

INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2017

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
December 2017

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.

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

- Better candidates planned out their answers, particularly for the longer questions and were rewarded because there was less duplication in their answers and ensured they thought widely enough to score well.
- Answers to the application questions were mixed in that those that were structured scored well, whereas those that weren't had problems getting sufficient depth into their answer.
- It was clear that the well thought out answers had better planning. 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.
- Candidates are assessed based only on their average score across both papers. In this diet candidates tended to score more highly on paper 1 than on paper 2. Performance on paper 1 was generally stronger than in previous diets.

C. Pass Mark

The pass mark for CA1 was 58.

Solutions

Q1 State Benefits [1]

The State may be cutting back on provision as part of the spending reductions. [2]

Meaning individuals need to make more provision themselves. [1]

Companies may be sponsoring such policies as government support reduces. [1]

Taxation [1]

Taxation on such products may have become favourable as government wishes to encourage private provision. That is, they are trying to reduce the burden on the state for the future – linked to reduced state revenues. [2]

Legislation/regulation [1]

Regulations e.g. on selling procedures, compliance, expenses or type of products that can be sold may have been changed leading to more policies being feasible. [2]

The government could actively promote selling these products or introduce compulsory enrolment. [1]

Regulations on state provisions may have been tightened so reducing eligibility for state subsidised care – charges higher. [2]

Regulation on minimum standards for state long-term care may have been weakened to reduce the cost. This reduced the demand for state care from individuals who want a higher standard. [2]

Insurance companies may have reduced price to increase volume following an Accounting standards change accelerating the recognition of profits [1]

Capital Adequacy and Solvency [1]

As a bid to boost business, the capital required to support these policies may have been reduced e.g. in relation to new business strain. [1]

Alternatively, the company may have received an injection of capital as investors see the potential in the market for these policies. [2]

Risk Management Requirements [1]

The main risks for the insurance company are mortality, morbidity and investment. [3]

It may be that new products (long dated bonds or mortality derivatives) have become available or markets for managing these risks are bigger and more sophisticated. [2]

Such products or innovations could have been sparked by the latent demand arising from the recovery. [1]

A new industry wide set of standardised long-term care claim eligibility tests may have been introduced to increase product comparability and predictability of being eligible to claim. Standardised, straightforward comparable products can encourage a competitive market to develop. [2]

Competitive Advantage or Commercial Requirements [1]

A recession implies that many insurance companies may have left the market due to an inability to make profits. [2]

A recovery may boost demand through the wealth effect i.e. more people with money to spend on semi-luxuries. [2]

In a recovery competition may increase with more insurance companies entering the market reducing price and increasing take-up [2]

New products (for example with flexible benefits, e-distribution product) with benefits and price more aligned with customer demand increasing take-up [1]

A significant boost in volume may have arisen because fewer providers to take up the extra demand. [1]

Social/Cultural changes [1]

It is possible to argue that recession may have caused cultural trends to change e.g. people more aware of the need for security in old age and seek to provide for it. [2]

Similarly, less cross-subsidy between generations as recession may bring home the risks inherent in this. [1]
[Max 14]

This question was reasonably well answered; most could generate plenty of answers. The stronger candidates provided breadth in their solutions and tailored their answers to the recession point

Q2 (a) The shareholder will be concerned that the risk management systems are inconsistent across all the subsidiaries. This increases the risk of unexpected reduction or volatility of profits or the group operating outside its risk appetite. [3]

The shareholder may be concerned that lack of an enterprise wide risk management system increases the group risk of failure. [1]

An ERM may result in credit rating agencies giving a higher credit rating and reducing the cost of debt. [1]

Risk analysis involves allocation of capital to support the risks retained by each business unit, this approach is likely to mean that the group is not making best use of its available capital. [2]

For example, different business units of Conglomerate Group (CG) might carry out the same activities in different locations or they may carry out different activities in the same or different locations. They may operate in different countries or in different markets. [2]

Identical risks in different business units may be allocated significantly different amounts of capital. This is likely to mean that the CG is not making the best use of its available capital. [2]

Identical risks in different business units may have different risk-adjusted cost of capital resulting in risk vs reward inefficiencies. [2]

Identical risks in different business units may be managed in significantly different ways. [1]

There could be a wide range of risks involved across the group as a whole many of which could counteract. [2]

The current approach will not control overall risk as well or reliability as it could/should. For example, harder for internal and external audit to ensure

that the risk management system of controls meets the Conglomerate Group standard. [2]

It could be argued that the staff at each business unit know their risks better and so can manage them better – but this may not be true of all units and best practices will not be followed group wide. [2]

Even so, they won't be aware of the bigger picture and so on the current approach, overall control is more difficult. [2]

The current approach makes no allowance for the benefits of diversification or pooling of risks. For example, a captive insurance company could allow the group to pool risks to provide diversification benefit and more cost effective external insurance terms. [3]

The ERM allowing for diversification will reduce capital requirements, allowing capital to be either returned to shareholders or invested to generate further profits [2]

- (b) The major shareholder's suggestion involves establishing a group wide enterprise risk framework with one set of common group wide set of standards for the acceptance and management of risk. [2]

An enterprise risk framework involves establishing a group risk management function to set the standards, to manage group wide risks and to centrally run the group wide business planning and capital allocation cycles. They will also consolidate the central reporting of risk and carry out validation that the standards are being applied. [3]

An enterprise risk framework with common standards, controls etc. will be more cost efficient to operate reducing expenses. [1]

The individual business units will retain responsibility for the identification of business unit risks and day-to-day operational of systems of control both of risks and capital. [2]

The internal audit function will also carry out reviews of the individual business unit risk management systems and process against the group standard to ensure the group operates a robust enterprise risk management framework. [3]

This will enable the results from the individual business units risk assessment model to be combined at Conglomerate Group level. [1]

This will give the CG management insight into the areas with resulting undiversified risk exposures where the risks need to be transferred or capital set against them. [2]

This approach to risk management will enable CG to take advantage of opportunities to enhance value. CG should understand their risks better and so

can use them to their advantage by taking greater (educated) risks in order to increase returns or reduce their volatility. [3]
[Max 14]

This question was generally well answered by the stronger candidates. A significant number of candidates confused an enterprise wide risk management system with a centralised risk management system.

Q3 (i)

- Regulatory returns/Statutory returns
- Investment/benchmarking investments
- Financial Control/Management Information/Accounting
- Risk Management
- Setting Provisions/Reserves
- Using Experience Statistics
- Experience Analysis/Analysis of surplus/Actual vs expected.
- Premium Rating, Product Costing, Determining Contributions
- Marketing
- Capital modelling/ORSA

[Max 6]

(ii) The main reasons for poor quality data are:

- A lack of sufficient consistent data to provide a credible result
- The data may not be detailed enough i.e. of the wrong sort
- It may contain errors or mistakes – either inherently or after processing

[4]

The best way to reduce problems would be to get better quality data in the first place. That is take steps to ensure it's the best possible i.e. suitable for purpose. E.g. through data audits, controls or root cause analysis [3]

Similarly, ensure that and systems used to process or manipulate data are working properly i.e. maintained, tested and reviewed. (improved employee training) [1]

Start from the source. [1]

Proposal forms or similar should aim to capture all the necessary data in a form that is easy to use and consistent over time. [2]

So well designed and unambiguous questions are essential. [1]

Cross-checking with other independent sources e.g. claims forms, accounts or previous similar work will help. [2]

- Validation of data supplied by 3rd parties is necessary. [1]
- Data should be checked (obvious errors could be fixed e.g. incorrect dates of birth) [1]
- It will be necessary to decide on the level of detail that will be appropriate. [1]
- As a minimum, reconciliations, checks for consistency, investigating or excluding obvious anomalies and random spot checks should be carried out. The data capture and processing procedures should optimise the cost vs benefits. [3]
- Take care when using summarised data since summarising may compromise validation and reliability. [2]
- Likewise, when grouping data, care should be taken to use homogeneous groups (reduce heterogeneity). [2]
- That is there is a trade-off between quality and quantity – grouping makes life easier and can reduce variance from ungrouped data. [1]
- It may be possible to use other (alternative) sources of data that have better quality at the expense of less direct relevance. [1]
- Likewise, there may be other ways of doing the job that involve using better data. [1]
- Making allowances implies actions to take when work has been done with poor quality data. That is when the data used is not fully appropriate. [2]
- Hence the work produced may not be fully fit for purpose (fully reliable). [1]
- Full disclosure should be made to the client in documentation [1]
- With appropriate health warnings about using the results. [1]
- Hence contingency or risks margins (loadings) may need to be included (objectively determined loadings). [1]
- The level of objectively determined loadings can take account of financial warranties provided for the data. [1]
- Some form of independent check for reasonableness (back of the envelope calculations) may help. [1]
- Could run sensitivity analysis on the data quality [1]

As may looking at others (competitors say) who have done similar work i.e. why are we out of line? [1]

Further contingency or risks margins (loadings) many be added based on subjective expert judgement [1]

[Max 16]

[Total Max 22]

Part (i) This question part was answered well.
Part (ii) The stronger candidates answered this question part well providing breadth to their answer. Only the best answers managed to get into the detail of how to minimise errors in a set of hard factual data.

Q4 (i) The likelihood of the risk occurring is small so few will suffer loss, however, the impact, both financial and non-financial of a risk event may be large for each individual member of the public. (Avoids exposure to large loss for individuals) [3]

So, by pooling the risk among a wider group, each person pays a much smaller cost. [2]

Pooling the risk among a wider group provides greater certainty of outcome/cost for each person [1]

A minimum amount of pooling of risks may be required for an insurance company to make insurance cover available. [1]

To be fully protected if the risk ends up falling on them. [1]

Individuals may not have the expertise to manage risk on their own. [1]
[Max 4]

- (ii) Individual risk events should be independent of each other. [1]
- The probability of the event should be relatively small. [1]
- Large numbers of potentially similar risks should be pooled. [1]
- So as to reduce the variance and hence achieve more certainty. [1]
- There should be an ultimate limit on the liability undertaken by the insurer. [1]
- Moral hazards should be eliminated as far as possible. [1]
- There should be sufficient existing statistical data/information to enable the insurer to estimate the extent of the risk and its likelihood of occurrence (price or underwrite the risk). [2]
- [Max 6]
- (iii) Risk pooling via traditional private insurance market sense is very unlikely to be successful. [2]
- The potential losses from incidents are potentially unlimited. [1]
- Given the scale of the plants and possible inexperience with the technology, such incidents may not be uncommon. [1]
- Such losses are likely to be beyond the financial solvency of even the biggest private insurance companies. [2]
- Even if reinsurance were used the possible default risk would be large. [1]
- Alternatively, insurance companies would charge prohibitively high premiums to the government as compensation for the high risks involved. [2]
- Private insurance companies would usually still be limited liability in practice – so government may not be able to get full losses back anyway. [1]
- But some unlimited liability vehicles may exist e.g. Lloyds of London. [2]
- Apart from the unlimited liability aspect, there would not be a large enough number of risks within the country. [1]
- Data would not be homogeneous enough/too much heterogeneity. For example, losses may arise from a unique set of events such as earthquake, weather or terrorism. [2]
- To enable sufficient credibility for a pure premium to be calculated reliably. [1]
- This could mean high contingency margins pushing premiums higher. [1]

It should be possible to obtain some limited credibility however. [1]

By using alternative approaches to pool risks in greater/more homogeneous volumes. [1]

For example, pooling across the different power plants within the country [1]

Self-insuring a national pool – in effect set aside funds to cover all potential incidents the government is exposed to or has capacity to raise funds (borrowing or taxation) post an event. [2]

By further pooling across other countries who have nuclear energy plants. [1]

Ultimately the pools may not have enough capacity for the unlimited liability. [1]

The government may have to guarantee the final layer of any insurance coverage. [1]

Potentially a government pool formed of all the nuclear operating countries would need to be used. [2]

Other associated parties e.g. contractors, builders or even larger consumers could have their related risks included in the pool in return for benefits if incidents didn't occur. [2]

[Max 12]

[Total Maximum 22]

Part (i) This question part was answered well.
Part (ii) Most candidates provided good answers to this question part.
Part (iii) This question was not answered well. The strongest candidates applied the ideal criteria to be met for insurance of risk events from part (ii) to structure their answer this question part and identified the significance of nuclear risk events generating unlimited losses.

Q5 (i) The premium may have increase due to an absolute amount of shift in distribution of premiums, a greater spread of premiums or a combination of the two. [1]

Household insurance policies will provide cover for losses or damage caused by flooding. [1]

Significant increases in flooding will mean significantly higher claims costs for the industry to cover. Both number of claims and increase in claim amount (severity of loss). [3]

Premium rates are based on current and expected future claims experience. [1]

Recent changes in expected claims experience will not have been reflected in past premiums. [1]

Hence, to the extent that climate change was not expected, premiums will change to reflect it. [1]

Also, if losses have arisen due to higher than budgeted for claims, these will need to be made up and increasing future premiums is one way of doing this. [1]

If this trend (in claims experience) is expected to continue (or if there is uncertainty about whether it will), premiums will need to rise. There may also be pressure from reinsurers subject to similar claims experience and uncertainty. [2]

Even though overall incidents of flooding have increased, such incidents will be localised. [2]

Many areas won't be exposed to flooding risk e.g. high ground in relatively "dry" areas, those with the best flood prevention or management systems. [2]

Hence premiums in these areas shouldn't change much. Whereas, at risk areas will need large increases in premiums. [2]

This will explain the widening of the range of premiums. [1]

It could be argued that all policies should have increased premiums on the basis that insurance involves some cross-subsidy. [1]

But insurance companies that don't charge on a risk basis will suffer from anti-selection if they don't charge enough for higher risks. [1]

Other factors may be at work e.g. increased building on flood plains will mean an increase in risk and hence premiums. [1]

Some insurers may be heavily subsidised by the government [1]
[Max 8]

(ii) The government will (should) be interested in the general wellbeing of the population. [1]

If many people can't afford what could be viewed as an essential expense the government would be concerned from a "duty of care" perspective. Lives

could be ruined by uninsured flood damage (unaffordable repairs for uninsured/financial hardship caused by lack of insurance). [2]

In any event, there will be purely political considerations. [1]

For example, high premiums may discourage development of housing. Such development may be a government objective. [1]

Examples of suffering caused by flooding will create public demand for something to be done. The government may need to step in and provide financial assistance. [2]

Failure of the government to act (or seen to be acting) will create bad publicity and will lead to a loss of popularity. [2]

There will be great pressure on the government to provide direct financial assistance. For example, more spending on flood defences. [2]

Hence there will be consequences in terms of government spending and possibly higher taxes/borrowing. [2]

[Max 6]

- (iii) Direct subsidy and maximum premiums will only help if insurance companies continue to provide cover in those areas potentially benefiting. [1]

Direct Subsidy

In theory, those who receive the subsidy should have to pay less for their insurance cover. [2]

However, the problem is really about those who can't afford cover. [1]

Hence the government will need to be selective in deciding on who should receive a subsidy and how much it should be. [2]

Otherwise, there will be a lot of unnecessary payments from the government. [1]

Any mechanism chosen by the government will be a minefield in terms of administration and questions of fairness and inappropriateness. [1]

Hence it may be difficult to target the correct cases efficiently. [1]

There is no guarantee that individuals will spend the money on home insurance unless paid direct to insurer. [2]

If many people choose to spend the subsidy in other ways, the basic problem will still exist. [1]

Maximum Premium

In this case, there will be more direct targeting in that only those individuals who currently pay high premiums will benefit. [1]

With those who currently pay the most benefiting the most, it would appear that the unaffordability problem is better addressed. [1]

However, unaffordability is subjective. [1]

There may be many cases where individuals have suffered large increases in their premiums but the current premium is below the maximum. [1]

These people may well find premiums unaffordable but they won't benefit from the cap. [2]

In particular, those with higher value homes will pay the highest premiums (generally speaking). [1]

The maximum premium may thus help the "rich" the most – and they may be the ones less in need of help. [1]
[Max 8]

- (iv) Direct subsidy and maximum premiums may make those in affected areas take less care to reduce or avoid losses [1]

A reduced premium to customers will increase demand and amount of business (i.e. from those where premiums were previously unaffordable) [1]

Direct Subsidy

Insurance companies will still receive the appropriate premium – so no major changes in the market should arise. [1]

However, the existence of a subsidy (especially if some of it isn't really needed) may make consumers less concerned about premium levels as they won't be paying all of it. [2]

This may mean that less care is taken when choosing cover so higher premiums may end up being paid. [1]

Likewise, there may be less consumer resistance to higher premiums enabling insurance companies to increase premium rates. [1]

Maximum Premium

In this case, the direct cost is borne by insurance companies and not, as before, by the government. [1]

Hence, the direct effect will be that insurance companies can't charge enough to cover the risks they are insuring. [2]

These potential losses will need to be made up somehow. [1]

The most obvious way would be via a general increase in all premiums for home insurance. [2]

Depending on how the cap works (e.g. fixed amount or relative to an average), this may mean higher proportionate increases for lower premium policies. [1]

Which, as above, will affect the “poor” the most i.e. compounds the unaffordability problem. [1]

The other way would be to reduce cover i.e. lower claims for the same premium. [1]

This could be done via for example: lower maximum claim amounts, higher excesses, restrictions on perils covered, more exclusions or tighter claims control measures. [2]

[Max 8]

[Total Max 30]

Part (i) This question part was mostly well answered.
Part (ii) This question part was mostly well answered.
Part (iii) & (iv) These question parts were fairly well answered. The stronger candidates identified the implications of insurance companies not offering household insurance in high risk areas if they are unable to charge an appropriate premium.

Q6 (i) The traditional explanation for the hump in male mortality rates is the boy racer syndrome i.e. testosterone. [1]

The late teenage years are when males start to drive cars and motorbikes. [2]

Due to a lack of experience and the recklessness of youth, this leads to more accidents and hence more deaths amongst males. [2]

The rise in male rates to age 25 is probably explained by increasing proportions of drivers at those ages. [1]

Thereafter, males become subject to maturity, relationships, children, jobs etc. and hence safer driving (e.g. more sensible cars) and accident rates fall. [3]

By age thirty, this impact on male mortality is much less significant and the “normal” general health, lifestyle and age factors have most influence. [1]

These factors i.e. those that cause a steady rise in mortality with age are much more influential on female mortality at ages up to thirty. [2]

Traditionally females at these younger ages are less likely to own cars (and especially motorbikes). (For example, due to cultural changes) [1]

They will tend to own more sensible cars (less powerful and safer). [1]

Females will in general be less recklessly than males. [2]

Hence lower mortality rates in general. [1]

Other factors that could be an influence on male rates include more dangerous hobbies or sports, more likely to get into "trouble" e.g. when drunk, crime (gang) activity or more susceptible to teenage angst. [2]

[Max10]

(ii) The evidence available to support a change in mortality rates is insufficient (amount of data insufficient). [1]

What exactly does anecdotal mean? It could imply a general impression created by a few high-profile events or stories. Or it could be related to experience from doctors or hospitals. (credibility of source important). [2]

No serious or wide-ranging investigation has been conducted. [1]

Even if this evidence reflects an actual change in experience, it is not detailed enough to be used as a basis for changing assumptions. [2]

A lot of information will be needed so that specific rates for specific ages can be determined. [2]

It is likely that any changes won't be uniform across all females of the same age. For example, changes could vary by location or with income. [2]

In any event, three years is probably too short a time period to base changes on. (too short a history of data) [1]

The evidence may be distorted by random or abnormal fluctuations. [2]

Hence it is unlikely that such limited information could be used as a basis for assumptions about future mortality experience. [1]

Changing assumptions is a significant exercise with significant consequences. Hence the need for accurate experience data. [2]

Assumptions used by providers will need to allow for future experience because, for example policies can be long-term (less relevant here as we are

looking at young ages) or new premium rates may be expected to remain in force for a while. [2]

Other factors such as underlying trends and medical advances need to be allowed for and in particular, whether this may not be properly reflected in the anecdotal evidence. [2]

[Max 10]

- (iii) Legislation/regulatory requirements may mean that changes to motor and term insurance risk for females has to be reflecting in premiums across males and females [2]

Motor Insurance

In general, motor insurance policies do not cover the death of the insured. [1]

Hence, in theory, higher young female mortality won't increase the number of claims under these policies. [1]

Therefore, in theory, premiums should be unaffected. [1]

However, the higher mortality rates are largely explained by more accidents whilst driving. [1]

This may imply more young females are driving more recklessly. [2]

If so, there will be more claims under their motor policies. [2]

Especially for the high claim amount liability cover. [1]

This will imply that their premiums need to rise. [1]

Also, increased bad (careless) behaviour may mean that young females are more likely to be victims of (or cause) more accidents. This could imply that premiums for all policies need to rise. [2]

Mortgage Linked Term Assurance

Higher mortality rates for young females would on the face of it imply more claims under this provider's policies and hence a need for higher premiums. [2]

However, the increase in mortality is only occurring at relatively young ages. [1]

It may well be that most of this provider's business covers older people. [1]

It would be necessary to consider at what age people start to buy property. [1]

In many developed countries, high property prices mean that young people don't buy houses. [2]

Hence, it may be that only a relatively small section of the business is affected – most rates won't need to change. [2]

Even at the younger ages, not all females will experience higher mortality. [1]

It could be argued that those who buy houses will be relatively more sensible and hence less likely to behave in a way that leads to an increase in mortality risk. [2]

Pension Scheme Benefits

Given that we are talking about women's clothes retailers, it would be reasonable to assume that, females would make up a significant proportion of their workforces. [2]

Pension schemes generally provide death in service benefits that can be high multiples of salary. [1]

Hence the change in mortality will be very relevant. [1]

It would appear that higher contributions will be necessary to cover the higher benefit outgo. [1]

Given that young females will probably be on relatively low wages, this increased cost may not be that great. [1]

Also, deaths will release the reserves being held for pension benefits which, won't now be paid. [1]

This will reduce the net cost of the higher number of deaths. [1]

However, these reserves may be quite low – not much past service and a long way to go before retirement. [2]

Much may depend on how death and pension benefits are funded. [1]

For example, death benefits are often insured. If so, more deaths won't directly affect the employers but they may have to pay higher insurance premiums in future. [2]

The impact on the scheme will depend on the age, sex and salary profile of employees. [1]

[Max 16]

[Max 36]

Q6 – Part (i) This question part was reasonably well answered.
Part (ii) This question part was fairly well answered. The stronger candidates identified the potential limitations of anecdotal mortality evidence.
Part (iii) This question part was fairly well answered. The stronger candidates provided structure and breadth to their answers.

- Q7** (i) Cover will be needed against financial losses arising on the tour or for extra costs (liabilities) incurred by the orchestra. To the extent that the risks leading to these outcomes arise or are increased due to the tour, extra insurance will be needed.

The precise cover required will depend on the risks faced by the orchestra in the particular countries. [1]

There may be compulsory insurance requirements depending on the countries included in the tour. [1]

It is likely that many of the additional needs will be explicit exclusions or restrictions under their existing arrangements e.g. employer liability, property, personal accident or death. [1]

For example, any existing cover probably won't include overseas travel risks (or any travel cover). Hence this will be needed particularly in relation to illness, medical treatment and repatriation – 150 people implies some risk and also a concentration risk (all get ill). [3]

Existing cancellation cover may be limited – domestically, the orchestra may not consider it to be a risk worth insuring (no risk, no refunds no loss) or it may only allow for a few narrow reasons – damage to venues or very bad weather. [2]

For example, any illness to players can be covered by others domestically – less easily on tour. [1]

Cancellation of concerts would have a big financial impact i.e. no revenue and it would also sully their name so affecting future income. [1]

Given the range of venues and tight schedule, this is a significant risk and could have knock – on (concentration) risk e.g. delays jeopardise more than 1 concert and you can't reschedule as you could domestically. [2]

The range of reasons for cancellations are wide – especially transport or as a result of 3rd party failures e.g. promoters or local organisers and so pecuniary loss and business interruption cover will need to be added or extended. [2]

Linked to this will be problems in relying on outsiders to deal with cash flows i.e. more parties who are less well known than for domestic arrangements and so an extension to fidelity guarantee cover may be needed. [2]

A particular problem may centre on the foreign nationals – will they have the correct visas or struggle to gain entry to some countries. This could lead to delays and cancellations. The orchestra may want to specifically include this risk in its insurance cover. [2]

Additionally, many risks that were covered by players may now be considered the responsibility of the orchestra – hence they will now need to cover them. [1]

For example, loss or damage to instruments (which can be delicate, bulky and tricky to transport and valuable) will be a major extra risk. [2]

It would seem unfair to expect players to cover these risks and so the orchestra should take on responsibility. [1]

Likewise, additional death or accident insurance (i.e. employer's liability) may be needed as the risks will be greater and possibly not covered elsewhere. [2]
[Max 10]

- (ii) The primary considerations will be the managers' assessment of the likelihood of a loss and its extent. [2]

In relation to the resources available internally to cover the cost should it arise and the premium that would be required from an insurance company. [2]

The insurance requirements will take account of the risk mitigation, for example the orchestra may be guaranteed a fixed performance fee with the promoter taking the cancellation risk. [2]

Contracts with sponsor/promote may require the orchestra to get certain insurances. [1]

The risk appetite of the orchestra will be considered [1]

As outlined in (i), there are significant risks e.g. the liability or damage to equipment but also less significant ones e.g. the odd cancellation might not be so bad given that there are 12 concerts. [2]

The managers may consider that some of these high impact risks have a relatively high chance of arising e.g. this is the first tour and so a lot of events may not have been properly planned for. [2]

Hence, they may only insure some of the risks and retain others. [1]

Three weeks is only a short time and so this may tend to minimise risks (e.g. health or accidents) and also premium required but it could also imply extra cancellation risks and loss of income a lot can happen in 3 weeks. [2]

The orchestra is unlikely to be profit maximising (probably non-profit or charity linked) and so it won't have large reserves i.e. survives on a tight budget. Hence any even small loss could be serious. [3]

It is unlikely that the managers will have the expertise to assess what is a fair premium (or cost if risks are retained) nor much to compare it with – ask other orchestras in similar situations. [2]

The orchestra will probably have existing insurance arrangements and so could negotiate a good deal assuming the continuation of these presumably profitable arrangements. [2]

For example, some sort of sponsorship deal on the tour could be attractive to an insurance company. [1]

There is also the question of whether insurance companies are willing to offer some or all of the insurance required e.g. risks linked to foreign nationals may not be insurable. [2]

Given the possible volatility (short term) and unusual nature (musical instruments), insurance companies may include large risk margins so making premiums unaffordable. [2]
[Max 12]

(iii)

An actuarial model needs to allow for all the cash flows that may arise. [1]

These will depend on the nature of the scenario being modelled. [1]

Any discretionary cash flows (benefits) should be allowed for. [1]

It also needs to allow for any commercial requirement to hold reserves. [1]

As well as supervisory requirements to demonstrate solvency. [1]

The cash flows need to allow for any interactions. [1]

Particularly where assets and liabilities are modelled together. [1]

Where the business being modelled includes options, the potential cash flows from such options and the take up rate need to be allowed for. [2]

In some cases there is a need to use stochastic models and simulation. [1]

The time period for calculating the cash flows in the projection needs to be chosen. [1]

- The more frequently the cash flows are calculated the more reliable the output from the model. [1]
- Bearing in mind the danger of spurious accuracy. [1]
- The less frequently the cash flows are calculated the faster the model can be run and results obtained. [1]
[Max 10]
- (iv) The model will need to cover:
- Revenue arising directly from the tour. [1]
- Future (indirect?) revenue arising as a consequence of the tour.
- Expenditure as a result of the tour (i.e. above normal outgoings). [1]
- As we are looking at profitability, we should also allow for any reduction in domestic revenue and expenditure because of the tour i.e. the tour may not be reflected in overall budgets and so it affects already assumed overall profitability. [2]
- The principal source of direct tour related income will be ticket receipts from the concerts. [2]
- However, it is possible that the orchestra will be paid a fixed fee with the local promoters taking the risk of poor ticket sales. [2]
- Or some combination e.g. lower fee plus share of ticket sales. [1]
- Given the number of venues, the arrangement may vary by country – more than 1 local promoter. [1]
- A fixed fee is likely to be in the orchestra's currency. [1]
- Ticket sales will probably be in local currency and so will need converting (at a cost). The exchange rate is unlikely to be known in advance. [3]
- Merchandise sales e.g. CD's, books, clothing etc. could be significant. [2]
- These are likely to be in local currency and shared with local promoters (no fixed fee). [1]
- Specific sponsorship for the tour may be received (i.e. over and above existing deals). This could be from domestic or overseas backers who could be new or existing. [2]
- The tour may receive attention in the local media and so fees could be received for interviews, articles, broadcasting concerts etc. [1]

It is possible that government or arts funding bodies (domestic or overseas) could contribute towards the costs e.g. domestic government advertising its culture. [1]

The indirect sources will be similar and it may be hard to distinguish between direct and indirect.

One way of distinguishing would be revenue during the tour and revenue after it.

The tour could lead to future tours in the same or different countries. [2]

Likewise, future merchandising sales including recording deals could be higher than they otherwise would have been without the tour. [1]

If the tour raises the orchestra's profile, more and better sponsorship deals could be negotiated. [1]

As with government related grants. [1]

There may also be some impact on domestic audiences – more interest for domestic tours and may attract bigger audiences, be able to [2]

The principal expenditure would relate to transport costs e.g. flights or road/rail journeys and accommodation. [2]

These will probably be pre-booked and be in domestic currency. [2]

However unexpected extras may be incurred if not everything is pre-paid. [2]

There will be expenditure on “living” expenses mainly food. [1]

This will be uncertain and in local currency. [2]

There may also be extra salary for players and others on the tour to cover extra workloads or family disruption/additional expenses. [1]

This will be fixed and in domestic currency. [1]

The orchestra will need to pay for the use of the venues and related costs e.g. staff and security – again probably pre-booked in local currency and fixed [2]

The orchestra will need to pay the local promoters, organisers and related middlemen. [1]

There are various ways that this could be done. In particular, via fixed fees or some form of profit share. [2]

It is possible that some of the other expenditure will be covered by the local promoters so resulting in a higher fee to them or a lower fee/share of revenue to the orchestra. [1]

Additionally, there will be the potential costs of shock events described in (i), the insurance premiums paid to protect against them, and insurance recoveries. [2]
[Max 20]

(v) The model would initially be run on a certain set of best estimate parameter values. [1]

But the output (results) from the model will be very sensitive to the parameter values used.

Hence the model will be re-run a number of times using different but feasible parameter values. [2]

The model could be re-run with a stress applied to only 1 parameter or scenarios applied to combinations of parameters. [2]

If so, correlations with other “fixed” parameters should be allowed for. [1]

In this case, the most important parameters will relate to the probabilities underlying the potential distribution of expected cash flows. Re-runs will be done by varying these probabilities. [2]

That is, how likely various levels of expenditure and revenue are. [1]

In particular, the revenue from ticket sales. [2]

Much of the revenue, direct and indirect, will be correlated. [1]

That is, a successful tour in terms of ticket sales will mean more sponsorship, more tours more CD sales higher domestic audiences and so on. [2]

However, the precise correlation may be uncertain – so that could be another parameter to vary. [1]

The expenditure is likely to be a lot less variable as a lot will be fixed and pre-paid. [1]

Though this does depend on the extent of additional insurance taken out – hence a variable here will be different levels of insurance cover. [2]

A lot of the cash flows will be in local (and possibly different e.g. if non-euro) currencies. [1]

Hence re-runs would be done allowing for currency fluctuations and any correlations e.g. some rates are linked explicitly. [2]

Note this is a 3 week tour so the choice of a discount rate isn't material – if any is used at all. Though an argument could be made that future income may need discounting at a rate that could be varied. [1]

[Max 10]

[Max 62]

Q7 – Part (i) This question part was generally well answered.
Part (ii) This question part was fairly well answered. The stronger candidates linked together risk appetite, the orchestra's financial resources, availability of insurance and cost of insurance.
Part (iii) This bookwork question part was not well answered. Most candidates listed requirements for good actuarial models and did not cover the basic features of models to project cash flows.
Part (iv) This question part was reasonably well answered. The stronger candidates identified the currency and timing of cash flows together with the sources of uncertainty.
Part (iv) This question part was fairly well answered, although answers lacked breadth.

END OF EXAMINERS' REPORT