THE INSTITUTE OF ACTUARIES OF AUSTRALIA

INVESTMENT MANAGEMENT **2003 EXAMINATIONS**
EXAM SOLUTIONS **PAPER ONE**

MARKING GUIDE

Level of Difficulty

PAPER ONE

Question	Syllabus Aims	Unit	Knowledge & Understanding	Straightforward Judgement	Complex Judgement	Total
1	3	1	8			**8**
2	6, 9, 17	2, 3, 8		14	7	**21**
3	10	4	4	7	4	**15**
4	1, 10	1, 4	6	6	10	**22**
5	4, 10, 16	1, 4, 8	4	4	10	**18**
6	5, 8, 10, 13	2, 3, 4, 6		6	10	**16**
TOTAL			**22**	**37**	**41**	**100**

QUESTION 1 **(8 marks)**

Recent years have seen large falls in all of the world's major sharemarkets, with average PE ratios falling dramatically. Is this evidence that the equity risk premium has increased over the same period? State your view and provide reasons for it. What other factors have played a role in the decline of these markets?

QUESTION 1: SOLUTION **(8 marks)**

There are several plausible reasons as to why equity markets may have fallen. Some of the reasons that can be put forward for this include the following:

- The global economy is not as healthy as it was in the late 1990s, and hence investors have reduced their expectations of future earnings growth for listed companies. This would cause a contraction in price earnings ratios, without any of the other effects alluded to coming into play.
- The absolute level of company earnings in some cases have fallen precipitously, reducing the value of many companies.
- In some cases published earnings and accounts have been "discounted" by investors dubious as to the accuracy of the accounting treatments applied by companies.
- Many investors, disillusioned with the absolute performance of equities as an asset class and with the behaviour of public companies in general, have reduced their level of investments in equities. This has reduced the supply of funds available for equity investment.
- Interest rates have actually come down over recent years, in some countries such as the US by very substantial margins. That the sharemarket has still fallen in this environment suggests that investors are quite risk averse – lending weight to the rising equity risk premium argument.
- The threat of terrorism, wars, and a generally uncertain global economy has made investors less confident of investing in risky investments.
- Finally, investors may well have become overconfident as to the risks involved in investing in equities in the boom times of the late 1990s, and having realized the extent for loss, their appetite for equity investments has fallen off.

Only the final four factors could be said to relate to the equity risk premium demanded by investors. It is quite plausible to argue that the supply of funds for equity investments has tapered off, and that investors have become more risk averse, or at least risk aware, in the current environment – leading to an increase in the equity risk premium demanded by investors.

It needs to be said, however, that the equity risk premium is but one of the factors that has lead to the fall in global sharemarkets – albeit possibly the most important one.

(1 mark for each reasonable point made, 1 mark for a well-structured answer. Up to a maximum of 8 marks.)

QUESTION 2 **(21 marks)**

You are the investment manager for an Australian life insurer. Seeking to gain early momentum in the financial year, your company has successfully offered very competitive rates on 15-year complying annuities. These policies pay a fixed real amount per annum in each of the next 15 years. Each year, the annuity payments are adjusted in line with headline CPI inflation.

Your company has sold approximately $500 million (in terms of initial client investments) of these policies.

Initially it was proposed that inflation-linked bonds be used to match the liabilities. Recent government pronouncements that they would cease issuing inflation linked securities and the subsequent market disruption have forced the company to consider alternative strategies.

You have been asked to write a report for the company's investment committee on three potential investment strategies for the assets backing these liabilities. The three alternative asset mixes being considered are:

i) Commonwealth Government bonds only, but the total portfolio will have a duration less than that of the liabilities due to insufficient long dated bonds being available.
ii) Corporate bonds only, but with terms sufficient to permit duration and convexity matching.
iii) Government bonds as in i), but with a proportion of the portfolio invested in equities to "increase the duration."

(a) Outline the advantages and disadvantages of each of these strategies that you would include in your report (note: a report format is not required). **(14 marks)**

(b) Which strategy would you recommend? What additional risk constraints would you place on your chosen strategy? What further modelling work would you perform to confirm your initial recommendation? **(7 marks)**

QUESTION 2: SOLUTION **(21 marks)**

(a)

The key points to consider in respect of these strategies are their relative downside risks. Taxation is not a particularly important issue as complying annuity funds do not pay tax on policyholder fund investment earnings. (1 mark)

Note that none of the proposed investment strategies properly address the issue of inflation. This point should be made at some point by the student.

The principal advantages and disadvantages in respect of each strategy are as follows:

(i) Strategy 1: Government bonds

Advantages

- Virtually no credit risk – risk of Commonwealth Government defaulting is very low!
- Commonwealth government bonds have good liquidity, hence if the portfolio requirements or investment strategy changes the position can be unwound.

(2 marks)

Disadvantages

- Not being duration matched raises problems of exposure to interest rate changes (specifically falls in interest rates) leading to capital losses. The insurer should hold extra capital to protect itself against this risk of loss.
- Commonwealth government bonds do not have any inflation linkage.

(2 marks)

(ii) Strategy 2: Corporate bonds

Advantages

- Corporate bonds have higher yields than government bonds, meaning that either less money will need to be put aside to meet the liabilities and/or the life company should make a higher return on equity.
- Being able to duration and convexity match will significantly reduce the exposure to interest rate changes.

(2 marks)

Disadvantages

- Credit risk is the foremost concern – on a number of levels.
  - Assessing the creditworthiness of 15-year corporate bonds (or thereabouts) is a complex problem.
  - The insurer will need to make sure that it has sufficient skills to assess the credit risks that it is taking.
  - Capital losses can arise from downgrades and/or defaults on the bonds in the portfolio.
  - It will be necessary to ensure that the extra yield being received on these bonds is sufficient to justify the extra risk.
- Liquidity can be a problem for corporate bonds
- Nominal corporate bonds also have no inflation linkage. (4 marks)

(iii) Strategy 3: Government bonds and equities

Advantages

- The equities should, all other things being equal, provide a higher return than either government or corporate bonds.
- There may be some argument (although reasonably tentative) that equity returns may have some correlation to inflation over long periods. Hence this is one possible conjecture that could be investigated in the modeling of part (b).

(2 marks)

Disadvantages

- The risk of capital losses from the equity investments is much greater than that for bonds. This option is likely to require the most capital support, and is probably the riskiest option if a material proportion of equities are used.

(1 marks)

(14 marks in total, 1 mark for each point)

(b)

Marker's note: The student could nominate any of the strategies providing valid reasons are put forward.

On balance, the corporate bond strategy is probably the best strategy, as the risk of default is typically low for the types of bonds available in the Australian marketplace, whereas the risks of being significantly short duration can be quite large. Using equities is not considered a viable alternative due to the additional portfolio volatility (aside from inflation, our liability cash flows are fixed).

(1 mark)

The primary risk constraints would relate to interest rate and credit risk, and would be along the following lines:

- Duration and convexity of both the assets to be kept within a certain risk tolerance of those of the liabilities. By extension (and perhaps necessity in order to meet the duration and convexity target), a degree of cash flow matching should be employed.
- Limits of the investments permitted in the lower credit ratings, and conversely a minimum amount that must be invested in the higher credit ratings.
- Limits on concentration risk by company and industry.

(3 marks)

The types of modeling that could be performed might include:

- An interest rate model, possibly stochastic, to test the ability of the portfolio to cope with shifts in the yield curve (parallel and otherwise).
- Ann extension to the interest rate model to incorporate allowances for credit risk (e.g. what if a certain number of downgrades occur, or what if credit spreads blow out).
- Back testing as to how these matching strategies would have worked with historic yield curves. It is noted that this may be difficult due to the relative lack of credit risk data in the Australian market.
- Some testing as to various inflation and interest rate outcomes is also important given the problems outlined above with respect to inflation matching.

(3 marks)
(7 marks in total).

QUESTION 3 **(15 marks)**

You are an Australian fund manager specialising in Australian equities for a local super fund, BBQ Super. You are currently responsible for a $500 million passive equities portfolio with the S&P/ASX200 index as your benchmark. One of the investment instructions specified in your investment manager's mandate is that the ex ante tracking error of the fund shall not exceed 0.5% per annum.

ABC is a local industrial company with 1.5 billion shares on issue. It is also a member of the S&P/ASX200 index with an index weight of 2.5% at the close of 29th August 2003. ABC has just announced an off-market buyback of up to 75 million shares. The price range has been set at between $7.00 and $9.60. Shareholders can tender their shares at any price (10c interval) within this range. The buyback closes at 5:00pm on the 5th September 2003.

(a) Briefly discuss the issues that you would consider before deciding whether your fund should participate in the buyback. **(4 marks)**

(b) The structure of the ABC buyback is such that the price consists of 2 components – a capital component of $3.00 and a fully franked dividend component equal to the difference between the buyback price and the capital component. It is now 4:05pm on the 5th September 2003. ABC closes at $10.00. Its index weight in the S&P/ASX200 index is still 2.5%. Being an index fund, your $500 million fund holds ABC at exactly its index weight at the moment. Assuming that you can still tender your shares for the buyback, determine the minimum price at which you would tender your shares for the buyback. In addition, calculate the number of shares you would tender for the buyback. State any assumptions you made in your calculations. **(7 marks)**

(c) In respect of the buyback, what additional issues would you consider if you were an active fund manager specialising in Australian equities with the S&P/ASX200 index as your benchmark? **(4 marks)**

QUESTION 3: SOLUTION **(15 marks)**

(a)

The following issues would be considered:

- The extent to which we currently deviate from benchmark on ABC shares. If we're over, then a sale is likely to reduce tracking error. If we're currently under, then further sales are only likely to increase tracking error. This may be an issue as we are on a passive mandate.
- If we under pitch our offer, then we would have effectively decreased ex post return.
- Although unlikely, there may be restrictions on participation in buybacks prescribed in the mandate.

- The current market perceived prospects for the buyback and the current volatility on ABC's share price (which will dictate the width of the range in which offers are likely to lie).

(4 marks, 1 mark per valid point)

(b)

Assume that all franking credits can be fully offset against other assessable income.

(1 mark)

We should set our offer price such that we are indifferent between the prevailing market price of $10 and the buyback offer.

(1 mark)

The value of the buyback offer is, then, equal to the sum of:

- The capital amount returned, or $3;
- The dividend paid, equal to X-$3, where X is our offer price; and
- The franking credits received, equal to 30/70 times (X-$3), given the current Australian corporate tax rate of 30%.

That is, we need:

$$10 = 3 + (X - 3)\,(1+30/70)$$
$$X = 7/(1+30/70) + 3 = \$7.90$$

(2 marks)

Capital gains taxation

Assume that the original purchase price for these shares was less than the current market price of $10.

There may also be a capital loss for taxation purposes equal to the sale price less the capital amount returned. Assuming that such losses could be used immediately (as an approximation), and the tax rules were indeed applied in this manner, this would give rise to an additional benefit of 10% (Purchase price -$3).

Yet further "gains" arise from participating in the buyback when compared to selling on market from the taxable capital gain that we avoid. That is, if we sold on market we would pay tax of 10% times ($10 – Purchase Price).

Further assuming a purchase price of $7, and adding these two components together gives us an additional $0.70 reduction in the offer price, i.e. $7.20 instead of $7.90. This $0.70 amount is calculated as: 10% x (Purchase Price – 3) + 10% x (10 – Purchase Price).

(**Markers note**: students should receive a mark for noting that there could be capital gains tax implications, although it is not necessary for them to make this adjustment. For the remainder of the model solution, we shall work from the $7.90 offer price.)
(1 mark)

To keep our holdings to market weight, we will need to sell our shares roughly in line with the proportions of the total shares the company is buying back. That is, we will have to sell 75M/1500M or 5% of our holding. (1 mark)

Our current holdings of these shares are $500M times 2.5% index weight or $12.5 million. At the current market price of $10 per share, this implies a holding of 1.25 million shares. Hence we should tender 5% of these shares, i.e. 62,500 shares.
(1 mark)

(7 marks in total)

(c)

The following additional issues would be considered:

- Whether or not we are allowed to short sell and the extent to which this is allowed.
- The ex post returns to date.
- The extent to which our peers are participating in the buyback.
- Expected tender prices based on the investor base, e.g. if there are many overseas investors that do not value the franking credits, the tender prices may tend towards the upper end as they cannot bid low in order to get franking credit benefits.
- Capital gains tax issues – one may not want to sell in order to defer significant capital gains for an even longer period. Alternatively, depending on the tax treatment applied, one might be more keen than otherwise to participate if a capital loss is generated that can offset other capital gains that are to be realized elsewhere in the portfolio over this period.
- Control issues. Who will and will not participate in the buyback – will a 5% buyback tip the scales in terms of controlling interests or controlling factions for the company. If so, the impact of this on the value of the company or indeed, on "marginal" shares may be material.

(4 marks, 1 mark per valid point)

:

QUESTION 4 **(22 marks)**

The value style investment management firm that you work for "This Is Superannuation Management" has been expanding into Asia for around 12 months. You have just been appointed as the Head of Asian Equities (ex Japan and ex Australia). As soon as you put your feet under the desk in Hong Kong, it becomes apparent that there are some important decisions to make with respect to the portfolio.

One of your first portfolio decisions is to decide on your position with respect to TELEFIN, a Hong Kong based company that operates two businesses, TELCO, a provider of retail telecommunications services and FUNDFIN, a distributor of retail funds management services (they outsource their funds management so they are not a direct competitor to you). Summary financial information for both companies is provided below.

Currently, this stock represents around 10% of your portfolio.

(a) Outline what your primary considerations in respect of the weighting of this stock in your portfolio would be going forward. (6 marks)

(b) Analyse both businesses. Comment on the different features of each. (8 marks)

(c) Subsequent to your initial analysis, TELEFIN "demerges" the two business units into two separate companies. Both are now listed in Hong Kong, with TELCO and FUNDFIN trading at PE ratios of 15 times and 16 times respectively, based on the 2003 earnings shown below. You have decided to hold only one of the two companies. Outline which company you would prefer to hold post demerger, and explain your reasons. State any assumptions that you make and any further research that you would conduct before making your final decision

(8 marks)

TELCO					
Calendar year	1999	2000	2001	2002	2003
Revenue	100	102	104	106	108
Operating Expenses	(60)	(61)	(62)	(64)	(65)
EBITDA	40	41	42	42	43
Interest payable	(10)	(10)	(11)	(10)	(12)
Depreciation	(5)	(5)	(5)	(5)	(5)
NPBT	25	26	26	27	26
Tax	(3)	(3)	(3)	(3)	(3)
NPAT	22	23	23	24	23
Dividends paid	11	12	12	12	12
Assets	500	511	532	544	585
Liabilities					
Senior Debt	200	200	210	210	240
Other liabilities	3	3	3	3	3
Equity	297	308	319	331	342

FUNDFIN					
Calendar year	**1999**	**2000**	**2001**	**2002**	**2003**
Revenue	**80**	**88**	**77**	**77**	**84**
Operating Expenses	**(64)**	**(79)**	**(69)**	**(54)**	**(55)**
EBITDA	**16**	**9**	**8**	**23**	**29**
Interest payable	**(1)**	**(1)**	**(2)**	**(1)**	**(1)**
Depreciation	**(5)**	**(5)**	**(5)**	**(5)**	**(5)**
NPBT	**10**	**3**	**1**	**17**	**23**
Tax	**(1)**	**0**	**0**	**(2)**	**(2)**
NPAT	**9**	**3**	**1**	**15**	**21**
Dividends paid	**8**	**2**	**1**	**12**	**16**
Assets	**70**	**71**	**81**	**84**	**94**
Liabilities					
Senior Debt	**10**	**10**	**20**	**20**	**25**
Other liabilities	**3**	**3**	**3**	**3**	**3**
Equity	**57**	**58**	**58**	**61**	**66**

QUESTION 4: SOLUTION (22 marks)

(a)

The primary considerations of the portfolio weighting of this stock relate to the rewards and risks of this position. That 10% of the portfolio is held in a single stock suggests that we are currently overweight in the stock, and that any movement in holdings is likely to be a selldown rather than an increase in the position.

(1 mark)

In fact, even if we believe that the stock is a good one, it may be prudent to reduce our holdings given the tracking error that a materially overweight position may involve. This being said, our primary considerations as to the forward looking weighting of this stock in our portfolio will include:

- The manager's view on the relative and absolute risk and rewards from holding this stock.
- The weighting of the stock in the benchmark index, relative to its weighting in TISM's portfolio.
- The manager's style and the nature of the stock. Note that TISM is a value manager – if this stock is considered as more of a growth stock one would need to consider carefully its relevance to the portfolio (given that TISM is a value manager).
- Relative preference for income and capital gains, matched against realistic expectations for same from this stock.
- The level of unrealised capital gains (or losses), which may suggest being overweight in this stock is due to the benefit from deferring the realisation of these capital gains.

- Any other issues in respect of changing this weighting, e.g. the level of market impact that changing this weighting would have. Is the manager's portfolio large relative to the market as a whole, or is the holding large relative to the level of liquidity of the stock? The time frame for changing the level of investment becomes relevant here.
- The transaction costs of altering the level of the holding also need to be taken into account in terms of changing the level of investment.

(1 mark for each valid point, maximum of 6 marks for part (a) in total)

(b)

My analysis of the financial statements of the two companies is set out below.

TELCO

Calculation	1999	2000	2001	2002	2003
EBITDA margins	40%	40%	40%	40%	40%
EBITDA/interest	4.0 x	4.1 x	3.8 x	4.2 x	3.6 x
Payout ratio	50%	52%	52%	50%	52%
Gearing:					
Debt/(Debt+Equity)	40%	39%	40%	39%	41%
Growth in revenue		2%	2%	2%	2%
Growth in profit		4.5%	0%	4%	-4%
Return on equity	7%	7%	7%	7%	7%

FUNDFIN

Calculation	1999	2000	2001	2002	2003
EBITDA margins	20%	10%	10%	30%	35%
EBITDA/interest	16 x	9 x	4 x	23 x	29 x
Payout ratio	89%	66%	100%	80%	76%
Gearing:					
Debt/(Debt+Equity)	15%	15%	26%	25%	27%
Growth in revenue		10%	-13%	0%	10%
Growth in profit		-67%	-67%	1400%	40%
Return on equity	16%	5%	2%	25%	32%

The key points to note are as follows:

<u>TELCO</u>

- Telco is a much larger enterprise in terms of shareholders equity and profit.
- Telco has more stable headline revenue and profit numbers.
- Profit margins are lower, but still healthy.
- Payout ratios (dividends as a proportion of profit) are considerably lower. Presumably profits are being reinvested back in the business to either maintain existing infrastructure or else to invest in new infrastructure/technology.
- RoE is also lower. TELCO has a larger asset base (invested, no doubt, in infrastructure).
- Tax rate is lower – probably due to large depreciation write offs for tax purposes.

- Gearing levels are higher. This is not unreasonable given that it is a more stable business.

(1 mark, to a maximum of 4 marks, each point should be backed up by a calculation, deduct half a mark for each point made without a supporting calculation)

FUNDFIN

- As revenue for funds management companies tends to be a percentage of funds under management, and that FUM has likely been quite volatile (and falling for considerable periods) over recent periods, revenue for this business is more volatile than that for TELCO.
- Investment in infrastructure and systems is relatively lower, this being more of a human capital business than a physical capital business.
- This is likely to be one of the main reasons why the dividend payout ratio is higher – less reinvestment in the business is necessary (more reaping than sowing).
- Profit margins and returns on equity are higher.
- FUNDFIN appears to be good at managing its expenses to enable it to cope with adverse changes in headline revenue.
- Gearing levels are lower – reflective of the higher volatility of the business and the lower recourse to physical assets that such companies have in the event of default.

(1 mark per valid point, to a maximum of 4 marks, each point should be backed up by a calculation, deduct half a mark for each point made without a supporting calculation)

(8 marks in total)

(c)

I would recommend TELCO as the preferred stock.

My reasoning is as follows.

TISM is a value manager, and has a bias towards lower PE ratio stocks. Put another way, it is less inclined to pay a premium for future expected growth. On this basis, one might have suggested that FUNDFIN is preferable. I would, however, recommend TELCO as the preferred stock, despite the PE ratio premium being demanded, on the basis that:

- TELCO appears to be a lower risk stock with a track record of stable earnings over what has been a difficult period (especially for telecommunications companies); and
- The PE ratio premium required for what appears to be a lower risk stock is quite modest (a 7% PE ratio premium).

(3 marks)

Further, FUNDFIN is a fund manager, and hence its profitability is linked closely to the performance of investment markets in the future. Fees tend to be a percentage of funds under management, and hence this business ends to be leveraged to the

performance of financial markets. One's view of future market performance would be a crucial determinant of the decision. My recommendation is also based on the assumption of relatively modest future returns from financial markets over the next few years. FUNDFIN's expected future growth in revenues and profits should therefore also be low. (2 marks)

Further research

Due diligence work to be performed before making the final decision would include:

- Discounted cash flow valuations of each business.
- Obtaining more detailed information in respect of TELCO's future capital expenditure program (the scope of the spending and what it will be spent on).
- Earnings projections for each company from various brokers used by TISM.

(3 marks)

(8 marks in total for part (c))

QUESTION 5 **(18 marks)**

You have recently been appointed as an equities analyst at Tactical Investments of Australia, a manager of Australian equities. In this role, one of the first tasks given to you is to analyse a number of stock selection filters being considered for improving the fund manager's investment process.

One of their proposed filters involves valuing each company in their universe using the formula:

Company Value = EBIT/(r-g) – Net Debt

The explanation of each of these variables is set out in the table below.

Variable	Explanation
EBIT	Earnings before interest and tax
r	Risk discount rate. 10% is used for all companies
g	Expected future growth rate in earnings
Net Debt	Total company financial debt less cash holdings

Once each company has been valued in this way, the estimated value will be compared to the market value. Where the estimated company value is higher than the market value an overweight position in the company will be taken, and vice versa where the estimated company value is lower than the market value.

Outline some of the problems and challenges of implementing this filter.

Your answer should include:

- **A discussion of each element of the valuation formula.**
- **Any changes that you would suggest for applying this approach in practice.**

You should also comment on constraints that you might apply to this methodology in practice. **(18 marks)**

QUESTION 5: SOLUTION **(18 marks)**

At the outset, it is noted that no model is all encompassing and capable of infallible output. All output should be checked against what we would logically expect.

Weaknesses of the model formula are detailed below.

<u>EBIT</u>

EBIT may not be appropriate in all circumstances. Also, the formula implies that the latest EBIT is to be used. A three year average EBIT or a more "normalised" EBIT may be more appropriate.

The problem of how to assign a positive value to companies with negative EBIT also arises.

Further, EBIT does not take into account depreciation, capital expenditure, taxation or franking credits – nor the timing of cash flows to investors via dividend payments. For many companies, and indeed for the circumstance of particular investors (e.g. superannuation funds claiming full value for franking credits), such considerations are highly relevant and are a major driver of company value.

Comparing EBIT between companies is also problematic due to off-balance sheet financing structures. A company that buys an asset will incur interest (on the loan) and depreciation charges (with interest not being included in EBIT). A company who leases an asset will incur a lease charge (which is included in EBIT). Hence EBITs may differ simply because one company leases assets while another company buys its assets.

(3 marks)

Discount rate (r)

The same discount rate is not appropriate for all companies as companies will have differing risk profiles. On balance, the model is likely to over estimate the value of high risk companies by not applying the appropriately high discount rate and vice versa for low risk companies. This could lead (somewhat unwittingly) to a bias towards high risk companies.

The discount rate may also need to be dynamic. The 10% rate may need to be altered from time to time to reflect adjustments in the rates of return expected on competing investments (e.g. long term interest rates). (2 marks)

Growth rate (g)

The overall cash stream in perpetuity (EBIT / (r – g)) form is highly sensitive to the growth rate chosen. The assumption of stable and perpetual growth is highly dubious.

Again, this approach may lead to a style bias towards high growth companies.

(2 marks)

Debt measure

The approach as outlined does not define how net debt should be measured. Presumably this should be a measure of net debt (total debt less cash). Issues may arise where a company utilizes material level of hybrid funding (subordinated debt, preference shares, etc) than can change the quantum of and risk attaching to the cash flows to equity. For example, a company with large amounts of hybrid funding may have higher risk attaching to future dividend payments to equityholders, and both the measure of debt and risk discount rate applied to equity cash flows should reflect this. (1 mark)

General problems

This approach ignores some important sources of value. For some companies, the value of the future earnings stream of the company in its current form may under or over estimate its true value. For example, a mismanaged company may have a value that is lower than it would have if better management were hired. Alternatively, the company's share price may reflect a takeover premium that is not necessarily supported by its earnings as a standalone entity.

Further, the model presupposes that the manager is better skilled than the market at assessing value (i.e. markets are inefficient).

The model approach as outlined also does not say what would happen if the majority of stocks were under or over valued by the model. Would this lead to a tactical asset allocation decision to under or overweight stocks? (3 marks)

Adjustments required

First of all, one might consider using different discount rates for companies with different risk profiles, be this due to different levels of operational risk or leverage (note the CAPM suggests that one should only be compensated for non-diversifiable risk).

A more appropriate form may be to have an earnings projection for the next 5 to 10 years and then apply a terminal value thereafter. This resolves the inflexibility of the perpetual and linear growth assumption to some extent.

Overall, the form is reasonably robust for most cases aside from outliers such as high risk companies and smaller companies (or start up companies) where data is likely to be sparse, highly subjective and less reliable.

A general approach to mitigating some of the above problems may include the following:

- For each stock, estimate the percentage difference between the stock estimate and the market suggested company value.
- Establish a reasonability cutoff of, say, 15%.
- Where the estimated value differs (on either the buy side or the sell side) by more than this reasonability cutoff, examine the individual stock and ascertain why this is the case.
- For stocks that fall within the reasonability cutoff, choose, say, 10% of these and spot check that the valuation result looks reasonable against what we expect (as a double check on the model).
- Aggregate the model results into, say, sectors and ensure that the hold, overweight and underweight proportions look reasonable against what we expect (this can be done on, say, a quarterly basis to ensure the model continues to work).
- Look at the top 5 to 10 largest holdings individually as we are unlikely to have the room to err with these.

Data and parameter estimation is unlikely to be straightforward. Some issues that might arise and ways of overcoming each are detailed below:

- Stock data feeds are likely to contain errors. Therefore, have secondary sources to use as checks, establish limits on earnings movements and check where these are breached.
- Earnings data may have gaps. Establish a robust interpolation process, e.g. don't interpolate over a gap of more than 3 data points. Note where there are more than 3 gaps, etc.
- Look for outliers in the data and consider what smoothing needs to be done.
- Establish a robust expected future growth rate estimation process. If possible, utilise the average analyst recommended earnings figures for the next two to three financial years, estimate the implied earnings growth rate, and use this as a check.

(7 marks)

(Maximum of 18 marks)

QUESTION 6 **(16 marks)**

You have been retained as an asset consultant to a large Australian superannuation fund. Some questions have arisen in respect of one of their more unusual Australian equities mandates. The mandate is for $500 million of assets.

The investment manager in question is seeking to change the fee structure of their mandate, from a flat percentage of funds under management, charged monthly, to an incentive based formula.

In short, the manager wants the performance fee and mandate changed to the following:

- **The mandate is for one year certain.**
- **Fees are equal to 10% of the increase in fund value over the course of the year (before fees are deducted), payable at the end of the year.**
- **All dividends occurring across the year are reinvested with the manager.**
- **Fees are capped at 10% of $100 million, i.e. if the fund finishes above $600 million in value the fund manager's fees remain at 10% of ($600 million less $500 million), or $10 million.**
- **No contributions or redemptions are to be applied to the fund over the year.**

(a) What do you see as the primary advantages and disadvantages of performance fees of this nature in general? What are the potential problems with these particular arrangements? (6 marks)

(b) Calculate what you consider to be the value of these fees, assuming that performance will be in line with the index, and that option valuation techniques can reasonably be applied. Show all assumptions. (You may use the Standard Cumulative Normal Distribution Table on the following page.) (8 marks)

(c) Regarding your fee valuation, explain which assumptions concern you the most. (2 marks)

Standard Cumulative Normal Distribution Table

x	Φ(x)	x	Φ(x)	x	Φ(x)	x	Φ(x)
0.00	0.50000	**0.80**	0.78814	**1.60**	0.94520	**2.40**	0.99180
0.02	0.50798	**0.82**	0.79389	**1.62**	0.94738	**2.42**	0.99224
0.04	0.51595	**0.84**	0.79955	**1.64**	0.94950	**2.44**	0.99266
0.06	0.52392	**0.86**	0.80511	**1.66**	0.95154	**2.46**	0.99305
0.08	0.53188	**0.88**	0.81057	**1.68**	0.95352	**2.48**	0.99343
0.10	0.53983	**0.90**	0.81594	**1.70**	0.95543	**2.50**	0.99379
0.12	0.54776	**0.92**	0.82121	**1.72**	0.95728	**2.52**	0.99413
0.14	0.55567	**0.94**	0.82639	**1.74**	0.95907	**2.54**	0.99446
0.16	0.56356	**0.96**	0.83147	**1.76**	0.96080	**2.56**	0.99477
0.18	0.57142	**0.98**	0.83646	**1.78**	0.96246	**2.58**	0.99506
0.20	0.57926	**1.00**	0.84134	**1.80**	0.96407	**2.60**	0.99534
0.22	0.58706	**1.02**	0.84614	**1.82**	0.96562	**2.62**	0.99560
0.24	0.59483	**1.04**	0.85083	**1.84**	0.96712	**2.64**	0.99585
0.26	0.60257	**1.06**	0.85543	**1.86**	0.96856	**2.66**	0.99609
0.28	0.61026	**1.08**	0.85993	**1.88**	0.96995	**2.68**	0.99632
0.30	0.61791	**1.10**	0.86433	**1.90**	0.97128	**2.70**	0.99653
0.32	0.62552	**1.12**	0.86864	**1.92**	0.97257	**2.72**	0.99674
0.34	0.63307	**1.14**	0.87286	**1.94**	0.97381	**2.74**	0.99693
0.36	0.64058	**1.16**	0.87698	**1.96**	0.97500	**2.76**	0.99711
0.38	0.64803	**1.18**	0.88100	**1.98**	0.97615	**2.78**	0.99728
0.40	0.65542	**1.20**	0.88493	**2.00**	0.97725	**2.80**	0.99744
0.42	0.66276	**1.22**	0.88877	**2.02**	0.97831	**2.82**	0.99760
0.44	0.67003	**1.24**	0.89251	**2.04**	0.97932	**2.84**	0.99774
0.46	0.67724	**1.26**	0.89617	**2.06**	0.98030	**2.86**	0.99788
0.48	0.68439	**1.28**	0.89973	**2.08**	0.98124	**2.88**	0.99801
0.50	0.69146	**1.30**	0.90320	**2.10**	0.98214	**2.90**	0.99813
0.52	0.69847	**1.32**	0.90658	**2.12**	0.98300	**2.92**	0.99825
0.54	0.70540	**1.34**	0.90988	**2.14**	0.98382	**2.94**	0.99836
0.56	0.71226	**1.36**	0.91308	**2.16**	0.98461	**2.96**	0.99846
0.58	0.71904	**1.38**	0.91621	**2.18**	0.98537	**2.98**	0.99856
0.60	0.72575	**1.40**	0.91924	**2.20**	0.98610	**3.00**	0.99865
0.62	0.73237	**1.42**	0.92220	**2.22**	0.98679	**3.02**	0.99874
0.64	0.73891	**1.44**	0.92507	**2.24**	0.98745	**3.04**	0.99882
0.66	0.74537	**1.46**	0.92785	**2.26**	0.98809	**3.06**	0.99889
0.68	0.75175	**1.48**	0.93056	**2.28**	0.98870	**3.08**	0.99896
0.70	0.75804	**1.50**	0.93319	**2.30**	0.98928	**3.10**	0.99903
0.72	0.76424	**1.52**	0.93574	**2.32**	0.98983	**3.12**	0.99910
0.74	0.77035	**1.54**	0.93822	**2.34**	0.99036	**3.14**	0.99916
0.76	0.77637	**1.56**	0.94062	**2.36**	0.99086	**3.16**	0.99921
0.78	0.78230	**1.58**	0.94295	**2.38**	0.99134	**3.18**	0.99926
0.80	0.78814	**1.60**	0.94520	**2.40**	0.99180	**3.20**	0.99931

QUESTION 6: SOLUTION **(16 marks)**

(a)

Performance fees in general

Properly structured performance fee arrangements are meant to better align the interests of the fund manager and the investor. Given that these fees are typically lower when performance is poor, the fee level is a function of the investor's capacity to pay.

The primary disadvantage is the element of moral hazard that they can introduce. The manager's remuneration is heavily skewed towards the upside - the manager may be very handsomely rewarded when things go well, with little downside if returns are very poor. This can encourage the manager to take greater risk than otherwise.

(2 marks)

Issues specific to these arrangements

The potential defects noted above apply here. Specific issues with respect to these particular arrangements include:

- If performance is poor, the manager has zero downside, but potentially very large upside if portfolio performance is outstanding. For example, if they achieve a return of 20%, their normal management fees might be 0.5% of funds under management, or around $2.75 million (0.5% x average funds under management over the year of $550 million), as opposed to the $10 million they would reap under the proposed arrangements. This gives them a considerable incentive to take quite large risks that may not be in the interests of the investors.
- The cap on the fee means that performance above a 20% return is not rewarded. While this may not be considered a big issue with current expectations, one needs to consider how this cap might apply over time, and how motivated the manager might be once performance hits this target (will they become too conservative, which may not make sense from a total portfolio perspective).
- Absolute performance rather than relative performance (to index) is being rewarded. If equities as an asset class perform well or poorly this is not a basis for rewarding a sector specialist manager – this is the decision of the trustees of the portfolio and is "for their account". In bull markets the manager could perform poorly relative to the index and still be well paid.
- There is no clawback provision if performance is negative. The arrangements would seem to start anew each year, giving the manager a free option.

(4 marks)

(b)

Given the assumption of index performance, this fee structure can be considered as a series of call options on the index.

The particular fee arrangements can then be valued as 10% times:

1. A long position in an at the money call option (Option 1 or c_1).
2. A short position in a call option with a strike price of $600 million (Option 2 or c_2).

In both cases the starting value of the underlying asset is $500 million.

(1 mark for correct structure)

For simplicity we will use the same set of assumptions for valuing each of these options. In practice one might make a higher volatility assumption for the out of the money option to allow for "volatility skew."

Option 1 valuation

We shall use the Black Scholes call option formula

$C = S \,.\, N(d_1) - X \,.\, e^{-rt} N(d2)$

Where

$d_1 = [\ \ln(S/X) + (r+\sigma^2/2)\ T\ ] / [\sigma\ T^{0.5}]$
$d_2 = d_1 - \sigma\ T^{0.5}$

(1 mark)

We shall assume

Parameter	Symbol	Assumption
Risk free interest rate	r	5.5%
Volatility	σ	20%
Initial asset value	S	500M

T = time to maturity = 1 year

(1 mark for a reasonable set of assumptions)

Given that dividends are reinvested we do not need to make any assumption in respect of dividends. The risk free rate should be a continuous rate of return based on current interest rate levels.

(1 mark)

These assumptions give:

$c_1 = 500 \,.\, N(0.375\ ) - 500\ N(0.175\ )\ \exp(-5.5\% \times 1) = \$53.6M$

(2 marks for a correct answer given the amount of calculation involved)

Option 2 valuation

We value this option as per option 1 assumptions and formula, but with X=$600M.

Applying the formula above gives the following value for option 2:

c_2 = 500 . N(-0.54) – 600 N(-0.74) exp(-5.5% x 1) = $16.9M

(1.5 marks)

Present value of fees can then be calculated as:

10% x [$53.6M - $16.9M]

or $3.7 million (or 0.73% of initial funds under management)

(½ mark)

(c)

The volatility assumption needs to be prospective, and hence requires considerable judgement. The valuation of the fee is heavily influenced by the assumption for this parameter. There is also an argument that by virtue of the basic form (and the nature) of the contract, the manager may have an incentive to follow strategies that result in above index volatility – increasing the value of the "fees" to the manager in their option-like form.

(1 mark)

The assumption of log-normal share price performance underlying the Black-Scholes is also questionable. In practice investment banks make adjustments to their inputs and methodologies to allow for expected violations of this assumption. Once again, one could also make an argument that the assumption of index performance for the underlying asset is dubious in this particular context given the incentive fee arrangements encourage the manager to pursue an absolute rather than a "relative to benchmark" out performance – which is likely to manifest itself in positions considerably at variance with index weightings.

(1 mark)

END OF PAPER ONE SOLUTIONS