Institute of Actuaries of India

Subject CA1-II – Actuarial Risk Management

November 2013 Examinations

INDICATIVE SOLUTIONS

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution 1:

i) Underwriting risks: The risk that

- the premium rates are not appropriate to the risks concerned
- the premium rates permit selection against the insurer by the policyholder.

Management of Underwriting Risks:

- Adequate risk classification so as to minimize the anti selection risk and price is fair in each risk class
- Decline high risk cases
- Defer the risk which are difficult to assess and reconsider after sometime when it's possible to assess
- Ensure pricing assumptions and underwriting procedures are consistent
- Do financial underwriting which will help in eliminating the risk of over insurance
- Write par business so that a part of the insurance risk can be shared with policyholders by adjusting the future bonus rates
- Ensure consistency in underwriting at proposal stage and Claims underwriting
- Use reinsurance technical expertise /lower retention - accept only part of the risk and reinsure the remaining especially.

(5 Marks)

ii) Lifestyle underwriting is the underwriting process which assess the risk factors that can affect the mortality or sickness risk and need to be investigated other than the medical state of health of the applicant.

The factors is associated with the lifestyle of the applicant mainly,

- applicant's occupation
- leisure pursuits of the applicant
- applicant's normal country of residence. **(2 Marks)**

[Total Marks-7]

Solution 2:

i)

Systematic Risk:

- Systemic risk is the risk that affects an entire system (e.g. financial market) and not just specific to various participants. For example, for equity investments the risk of a decline in the stock market as a whole, with all stocks being affected, is a systemic risk.

- It is not possible to avoid systemic risk through diversification. As the insurance company needs to invest in equity (e.g. to meet customer's expectations, treat customers fairly, earn competitive returns etc.), systemic risk cannot be avoided.

Diversifiable risks

- **Diversifiable risks** arise from an individual component of a financial market or system. In the context of equity markets, diversifiable risk occurs when the price of an individual share falls more than the market.
- Investment theories assume that a rational investor should not take on any diversifiable risk. As only non-diversifiable risks are rewarded within the scope of most financial systems. This implies that a passive or index tracking strategy should be followed.
- However, one may wish to aim for a particular level of exposure to diversifiable risk in following a particular investment strategy. That is they may decide to follow an active management policy with the aim of beating a passive/tracking approach.
- There will thus be a tradeoff between the diversifiable risk taken on and the projected extra expected return.

(3 Marks)

(ii)

- **Systemic risks** of the equity portfolio can be managed by
    - **i.** Retaining the systemic risk, manage it and hold the risk capital for this risk
    - **ii.** Mitigating the systemic risk by using hedging strategies for example transfer/share the systemic risks:

Possible options for mitigating the systematic risk could be for eg.,:

A company could share risk with customers (eg., life company writing unit linked policies)
The company could transfer the policy book to another company but this could be costly as the transferee would need to be compensated for the risk taken

- The company could ensure that equities are not held in respect of guaranteed benefits. That is a policy of asset liability matching could lessen the impact of the systemic risk.

Diversifiable risks can be mitigated by

- The risk of a decline in the value of a particular security can be mitigated by an investor spreading the risk and investing in a large number of smaller holdings within each market and by covering a range of markets if the fund is not restricted to domestic equities.
- In developed markets, a portfolio of 30 to 40 shares will render the portfolio sufficiently diversified to limit exposure to systemic risk only. Such a portfolio will need to cover a range of sectors to be efficient.
- More shares would be required in developing markets because of higher equity volatility. That is the impact of the movement of a particular share could be more significant.
- The level of exposure taken will be documented within the company's risk appetite and monitored in order to manage the risk.
- The risk will also be factored into capital requirements.

- The company could mitigate the risk through tailored derivative strategies specific to the needs of individual assets.

(5 Marks)
[Total Marks- 8]

Solution 3:

Reinsurer arrangement can help in the following areas:

Morbidity Risk Transfer:

- Ceding a portion of the risk to the reinsurer to enhance the ability of insurer to write more business
- Providing upfront reinsurance commission in first year which helps the insurer in funding the new business strain
- Risk cessions helps insurer to reduce the reserving and solvency margin requirements
- Company can write large size risks by ceding a portion of risk to reinsurer which helps the insurer to write/ manage the large size risks
- For certain high risk cases, the insurer may be unwilling to accept such risks which, by ceding a large of risk to reinsurer, can be accepted by the insurer

Product designing

- Advice to insurer on what kind of benefits to cover in the product
- Assisting in drafting the definitions and exclusions for the benefits covered

Pricing

- Assisting in assumptions setting for various risk parameters
- Developing the Pricing models to assist insurer to price the products

Smoother Profits

- Helps in smoothing profits particularly in years when the claims experience turns out to be adverse
- Helps in limiting the losses from single events such as catastrophe or from large size claims
- Through post lost funding type of reinsurance arrangement, the reinsurer will fund the debt or equity capital on pre agreed terms on occurrence of the reinsured events

Market Research

- Providing product information on similar products by other insurers in the domestic market and from other countries

Underwriting and Claims

- Developing the rules for underwriting and claims management to manage the risks better

Administration System

- Assist in developing the administration system for underwriting, claims management and policy servicing
- Some of the administrative activities can be transferred to the reinsurer and insurer can reduce its operational risks

(8 Marks)

Solution 4:

i)

- Higher than expected payout on prizes due to either accumulation of small prizes or higher number of winners with large prize monies. The appropriate insurance cover would be excess of loss insurance cover under which the loss on account of higher amount of prizes beyond an agreed limit would be paid by the insurer.

- The company will aim to make profits from high viewing figures attracting significant advertising revenues. Hence they may want some form of insurance against poor viewing figures leading to lower than expected income from the show.

- The circumstances imply that the program may be past its best and 52 weeks 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 if the viewership is low and the show is required to be cancelled.

- It has been established that one of key factors of past successes is the reputation of the film actor who anchors the show. The Channel would require the keyman insurance cover on the anchor to cover the loss arising from the sickness, disability or death or non availability of the host for any other similar reason.

- The Company could be sued by contestants who have been denied prize money or for some other reason e.g. due to suspected fraud or because of some other reason. An indemnity insurance cover is required to mitigate such risks.

- Company would need protection against legislation changes leading to financial losses eg restrictions on prize money through legislation might impact the participation and viewership.

- The company will have a duty of care for contestants, staff and any audience. Hence, some form of insurance cover against injury or trauma caused may be needed.

- Some form of 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 legal and related expenses incurred may be required.

(7 Marks)

ii) The insurer would face the following risks:

- The moral hazard risk relating that the television channel 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. For example, 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 to make the show popular 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.

- 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).

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

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

- Competition Risk to the Channel – if a similar show or a different type of show which is equally popular is launched by any other channel at the same time of broadcast, the viewership might get impacted significantly leading to losses to the channel.

Benefits to insurer

- A major benefit could be related to publicity or advertising opportunities for the insurer. The audience profile may be the attractive target market for the insurer particularly.

- There may also be favourable sponsorship/advertising terms during the show for the insurer.

- Another benefit could be a chance to take on other insurance requirements e.g. group insurance for the employees of the channel, 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 or potential customers. For example, free tickets of show or preference to staff or to customers for contesting the show.

- The association with the show as an insurance provider for the show could be exploited in marketing material of the insurer.

(6 Marks)
[Total 13 Marks]

Solution 5:

i) Claims control systems mitigate the consequences of a financial risk that has occurred.
They guard against any fraudulent claims.
This also limits excessive claims. **(1 Mark)**

ii)

Life insurance Company

- In case of death claims, the life insurance company can check, the death certificate that the claim is genuine (not a fake death certificate), and that the details declared at policy proposal were correct.

- For instance, if a declared "no dangerous hobbies" policyholder dies from a parachuting accident, the life insurer might decide to repudiate the claim.

- Although the potential bad publicity such a decision could cause would be a factor along with the brands for the company.

    - However the costs of implementing and maintaining a control system must be compared with the benefits gained from it.

General insurance Company

- Most general insurance companies will accept small claims on the basis of a claim form and a single estimate for the necessary repairs.

  Above a monetary limit the general insurance company may wish to see two or three estimates, including one from a company approved by the insurance company.

- At a further level the insurance company might require that damage is inspected by one of its employees or agents before remedial work is authorised.

- For the larger claims the insurer might appoint a firm of loss adjusters to manage the whole remedial programme on its behalf.

Health insurance Company

- A Health insurance company needs to manage income protection or permanent health insurance claims. The claimant needs to have a strong incentive to return to work.

- While the claim payments fulfill an important need, it is equally important that the claimant does not see the additional income as a justification for not working.

(5 Marks)

iii) A good management control systems should include:

- Data recording

The company should hold good quality data on all the risks it insures, with particular emphasis on the risk factors identified when the product was designed or when the risk was underwritten.

While this cannot change the provider's exposure to the business risks underwritten, it can assist in ensuring that adequate provisions are established for those risks, and reduce the operational risks from having poor data.

- Accounting and auditing

A good accounting and audit procedures cannot change the risks accepted, but enable proper provisions to be established, regular premiums to be collected, and the providers of finance to the provider to be reassured as to its financial position.

- Monitoring of liabilities taken on

It is important to monitor the liabilities taken on by a company to protect against aggregation of risks of a specific type to an unacceptable level.

Where the acceptance of risks involves the provider in new business strain, it is important to quantify the amount of new business to ensure that it is within the provider's resources.

In addition, premium rating may involve cross-subsidies from one type or class of business to another. If the business mix expected in the premium rates is not achieved in practice, the profitability of the contract may be at risk.

- Options and guarantees

Care needs to be taken when offering options and guarantees, particularly those which appear to have limited value when granted but which could become valuable if market or other conditions change.

Liability hedging can be used to manage options and guarantees.

A specific example of this is immunisation, where assets are matched to liabilities by term in order to hedge interest rate risk.

- Monitoring across business areas

It is particularly important that systems or procedures are in place to enable monitoring across business areas, ie at the enterprise level.

For example, a composite insurance company's exposure to a large corporate customer might encompass life business (group life term insurance) and general insurance (property and liability insurances).

(8 Marks)
[Total Marks-14]

Solution 6:

(i)

Purpose of the Issue - A debt taken to fund investments of its expansions will be seen more favourably than a loan to cover cashflow difficulties.

Size of the Issue – How size of the loan compares to the fund requirement of stated purpose? Size of the bond issue relative to the size of the lender will also affect the perceived credit risk.

Repayment of the loan - How certain is the source of repayment and what safety margin is built into projections and assumptions. Will the borrower have free cashflow to cover loan repayments?

Past practice - If the borrower has defaulted on a payment, the credit rating will be lower.

Other counterparties - The borrower may be exposed to other creditors e.g. customers with outstanding credit, or outstanding tax bills.

The quality of these other creditors will impact on projected cashflows and security.

If any existing bonds have higher priority, for example if they are secured on specific assets, then this will decrease the security of any subsequent bond issue.

Exposure to other risks - Exposure to market, currency and operational risks will affect the security of any loan as these will influence the range of scenarios under which the loan can, or cannot, be repaid.

Future developments - There may be other events in the future which could impact the borrower. For example fears of an economic downturn may spark concerns on the security of ability of the borrower to make interest payments and capital repayments

Character and ability of the borrower- Knowledge of the borrower, its principles and ability to repay any loan will be the main driver behind any credit rating.

(5 Marks)

(ii) Following could be reasons for the difference in yield:

- Bonds issued by a government offer absolute monetary security of both income and capital. There is virtually no risk of default. Government bonds are also typically seen as lower risk due to the ability to change taxation to meet obligations, or to print money if required
- The degree of security of the interest and capital repayments is generally lower for corporate bonds than government bonds. Hence government bonds offer lower returns.
- The degree of security of income and capital repayments could deteriorate in future and hence there is more uncertainty in future on repayments on the bonds issued by ABC
- The level of coupons which might affect the reinvestment risk and hence the difference in yield
- Difference in the level of liquidity of the instruments
- Yields are also a function of supply and demand. The level of demand for the two types of assets may be significantly different and hence may impact the yield.
- Tax treatment of the coupon may be different for the two bonds
- Dealing cost could be different under the two bonds significantly

(3 Marks)

(iii)

- Nature of liabilities backing the investments. Any mismatch risk needs to be evaluated.
- Yield differentials vis a vis risks- Higher yield generally mean taking higher risks
- Credit Rating of the bonds
- Risk appetite of the investor i.e. whether the company has the free assets to support investing in higher risk higher yield bonds
- Level of Diversification offered
  - A large multi-national firm will be exposed to a number of different economies. This diversification means changes to the local economy will be less significant to the company and may reduce risk.
- Investment objectives of the finance company –Exposure to certain industries may be explicitly disallowed e.g. weapons manufacturing, nuclear power companies etc.
- Liquidity considerations – which investment offers higher liquidity especially a concern if liabilities are also liquid
- If decided to invest in corporate bonds, Security offered under each bond e.g. charges on assets of ABC and XYZ Company.
- Any preferential tax treatment of any one of the bonds
- Regulatory sectorial restrictions which may apply to investing in the different bonds.
- Any Options or guarantees available on a particular bond.

(6 Marks)
[Total 14 Marks]

Solution 7: i)

- To determine the liabilities to be shown in the provider's published accounts and help to show the cost of accruing benefits. (e.g. last years' pension cost).
- If separate accounts and reports have to be prepared for the purpose of supervision of solvency, to determine the liabilities and cost to be shown in those accounts and reports.
- To determine the liabilities and cost to be shown in internal management accounts and reports of the provider.
- To disclose the overall solvency/funding position to members eg via scheme accounts.
- For the purpose of valuing the liabilities in respect of employees involved in mergers or acquisitions
- To compare with the existing assets of the scheme, and hence decide how to spend a surplus or correct a deficit, for example introduce benefit improvements or amend contributions
- To set future contributions for the scheme.
- To value benefit alterations or the cost of discretionary benefits.
- To assess the implications for investment strategy
- To assess changes in experience e.g. salary or withdrawals.
- On discontinuance or buy-out of all or part of the scheme.

(5 Marks)

ii)

Global provisions would be for risks which are perceived to be at global level and not at an individual member level.
It is often necessary to make global provisions looking at the provider's liabilities as a whole, if the scheme solvency is to be demonstrated.
Risks relating to mismatch between assets and liability cash flows which in case of change in investment conditions may result in liabilities increasing more than the assets, hence affecting the solvency position of the scheme

Therefore, the risk of mismatching is a *global provision* rather than an *individual member level* liability and hence provisions should be established on a global basis.

Global provisions are usually held for options and guarantees because they tend to affect a portfolio all in one direction or another and are hence determined at the scheme level.

Global provisions could be held to cover other than member level liabilities , if any e.g. tax liabilities, the investment expenses, trust management expenses.

The scheme might have some miscellaneous liabilities e.g. professional insurance premium for trustees etc.

(5 Marks)

iii)

- The assumptions used will depend critically both on the *purpose* for which the provisions are calculated and the *client* for whom the calculation is for.

The *purposes* are:

- *The published accounts* – the assumptions will reflect legislation and accounting principles.
- Matters to be considered include:
  – using a going concern or break-up basis
  – reflecting a true and fair view
  – the degree of prudence in the basis.
- *Demonstrating supervisory solvency* – there will be a need for:
  – prudence
  – any prescribed methods / assumptions to be followed.
- *The internal accounts* – a realistic (best estimate) set of assumptions is typically used.
- *Calculating discontinuance benefits* – a best estimate basis may be considered to be fair. Other bases may be appropriate, *e.g.* a more cautious basis if the aim is to encourage surrenders.
- *Determining whether discretionary benefits can be paid* – likely to err on the side of caution so surplus is not over-stated.
- *Setting contribution levels* – the assumptions used will depend on the objectives of the parties concerned. *E.g.* trustees are concerned with the security of the benefits so will want prudent assumptions, whereas the sponsor may not want to unduly tie up capital in the pension scheme, and so may prefer optimistic assumptions.
- *Setting investment strategy* – a realistic set of assumptions is typically used, with sensitivity and scenario testing.
- Disclosure information for beneficiaries – the assumptions will reflect legislation, but a realistic basis will typically be used, with a range of results also provided.

(5 Marks)

(iv) With benefit guarantees there is a risk that the guarantee will apply and so the costs might be greater than would otherwise have been the case.

The value of a financial guarantee will normally be assessed using a stochastic model.

The stochastic model should also incorporate dynamic customer behavior under various scenarios

The parameters input to the model should reflect the purpose for which the results are required.

For example are we looking at a best estimate or a worst case scenario?

The purpose may also drive the approach in terms of legislative requirements.

(3 Marks)
[Total Marks-18]

Solution 8:

i) There are two possible approaches of establishing customer's needs:

- a logical approach
  of systematically and carefully working out what needs a customer has and fitting products to these needs
- an emotional approach
  which plays more on what an individual feels is needed.

If customers' emotional needs are met then they may get what they want rather than what they really need.

The logical needs approach involves establishing the customer's needs, analysing them, prioritising them and fitting the benefits or products provided to those needs.

Eg., An individual may believe they have a need to generate additional income on retirement from investment capital. However, this may be an emotional need.

On analysis, it may be that the customer's expenditure levels will fall on retirement and that the level of additional income required may be lower than perceived. This is the logical approach.

These two approaches can lead to identification of some of the same needs.

(4 Marks)

ii) The need is to get income or cash inflow during one's life time and an asset (property) is the asset with the customer

Based on requirement and availability of asset, the product may have the following features:

- Since property ownership is common house owner can sign over his residential property to the insurance company on retirement
- In return, they will get an annuity for life.
- The annuity could be either level or linked to an inflation index
- The policyholder/homeowner can continue to live rent free in the premises till his death.
- The option of joint life last survivor may also be provided to take care of spouse as well.
- On the death of the last survivor, physical possession of the property is taken by the life company.
- They are then free to sell or otherwise use the property.

The reasons why the product is attractive

- The only option with property owners who otherwise have made very limited provision for income on retirement is
    - Sell the property
        - Home ownership is an area most people are sensitive about and the product entitles the home owner to keep this property which they may be attached to.
        - For a homeowner, selling his home would require him to purchase or rent a new place (smaller, suburban rather than city) for living.
        - Selling/buying property or renting it involves considerable time, energy and expenses which the home owner may not be interested in.
        - Homeowners may also not have the expertise to manage the cash on sale , whereas an annuity is simple and easy to understand.
        - Homeowners can buy an annuity from sales proceeds but probably a standard annuity could be more expensive and a worse deal than under the equity release.
    - Rent the property and take alternative and cheaper accommodation. This involves following risk-
        - Finding and managing tenants requires effort
        - Would not satisfy emotional need of staying in one's own house
        - Risk of void
        - Rent control leading to limited scope for rent review and hence erosion in value of rent income
    - The product design is attractive to above 2 options due to-
        - House owners are asset rich but income poor- then this product uses the asset efficiently by releasing equity
        - Satisfies the logical need for income as well emotional need for living in one's own property ie income and accommodation for life.
        - More attractive than outright sale as sale proceeds may not give this benefits of guaranteed income
        - Especially attractive to those who do not have any dependents and hence no requirement to leave the house property to any one after their death.
        - The product could also be a good deal if house prices are high
        - Also could provide good value for money if he is in very good health (better than insurer assumes).

(8 Marks)

iii) The main risks are:

- On death of policy holder the insurance company has to sell the property to achieve a cash inflow, which is unknown in both amount and timing.
- There is a risk that policyholder's longevity is longer than expected would delay the reversion of property to insurance company i.e. Uncertainty on timing
- Property especially house price returns are very volatile and can be subject to political issues or other uncertain risks. Hence for the insurance company there would be uncertainty of amount that will be received from sale of property
- The insurance company can consider renting out the property but it will still involve administration expenses and hassles.
- Investment risk is with Life Insurance Company. There is risk of home value falling short of the annuity pay outs and notional rent.
- The reverse is also possible and the company may get bad publicity and be accused of profiteering from the elderly. There could also be legal challenges from relations e.g. mis-selling issues.
- The insurer will have expenses related to selling and maintaining the policy. Especially significant expenses could be involved in property valuation and it may not always be possible to load all expenses in the policy.
- Risk of not achieving adequate business volumes leading to higher expenses than allowed for in pricing leading to loss.
- There is a risk of anti-selection in that only healthy lives take the product leading to risk of underestimation of longevity risk.
- The policy may be perceived to be poor value, especially in the event of early death, and because when calculating the annuity rate the company will have to reflect the risks of matching a stream of annuity payments with a reversion on the house, which yields no income.
- Any house valuation is likely to include a margin for risk and may not reflect the value on a competitive open market leading to customer dissatisfaction and loss of new sales.
- Perception of poor value in respect of lack of flexibility in the product design
- eg restrictions placed on homeowner in terms of renting out, raising loans, altering property or cashing in on further capital appreciation. This could lead to significant customer dissatisfaction and bad publicity.

- Unexpected legislation impacting such products (likely considering the sensitive nature of business)

- There may have some risk of litigation

(6 Marks)

[Total 18 marks]

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