# Institute of Actuaries of India

## Subject CA1 – Actuarial Risk Management (Paper I)

## November 2011 Examinations

## INDICATIVE SOLUTIONS

1.

i) **Traditional Discounted cash flow method**

- A long-term valuation rate of interest is used to value the assets and the liabilities.
- The assumptions are chosen based on actuarial judgment.
- The use of a consistent long-term discount rate gives consistency in the valuation of assets and liabilities, and stability to the result over time.

ii) **Market consistent method**

- Assets are valued based on their current market value.

- To value the liabilities, a discount rate of interest is set that is implied by the market, based on assets that best reflect the liability.(replicating portfolio)
- Volatility of asset value, liability value over time may occur due to market movements.
- The method is most suitable for discontinuance valuations as the assets/liabilities are valued at their immediate realizable value.

**[4]**

2.

- Regulator
- Shareholders
- Policyholders
- Lenders
- Senior Management
- Employees
- Agents (brokers)
- Rating Agencies
- Competitors
- Auditors

**[4]**

3.

- The proposed investment norms appear too prescriptive and may not suitable for all schemes. It may not be an optimal or efficient strategy for all schemes.

- Not all defined benefit schemes will have the same liability profile- for e.g., a defined benefit scheme with pre-dominantly retired and near retirement employees requires a higher exposure to fixed interest securities than a scheme with a pre-dominantly young work force.

- Rate of benefit accrual, early retirement/withdrawal benefits will differ with schemes and investment strategy needs to reflect the same

- Investment strategy should reflect the risk appetite of the sponsor, surplus situation of the fund, size of the scheme etc- this 'straight jacket" approach defeats this completely

- Many investments are not allowed- property investment which could provide a real return but with higher volatility, or derivatives which may be used for hedging are not allowed which could prove counter intuitive in the long term for some schemes

- To become compliant with the new norms existing pension schemes would be involved in forced sales moving the market

- Pension schemes would need to make changes to their investment strategy and objectives and might actually need new managers

- It will involve huge cost for existing schemes in disinvestment and reinvestment in order to comply with the regulation.

- Since a minimum of 75% of investments have to be in fixed interest securities -is the market big enough? Increase in demand may outgrow the supply of AA/AAA rated corporate bonds/government securities, distorting returns as well.

- AAA/AA rating being the highest credit rating can be expected to give lower returns than corporate bonds with lower ratings. Thus the overall returns on assets may reduce.

- If there are not sufficient corporate bonds available, the company may need to invest more in government bonds to stick to the limit of 75%, further reducing the return.

**[6]**

4. The event management company might like to insure itself against stress events and protect itself from risk of loss of revenue arising from any event impacting the concert event, any event leading to less than expected revenue generation or from events leading to higher costs or expenses.

   - Loss of revenue arising from business interruption due to-

     - Cancellation, abandonment or postponement of concert due to reasons beyond the control of the organizer e.g. rain, protests, terrorist events etc.
     - Cancellation, abandonment or postponement of concert due to the non-appearance of specified persons of the band/band itself
     - Ticket sales less than expected

     The company can protect itself from such risk events by purchasing a 'Business interruption' cover.

- Risk of revenue shortfall arising due to inability to sell advertisement spots/TV rights at expected costs, or less than expected booking of spots, or inability to book sponsors etc. This risk can be covered by purchasing an insurance policy to cover the revenue shortfalls.

- Risk of loss due to delays caused by flight cancellations, delay in transit of band's musical instruments, loss/damage of any musical instrument, music systems while in transit etc. This risk can be insured against by purchasing travel insurance.

- Injury/death caused to own employees, volunteers and temporary staff due to negligence of company. This can be insured against by purchasing employer liability insurance.

- Injury/death to 3rd party for eg., members of the band, public due to negligence of the company. This can be insured against by purchasing 3rd party liability insurance.

- The company is exposed to risk of loss of revenue due to fraud/ theft by any of its employees. This risk can be insured against by purchasing fidelity insurance.

- The company is exposed to risk of loss arising due to damage to its own property like building and its contents, vehicles etc. This can be insured against by purchasing Property insurance and motor insurance.

- The organizers could also purchase insurance cover as a "benefit' for their supporting staff, employees etc. This could include life insurance, critical illness and accident covers.

**[8]**

5.

i) Underwriting can be used to manage risk in the following ways:

- It can protect a life insurance company from anti-selection, and can help avoiding giving cover to the really unhealthy lives
- It also identifies risk arising from geographical location, occupation and lifestyle.
- For the substandard risks, the underwriting process will identify the most suitable approach and level for the special terms to be offered.
- Adequate risk classification within the underwriting process will help to ensure that all risks are rated fairly and lives placed in different underwriting classes are fairly homogenous in respect of risk profile.
- This will ensure actual mortality experience is close to that expected in the pricing
- Financial underwriting is done to reduce the risk of over insurance

- Under Individual (retail) business the underwriting would be at individual life basis where as under group business, underwriting would be broad risk band based (say on the occupational classes)
- Underwriting while mostly done at proposal stage, can also be done at claims stage
- Claims underwriting is more used in pure risk contracts and helps in admitting and monitoring claims.
- It can be used to check on non-disclosure or for enforcing the exclusion clause
- Reinsurers take lot of interest in the setting up the underwriting guidelines for the ceding company. Reinsurance terms could vary based on the comfort they have with the underwriting process. Hence sound underwriting practices will also ensure that re-insurer honor claims as agreed upon.
- Good underwriting can also reduce premiums charged by -reinsurers – hence cheaper to manage

ii) Sources of information about the proposer would be:

- Questions on the application or proposal form completed by the applicant.
- Reports from medical doctors that the applicant has consulted (Family physician, Medical attendant report).
- A medical examination and report carried out on the applicant as a part of underwriting.
- Specialist medical tests (such as AIDS/HIV test)called for post initial scrutiny of application and report.
- Applicant's answers to questions asked by the company, such as lifestyle questions.
- Previous applications to this or other insurers, if such information is shared between insurers. Sometimes, insurers share data on declined lives among themselves.

**[8]**

6.

(i) It is important to perform analysis of surplus (deficit) for a benefit scheme to:

- Assess the impact of divergence between actual assumption and expected experience and hence understand the financially significant assumptions. This would help in reviewing the risks inherent in operating the scheme
- The analysis would also assist the scheme actuary to update assumptions used for funding
- To assess the cost of new benefit accrual
- It is an independent check for the accuracy of the valuation data and results, if carried out independently
- provide information for the provider’s accounts
- Also helps us understand the appropriateness of the valuation method and basis
- To help decide how to use the surplus/ deficit – whether it is a one of surplus or recurring-
- To assess the performance of the trustees and managers and
- to review Whether a change in investment strategy and tactics is required

- Would be required by legislation or professional guidance
- To monitor any trends in experience and to take any corrective action – for eg., action relating to expense management, withdrawal benefits etc.

- It is necessary to do this exercise annually as a lot can happen quickly with big financial impact and hence a need to keep abreast of things

(ii) Steps involved would be:

- Take last year's valuation: assumptions, data, method and results. This would be the starting point.
- The impact of any changes in models and assumptions-changes in benefits provided, eligibility criteria or contribution rates, any change in bases needs to be assessed and quantified first.
- This impact of changes in models and assumptions can be assessed by running last year' data and model using current year assumptions and last year assumptions and determining the difference between the two.
- Then based on last year' data, current year assumptions and allowing for expected new member additions an expected revenue account can be generated
- The modeled accounts can then be compared with actual accounts to derive deviation from expected
- The deviation can be analysed further to determine source of profits which could be due to

    - *Decrements* **–**new member additions, transfers, early or ill-health retirements, discretionary benefits or options exercised.

    - *Cash flows***–** contributions paid, investment income and gains, benefit amounts, expenses
    - *Other factors* **–** salary growth, inflation, taxation.

**[9]**

7.

i) The Basel II capital adequacy framework for banks categorizes risks as follows:

- market risk- Essentially market risks are the risks related to changes in investment market values or other features correlated with investment markets, such as interest and inflation rates.
- credit risk – It refers to the default on loans issued by the banks and defaults on other bank investments e.g. the bonds it holds-the issuer of a corporate bond defaulting on the interest or capital payments. The term credit risk is sometimes also used to describe the risk associated with any kind of credit-linked event. This could include changes to credit quality (up or down) or variations in credit spreads in the market as well as the default events described above.

- Operational risk -Operational risk refers to the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events.

ii)

Market risk-

- So far the bank has been operating in the short to medium term space which might be well matched with its liability portfolio of short to medium term deposits.
- Introduction of the long term mortgage product will change its asset profile which if not matched by changes in term deposit profile will expose the bank to market risk due to mismatch in asset and liability cash flow profile.
- Note for the bank mortgage loans are assets and term deposits are liabilities.
- If the mortgage loans are based on floating rates and the source of funds (like term deposits) are promised a fixed rate of return, this will also lead to an asset liability mismatch. The reverse, i.e, borrowing on floating rate and lending mortgages on fixed rate will also have similar impact.

Mitigation-

- Ensure suitable source of long term finance can be found
- or limit the mortgage portfolio to the extent that long term borrowing is available
- Ensure terms offered are similar- fixed/fixed or floating/floating

Credit risk

- The risk that a borrower is unable or unwilling to make payments required under the mortgage agreement.
- If they do default, then there is the risk that the value of the security taken (the property) doesn't cover the loan.
- The risk that the borrower has an inability to meet payments when they fall due because of inadequate cash or other liquid assets.
- There may be concentration of risk by location or regional economy or industry sector. For example, many borrowers working for a same firm which suffered bankruptcy may default loan payment.
- Further Concentration means non-independence of risks, so if value of 1 property fall, it is likely that others properties in the same location/region will suffer in value as well.

Mitigation

- Follow fundamental principles of good lending
  - Assess Character and ability of borrower
  - There should be a healthy margin between borrowed amount and the expected value that can be realized on sale of property- give loan for 70-80% of the value of the property

- Securitization of whole/part of the loan portfolio
- Purchase insurance for protection against default, if available
- Relate the loan size to the income of the borrower and
- restrict size of this new business absolutely and relative to other business, to avoid over exposure to a single line of business.

Operational Risk-

- Since it is new product there is operational risk due to lack of prior experience in assessing creditworthiness of individuals, hence inadequate systems and process
- Property valuation requires expertise and the bank may have limited or poorly trained personnel manning these areas and
- Risk of fraud and non-disclosure by customers. Dealing with retail customers comes with its own risks as opposed to corporate customers which is the existing client base for the bank
- Modeling risk associated with new systems/models and the fact that bank may actually not be able to hedge long term interest rate risk

Mitigation

- Recruit people with knowhow, train existing staff on the requirements
- Develop systems and processes and have the same reviewed to ensure all key controls are in place
- Conduct audit (internal/external) to test the effectiveness of control measures put in place
- Purchase insurance against fraud by staff, officers etc if available
- Mitigate model risk by comprehensive testing and employing skilled staff

**[11]**

8.

(i) why high lapse rates:

- Assumptions used in pricing were wrong eg lapse was more linked to economic conditions or investment returns than expected.
- Relative to competition
    - The policies could have been sold inappropriately/ aggressively
    - This could be because company is paying higher commission than competitors
    - Inappropriate or inadequate selling process must have been used compared to competition
    - Higher pressure marketing techniques were used,
    - So the sale was not on "need – based". After sometime when the customer realizes what he has been sold, he was more very likely to discontinue/ surrender it compared to competition

  - The surrender values offered was too lucrative compared to competition, which is causing higher surrenders
  - Availability of Longer cooling off period compared to competition, i.e more chance for policyholders to reconsider
  - Surrender values might have been guaranteed, hence in a falling market people might cash-in.
- Pure risk contracts are very price sensitive and easily comparable across companies. If the customer has realised that the same product is available cheaper elsewhere or the same insurer has introduced a similar product with lower premiums, he is likely to withdraw and re-enter

- For regular premium term assurance business, the problem is that on a lapse the policyholder doesn't lose anything since no benefits are paid (no reserve built up) – hence lapse could be very attractive to customers if he gets a better rate elsewhere

- This could happen if the company's premium rates are higher (due to higher commissions, overhead expenses, higher profit requirement etc)
- Under reviewable charges, if the company has recently revised its charges upward, then it is quite likely for withdrawals to increase
- If the company has had bad fund performance over the last year compared to the competitors, then there could be some surrenders on the savings contracts.
- Other bad performances like poor customer service (due to new admin system, change in processes, etc)
- Bad publicity due to a claim rejections
- If the company has been focussing on a particular market segment, which has a higher withdrawal rate than the general population
- Any bad media coverage about the financial strength of the company, there would be a run on the company after such news

(ii) Steps to reduce policy lapses:

- The exact reason or reasons should be evaluated before any action taken
- Should do channel / agent wise analysis to see if there is any particular group of agents/channel whose customers are withdrawing
- Similarly we should also attempt to talk to the recently withdrawn customers to understand the reason for their withdrawal
- Improve areas of customer service- more touch points for paying renewals
- Improve areas such as claims processing, customer query handling, etc.
- improve the admin system and other support required for the staff to deliver the same
- Improved training levels to the sales force and customer service staff
- Provide "need based analysis" tools, etc for the sales force

- Strict enforcement of the sales process, all documentation to be audited or verified
- Welcome calling to the customer to understand, if the customer knows what he is purchasing
- Renewal chasing should part of the sales forces mandate
- Let the incentive structure be based on better persistency; have level commissions or have claw back provisions
- Encourage direct debit/ ECS methods of payment so that withdrawals are lower compared to cheque/ cash payment of premiums
- Any redesign of the product should be done, compare the products and premium rates with that of the competitors
- Decrease the surrender values to dis-incentivise surrenders;
- give loyalty additions which will encourage persistency
- Ensure the target market for each product line is clearly identified and need based selling is encouraged
- Improve brand image, reputation through appropriate advertisements/ promotions
- Project financial strength in public disclosures, for customers to get confidence about the company
- For term assurance, consider offering guarantees on renewal, conversion options or renewal with no extra underwriting even if sum assured is increased (within limits)

**[12]**

9. (i)

- For pricing/re-pricing an actuary needs future costs so what you have may from current study may not be a good guide to what you need. The actuary needs to determine the long term estimated unit costs for pricing/re-pricing any product.
- Since it is new rapidly growing company, it may be in a state of expense overrun. Expense overrun means current units costs are relatively high and may be expected to fall as company achieves economies of scale

- The starting point for determining long term unit costs would be estimates given by the finance team.

- The total costs attributable to various activities could include expenses which might one off be in nature-system costs, cost of setting up of distribution channel etc.

- The total costs for each activity must be recalculated removing the impact of these first.

- Then a business projection based on existing business and estimated new business volumes for the future must be done. Ideally this should be done until the business reaches a level of stability (no of polices coming in is comparable to that going out)

- Any Business projected should take care of all the expected movements in the data- death, maturity claims, lapses, surrenders etc

- New business volume should not too aggressively projected, else the derived unit costs will not be able to cover the overheads

- Corresponding expenses split by fixed, variable should be projected based on expected existing and new business volumes

- While projecting fixed costs , impact of salary or price inflation should also be allowed for

- The long term expected unit costs can then be determined as that cost per policy which allows full expense recovery when the company achieves a position of stability.

- For pricing, the unit costs will be used without any margins for prudence .Best estimate unit costs should be used for pricing/re-pricing.

- While pricing/re pricing, risk associated with mis-estimation of long term unit costs, might be reflected in the Risk discount rate used for determining the profitability of the premium rates

- However some adjustments could be made for:
    - How competitive the company needs to be will determine if we need any additional margins over the estimates
    - What is the period the premium rates would be applicable. Short term or long term

(ii)
Specific additional modifications that would be required for year-end Valuation:

- New business unit costs would not be used for reserving
- The long term unit maintenance and claim unit costs used in pricing/latest expense analysis should be increased by a margin for prudence.
- The extent of prudence would depend on the regulatory regime and solvency capital requirements.

- If the explicit solvency margin is high, then the prudential margins could be low. But if the explicit solvency capital is low, then it is necessary to have higher margins for prudence in each of the unit cost

- Maintenance and claim unit should be loaded as a specific allowance in the valuation basis, applied to each policy and each expected claim.

- Investment costs would be allowed for by a deduction from the valuation interest rate.
- Existing valuation regulation may imply using several different expense bases for valuation

Special expense provision could be required in valuation for-

- Some jurisdiction require than if company is in a state of expense overrun (which is likely for this company), provision in the valuation should be made for these expense overruns. or

- Regulations might require the valuation actuary to ensure expense assumption used in valuation would be adequate even in a scenario where company is closed to writing any new business

**[12]**

10.

i)

To estimate the premiums for a health insurance product we need to decide on suitable assumptions for the parameters - expected claim frequency, expected cost per claim, expected expenses- acquisition, maintenance and claims related and expected lapse rates.

Data available with the company are mortality experience under various long term life insurance products, morbidity experience under CI product and expense experience related to these products and overall overheads. What is required for pricing is morbidity experience and since current experience are from very different products it is unlikely that existing data will be very relevant

Mortality experience will give a general understanding of cause of death at various age groups, though it may be of some relevance, will not give any idea on hospitalization history or treatments costs etc.

Data requirements for pricing an indemnity type health insurance product are very different from the products currently being sold by the company. We need expected claim frequency i.e. claim incidence rates for each benefit or treatment category separately. Incidence rates for CI cover may be available but it is limited to certain illnesses (covered under the plan) only.

Moreover the underwriting, policy exclusion and waiting period for claims admissibility are likely to be different compared to existing critical illness product. The data in respect of cost for each type of benefit will be required which will not be available with the company since its existing critical illness product is a fixed benefit product.

The expenses are also likely to be different for health insurance, for example, health insurance contracts are likely to have higher underwriting costs both at new business as well as claim stage as expert knowledge is required for evaluation of detailed medical information.

In addition, assumptions will be required for claim cost inflation, future medical advances, earlier diagnosis possibilities for setting a fair premium rate which though relevant for a critical illness product is likely to be far more crucial for indemnity type products.

ii) Other sources of data are:

- Reinsurers' data – provided in return for share of business. Fairly relevant and credible expert data source.
- Population data – credible, but problems of relevance due to non-insured lives and different definitions of sickness from insurance claims.
- Industry data – more relevant than population data, but very heterogeneous due to varying policy terms, underwriting and claims management practices, different network of hospitals used –cost variances could be high across hospitals for same treatment protocols
- Studies published by hospitals, other relevant groups on average days of stay for differing treatments, costs for varying treatments, reasons for stay in hospitals etc if available
- Data available with Third party health claim administrators, if such data is available for sale
- Data if published in other countries with similar socio-economic profile, similar ethnic groups etc. in determining claim incidence

iii) Risks in offering indemnity type health insurance product:

**Claims Risk-**

- **Risk that claims experience is worse than priced for**.

- This being a new product line for the insurer, it will lack relevant internal data making it difficult to ascertain likely claims experience. There is a risk that basis, model and assumptions based on which the premium has been arrived at may be incorrect.

- The cost of the benefit may change if new medical treatments develop or health care providers increase costs of treatment which has to be paid for.

- Increase in claim frequency. This may be due to:
  - Longevity risk- improving mortality, so insured live longer (though not necessarily in good health)

- General awareness on medical issues and treatments increase so that more people require treatment or go for screening and subsequently treatment

- There is a risk of anti-selection if the underwriting norms are perceived lenient to other insures in the market. This could lead to unhealthy lives taking the product leading to risk of underestimation of claims rate.

- There is a risk that the underwriting process is inadequate/incorrect leading to worse than expected experience. This is especially likely since the company is offering the product for the first time and so will not have past expertise of underwriting health indemnity products.

- There is risk of selective withdrawal/lapses i.e. those in better than average health withdraw, if the premiums are perceived to be higher compared to competition.

- Catastrophe risk- Outbreak of local illness, epidemics etc. leading to high number of claims than expected.

- Although premiums are reviewable every year, competition, policyholder expectation and regulatory constraints may prevent the company from increasing the premiums in line with medical inflation, worsening claim trends or expenses. Hence there is risk associated with inability to raise future premiums for existing business or charge appropriate premium for new business in line with expected claims experience.

**Expense Risks –**

- **Risk that expenses are higher than expected.**

- There will be a large capital strain due to designing, developing system, training staff and agents and launching this new product before money is gradually recouped over time from sales. There is risk of not achieving adequate business volumes leading to higher expenses than allowed for in pricing leading to loss.

- Alternatively, sales volumes could be too high, leading to an unacceptable level of new business strain. New business strain is likely to be due to high first year commissions and high initial expenses

- There is a risk that claims handling expenses are greater than expected, *eg* due to inefficient processes or more small claims with proportionately higher expenses than expected.

- If business volumes are lower than expected or lapses are higher than expected fixed expenses recovery will not happen.

- With no expertise in claim management of this product, there is risk of poor service standards than industry and customer dissatisfaction leading to bad publicity and loss of overall business and lower expense recovery than expected.

**Other Business Risks**

- Risk of default by reinsurer
- Worse than expected investment performance
- Operational risks associated with failure of people, system and process, especially likely since this is new product line for the company
- In health insurance there is more scope for fraud, since claims can be exaggerated or falsified more readily by customers some times in collusion with health care providers.
- Any change in legislation affecting premiums, claims, reserves or investments.

iv)

Advantages

- Claims management in case of health insurance requires expert knowledge for the evaluation of medical information. Training the existing staff or hiring new staff with expertise in medical field may not be cost effective unless there are suitable large volumes of business.
- Hiring of TPAs may make the claim administration simpler and cost effective for the insurer in the initial few years as it builds up business volumes and expertise.
- Engaging TPAs may allow the insurer to launch its new product line faster than if it had gone for in-house claims management.
- TPAs are likely to have well connected network of hospitals, preferred providers, which would allow better control on claim costs.
- Passing certain processes in the business chain like claim assessment, claim approval and claims settlement to experts will reduce the insurer's risk.
- The TPAs are likely to be regulated by the insurance regulator. So there will be some control and checks on them.
- Aligning with TPA will also give some valuable insight on health indemnity claim frequency and costs especially if TPA plans to share its past experience.
- The TPAs could have better systems, economies of scale and/or expertise, which the insurer could use to build up their own resources.

Disadvantages:

- Loss of a crucial tough point with customer – which is at the time of claim settlement which could lead to certain level of apathy for the business within the company
- Loss of control over processes. TPAs may carry the business in their own ways which may go against the insurer.
- TPAs will be seen as being representatives of the insurer. If their poor service leads to customer complaints, this will reflect badly on the insurer's reputation.
- TPA may be more interested in maximizing its profits rather than on risk control and mitigation or enhancing customer experience. If the TPA does not do its job properly it may actually lead to increase in claim costs.
  For example, poor claims underwriting can lead to claims being accepted which were not allowed for in the pricing, resulting in increased claim costs.
- If the TPA has poor data management system or there is failure of systems and process, it will be very difficult for insurer to monitor its own claim experience and take corrective reaction.
- Delay in communication of information between TPA and insurer will lead to delay in making provisions for claims or inadequate provisions being made.
- All the claims data will be available with the TPA, this may lead to risk of misuse of the information.
- TPAs may increase their costs more frequently than insurer can raise its premiums, in which case, this could lead to some loss for the insurer.
- It is unlikely that any single TPA will have pan country presence or a TPA might be strong on one geographical area only. Company might be forced to employ several TPAs and in the long run managing multiple TPAs might prove costly.
- The fee structure levied by the TPAs may be such that it may have high hidden charges.

**[26]**

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