

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2011 examinations

Subject ST5 — Finance and Investment Specialist Technical A

Purpose of Examiners' Reports

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and who are using past papers as a revision aid, and also those who have previously failed the subject. The Examiners are charged by Council with examining the published syllabus. Although Examiners have access to the Core Reading, which is designed to interpret the syllabus, the Examiners are not required to examine the content of Core Reading. Notwithstanding that, the questions set, and the following comments, will generally be based on Core Reading.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report. Other valid approaches are always given appropriate credit; where there is a commonly used alternative approach, this is also noted in the report. For essay-style questions, and particularly the open-ended questions in the later subjects, this report contains all the points for which the Examiners awarded marks. This is much more than a model solution – it would be impossible to write down all the points in the report in the time allowed for the question.

T J Birse
Chairman of the Board of Examiners

December 2011

General comments

Candidates are reminded of a bias in the paper towards recognising higher level skills and practical application – this is intentional and will continue. Likewise the examination system does properly allow for prior subject knowledge to be assumed. Investment is a necessarily practical subject and, at this level, the examiners expect candidates to demonstrate a breadth and depth of competency as would be expected from a senior student in a frequently evolving discipline. Hence simple regurgitation of bookwork will never be sufficient to ensure a Pass grade – and this was evident from the dispersion of candidates' responses in the more differentiating questions.

In order to succeed, candidates must ensure they familiarise themselves with the prevailing investment issues and the general market background facing institutional investors in the 12–18 months preceding a diet, more so the solutions (and sources of) being debated by the various stakeholders. Hence questions regarding banking and derivative approaches, as well as active and passive asset management and insurance solutions, to asset and liability risk management (including model risk) or modern financial theory and commercial applications should be considered likely scope for examination. Against a background of the credit crisis, new asset classes and ways of structuring investments will themselves generate new types of risk (such as operations, liquidity, credit and counterparty), so the need for new ways of regulation, monitoring and management. Finally the examiners encourage candidates to recognise there are different types of investor beyond purely pension funds and different taxation, time line and cost considerations will apply – it would seem that candidates have taken this on board.

Whilst the examiners will tolerate bullet point style responses, some candidates' handwriting was too poor to assess and they will have lost marks. Likewise "text speak" abbreviations will not be accepted.

Specific comments on September 2011 paper

This paper had a similar pass mark to the April diet which resulted in a lower pass rate, albeit comparable with previous years. Candidates typically answered Questions 4 and 6 much better than the others (albeit still foregoing 30–40% or more of marks available), with Questions 2 and 9 attracting the worst responses, considerably so, with average scores of around a third of the available marks. These latter two questions were two of the calculation biased ones and, notwithstanding the performances in questions 4, it is disappointing to see a lack of skill demonstrated in this area given recent improvements in data handling in previous exams.

Question 1 dealt with some of the core products cited as a key factor in the "Credit Crisis" when risk management failed. Actuaries could reasonably feel they could offer relevant skills and knowledge in this area, so it is important candidates demonstrate understanding. Questions 3, 5 and 7 focussed on the practical aspects of investment as distinct from theory. Question 8 took this further in looking at behavioural aspects – markets and funds are susceptible to such biases and it is important for candidates to be able to recognise and identify such distortions; although one of the better answered questions, a lot of marks were missed and candidates should expect further examination in this area. Many questions represented opportunities to demonstrate higher level skills in terms of non-standard/practical application of theory to current or unusual issues in investment – hence

candidates who wish to progress to SA6 will need to improve their understanding of and approach to such questions.

Most candidates seemed to identify and understand the key issues being examined and so appreciated the general content of solutions that the examiners were looking for – however those that were unsuccessful will find their solutions lacked sufficient (and often the most basic) detail or application of knowledge and scored lower accordingly. Many candidates still deviate from the topic and include irrelevant material or over emphasise minor points – although candidates will not be explicitly penalised for this, it gives an impression of a lack of understanding and, more importantly, wastes limited time. Time and priority management are key skills actuaries need to have. Where candidates made relevant points in other parts of their solutions, the examiners have used their discretion as to whether to recognise these answers or not. Likewise the examiners share and agree alternative possible solutions to questions alongside the approach outlined below.

- 1** (i) A credit default swap is a contract that provides a payment if a particular event occurs. The party that buys the protection pays a fee to the party that sells the protection. If the credit event occurs within the term of the contract a payment is made from the seller to the buyer. If the credit event does not occur within the term of the contract, the buyer receives no monetary payment but has benefited from the protection during the tenure of the contract.

There are two ways to settle a claim under a credit default swap:

- A pure cash payment, representing the fall in the market price of the defaulted security. However, the market value may be difficult to determine.
 - The exchange of both cash and a security (*physical settlement*). The protection seller pays the buyer the full notional amount and receives, in return, the defaulted security.
- (ii) A structured product is a pre-packaged investment strategy in the form of a single investment.

A typical structured product will consist of two components:

- A Note – essentially a zero-coupon debt security that provides capital protection, i.e. guarantees a return of all or part of the initial investment at maturity
- A derivative component that provides exposure to one or several underlying assets such as equities, commodities, FX or interest rates.

Returns from the derivative can be paid out in the form of coupons during the lifetime of the product, or added to proceeds at maturity.

In some, more complex, structured products, the amount invest in the zero-coupon debt security can vary dynamically over time depending on a pre-determined view. And in others, the capital protection may itself be dependent on the performance of the underlying assets.

Structured products are also typically provided in a packaged format that provides advantages to investors over investing directly in the underlying derivatives – for example:

- Practical – investors may be unable to invest themselves in the underlying derivatives. The structured product also provides a pre-packaged investment strategy that does not require active intervention by the investor.

- Legal – the format may be designed to satisfy legal or regulatory requirements as to accessible investments for retail or institutional investors.
- Tax – the tax treatment from the structured product may be more favourable than direct investment.
- Accounting – for example, the product may be structured so as to avoid income statement volatility from the underlying derivatives.

Structured products may lack transparency, making them hard for the investor to assess. There may be cost advantages to the investor (compared to using the underlying instruments. Alternatively, the structured product may cost more.

- 2** (i) The forward rate is the guaranteed price agreed today at which the buyer will take delivery of the currency on a specific future date. Pricing of forward contracts is known as “Covered interest parity” (CIP) and involves the spot rate and money market interest rates in the two countries. If r_d and r_f are the interest rates in the domestic and foreign markets and F and S are the forward and spot rates, then

$$F = S \times (1 + r_d) / (1 + r_f) \quad [1/2] \text{ for a one year contract.}$$

(ii) Forward rate = Spot rate $\times (1 + r_A)^2 / (1 + r_B)^2$
 $= 1.15 \times (1.02)^2 / (1.03)^2$
 $= 1.1278$

(or Forward rate = Spot rate $\times \exp 2(r_A - r_B)$
 $= 1.15 e^{-0.02}$
 $= 1.1272$)

- (iii) In practice, outright forward rates do not usually appear on a dealer's screens. Instead, “forward points” are quoted where forward points = $F - S$. Thus the “outright” forward rate is the spot rate plus forward points.

- 3** (i)
- Index Fund is open ended fund, exchange traded fund is closed ended.
 - Index fund redeem at NAV (sometimes with spread). Exchange traded funds not always priced at NAV
 - Index Fund tend to replicate main indices, exchange traded funds can be much more focussed on a sector

(ii)

- Tracking error – not holding all securities in benchmark
- Management fees
- Expenses
- Handling of dividends
- Treatment of tax taken at source

4

(i) Mean-variance portfolio theory relies on some strong and limiting assumptions about investor behaviour. It is assumed that:

- (i) investors select their portfolios on the basis of the expected return and the variance of that return over a single time horizon.
- (ii) investors are never satiated. At given level of risk, they will always prefer a portfolio with a higher return to one with a lower return.
- (iii) investors dislike risk. For a given level of return they will always prefer a portfolio with lower variance to one with higher variance.

(ii) The covariance for the two assets C_{AB} is given by $\rho_{AB}\sigma_A\sigma_B = .0012$
Minimum variance occurs when the proportion of asset A (x_A)

$$\begin{aligned}
 &= \frac{V_B - C_{AB}}{V_A - 2C_{AB} + V_B} \\
 &= \frac{0.0064 - 0.0012}{0.0025 - 0.0024 + 0.0064} \\
 &= \frac{0.0052}{0.0065} = 0.8
 \end{aligned}$$

$$x_B = (1 - x_A) = 0.2$$

(iii) $E = x_A E_A + x_B E_B = 0.8 \times 5\% + 0.2 \times 9\% = 5.8\%$

$$\begin{aligned}
 V &= x_A^2 V_A + x_B^2 V_B + 2x_A x_B C_{AB} \\
 &= .00224
 \end{aligned}$$

So standard deviation = 4.7%

- 5** (i) The amount of the bulk transfer is linked solely to the level of the market for UK equities.

The fund is invested across a range of asset classes in accordance with a set benchmark distribution.

Unless the proportion of the benchmark allocated to UK equities explicitly allows for this bulk transfer, part of the bulk transfer liability is effectively mismatched by asset class.

If, for example, the portfolio is 50% invested in UK equities and 50% in overseas equities, bonds, properties etc., then circa £100m of the bulk transfer is matched by asset class. However, there is still a circa £100m liability linked to UK equities which will be settled by transferring securities to the requisite value from the overseas equities, bonds, properties etc. classes i.e. this £100m is mismatched by asset class.

- (ii) You may be able to reduce your exposure to these other asset classes and increase your exposure to UK equities by using financial futures.

In total, you need to change your exposure for approx. £100m i.e. sell £100m worth of futures on these other asset classes and buy £100m worth of UK equity futures.

A variety of futures would be sold related to the markets in the other asset classes and in proportion to the distribution of the assets amongst these markets.

At the time of payment the futures position would be unwound.

The principal problem is that there may not be appropriate derivative contracts for some of these other asset classes e.g. property, venture capital etc. Other main problems are:

- The basis risk associated with futures contracts
- The need to take account of foreign exchange hedging in relation to overseas asset classes
- The trustees may be restricted in their use of derivatives
- Margin payments may need to be funded
- The investment managers may lack the requisite expertise, which may result in additional costs

- 6** (i) Fundamental analysts use a variety of techniques to try to determine whether a share is over- or under-valued by the market. Most methods involve an attempt to obtain a better estimate of future earnings or dividends, either by the use of a superior model or by the use of information which hasn't been taken into account by the market. The process can be considered as consisting of two stages. The first is the construction of a model of the company which

allows future cash flows and earnings to be estimated. The second involves the use of the output from the first stage to determine whether the company's securities are over- or under-valued by the market. In practice, a wide range of techniques is used and the degree of sophistication employed varies greatly.

(ii)

- The analyst will consider the following:
 - Management ability
 - Quality of products
 - Prospects for market growth
 - Competition
 - Input costs
 - Retained profits
 - History
- In order to consider the above they will undertake the following analysis:
 - Financial accounts and accounting ratios
 - Dividend and earnings cover
 - Profit variability and growth
 - Level of borrowing
 - Level of liquidity
 - Growth in asset value
 - Expenditure
 - Performance relative to other similar companies

(iii) **Reduce Costs**

- Reduce expenses – this could be done by:
 - Reducing size of work force
 - Reduce salaries of firm or cut benefits
 - Reduce costs of manufacturing by sourcing cheaper materials
 - Improving efficiency of current process or outsourcing activities/processes to cheaper location
 - Reduce/eliminate non-essential expenses
 - If firm has debt, maybe able to restructure debt to lower borrowing costs
 - Move headquarters to more tax beneficial location

Increase Revenues

- Increase prices of beds
- Expand product range available to market
- Expand beyond hotel market and offer to public as well
- Expand into overseas markets
- Stop producing any loss making products

- 7 (i) A discussion of the four main methods is provided below.

Full replication involves holding every stock in the chosen index in the index proportions. Thus the index is fully matched.

This can be an expensive approach to matching the investment performance of the index if there were a lot of stocks in the index.

Imagine the dealing costs involved in full replication of the FTSE All Share Index as stocks move in and out of the index and dividend income is reinvested in the correct proportions across the index.

The need to be a “forced” buyer or seller as index constituents change may result in trades being made at unattractive prices.

Stratified sampling entails purchasing a sample of the stocks in the index so that the proportions of the fund in the specified industry categories matches that of the index. Some mismatching is inevitable.

Fewer stocks are required compared with full replication and this should lower transactions costs.

The method requires a significant statistical analysis to find the sample that best matches the performance of the index.

There will be less 'forced' buying and selling involved.

Optimisation entails constructing a portfolio that matches the index in certain specified fundamental factors (e.g. price earnings ratio, capitalisation, and beta) that are known to affect performance.

Choosing the fundamental factors in the first place is a problem that requires high level analytical skills – choosing appropriate stocks thereafter is yet another problem. This approach requires ongoing analysis and computing power to carry out the optimisation.

Again the method has the advantage of requiring less stocks than full replication and hence lower transaction costs. However some mismatching is inevitable.

Synthetic funds are constructed using derivatives on the underlying assets rather than holding the assets themselves.

For example, a passive fund manager could hold cash (perhaps in the form of T-bills) and futures on the index. Provided suitable derivatives exist/are used, the index is fully matched, at least in capital terms.

If futures are underpriced relative to fair value the manager may outperform an index fund that holds stocks directly and vice versa.

The necessity to roll over the index futures every few months can give rise to basis risk [$\frac{1}{2}$] which may cause the fund to outperform/under perform a portfolio holding the stocks directly.

The costs associated with constructing the synthetic fund may be significant.

- (ii) Matching an index may be problematical due to the lack of fungibility i.e. you can only buy what bonds others want to sell. Hence matching an index may be quite easy in gilts but very hard in corporate space. Moreover a single issuer can have multiple stocks available with different terms and features, some rated some not, so you could get a yield pick up for the same underlying credit risk simply because, say, there is less demand for unrated issues.

Where the index being matched is a very broad market index, indexation exposes the investor to market risk whereas active management which aims to beat the performance of the index exposes the investor to both market and stock specific risk.

Index portfolio managers tend to deliver a narrower range of returns compared to active managers targeting the same benchmark. This has led some observers to argue that the average active manager provides a poor risk-return trade-off relative to the average index manager targeting the same benchmark index.

Index funds tend to beat the average active manager which aims to beat the same benchmark index.

Markets are relatively efficient – information is disseminated quickly and simultaneously to all major market participants who take the correct action, which is quickly reflected in stock prices – and any outperformance by generated by an active manager may not justify the extra dealing and fund management costs.

The problem with active management is that while some active managers do indeed produce returns well in excess of the benchmark the question is can they be identified in advance and can they consistently outperform the index.

Where a bond fund is subject to taxation, active fund management means an earlier incidence of capital gains tax. Index funds have a very low level of

turnover, so until all or a part of the fund is disposed of it (and ultimately the investor) pays minimal capital gains tax.

The need to match liabilities may make the use of passive management preferable.

8

(i)

- Portfolio manager picked underperforming securities (i.e. was “unlucky”)
- Portfolio manager might have been given a different brief (asset class) to manage than they are used to managing before
- Portfolio restrictions might be too restrictive limiting ability to add value
- Portfolio manager's style might be out of favour (i.e. growth manager and market conditions have been value markets)
- Quality of analyst recommendations have been poor
- The skill of the supporting team or systems may be less developed

(ii)

- 1 – regret aversion – retaining current arrangements minimise possibility of regret. Also, anchoring and adjustment to keep convincing themselves the new price is correct
- 2 – Overconfidence in own abilities and believes own judgement is best
- 3 – Overconfidence – confirmation bias, looks to change views to suit their own views
- 4 – Dislike of negative events - influence of the 'valence' of the outcome
- 5 – Primary effect – like to pick first option on list

(iii)

- Have strong sell rules (stop losses) to stop portfolio managers holding onto underperforming securities too long
- Have all sell decisions reviewed by second person to stop securities being sold too quickly
- Have a model portfolio which is decided by a group of portfolio managers rather than stock selection influenced by a single manager
- Remunerate portfolio managers on their stock selection could increase focus on performance

- Introduce rules that all stock selection must have an analyst recommendation
- Change way stock recommendations are presented to stop stock at the top of list being selected

9

Start value	10000000	Benchmark	1
Domestic Equities	3500000		50%
Overseas Equities	4000000		30%
Small Cap Equities	2000000		15%
Cash	500000		5%

	Period 1	Period 2	Transition Period	Period 4	Period 5
Domestic Equities value	3500000	3815000	3000000	5255000	5570300
Domestic Equities return	9.0%	8.0%	7.0%	6.0%	8.0%
Benchmark return	11.0%	7.0%	7.0%	6.0%	5.0%
Overseas Equities value	4000000	4160000	3000000	3153000	3310650
Overseas Equities return	4.0%	7.0%	6.0%	5.0%	7.0%
Benchmark return	5.0%	7.0%	5.0%	5.0%	8.0%
Small Cap Equities	2000000	2060000	1000000	1576500	1639560
Small Cap Equities return	3.0%	6.0%	6.0%	4.0%	5.0%
Benchmark return	3.0%	6.0%	8.0%	4.0%	3.0%
Cash	500000	505000	3000000	525500	530755
Cash return	1.0%	1.5%	2.0%	1.0%	3.0%
Benchmark return	1.0%	1.0%	2.0%	1.0%	2.0%
Total portfolio	10000000.0	10540000.0	10000000.0	10510000.0	11051265.0
			10540000.0	10510000.0	
Benchmark	7.5%	6.6%	6.3%	5.1%	5.5%

Answers

	Domestic	Overseas	Small Cap	Cash	Total return
(i)					
(a) Super Return	4120200	4451200	2183600	512575	12.7%
Benchmark Return					14.5%
(b)					
Transition Period	3210000	3180000	1060000	3060000	5.1%
Benchmark Return					6.3%
(c)					
Think Return	6015924	3542396	1721538	546678	12.5%
Benchmark Return					10.9%

(ii)

(a) Cash taken out 1267575

(b) Total scheme 33.3%
Total benchmark 35.0%

(iii) Stock attribution	Period 1	Period 2	Transition Period	Period 4	Period 5
Domestic equity return	9.00%	8.00%	7.00%	6.00%	8.00%
Benchmark	11.00%	7.00%	7.00%	6.00%	5.00%
Stock attribution	-2.00%	1.00%	0.00%	0.00%	3.00%
Overseas equity return	4.00%	7.00%	6.00%	5.00%	7.00%
Benchmark	5.00%	7.00%	5.00%	5.00%	8.00%
Stock attribution	-1.00%	0.00%	1.00%	0.00%	-1.00%
Small Cap Equity	3.00%	6.00%	6.00%	4.00%	5.00%
Benchmark	3.00%	6.00%	8.00%	4.00%	3.00%
Stock attribution	0.00%	0.00%	-2.00%	0.00%	2.00%
Cash Benchmark	1.00%	1.50%	2.00%	1.00%	3.00%
Benchmark	1.00%	1.00%	2.00%	1.00%	2.00%
Stock attribution	0.00%	0.50%	0.00%	0.00%	1.00%
Actual alloc, benchmark perf	6.50%	6.52%	5.00%	5.15%	5.46%
Actual / actual	5.40%	6.90%	5.10%	5.15%	7.02%
Overall Stock attribution	-1.10%	0.39%	0.10%	0.00%	1.56%
Sector attribution answers					
Sector attribution	Q1	Q2		Q3	Q4
Actual alloc, benchmark perf	6.50%	6.52%	5.00%	5.15%	5.46%
Benchmark / benchmark	7.50%	6.55%	6.30%	5.15%	5.45%
Sector attribution	-1.00%	-0.03%	-1.30%	0.00%	0.01%

Alternative approach

Benchmark alloc, actual perf	6.20%	7.08%	6.30%	5.15%	7.00%
Actual / actual	5.40%	6.90%	5.10%	5.15%	7.02%
Overall Stock attribution	-0.80%	-0.17%	-1.20%	0.00%	0.02%
Sector attribution answers					
Sector attribution					
Benchmark alloc, actual perf	6.20%	7.08%	6.30%	5.15%	7.00%
Benchmark / benchmark	7.50%	6.55%	6.30%	5.15%	5.45%
Sector attribution	-1.30%	0.52%	0.00%	0.00%	1.55%

(iv)

- Transition managers have performance benchmark, so assets would have been managed to the target asset allocation which would have improved performance
- Transition manager could have used derivatives to manage against target benchmark whilst underlying securities are bought/sold
- Transition manager has skills in trading securities which might be beneficial compared with the investment manager trading the portfolio

END OF EXAMINERS' REPORT