INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2011 examinations

Subject CA1 — Actuarial Risk Management

Paper One

Introduction

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

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Chairman of the Board of Examiners

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General comments

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

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

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

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

1 (i) The key influence is the level and uncertainty of the benefits that will be paid. These benefits and the timing of contributions will present an opportunity cost for the company.

If the benefits are low and frequent with a stable total cost for a period then they could self-insure, for example a company with a large motor fleet may self-insure and pay for repairs as they arise.

If the benefits are high and/or infrequent, the cost for the period is uncertain either in timing or amount then it is usual to regularly set aside monies before the full benefit payment becomes due. This mitigates the risks of the direct payment approach where both the level and incidence of payments would otherwise be uncertain.

(ii) Providers of financial products/benefits in the market may charge premiums that differ from the expected cost.

The insurance company may have economies of scale so is able to charge lower premiums.

A different price may be charged as a result of the insurance company taking a lower contribution to expense overheads or profit.

There may only be a limited number of providers so higher premiums can be charged.

There may be many providers so lower premiums as providers compete for the business to maintain volumes or market share.

Insurance companies may offer lower priced products to attract consumers to other more profitable contracts (loss leader).

The amount of benefits may be large relative to the premium and the timing uncertain so the consumer may perceive the benefits more valuable to them than it costs the insurance company.

There may be a loss that the insurer has incurred and so it may charge a higher premium to recoup that loss.

The insurer may value benefits in a different way, for example with more or less prudence in assumptions. Use of reinsurance may also change the cost of providing these benefits.

Surprisingly poorly answered; stronger candidates covered more benefits than pensions. In (i) funding method in itself is not sufficient – what influences the funding method? In (ii) some marks were available for explaining how different insurers charge different prices but candidates could score more by comparing premiums to expected cost.

2 (i)

Excesses

The sum specified in the policy, that the insured must bear before any liability falls on the insurer.

The excess is deducted from the amount of any claim to be paid by the insurer.

If the claim is less than the excess, there is no liability on the insurer. Which reduces the number of claims for the insurer.

For example if a policyholder claimed 1,000 and the policy specified an excess of 250, the insurer would be liable for 750.

In many cases the policyholder can choose the level of excess when applying for the policy, or the insurer may force a higher level of excess for risky applicants.

For example, a policyholder who can afford to meet small claims may request an excess at a level where they can afford to pay the entire claim. This may reduce premiums as the liability for the insurer is lower. Liability for larger claims would still rest with the insurer in respect of the amount over the excess.

No claims discounts (NCD)

NCD is a form of experience rating where policyholders are allowed a discount from the basic premium according to a scale that depends on the number of years since the most recent claim.

Following a claim, the premium reverts to a lower rate of discount, or may increase more if the insured is now viewed as higher risk.

The discount acts a discouragement against making small claims. This is because the claim amount may be less than the consequent loss of discount on future premiums.

The discount is more likely to affect claims experience under contents rather than buildings insurance, as contents claims are typically smaller in value.

In certain cases the discount may be protected. That is for certain types or numbers of claims policyholders won't lose their full discount following a claim.

Exclusion clauses

A clause within the policy setting out the events causes or perils beyond the scope of insurance cover.

Exclusions set out the circumstances where an insurer will not be liable to meet a claim.

They are designed to cover circumstances where insurance cover would be unreasonable, expensive or encourage claims.

Exclusions may cover extremely high-risk situations where claims are "certain", e.g. building located on a flood plain, or where the policyholder has left a property unlocked.

In general, the "insured event" must be an event. Gradual wear and tear damage, for example to roofs may be excluded.

Large-scale catastrophes where overall claims would be huge such as war or civil unrest or earthquakes may also be excluded.

(ii)

Premiums will vary if the chances and/or amounts of a claim are different and this could be impacted by the position of the apartment.

Depending on location of the property, the most significant risk could be burglary. Ground floor flats have a significantly higher risk and so the bottom flat could be charged a higher premium.

The ground floor flat may be more susceptible to flood damage, and charged a higher premium if this is not excluded from the policy.

The middle flat may pose a higher risk due to difficulty with access for emergency services or fire escapes, which may be available on the top and ground floors.

Depending on location of the property, damage due to bad weather may be a significant risk. In particular, damage due to leaks from a damaged roof. As a result the top floor flat could be charged a higher premium.

Damage to the roof could be excluded as wear and tear from any structural cover. In this case, the top apartment would still be a higher risk for contents insurance.

Building insurance is also typically covered under one policy, which may be held by the freeholder. Events causing structural damage may affect all the flats similarly – but, if not, the premium could be split appropriately between the flats.

Other sensible suggestion for variation in pricing, for example principle of fire goes up a building or water goes down.

Generally well answered; better candidates gave more than the basic definitions in (i) (given the marks available) and focussed on position in (ii).

3 (i) The main cover required would probably relate to having to pay out more prize money than expected.

This could arise either from an accumulation of smaller prizes or from a number of jackpot wins.

The company will aim to make profits from high viewing figures attracting significant advertising revenues. Additional profits would also be made if there was a high take up of the viewer competition

Hence they may want some form of insurance against poor viewing figures or poor income (this will be hard to get – see (ii)).

The circumstances imply that the program may be past its best and two years is quite a long time for a show. Hence there may be considerable amount of investment depending upon a good sustained run.

To this extent, the company may want some form of cancellation cover.

More likely, they may look at issues that cause cancellations or otherwise reduce the attractiveness of the show.

For example, they could look at keyman insurance cover on the host or protection against legislation changes eg restrictions on prize money.

The company will have a duty of care for contestants and any audience (though audience cover may already exist under current policies). Hence some form of cover against injury or trauma (emotional or stress related) caused may be needed.

The company could be sued by contestants who have been denied prize-money (e.g. due to suspected fraud or because the particular show wasn't broadcast).

The new viewers' competition could cause similar problems. In that if it were not run properly, compensation (and related expenses) could be due to viewers. There would also be the impact on viewing figures etc.

Some form insurance against fraud (fixing the result), breach of contract or negligence by employees or third parties could be possible.

Alternatively, the company may have to sue external suppliers and so cover against expenses incurred may be required.

(ii) The moral hazard relates to the point that, in most cases above, the company has significant control over potential claims so may attempt to take unfair advantage of the insurer.

This could include, for example withholding information from the insurer.

In addition behavioural effects, such as taking less care in setting questions would also present a moral hazard.

The company can make calculated decisions and operate the show so that claims would be much more likely.

For commercial reasons they could make the questions easier and so increase overall prize money and hence claims.

Not only is there no incentive to control prize money, there could be a positive benefit to increasing it, as they wouldn't meet the costs

Likewise, if cover were provided against poor ratings or profits, the company would have no real incentive to turn things around.

Again, the company could take decisions eg number of shows per week or broadcast times that directly affect claims. For example they could put different shows in the allocated time slot that will make more profit (more soaps or talents shows) and move the quiz to a worse slot. Hence, the company gains profit at no cost.

Similarly any cancellation could be the decision of the broadcaster. So again it is a no lose, probable gain decision. Any cover would need to relate to cancellations for reasons outside the insurer's control.

There may be no incentive to run the viewer competition properly if any costs (eg loss of profits or viewers) are insured against. Again decisions could be taken to keep operating costs low since there is little downside from the consequences.

It may be possible to mitigate these hazards, for example independent question setting, cover invalid if show not broadcast as originally set out, payout limits or exclusions (e.g. negligence).

(iii) A major benefit could be related to publicity or advertising opportunities.

- The audience profile may be one the insurer particularly wants to attract.

- There may also be favourable sponsorship/advertising terms or the opportunity for name-checks during the show.

Another benefit could be a chance to take on other insurance requirements the broadcaster may have. These could be substantial and profitable.

Creating a good working relationship by taking on potentially loss-leading business could open up other opportunities and provide useful contacts with decision makers both in the company and in the wider industry.

There could be benefits for staff, other clients and/or existing customers.

For example, free tickets to shows (not just this one) or even the chance to appear as a contestant.

The link could be exploited in marketing material by giving discounts on TV packages or related products linked to the broadcaster (games etc.) for new policyholders.

A fairly wide range of marks on this question. Better candidates explained the concept of moral hazard in (ii) and then applied that to the question, and suggested risks/etc specific to the show and to the proposed insurance cover.

4 (i)

Liabilities to be shown in provider's published accounts and reports.

To show supervisory solvency levels or for regulatory reports.

For internal management accounts and reports.

To value the provider for a merger or acquisition.

To determine whether discretionary benefits can be awarded.

To set the future contribution rate, for both benefit accrual and correction of any deficit.

To value benefit improvements.

Valuation of discontinuance/surrender benefits.

To influence investment strategy.

For disclosure to beneficiaries.

To review scheme experience.

(ii)

Cashflows occurring over the period, for example expenses and benefit paid, or contributions received.

Investment policy of the scheme.

Investment return achieved over the period.

Contribution obligations for the future.

Assumptions and actuarial method used in the valuation.

Size of the assets, liabilities and surplus/deficit position.

Explanation of the change in the surplus/deficit position since the last valuation.

Risks involved and risk management arrangements.

Treatment of benefit entitlements in the event of insolvency.

Number of members or membership movements.

(iii)

General considerations

There is always a time lapse since the effective date of a valuation, even if completed recently. Therefore it may no longer reflect the characteristics of the scheme, for example:

- A large number of new entrants or deaths since the valuation may mean the membership modelled is significantly different.

- Market conditions may have changed significantly (e.g. different outlook for investment performance or inflation).

- There may have been significant one-off events since the valuation which have changed the nature of the scheme (e.g. regulatory change to dependent benefits).

The supervisory valuation may not have produced all the information required for the investment strategy review, for example:

- A detailed breakdown of provisions split into different categories.
- Complete cashflow projection.

Overall basis

The investment advisor should be looking for a best estimate of provisions.

The supervisory valuation is more prudent than this so may not be appropriate.

In particular this means the supervisory valuation may overstate liabilities or projected cashflows compared to a best estimate basis, so need to consider how supervisory basis is prudent, and in particular which individual assumptions may be inappropriate.

Though it may be necessary to model development of the funding position on the supervisory basis using realistic assumptions for the projections. The size of supervisory surplus/deficit may influence the level of risk appropriate

Individual assumptions

Investment advisor will be primarily interested in cashflows, so discount rate or investment return are less relevant.

A number of assumptions may be prescribed on a supervisory basis, which may not be appropriate for the investment strategy review.

Expenses: will need to consider timing and linkage (to inflation/earnings) in order to assess cashflows arising from expenses.

Inflation: investment advisor will require a market related rate; supervisory allow for an inflation risk premium.

Consider how the inflation assumptions impacts on revaluation in deferment and pension increases in payment. Depends on how benefits are linked to inflation.

Mortality: investment advisor will require a best estimate of mortality considering the characteristics of scheme membership for a base table, and for future improvement.

Salary growth: if benefits are linked to salary growth, investment advisor will need a best estimate assumption including promotional scale. Consider if supervisory basis restricts this, or if this is a discontinuance valuation.

Valuation of options and guarantees: may be differences in approach, for example use of stochastic models to value guarantees and member options. Would require consistency with a market based approach.

Commutation of pension: Will have an impact on benefits, but may be ignored under the supervisory valuation. This could have an impact on both the total value of benefits, and more significantly on the timing of cashflows.

Other assumptions impacting on cashflows including: Proportions married, withdrawal rates, ill-health retirement or other sensible suggestions.

Some assets may have been inadmissible under the solvency valuation and can be included for investment strategy purposes.

Most candidates scored well on the bookwork in (i) and again in (ii), though some diverted onto individual benefits. In (iii) most commented well on prudence overall but didn't answer the question on specific assumptions or on general issues such as the need for cashflow information and the time lapse since valuation date.

5 (i)

Market risk

Market risk will be the most significant risk for investors.

Movements in the property market will directly impact on the price of the derivative. If the derivative is geared there may be a further increase in price movements and market risk.

There may also be market risks relating to the index. For example if the index ceases to be produced, or if the surveyor changes it's methodology.

Prices will be influenced by the broader global property market as well as local pressures.

Additional market risk will also occur due to the performance of alternative investment classes.

Credit risk

Credit risk will exist as there is a counterparty risk, i.e. risk that the bank may default on any payment.

Credit risk should be relatively small for the investor because:
- The bank is large;
- The bank is diversified across many business lines and countries.

Risk may be higher if there are broader fears for the financial sector.

Business risk

This will be a low risk for the investors.

May be a business risk relating to the derivative not being commercially viable, i.e. few buyers for investment, at which point product may cease to be offered.

If product ceases the long-term investment expectation will be lost and will be replaced by returns in the market at closure.

In general it is the bank which will be exposed to business risk, rather than the investor.

Liquidity risk

Liquidity risk may be material, but will not be the most significant risk.

Liquidity of the derivative dependent on bank which packages and markets product, hence will not be as low as for direct property investment.

The actual liquidity will depend on the secondary market available for these products.

The secondary market will be greatly improved if the bank is willing to buy back before the full term, although this may be on penal terms.

If the bank is in financial difficulty the liquidity risk may rise significantly.

(ii)

There is dominance risk from the individual controlling this aspect of the banks business.

This gives potential for fraud or error if work cannot be reviewed

As a single individual resiliency will be low, leading to issues with:
- Business continuity planning, in the event of an emergency;
- Sickness or holiday cover and alternative contacts.

There will also be difficulties with succession planning and handover.

Given the small workforce there may be a need to rely on outsourcing or use of third parties to maintain capacity. This will expose the bank to any operational risks within the third party.

Depending on the relative significance of the bank's business relative to all work carried out by the third party these risks may be significant.

The computer system and programs used by the employee will need to be usable by other bank employees, there would be additional risk from standalone processes set up by the employee.

(iii)

Use two employees on job share or expand the team.

Have contingency plans in place for employee replacement or rotation.

Appropriate remuneration package to aid recruitment and retention.

Employment contract should state clearly notice periods and restrict employees ability to leave.

Management contact to monitor difficulties and spot check work of employee, addressing problems before they become significant.

Identify and implement any training requirements for the employee.

Encourage consistency with procedures in other business areas (easier to transfer).

All procedures must be documented with complete audit trails.

Key contacts and data sources should be documented.

Alternative methods of tracking market could be used to check consistency with work of the employee.

(iv)

(a) **Reduced volatility**

If the property market falls, the value of the derivative will rise.

If the property market falls, the value of the mortgage portfolio and hence the second derivative will fall.

This is because the underlying security for the mortgages will reduce in value as property prices reduce.

Movements in the two elements of the portfolio may therefore offset each other.

The extent of any matching will depend on the proportion of the product relating to each derivative.

(b) **Additional volatility**

Lag in production of the property index, which could lead to delays relative to movement in the second derivative.

Mismatch between properties backing the index and those in the mortgage portfolio: for example different locations/geographies and perhaps also types of property

Subjectivity in the components of the property index could lead to changing exposure over time relative to the property underlying the bank’s mortgage portfolio.

Expenses could impact on the relative performance of the mortgage portfolio.

There is gearing in the mortgage portfolio, so profitability not directly proportionate to prices.

A wide range of marks on this question. In (i) better candidates set out their answers clearly with good discussion of financial risks rather than discussing general risks associated with property.

6 (i) Contents insurance providing cover for loss or damage to contents in shared student accommodation.
Building insurance (accidental damage) could also be provided.
Cover away from the home can also be offered
This could relate to taking possessions to and from student accommodation and also to more specialist cover. This could include cover for valuable items such as:
Mobile phones
Laptops

Car insurance
Travel insurance, possibly including cover for gap year travel could be offered.
Insurance could be provided for those studying abroad.
Medical insurance, for countries where students are not covered by universal healthcare.
Dental insurance
Accident insurance
Critical illness insurance
Course fee insurance, providing cover for course fees due to cancellation or curtailment of the course.

(ii) Some assumptions will be derived in the same way as for other lines of business – for example investment returns

But many assumptions will need to be tailored. Historical data will usually be a primary source of data in determining assumptions about future experience, but the company may not have data relevant to the group of individuals (students) about whom assumptions are to be made.

Past data will usually need to be adjusted in a subjective manner to allow for differences in the characteristics of the individuals concerned.

Particular care will be needed over the choice of the assumptions that will have the most financial significance.

With contents insurance, the likelihood of theft may be higher as the accommodation is shared and it is unlikely that security measures are in place. The value of the contents is likely to be much lower than that of the company's usual business.

For cover away from home, it is again likely that the value of the contents is different than for the usual policies, for example in a shared house each resident may have their own television.

For the more specialist insurance, the value of the sum insured will not be expected to be different from those of other such policies. Loss or damage may, however, be more likely. Whether and how assumptions are changed will depend on how much experience the company has with the particular specialist area.

Students may have a different propensity to claim compared to typical policyholders, which may also lead to a different pricing assumption.

Car insurance assumptions may be similar as they will already allow for age, occupation and NCD in their pricing. Will, however, need to ensure that the correct address is used when pricing these policies.

Travel insurance will need different assumptions for the different types of insurance i.e. holiday, gap year, study abroad. Holiday insurance is likely to have similar assumptions to standard travel insurance but could add cover for more adventurous activities to appeal to this market. The gap year and study abroad assumptions will be very different from that of their normal business and the country/countries to be visited will need to be taken into account.

Medical insurance is likely to have similar assumptions to any other similar policies as age, sex and state of health will be allowed for.

Course fee insurance is likely to be different from other insurance business written, prudence will be needed when setting assumptions for this business.

Expense loadings will need to be adjusted as policies are likely to have lower premiums and lower sum assured as well as an increased likelihood of claims.

Contingency loadings may be higher as this is a new market.

Profit loading may depend on how competitive this market is.

Recognising that students may stay with the same insurer after completing their studies, the insurer may price student insurance as a loss leader, hoping to make profit from retaining policyholders later in their careers.

Generally well answered, with inventive relevant suggestions in (i), though weaker candidates in (ii) did not show that they understood that existing business would be rated by age anyway.

7 (i)

A high level preliminary risk analysis to confirm that the project does not obviously have such a high risk profile that it is not worth analysing further.

Need to look at whether any of the three areas is not viable using the high level preliminary risk.
Hold a brainstorming session of project experts and senior internal and external people who are used to thinking strategically about the long term.

This would involve people that have worked in the areas being considered particularly understanding the risks that are relevant to those areas (for example pilots or stewardesses that have worked in those locations).

Identify project risks for each of the three areas, both likely and unlikely, and upside and downside.

Discuss identified risks and their interdependency.

Attempt to place a broad initial evaluation on each risk, both for frequency of occurrence and probable consequences if it does occur.

Generate initial mitigation options.

Carry out a desktop analysis to supplement the results from the brainstorming session, by identifying further risks and mitigation options researching similar products undertaken by the airline or others in the past and obtaining the considered opinions of the experts in those locations who are familiar with the details of the project and outline plans for financing it.

Carefully set out all the identified risks in a risk register, with cross references to other risks where there is interdependency – this should be done for each of the 3 areas.

(ii)

Risk – Language of other areas may be different from the domestic airlines.
Mitigation – Employ people who are bi-lingual and can work in different cities

Risk – Competition, considering the approach of other airlines and how the competition may react if an area is selected.
Mitigation – Monitor the competition is doing and assess the strength of localised competition in each area.

Risk – Demand for airlines in the areas may make the projects unprofitable.
Mitigation –Research demand and sensitivity of demand in each of the areas.

Risk – Currency risk, as will need to price flights in different countries and therefore will be exposed to exchange rates affecting the prices of the flights.
Mitigation – Hedging currency with derivatives.

Risk – Market risk, the stock market may regard the new venture as very risky and put a lower valuation on the whole group.
Mitigation – Explain to investors the plans for expansion and the strategies that are being put in place to minimise the risk and maximise the return.

Risk – Fuel prices may be higher in other areas increasing costs.
Mitigation – Consider fuel prices as part of the assessment of risks, and explore the possibility of planes avoiding the need to refuel in expensive areas.

Risk – The legislation/rules on airlines running outside of the domestic country may have significant differences to the domestic country.
Mitigation – Research the rules that will need to be considered as part of the analysis of each of the countries, and ensure that local experts are actively involved in the project team.

Risk – Equipment currently used by the airline may not work in the new areas. For example planes may not have the range required, or computer systems may not work without access to local intranet.
Mitigation – Consider whether any upgrades are required as part of the risk review. Will need to consider upgrades required for each area.

Risk – The airports in the areas being considered may have a bad reputation, for example for losing luggage. There may be a reputational risk for the airline.
Mitigation – Include individual airports under the risk review.

Risk – If planes are grounded in airports they may not be covered should accidents, for example fire, occur under the current insurance arrangement.
Mitigation – Extend any insurance held to either cover other areas.

Risk – The planes may break down in the new areas and availability of parts and engineers may lead to higher costs.
Mitigation – Consider what contracts could be set up for maintenance and/or explore setting up pool of own maintenance staff either travelling with flights or based in the areas.

Risk – Operational costs, such as wages may vary in each region
Mitigation – Research cost in each region and consider extent to which they must be incurred locally (or sourced centrally)

Risk – As a new business venture there may be significant unknown hazards not considered in advance of set up.
Mitigation – Consider use of experts from each region, or targeted hiring of established individuals.

Risk – Overseas regions/route may be more subject to natural disasters or war.
Mitigation – consider availability of insurance.

(iii)

Assume that the set up costs are on day one but the yearly cashflows are on average half way through the year. (or alternatively at year-end)

Scenario A NPV = –100 + 50v0.5 + 50v1.5 + 50v2.5 = £39.5m

Scenario B NPV = –110 + 40v0.5 + 40v1.5 + 45v2.5 = £6.0m

Scenario C NPV = –120 + 30v0.5 + 30v1.5 + 30v2.5 = £(36.3)m

Expected NPV = 0.3 * 39.5 + 0.5 * 6.0 + 0.2 * (36.3) = £7.6m

(iv)

The project shows that it will make a profit 80% of the time and a loss 20% of the time. The range of profits vary quite significantly, with a very high loss 20% of the time.

The decision to proceed will depend on the risk appetite and required return on capital for the airline.

The cash available to invest in any project will impact on the decision to proceed.

Alternative projects, particularly those with higher return or lower risk may provide a more attractive investment.

Availability of insurance, or other mitigation options, could change the risk associated with the project and influence the investment decision.

May wish to consider possible cashflows beyond the three year time horizon.

May wish to consider further developments since the initial risk analysis was carried out.

This was generally well answered, though some candidates did not make their answers specific to the question in (ii) and didn't comment in (iv) on the variability of outcomes.

END OF EXAMINERS' REPORT