INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2012 examinations

Subject ST5 – Finance and Investment Specialist Technical A

Introduction

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 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. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

D C Bowie
Chairman of the Board of Examiners

December 2012

General comments

Investment is a 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.

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. Candidates are reminded to avoid being too narrow in their responses to questions, but ensure that responses remain relevant and do not labour minor points. Candidates will not be explicitly penalised for this last activity, but it gives an impression of a lack of understanding and, more importantly, wastes limited time. The examiners have used their discretion as to whether or not to recognise valid points for one part of a question made in another. Likewise the examiners share and agree alternative possible solutions to questions alongside the approach outlined below.

Investment is a fast evolving subject driven by the greater volatility and globalisation/ integration of markets and economies alongside the challenges of delivering an acceptable return for a long term strategy in the context of a focus and political/regulatory backdrop that is increasingly short term. 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 thereof) 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) and 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 so that 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 made assessment difficult and they may have lost marks. Likewise "text speak" abbreviations will not be accepted.

Specific comments on September 2012 paper

This paper resulted in a relatively high pass rate. It was of a comparable standard to previous exams and so the examiners were pleased to note candidates were generally better prepared, providing better content in quality and not just quantity. The examiners are hopeful that this trend will continue.

Candidates typically answered Question 5 much better than the others (albeit still foregoing a third of marks available), with Questions 1 and 6 attracting the worst responses, considerably so, with average scores of around a third of the available marks. Question 1 was predominantly bookwork knowledge so the scores are disappointing. Question 6 focuses on Liability Driven Investing, one of the most topical issues facing many institutional investors today and so candidates might reasonably have been expected to be aware of the key issues. Candidates generally scored very well on the risk and management aspects of Question 5 and 2.

Questions 4 and 7 focussed on the practical aspects of investment as distinct from theory, right down to stock level and candidates generally gave a good account of the detailed considerations required. 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 – candidates who wish to progress to SA6 will need to improve their understanding of, and approach to, such questions.

1 *Asset / liability mismatch reserving* is an example of the use of modelling in actuarial work. The emerging asset and liability position is projected under a range of possible conditions (economic, environmental, etc.) in order to establish the extent to which assets and liabilities are mismatched. Appropriate supplementary reserves can then be set up to cover the possible levels of shortfall identified.

The modelling can, as usual, be carried out using either deterministic or stochastic methodologies. In a deterministic framework, it is up to the modeller to decide the nature and extent of the scenarios to be tested for the purpose of setting the reserves. At its simplest, the investigation may be restricted to the current portfolio of assets and liabilities only, and consider the impact of an immediate change in conditions, rather than involve projections of the emerging state of the fund. Such an approach is often referred to as *resilience testing*. However, with modern computer modelling power readily available, more dynamic approaches are typically adopted.

These would include the use of stochastic techniques, where multiple projections would be made in order to generate many possible future scenarios. Most often, the stochastic element of the projections would apply to the asset portfolio and investment returns, in order to assess exposure to systematic risk. Given that a finite number of projections must be performed, assessment of the results is often carried out in the form of *ruin probability*, that is, the outcomes are ranked in terms of a target measure (such as the shortfall of assets relative to liabilities at a specified future date). Additional reserves are then set up at a level sufficient to cover all but a specified proportion of such shortfalls.

2 (i) The simultaneous buying and selling of two economically equivalent but differentially priced portfolios so as to make a risk free profit.

(ii) We can apply the concept of arbitrage to derive the price, F_0, of a forward contract in terms of the spot price S_0. No arbitrage requires that $\boldsymbol{F_0 = S_0 e^{rT}}$ where T is the time when the forward contract matures and r is the risk-free rate of interest (for an investment maturing at time T). If this equality did not hold, arbitrage possibilities would exist. If $F_0 < S_0 e^{rT}$ the investor can sell the asset short at the current spot price S_0, invest the sale proceeds risk-free (to accumulate a sum $S_0 e^{rT}$), and, at the same time, enter into a long forward contract to buy the asset at time T at price F_0. This will generate a risk-free profit of $S_0 e^{rT} - F_0$ for no initial outlay.

Similarly, if $F_0 > S_0 e^{rT}$ unlimited profit can be made from a strategy of borrowing S_0 now to buy the asset and entering into a short forward contract to sell the asset at time T for F_0. At that time the loan and accumulated interest of $S_0 e^{rT}$ will be repayable, leaving the investor with a risk-free profit of $F_0 - S_0 e^{rT}$. The only price for the forward, F_0, that eliminates the arbitrage opportunities is $S_0 e^{rT}$.

(iii) Cannot get access to unlimited borrowing.

Arbitrage opportunities only exist for a finite time frame before other investors recognise the arbitrage and the opportunity is closed. The use of modern technology increasingly limits such arbitrage opportunities.

Frictional / transaction costs, taxes, etc. The loan interest rate may be higher than the risk free rate. Operational and credit risk may be involved.

"Basis" risk e.g. the funds borrowed are recalled before the investment period expires.

Limits on the use of short-selling.

3 (i) The field of behavioural finance looks at how a variety of mental biases and decision-making errors affect financial decisions. It relates to the psychology that underlies and drives financial decision-making behaviour.

(ii) (a) Recency effect – in some instances the final option (presentation) is preferred.

(b) Anchoring and adjustment – people base future perceptions based on past experience and expert opinion. The valuation is then amended for the scenario to fit the assumptions.

Could also mention myopic loss aversion – investors less risk averse when faced with a multiple period of gambles.

(c) Primary effect – people are more likely to choose the first option presented.

Effect of options – a greater range of options tends to discourage decision making.

(d) Status Quo bias – people like to keep things the way they are.

Regret aversion – by retaining the existing arrangements people minimise the possibility of regret.

Other behaviours cited were given credit if fully described so that their applicability to the scenario was clearly demonstrated.

4 (i) Utility – stable profits so likely to have little additional capital requirements.

Consumer goods – durables tend to have volatile profits so will have additional requirements. Non-durables have more stable profits so capital requirements will tend to be lower.

Industrials – In general volatile profits which means that industrials are likely to be hit hard by capital requirements.

Banks have volatile profits and therefore banks are likely to be hit hard by the introduction of the regulations.

If banks are required to hold extra capital then this is likely to impact how cash is invested as capital reserves tend to be held in low risk assets. As a result the bank profits are likely to be lower which will negatively impact the share price.

(ii) To lower the risk of firms becoming insolvent in times of poor economic climate.

To increase investor/consumer confidence in the market and protect consumers.

To bring them in line with regulations in other countries.

To restrict new entrants to well funded organisations.

(iii) Lower profits as capital being used to meet reserves plus the cost of monitoring. Companies may respond by charging higher prices or reducing the workforce.

Higher barriers to entry as new companies might not have enough capital to meet the requirements.

Companies that don't have enough capital might be forced into bankruptcy.

Could make companies less competitive relative to international peers.

Capital requirements will mean less cash to spend on growing business and product development. Hence lower international competitiveness.

Companies might restructure to get into a less volatile sector.

Companies might relocate to other countries.

Tax revenues might be reduced.

5 (i) Market risk – the risk relating to changes in the value of the portfolio due to movements in the market value of the assets held.

Credit risk – the risk that a counterparty to an agreement will be unable or unwilling to fulfil their obligations.

Operational risk – the risk of loss due to fraud or mismanagement within the fund management organisation itself.

Liquidity risk – the risk of not having sufficient cash to meet operational needs at all times.

Relative performance risk – the risk of underperforming comparable institutional investors.

(ii) (a) Operational risk – The trader has the opportunity to influence the price of the trades he makes and therefore the risk of fraud is increased.

Liquidity risk – the loss might have caused the bank to have liquidity problems due to loss.

Credit risk – risk that other banks might not lend to affected bank as perceived higher credit risk.

(b) Market risk – Equities can be volatile so this could result in capital losses and therefore the risk that portfolio value decreases.

Relative performance risk – if the pension scheme is holding a different asset allocation compared to other schemes then there is the risk that the allocation underperforms relative to the other schemes. This can be exaggerated by holding greater allocation to equities which can be volatile.

(c) Credit risk – restricted lending as fear that other banks in country with bankrupt bank could be affected and therefore other countries reduce credit risk exposure.

Also liquidity risk.

(d) Operational risk – the professionals have too many funds to look after and regulation is light which increases the risk of fraud and errors due to lack of oversight.

(iii) (a) Risk could be reduced by separating trading function from the operations department so that a trader cannot settle own trades, and someone in operations is responsible for settling trades. This is referred to as segregation of duties.

(b) Return asset allocation to the peer group to reduce relative performance risk.

The pension fund could look to offset increased volatility in the equity portfolio by investing remaining assets in less volatile assets (such as cash) to reduce risk of portfolio declining in value.

(c) The banks lending could insist on derivative deals being completed on a collateralised basis.

Banks could ask for Government guarantee if the banks in the country fail. This will allow lending to take place again.

(d) Limit the number of funds that a professional could represent. Increase regulation.

6 (i) Liability hedging is where the assets are chosen in such a way as to perform in the same way as the liabilities (that is to change in value by the same proportion). A specific example of this is the concept of immunisation, where assets are matched to liabilities by term in order to reduce interest rate sensitivity (to parallel movements in the yield curve). Other forms of hedging would include matching by currency and the consideration of the real or nominal nature of liabilities when determining the choice of assets. However, these examples relate only to specific characteristics of the liabilities, whereas liability hedging aims to select assets which perform *exactly* like the liabilities in all states.

The most familiar example would be for an investor to hold a portfolio of government bonds (in the appropriate currency) until maturity to meet a pre-specified stream of future fixed payments. Provided the future payments do not change in amount or timing, the coupon and principal proceeds from the bond portfolio can be used to meet the obligation to make the payments.

(ii) Difficulties with this approach arise for the following reasons:

- Such an approach requires a bond asset to be held that is equal in present value to the future payments discounted at bond yields (using the full yield curve). Therefore, only a partial hedge is only possible if asset cover is less than 100%.

- If the latter payments are payable after the principal payment of the longest available government bond then it will not be possible to hedge these payments at present (until longer maturity bonds become available, i.e. creating reinvestment risk).

- Due to "gaps" between bond maturities (particularly at longer durations), there may be a need to reinvest or disinvest bonds prior to maturity, and the hedge may therefore be imperfect.

- The use of government bonds gives risk to a (small) degree of credit risk that may not necessarily be reflected in the liability. If other bonds are used, they are more risky.

- If the tax status of the government bonds worsens, this will mean the assets are likely to be insufficient to meet the liability payments.

- Due to the above factors, there may be some mark to market risks between the asset value of the bond portfolio and the present value of the liability payments discounted using the bond yield curve. In some cases this may be a material risk factor, but in other cases this will be much smaller than uncertainties in the liability payments themselves or other portfolio risks.

(iii) Liability Driven Investment (LDI) is the terminology used to describe an investment decision where the asset allocation is determined in whole or in part to a specific set of liabilities.

LDI is not a strategy or a type of product available in the market but an approach to setting investment strategy that controls asset-liability mismatches. Thus, while liability hedging seeks to address specific features of the liability structure, LDI is a more holistic approach to developing an investment strategy.

An LDI approach would typically aim to achieve a close match of the following liability features:

- The interest rate sensitivity (duration) of the liabilities. Investments that are used to match the duration of liabilities include fixed rate bonds and interest rate swaps.

- The inflation-linkage of the liabilities. Investments used to match the inflation exposure of liabilities include inflation linked bonds and inflation swaps.

The shape of the liabilities. The shape of the liabilities will depend on when the cashflows are expected to be paid. Although it is possible to construct a bond portfolio where bond payments match the projected liability payments for a pension fund it is often more difficult to match longer duration payments (40–50 years) due to the limited issuance or non-availability of bonds. This presents particular challenges for long-dated liabilities, especially inflation linked liabilities. In order to purchase assets that match the shape of cashflows at longer durations, investors rely on using swaps to hedge both interest rate and inflation risks.

However, non-investment risks such as longevity tend to remain, although products are being developed to manage non-investment risks and are gaining in popularity.

Examples relating to asset classes other than bonds were given equivalent credit.

7 (i) (a) Active investment managers apply various types of judgement to the selection of portfolios with the objective of outperforming a benchmark. Active management offers the prospect of large returns (in excess of fees paid) and the limitation of "peer group" risk. However, successful selection of active investment managers is hard to achieve and timing the changes to the line-up of active managers is also very difficult.

(b) Passive investment managers are, typically, index-trackers. They manage assets without taking active investment decisions. Instead, their objective is to track closely the performance of a specified index. This offers the advantages of lower cost and volatility, but with the loss of upside potential and the implicit restriction to markets and asset classes where a suitable benchmark exists.

(c) An increasingly popular fund management structure is to manage the majority of the fund (the "core" portfolio) on a passive, low-cost basis. Specialist satellite managers are then employed to provide increased performance (in excess of fees paid) in respect of the balance of the fund. This may extend to employing a number of competing managers in respect of the specialist asset classes, if the size of the overall fund warrants this. Increasingly, the satellite managers will include hedge fund and private equity specialists.

(ii) The trustees have to decide how much return will be derived from beta (exposure to systematic risk) and how much from alpha (asset selection to exploit market inefficiencies). For the alpha allocation (manager outperformance) the trustees need to decide which is the most efficient way to generate the alpha.

The alpha can be generated from either the emerging markets portfolio or the US equities portfolio. US large cap is a highly efficient market and therefore difficult to generate alpha. Emerging markets is less efficient and should be easier to generate alpha. Based on the choices recommend to invest US equities on passive basis.

(iii) To reduce the risk of underperforming the benchmark by applying a core and satellite approach to the emerging market portfolio.

Has concerns that Emergaine are not the most suitable manager and therefore, wants to decrease allocation.

Trustee wants to spend alpha budget on another bit of the portfolio rather than the emerging markets.

To cut costs.

(iv) Gross of Fees

Manager	Value 1	Return 1	Value 2	Return 2	Value 3	Return 3	Value 4	Total Return
Emergaine Capital Markets	10000000	33%	13300000	18%	15694000	–7%	14595420	**46.0%**
Commertoze	10000000	14%	11400000	9%	12426000	15%	14289900	**42.9%**
Benchmark	10000000	14%	11400000	9%	12426000	13%	14041380	**40.4%**

Net of Fees

Manager	Value 1	Return 1	Value 2(net)	Return 2	Value 3	Value 3 (net)	Return 3	Value 4	Value 4 (net)	Total Return (net)
Emergaine Capital Markets	10000000	33%	**13010250**	18%	15352095	**15119862**	–7%	14061471	**13956010**	39.6%
Commertoze	10000000	14%	**11383950**	9%	12408506	**12390661**	15%	14249260	**14229280**	42.3%
Benchmark	10000000	14%	11400000	9%	12426000		13%	14041380		40.4%

Note:

Candidates may choose to apply the returns obtained to the *year-end* fund values in calculating the performance fee for Emergaine. Credit should be given for this alternative approach – the appropriate figures are:

	Value 1	Return 1	Value 2 (net)	Return 2	Value 3	Value 3 (net)	Return 4	Value 4	Value 4 (net)	Total Return (net)
Emergaine Capital Markets	10000000	33%	**12947550**	18%	15278109	**15026020**	–7%	13974199	**13869392**	38.7%

(v) Based on results there is very little to choose between active and passive managers on a net of fees basis. The passive manager has slightly outperformed which suggests that up to all the portfolio could be invested on a passive basis. However, past performance is no guarantee for future and active manager might offer outperformance in the future.

(vi) Negotiate lower management fees with the active manager.

Have a high watermark applied to performance fee to reduce performance fee payable.

Increase risk that manager is allowed to take.

END OF EXAMINERS' REPORT