

# **INSTITUTE AND FACULTY OF ACTUARIES**

## **EXAMINERS' REPORT**

April 2014 examinations

### **Subject SA6 – Investment Specialist Applications**

#### **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.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

D C Bowie  
Chairman of the Board of Examiners

July 2014

## **General comments on Subject SA6**

As actuaries move into wider fields, the examiners are likely to focus on the practical application of core skills in what may appear unfamiliar situations. However, better candidates should be able to identify the key principles and considerations that a solution demands. Indeed, the ability to bring these familiar principles to bear on unfamiliar situations is, primarily, what is being assessed in this subject and others at SA level.

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 recently qualified actuary or 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 parts of questions.

Whilst the examiners will accept 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.

Given the greater volatility in recent years and globalisation/integration of markets and economies, it has become more challenging to deliver an acceptable return from a long term strategy in the context of an increasingly short term focus, disclosure regime and political/regulatory backdrop. This challenge needs to be recognised as a more complex variant of the traditional risk/reward trade-off, particularly with the "return-free risk" becoming increasingly and unfortunately common. Investors generally only have assets because they have liabilities and it is the latter that will drive strategy. As investors are driven away from equities, inflation and interest rates become the greater components of risk (as measured by VaR or similar measure) and so it becomes necessary to find innovative ways to hedge these risks effectively.

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. This familiarity should include the solutions being debated by the various stakeholders. Hence questions regarding banking and derivative approaches to hedging, active and passive asset management and insurance solutions to asset and liability risk management should be considered likely scope for examination. Against a background of the credit crisis, new asset classes or ways of structuring investments will themselves generate new types of risk (such as benchmark, model, operations, liquidity, credit and counterparty) and also the need for new ways of regulation, monitoring and management. This is increasingly so for "alternative" investments where the associated illiquidity demands greater due diligence prior to investment as errors or poor judgements can rarely be easily or cheaply corrected.

Finally the examiners encourage candidates to recognise there are different types of investor and stakeholders beyond purely group/defined benefit pension funds where different risk perspectives/tolerances, taxation, time line and cost considerations will apply.

A clear trend has been the move towards solutions that balance risk and reward appropriately given the sophistication of the investor. All investors need to drive out costs given a lower nominal return environment, leading to larger investors insourcing or operating shared services or “club deals” which disenfranchise agencies and advisers. Given an overall appraisal framework of “quality, security, profitability and liquidity”, candidates need to be able to explore the trade off each opportunity represents and any new types of risk (such as reputation, operations, liquidity, credit, model and counterparty) and conflicts of interest incurred that justify new ways of regulation, monitoring (and against what benchmark) and management.

### **Comments on the April 2014 paper**

Another poorly answered paper consistent with recent diets. The pass mark was similar to the previous diet and the average mark remains much lower than the examiners feel ought to be achievable by candidates.

Whereas previous papers had looked to examine capital market or government policy detail, this paper in many areas reflected some of the very practical portfolio management issues and conflicts faced in trying to source adequate returns and the interactions between sponsors and the funds they sponsor in mutually challenging times. Even where a paper includes topics not previously examined, candidates should be able to carry out their analysis using the same fundamentals of economics, portfolio management, investor requirements, etc. that underpin more familiar issues.

Question 1 attracted the worst response with average scores of less than a third of the 50 available marks. This was disappointing as the question covered the challenges of hedging in a low interest rate environment as has persisted in most developed countries and the practical solutions presented by banks and assets managers in real client solutions.

Candidates typically answered Question 2 better than the other two, with some very good answers indeed. Given that this question covered a unusual type of investment, the examiners were encouraged that candidates demonstrated the thinking highlighted above. Consequently the poorer performances on what should have been more familiar ground were out of character.

Question 3 was similarly poor – although a low interest rate/low inflation environment may have persisted for much of the candidates' careers, this is not the historic norm and fears of mean reversion are often uppermost in central banks and governments' thought, tempered by increased globalisation, digitalisation and changing market dynamics.

Those candidates that were unsuccessful will find their solutions lacked sufficient (and often the most basic) detail or application of knowledge and scored lower accordingly. Whilst some candidates are too narrow in their responses, a greater number 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 during the marking process.

- 1** (i) A profile of known or estimated future payments can be constructed for the liabilities.

A gilt portfolio can be constructed that generates coupon and principal payments that can be used to meet the obligation to make the payments.

Due to the limited number of gilt issues, it may not be possible to construct a gilt portfolio that allows for precise netting off of asset proceeds against liability payments. However a gilt-based hedge can be constructed that satisfies the liabilities' duration and achieves a broad cashflow match across the curve, assessed using maturity buckets or key rate duration bucketing.

A repo is an agreement whereby one party sells stock to another with a simultaneous agreement to repurchase it at a later date at a pre-agreed price.

By using gilt repo, it would be possible for the scheme to hedge a higher proportion of its liabilities than otherwise, by employing leverage. Gilt repo enables some of the gilt purchases to be financed by placing existing gilts on repo to generate cash for the purchases.

As repo transactions are short dated, the cash financing will need to be rolled over using new repo transactions at expiry, but ultimately the cash financing will need to be repaid.

It is desirable to use a number of counterparties and a range of roll dates and maturities to reduce market impact at the time of a roll.

A pool of available collateral (e.g. gilts and cash) will need to be maintained to cover haircuts and provide available collateral to cover adverse mark to market movements.

- (ii) Repo financing is usually profitable for banks, when provided at a market rate.

This reflects its very low risk nature as funds are lent on a secured basis, which results in low capital consumption.

However, repo financing is balance sheet intensive for banks. It is also short term in nature, with most of the repo book having maturity below 90 days.

Banks are under pressure from regulators to manage both their capital and the size of their balance sheet.

Due to its short term nature, repo is one of the easier business lines for a bank to scale back.

This is particular concern for a pension fund making us of repo in that this withdrawal of financing is likely to occur to a number of banks following a banking crisis, reducing the fund's ability to roll over repo financing. Stronger relationships between a pension fund (or its sponsor) and its banks may be helpful in reducing this risk, as might diversification of repo counterparties.

(iii) **Hedge design**

If the latter payments are payable after the principal payment of the longest available gilt then it will not be possible to hedge these payments at present, creating reinvestment risk. It may be possible to trade Sterling interest rate swaps at longer maturities than the longest available gilt.

A partial solution may be to hedge the interest rate sensitivity using shorter duration gilts, but this leads to some degree of curve risk compared to a hedge at the correct duration.

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. With a swap based hedge this issue does not arise as swaps can be written to any maturity up to 50 years, and with some availability up beyond 50 years.

**Credit risks**

The use of gilts gives risk to a (small) degree of credit risk due to UK government exposure. Arguably this is of a lower likelihood than counterparty risks with banks under swaps, but the severity would be far greater as exposures to bank under swaps are collateralised whereas gilts are senior unsecured bonds issued by the UK government.

**Basis risk**

For an investor who measures its liabilities using the swap curve, the gilt plus repo approach will lead to basis risk between the liability benchmark and the value of the hedge assets.

**Capital requirements**

If the investor is required to reserve against UK government default risk or spread widening, then reducing the value of gilts held will reduce the capital requirement.

**Expected return**

When government bond yields are lower than swap yields, an unfunded hedge can be created with higher expected return / high yield using swaps rather than gilts. Allowance should be made for both of the following factors:

- The fixed yield (i.e. gilt yield or swap yield)
- The floating rate (i.e. repo rate or LIBOR or SONIA)

**Roll risk**

Gilt repo exposure creates roll risk, that is the risk of it not being possible to roll over repo transactions.

In this situation the investor would need to find alternative means of financing the gilt purchases (e.g. cash elsewhere in the portfolio). If no cash can be sourced, then the gilts would need to be sold and the hedge would be scaled back.

- (iv) In the context of risk management, derivatives create risk if the economic return from the derivative transaction may be different to that expected at the time of trade.

**Basis risk** is the risk of a derivative transaction not changing in price in an identical way to the liability or asset being hedged.

Sometimes basis risks are expected, but on other cases they are unexpected when asset prices diverge due to changes in market conditions (e.g. gilt-swap basis, 3m vs 6m Libor, Sonia vs Libor, CDS vs cash bonds).

**Counterparty risk** is the risk of the counterparty being unable to honour the transaction due to its own default or selecting to terminate due to a termination event or break clause being triggered.

If the derivative is collateralised then there will be no loss of current market value.

However there will be **replacement risk** (the cost of replacing the hedge) and possible **out-of-market exposure**.

Counterparty risk is a particular concern when the counterparty terminates a contract at a time when the fund particularly requires the hedge (e.g. at a time of market volatility).

Additional risk may be created due to leverage, in which case termination may occur if the fund is unable to post sufficient collateral to the counterparty to continue the derivative transaction.

- (v) (a) Current gilts will hedge  $1.0315^{10} \times 5,000,000 = 6,818,084$  of liabilities  
8,181,916 of liabilities to be hedged
- (1) Buy  $8,181,916 / 1.0315^{10} = 6,000,158$  of 10 year zero coupon gilts, and finance these on a repo basis.
- (2) Enter into a 10 year zero coupon interest rate swap with notional of  $8,181,916 / 1.0305^{10} = 6,058,639$
- (b) (1) £122,452 (=  $6,000,158 / 0.98 - 6,000,158$ ) of initial margin due to 2% haircut on gilt collateral. Variation margin paid using gilt holdings, again with 2% haircut.
- (2) Nil initial margin. Variation margin subject to 5% haircut.

$$(c) \quad (1) \quad (5,000,000 + 6,000,158) \times (1.0315)^{10} / (1.035)^9 - 6,000,158 \times (1 + 0.5\%) = 4,975,805$$

Return = -0.48% of initial net asset value.

$$(2) \quad 5,000,000 \times (1.0315)^{10} / (1.035)^9 + 6,058,639 \times ((1.0305)^{10} / (1.033)^9 - 1 - 0.55\%) = 5,019,425$$

Return = +0.39% of initial net asset value.

- (vi) The switch from 10 year gilts to swaps (and back) may not be value creating after allowing for transaction costs.

For example the cost of the above two-way switch might be in the region of 1.5–3bps  $\times$  PV01 (or 0.15–0.3% of PV). This is a meaningful proportion of the total gain from the trade (44K).

Other reasons might be:

- Weak conviction in the likelihood of there being significant gains from a switch of this type
- Concern about adverse risks
- A desire to wait until conditions are more favourable for this switch
- Limited risk budget for such transactions (e.g. already overweight swaps)
- Gilts currently out on repo
- Gilt yields higher than swap yields (i.e. negative carry)
- Negative carry leads to lower gains if trade takes longer to be successful

- 2** (i) Buying funds or shares (or debt securities or other direct investments) in “green” companies – companies that support or provide environmentally friendly products or practices.
- i. Green energy companies, companies producing energy or involved in producing goods or services leading to the production of green energy generating capacity using...
1. Solar power
  2. Wind power
  3. Geothermal
  4. ocean/hydro
  5. biofuels
- ii. Energy storage companies – e.g. fuel cells and fuel batteries
- iii. Companies in the buildings and efficiency sectors – including recycling companies

- iv. Eco-living companies – companies offering sustainable goods and services for healthy living
  - 1. Agricultural companies, producing food in more environmentally sound ways
  - 2. Companies using recycled materials
- v. Companies with strong environmentally sound policies

(ii) **Direct v indirect investment issues**

Expertise  
Diversification,  
Liquidity,  
Possible gearing,  
Given size, might be better to go direct (e.g. hiring expertise etc. or buying out a forestry investment fund)

**Investment size**

Investment size

- Country is small – Is there sufficient forestry investments available?  
How liquid is the market (would it push up prices/push down yield)?  
Relative size of national pension fund to potential size of eco fund

**General issues**

What is the expected return and expected risk from investing in forestry

Term of the investment

- Likely to be long term – a good match for the pension liabilities
  - Specifics about forestry
    - What is the typical time to maturity of the trees in the forest?
    - How frequently is income generated?
  - Liquidity / marketability
  - Nature – real in nature – timber is a real asset - should correlate with cost of living measures
  - Costs
  - Expertise
  - Tax
  - Externalities
  - Correlation with other assets
  - Existing portfolio of national pension fund
  - Statutory regulations and legislation
  - Possibility legislative changes resulting in future subsidies / transfers from carbon producers



There are potential reputational issues with the government by way of the national fund giving an implied endorsement to any one particular fund or provider without a transparent governance and procurement process

(iii) **Practical issues**

Need to consider, both quantitatively and qualitatively, scope for enhancement or conflict with existing business and the capacity to enhance, re-engineer or insource/outsource.

Key areas:

- a. organisation and people
  - structure
  - availability and depth of relevant experience and skills, actual and perceived – front office, middle office and back office
  - growth of business, recruitment and succession plans
  - consistency with overall business strategy, size of business and financial strength
  - regulatory authorisation
  - internal systems and communications
- b. investment process, philosophy and performance analytics
  - consistency with existing philosophy and process
  - research capability – data, analysis, commentary
  - portfolio construction methodology and governance structure
  - how to source returns and deal flow
  - diversification of opportunities in a small country
  - execution ability
  - attribution of returns
  - risk management
  - cashflow management – investments, redemptions, cost management
  - marketing and business development
  - regulatory structure and pricing
  - governance and oversight
  - quality control and other regulatory compliance
- c. resourcing
  - administration
  - client servicing and marketing
  - operational management
  - systems and controls
- d. valuation and verification of investments for audit purposes

**3** Issues to consider in the letter are as follows.....

Consequences of a high inflation environment for the financial markets and for the economy.

Inflating the economy – should the policies be successful – would likely lead to higher inflation and higher inflationary expectations.

The likelihood of success of the proposed policies is not guaranteed – the methods proposed may not work.

Should they be successful and inflation and inflationary expectations increase – the following consequences are likely.

Bond yields are likely to rise – as higher inflation results in a lower real yield on bonds – which is likely to lower demand, resulting in higher yields.

To combat higher inflation – the central bank may be forced to increase interest rates – if its mandate is to keep inflation low – higher interest rates are also likely to result in higher bond yields.

If inflation increases – and inflation expectations increase – but if these are from deflationary levels and expectations to moderate levels – below any level where the central bank would be necessitated into action – then the impact on bonds may be less – and it may bring them from historically low levels to more moderate levels – and closer to their long term averages – which could be considered a good thing (doctrine of the mean etc.).

Corporate bond yields may rise less than government bond yields as corporates may be able to increase nominal profitability in an inflation environment and consequently their risk relative to government bonds may fall.

Some companies will do better out of the inflationary policies than others – these companies will see their spreads relative to government bonds fall most and vice versa.

If the policies result in higher inflation – but don't impact inflation expectations as much – the yield curve is likely to flatten – so short dated bonds will under-perform and vice versa.

If the policies result in higher inflation – but also much higher inflationary expectations – the yield curve will steepen – so longer term bonds will under-perform and vice versa.

[If the policy has followed a period of QE and the bond market is at very low yields – such a policy may result in a sizeable correction to the bond markets – or may even result in a crash of the bond markets.]

Higher inflation may be good for equities in that they are a real asset – and their nominal profits may increase. Some companies will do better than others – and their share prices will outperform.

The inflationary policies may increase nominal, and/or real economic growth – which would also be beneficial to equities.

However, higher bond yields would make equities relatively less attractive as an investment.

Any necessity for the central bank to increase interest rates may damage confidence in the stock market.

Higher bond yields would also mean a higher discount factor to discount future earnings which could see share prices falling also.

Inflationary policies could see an increase in the money supply which might add to the demand for equities and other assets pushing up their prices.

Higher bond yields should curtail economic growth – hurting equities.

Historically the stock market has been volatile during periods of high inflation – it is considered that, periods of economic stability best foster economic growth rather than extremes.

Inflationary policies are likely to result in a depreciation of the national currency as they may be considered to lead to higher inflation.

This may stimulate export demand and curb import demand – aiding the economy in the short term. However, it is also likely to result in imported inflation.

Higher interest rates may however stimulate demand for the currency – offsetting this somewhat.

Overall the national currency will rise or fall depending on the overall judgment of financial markets as to whether the policies are ultimately progressive or regressive for the overall strength of the economy.

Economic growth is likely to be stimulated by the inflationary policies.

However – higher interest rates will curb economic demand, e.g. it will likely result in higher mortgage rates reducing disposable incomes.

Higher interest rates will encourage saving rather than consumption.

Capital investment may suffer due to higher cost of capital.  
Higher interest rates will likely discourage borrowing.

Implications for assets and liabilities of insurance companies and pensions funds...  
Higher bond yields is likely to lead to higher discount rates – resulting in lower values being placed on the liabilities of insurance companies and pension funds.

This impact is likely to be greater for pension funds – because their assets are typically longer term.

The impact of higher discount factors is greater at lower absolute discount rates – so the impact could be substantial.

Higher inflation is also likely to increase any liability linked liabilities – e.g. pensions linked to inflation.

The impact on assets is likely to depend on the markets view as to whether the policies pursued are progressive or regressive for the economy.

The quantity theory of money argues that inflationary policies will ultimately lead to either higher prices or higher asset prices. The extent to which the insurance companies are exposed to the higher asset prices will be of benefit to them.

Higher inflation is likely to result in instability to some extent – confidence in price stability may suffer – and in the extreme if confidence in financial markets is significantly hit the consequences could be enormously bad.

## **END OF EXAMINERS' REPORT**