

# INSTITUTE AND FACULTY OF ACTUARIES

## EXAMINERS' REPORT

September 2016

### Subject CA1 – Actuarial Risk Management

#### Paper Two

##### 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.

Luke Hatter  
Chair of the Board of Examiners  
December 2016

**A. General comments on the *aims of this subject and how it is marked***

1. The aim of the Actuarial Risk Management subject is that upon successful completion, the candidate should understand strategic concepts in the management of the business activities of financial institutions and programmes, including the processes for management of the various types of risk faced, and be able to analyse the issues and formulate, justify and present plausible and appropriate solutions to business problems.
2. This subject examines applications in practical situation 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 candidates who perform best learn, understand and apply the principles rather than memorising the core reading.
3. The examiners set questions that look for candidates to apply the principles specific to the situation set out in the questions, having read the question carefully. Many candidates gain few marks by writing around the subject matter of the question in a more general fashion. Detailed specialist knowledge is not required and nor is very detailed development of particular points.
4. Good candidates demonstrate that they have used the planning time well to understand the breadth of the question and to structure their answer – this 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.
5. Time management is important so that candidates give answers to all questions that are roughly proportionate to the number of marks available.
6. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Candidates approaching the subject for the first time are advised to use these points to aid their revision.
7. Candidates who give well-reasoned points, not in the marking schedule, are awarded marks for doing so.\
8. In this diet the scoring for the exam was done out of 200 and therefore the mark scheme shows a total of 200 marks available for the paper.

**B. General comments on student performance in this diet of the examination**

1. The standard of the answers to this paper were consistent with previous sessions. Better candidates planned out their answers, particularly for the longer questions and were rewarded because there was less replication in their answers and their planning ensured they thought widely enough to score well.
2. As per previous sessions the application questions were mixed in that those that were structured scored well, whereas those that didn't had problems providing sufficient depth into their answers.
3. Bookwork questions were answered well compared to the April 2016 session, with most candidates scoring well.

**C. Pass Mark**

The Pass Mark for this exam was 58%.

**Solutions**

- Q1** (a) Liquidity risk is the risk that an individual or company, does not have sufficient financial resources available to enable it to meet its financial obligations as they fall due. Liquidity pressures are the most common reason why a trading company goes into liquidation.

OR:

In the context of financial markets, liquidity risk is where a market does not have the capacity to handle (at least, without a potential adverse impact on the price) the volume of an asset to be bought or sold at the time when the deal is required. [3]

Relevant example [1]

- (b) Market risks are the risks related to changes in investment market values or other features correlated with investment markets, such as interest and inflation rates. [3]

The risk can be divided into the consequences of changes on asset values, the consequences of investment market value changes on liabilities and the consequences of a provider not matching asset and liability cashflows. [2]

Relevant example [1]

- (c) Operational risk refers to the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. The risk can be controlled or mitigated by an organisation. [3]  
Relevant example [1]
- (d) Business risk is specific to the business undertaken. [1]  
Relevant example's [2]
- [Maximum 12]

This question was answered well by most candidates. Credit was given under each part if a relevant example was given to explain the requested risk.

- Q2** (i) Need to build a model of the expected future cost of each option using option pricing techniques, [3]  
or based on equivalent annuity values. [1]  
Mortality of annuitants, or investment returns, are key assumptions. [1]  
In setting pricing assumptions, will need to allow for the scheme's valuation basis. [1]  
Understand cultural issues relating to the likelihood of the uptake of options. Use of other statistics to estimate the likelihood of uptake. [2]  
Consider anti selection risk [2]  
For example, poor health individuals all taking a higher initial pension as they will not be alive to benefit from increases. [2]  
Understand the interaction between the escalation and spouse % options. [2]  
For example, allow for possible concentration of risk say a poor health individual might choose a high spouse's pension as well as no pension increases. [2]  
Could require health information to allow the option, or categorise members and offer different factors. [2]  
Consider the impact that any hedging of the risks would have on the pricing assumptions, with appropriate example, e.g. inflation hedge via swaps/liability driven investment. Mortality hedging. Underwritten annuities for members in poor health. [2]

Perform sensitivity testing. [1]

Consider administration costs. [1]

Obtain full data, e.g. age of spouse in the case of higher dependant’s pension. [2]

A margin for prudence should be allowed in the assumptions. [1]

Consider other schemes’ factors. [1]

Regulatory restrictions may apply [1]

[Maximum 14]

(ii) Specifying the problem/Develop Solution/Monitor

Experience/Feedback/Professional implications/External environment [2]

Set out the risks of the options, how they can impact funding. [2]

Determine financial objective (e.g. cost neutrality). [1]

Show how the factors to be used can influence take up and the associated change in liabilities, consider administrative issues. [3]

Review take up rates and actual impact on liabilities. Over the longer term assess if there is an anti selection effect. [3]

Review/amend factors in the light of emerging experience. [1]

[Maximum 8]

[Total 22]

Generally mixed answers to the question.

Part (i) Better candidates explored all the issues in setting the options and used a broad approach to the answer rather than focusing on just building a model.

Part (ii) Weaker candidates struggled to put relevant points under each of the areas of the control cycle.

### Q3

| <i>Risk</i>   | <i>Mitigation</i>  |
|---|--|
| Inappropriate scale of expansion  | Clear, realistic volume target from outset<br><br>Given nature of product, likely to be higher than home kitchen volumes but much less than mass production  |
| Awareness of product and website<br><br>Loss of publicity across time e.g. initial public awareness, but unlikely to last beyond any next winner of competition | Advertising<br><br>Need to reach market fast<br><br>and be ready for early exit if public interest cannot be sustained<br><br>e.g. via maintaining profile on internet food blogs (or other reasonable example)                        |
| Lack of available funding   | Source financial backer(s)<br><br>Possible crowdfunding via internet (or other reasonable example)   |
| Inability to repay funding due to loss-making venture   | Obtain equity rather than debt based financing<br><br>Use limited company or equivalent  |
| Lack of available premises  | Rent (or, less likely initially, buy) suitable food production premises<br><br>May be able to partner with a local bakery to use their facilities e.g. out of their normal baking hours  |
| Lack of available staff   | Recruitment exercise<br><br>Possible use of staff employed by a local bakery partner   |
| Unclear costs for product   | Analyse:<br><br>ingredients costs<br>baking costs (e.g. energy/cost of baking tins)<br>allowance for overheads/premises costs<br>packaging and distribution costs<br>web design/advertising costs<br>allow for required profit margins |

| <i>Risk</i>  | <i>Mitigation</i>  |
|--|--|
| <p>Unclear demand/price point for product</p> <p>Unclear what quality of product will be expected by market</p> <p>Unclear what types of cake will be more popular than others</p> | <p>Market research</p> <p>Must be based on the product that can be produced consistently in the targeted volumes</p> <p>Monitor competitors</p>  |
| <p>Unclear infrastructure for bulk provision</p>   | <p>Costs and/or pricing need to be based on a recipe that can be produced in the targeted (bulk) volumes, rather than existing small-scale recipe</p> <p>Employ food technicians to advise on appropriate (bulk) recipes</p> |
| <p>Quality of product poor at point of dispatch</p>  | <p>Quality control procedures</p>  |
| <p>Quality of product poor at point of delivery</p>  | <p>Contract with reputable delivery companies</p> <p>Use robust food packaging</p> <p>Encourage internet reviews from customers</p>  |
| <p>Unable to produce sufficient quantities of product</p>  | <p>Accept orders only on a “subject to availability” basis</p> <p>Contract with reputable ingredient suppliers</p> <p>Insurance against loss or breakdown of cooking equipment</p>   |
| <p>Unable to deliver sufficient quantities of product within promised timescales</p>   | <p>Investigate and contract with reputable delivery companies</p> <p>diversify delivery options</p>  |
| <p>Complaints i.e. how will they be handled</p>  | <p>Set up a suitable internal system</p>   |
| <p>Possible breaches of food hygiene regulations or labelling regulations</p>  | <p>Work with specialists</p>   |
| <p>Possible “copycat” behaviour from major cake manufacturers</p>  | <p>Diversify range of cakes</p> <p>keep one step ahead – have new cakes ready to launch</p> <p>may be possible to use product licences/patents but difficult to prevent close substitutes</p>                                |

| <i>Risk</i>   | <i>Mitigation</i>                                  |
|---|--|
| Web security i.e. risk that data supplied to the retailer is not secure | Employ software firm to advise on suitable package |
| Credit Card Fraud   | Employ software firm to advise on suitable package |

(Note: 1 mark was given for each **distinct** risk (subject to a maximum of 10), with a maximum of 3 marks for each distinct mitigation for the risk specified.)

[Maximum 24]

This question was answered well by most candidates. The better answers were structured well – covering the risk and the mitigation at the same time. Stronger candidates thought widely in terms of the possible risks rather than focusing on narrow lists of risks.

- Q4** (i) Information asymmetry is the situation where at least one party to a transaction has information which the other party or parties do not have.

[Maximum 2]

- (ii) General point for any of (a) – (c):

There is a difference in expertise and/or negotiating strength between policyholder and insurer. [1]

- (a) **Impaired life annuity**

The policyholder gets a higher annuity if they have an impairment affecting their life expectancy. [1]

The prospective policyholder has more information than the insurer on their health. [1]

The policyholder will want to over disclose medical impairments or exaggerate them. [2]

Policyholder will know underwriting costs money so all information will not be fully checked. [1]

For example ex-smokers who have not disclosed they have stopped smoking to doctors claims to still smoke. [1]

Split their fund value between product providers so fund values stay below levels for enhanced underwriting. [1]

The product provider will understand the underwriting factors better than policyholder and could ask for less policyholder details so as to offer a lesser annuity. [2]

(b) **Car insurance with two named drivers**

Insurers will make assumptions based on the information about each driver to calculate the risk. This includes how much, when, where and purpose each driver drives. [2]

For example a parent may be named as owner of a car and main driver on which a son or daughter is actually the main user to get a lower premium (i.e. "fronting") [2]

Due to the information asymmetry the insurer is likely to under-price the risk. [1]

This is more of a risk if one of the drivers has access to more than one vehicle. [1]

The insurer may decline claims on technicalities or minor reasons. [1]

(c) An insurability option where an individual can increase the level of life cover without supplying medical evidence.

The information asymmetry is that the policyholder knows their state of health but the insurer does not if there is no medical underwriting. [2]

A policyholder will be more likely to exercise the option if they are in ill-health and ineligible/charged a higher premium for a new policy with full underwriting. [2]

The insurer could have small print in the contract. [1]

The higher the premium the more likely there is anti-selection as more will find policies with lower premiums with full underwriting. [2]

The anti-selection may be combined with intentionally applying for a lower sum assured with reduced underwriting and increasing the sum assured after. [2]

[Maximum 16]

(iii) In all cases, Information asymmetry can be reduced by requiring disclosure of full information that is clear and concise, from both policyholder and insurer. [2]

- Also via better education of consumers and appropriate regulations. [2]
- (a) Initial underwriting at outset by the insurer, to understand level of health impairment. [1]
- More detailed doctor's reports/medical tests for larger cases. [1]
- To avoid split fund value problems, policyholder should be required to disclose aggregate retirement fund, not just the part being annuitised with this particular insurer. Insurers could share information to prevent fraud here. [2]
- Margins in pricing basis, but conflicts with competitiveness. [1]
- (b) Require disclosure of main driver and insurer must make clear to policyholders that insurance can be invalidated if false disclosure made and may affect future ability to take out insurance [3]
- Premium could be based on higher risk driver only, but conflicts with competitiveness and could produce premium anomaly compared with single driver policy. [2]
- (c) Tight limits on when option can be exercised and maximum increase [1]
- Option should be granted only on policies accepted on normal terms [1]
- If exercised on term assurance/endowments, ensure new maturity date not beyond original [1]
- Use of option pricing techniques to set adequate option premium [1]

Initial underwriting could be based on a sum assured that includes the optional increase, although will be additional underwriting expense and may reduce marketability. [2]

[Maximum 8]

[Total 26]

Part (i) Well answered by most candidates.

Part (ii) Generally this was not answered particularly well. Better candidates focused on the issue and expanded on why it would be a problem for either the policyholder or company.

Part (iii) This was answered well compared to part (ii) with most candidates understanding what was required.

**Q5** (i) Report claim to insurance company and provide personal/policy details. [2]

Receive report, information from appropriate investigating authority, e.g. police or fire service. [1]

Initial description of claim to insurance company. [1]

Complete claim form including items claimed for and amount claimed. [2]

Explain any immediate needs (e.g. emergency accommodation). [1]

Obtain evidence of costs incurred or to be incurred, e.g. repairs, rebuilding with estimates/receipts. [2]

Co-operate with insurer's claim process and required timescales. [2]

Allow insurer (e.g. loss assessor) access, information to investigate claim. [1]

Decide whether or not to accept initial offer from the insurance company. [1]

Negotiate or take legal advice/action to improve terms of the offer. [1]

[Maximum 8]

(ii) Report/provide personal details

Clearly, the claim cannot be processed unless the insurance company is aware of it. [1]

This will allow the insurance company to set procedures in motion, e.g. assign staff, administration records, reconcile with proposals and prepare the necessary groundwork. [2]

Providing personal/policy details allows the insurer to establish identity of policyholder, and the insurer may also obtain evidence that the family have indeed been away on holiday whilst the fire occurred. [2]

Info from fire service/police

Given that this looks like a major incident, the fire service will probably have already been involved. [1]

They will be able to confirm to the insurance company that a fire has indeed arisen and extensive damage caused. [1]

Most importantly, they will be able to determine the cause of the fire. [2]

Also determine whether any neighbouring properties have been damaged (for which the insurer may also be liable). [2]

This will help the insurance company determine whether or not the family are covered under their policy, i.e. is the insurance company liable, allowing for possibilities such as:

- date of fire outside policy coverage period
- other insurances may also cover (parts of) the risk [3]

In particular, exclusions may exist if for example, the fire was due to negligence (gas left on whilst away), criminal activity (cannabis farm) or indeed due to an uninsured party (fire started next door – so their policy applies). [3]

### **Initial description**

This will enable the insurance company to get an idea of type of claim and decide on the level of claims underwriting necessary. [1]

In particular, it will drive the forms, information needed, specialist staff to assign to the case and the level of detail and costs involved. [2]

It may also help to decide whether the story looks credible or whether warning signs are given off. [1]

Given that the claim could be large, it may enable a provisional reserve to be set up i.e. estimate of claim cost and time to settlement. [1]

It may be possible to disqualify the claim or at least strongly imply it, straight away, e.g. a clear exclusion. [1]

### **Complete claim form/provide details of claim**

Clearly, in order to process the claim, the insurance company needs to know exactly how much is being claimed and what items make up the claim. Also important to understand how quickly the family will need to be paid (some immediate needs). [3]

Obtaining details of the claim also allows the eventual claim amount to be managed e.g. check family claims for adequate alternative temporary accommodation but not luxurious compared with old house. [2]

The claim form will collate all the necessary information in one place. [1]

It should enable the insurance company to obtain all the information they need to make their decision i.e. the form will cover all the questions and details required to process the claim. [2]

This will make administration a lot easier. [1]

The claimant will be required to sign a statement confirming that the information provided is truthful. This will allow the insurance company the opportunity to reduce or disqualify the claim if false statements are made [2]

At all times, it will be necessary to check for over (and indeed under) insurance, i.e. was the premium paid commensurate will the sums actually at risk. [1]

### **Evidence of costs**

The amount of the claim could be very large. The insurance will not want to accept the claim without proof. [1]

In particular, they will require independent quotes i.e. more than 1, for any large jobs needed, e.g. rebuilding. [2]

Likewise, if the house is totally destroyed, independent valuations will be needed to determine the true loss. [1]

Special attention will be paid to valuable contents claimed, for e.g. electrical goods, furniture, valuables etc. [1]

Receipts or other evidence may be required – could be tricky if lost in the fire, could use bank records, information from retailers. [2]

Large items may have been required to be declared on the proposal form or they may be excluded or may have required extra premiums – cross checking will be needed. [2]

It may be easier to obtain receipts for and control post-fire costs, e.g. temporary accommodation – again it will be necessary to check what the family are covered for. [1]

### **Co-operate with insurer's claim process/required timescales**

This allows the claim to be dealt with efficiently e.g:

- reduced complaints/compensation payouts
  - avoids interest payments on claims
  - reduces bad publicity
- [3]

### **Insurer access/Loss adjuster**

As well as relying on third parties, the insurance company will want to send in its own experts to assess losses and gain a fuller picture. This can only really be done by access to the site. [1]

The use of assessors will encourage the family to be more accurate with their claim amount. Obstruction may be seen as a reason to more closely examine the claim. [1]

It will give vital corroboration (or otherwise), i.e. are claim amounts reasonable, causes covered etc. They will have extensive experience of similar cases and so can compare and evaluate more accurately. [2]

For example, they can check to ensure that building work isn't being claimed for that had nothing to do with the fire, e.g. repair the roof at the same time and add it to the claim. [1]

Initial offer

The insurance company will make an offer to settle the claim.

Clearly if this is the amount claimed, the family will probably accept it and the claim can be finalised. [1]

If the insurance company has any doubts (or for normal commercial considerations) they may be conservative and offer less than has been claimed. That is, they will not want to pay than they should, are obliged to. [2]

In this case, they will need to set out exactly what they are offering for what insured event. They will need to explain their reasoning and why the offer may be less than the amount claimed for (especially if all or part of the claim is disqualified). [2]

### Negotiate

If the family are unhappy with the offer, there may be scope to re-assess the offer e.g. if further evidence emerges or mistakes have been made by the claims underwriters. [2]

In order to avoid paying too much, the onus will be on the family to provide adequate justification. [1]

There may be regulatory or industry bodies to whom the family could appeal, e.g. arbitration or an ombudsman. [1]

Alternatively, the family may take legal action and threaten to sue the insurance company, e.g. for breach of contract. [1]

Again, assuming that the insurance company are satisfied that their offer is fair, they will want to defend their stance. Any perceived weakness may lead to other inflated claims, e.g. seen as a soft touch. [2]

However, the insurance company will weigh up the costs of contesting a claim against the possible award made. Hence a compromise sum may be offered. [2]

[Maximum 18]

[Total 26]

|           |   |
|-----------|---|
| Part (i)  | Strong candidates managed to consider a number of areas which the policyholder would need to disclose to the insurer.   |
| Part (ii) | This part was not answered as well as (i), those candidates that had thought widely on the process, managed to answer (ii) well. The stronger candidates consider the stages an insurer would go through in assessing and paying the claim and picked up marks by using this approach. All in all the structured answers scored better. |

- Q6**
- |     |                               |     |
|-----|-------------------------------|-----|
| (i) | Legislation/regulation        | [1] |
|     | State benefits                | [1] |
|     | Tax                           | [1] |
|     | Accounting standards          | [1] |
|     | Capital adequacy and solvency | [1] |
|     | Corporate governance          | [1] |

|  |              |
|--|--------------|
| Risk management requirements   | [1]          |
| Economic conditions/exchange rates                                       | [1]          |
| Competitive advantage (or commercial requirements or Underwriting cycle) | [1]          |
| Changing cultural and social trends                                      | [1]          |
| Demographic changes  | [1]          |
| Environmental issues   | [1]          |
| Lifestyle considerations   | [1]          |
| International practice   | [1]          |
| Technological changes  | [1]          |
|  | [Maximum 10] |

(ii) **Legislation/regulation**

In some countries there may be compulsory pension provision

- making insurers more likely to offer certain types of product in that country
  - but there may be lots of smaller policies with consequently higher per policy expenses
- [3]

In some countries the insurer may be prohibited from selling pensions policies

[1]

Level of simplicity of pensions legislation will also be a factor

simpler structures will encourage insurers to offer simpler products to wider ranges of the population

- and encourage more take up by consumers as well
- [3]

Countries will vary in the level of disclosures required at point of retirement

- in particular, a requirement to inform policyholders of open market options at retirement

- will impact on annuity rates offered by the insurer/its profitability and sales [3]

Regulations may influence the type of financial product most suited to a consumer's needs when there are a number of otherwise acceptable products

- e.g. charge caps may be imposed [2]

Sales process regulations for different types of product [1]

- may influence the types of product that are brought to market [1]

- e.g. requirements for detailed explanation to consumers of complex benefit smoothing processes or derivative investment strategies may mean that they are not marketed however suitable they might be for consumers' needs [2]

- and whether direct sales are allowed or the customer must take advice [1]

There may also be variations in investment restrictions. [1]

### **State benefits**

Where the state provides pension benefits to its citizens these are often at a low level which may only be sufficient to keep individuals just out of poverty

- many individuals will want have a higher level of benefit leading to selling opportunities for the insurer
- some governments provide much higher levels of pensions to its residents so the insurer would not be targeting these areas [3]

### **Tax**

The tax treatment of benefits/premiums in the country concerned can also have an impact

- on product features and likely sales volumes
- some countries may have more favourable tax regimes, leading to greater competition [3]

### **Accounting standards**

The different accounting requirements for setting the provisions for different types of insurance contract can influence the design of contracts. And generally provide complications/added expenses. [2]

**Capital adequacy and solvency** – will have various impacts:

- on how much volumes of a particular product the insurer can afford to sell
- on how the product is designed
  - e.g. policies with fixed charges will require more capital than those with reviewable charges, e.g. guaranteed annuity periods require more capital (or other reasonable example)
  - and on how much the premiums/charges need to be increased to allow for cost of capital [4]

**Corporate governance**

- if the insurer has shareholders it may be viewed as offering less value for money than non-shareholder companies competing in the same country
  - although shareholder companies are able to raise capital more easily, and may be able to offer wider product ranges and competitive payouts (*Any one for mark.*)
  - poor corporate governance in particular countries may have led to lack of confidence in the financial system [3]

**Risk management requirements**

- the risk profile of products will also impact on capital requirements
  - will be particularly interested in the investments backing the annuity business with Market and Credit risks needing to be monitored [2]

**Economic conditions/exchange rates**

- the levels of income/wealth across countries will have an impact on products offered and volumes of sales
- also impacts from spread of income/wealth within countries
- and impacts from variations in currency exchange rates [3]

Variations in economic outlook will also impact on the investment choices that the company makes. [1]

**Competitive advantage (or commercial requirements or Underwriting cycle)**

- profitability of insurance classes tends to go in cycles, which are driven by market forces of supply and demand in a country

- if the pensions products are very profitable then it is likely new insurers may enter the market – reducing premiums and hence lead to reduced profits
- inability to make profits in either of the products could lead to loss of business, or a reduced solvency position, requiring additional capital support or other remedial action, e.g. stop selling

[4]

### **Changing cultural and social trends**

- changing cultural and social trends can have an impact on the pensions products made available
  - e.g. in some cultures there may be greater support from extended family during retirement, making pension provision less required
  - e.g. reduced amount of people smoking will affect annuities by increasing longevity (hence potential losses and/or reduced payments for new business)

[3]

### **Demographic changes**

- demographic changes to a population can have a major impact on a pensions provider [1]
- changes to longevity and/or fertility rates will impact dependency ratios and hence affordability of state-run schemes [1]
  - and therefore demand for pensions products [1]
- rising life expectancy will mean that the annuities in payment will last longer than expected [1]
  - and therefore will cause losses for this part of the business [1]
    - for new business the annuity payments could be reduced but will be dependent on the competitive position of the market [1]
- differences in the countries' awareness of financial products [1]
- differences in the countries' level of trust in financial companies [1]

### **Environmental issues**

- environmental issues will need to be considered in order to not hamper the selling of these products

- some product features might become more favourable than others
    - e.g. ethical choices within the unit-linked range of funds
- [3]

**Lifestyle considerations** need to be considered

- e.g. annuitants could take up more exercise in retirement and hence become healthier
    - this would impact the life expectancy and hence impact the annuity profits/losses
  - but declining health standards may mean more demand for impaired life annuities
- [3]

**International practice**

- the company would be looking at competitor products in its countries of operation
  - and products in other countries where it does not operate
  - to see whether to offer a similar product itself
  - often, differences in tax and legislative requirements between countries make this difficult
- [4]

**Technological changes**

- the ways in which financial products are provided for individuals has changed significantly over recent years following wider use of the internet [1]
- pensions have become simpler and products can now be researched online [1]
  - countries vary in whether products can be purchased online [1]
  - but the level of premiums/fund choices may be flexibly altered online [1]
    - and the policyholder can access regular valuations/projections online [1]
    - thus possibly encouraging greater pension savings going forward [1]

- and the product provider should be looking for new ways to exploit technological change into the future [1]
  - e.g. use of smartphones at the supermarket to allow smaller but more frequent top ups into pensions pot (or other reasonable example) [1]

[Maximum 30]

[Total 40]

|           |   |
|-----------|---|
| Part (i)  | This was answered very well with most candidates scoring full marks.  |
| Part (ii) | This was less well answered, with only the strongest candidates writing sufficient information in each section to score well. Candidates need to produce answers of sufficient depth to score well. |

**Q7** (i) *Advantages* of valuing using the ELL system compared with the spreadsheets:

**Less prone to model errors than spreadsheets (more valid/rigorous)** [2]

because:

- extensively used across industry [1]
- individual users can't amend ELL code but can amend spreadsheets [1]
- ELL code original build will be better controlled and tested [1]
- ELL code changes will be better controlled and tested [1]
- ELL will be externally audited [1]
- ELL will receive wide peer review internally [1]
- and be subject to more formal governance controls [1]
- version control will be much clearer [1]

**Less prone to data errors than spreadsheets** [2]  
**because**

- the ELL data feeds will not be open to individual manipulation or error like the data feeds to a spreadsheet would be
- and so easier to be convinced of completeness of data

and therefore results should be available more quickly as less need to manipulate data. [3]

**Better documented** [2]

- less chance of key-person dependency that can arise with spreadsheets [1]

and because of all the above

**Independent verification of outputs for reasonableness (or external audit) should be easier/cheaper** [2]

**Workings of the model should be easier to appreciate and communicate** [2]

and therefore

**Less likely to have material errors in the valuation results** [2]

- so the Directors should have more confidence in being able to sign off results [1]
- complying with professional guidance should be easier and cheaper [1]
  - e.g. standards on model building or on data [1]
- regulator should have more confidence in results [1]
  - and less need to intervene or ask questions of the insurer [1]
  - and less requirement for capital add ons to be held [1]

Supervisory valuations may well require individual policy valuation; large numbers of policies may become impractical to manage using spreadsheets [2]

ELL could be quicker to complete calcs [1]

**Outputs from ELL are likely to be clearer – more standardised /consistent** [2]

- across products and valuation dates
  - and therefore results are quicker and easier to interpret and communicate/require less senior review
  - and quicker to consolidate/aggregate/disaggregate
  - changing the frequency of output, e.g. monthly rather than annual results should be easier
- [4]

**Stochastic modelling, where required, should be more accurate and quicker** [2]

- easier to cover full range of scenarios
  - easier to allow for interactions at Company level as model will be able to aggregate product lines together
- [2]

Other:

Consistency with economic capital methodology

Easier to use within Enterprise Risk Management

Automatic tie in to pricing [3]

Systematic changes can be rolled out once to all products (rather than having to change multiple spreadsheets) [1]

Given ELL is already being used for most products, more efficient to use it for all. [1]

More support should in theory be available e.g. consultancy helpdesk. [1]

May have a more user-friendly interface. [1]

*Disadvantages* of valuing using the ELL system compared with the spreadsheets:

**Higher costs** [2]

- may be ongoing license fees to pay for using the software [1]
- and the hardware necessary to run the system will entail further costs [1]
- any developments/new products will have to be coded, tested, and approved within governance strategy before any results can be obtained [1]
- Company has no control over upgrades to software issued by actuarial consultancy [1]
- May be poorly supported in reality (e.g. if consultancy helpdesk overwhelmed by demand from other clients) [1]

**Less flexible** [2]

- longer to develop and refine [1]
  - requires specialists to code [1]
  - adhoc/experimental changes to products/valuation methods – or just general “what if” scenarios are usually not possible, quickly, using ELL [1]
  - longer to get alternative/additional runs [1]
    - getting extra runs can be delayed until ELL processing time becomes available
      - or it may be necessary to go through the central team to get the additional runs
      - or due to licensing the software can be used only by restricted numbers of people
      - [3]
    - similarly, analysis of surplus may require additional adhoc/sensitivity runs, and these will be more difficult to accommodate within a tightly controlled ELL approach [1]

**Less transparent** [2]

- users of the ELL cannot see the code or data
- and therefore may be less likely to spot problems with either
- the ELL code is less likely to be readily understood, by a range of people, than spreadsheet formulae, making debugging more difficult in case of alleged errors or concerns
- systematic errors will affect multiple processes compared with spreadsheet errors which affect only supervisory valuation
- insurer may have a false sense of security about system e.g. treat as black box [5]

Dominance risk – exposed to failure of software/consultancy. [2]

[Maximum 26]

(ii) **General**

- keep a watching brief on key milestones at outset of project
- and monitor progress updates during implementation
- to ensure project is on track to implement in time for next valuation
- and check that plans are still in place to roll out the old procedures (i.e. manual data and spreadsheet) as a contingency if the implementation fails
- ensure key dependencies are being continually managed
  - particularly that the data team will provide the required feeds to the ELL team
  - and that all necessary valuations (plus a contingency margin) are able to be produced from ELL for next valuation
- consider need for peer review

[8 – one mark for each bullet point]

**Data specific**

- will want to be satisfied that data used in ELL valuation is accurate and complete [2]
- and can be reconciled to the manual data used in spreadsheet [1]
  - it may be necessary to ask for a parallel run of both these data systems at the same date [1]
  - and ideally the data will match exactly (once formatting differences have been removed) [1]
  - if possible each individual policy's data should be cross matched [1]
  - failing this, key summary statistics could be compared, e.g. number of policies, aggregate benefits, and so on [1]
  - it may be that the data sets do not reconcile [1]
  - in which case further investigations and reports should be requested to get to the bottom of which data set, if either, is accurate and complete [1]

- any differences between data sets should have their financial impact assessed and documented [1]
- so any material difference between the two valuation systems can be understood [1]

### **Model specific**

- will want to be satisfied that the calculation method is accurate on ELL [2]
- and it can be reconciled to the calculations used in the spreadsheet [1]
  - the team coding the ELL should document their formulae [1]  
and the valuation actuary should compare this with the spreadsheet [1]
    - allowing for the possibility that the ELL's calcs have been developed compared with spreadsheet
    - e.g. to allow for recent changes to valuation rules [2]
- it would be useful to spot check the valuation result for some example policies across the two approaches [1]
- will also want to review the available output formats from the ELL system to ensure they contain all the required information [1]
  - and can be downloaded successfully into other systems for further summarising or manipulation [1]
- a run integrity report should also be reviewed that shows how many policies were input to the ELL and how many policies ended up with a reserve calculated (i.e. extent of any errors must be understood) [1]
- a report should also be obtained to demonstrate that the valuation result remains unchanged for the pre-existing lines of business on the ELL [1]

### **Parallel run**

- will want to be satisfied that the valuation result can be reconciled between ELL and spreadsheet [2]
  - both systems should be run at the same date, with the same assumption set, and the same data [1]
- ideally the valuation result will be the same, but any material difference needs to be investigated, documented, understood, and resolved [1]
- stress/sensitivity tests should also be conducted [1]

- it will be necessary to get to the bottom of what is the correct data and what is the correct valuation result [1]

as well as looking at the valuation result, the valuation actuary should also ask for run time statistics to ensure the ELL can deliver results quickly enough during the real valuation. [1]

**At point of sign off**

- Final peer review/sense check [1]
- no further information is necessary if the valuation actuary is content with the above results
- but the implementation may be allowed to proceed subject to workarounds
  - in which case reports should be obtained that guarantee the necessary workarounds will be in place for the next valuation and not disturb ability to meet deadline [3]

[Maximum 16]

(iii)

- will need to act quickly
- and possibly negotiate extension to sign off deadline [2]
- first, consider materiality ... if difference is not material then no grounds to delay sign off [2]
- double check everything else is equal between ELL and spreadsheet i.e. same valuation date, same data, same assumptions [1]
- next, recall expected differences based on the reconciliations conducted in (ii) above, as these may explain away the difference [2]
- try to determine root cause of discrepancy
- spot checks on individual policies may be useful [3]
- which is higher result – spreadsheet or ELL? [1]
  - if ELL higher, concern is less as regulator will not be so concerned with over-reserving
    - although if an error is involved, and the over-reserving is subsequently removed, this might then have to be explained in an analysis of surplus [2]

- if spreadsheet higher, and time is very pressing, may have to make an end-piece late adjustment to the valuation result, replacing ELL answer with spreadsheet one
    - will also need to discuss the situation with the auditors and gain their view
    - it may be possible to leave the overall valuation result unchanged if, in aggregate, the overall reserves are high enough to meet regulations e.g. because there are sufficient margins elsewhere in the valuation
    - should obtain peer review if convinced spreadsheet is still more correct
- [4]
- should document any concerns and ensure elevated to senior management team [1]
  - if, after having conducted all the above steps, you remain convinced the overall valuation result would be materially understated: [1]
  - then consider if any solvency margin/minimum capital margins would be breached. If yes: [1]
    - may be a conflict of interest between the company (wishing to sign off) and the regulator (duty to ensure solvent) [1]
    - need to consider Actuaries' Code and any other relevant professional guidance [2]
    - may have professional duty to take things further, e.g. whistleblow to regulator [1]
    - although the valuation actuary should first take advice from the professional body [1]
  - should set aside time for fuller investigation before next valuation [1]

[Maximum 8]

[Total 50]

Part (i) The answers to this were mixed, with most candidates getting the high level advantages/disadvantages but only the stronger candidates expanding their answers to score the marks available.

Part (ii) This was poorly answered on the whole with not enough depth being given to score highly, i.e. most focused on one of the areas in the solution.

Part (iii) This part was answered better than (ii) with the stronger candidates focusing on the options available.

## **END OF EXAMINERS' REPORT**