INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 1 INVESTMENTS MAY 2007 EXAMINATIONS

MARKING GUIDE

Level of Difficulty

Question	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1a	BM[1]	2	1		3
1b	BM		2		2
1c	BM		2	1	3
1d	BM	2	1		3
1e	BM		3	2	5
1f	BM			4	4
2a	1	1½			1½
2b	1		1½		1½
2c	1	1	2	2	5
2d	1		1	3	4
2e	1		2	2	4
2f	1		2	2	4
3a	1	2			2
3b	1		2	1	3
3c	1	2	2	2	6
3d	1		2	3	5
3e	1			4	4
4a	2	2	1	1	4
4b	2	1½	3		4½
4c	2		2	2	4
4d	2		3		3
4e	2		3	1½	4½
5a	2		1	1	2
5b	2	2	1		3
5c	2	1	3	2	6
5d	2			3	3
5e	2		2	1	3
5f	2			3	3
TOTAL		**17**	**42½**	**40½**	**100**

[1] Background Material

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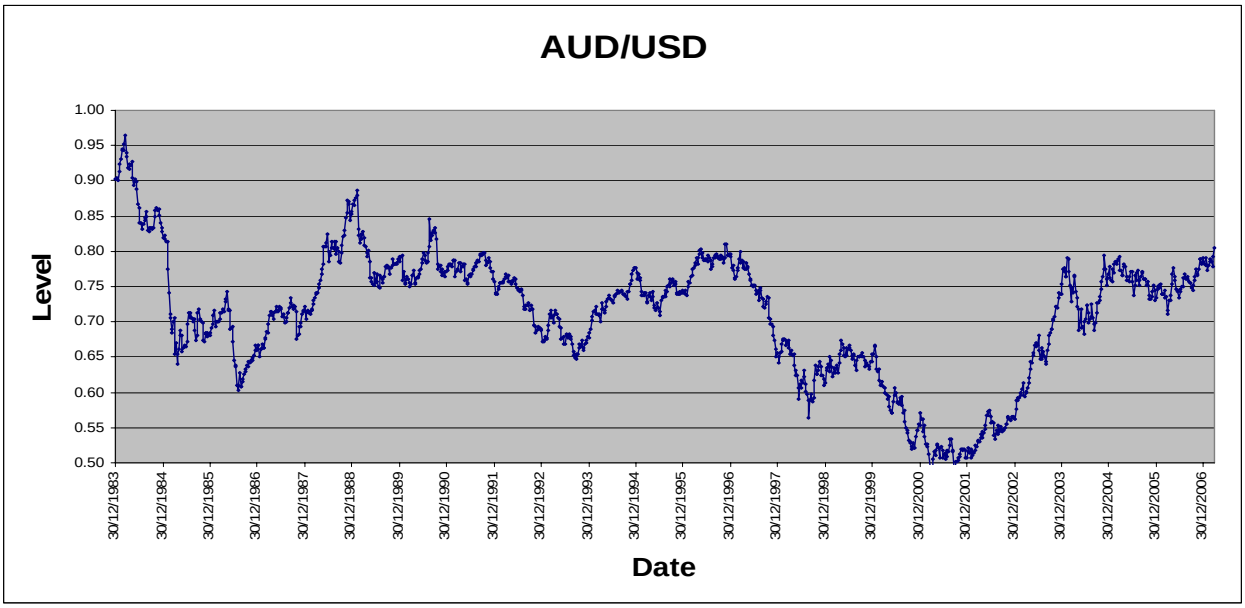
COURSE 1 INVESTMENTS **MAY 2007 EXAMINATIONS**

Answer all 5 questions.

QUESTION 1 **(20 marks)**

One of the risks with overseas investments is currency. The Australian dollar (AUD) has in recent months performed strongly against other major currencies. A chart of its progress against the US dollar (USD) since it was floated in 1983 is as follows:



(a) Suggest reasons for the recent strength of the AUD. **(3 marks)**

(b) Discuss the impact of the AUD strength for investment in Australia and overseas by Australian institutional investors, assuming no currency hedging. **(2 marks)**

(c) Discuss the feasibility of forecasting short-term currency movements by means of forward exchange rates. **(3 marks)**

(d) There are various ways of hedging currency risk. List the benefits and limitations of 3 ways of doing so. **(3 marks)**

(e) Discuss the factors you would consider in adopting a policy of hedging of overseas investments in developed economies for an Australian investor. **(5 marks)**

(f) Discuss whether your factors in (e) would be different when hedging investments in emerging economies. **(4 marks)**

SOLUTION

(a) Possible reasons are:

- The balance of trade in USD denominated transactions is positive as a result of strong global demand for commodities (a traditional source of strength for the AUD);
- interest rate differentials with US and Europe favour the AUD;
- recent private equity interest in investment in Australian business;.

[1 mark for each or similar point; maximum 3 marks]

(b) Possible implications of the strong AUD are:

- Future investment in Australian exporters exposed to foreign competition (eg agriculture) discouraged,
- Foreign imports (manufactures) encouraged, especially from low cost centres;
- movement of Australian cost centres offshore;
- Investment flows to developing countries.

[1 mark for each or similar point; maximum 2 marks]

(c) Forward exchange rates are governed by the rule of covered interest rate parity, which is a no-arbitrage condition. However forward rates are not good predictors of future exchange rates – this is known as forward exchange rate bias. It is commonly believed that the bias arises from behavioural effects; in the case of the AUD it is exacerbated by the currency volatility because of the relative size of Australian economy and its reliance on exports.

[1 mark for interest rate parity; 1 mark for bias; 1 mark for specifics of AUD]

(d) Hedging may be achieved through:

- Forward contracts – this results in a complete hedge with no currency gain/loss and low transaction costs.
- Dynamic hedging (generally through option replication) – some upside and limited downside. However downside protection is not guaranteed and there can be difficulties in implementing the strategy when conditions are volatile near expiration of the strategy
- Active management – this relies on currency prediction, which is notoriously difficult.

[1 mark for each strategy and comment; maximum 3 marks]

(e) The factors that might be considered are:

- The impact of currency volatility on performance for different asset classes (generally overseas debt is regarded as diversifying political and other risks, so it is hedged);
- The correlation between local (foreign) returns and currency and the diversification benefits as a result;
- The correlation between domestic returns and currency, a further form of diversification that has been noted for the AUD in relation to foreign investment;
- The correlation between currency and domestic liabilities;
- The possible value added through active currency management;
- The transaction costs involved in hedging.

[1 mark for each or similar point; maximum 5 marks]

(f) Emerging markets may be expected to enjoy a higher rate of GDP growth than developed markets. This results in higher potential returns for investors through higher local equity premiums, interest rates or favourable currency movement. Thus there is a weaker case for currency hedging than for developed markets, especially as many emerging market currencies are tied to the USD. A compromise might be to adopt downside hedging only.

[1 mark for difference between emerging and developed economies; 1 mark for results; 1 mark for effect on currency; 1 mark for conclusion]

QUESTION 2 **(20 marks)**

Infrastructure as an asset class is sometimes defined as the basic physical systems of a country's or community's population, including roads, utilities, water, sewage, etc. These systems are considered essential for enabling productivity in the economy and as such are often subject to government regulation. Developing infrastructure often requires large initial investment but the economies of scale tend to be significant.

You are a promoter of infrastructure investments and have been asked several questions by your audience at a recent presentation.

(a) Suggest with reasons the types of investors generally who would (or should) be interested in direct infrastructure investment and provide one specific example. (1½ marks)

(b) Suggest 3 less tangible forms of infrastructure that are necessary in modern times. (1½ marks)

(c) Discuss the nature of infrastructure as an asset class compared to the traditional asset classes of equity and debt and illustrate the characteristics that are not common to the traditional asset classes. (5 marks)

(d) In light of your discussion in (c), suggest an appropriate basis for the expected return and volatility of infrastructure investments that may be used in asset modelling. (4 marks)

(e) Discuss the practical difficulties of investing in infrastructure and how you would approach the resulting issues. (4 marks)

(f) Discuss ways in which unlisted infrastructure investments may be valued as part of an overall portfolio. (4 marks)

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SOLUTION

(a) Investors would include large institutions with a long term liability profile that matches the profile of infrastructure investments. Examples for direct investment include superannuation funds and life insurers, with an in-house capability for deal analysis. There are many modes for indirect investment.

[½ mark for general; ½ mark for reason; ½ mark for specific example]

(b) Less tangible forms of infrastructure are the electromagnetic spectrum (telecommunications); education; emergency services and public safety (prisons).

[½ mark for each example; maximum 1½ marks]

(c) Infrastructure as an asset class may be positioned between equity and debt:

- As infrastructure is used to support the economy, the expected demand should be stable and linked to GDP growth.
- Thus it may be expected that long term returns be linked to CPI, resembling debt.
- Infrastructure may also have some equity characteristics as a result of active management (eg. the shopping centres found at major airports).
- Monopoly power gives scope to active management – depending on government regulation and the extent of competition permitted.
- There is the potential for higher returns than debt with similar risk levels.
- However the infrastructure universe is vast, investments are very heterogeneous and they may be difficult to exit.

[1 mark for each or similar point; maximum 5 marks]

(d) The expected return and volatility of infrastructure in view of (c) should be intermediate between debt and equity:

- The closeness to equity should depend on tax incentives offered by government and the degree of monopoly power afforded.
- Its volatility should also be between debt and equity but closer to the former, to reflect the stability of returns.
- The volatility should also reflect the method of valuation of infrastructure (whether listed or unlisted); Unlisted property should have some serial correlation as a result of the appraisal process.
- There is a strong correlation with debt because of stable returns and a loose correlation with equity because of the price inelasticity of demand.

[1 mark for each or similar point; maximum 5 marks]

(e) The following are practical issues in infrastructure investment:

- Exit mechanisms, as it is by nature a long term commitment with possibly long lead times for development. Thus the investor's horizon should be taken into account in investing in infrastructure.
- The illiquidity of infrastructure should itself command a premium and this needs to be assessed in the light of an investor's overall asset allocation.
- Analysis of monopoly rights is the key to superior returns (eg. tollways, electricity, water).
- Participation may be direct or pooled, via debt or equity. Expertise, experience and the investor's tax position are factors in this regard.
- In line with illiquidity, there are valuation issues that might affect the ability to have investments 'marked to market' for the purpose of investment switching.

[1 mark for each or similar point; maximum 4 marks]

(f) Unlisted infrastructure can be valued in the following ways:

- Where cash flows can be reasonably projected, using DCF methods. Debt financing and tax issues can be accommodated under such an approach.
- Substitution risks (i.e. the possible loss of monopoly rights) are always present. This needs to be allowed for either in the discount rate or in projected revenue streams.
- Investments involving entrepreneurial skills (eg TV rights, airports), a PE basis would probably be more feasible, having regard to similar types of investment.
- Before infrastructure projects become productive (the construction phase) it is hard to go further than book values.

[1 mark for each or similar point; maximum 4 marks]

QUESTION 3 **(20 marks)**

A *real option* is defined as

"… the right but not the obligation to undertake some business decision, typically the option to make a capital investment. This kind of option is not a derivative instrument but an actual tangible option (in the sense of "choice") that a business may gain by undertaking certain endeavours."

You are the CFO of a small listed oil exploration company in Australia. A key asset of your company is an offshore lease. Preliminary exploration has given you a probability distribution of oil reserves for the lease.

You have a decision to make as to whether to construct an exploration well on the lease site. Construction of such a well would:

- **Involve a known cost, related to CPI**
- **Provide information to refine the distribution of oil reserves.**

At current oil prices, however, it is not economic to construct such a well but it may be feasible to do so in future.

(a) Suggest two examples from investments or insurance where similar real options may arise. (2 marks)

(b) Discuss an objective for the oil company in managing the lease and any constraints that may apply in practice. (3 marks)

(c) Discuss the variables and the form of the asset model that you would adopt in managing the lease. (6 marks)

(d) Outline how you would apply the asset model to value the lease at the present time. (5 marks)

(e) Discuss the complications and the differences from (d) that would arise if there were two possible sites for exploration wells on the lease, each with a known exploration cost. Assume that you have a joint probability distribution of oil reserves for the two sites and that an exploration well for one site provides further information on the reserves of both sites. (4 marks)

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SOLUTION

(a) Some examples are:

- property selection or development by a property manager, as a real option
- introduction of a new GI business line
- selection of start-up investments in venture capital.

[1 mark for each example; maximum 2 marks]

(b) The company's objective may well be to maximise the economic value of lease, having regard to:

- The exploration costs required for exploitation;
- The availability of capital and its cost;
- Competing uses for capital.

[1 mark for objective; 1 mark for each constraint; maximum 3 marks]

(c) The company's decision is when to construct an exploration well and, depending on the outcome, decide when and how much oil should be extracted. The scenarios for this decision have to be provided by an asset model, that clearly needs to cover:

- The development of world oil prices in accordance with projected world demand and supply. [This is the most difficult aspect and would have to involve the expertise of oil economists.]
- interest rates, to the extent that this determines the company's cost of capital and is linked with oil prices;
- exchange rates, to the extent that this impacts AUD revenue;
- CPI, to the extent that this impacts exploration costs;
- The correlation structure between oil and interest rates (Hotelling's rule[2]).

[1 mark for each purpose; 1 mark for each variable; maximum 6 marks]

[2] http://en.wikipedia.org/wiki/Hotelling%27s_rule

(d) As it is presently uneconomic to undertake exploration, the (intrinsic) value of the lease under current oil prices is zero. However the asset model should indicate the probability of a time when oil prices would justify exploration and the costs of doing so at that time. The process would be as follows:

- Simulate oil prices and interest rates as in (c)
- Develop a trigger in terms of the oil price and interest rates for well construction, in line with (b)
- When the trigger is satisfied under any simulation, the expected value of the oil reserves at that time can be ascertained in accordance with their a priori distribution. In practice, the exploration well should provide a narrower distribution and indicate whether and how extraction should proceed. This should also be reflected in expected value.
- The present value of the lease can be assessed as the expected value of the oil reserves, less exploration costs, discounted to the present time and weighted for the oil price/interest rate simulations.

[1 mark for direction; 1 mark for each step of process; maximum 5 marks]

(e) The complication is that it is not optimal to undertake exploration of both sites at the same time. This is because one site can be explored first and this may provide information for the other site. Thus there are further real options involved in the process:

(i) Decide when to construct an exploration well
(ii) Decide which site to explore
(iii) Analyse outcomes of exploration
(iv) Decide whether the other site should also be explored
(v) Depending on all outcomes decide whether and how to extract oil

Steps (ii) and (iv) depend on the relative exploration costs for the two sites and the joint distribution of reserves.

[1 mark for principle; 1 mark for initial exploration; 1 mark for exploration costs; 1 mark for comment on joint distribution]

QUESTION 4 **(20 marks)**

As an adviser in property (real estate) investment, one of your main skills is in the assessment of property managers. However the property universe is vast and there is a plethora of different property vehicles that can be used by retail or wholesale investors. In marketing your services to clients, you have found it necessary to explain several key issues with the work that you do.

Design a brochure for clients dealing with the following issues:

(a) The main vehicles that can be used for property investment and their strengths. (4 marks)

(b) The desirable characteristics that you would seek in a property manager. (4½ marks)

(c) A general process that you would adopt for assessing the management skills of individual property managers. (4 marks)

(d) How management expertise is reflected in the returns available to investors for both listed and unlisted property. (3 marks)

(e) 3 methods for benchmarking the performance of selected property managers and the benefits and limitations of each method. (4½ marks)

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SOLUTION

(a) The main property vehicles are as follows:

- Direct mandates with a property manager. This is feasible only for an investor with a large diversified property portfolio (such as for a hotel chain or other specialised portfolio: Eureka). The investor retains control of investment policy and property selection. In addition property management services and fees can be negotiated, consistent with any in-house capabilities.

- Listed trusts and unlisted trusts. These vehicles are available for any size of investment as they allow pooled access to a diversified portfolio of properties. The manager usually retains control of property selection and charges accordingly. Listed trusts have an automatic entry/exit mechanism, whilst unlisted trusts need to construct their own. Unlisted trusts also need to develop a pricing mechanism, usually based on the appraised value of properties. Flexibility in investment policy is often provided by leverage.

- Property development companies. These are usually listed (eg Multiplex, Becton) and are involved in the development of large projects, such as shopping centres. Thus a wide range of specialist skills is needed. The investor is completely reliant on management skills but seeks the rewards (and risks) of meeting the demand for new properties.

[½ mark for each type; ½ for each characteristic; maximum 3 marks]

(b) Property managers should meet several key criteria:

- Clear investment philosophy and objectives, as with all investment managers. In the case of property, this is focused more on specialisation in specific types of property and how the manager can add value through its services.
- Staffing with adequate qualifications and experience;
- Retention and remuneration policies for key staff, in order to ensure continuity in management;
- Research capabilities for identifying property opportunities as well as needs (e.g. economic, socio-demographic analysis for urban trends). This is because location is a key driver of value;
- Well structured selection processes for individual properties, which has valuation, engineering and architectural aspects;
- Operational expertise in the administration of tenants and property maintenance, because this is a necessary and important aspect of property investment.
- Strength of commercial relationships with suppliers and advisers, as management requires many different types of expertise (eg legal, architectural, construction).

[½ mark for each criterion; ½ mark for explanation; maximum 4½ marks]

(c) An assessment of a property manager could be based on the following process:

- Analysis of current property holdings, as to tenancies, maintenance policy, outgoings and overall performance;
- Allocation and delegation of responsibilities within the organisation. Consistency of the organisational structure with investment objectives;
- Interviews with key staff as to experience, relationships and incentives;
- Identification of processes for property selection/disinvestment and cash flow management;
- Client service standards in relation to record keeping and reporting.

[1 mark for each step; maximum 4 marks]

[plus 1 mark for brochure format]

(d) Apart from purely administrative functions, management expertise lies in the exercise of real options for purchase, development, realisation or tenanting of properties. With listed vehicles, this is reflected directly in the unit price that investors are willing to pay, which may differ significantly form the appraised value of existing properties under management. For unlisted vehicles, the value is reflected more gradually through the appraisal process.

[1 mark for real options; 1 mark for listed; 1 mark for unlisted]

(e) The main ways of benchmarking property are as follows:

- A transaction approach, as with the PCA index of transaction values. The merit of this approach is that such values are objective but the class of properties involved may be too disparate for some applications.
- An index of appraisal values, such as in the Mercer survey. Though appraisal values are subjective, the properties in the benchmark can be chosen for relevance.
- Listed property indexes. These provide ‘market’ valuations but such indexes are also distorted by the value of management options (see (d)) as well as financial effects such as gearing.

[½ mark for each method; ½ mark for each benefit; ½ mark for each limitation; maximum 4½ marks]

QUESTION 5 **(20 marks)**

As the financial controller of a large grain marketing firm that operates worldwide, you are vitally interested in the return delivered to grain growers as a result of your firm's operations. You see some analogies between your firm's activities and those of an investment manager and are keen to exploit the similarities.

Your firm does not trade in grain on its own account but acts as the agent of grain growers. Your firm arranges three main services for growers:

- **the storage and delivery of grain from growers;**
- **the sale of grain on world markets, including price hedging; and**
- **foreign exchange of the proceeds including currency hedging.**

In return, your firm earns commission from growers, based on the return available to growers relative to a performance benchmark.

Growers can choose to sell their grain into one or more pools operated by your firm. Each pool is operated as a single trust fund and provides a uniform return to growers, taking account only of the source and grade of grain delivered.

Your firm is concerned with remaining competitive with other means of sale but also with its profitability. Growers are concerned with predictability of return.

(a) Discuss the merits to growers of selling grain under an agency framework as described above compared to selling direct. (2 marks)

(b) Describe 3 ways in which the firm can add value for growers. (3 marks)

(c) For each of the ways in (b), discuss the basis of an appropriate performance benchmark, having regard to your firm's concerns. (6 marks)

(d) Discuss appropriate constraints that may be imposed on your firm's operations in the interests of growers and how these might affect your response to (c). (3 marks)

(e) Discuss a suitable basis for your firm's remuneration, in light of performance fees available generally to investment managers. (3 marks)

(f) Discuss what risk controls you would adopt for your firm's operations in its three main areas of operation. (3 marks)

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SOLUTION

(a) The agency model for selling grain provides the grower with similar benefits as investing in venture capital – the agent is endowed with market power and has experience in broking deals; there is an alignment of interests between the agent and grower.

With direct selling, the grower's interest is assured only by competition between the principals involved in trading. There is no necessary alignment of interests and each grower must look after his own.

[1 mark for description of agency model; 1 mark for direct sale]

(b) The firm can add value for growers by:

- exploiting economies of scale in chain supply services;
- exploiting monopoly power in grain sales, with respect to the timing and location of grain sales;
- exerting market power in the foreign exchange and grain hedging markets.

[1 mark for each or similar point; maximum 5 marks]

(c) Performance benchmarks could be constructed in the following ways:

- grain price – the weighted average of comparable world prices according to domestic grade and the delivery schedule of grain. This may require historical regression of local grades against world prices, as local grades are not traded on an exchange;
- foreign exchange - based on delivery schedule and the hedging policy for exchange. This reflects what a passive manager would need to do in light of the firm's hedging policies.
- supply chain – local freight and storage costs based on the sources of local production and on the prices charges by local suppliers. Again this reflects what a passive manager could do by acting as a price taker (and not price maker) in light of the firm's hedging policies.

[1 mark for each benchmark; 1 mark for comments relating to each benchmark; maximum 6 marks]

(d) Appropriate constraints might be as follows:

- Limitations in the timing of grain sales and on carry-forward to future pools.
- Specific policies in respect of hedging of grain and currency, which should be reflected in the benchmarks in (c).
- Limitations on deviations from those policies (similar to limitations on tracking error in investment mandates).

[1 mark for each constraint; maximum 3 marks]

(e) It is natural to structure revenue on base fee, plus a performance fee set as a percentage of outperformance against benchmarks. The percentage could be set by reference to similar remuneration structures in venture capital, in which 20% outperformance is common. This is the primary factor in alignment of the growers' and agent's interests. There are similar issues as in an investment in venture capital:

- Should losses be carried forward?
- Should a fixed remuneration fee, independent of performance, also apply? Is this justified on the basis of the manager's viability?
- Should there be a cap on fees?

[1 mark for suggested fee basis; 1 mark for each issue; maximum 3 marks]

(f) Operational risk controls might focus on the following:

- Quantification of value-at-risk measures for each of the three main operational areas: grain trading, FX management and supply chain services. Decision making and audit procedures would be structured along these measures.
- Limits on daily trading in grain and FX hedging positions, based on open interest in futures/currency markets.
- Indemnity by the agent to growers for specific operational risks- settlement; fraud; valuation.

[1 mark for each risk control; maximum 3 marks]

END OF SOLUTIONS