest term interest rate). This, in turn influences the supply and demand for goods and services, for credit, and for foreign exchange in the short term. (1 mark)

The impact on long-term interest rates arises from the perceived persistence of monetary policy, especially for controlling domestic inflation. Longer term interest rates are a function of shorter-term interest rates. Hence any perceived permanent change in short-term interest rates will have an impact on long-term interest rates. (1 mark)

Thus implementation of monetary policy may also change expectations for inflation, thereby impacting on longer term interest rates and for economic activity, credit and foreign exchange in the longer term. (1 mark)

(d) The RBA's independence means that:

- It is free to pursue its inflationary objectives without compromising other objectives or constraints imposed by the government. (1 mark)
- It can afford to take a long-term perspective to implement its objectives, which assists in the development of market expectations. (1 mark)

QUESTION 2 **(14 marks)**

You are the fixed interest analyst of a reputable Australian funds manager and have been asked to explain your firm's approach to the management of its portfolio of Commonwealth Government Securities (CGS).

To illustrate your response, you have provided the following table of yields, which shows the movement over a 3 year period from a normal yield curve to an inverted yield curve.

	Yields % pa			
	cash	3 year	5 year	10 year
30/06/2002	4.72	5.61	5.78	5.99
30/09/2002	4.75	4.95	5.11	5.34
31/12/2002	4.75	4.55	4.79	5.16
31/03/2003	4.75	4.64	4.90	5.33
30/06/2003	**4.75**	**4.47**	**4.71**	**5.01**
30/09/2003	4.75	5.04	5.21	5.38
31/12/2003	5.23	5.39	5.55	5.60
31/03/2004	5.25	5.15	5.33	5.49
30/06/2004	5.25	5.43	5.67	5.87
30/09/2004	5.25	5.24	5.35	5.47
31/12/2004	5.25	5.10	5.22	5.33
31/03/2005	5.49	5.62	5.67	5.67
30/06/2005	**5.50**	**5.10**	**5.10**	**5.11**

(a) **Discuss possible reasons for the shape of and movement in the yield curve.** **(5 marks)**

(b) **Explain *in detail* the meaning of a zero coupon yield curve and how you would derive it from the yield curve at any particular time.** **(4 marks)**

(c) **Explain how, with the benefit of foresight, you would structure a CGS portfolio as at 30 June 2003, given the movements of the yield curve that occur subsequently. You should show the calculations required to support your explanation.** **(5 marks)**

QUESTION 2: SOLUTION **(14 marks)**

(a) There are three explanations for the shape of the yield curve: (i) liquidity preference (ii) market segmentation and (iii) pure expectations.

The liquidity preference theory supposes a risk premium for longer dated maturities, and hence cannot on its own explain an inverse yield curve. (1 mark)

In addition, it is doubtful whether *domestic* market segmentation can explain a shift in the yield curve within a period less than 5 years, when no obvious explanation for a change in the domestic market structure is available. (1 mark)

This leaves the pure expectations theory alone as the most likely to explain the shift from a normal shape to an inverted one. A normal curve corresponds to expectations of constant, or increasing interest rates; an inverse curve to expectations of falling interest rates. (1 mark)

It is plausible that expectations have shifted over five years in this manner. Possible economic reasons for the shift are as follows:

- Inflation has now been brought under control and thus tight monetary policy to combat it is no longer necessary – future inflation and interest rates will be lower than current levels.

- Demand for longer dated maturities may reflect expectations of a recession, which is accompanied by low interest rates and inflation (this is the conventional view).

- The low yields on long dated bonds are imported from the US, where there has been some demand by Asian central banks for longer maturities, in their attempt to maintain currency pegs with the USD.

  (1 mark for each point, maximum of 2 marks)
  (Other reasonable explanations also accepted, maximum of 5 marks for question)

(b) The zero coupon yield curve is the curve that would result if all bonds on issue were 'bullet bonds', i.e. they consist only of repayment of interest and capital on maturity. Thus this type of curve removes all the complications with varying coupon levels and different maturities.
(1 mark)

Unfortunately bullet bond yields are not directly observable in Australia, but need to be estimated from observed yields of bonds with non-zero coupons. (1 mark)

A method relying on arbitrage is as follows (see Ilmanen). Suppose that the zero coupon yield for maturity t is denoted r_t. Then a bond paying a coupon g per period, maturing at time n for par, should have a price of:

$$P = \frac{100}{(1+r_n)^n} + \sum_{t=1}^{n} \frac{g}{(1+r_t)^t}$$

By taking at least as many bonds of different maturities as there are dates, it is possible to solve for the zero coupon yields r_t. This approach does rely, however, on the price of a bond being equal to that of its components, which may be invalidated by tax effects. (2 marks)
(Markers should use discretion in allocating marks. Maximum of 4 marks).

(c) The portfolio should be structured to provide the greatest expected return over the 2-year holding period. It is possible that the optimal solution would be to hold a bond for only part of the two year period. However if a bond were to be held at all, the highest return would be achieved if it were sold when yields are lowest, ie. as at 30 June 2005. This means that it is enough to investigate holding yields on the bonds for the full period.

With perfect hindsight, the 2 year holding period yields on cash, 3, 5 and 10 year securities can be calculated as follows (assuming that yields are quoted on a semi-annual basis for all but cash):

Cash – approximately the geometric mean of the cash rates, 5.35% (1 mark)

3 year bond – assuming that the bond is taken initially at par with a coupon of 4.47%, the price at 30 June 2005 is:

$$\frac{100}{\left(1+\frac{5.10}{200}\right)^2} + 4.47\frac{1-\left(1+\frac{5.10}{200}\right)^{-2}}{5.10/100} = 99.388$$

The holding yield i is therefore the solution of:

$$\frac{99.388}{\left(1+\frac{i}{200}\right)^4} + 4.47\frac{1-\left(1+\frac{i}{200}\right)^{-4}}{i/100} = 100$$

or 4.17% pa semi-annual. (1 mark)

5 year bond – assume that the bond is taken initially at par with a coupon of 4.71. The calculation above can be repeated to give a holding yield of 4.19%.
(1 mark)

10 year bond – assume that the bond is taken initially at par with a coupon of 5.01%. The calculation above can be repeated to give a holding yield of 4.69%
(1 mark)

With perfect foresight, the portfolio should be invested entirely in cash as it provides the greatest expected return over the 2-year holding period. This is due to the fall in yields over the 2-year period (offsetting the higher yield on the 10 year bond initially).
(1 mark)

(Note: 1 mark for each correct calculation, 1 mark for correct conclusion).

QUESTION 3 **(19 marks)**

You are the asset consultant to a large Government funds management operation. You have been requested to review one of the operation's international equity managers, MULTIFACT, who has provided the following information on its investment philosophy and approach.

Investment Philosophy: MULTIFACT uses a rigorous "*Enhanced Value*" approach which methodically exploits characteristics such as low P/E and low P/B ratios and other pricing anomalies in world equity markets. This approach was originally developed based on strong empirical evidence indicating that value investing in the global markets results in superior returns over the long term.

Market inefficiencies exploited: Many of the stock selection factors that MULTIFACT uses derive their efficiency from certain behavioural characteristics of investors that cause inefficiencies in markets. Tendencies toward overreaction, overconfidence, extrapolation, agency effects and other behavioural issues play a role in how investors make decisions.

Value Added:

Source of Value Added	Expected Contribution to Performance (%)
Long Term Country Allocation	0
Shifts in Country Allocation	25
Industry Allocation	5
Currency Allocation	5
Individual Security Selection	65
TOTAL	100%

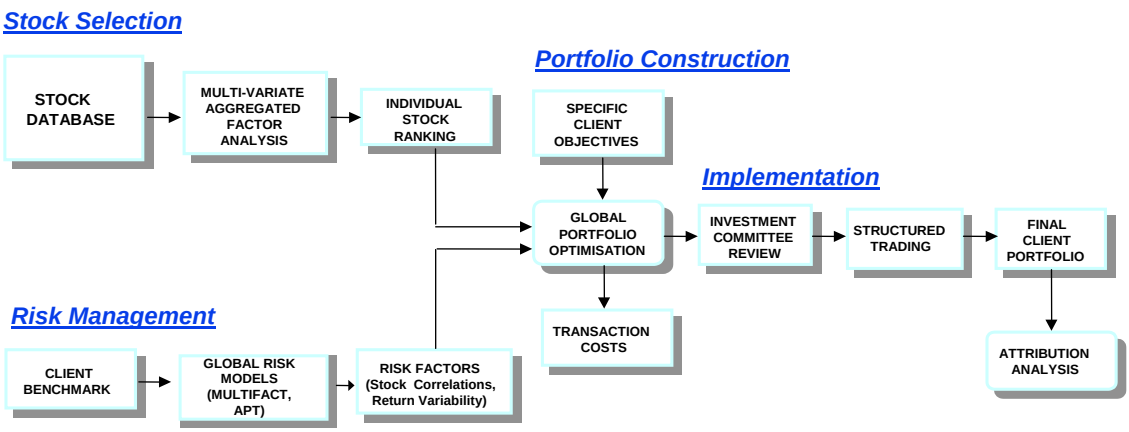
Country allocation: MULTIFACT's process does target a particular country allocation. Country allocation is the result of the bottom-up stock selection process.

Currency: Currency forecasts are an implicit part of the stock valuation process. The currency return forecast model considers both local currency equity market return and the projected change in the market's currency versus the base currency of the investor. The framework incorporates short and long term interest rate differentials and price momentum in generating return forecasts.

Individual Security Selection: Much of the research process is computer-driven using the extensive and detailed information in MULTIFACT's proprietary stock and market database. Investment professionals review and discuss key outputs at their regular meetings to ensure that the valuation models continue to function optimally.

Portfolio construction: Portfolio management is based on an active, bottom-up investment process that begins with a market-by-market attractiveness ranking of all securities in the MULTIFACT database. Once this "combined ranking" has been derived, portfolio construction begins. A sophisticated portfolio optimiser is used, which takes into account the client benchmark, desired risk level, transaction costs, correlation among securities, client restrictions, and any other relevant factors. This then undergoes a detailed "quality control review" by the portfolio management team to ensure that all client goals have been met.

A diagram of the investment process:



(a) **Explain the Efficient Markets Hypothesis and in what respects MULTIFACT's philosophy diverges from it.** **(3 marks)**

(b) **List the features of MULTIFACT's approach which support or contradict its claim to being a *value* manager.** **(7 marks)**

(c) **List the possible factors which determine the stock rankings in MULTIFACT's process for portfolio construction.** **(5 marks)**

(d) **Discuss what further information you would seek to confirm your recommendation for/against an investment with this manager.** **(4 marks)**

QUESTION 3: SOLUTION **(19 marks)**

(a) In the context of stock selection, the EMH asserts that all available information on the various stocks is reflected in their relative pricing, at least to the extent that the cost of acquiring such information is so justified. (1 mark)

Since value-based measures of stock valuation such as PE and PB are public knowledge, MULTIFACT believes that the EMH does not hold generally in global markets. (1 mark)

MULTIFACT points to irrational investor behaviour as one of the causes of market inefficiency. (1 mark)

(Other responses that relate to use of past or public information may also be acceptable. Maximum of 3 marks).

(b) Features of MULTIFACT's approach which support its value claim are as follows:

- The valuation measures cited are all based as on assessment of current price against objective (accounting based) characteristics such as earnings, book value or dividends. (1 mark)

- Most of the value-add results from individual stock selection, and not factors which favour any particular class of stocks. The only other source is currency allocation, which clearly affects all stocks in the same currency equally. (1 mark)

- All research appears to be directed to identifying additional value measures. (1 mark)

- The stocks are ranked on the basis of the value measures only. (1 mark)

Features of MULTIFACT's approach which may detract from its value claim are as follows:

- Though clearly other measures are used (as this is the focus of the research process), they are not identified, so they may not be all value based. It is possible that modern ranking factors (eg. technology) be biased more towards a stock's prospects, which would compromise the manager's value claim.(1 mark)

- The method of ranking stocks is unclear. In particular, it is not specified how value measures are rewarded. A bias towards value measures is needed to justify a value style. (1 mark)

- It is not clear what the objectives of portfolio construction are. Presumably this is to maximise the portfolio's expected return, taking account of the returns to value factors. However the process must also ensure neutrality with respect to non-value factors (and also to factors which do not appear in the model but are important for explaining the portfolio's risk relative to the benchmark). (1 mark).

(Other valid responses are also acceptable, maximum of 7 marks)

(c) The set of ranking factors used by MULTIFACT has to be consistent with its sources of value-add and also reflect its status as a value manager. Thus a possible set of factors would be as follows:

- Value measures at a point of time – eg. PE, PB, dividend yield, credit rating. These are all based on current accounting data which seeks to measure current performance.
- Recent movement in value measures – eg. earnings momentum, earnings revision, as these factors may indicate special events for certain stocks.
- Size – market capitalisation. It is commonly thought that size is a significant factor in performance (which is why small cap stocks are distinguished from large cap).
- Industry – eg. GICS classification, as performance varies widely between industries.
- Country/currency – revenue or costs attributed to various localities.

(1 mark for each valid point, maximum of 5 marks)

(d) It would be reasonable to expect MULTIFACT to describe its research process for identifying value measures, as this is the key to its operation. This should include:

- The reliance placed on historical performance data.
- The theory underpinning the success of possible measures.
- The process for extracting measures from live data (ie. how value measures are derived from the detailed accounting or other information).
- The process used for backtesting.

(1 mark for each valid point, maximum of 2 marks, SJ)

In addition, the process of portfolio construction should be described in more detail, covering the specific rewards that are ascribed to value measures. The objectives and the possible constraints used in optimisation should be explained. (1 mark, SJ)

Apart from process, there is general information required for the selection of any manager, namely:

- The profile of its research staff and management.
- The policies of remuneration and staff retention.
- Relevant past performance against the benchmark, and explanation thereof.

(1/2 mark for each valid point, maximum of 1 mark, KU)

QUESTION 4 **(20 marks)**

You are the consulting actuary to a major Australian bank which proposes to introduce a capital guaranteed product for trustee investment. The product will have the following features:

- **Assets will be invested passively in Australian equities and cash and associated derivatives.**

- **Dynamic asset allocation will be determined by the bank to replicate a call option on the equity assets, with a specified minimum return to the client (before management fees) over a specified period. This will be achieved by using a strategy based on the well known Black-Scholes no-arbitrage relationship for call options:**

  $$C = \delta S + \varepsilon B$$

  where C, S, B **are the values of the options, equities and cash respectively,** δ **is the delta of the option and** ε **is the amount invested in cash, calculated under a pre-determined option model. (Hint: If continuous rebalancing to this strategy can be guaranteed at all times, even if the option model is unrealistic, then it is certain that the option outcome will be provided.)**

- **Capital to support the capital guarantee will be provided by the bank, who will be remunerated by specified management fees.**

You have been asked to advise on the assessment of capital and the pricing of the management fees.

(a) **Explain why the investment strategy outlined above may be preferable to the purchase of an actual (over-the-counter) option.** **(2 marks)**

(b) **Explain why an asset model is required to price the product (that is, why a simple option formula will not work) and indicate what aspects of the product need to be specified in order for it to be modelled.** **(6 marks)**

(c) **Discuss the features the asset model must contain in order for you to assess the capital requirements of this new product.** **(5 marks)**

(d) **Describe the approach you would take to price this product and list the information you would need.** **(5 marks)**

(e) **Describe briefly how derivatives may be used to assist in implementing the investment strategy outlined above.** **(2 marks)**

QUESTION 4: SOLUTION **(20 marks)**

(a) The purchase of a call option (or a physical position together with a put option) would certainly allow the product's objectives to be realised.

However the option may not be available at a reasonable price. (1 mark)

Further, the option may restrict flexibility in exploiting economic conditions as they vary over the period. For example liquidity and availability could be limiting factors. (1 mark)

(b) In an ideal world of perfect trading, the option could be perfectly replicated if the stochastic process underlying the equity index were known. In this situation no capital would be needed to support the guarantee. However this clearly does not apply to the real world. (1 mark)

An asset model is required to model the product because:

- The rebalancing of the equity/cash cannot be continuous in practice. This is because to attempt continuous rebalancing would incur severe transaction costs especially when equity prices are volatile. (2 marks)

- In addition, it may not be possible to rebalance if the equity index moves discontinuously (or cannot be traded at all, as occurs in market crashes). This is known as 'gapping'. (1 mark)

- For the replication strategy, it is necessary to have rules for rebalancing i.e. what size and frequency of market movements would trigger rebalancing and these need to be determined using a model. (1 mark)

- Only an asset model giving simulated movements in equity values can perform the complex task of assessing the success of the rebalancing strategy in meeting the required guarantee. (1 mark)

The aspects of the product that need to be specified in order for the product to be modelled are the rebalancing strategy, and parameters such as the period and the level of the return guarantee. (1 mark)

(1 mark for each valid point, maximum of 6 marks)

(c) The asset model must contain the following features:

- Allowance for the possibility of gapping, as this is a feature which strongly drives reserves. Discontinuous return processes are available for this purpose. (1 mark)

- Catering for daily equity price movements and fluctuations in price volatility over time. This is needed because the replication strategy is based on daily trading, and there has to be some consistency with traded option prices - which do exhibit varying volatility (1 mark).

- Modelling not only of equity, but also of cash investment. (1 mark)

- The model would ideally be stochastic with respect to interest rates, and allow for linkages between interest rate and equity price movements. (1 mark)

- The model needs to be more than just a simple mean-variance model, and might involve non-stationary return expectations as well as fat-tailed return distributions and clustered volatility. (1 mark)

(1 mark for other valid points, maximum of 5 marks).

(d) The approach I would take would be to develop an asset model as follows:

- Obtain appropriate equity prices and fit an asset model satisfying the features of (c). (1/2 mark)
- Apply the model to simulate the replication strategy, including the cost of meeting the guarantee from the bank's capital, when the strategy cannot be implemented. (1 mark)
- Assess the reserves that emerge from modelling the guarantee provided by the product. (1 mark)
- Apply the bank's requirements for return on capital to reserves so as to determine the appropriate management fees. (1/2 mark)

(up to 3 marks)

Therefore to price the product, the information needed would be:

- the specifications as to product design and replication strategy set out in (b)- particularly the rebalancing rules;
- the bank's capital requirements;
- current economic and financial variables (eg. interest rates) to calibrate the asset model;
- historical equity prices to estimate the asset returns.

(1/2 mark each, up to 2 marks)

(e) Derivatives in the form of options or futures on the equity index may be used to assist in replication by adjusting equity exposure quickly and with minimal transaction costs. (1 mark)

Options may be directly used as a substitute for replication when their pricing is suitable. Futures may be used to adjust equity exposure directly or as a substitute for index replication. (1 mark)

(1 mark per valid point, maximum of 2 marks).

QUESTION 5 **(16 marks)**

As the CFO of a large Australian corporate superannuation fund, you are attending an international conference on currency management.

The conference participants are evenly divided on the theoretical benefits of hedging foreign currency exposures (even after allowing for differences in their own exposures and their currencies). Some participants favour full hedging on the basis that failure to do so may lead to regret if currencies move adversely. Others favour no hedging on the basis that it will result only in costs if currencies do *not* move adversely. Others still take the middle road.

(a) **Suggest reasons why there is such a diversity of views on currency hedging as a means of controlling risk.** **(4 marks)**

(b) **Given that currency hedging is to be adopted for your superannuation fund, describe briefly the main ways it can be achieved, and the benefits and limitations of each approach.** **(5 marks)**

(c) **Explain the main impacts of currency hedging.** **(4 marks)**

(d) **Discuss, with reasons, your views as to how the issue of currency management should be addressed.** **(3 marks)**

QUESTION 5: SOLUTION **(16 marks)**

(a) The reasons for the disparate views on currency hedging are as follows:

- Long term models based on purchasing power parity (PPP) explain long term prices in different currencies, but these are not helpful for short term hedging purposes. PPP only suggests that the long term effect of currency movements on investment is zero, which does not argue for hedging one way or the other. (1 mark)

- In the short term, exchange rates are dependent on the demand for currency which may arise for the purposes of both trade and investment (the current and capital accounts in the balance of payments). Both of these causes depend on a large number of other economic and physical variables, and thus are highly unpredictable. (1 mark) This may make short term currency risk seem almost impossible to model except as background noise. (1 mark)

- Currency movements can have a large impact on capital values. However investors do not have much understanding of their causes, so it is not surprising that investors view their decisions with hindsight or regret. (1 mark)

(1 mark for any other valid point mentioned, maximum of 4 marks)

(b) Currency risks may be hedged:

- Precisely, using forward currency contracts. A typical method is for rolling monthly forward contracts for the required currency exposure. Forward markets are deep and liquid, and transaction costs small. However this method removes currency gains as well as losses. (2 marks)

- To eliminate only downside risks, using an option replication strategy or purchased options. Replication strategies typically adopt an option formula approach, with forward currency being the protected asset. The main benefit is upside capture, but the cost is of course the premium, which may be unrealistically high in illiquid markets, or unquantifiable in the case of replication strategies. (2 marks)

- At the discretion of an active currency manager, usually with an overlay product. The manager uses his judgement to time the application of the hedging approaches described above. This depends on the manager's skill and knowledge of currency markets, which can be either a benefit or limitation. (1 mark)

(1 mark for method; ½ mark for each benefit/limitation up to 5 marks)

(c) The main impacts of currency hedging are as follows:

- It is generally accepted (except by active currency managers) that currency is a zero-sum game, so the long term consequences of currency hedging in terms of expected return are zero (or slightly negative, if transaction costs are allowed for). (1 mark)

- Currency hedging removes or reduces the upside as well as downside associated with currency. With currency options, all returns are reduced by the option premium. (1 mark)

- In general, the volatility in values of international assets, as well as overall performance, is reduced. (1 mark)

- The reduction in volatility may be offset by any correlation of currency with asset returns (it has been suggested that currency is correlated with Australian asset returns). However in many cases this is negligible. (1 mark)

(d) A justifiable view is that currency hedging should be seen as a decision entirely independent of that of selecting a particular asset class for investment. (1 mark)

Hedging or not hedging has the effect of adjusting the return characteristics of that asset class, especially in terms of its volatility and correlation with other asset classes. This needs to be investigated empirically. (1 mark)

The decision should be made on the basis of whether hedging improves the likelihood of meeting the investment objectives, given the particular circumstances of the investor in terms of the currency exposure of liabilities and assets. In many cases, the volatility reduction in asset return will offset any costs incurred in hedging. This can be determined only by an analysis of the costs and benefits. (1 mark)

(Marks should be allocated for specifying a definite view with valid supporting comments. For example, a case for full hedging may be made if one believes that overall portfolio volatility is always reduced by hedging. Maximum of 3 marks).

QUESTION 6 **(19 marks)**

You act in an honorary capacity as the asset consultant to a charitable Australian endowment fund. The fund is supported by bequests to provide financial assistance to needy individuals. Significant distributions from the fund (up to 30% of its value) are made from time to time by the trustees. As a charity, the fund is exempt from tax but has access to imputation credits.

The fund is invested with professional managers in Australian listed equity, listed debt and listed property, for which the fund's strategic benchmark is 40%/50%/10% respectively. You advise on the selection of managers as well as on the asset allocation, which is adjusted every quarter with the help of derivatives. Performance is assessed quarterly.

You have recently received a letter from one of the trustees:

> **"Dear consultant**
>
> **The recent performance of the fund has been troubling. Not once in the last two years has benchmark performance been achieved. I think it is time that we analyse the reasons for this situation.**
>
> **Is the present asset allocation to property reasonable for our purposes? The inclusion of listed property with Australian equities does nothing for diversification of the investments. I believe we should consider using direct property vehicles for their more stable income and capital values.**
>
> **And is our performance benchmark appropriate for our purposes? Is it in fact something we can achieve? Perhaps we have been too hard on ourselves in this regard.**
>
> **I look forward to your response.**
>
> **Yours sincerely…"**

Draft your response, addressing the following points:

(a) What are the general purposes of performance benchmarks for both asset allocation and sector management. (4 marks)

(b) Suggest suitable benchmarks (at the fund and sector levels) and briefly outline what adjustments would need to be made to these benchmarks to measure the fund's performance. (5 marks)

(c) Using formulae (if necessary) provide an explanation of how you would measure performance against the benchmark, and how you would attribute it to manager selection and asset allocation. Discuss briefly whether there is any ambiguity in this attribution. (6 marks)

(d) What are the benefits and limitations of direct property versus listed property in the fund's asset allocation? (4 marks)

QUESTION 6: SOLUTION **(19 marks)**

Dear Trustee

Your concerns about the fund's benchmarking and performance are very pertinent. In addressing your concerns, it may be helpful to review the following points.

(a) The purpose of performance benchmarks for asset allocation are:
- To help in making the asset allocation decision.
- To assess the success of the asset allocation decision.

The purpose of performance benchmarks for sector management are:
- To assist in measuring the performance of the sector managers.
- To assist in assessing the risks taken by the sector managers.

(1 mark for each valid point, maximum of 4 marks)

(b) As the fund currently invests in only publicly listed investments, indexes for public markets would be appropriate for individual asset classes.

For example, the following indexes could be adopted:

Australian equity – S&P/ASX 300, ex property trust index
Australian debt – UBSW Australian composite bond index
Australian listed property - S&P/ASX 300 property trust index
(1.5 marks KU)

The fund's overall benchmark may be taken as 40%/50%/10% of the relevant asset classes at the start of each quarter, as the asset allocation of the fund could in principle be rebalanced at this time. However, it needs to be adjusted for actual cash flows as follows. (1.5 marks SJ)

Since cash flows can be a significant factor in the fund's level of assets, the actual cash flows to each asset class - and their timing - should be allowed for during the quarter in assessing benchmark performance. If this adjustment were not made, the benchmark may well be unachievable, and would distort performance assessment. (2 marks CJ)

(1 mark for each valid point, maximum of 5 marks)

(c) Performance relative to benchmark should be measured by performing the following calculations on a quarterly basis:

1. Actual allocation weights times actual performance in each sector – this is the money weighted return over the quarter, with actual imputation credits attributed to Australian equities.
   (1 mark)

2. Actual allocation weights times benchmark performance for each sector – this is the return that would have resulted if the actual asset allocation were adopted at the start of the quarter, and actual cash flows were applied to each asset class, but each asset class earned only benchmark performance. An aggregate level of imputation credits attributable to the S&P/ASX 300 can be allowed for.
   (1 mark)

3. Benchmark allocation weights times benchmark performance for each sector - this is the return that would have resulted if the benchmark asset allocation were adopted at the start of the quarter, actual cash flows were applied to each asset class, and each asset class earned only benchmark performance. Imputation credits can be allowed for as in (2).
   (1 mark)

The outperformance relative to benchmark would be (1) – (3). This can be attributed to asset allocation (2) – (3), and manager selection (1) – (2).
(2 marks)

There is no ambiguity of attribution, since the only other possible performance measure, namely

4. Benchmark allocation weights times actual performance in each sector, cannot be determined with any certainty (the actual performance for each manager is the outcome of its initial allocation and cash flows. This would certainly be different if its initial allocation were higher or lower).
   (1 mark)

(d) The benefits of direct property investment vs. listed property investment are:

- More stable capital values (as a result of the appraisal approach to valuation);
- More opportunities to exploit the potential for individual properties.

(1 mark for each valid benefit, maximum of 2 marks)

The limitations of direct property investment vs listed property investment are:

- The lack of liquidity of direct property (which is a particular problem for the fund);
- The large transactions costs in acquiring and realising direct property;

- The management and maintenance required;
- The practical difficulties in getting sufficient diversification across direct property;
- Finding a suitable benchmark for the direct property that the fund would be able to invest in.

(1 mark for each valid limitation, maximum of 2 marks)

Please let me know if I can clarify any of these comments.

Yours sincerely

Consultant.

(1 bonus mark for appropriate letter format and style).

END OF PAPER