INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2018

Subject CA1 – Actuarial Risk Management

Paper One

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
July 2018

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 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 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.

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

- The standard of the answers to Paper 1 was weaker compared to other sessions. Better candidates planned out their answers, particularly for the longer questions and were rewarded because there was less duplication in their answers and they ensured they thought widely enough to score well.
- As per previous sessions answers to the application questions were mixed in that those which were structured scored well, whereas those that weren't had problems getting sufficient depth into their answer
- It was clear that candidates giving well thought out answers had planned them better; this is a good use of reading time.
- 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.

C. Pass Mark

The Pass Mark for this exam was 59.

Solutions

Q1 (i) Liquidity risk is the risk that the individual or company, although solvent, does not have sufficient financial resources available to enable it to meet its obligations as they fall due. [2]

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. [2]

[Marks available 4, maximum 4]

(ii) The impact of liquidity risk on the investor's views of assets depends on their preferences. An investor may accept a certain amount of liquidity risk if they think the benefit of investment in a certain asset class outweighs the risk. The investor will consider a liquidity risk premium for holding on to the asset. [2]

Traded Equities

Given that these assets are traded then they are likely to pose low liquidity risk and therefore likely to be attractive if the investor needs to access the funds quickly. [4]

But although the assets are traded, they may not be traded very often if the individual equities are less well known or are unquoted, and hence pricing might be relatively volatile. This would make certain equities less attractive for the individual. The investor may need to access fund during times when market conditions are adverse. [4]

Property

This asset poses high liquidity risk as they cannot be sold quickly [2]

The speed of any sale could actually take a very long time or be costly in some areas depending on the marketability of the property [2]

The investor may be able to trade off liquidity for value/price. [2]

May be attractive to a long term investor as will expect a liquidity premium, i.e. higher return to compensate for liquidity risk [2]

Also depends on how the investor is exposed to property, it could be invested in property unit trusts but this can also be exposed to risks that the UT company puts a stop to getting money out in times of property crashes. [2]

Hedge funds

The liquidity of the fund depends on the terms and conditions of the funds and many funds reserve the right to reduce or restrict redemptions. This generally only tends to be at certain times, but this could be the times when an investor would like to get access to the fund. [4]

May be attractive to a long term investor, if they are prepared to wait for the restrictions to be removed [2]

However in normal circumstances the fund should be relatively liquid and therefore attractive to investors. They may be marketable but not at a stable price. [3]

Investing in a fund of hedge funds would improve liquidity. [1]

Collectable Cars

There generally is no liquid market for an investor to sell into. Looking for specialist auctions (or other collectors) and the investor may not get the price that they are looking for. [4]

The liquidity of any collectable car will depend on its features. [1]

Unlikely that a risk averse investor will want to invest in this area [1]

Always an option to trade the car for scrap metal parts, but again this will be for a lower price than the investor is actually looking for. [2]

Investor could again consider funds, but these probably have exactly the same issues as the underlying assets. [2]

May be attractive to an investor that understands the market or can get specialist advice in this area. [2]

[Marks available 44, maximum 16]

[Total marks available 48, maximum 20]

(i) *This was generally well answered, although some candidates wrote significantly more than required for a 2 mark question.*

(ii) *Answered reasonably well – with (a) and (b) covered well but with only the strongest candidates answering (c) and (d) in sufficient depth.*

Q2 i(i) (a) A regulator will monitor the adequacy of the provisions that a provider sets aside against future liabilities. It may prescribe the basis (assumptions and methodology) by which these amounts are calculated. The assumptions will contain margins above those that might be assumed on a best estimate/realistic basis. A provider may also be required to hold further free capital as a buffer for general adverse experience. [4]

The total of this additional capital in excess of the provisions established and the margins between the best estimate basis and the regulatory liability valuation basis is the solvency capital requirement. [2]

In some regulatory regimes, the solvency capital requirement comprises a highly prescriptive, prudent valuation basis with no or negligible additional amount. In others, the basic provisions are established on a best estimate basis, and substantial additional capital needs to be held. The security given by the regulatory regime is measured by the total of the two elements. [3]

(b) Economic capital is the amount of capital that a provider determines is appropriate to hold given its assets, its liabilities, and its business objectives. [3]

Typically it will be determined based upon the risk profile of the individual assets and liabilities in its portfolio, the correlation of the risk and the desired level of overall credit deterioration that the provider wishes to be able to withstand. [4]

[Marks available 16, maximum 10]

(ii) The regulator will probably require a company to hold more capital than they would consider necessary. It will probably ensure that the capital assumptions are stronger than the insurance company would otherwise assume and therefore the liabilities and capital will be higher under solvency basis than the economic basis. Therefore the surplus (assets less liabilities less capital requirements) will be higher under the economic basis [4]

The regulator will make assumptions relating to the average risk about companies when considering suitable requirements for solvency capital. As an example in this case the mortality assumptions may not be appropriate to the experience and expertise of the company. [4]

Also, the regulator will be unlikely to allow for the benefits of diversification between the annuity business and the term assurance business (i.e. mortality offsetting) [4]

In this case, the assets are the same but this will not always be the case if there are differences in regulation on certain asset classes, i.e. inadmissible assets [3]

[Marks available 15, maximum 6]

(iii) Advantage

- The internal model will reflect the company's specific risk or business characteristics rather than the standard model which may have inappropriate assumptions embedded into the calculations based on an average company [3]

- Indeed the internal model may allow for risks that are not covered in the standard model [1]

- In this case the assumptions regarding mortality could be penal under the standard model and the company may have better more appropriate experience which can help assess both the assumptions and the relative stresses for its capital model [3]

- Clearly if the director's hypothesis is correct then there will be a significant reduction in capital (£75m) which could be used to fund new business or pay additional dividends etc. [3]

- Also the standard model may have approximations – especially in modelling risk, which actually make comparing against competitors not that useful (and may impact share prices/valuations of the company) [2]

- The internal model could be used for other purposes e.g. check on the difference between economic and solvency capital OR indeed for pricing purposes. It can also better understand its own risks. [2]

Disadvantages

- The calculation under the standard regulatory model will be less complex and time consuming to calculate for the company compared to building an internal model [2]

- The company will need to explain in detail to the regulator why their model is valid and it is expected that the regulator will compare the results of the internal model to the standard regulatory model [1]

- All of this could be very costly to the insurance company, especially if it chooses to use stochastic models to predict the stresses for the longevity and asset assumptions. There will be significant expertise and resources needed to develop and maintain the model, which will be costly over both the short and long term [5]

- After all of the work the regulator may not agree with the £75m reduction in capital and once costs have been taken into account the benefit may be a lot lower. [2]

- It could be a potential barrier to future acquisitions by the insurance company [1]

- Using a standard model will help give the public confidence in the results [1]

[Marks available 26, maximum 8]
[Total marks available 56, maximum 24]

(i)	*Most candidates answered this well, but there were a higher than expected number of candidates that didn't score more marks given the bookwork nature of the question.*
(ii)	*This was fairly well answered with most candidates giving a good explanation of possible reasons.*
(iii)	*This was again fairly well answered but some candidates did not consider points other than a direct bookwork response – i.e. they did not tailor their response to the question being asked.*

Q3 (i) The most usual backwards risk measure adopted is the retrospective or backwards-looking tracking error — the annualised standard deviation of the difference between portfolio return and benchmark return, based on observed relative performance. [5]

The equivalent prospective measure is the forward-looking tracking error — an estimate of the standard deviation of returns (relative to the benchmark) that the portfolio might experience in the future if its current structure were to

remain unaltered. This measure is derived by quantitative modelling techniques. [5]

Value of Risk is another method used to quantify asset risk. It generalises the likelihood of underperforming by providing a statistical measure of downside risk. [3]

[Marks available 13, maximum 4]

(ii) Infrastructure investments are often broken down into components due to size and to improve marketability and attractiveness to different investors. For example, insurance companies and pensions fund wanting bond investments to match liabilities. Construction project to construction firms, power generation to electricity generator. This provides the opportunity to enhance yield. [3]

Many infra-structure investments are typically monopolies for a defined geographic area of operation. This is likely to lower correlation relative to other asset classes. [2]

Length of contracts is important, long-term, minimum usage contacts improves predictability of cash flows reducing risk premium [2]

Other risk characteristics include political risk, illiquidity risk, it is a tangible asset, and therefore has an intrinsic value, and its returns are often linked to an inflation measure. [4]

[Marks available 11, maximum 4]

(iii) Infrastructure investments can include a range of investment including property, equity and bonds. [3]

Bond components may be fixed or index linked. [2]

Examples of infrastructure investment include; buildings, roads, railways, power supplies, communication systems, schools, water utilities etc.

1 mark per example, maximum 3 [3]

All components of infrastructure investments may now be available for public or institutional investment. [2]

Changes in market values will be positively correlated to market prices of similar assets. [1]

For example:

Property component values will be correlated to institutional property investments. [1]

Equity component values will be correlated to general equity market levels. [1]

Bond component values will be correlated to risk free interest rates and credit spreads for assets of the same credit rating. [2]

Index linked bond components will be correlated to real risk free interest rates rather than nominal interest rates. [1]

However, they are often subject to regulations to control or incentivise various aspects of their operation and as such usually enjoy some form of regulated income structure. The certainty from guaranteed income streams will lead to lower discount rates applied to the income streams and higher values. The investment returns are sensitive to expectations on changes to regulations and/or taxes. [3]

Transport sectors are exposed to demand and therefore investment returns are more closely linked to GDP (*give credit for relevant examples for other sectors/inflation).* [1]

The GDP sensitivity varies, depending upon the asset specific characteristics. [1]

Supportive regulatory and policy frameworks, for example for renewable energy generally improve certainty relating to political risks. This increases stability of investment returns relative to other asset classes. [2]

Infrastructure assets and business tend to provide essential services such as water, gas etc. to society. The demand for such services is fairly inelastic (short term) and ensures relative stability during economic downturn. [2]

Increased stability of cash flows through the economic cycle lowers volatility of investment returns. [1]

Market values and investment returns depend on supply and demand, as well as investor sentiment. [3]

Market Values may be hard to obtain [1]

Increased supply for infrastructure investments pushes up expected returns. Increased demand for infrastructure investment reduces expected returns. [1]

The term of the infrastructure investment will affect investment returns related to demand to match liabilities with a similar term. Infrastructure is an illiquid investment. [3]

The phase, cost or delays of the infrastructure investment affect investment returns, for example construction work will be exposed to delivery risks and cost overruns. [2]

Infrastructure will often be exposed to refinancing. Often bond financing will

be shorter than the cash flows. Market conditions at the time of refinancing could have an impact on the cost and amount of borrowing available. [2]

Investors will want a higher yield because of the risks that it is taking on. [2]

The capital cost of the maintenance can be significant [1]

[Marks available 41, maximum 20]
[Total marks available 65, maximum 28]

(i)	*Answered well by the candidates that knew this part of the course.*
(ii)	*This was answered adequately but candidates need to consider the asset from as many different characteristics as possible to score well. There were a number of candidates that assumed this was a property asset which scored limited marks.*
(iii)	*This was answered less well with most candidates going into too much detail on a narrow range of points.*

Q4 (i) **Historic Book Value** [1]

Historic book value is the price originally paid for the asset and is often used for fixed/tangible assets in published accounts. [2]

Adjusted book value can also be used [1]

Written up or written down book value is historic book value adjusted periodically for movements in value. [1]

Market Value [1]

The market value of an asset varies constantly and can only be known with certainty at the date a transaction in the asset take place. [2]

Some assets may not have a market value or valued infrequently [1]

Even in an open market more than one figure may be quoted at any time e.g. bid/offer spread. [1]

Smoothed Market Value [1]

Where market values are available they can be smoothed to remove daily fluctuations (for example by taking some form of average over a specified period period). [3]

Fair Value [1]

In accounting terms fair value is the amount for which an asset could be exchanged or a liability settled between knowledgeable, willing parties at arm's length. [2]

This definition does not specify how such a value is calculated [1]

Discounted Cash flow [1]

This method involves discounting the expected future cash flows from an investment, in which the future cash flows, interest rates or both are treated as assumptions. [2]

Any material uncertainty in the cashflows can be allowed for by having a higher discount rate [1]

It has the advantage of being easily made consistent with the basis used to value an investor's liability. However it relies on the assessment of a suitable discount rate, which is straightforward for some assets but less so for others. [2]

Stochastic Models [1]

These are an extension to the above model in which the future cashflows, interest rates or both are treated as random variables. [1]

The result of a stochastic valuation is a distribution of values from the expected value and other statistics can be determined [2]

Arbitrage Value/Proxy Value/Equivalent Portfolio [1]

Means of obtaining a proxy market value and is calculated by replicating the investment with a combination of other investments and applying the condition that in an efficient market the values must be equal. The technique is often used in the valuation of derivatives. [3]

[Marks available 32, maximum 20]

(ii) A swap is a contract between two parties under which they agree to exchange a series of payments according to a pre-arranged formula. Under an interest rate swap, one party agrees to make payment linked to a fixed interest rate (fixed leg) and receive payments linked to the market interest rate (floating leg). The other party agrees to make payments on the floating leg and receive payments on the fixed leg. [5]

A swap can be valued by discounting the two component cashflows. [2]

At inception the value (at market rates of interest) of the swap to both parties will be zero, ignoring the market makers profit and expenses. [3]

As the market interest rates change the value of the two cashflows will alter which will lead to a positive value for one party and a negative net value to the other [3]

Consider interaction between interest rates and discount rates [1]

The relative position for the company will need to be the value that is put on the balance sheet [2]

If rates don't differ from what was expected, the value of the swap is likely to be positive for parts of its term and negative for others [2]
An alternative way of viewing a swap contract is as a series of forward agreements, If each of these forward arrangements can be valued, then so can the swap [2]

Alternatively use Cash flow matching using risk free zero coupon bonds to construct a portfolio which matches the payments out. [3]

It is unlikely that market values or smoothed market values will be available, as swap contracts tend to be bespoke contracts between two parties [2]

Need to know the timing of asset inflow and liabilities. [1]

May not be sufficient bonds available, or not at the appropriate term. Does not work for other risks such as demographic or inflation. [2]

If anticipated future interest rates become lower than expected at the inception of the swap, the value of the asset held by the insurer will decrease, but this will offset the increase in their other assets (assuming the durations match) making the impact less volatile on the liabilities side.. [5]

Any value put on the balance sheet will need to be auditable and in line with accounting rules. [1]

Can't value the swap using certain methods [2]

If interest rates change, the asset can change into a liability for the insurance company [1]

[Marks available 37, maximum 12]
[Total marks available 69, maximum 32]

(i)	*Most candidates picked up most of the marks for this part of the question. It is worth noting that no credit was given for more than 5 methods.*
(ii)	*This was generally answered reasonably well by those candidates that understood what a swap was (there was a higher than expected number of candidates that didn't*

understand the swap) but some candidates missed the easy marks for stating the obvious points.

Q5 (i) Pay as you go (includes smoothed pay as you go) [2]
Funding all benefits in advance (lump sum funding) [2]
Regular payments building up a fund value [2]
Paying an amount when the benefit event happens for example purchasing an annuity at the point of retirement (just in time, terminal) [2]
[Marks available 8, maximum 8]

(ii) The parties in the benefit schemes are:

- Members and their dependents
- Employers
- Sponsors of benefit scheme
- Trustees of benefit scheme
- Employees of employers/sponsors
- Regulators
- Shareholders

[6]

General considerations for all methods

- Tax advantages, for both employer and employee
- Benefit of any surplus generated through better than expected experience
- Regulatory requirements
- Preferential treatment of some members and dependants over others

[5]

Pay as you go

A pay as you go system defers incurring the cost of benefits promised until the point of payment. [1]

From members, dependents and regulators perspective this reduces the security of future benefits. [1]

Deferring the point cost is incurred can allow cash to be invested profitability by the employer/sponsors. It also saves on ongoing and monitoring costs. [2]

Deferring the cost can create cash flow issues when benefits have to be paid. This could reduce numbers of jobs and incomes for present employees. [2]

If the benefits payments have irregular timing this can impact beyond employees to shareholder incomes. The employer may not have the free cash flow when dividends need to be paid i.e. lower dividends are paid [3]

Where there are multiple sponsors or employers for a benefit scheme the failure of one can result in additional liability for others. [1]

The method does not give the Company a realistic estimate of the future cost of the benefit scheme. [1]

Funding all benefits in advanced

Under this funding system the cost of benefits is paid in full at the point a benefit is promised irrespective of the period before which the benefit starts to become payable. [2]

This system provides the highest security for members, dependents and regulators [1]

In multiple employer/sponsor schemes this eliminates the risk of the cost of benefits being passed to other sponsors. [1]

For an individual employer/sponsor the inability to spread or smooth the cost of financing benefits can cause cash flow issues and potentially result in company failure. [2]

The inability to spread the cost of benefits is a disadvantage also to employees, fewer jobs as company needs to put financing benefits ahead of more jobs and pay increases; increasing insolvency risk reduces the likelihood members will get future benefits. [3]

Paying an amount when the benefit event happens for example purchasing an annuity at the point of retirement

Under this funding system the cost of benefits is paid in full at the point a benefits starts becoming payable. [1]

This system provides the higher security than pay as you go but lower than the other methods for members, dependents and regulators [1]

In multiple employer/sponsor schemes there is the risk that the cost of benefits is passed to other sponsors. [1]

For an individual employer/sponsor the inability to spread or smooth the cost of financing benefits can cause cash flow issues and potentially result in company failure. [2]

The inability to spread the cost of benefits when the event happens is a disadvantage also to employees because of risk to jobs and benefits as the employer will need to have the money when the event happens. [2]

Regular payments building up a fund value

Under this funding system the cost of benefits is spread with contributions invested in a fund that together with investment return will pay the benefits.[2]

This system provides the higher security than pay as you go and funding benefits when benefits start to become payable but lower than funding in full in advance for members, dependents and regulators [2]

In multiple employer/sponsor schemes there is the risk that the cost of benefits is passed to other sponsors. However, surviving sponsors may also benefit from surplus build up in the fund. [2]

For an individual employer/sponsor the flexibility to spread cost of financing benefits will reduce cash flow issues. [1]

The ability to spread the cost of benefits is an advantage to employees, members, employer and shareholders by providing a balance between the stakeholders overtime. Improving job security, potentially higher benefits for scheme members as the employer may be willing to fund higher benefits because it has more freedom on timing of funding the benefits. [2]

If fund growth is higher than expected there is likely to be reduce future cost of benefits to the employer, however, if investment returns are lower than expected there will be increased future cost. [2]

If a deficit builds up due to lower growth the additional cost can cash flow constrain the employer, reducing returns to shareholders, reducing employment levels and the ability for the employer to invest capital in the business. [2]

[Marks available 52, maximum 20]

(iii) The important point is that the insurance company has taken on all of the benefits, in return for a premium, i.e. the company has transferred all risks/opportunities to the insurance company [2]

General considerations

- The company will have saved on admin costs
- Any experience (e.g. mortality) will be given to the insurance company
- This removes any downside risk
- There is a risk that the insurer defaults
- Ceding profit from any favourable movements
- The insurance company is providing Investment guarantees [6]

Pay as you go

Insurance Company

This is unlikely to be beneficial, because they would expect most of the premium to have been paid up front to the insurer as part of a single premium [3]

But depends if the insurance company is taking future premiums as the benefits become payable, e.g. if there are members where pension only becomes payable once they retire, then the company may have agreed to pay the lump sum for the annuity as and when the members retire [2]

Alternatively the insurance company may require more premiums to meet administration-related costs as new employees enter the scheme, i.e. the premium may only be payable as the membership changes [2]

There also may be parts to the insurance contract where the premium is reviewable and hence the additional benefits may only be available when the premium is paid and the company may want to pay for this as they go [1]

There may be a problem with the regulation on choosing this approach [1]

The insurer has no money on which to make an investment profit [1]

Company

It may be an advantage for the company because buying the insurance product, it is expected that the company will need to find some funding rather than potentially paying for it out of profit [2]

Therefore paying as required may be beneficial to the company [1]

However the company may not have the funds when the new premium may become payable (i.e. as members join) and therefore this could require funding at possibly inopportune times [2]

Funding all in advance

Insurance Company

This is likely to be the insurance company's preference [1]

It would prefer this such that it can invest the premium and potentially make good investment returns, increasing their profit [2]

Equally from an expense perspective they would only need to cover the set up cost of the new arrangement itself once but will still need to cover expenses resulting from new employees joining.

[2]

Company

This is likely to be a very similar approach to not buying the insurance product, but would expect the insurance product to be more expensive to cover the insurers profit margin and expenses [2]

However it will be difficult to know the full cost of running the scheme upfront, and by buying the insurance contract this will be less of an issue [2]

There is a risk that the insurance company defaults and the company needs to find new funds [1]

The company will not receive any share of the experience profits [1]
Will need to be very clear with the insurance company what it requires as there might not be any future funds. This would be similar to funding the whole of the benefit scheme in advance [2]

Regular Payments

Company

This potentially could be a more expensive approach for the company [2]

The ability to buy the insurance contract using regular premiums will depend on what the benefits are, but would expect the insurance company to want to have a significant premium up front to pay for the initial expenses of setting up the scheme [3]

Insurance Company

The insurance company is unlikely to allow for the expected differences in experience (compared to the pricing basis) and hence is more expensive. If the experience for the scheme is favourable then regular premiums could be adjusted to reflect this. [2]

Conversely if the experience is unfavourable then it is unlikely that the insurance contract cost will be changed and therefore this approach could be cheaper than using regular premium to fund. [2]

Again the insurance company will want to make profits and this will be allowed for in the cost, but will not be in the regular payments made by the company [2]

There may be a problem for the insurance company with the regulation on choosing this approach. [1]

Paying at Benefit Event

If an insurance contract has been purchased it will already cover the cost of when the benefit comes in (e.g. payment of retirement pension, or lump sum on death) [2]

Some benefits (like an annuity) costs will be dependent on the market conditions at the time of the benefit becoming payable and therefore buying the insurance contract at outset may be more/less expensive depending on the actual conditions at the time [3]

Other benefits (like lump sum on death) would need to be covered by the company when they occur, and this could be costly. Compared to the insurance company who will cover this. [2]

However the benefit may not become payable at all, and no company funding would be needed. [2]

[Marks available 57, maximum 14]
[Total marks available 117, maximum 42]

(i) Most candidates scored well on this part of the question
(ii) Most candidates were able to answer this question but those that scored well went into more depth in their answers.
(iii) *This was poorly answered with few candidates considering the detail required. The candidates who did structure their answer in a coherent way scored better.*

Q6 (i) The extent to which mortality might increase in the home population is unknown [1]
and further unknown is impact on insured lives mortality. [1]

On the one hand, it may turn out to have minimal impact on the office's mortality experience. [1]

On the other hand, it may turn out to have a serious impact, given that it's already serious in the foreign countries. [1]

If the company wants to reprice, it should consider:

-
- how much to increase premiums; and
- when to reprice

[3]

Even if it could be fairly certain about the mortality impact. [1]

It will be in a potentially difficult situation/have conflicting pressures. [1]

Commercial pressures

Term assurances are sold on price so any increase to premiums will need to be carefully considered, [1]
to avoid harming future sales volumes. [1]

On the other hand, if mortality does increase then it would be selling unprofitable business, [1]

as the largest seller of policies presumably it has the most to lose by raising premiums, [1]

and would not want to be the first company to raise its premiums but other companies increasing premiums would provide more scope for the company to reprice. [2]

Reputational risks in increasing the premiums as a result of this new disease[1]

Regulatory pressures

The regulator will want the company to prioritise the interests of policyholders and the public at large, i.e. make sure they are able to continue to meet claims. [2]

The regulator may quickly start putting pressure on the company to review its pricing (especially as it is the market leader) [1]

and that it has no other lines of business to diversify away the mortality risk [1]

Availability of capital

Much will depend on the availability of capital. [1]

If the company's available capital is low then the company will have to increase premiums more quickly. [1]

If capital is very low, especially allowing for possible increased mortality, company may be forced to stop selling new business. [3]

If available capital is high then the company may be able to use its existing capital to delay repricing, although this should be only a temporary measure. [2]

There may be an industry agreement that can be reached on the way forward e.g. industry as a whole decides not to sell any new business until there is greater clarity on the disease's impact

[2]

The company would need to consider what the best use of its available capital is. [1]

The company may already have enough prudence in either its liabilities or capital to cover this scenario, and may have already considered in the past how best to react. [3]

Other

Repricing might also be avoided if:

- the company can be confident that the disease could be covered by a new exclusion clause;
- or the company can be confident that initial underwriting will limit the mortality impact sufficiently
  - allowing for any increases in expenses of underwriting.

[3]

May need to adapt current model to perform any repricing [1]

[Marks available 37, maximum 12]

Note that many issues – particularly, examples of how serious the disease may turn out to be – are relevant in both (i) and (ii). They should be credited once whichever section they are mentioned in.

(ii) **Overall approach**

Data will be needed for:

- expected future claims costs, ignoring the new disease
- expected future claims costs from the new disease [2]

And (within each of the above)

- baseline mortality assumption based on recent experience
- projection of possible future changes in experience …
- … as term assurances can be long term.

[3]

The main focus of the repricing will be on cost of claims from the new disease. [1]

Cost of claims (ignoring new disease)

This may have changed since the premiums were last repriced. [1]

should be based on own-office data as will be the most relevant

i.e. assumptions used in current premium basis likely to be starting point, supplemented by recent mortality investigation results. [4]

Above data should be sufficiently credible given the company is a market leader. [2]

Data should be split into homogeneous groups e.g. by age/sex
but need to balance with achieving sufficient credibility in each grouping.
also need to allow for projection of possible future experience/trends/cycles [7]

which can be largely based on the most recent assumptions made by the company (e.g. for the current premium series) [1]

but allowing for medical improvements and possible new diseases (except the disease in question as it will be assessed separately below) [2]

Also need to consider whether certain characteristics that are asked for in the application form means that could indicate a stronger likelihood in getting the disease – this info may not be easily available but could be in the medical reports [2]

Additional cost of claims (from new disease)

Much more difficulty will occur when trying to value the future claims from the new disease [1]

- as there will be a lack of data
- a lack of homogeneity
- and it will be difficult to establish relevance.

[3]

Likely that most available data relates to recent experience but some projections may also be available. [2]

Sources of data

Overseas

The following overseas data sources can be studied:

- any national studies conducted by, or data from, the foreign government
- any studies conducted by, or data from, insurance companies (or trade/professional bodies)
- any reinsurer studies or data

[4]

Relevance

the degree of relevance to the company will be highly uncertain due to:

- selection effects of general population versus insured population
- differing underwriting standards/use of exclusion clauses
- differing target markets and methods of sale

particularly effects of different socio economic classes

- differing factors affecting the spread of the disease
    - depends on how others get infected
    - climate may be different and affect infection rate
    - similarly poorer general public health standards (e.g. less availability of clean water) may lead to wider infection abroad than in home country
    - impact of holidays/stopovers/business travel to foreign countries
    - migration from foreign to home country
    - could be people or other things e.g. insects, imported foods that contribute to infection, rather than human contact, lifestyle, hereditary
    - effectiveness of identifying at-risk people e.g. border controls (or similar state initiatives)

[9]

May be social stigma attached, resulting in issues with the accurate recording of the cause of death [1]

Or alternative reasonable examples.

- differing factors affecting the treatment of the disease
    - developing countries may have poorer access to health care
    - does home country have (affordable) drugs available that combat the disease
    - or any infrastructure to contain/treat the disease

[6]

Home data

If lucky, the home medical profession (or World Health Organization *or similar*) may have already examined the impact of mortality in home country [2]

but:

- maybe unlikely, as only just starting to be diagnosed
- likely to be population projections rather than based on insured lives
- likely to have a wide spread of possible disease severities

- unlikely to be split into the homogeneous groups needed for pricing

1 for each, 4 total, maximum 2 [2]

Or there may be past experience (or projections) of how other infectious diseases have affected mortality in the home country in the past [2]

Although again relevance may be difficult to discern especially if there is only low medical similarity between the diseases. [2]

Likely to need to develop sources rather than simply use existing ones. [1]

The best approach is likely to be for the company to sponsor a trade association or professional body (e.g. CMI in UK) to conduct investigations and projections specifically based on the impact of mortality, from the disease, on insured lives in this country. But this will take time no immediate help. [4]

As there is so much uncertainty, and lack of data, any splits into homogeneous groupings are unlikely. [2]

Instead, simple approaches may have to be adopted e.g:

- % adjustment to standard mortality
- age adjustments

[2]

[Marks available 68, maximum 28]

(iii) For all remaining assumptions:

Update in the light of revised expected future experience (since last repricing) [2]

Consider overall competitiveness of new premiums (i.e. general contingency and profit loading issues) [2]

Higher allowance somewhere for likely increased reserving/capital requirements (and maybe additional costs due to reviewing capital stress scenarios). Investors will see it as more risky, hence will demand a higher return on capital. [3]

Likely as a result of new disease:

Expenses:

- underwriting costs may increase
- any costs of determining cause of death as being due to the disease (so as to impose exclusion clause) will be new
- and may be significant
- e.g. if medical tests have to be run in a post mortem.

- Reinsurance costs may have risen, with higher reinsurer default risk
- Commission is unlikely to have changed
- Will need to potentially spread higher fixed costs over a smaller number of policies

[7]

Investment return and inflation is unlikely to be material:

- Revise if investment strategy needs altering
  - e.g. more liquidity to meet increased claims

[3]

Future business volumes and mix may change, as would withdrawal/lapse rates AWA3

[Marks available 20, maximum 8]

(iv) Solvency of existing business e.g. capital [2]

- Strength of existing reserves
- Reinsurance approach

Investment programme

- Revise liquidity

Operational – business continuity if staff levels become impacted by the disease e.g. sick pay

particularly as claims volumes may be increasing at the same time

Other – impact on company dividends or loan repayments

Data collection on death of the member

Research departments may need to be expanded

Risk Management

Claims Monitoring

Lapse rates on existing business

Exclusion clauses on Terms & Conditions

[9]

[Marks available 15, maximum 6]

[Total marks available 139, maximum 54]

(i)	*Answered reasonably well*
(ii)	*Those candidates that considered the relevance and use of any data as well as accuracy of the data scored well – i.e. ensuring there was sufficient depth to the answer given.*
(iii)	*Explanation was required rather than just listing out the other areas to score well on this question,*
(iv)	*Generally answered adequately with better candidates giving more than 1 or 2 ideas.*

END OF EXAMINERS' REPORT