

EXAMINERS' REPORT

April 2010 Examinations

Subject CA1 — Actuarial Risk Management

Paper One

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

R D Muckart
Chairman of the Board of Examiners

July 2010

General comments

This subject examines applications in practical situations of the core actuarial techniques and concepts. To perform well in this subject requires good general business awareness and the ability to use common sense in the situations posed, as much as learning the content of the core reading.

The examiners therefore look for candidates to apply answers to the specific situation that the examiners asked, having read the question carefully. Too many candidates write around the subject matter of the question in more general fashion, and gain few marks. On the other hand, detailed specialist knowledge is not required nor is very detailed development of particular points.

Good candidates demonstrate that they have used the planning time well – an attempt to get a logical flow is a big advantage in making points clearly and without repetition. This also enables candidates to use the later parts of questions to generate ideas for answers to the earlier parts. Time management is important so that candidates give answers to all questions that are roughly proportionate to the number of marks available.

The notes that follow are not to be interpreted as model solutions. Although they contain the majority of the points that the examiners were looking for, they also contain more than even the best prepared candidate could be expected to write in the time allowed in the examination room.

- 1** Model must be valid and adequately rigorous and documented. It should reflect the risk profile of the uncertain events, and allow for the relevant features of the uncertain events
Inputs should take account of special features of this project.
Workings should be easy to communicate, with results displayed clearly and communicable to the client, and outputs capable of independent verification for reasonableness.
There should be sensible joint behaviour of variables.
It should not be overly complex or expensive to run, but capable of development/refinement, with a range of implementation methods to facilitate testing/parameterisation.
- 2**
- (i) Providing benefits to the population
Providing benefits as an employer
Providing/requiring education about benefit provision
Regulate to require/encourage benefit provision
Regulate providers/funds
Provide investment vehicles for benefit provision e.g. national savings, gilts
Provide a compensation scheme
- (ii) For existing beneficiaries, review the rules/practices, for example, remove/amend any discretionary increases to benefits, or for those who retired due to ill-health check that they still meet any ill-health criterion, or confirm that pensioners are still alive to avoid fraud.
Cut future benefit for those who are still in employment, for example by reducing rates of accrual for particular benefits, or by amending features such as retirement age, or cut discretionary features such as early retirement.
Similarly cut benefits for future employees, or restrict eligibility for future employees,
Cut the net cost to the government by requiring additional contributions from employees
If possible amend any benefits accrued in the past by existing employees for example by restricting pensionable salaries in a final salary plan
Increase cost certainty by (e.g.) moving to defined contribution approach (if currently defined benefit)
Reduce the number of government employees and so reduce benefit costs pro-rata
Introduce new taxes on benefits, so reducing the net cost to the government
Administration costs could be reduced, for example by reducing the number of small pensions which will have relatively high administration costs

The question asked about reducing benefit costs for government employees, not general state benefits.

- 3 (i) To calculate the IRR will require the amount and timings of all cash flows, so will need to know (or make a reasonable estimate of) the following:
- Initial cost of installation
 - Any available grants
 - Any favourable tax treatment
 - Cost of electricity saved which will depend on climatic conditions
 - Expected inflation rate for electricity
 - Expected maintenance costs and timings, insurance, etc
 - Expected inflation for maintenance costs
 - Expected lifetime of the turbine
 - Any residual value (could assume zero residual value)...
 - or termination cost
 - Any possibility of selling any generated electricity over that needed by the farm and expected income from this.

- (ii) Can calculate the **net present value**. All income and outgo will be discounted at a suitable discount rate. This rate could be cost of raising incremental capital. A positive NPV would be considered satisfactory.

Payback period could also be used. This is the length of time before the capital expended on the project is recouped from the net revenues without discounting the cash flows. This is easy to apply and easy to understand and so can be useful for an individual without a financial background.

A variation is **discounted payback period**. This is similar to payback period but takes account of the time value of money. This should still be relatively easy to understand and is likely to be more useful for a long term project.

- (iii) Will need to consider whether this will achieve synergy or be compatible with other activities undertaken by the farm or other local farmers.

May be suitable if the farm is eco-aware. This may be as part of the business and can be used when selling produce or it could be a personal decision. There may be upside potential as this decision could lead to increased sales if used in marketing.

It will be necessary to decide if this is the best way of using what may be scarce funds and also if this is the best way of using the farmer's land? Are there any other suitable projects which may be considered? May wish to consider alternative renewable energy schemes.

If the farm is large, this could be considered on a larger scale. This will help with diversification of the business.

It will be necessary to investigate the risks involved in the project and come to a view on the best course of risk mitigation, having regard to the costs involved, e.g. can estimate maintenance costs and mitigate against any unplanned increases by using a long term maintenance contract to fix the price.

Will need to consider whether planning permission is likely to be given. Are there likely to be any objections? Have any other turbines been built locally? If so, do they differ in any way?

- 4** (i) Asset classes include:
- Cash on deposit
 - Money markets
 - Bonds
 - Corporate or government
 - Fixed interest or index-linked
 - Equity
 - Property
 - Direct: freehold or leasehold
 - Indirect: pooled or property company shares
 - Futures and options
 - Overseas investments: bonds, equity, property
 - Collective investment schemes:
 - Closed-ended: Investment trust
 - Open-ended: Unit trust, OIEC
 - With –profits
 - Gold, commodities

Other sensible assets that are not typically considered to be investment assets but may be suitable for this type of product e.g. art, vintage cars, wine etc.

- (ii) The asset classes that the individual selects should reflect:
- Age: if the investor is young, then he/she can afford to take more risk with the aim of achieving higher returns
 - Risk appetite: the assets should reflect the risk appetite of the investor
 - Tax situation: must take account of the tax treatment of each asset. It will also be necessary to consider whether any tax paid on income before receipt can be reclaimed
 - Objective of the investor: e.g. a wealthy individual who may use the IPA for any tax benefits may have a different asset mix to an investor who is using the IPA as the primary retirement savings vehicle
- (iii) The suitability of the asset mix will depend on the planned retirement date and the required form of benefit.
- Cash on deposit: the investor is close to retirement; cash provides a safe investment but returns are likely to be low
 - The money markets: individual is unlikely to have access to invest in money markets and the term is too short; can use collective investment schemes (see below)
 - Government bonds: safe investment with return greater than cash and suitable terms available; can use collective investment schemes (see below)

- Corporate bonds: less safe investment with return greater than government bonds; reflecting credit rating and hence risk; suitable terms available; can use collective investment schemes (see below)
- Fixed interest bonds: will be suitable for the investor; government or corporate depending in investor's attitude to risk; influenced by the relatively short time to retirement
- Index-linked bonds: provide protection against inflation; may be suitable if investor is concerned about inflation
- Equity: risky assets providing high potential real returns; very suitable if there is a significant time to retirement but this investor is still likely to have some equities; will depend on attitude to risk; access to equity markets is possible directly or through collective investment schemes; overseas markets allow access to high risk e.g. emerging markets
- Property: risky assets providing high potential real returns; more likely to be suitable if the investor has a significant time to retirement;
 - Access to property markets is possible directly for residential properties
 - Through collective investment schemes (to include commercial property) or property company shares
- Futures and options: difficult to invest in due to exchange requirements and access to markets; risky unless expertise; potentially included within pooled investments
- Overseas investments: similar comments to above with opportunity for diversification but there will be currency and political risks
- Collective investment schemes allow access to markets that the individual investor may not be able to access directly
 - Closed-ended: can benefit from gearing and changes to the discount to net asset value
 - Open-ended: will be less volatile but likely to have higher management charges
- Gold and commodities: influenced by different factors; can be considered a safe haven; suitability will depend on investor's view
- Other assets: may be suitable but marketability/liquidity may reduce value of retirement benefits

- 5** (i) (a) Shares can be classified by size of company, say split by large-cap, mid-cap and small cap.
Or by the index they are quoted on, if any
Or they could be classified by expected profits growth.
Or categorised by industry
- (b) Bonds could be split by term to maturity – short, medium or long term or undated.
Or by the quality of the issue. This will depend on whether they are government, public body or corporate bonds and the credit rating of the issuer.
Or by fixed-interest or index-linked bonds.
Or by coupon level

- (ii) Equity analysts will need to identify and analyse key factors affecting the profitability of a company.

They will then be able to determine whether they consider a share is undervalued or overvalued compared to its market price.

There are practical reasons for investment analysts to specialise within particular investment sectors because:

- The factors affecting one company within an industry are likely to be relevant to other companies in the same industry.
- Much of the information for companies in the same industry will come from a common source and will be presented in a similar way.
- No one analyst can expect to be an expert in all areas, so specialisation is appropriate. By specialising, an analyst can become an expert in an industry and understand it very well.
- The grouping of equities according to some common factor gives structure to the decision-making process. It assists in portfolio classification and management.

Companies within industrial groupings tend to correlate more closely with each other than with companies in other industries.

The share price movements reflect the changes that have occurred in the operating environment. These changes affect companies in individual industries in similar ways.

Factors affecting one company in a sector that are relevant to other companies in the same sector include:

- Resources: companies in the same sector will use similar resources (e.g. labour, land and raw materials), and will therefore have similar input costs.
- Markets: companies in the same sector supply to the same markets, and will therefore be similarly affected by changes in demand.
- Structure: companies in the same sector often have similar financial structures and will therefore be similarly affected by changes in interest rates.

Stronger candidates linked their answers to the fund's objectives (such as improving returns)

- (iii) Specialising by industry can mean that analysts miss out on companies which are between sectors.

Some shares may not move with their industries and may be influenced by different factors from those the analyst is focusing on. For example, a company could have a significant overseas earnings base.

- (iv) Cash will come into the fund from new investors and from dividends received and cannot be immediately invested. So cash may have increased if there has been a significant increase in either of these.

Cash may be needed for liquidity purposes and for investment. So an increase in cash may be due to an increase in expected encashments or an expected investment e.g. a rights issue.

Cash may be particularly attractive when the equity market is uncertain or expected to fall. The stability of capital values will make cash investment attractive.

This may be due to:

- generally rising interest rates which will depress equity markets
- the start of a recession if it is thought that equity markets will suffer from lower growth

Equity markets could have moved adversely and so the proportion held in cash will increase even if the amount of cash has not changed.

New regulations may require an increased level of cash to be held.

- (v) Derivatives may be used to assist in efficient portfolio management e.g. to give exposure to all assets classes, and also to reduce risk.

They may be used to protect the portfolio against a fall in asset values.

They may be used to ensure that income received is exposed to the market immediately, especially if they have temporarily large cash holdings.

They may also be used for speculative purposes, this will increase risk.

The fund may be invested entirely in derivatives.

- (vi) Passive management is the holding of assets that closely reflect those underlying a certain index or specific benchmark. The manager therefore has little freedom to choose investments and so is unlikely to deviate far from the required benchmark.

Active management involves investing in assets with the aim of outperforming a benchmark and so is generally expected to produce greater returns due to the freedom to apply judgement. However, this is likely to be offset by the extra costs involved in more regular transactions, particularly when attempting to make short term gains. It is also likely to increase the volatility of returns. There will also be the costs of the analysts employed.

Active management also carries the risk that the manager's judgement is wrong and so the returns are lower.

Passive investment is not, however, entirely risk free as the index may perform badly or there may be tracking errors.

- 6 (i) Surplus is generated by margins from the products and how assumptions differ from actual experience, such as from investment returns

For a mutual, the products are designed to return profits to policyholders, by declaring bonuses e.g. annual bonus or terminal bonus

However, mutuals like all companies have to ensure they do not distribute too much of the surplus to allow for possible future experience being adverse, hence the mutual will smooth the bonus declarations.

This means that if a policy is surrendered part of the profit may be retained in the fund which gives rise to the undistributed surplus

Also, when calculating and distributing the surplus, there may be:

- Approximations in the modelling e.g. timing
- Approximations in the assumption derivation, e.g. investment returns may not be exact, or e.g. mortality investigations may not be precise
- Margins for prudence may be included in the assumptions to help smooth bonus declarations and allow for potential data issues
- Approximations in the policy data file e.g. grouping to allow for modelling capacity

- (ii) To calculate the provisions the data needed includes details of each of the policies i.e. a valuation file containing:

- Policyholder details:
 - sex
 - age/DOB
 - smoking/health status
- Product details:
 - product type
 - term to maturity
 - duration
 - sum assured
 - attaching bonus
 - premiums paid

Financial data will also be needed

- (iii) Data would need to be grouped to value the provisions to allow for system and model limitations

Grouping the data will reduce the time it takes for the model to calculate the results of the investigation

This will also reduce the time required for re-running the model and/or producing scenarios

This is especially relevant where stochastic modelling is required

Modern processing power is reducing the need to group data as much

- (iv) The grouped data needs to replicate the full policy data and to produce valid results

This can be tested by calculating summary statistics using the grouped data and comparing those to the ungrouped data and also checking that there is no double counting e.g. check total sum assured, number of policies etc.

The data must be summarised in homogeneous groups i.e. similar policies can be grouped together

Heterogeneity in data groups will serve to distort the results and can lead to an incorrect surplus calculation

Grouping can be done using a program to summarise the policy data using each field

If the tests do not produce satisfactory results, will need to use different grouping (application of control cycle)

- (v) The demutualised company will need capital for similar reasons as any other insurance company needs capital:
- Regulatory solvency requirements
 - Margins for future adverse experience
 - To finance new business
 - Business objectives of the company
 - Policyholder expectations e.g. future bonuses
 - Mismatching of liabilities to assets – liquidity
 - Deferral of profits, smoothing of reported results
 - Finance guarantees and options
 - Financial strength to attract policyholders/their advisors and strong ratings for debt raising if needed

In addition, the company needs capital to compete with other companies

- (vi) To determine the split, the company will need to decide on its required capital.

The benefit enhancements should not use so much of the undistributed surplus as to leave insufficient capital.

It is likely that the regulator will require the company to provide benefit enhancements to policyholders.

This needs to be allowed for in deriving the split between the cost of the benefit enhancements and the shares.

There may be precedents which may lead to certain expectations

Will need to take account of policyholder preferences e.g. relative tax positions

Additional benefit enhancements:

- Must ensure policyholders are treated fairly
- Purpose of mutual is to benefit policyholders
- Benefit enhancements will increase reserves and capital requirements
- Capital will be reduced by the benefit enhancements as well.

Shares:

- Will provide the company with working capital for future investment and expansion
- The shares will belong to the policyholders and so they benefit from the future prospects of the company
- This also gives policyholders a choice; they can sell the shares and get the cash upfront or invest and receive the benefits expected under the with profits policy

- (vii) As a mutual, the company would distribute surplus to its policyholders in the form of bonuses. The aim would be to distribute as much of the surplus as possible but allowing for uncertainty through smoothing and the use of terminal bonus

Following demutualisation, the company may be able to raise future capital from the market and so will not need to hold as much capital and so can adopt a different surplus strategy

As a plc, the company will have to distribute the surplus between shareholders and policyholders. This is a classic conflict of interest and the regulator is likely to take an interest in how this is managed

Can consider what other companies in similar situations have done

Surplus arising in this fund will be distributed to policyholders and shareholders in a defined way e.g. shareholders may get a proportion of the bonus declared within the fund

The surplus from the business may be retained within the company (with a consequent effect on the share price) or distributed as a dividend to shareholders

Stronger candidates understood the concept of a mutual organisation (without existing shareholders) and linked to the specifics in the questions:

- *in (i), why has surplus not been distributed?*
- *in (iii)/(iv) the purpose is calculating provisions*

END OF EXAMINERS' REPORT