THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **2001 EXAMINATIONS**
PAPER ONE

SOLUTIONS

The purpose of this document is to assist candidates in their preparation for future examinations. It is emphasised, however, that the solutions herein are not necessarily the only solutions or the best solutions, especially for those questions testing judgement. They should be regarded as illustrative only. However, a candidate who covered all the points in the specimen solution in the examination would have scored a very comfortable pass. This document should be used in conjunction with the 2001 Examiner's Report which is on the IAAust web site.

QUESTION 1 **(11 Marks)**

a) Identify & briefly explain the various forms of the Efficient Market Hypothesis (EMH). **(3 marks)**

b) Briefly state with reasons the form/s of EMH you would expect to be relevant:

i. for an Australian equity portfolio benchmarked against the All Ords Index
ii. for a balanced portfolio including global equities and global bonds **(4 marks)**

c) A major international broker who specialises in tactical advice has suggested a purchase of UK equities. The stated reasons are that the earnings yield (earnings/price) on the FTSE 100 Index is almost identical to the yield on 10-year gilts, whereas typically the earnings yield has been significantly lower than the yield on 10 year gilts.

Discuss the factors which influence the relationship between the earnings yield and the yield on 10 year gilts, and reach a decision on whether the broker's suggestion has merit. **(4 marks)**

Solution – Question 1

a) Identify & briefly explain the various forms of the Efficient Market Hypothesis (EMH). ***(3 marks)***

Define Strong, Semi-strong and Weak forms. (0.5 mark for naming each form, 0.5 mark per accurate definition)

b) Briefly state with reasons the form/s of EMH you would expect to be relevant:

i. for an Australian equity portfolio benchmarked against the All Ords Index
ii. for a balanced portfolio including global equities and global bonds ***(4 marks)***

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(i) Expect semi-strong form EMH to apply, as the All Ords is dominated by large stocks, which are arguably more likely to be efficiently priced. (2 marks). However, the All Ords contains a lot of small companies that are not well researched; hence the semi-strong form does not apply outside of the large stocks. (1 mark)

(ii) Expect semi-strong form EMH to apply to the large stock/bond portion of each individual developed market, and less so for less developed markets. Further, even weak-form EMH will be less applicable in markets where there is less liquidity. Also, there is less theoretical justification for applying the EMH at the asset allocation level, since many investors have a local bias. (3 marks)

(Max 4 marks in total)

c) A major international broker who specialises in tactical advice has suggested a purchase of UK equities. The stated reasons are that the earnings yield (earnings/price) on the FTSE 100 Index is almost identical to the yield on 10-year gilts, whereas typically the earnings yield has been significantly lower than the yield on 10 year gilts.

Discuss the factors which influence the relationship between the earnings yield and the yield on 10 year gilts, and reach a decision on whether the broker's suggestion has merit. (4 marks)

The total equity return should contain a risk premium over the gilt yield. (1 mark)

During periods of high inflation, profit growth could amply provide this risk premium. The earnings yield anticipated this effect and fell well below the gilt yield. (1 mark)

Now that inflation is barely evident, this source of risk premium has disappeared and the earnings yield should be close to, or even higher than, the gilt yield. (1 mark)

The other point to note is that instead of equity yields being too high, gilt yields could be too low – thus instead of buying equities, perhaps you should be selling gilts and holding cash. (1 mark)

Hence the stated reasons alone do not justify the broker's recommendation. (1 mark)

(Other valid comments may also be worth a mark each.
Max 4 marks.)

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(Note: Gilt yields may still be depressed because of the guaranteed annuity debacle and also the MFR changes. Australian students are not expected to know this. If they cite one of these points, they get a bonus mark, max 1 mark total.)

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QUESTION 2 **(14 Marks)**

You are an actuary whose work involves financial planning advice to individuals. The following describes the circumstances of a new client:

- **Male aged 45**
- **Recently divorced**
- **Superannuation assets of $220,000, all of which is subject to preservation to age 60**
- **Property owned in his own name includes own residence valued at $400,000 and investment property valued at $180,000**
- **A share portfolio valued at $100,000**
- **An interest only mortgage of $80,000 (extendable up to $700,000).**

The client's ex-wife has been granted a cash settlement of $300,000 to be paid by your client as $50,000 immediately and $250,000 in 15 years time (with no interest to be added). The forecast average long term returns for your clients' investments are as follows:

- **Superannuation return 8% pa up to age 60 and 11% pa thereafter.**
- **Share return 10% pa**
- **Investment property return 6% pa**
- **Mortgage interest 7% pa**
- **Appreciation in value of own residence 5% pa**

a) Ignoring any tax which might be payable, provide recommendation for the optimum priority of payment of the settlement from your client's assets to the wife. You may assume that the mortgage could be extended at any time to finance any part of the payment and that the client would readily sell the residence if this was a preferred option on financial grounds. Your recommendation may be either based on calculations of outcomes or a well reasoned explanation based on the above information only. Please state any additional assumptions that you make. (5 marks)

b) How would your answer in a) change if the superannuation return was 6% pa up to age 60 and 4% pa after age 60. (2 marks)

c) Based on the original assumptions, what advice would you give to your client about rearranging investments and mortgage to give maximum return, again ignoring tax. (3 marks)

d) Explain, by reference to the IAAust professional standards and guidance notes, the other factors which should be considered in determining recommendations for this client as per Part (a).

(4 marks)

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Solution – Question 2

a) Ignoring any tax which might be payable, provide recommendation for the optimum priority of payment of the settlement from your client's assets to the wife. You may assume that the mortgage could be extended at any time to finance any part of the payment and that the client would readily sell the residence if this was a preferred option on financial grounds. Your recommendation may be either based on calculations of outcomes or a well reasoned explanation based on the above information only. Please state any additional assumptions that you make. (5 marks)

The candidate must recognise that the priority is to use lowest returning assets to pay the settlement or to extend the mortgage if interest on the mortgage is lower than the return on other assets and investments or if money has to be paid before other asset can be sold.(2 marks).

The lowest returning asset is his own residence however you would need to consider what rent he would have to pay for any replacement place to live and what other changes in living cost would be associated with moving to another house. There is no information on these factors in the question. The use of appreciation rate for the own residence is only part of the total net return equation for the house. There is emphasis in the financial planning part of the course in collecting information from clients to be able to advise. Although the question says he would readily sell the residence if this was the preferred option on financial grounds, this option could not be recommended without further financial analysis (1 mark).

This leaves the investment property as the next lowest returning asset. But this will take time to sell so to make the immediate payment of $50,000 the client should extend the mortgage and then repay it when the investment property is sold. (2 marks if they get both points , 1 mark if they assume the investment property money is immediately available and ignore use of the mortgage). At age 60 when the $250,000 is due, this should be met from selling the investment property and extending the mortgage again (if necessary) to fund the rest (1 mark).

An alternative answer to the above would be to just use the numbers given for returns and therefore sell the house because it has the lowest face value return. This should only score 2 marks if given with no explanations other financial and timing of cash availability implications.

[5 Marks in total]

b) How would your answer in a) change if the superannuation return was 6% pa up to age 60 and 4% pa after age 60. (2 marks)

In this case, super becomes the lowest returning asset and would be used to finance the second payment of $250,000 (1 mark) with the investment property (with use of mortgage for immediate payment until settlement) used for the first payment (1 mark).

[2 Marks in total]

c) Based on the original assumptions, what advice would you give to your client about rearranging investments and mortgage to give maximum return, again ignoring tax. (3 marks)

Borrow more on the mortgage and invest it in shares (1 mark). In giving this advice you would need to consider the minimum time horizon for this to be effective given the short term volatility of share returns and the likely variability of mortgage interest (2 marks).

[3 Marks in total]

d) Explain, by reference to the IAAust professional standards and guidance notes, the other factors which should be considered in determining recommendations for this client as per Part (a).

(4 marks)

The other factors are:-

- Characteristics of the shares and property asset classes including benefits of diversification over shares and more than one property (1 mark).

- Non-diversifiable risks such as loss of employment (ability to service mortgage), regulatory changes to superannuation conditions (1 mark).

- Costs and efficiency of making, managing and selling investments (1 mark).

- Range of outcomes from the total investment portfolio in relation to the investor's investment objectives (1 mark).

[4 marks in total]

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QUESTION 3 **(6 Marks)**

You are an analyst working for the Commonwealth Government. The Government is considering a plan to abolish the Australian semi-government bond market. This would involve the States relinquishing the ability to issue bonds through their central borrowing authorities (such as the New South Wales Treasury Corporation) and instead relying on the Commonwealth Government for their borrowing needs.

Your manager has asked you to state and assess the strengths and weaknesses of this proposal, taking into account the interests of the Commonwealth Government, the State Government and the capital markets.

Give a recommendation on the proposal based on your assessment of the relative importance of the strengths and weaknesses.

Solution – Question 3

NB: This question is based this on something in the media in the first week of July 2001 ("Plan to shake up Australia's $74bn debt market, Aust Financial Review, pages 1, 22, Wednesday 4 July 2001). This question has deliberately been kept general, to not disadvantage someone who has not read the article. Nevertheless, students should be reading the financial press and should be familiar with the issue. It is relevant as it deals with the changing nature of the Australian fixed interest market.

Benefits:

- Savings in administrative and borrowing costs through economies of scale (1 mark)
- Greater liquidity in bond issues – will attract interest from offshore investors. This is important given the shrinking relative size of the Commonwealth Government Bond market as the Government does not run large budget deficits anymore, and the corporate bond and asset backed security markets grow. (1 mark)
- Greater weighting in international bond indices – will also lead to greater interest from offshore investors (1 mark)

Weaknesses

- Commonwealth Government underwrites State debt, taking on additional risk and potentially damaging its own credit rating. This was the situation in the late 1980s when several States were in financial difficulty. (1 mark)
- Less flexibility and independence in structuring borrowing program, particularly if the new borrowing authority issues few standardised issues to improve liquidity. However, the state government can use derivatives to tailor their preferred borrowing exposure (1 mark)

- Removal of incentive for States to be fiscally responsible. Under the current system, the worse a State Government's balance sheet is, the poorer is their credit rating. This in turn leads to a more expensive cost of funds (1 mark)
- Less choice for fund managers to structure their portfolios in an effort to add value above the benchmark. However, opportunities to add value through the level of credit risk in the portfolio will continue with the growing corporate bond and asset backed security markets (1 mark)

Max 5 marks for total benefits & weaknesses.

plus 1 mark for a well reasoned argument for or against the proposal.

Students may be awarded marks for other responses at the marker's discretion, although the total of these other points should not exceed 3 marks in total.

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QUESTION 4 **(20 Marks)**

a) Your client is a large Australian based general insurance company, which currently invests in a portfolio of Australian government bonds with a duration equal to that of its liabilities. A Fund Manager has approached your client marketing the following product:

> **"The manager will invest exclusively in US corporate bonds. Whilst the manager has the scope to invest in corporate bonds outside the US, their marketing material states that it is intended that at least 90% of the portfolio will be invested in US corporate bonds.**
>
> **Currency is to be managed in the following manner: every three months a forward contract is to be entered into based on 100% of the market value of the portfolio (at the date of entering into the contract) to purchase Australian dollars and sell US dollars at the prevailing forward rate.**
>
> **Fixed interest futures are to be used to ensure that the duration of the portfolio matches the company's liabilities."**

The marketing representative tells the client that by putting 50% of the portfolio with the manager, the client can achieve higher returns with no additional risk. The client has asked you to comment on the appropriateness of appointing the manager to manage 50% of their portfolio on this basis.

Discuss the appropriateness of the proposal. (5 marks)

b) Consider the following two statements:

> **"Listed Property Trusts are really just a hybrid between bonds and equities. They are not a property investment at all."**
>
> **"Listed Property Trusts have market values that change daily and are geared. An investment in an unlisted property fund therefore provides a lower risk investment".**

State with reasons whether or not you agree with these statements. (11 marks)

c) Discuss the suitability of listed property trusts, directly held property and unlisted property trusts as an investment for a defined benefit superannuation fund of approximately $100 million that is closed to new entrants. The average age of members is 45 years. (4 marks)

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Solutions – Question 4:

a) Discuss the appropriateness of the proposal. (5 marks)

Part a:

- Previously the insurer has only invested in government securities, this product would introduce credit risk. Not only is there default risk, but also sector risk (eg. if economy slows & corporates are downgraded & yields rise). Therefore there is likely to be more risk in this approach. (1.5 marks)

- The forward contract is only entered into once every 3 months, movements in the value of the underlying assets in the meantime will mean that the currency hedge will not be perfect. (1 mark)

- From an "efficient frontier" point of view a small allocation to a product such as this may improve the risk/return outcome, however a 50% allocation seems excessive. (1 mark)

- The manager has the scope to invest outside the US, whereas the currency hedge is only implemented with respect to USD. Therefore the insurer would be exposed to other currencies. (Furthermore given that 100% is hedged into USD there could effectively be a short USD long Euro exposure etc) (1.5 marks)

- Basis risk also exists: If the futures used to bring the portfolio in line with the correct duration do not trade at fair value. (1 mark)

- Yield curve risk: as futures are not necessarily available on all maturities of bonds, if interest rates do not move uniformly across the yield curve the portfolio may underperform the government bond portfolio & may also move out of line with the present value of the liabilities. (1 mark)

- Asset/Liability country mismatch risk: Australian yields used to value the Australian general insurer's liabilities may not necessarily move in line with the US yields used to value the US assets. (1 mark)

Therefore it is recommended that the proposal not be adopted.

(maximum 5 marks)

Part b:

b) Consider the following two statements:

> ***"Listed Property Trusts are really just a hybrid between bonds and equities. They are not a property investment at all."***
>
> ***"Listed Property Trusts have market values that change daily and are geared. An investment in an unlisted property fund therefore provides a lower risk investment".***

State with reasons whether or not you agree with these statements. (11 marks)

First statement:

- as listed property trusts are listed on the stock exchange they will tend to be affected by general market movements on a day to day basis, therefore they do take on some of the same characteristics as equities. (1 mark)

- Listed property trusts are "high yielding" investments and are often valued by comparing the available yield to that on bonds (plus a risk premium). Furthermore as the trusts are geared earnings are affected by the level of interest rates. Therefore higher interest rates are expected to cause a fall in price of listed property trusts in a similar way to bonds. Therefore a reasonably high correlation with bonds is to be expected. (2 marks)

- Due to the above two factors the performance of listed property trusts is expected to be positively correlated with both equities and bonds (however the correlation will not be perfect) (1 mark)

- However the underlying assets are still properties & in the long term the return from an investment in listed property should correspond to the rentals received plus capital gains less costs, in the same way as direct property. (1.5 marks)

- Logical conclusion consistent with arguments raised (1 mark)

Second statement:

- Just because listed property is revalued every day by the market does not mean that it is necessarily more volatile than direct property. The real underlying volatility of direct property is hidden by the infrequency (& possibly subjectivity) of revaluation. For example, if a DCF method is used to value direct property then every time market interest rates changed the value of the direct property portfolio would be expected to change accordingly! (2 marks)

- Gearing can increase risk. The extent of this risk depends on the level of gearing & for example how well matched the interest payments are to rental income (for example if interest payments are fixed & tenants are on long term leases & have

good credit ratings then the risk imposed by gearing may not be excessive). On balance the reference to gearing increasing risk probably has some merit. (2 marks)

- Within a portfolio of listed property there will be a reasonable number of trusts held. Each of these trusts will include exposure to a number of properties. Overall therefore it is expected that a portfolio of listed property trusts will be exposed to a larger number of properties than a direct property portfolio & will therefore (arguably) be more diversified. In particular there may be greater diversification of geography, sector and management. This indicates that a well structured listed property exposure could be *less risky.* (2 marks)

- The risk associated with investing in any asset class also depends to a large extent on the correlations between that asset class and the other assets which the investor holds. The statement takes no account of this. (1 mark)

- The statement also ignores mismatch risk – e.g. for investors requiring greater liquidity there is potentially more risk in investing in direct property. (1 mark)

- Logical conclusion consistent with arguments raised (1 mark)

(maximum 11 marks)

Part c:

Discuss the suitability of listed property trusts, directly held property and unlisted property trusts as an investment for a defined benefit superannuation fund of approximately $100 million that is closed to new entrants. The average age of members is 45 years. (4 marks)

- At $100m the Fund is probably too small to get sufficient diversification buying property directly. Therefore investment via listed trusts or unlisted trusts is the most appropriate means of obtaining property exposure. (1 mark)

- As the Fund is closed to new entrants it is likely that membership will decline over time. This indicates that liquidity is important and therefore any direct property exposure should be relatively small. (1 mark)

- The average age is 45 which indicates that there is still some time to retirement for a number of members, this provides the flexibility to invest a proportion of the assets in an unlisted property trust. However a number of members are also likely to be near retirement now. Also members can leave by means other than retirement (eg. Resignation), indicating that liquidity remains important. (2 marks). {To assess this properly cash flow projections could be obtained from the Plan's actuary}

- Logical conclusion (1 mark) – this could be that a mix of unlisted property trusts and listed property is best or that exposure to just one of these is appropriate.

(maximum 4 marks)

QUESTION 5 **(9 Marks)**

The Black-Scholes formula is probably the most commonly used option pricing formula. The value of a put option is given by:

$$p = \max [\, 0, Xe^{-rt}N(-d2) - SN(-d1) \,]$$

a) It is not always appropriate to use the standard Black-Scholes formula to value an option. Explain why use the standard Black-Scholes formula is not appropriate for the following derivatives:

i. a put option on a CBD office tower (2 marks)

ii. an interest rate cap {an interest rate cap limits the effective interest rate used to determine a cash payment, which is equivalent to a call option on the interest rate} (2 marks)

iii. a call option on the US dollar {this option gives the holder the right to buy US dollars at a specified exchange rate} (2 marks)

iv. share options used in remuneration of senior executives (3 marks)

Solutions – Question 5:

a) It is not always appropriate to use the standard Black-Scholes formula to value an option. Explain why use the standard Black-Scholes formula is not appropriate for the following derivatives:

(ALL ANSWERS 1 MARK PER POINT)

{This question is testing for recognition of the breakdown of the model assumptions.}

(i) a put option on a CBD office tower (2 marks)

- Market is not efficient
- Underlying asset does not trade continuously
- Large transaction costs
- Replication not possible (cannot trade in portions of asset) {no-arbitrage valuation}
- Interest rates may not be constant

(ii) an interest rate cap {an interest rate cap limits the effective interest rate used to determine a cash payment, which is equivalent to a call option on the interest rate} (2 marks)

- Inconsistent to model interest rates and assume constant risk-free interest rate!
  {No marks for this part b if student misses this point.}
- Transaction costs
- May not be able to borrow at risk-free rate

(iii) ***a call option on the US dollar {this option gives the holder the right to buy US dollars at a specified exchange rate} (2 marks)***

- Inappropriate in standard formula because holder of foreign currency receives a holding return (equivalent to a dividend yield) of the foreign risk-free interest rate.
- Returns may not be lognormal.

{Award additional mark to student who states valuation is appropriate only if they explain that a transformation of the standard formula is required to accommodate the holding return. This transformation is sometimes called the Garman-Kolhagen formula.}

(iv) share options used in remuneration of senior executives (3 marks)

The following problems may arise when applying the standard formula: (1 mark per point)

- Inclusion of additional performance hurdles which cannot be evaluated eg. conditions relating to sales revenue, return on equity, net operating income, profit etc.
- May have other additional vesting requirements
- May be exercisable over several dates or during a given period, rather than at maturity only
- Exercise of options may give rise to dilution effects
- May be difficult to estimate volatility of shares (eg. new float)
- Exercise price of options may not be fixed or known in advance
- Long-term nature of options may invalidate assumptions of constant volatility and risk-free interest rate
- Dividends may be payable during life of option (and may be determined by these same executives!)
- Taxes and fit with other remuneration must be considered

QUESTION 6 **(20 Marks)**

a) An industry colleague of yours says that he is an active quantitative equity manager but with a very strong value focus. However, he mentioned to you that one of the traps of being such a value manager (albeit from a quantitative perspective), is being heavily in stocks that appear to be cheap but for a good reason and this has recently hurt his performance.

He says "We had big positions in stocks like Pacific Dunlop, PMP, Pasminco, and Caltex. Even though they had fallen a fair bit before we bought them, they still continued to decline in price after we got set in them. We need to improve our performance."

After looking at the active value factors used by your colleague you noticed that as far as "value" was concerned they looked sound.

i. Discuss other active return factors that your colleague could include to avoid falling into those "value traps"? (5 marks)

ii. You also noted that your colleague just used the average of the z-scores of the active factors as his "alphas". Explain a better approach to generating alphas, the logic behind it, and the further final adjustment you need to make to those alphas before you can commence portfolio construction?

(5 marks)

b) Your colleague becomes bored after successfully running the quantitative value approach for quite some time, and decides to try fundamental stockpicking. He says, "The company I work for believes the best stocks to have in your portfolios are those stocks whose earnings are not only going to grow consistently over time but will also be re-rated."

What exactly is your colleague saying, and do you agree with him?

(5 marks)

c) One of the "Risk Factors" discussed in the Grinold & Kahn text is the industry factor. Standard & Poors (S&P), who purchased the ASX index business, will soon replace the old ASX industry groupings with GICS (Global Industry Classification Standard).

Many quantitative analysts will now argue that risk modelling stocks under GICS can be done with higher explanatory power than under the old ASX industry groupings. Therefore they would argue that active fund managers can now have greater confidence in taking larger active bets than before while staying within the same ex-ante active risk constraints.

Discuss this statement. **(5 marks)**

Solution – Question 6

(a)(i) Discuss other active return factors that your colleague could include to avoid falling into those "value traps"? (5 marks)

A portfolio of value stocks that excludes "value trap" stocks can produce highly superior returns. Hence we need to find a mechanism to reduce the impact of such stocks.

Many studies suggest selecting value stocks with the best momentum will provide these superior returns. We can therefore minimize our exposure to these "value trap" stocks, as such "value trap" stocks tend to have poor momentum.

This means we need to combine our value factors with momentum factors.

(*1 mark total for this point, whether expressed as in this sentence or the paragraph above*)

This can be done by incorporating one or more of the following factors:

- earnings revision (*1 mark*)
- price momentum (*1 mark*)
- analyst's recommendation changes (*0.5 mark*)

An overriding consideration is that the weights allocated to these momentum factors should not be so high that they swamp the value factors and leave us with a portfolio that has a miniscule or negative value bias. To do this we need to back test and put the portfolios in a risk model such as Barra which has value as a risk factor.
(*1 mark*)

Another way to minimise the impact of "value traps" is to incorporate a qualitative way to identify stocks that either have very poor management that tend to destroy shareholder wealth (e.g. Pacific Dunlop), or are in industries with very poor structures. However, to incorporate this we need to somehow come up with a quantitative way to measure these qualitative issues, and to collect them from various brokers to come up with some form of consensus.
(2 *marks; 1 mark per point*)

One way to do this is to collect "Porter Scores". Increasingly many brokers are putting together Porter Scores for the stocks they cover which put a numerical score to qualitative issues as outlined by Porter.
(*0.5 mark*)

Another alternative (which is less appealing to a low tracking error fund), is to have a "quality filter" which screens out stocks with poor characteristics such as very high levels of gearing, consecutive years of earnings deterioration etc. The stocks screened out are forced to maximum underweight.
(*2 marks; 1 mark per point*)

(Subject to maximum of 5 marks.)

(a)(ii) You also noted that your colleague just used the average of the z-scores of the active factors as his "alphas". Explain a better approach to generating alphas, the logic behind it, and the further final adjustment you need to make to those alphas before you can commence portfolio construction? (5 marks)

There are many key issues.

These alphas will be used as inputs into the portfolio construction process, and most likely by using an optimisation process.

Firstly, just using the average of the z-scores of the factors means that we no longer have z-scores, as the standard deviation of the average is no longer 1. So we need to re-normalise or re z-score the average number.
(*1 mark*)

We also need to allow for outliers in case they are anomalies and to ensure they do not swamp the results from the other factors. Within each factor and overall we may want to truncate the extreme scores at +3 and –3.
(*0.5 mark*)

Another issue, is that we need to incorporate our forecasting skill into the alpha. It may be that the active quant factors that we use are of little value with say Property trusts but work well with Banks. Therefore we need to adjust the scores to allow for this. Grinold & Kahn talks about IC (Information Coefficient) which measures this forecasting skill. The closer a stock's alpha is to zero the closer to index weight the stock will be held. Therefore, in this case we will moderate the alphas of Property trusts (as we believe we have little skill here). IC s are effectively the correlation of scores to ex-post alphas. One way to do this is to multiply the z-score by IC.
(*1 mark*)

A less obvious, but very important point, is that risk models will want to hold stocks closer to index weight the higher its stock specific (residual/idiosyncratic) risk. This is because, all other things being equal, a 1% active position in that stock will result in a higher portfolio tracking error compared to other stocks. Therefore, we need to somehow force our views in such situations by increasing the alpha the higher the stock specific risk of the stock, to ensure we hold a meaningful active position in such stocks. Otherwise, risk models will "eat away" our alphas.

(*1 mark*)

The resulting output is then (this is discussed in the latter chapters in Grinold & Kahn text):

Alpha = z-score x IC x stock specific risk
(*0.5 mark*)

One overriding factor is that the benchmark must have an alpha of zero.
(*0.5 mark*)

Therefore, we must adjust the alphas generated for each stock. In practice, the index weighted sum of our stock alphas will not be zero. One way to adjust the alphas is to deduct this difference from every stock, but ideally this deduction will be multiplied by the stock's beta (but doesn't have to be).
(*1 mark*)

Adjusted Alpha =

Alpha – Beta x ExcessReturnOfIndexWeightedSumOfAlphas
(*0.5 mark*)

(*Subject to maximum of 5 marks*)

b) Your colleague becomes bored after successfully running the quantitative value approach for quite some time, and decides to try fundamental stockpicking. He says, "The company I work for believes the best stocks to have in your portfolios are those stocks whose earnings are not only going to grow consistently over time but will also be re-rated."

What exactly is your colleague is saying, and do you agree with him? (5 marks)

The colleague is trying to say that by selecting stocks whose earnings are going to grow at above average market rates consistently over time (which the market is not expecting), that as time passes the market will eventually realise that the stock is going to keep on delivering these rates of growth. As a result, the market will price this new expectation in by re-rating the stock…i.e. increasing the PE multiple.
(*1 mark*)

This has a "double whammy" effect. Not only will the stock price produce above average increases through above average increases in earnings (assuming the same PE multiple applies), but the stock price will also increase significantly more so as the PE multiple increases sharply from the re-rating.
(*1 mark*)

Example of such stocks are Woolworths and Wesfarmers.

In theory, this approach sounds great, and is most likely to generate significant alpha, if it can be implemented effectively. Yes, we would agree with the colleague. (*1 mark*)

This approach is in reality a GARP (Growth at A Reasonable Price) approach. A GARP approach effectively selects growth stocks that are undervalued. (*1 mark*)

However, the key problem with this approach is how do we identify such stocks?? It is extremely difficult to identify growth stocks whose "growth", which will "definitely" eventuate, which has not yet been be priced in. Only hindsight will reveal stocks that are like this. (*1 mark*)

(c) In the Risk Factors discussed in the Grinold & Kahn text, one of them is the industry factor. Standard & Poors (S&P) who purchased the ASX index business, will soon replace the old ASX industry groupings with GICS (Global Industry Classification Standard).

Many quantitative analysts will now argue that risk modelling stocks under GICS can be done with higher explanatory power than under the old ASX industry groupings. Therefore they would argue that active fund managers can now have greater confidence in taking larger active bets than before while staying within the same ex-ante active risk constraints.

Discuss this statement. (5 marks)

The S&P GICS proposes to have about 12 sectors instead of the roughly 24 ASX industry groupings. However, although fewer, the GICS sectors are a better way of categorising stocks with similar characteristics. (*Bonus ½ mark if the student quotes this detail, but this is not required knowledge.*)

The key problems with the ASX industry groupings were that some of them had stocks that were very different but were classified to be in the same industry. E.g. "Miscellaneous Industrials" currently holds quite a few technology stocks and some steel manufacturing stocks…new economy and old economy stocks in the same industry classification!!! (*1 mark*)

A related problem was that there were some stocks that were very similar in nature but were classified to be in very different industries, e.g. Crane Group in "Engineering", but the products that Crane produced and distributed are used in the building construction sector, and as such is very closely related to "Building Material" stocks such as Boral. (*1 mark*)

In risk models that incorporates the ASX industry groupings as factors (e.g. Barra), this creates significant problems. Firstly, in such risk models, the industry grouping is the dominant driver of a stock's risk model. As such, in the case of "Miscellaneous Industrials" this hodge podge group of stocks that can be very different, results in a risk model for these "Miscellaneous Industrial" stocks that have lesser explanatory power than what could otherwise have been. As a result, the estimated stock specific risks for these stocks are likely to be higher than what it should really be. This has the effect of overestimating their marginal contribution to active risk (tracking error), and will thus make you more inclined to reduce the active position in such stocks than is warranted.
(*2 marks; 0.5 per point*)

Similarly, a lot of fund managers keep a tight reign on factor biases. If the factors include the ASX industry groupings, then this has the effect of distorting the true extent to which you are overweighting or underweighted "similar" stocks, and as a result can really restrict the active positions you may have in sector A (which is meant to be comprised of similar stocks).
E.g. stock X is highly correlated to stock Y, and in the ASX industry groupings they are in different categories, but in GICS they will be in the same sector. You may really like X but hate Y. You are overweight X, but cannot overweight to the extent you want due to your other overweight positions in that ASX group. With GICS, X & Y will be in the same sector, as such you can increase your overweight position in X to the extent you were underweight Y, as the active GICS sector position would have been unchanged on a net basis.
(*2 marks; 0.5 per point*)

As a result, on an ex-ante basis, you could strongly argue that with GICS you could have greater active positions in stocks but stay within the same ex-ante active risk constraints that existed when risk modelling under the ASX industry groupings.
(*no mark – this is the information given in the question*)

From a behavioural finance perspective, it is likely, as most feel that GICS better classify stocks into sectors, that they will feel far more comfortable treating stocks within each of the GICS sectors in the same way, more so than under ASX industry groupings. This will lead to increasing correlation of stocks within each of the GICS sectors. This in turn will lead to improved explanatory power of the risk models under GICS, which will in turn reduce the estimated stock specific risk of each stock, and as such it will be easier to substitute a stock with a composite that has the same common factor exposures. This all has the effect of permitting far greater active positions in anyone stock, but staying within the same ex-ante risk constraints as under the ASX industry groups.
(*1 mark for expansion; note that the final sentence is given to students as part of the question*)

(Subject to maximum of 5 marks)

(total 20 marks)

QUESTION 7 **(20 Marks)**

The Board of Directors of XYZ Superannuation Fund is currently reviewing the benchmark asset allocations and variance bands (ie. minimum and maximum holdings in each asset class) that apply to the Fund.

You are the asset consultant to the XYZ Superannuation Fund.

The Board has provided you with the following list of issues relating to the superannuation fund investments:

- **a) fund surplus**
- **b) fund liabilities**
- **c) possible future benefit improvements**
- **d) cash flow and liquidity**
- **e) risk tolerance of the employer sponsor**
- **f) risk tolerance of the members**
- **g) historical fund crediting rates**
- **h) historical asset class returns**
- **i) future investment returns**
- **j) future view on inflation, which is that inflation will rise sharply in the next 12 to 18 months**
- **k) taxation**

Prepare a report to the board which:

(1) briefly describes the process you will use to determine the benchmark asset allocations and variance bands. (5 marks)

(2) discusses the impact, if any, of each issue raised by the board on your recommendations. Where the issue is important, describe how you will incorporate it into your process. (15 marks)

Solution

(1) Process

A possible approach is to start with historical return figures for each asset class, remove any past biases and apply future expectations and judgement {*1 mark*}. Analysis should be on an after-tax basis because this is how funds operate in the real world. Because of the different tax effects on asset classes, tax will obviously affect the final recommendation. (Note that imputation applies only to Australian shares.)

Once this is done this for each asset class, look at your assumptions in conjunction to ensure they are consistent {*1 mark*}. Generally, higher expected return comes only with higher risk (standard deviation). Note that if you simply apply historical figures, they may not be intuitively consistent. Some judgement is required.

Similarly with volatilities and correlations, the past can be used as a starting point but judgement must then be applied.

The recommendation of asset allocation should reflect the risk tolerances of the employer and/or trustee board (and perhaps the members). {*mark given 2 para. down* }

The assumptions of returns, risk and correlations are fed them into an optimisation model {*1 mark*}. The model should also incorporate the investment objectives and policy of the fund or other specific criteria (eg surplus must always be above a certain proportion of assets). The optimisation model provides a series of asset allocations which will maximise the fund return subject to a given measure of risk tolerance {*1 mark*}.

You match up the risk tolerance of the employer or trustee (which you have surveyed) and recommend the asset allocation or range of allocations which most closely reflect this tolerance {*1 mark*}.

Finally, the recommendation incorporate the relevant features outlined below {*1 mark*}.

{*Max 5 marks; there may be other approaches suggested.*}

(2) For each issue raised by the board:

a) Fund Surplus
- as this increases, risk tolerance can increase and therefore the investment strategy can be increasingly more aggressive.
- but any increase in risk tolerance depends on board's attitude towards surplus and its intended use (eg. to smooth returns, to add to returns, to pay expenses etc.) This in turn depends on whether the fund is defined benefit or accumulation.
- *incorporated directly as input into model (or part of total assets)*
- *alternatively, could invest surplus separately from balance of fund*

b) Fund Liabilities
- nature of liabilities may impact on recommendations (eg. whether accumulation or salary-linked)
- relevant for impact on risk tolerances
- *can be modelled as minimum asset levels at any time*

c) Possible future benefit improvements
- only relevant to effect on surplus
- *should not be modelled unless expected to be introduced*

d) Cash flow and liquidity
- only relevant to extent that redemption or rebalancing is required
- are contributions sufficient to meet benefit payments and expenses, plus rebalancing between asset classes, if required?
- *if not sufficient, need to model cash flow requirements (eg. costs of redemptions)*

e) Risk tolerance of the employer sponsor
- will impact aggressiveness of recommendations
- may reflect attitude of members or may be separate
- may be influenced by investment objectives or policy
- use of surplus
- impacts directly on final recommendation
- *incorporate by surveying board (NB but in an understandable way, eg. "In the pursuit of higher returns over the long term, you would be comfortable with an expected negative return one year in every .....?")*

f) Risk tolerance of the members
- may impact aggressiveness of recommendations (eg. will members accept a negative return?)
- (pure defined benefit) no impact
- (accumulation) definite impact
- possibly reflected by employer sponsor's attitude
- may impact on final recommendation
- *incorporate by surveying membership*

g) Historical fund crediting rates
- may impact through member expectations
- relevant for risk tolerances
- *not modelled directly*

h) Historical asset class returns
- should not in itself be an issue because concentrating on future returns
- *impacts because often used as a starting point to estimate future return expectations*

i) Future investment returns
- obviously big impact!
- should be long-term expectations to construct benchmarks and variance bands
- shorter-term considerations would only affect deviation of actual asset allocation from benchmark
- this is the main part of the model which requires judgement!

j) Future view on inflation
- may have some impact on the benefits if salary-linked
- over long-term, can be explicitly incorporated in model or removed by considering real returns
- short-term impacts must be modelled, may depend on strength of board's view

k) Taxation
- obviously big impact!
- returns should be modelled net of tax, including imputation and other rebates

(0.5 mark per valid point, max 14 marks, plus 1 mark for report format)