# Institute of Actuaries of India

## Subject CA1-II – Actuarial Risk Management

## May 2014 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 :**

- Use of a notional portfolio to value assets incorporates the advantages of a discounted cashflow valuation without the practically difficulty of valuing each asset individually.

- Speed of calculation
- Valuation results should not be influenced by the tactical investment positions taken

- Valuation result will be stable
- Investment strategy is not influenced by the valuation results
- It will be consistent with the discounted cashflow method used in the valuation of the liabilities
- Needs to be careful to make sure the notional portfolio is selected carefully and
- Reflects the long term realistic investment scenario
- It may be difficult to convince the proponents of the market value method of valuation, why we are using a fictitious portfolio for valuation assets.

**[5 Marks]**

**Solution 2 :**

**i)** if the inflation is underestimated in the claims reserve calculations:

- the liabilities will be understated
- excess of profits declared, leading to higher dividend payments,
- more tax payments
- increasing the expectations of the shareholders, which may not be possible to maintain in the long run
- the solvency will be overstated
- investment might take an aggressive position which might not be appropriate
- inappropriate reinsurance arrangements in place
- if this assumption is used for pricing, then premium rates charged would be too low
- later on increase the premiums to appropriate levels would have lot of marketing resistance
- there could be issues with the regulators too.

**[5 Marks]**

**Solution 3 :**

**i)** A Life insurer will invest in money market instruments because:

Attractive returns

- On a short term basis, money market instruments must be fetching attractive yields.
- This could be because of uncertainty in the financial markets, beginning of recession, or a temporary increase in interest rates

Known short term liabilities

- Some liabilities would be short term in nature, this would be used to match the liabilities

Uncertain outgo

- Some institutions have higher uncertainty of cashflows, in such cases the company would want to maintain higher levels of liquidity
- If the insurer's portfolio is small, the volatility in the outgo will be higher, needing more liquid assets

Opportunities

- Good investment opportunities are available only for very short durations, to make the best of those opportunities, it is important to maintain liquid assets

Recent receipt of large cashflow

- New premiums will be bringing cash into the system on a daily basis, if the company is expanding well, the cashflows will be good. The company will look for good investment opportunities and invest long term, in the mean while it will keep the funds invested in money market instruments.

Preservation of nominal value of capital and risk aversion

- if the insurer is highly risk averse or wants to protect the capital, they are likely to invest higher proportion of money market instruments.

**[4]**

**ii)** under certain economic conditions it becomes more attractive to park money in the money market instruments, they could be:

- generally rising interest rates, will make the bonds unattractive as the prices will fall
- also with rising interest rates, borrowing becomes expensive, industrial growth slowing down, equities are not expected to do well
- the start of recession, when equity markets may be expected to suffer from lower growth
- also at the start of the recession bonds may suffer from increase in government deficit.
- At such a time money market instruments will be more attractive as it not only provides a steady cashflow but also protects the capital.

- weakness of domestic currency, short term interest rates may be raised by the government in order to defend the domestic currency
- also weakness of domestic currency, will make cash investments in other currencies attractive
- also in times of general economic uncertainties, money market instruments will be a better option for the short term.

**[4]**
**[Total Marks-8]**

**Solution 4 :**

**i)**

- Investment policy should be appropriate to the nature, term and currency of the liabilities and the risk appetite of the investor
- Subject to the above, one should maximize the overall return on the assets, overall return includes both income and capital
- The liabilities are fixed in monetary terms , except for the uncertainty associated with how long the payments have to be made.
- The amounts are known hence fixed income bonds are best suited
- Company needs to earn in excess of 1% over the G-Sec rates, to make it profitable for the insurer.
- It can do that only it invests in assets other than G-secs. But it runs the risk of mismatch/credit defaults.
- Corporate bonds are known to provide higher return compared to G-secs to reflect poor marketability and the risk of default. In case of good rated bonds, the risk of default is manageable, atleast better than for equities. Risk of lower marketability is also fine as it is not a concern if the portfolio is matched by term and hence would be held till maturity.

- Equity is supposed provide overall higher return in the long run compared to G-Sec

- But equity returns can be volatile and the risk of default can be higher.
- Also there is no guarantee that the minimum yield would be earned over a given duration.

- As the amount of return on equity is unknown it is not a good match to the known cashflow of annuities
- Future expenses are likely to increase with inflation and a matching asset with similar characteristics is appropriate. Equities or index-linked bonds may be a good match.

- The investment strategy does look to be on the riskier side which means company may be required to hold higher provisions as well as capital. but if,

- The shareholders have the risk appetite and company is adequately capitalized the company may be justified in following this strategy

**[7]**

**ii)** Alternative strategies

- It has to earn more than 1% return over that available on G-Secs. The alternatives should support this objective.

- Company can invest in G-Secs and earn the extra return through active portfolio management. However if more than 1% can be earned through active portfolio management is doubtful.
- Also the returns will have to be taken net of any dealing costs.
- Invest in overseas bonds which might give higher returns, however the company is exposed to currency risk.
- Also dealing costs in overseas bonds could be higher

- Any alternative investment portfolio has to be assessed along with the level of capital that may be required to support the strategy. More the free assets, more risker/ mismatched the strategy that can be adopted.

**[3]**

**[Total Marks-10]**

**Solution 5 :**

- Need to check if the business objectives are met
- Is it the best use of capital for company x
- What other opportunities are there
- Company L is in a niche market, and since parent is big in property market may be it has some captive business from home insurance customers of Company G. This captive business may be lost on takeover.
- Hence split of business in Company L between captive and others and ability to secure future new business from other than captive business is important
- is company X already present in that market, will there be an advantage to get into a new niche market through Company L. Or if not,
- Can company x make inroads into that market without the take over.
- What will be the good-will company x will have to pay
- Company x is a medium sized company, is there limitation of capital.
- Will it have to raise capital for this purpose or does it have enough capital to invest
- Check the solvency position before and after the take over

- What should be the new structure, should company x maintain company L as a subsidiary or merge the business into its business
- Standard risk assessment exercise will have to be conducted
- Will the business be able to run on two administration systems or will two systems be maintained for a while, for how long
- How and by when the underwriting, policy servicing and claims practices of the two business be aligned
- The policy conditions may not allow certain alignment, then two versions will have to be maintained
- Company X writes par and non-par business, will the portfolio of Company L be part of the par fund, non-par fund (if already separately maintained) or a ring fenced fund be maintained for this portfolio.

Staff issues need to be considered:

- Where are they located
- Do we need to move them around, will all be willing to be transferred
- Are the remuneration levels aligned
- Are there locations where both companies have branches, in which case, there may be need to close down one. What about the staff in such branches
- What are the redundancy terms and who will fund them
- How are the employee benefits aligned between the companies
- Are there any pension issues to be considered
- Does company X want to retain some of the company L branches, or move all administration and staff to its own premises
- Is there any taxation synergies or disadvantages
- Will the per unit expenses go up or reduce due to increase in business size
- Company staff work culture may be different, this might be issue for some period
- Is there any regulatory approval required or tax authorities approval required

**[12 Marks]**

**Solution 6** :

**i)** The key factors to be considered are:

**i.** Asset share

- Asset share is the retrospective accumulation of the premiums less expenses and cost of cover at the actual rate of return earned on the assets
- For any contract this should be starting point for setting discontinuance terms. It will be the maximum the company can afford to pay
- The company could actually pay more or less than this value, which may depend on durations
- Another factor to consider is how does surrender value compare with reserving basis i.e. may want surrenders to be source of surplus or at least not a deficit

**ii.** Policyholder expectations

- At shorter durations, it is possible for the policyholder to compare it with the premiums paid (with some interest)
- However the asset share at this stage is usually less than the premiums paid or sometimes even negative
- The insurer might be willing to take some loss or reduced profit so that the surrender value does not appear too low compared to the premiums paid
- Regulations may specify what to pay in these circumstances
- Closer to maturity- discontinuance value would be expected to be closer to the maturity value as per the contract.
- Discontinuance terms have to allow for PRE created by statements in policy/ sales literature etc.
- In respect of with profit business some allowance may be needed for any bonuses i.e., may want to pay more than just guaranteed benefits

**iii.** Competition

- What the competitors offer is equally important.

**iv.** Other practical considerations

Ease of calculation

- Cost of implementing systems to calculate discontinuance terms
- Frequency of change of the discontinuance terms.

**[6]**

**ii)**

why surrenders could have increased:

- better product in the market, customers do not want to continue the existing policies
- same company has introduced a new product with better charging structure
- bad fund performance and low bonus declarations compared to competition
- general economic recession, customers not able to pay renewal premiums and want to cash in on their existing policy
- adverse publicity about the financial condition of the company, so there is a run on the company
- the companies agents must be encouraging surrenders to churn the money into new business
- the policy must be in-the-money, so the surrender value must be lucrative (this should not be the case, given that the company is making a lot of surrender profits, as informed in the question)
- bad publicity about insurance products or any operational lapse
- tax or regulatory change, which makes investing in insurance policy not attractive compared to other financial instruments
- very high interest rates; investors want to reinvest their investments in the higher interest rates
- must be happening to all the insurers; industry problem
- a major sales channel moving out of the insurer (like a broker or a bank, usually their customers are loyal to the bank or the broker and would like to move with them)

**[4]**

**iii)**

Insurer needs to consider:

- clearly there are two different issues to be examined, one why there were so many surrenders and how to control that and secondly, should the surrender values to so low, resulting in high surrender profits to the insurer.
- Why so many surrenders
  - if it is an industry across issue or company specific
  - if it is because a major sales channel moved out, can we retain them somehow. Can we run campaigns to the customers to explain taking a surrender value might not be best financial option, instead they should continue the policy
  - if any bad practice of churning of business happening, that needs to be curbed. It can lead to loss both to the customer and the insurer, with the intermediary benefiting
  - give public information/ advertisements to explain why it is bad value for customer
  - if surrenders happen, per policy expenses will start going up. So should try to stop it.
- High surrender profits
  - In the initial years surrender values will be low compared to premiums paid, but here seems the surrender values are consistently lower than the asset share.
  - Surrender value should be close to the asset share, need not be 100% as some penalty should be applied to those surrendering compared to those continuing
  - It can become a bad marketing point, if your company’s SV s are lower compared to the competitors
  - Compare what competitors are paying, what you are paying in other product, if surrender is happening in only certain product.

- Continued surrender based profits might attract regulatory intervention

**[3]**

**[Total Marks-13]**

**Solution 7 :**

- Define Economic capital as s the amount of capital that an insurer determines is appropriate to hold given its assets, its liabilities, and its business objectives. Typically it will be determined based upon the risk profile of the individual assets and liabilities in its portfolio, the correlation of the risks and the required level of security that the company desires.
- The risks will have to be assessed for different product types separately
- For risk products, the risk is of under estimation of the insurance liabilities and adverse claims experience compared to that assumed in the calculation of the technical reserves

- This could arise due to
  a. Volatility in claim experience which is the risk of random fluctuation.
  - Mortality risks are diversifiable but this may not hold true for small portfolios.
  - Smaller portfolios will have larger volatility risk than larger ones and hence may need to hold a higher capital for the same target level of security.

  b. Uncertainty - This is the risk associated with using the wrong model to
  - estimate the claims (model risk) or from an inaccurate estimate of the parameters used for the models.
  - If the company did not have adequate experience to set premiums and has used industry, reinsurer help to set premium rates, then the risks mentioned above assume greater significance.
- Accumulation of risks and extreme events- Is the risk of low frequency and high severity. There could be accumulation of risks by geographical locations. This would increase the risk to the company due to manmade and natural disasters.
- Anti-selection and moral hazard- Arising due to weak underwriting/claims process relative to competition or due to internal process failures.
- Reinsurance risk - Credit risk arising from reinsurer default also a principal risk to be considered.
- Selective lapses- The market for risk products is likely to be highly competitive and a company is always exposed to risk of selective lapses leading to deteriorating mortality experience.
- Expenses are relatively high compared to the premiums for risk products
- Expense inflation is a risk as the premiums would be fixed.

- In respect of the Unit Linked Plan the principal risks to be considered are
  - Market risk – risk associated with fall in value of assets and asset liability mismatching. If the product has any form of guarantee, then it exposes the company to significant risk of the guarantee biting. If the guarantee bites, it could bite for every policy hence its cost could either be huge or trivial (if it doesn't bite).

- o Credit risk arising from asset defaults – default arising from assets will be reflected in unit price. Here again, if there is any minimum value guaranteed, then the risk takes more importance
- o It can hedge itself against the market risk but this will expose it to credit risk from counterparty default.
- o Hedging becomes expensive if the size of transaction is not very big. Dealing costs also gets expensive in such customized deals, exposing the company to expense risk
- o There is also risk of reducing the potential return due to hedging
- o Policyholder behavior, it is difficult to model and hence hedge based on future policyholder behavior on lapsing the policy or surrendering, etc
- o Operational risks from failures in processing the hedge programs, unit pricing systems or error in recording unit transactions.

**[14 Marks]**

**Solution 8 :**

**i)** why only through the wedding planner

- They are in the business of managing the wedding arrangements
- They have direct access to the potential customers
- This can be a part of the wedding planning process, there is a natural connect in the selling process
- They already have a good brand name, the insurer can take advantage of that
- They potential customers will definitely trust the wedding planners more than the insurers
- Also there is a high chance of the customer to be convinced of a need of insurance while making the overall plan; separately they might think of it as an additional expense (which they may not feel the need to take at that time)
- They will have all the necessary data for rating,
- If the data requirements are directly taken from the system of the wedding planner, it will reduce the cost of administration also
- It is a new market, and the wedding planner are experts, so pricing becomes easier
- Insurer will gain access to data of a wide range of potential customers. This could be useful in cross selling other products.

**[4]**

**ii)** Risks policy can cover could be:

- Damage or loss of
  - Wedding dress
  - Wedding rings
  - Wedding presents, etc
  - Wedding arrangements (decoration)
- Failure on part of any of the suppliers prior to the wedding
- Failure on part of any of the services

- Photographs/video
- Venue decorators
- Transport
- Flowers suppliers
- Catering services
- Entertainment [Max 1 ½]
- Legal expenses
- Public liability
- Weather related
- In case of outdoor wedding arrangements; rain on the wedding day
- Any other natural perils causing the cancellation of the wedding [Max 1 ½]
- Other man-made perils
- Like riots, political unrest just before/ on the day of the wedding

**[5]**

**iii)** Rating factors:

- Rating factors are the factors the insurer will use so as to distinguish premium rates for different levels of risks
- The insurer needs to consider which factors will cause the chance of a claim to vary.
- In this case it is more likely to be a subjective exercise since detailed claims data may not exist. Even if it does, the insurer may not have access to it.
- the cover will be indemnity cover, covering the amount of loss at the time the event occurs.
- Hence the most significant and quantifiably variable risks is due to cancellation and liability costs.
- Claims for other perils may be more uniform across the insured population.
- Other factors could be:
- Age: younger people being more likely to claim.
- Location: some places may be more prone to claim (urban Vs rural)
- Income or social class : higher income groups may be less prone to claim
- Marriage: first marriage or subsequent – first marriages are more likely to claim. This is to some extent also linked to age too.
- Special premium to be charged if it in exotic locations or some destination weddings, etc. There could also be some exclusions
- Having too many different rating factors can be complex and may reduce marketability
- To simplify, the insurer can offer a menu of covers, which the customer can choose from and premium rates can vary depending on the risks chosen
- Premiums can also vary by ticket size, as the per policy expenses would be lower for larger premium policies.

**[5]**
**[Total Mark-14]**

**Solution 9 :**

**i)** The factors which may lead to contribution risks for both defined benefit and defined contribution schemes are stated below:

- loss of funds due to fraud or misappropriation by any parties
- incorrect benefit payments to the members
- inappropriate advice by the advisors
- administrative costs, *e.g.,* to comply with changes in legislation
- decisions by parties to whom power has been delegated
- fines or removal of tax status resulting from non-compliance with legislation
- changes to tax rates or status by the tax authorities or the government
- personal risks, such as jail or disqualification from office, for directors or trustees

**[4]**

**ii)**

- show the financial effect of divergences between the valuation assumptions and the actual experience, exposing the assumptions that are the most financially significant
- validate the calculations and assumptions used
- provide a check on the valuation data and process, if carried out independently
- identify non-recurring components of surplus, thus enabling appropriate decisions to be made about the distribution of surplus
- reconcile the values for successive years
- provide management information
- provide data for use in executive remuneration schemes
- provide detailed information for publication in the provider's accounts
- demonstrate that the variance in the financial effect of the individual levers is a complete description of the variance in the total financial effect
- give information on trends in the experience of the provider to feed back into the actuarial control cycle.

**[5]**

**iii)** **Option 1 :**

- Consider the nature of the surpluses. The surplus from equity sales appear to be a one off while the surplus from other sources is still small and some components could be one off (like change in assumption)
- Ideally the source of surplus should match the use to which surplus is put to.
- The surplus from equity sale is a One off. The temporary contribution reduction is also a one-off benefit.
- Consider the employer's contribution requirement. If the employer fully sponsors the scheme, the employer is required to pay additional contributions when strains arise, then it is highly reasonable for the employer to benefit from surpluses.

- Consider the nature of the benefit improvements. The improved pension escalation rate is an ongoing benefit, as it will apply to future accruals of service (and possibly also salary in a final salary scheme), as well as to past service for both current and former employees.

- Whether the employer leaves the surplus in the scheme against future strains, or withdraws it, accepting the need for future additional contributions, is not significant. The former increases members' security should the employer have financial difficulties.

- A reduction in the employer's contributions should increase the strength of the company and this should improve employment prospects. This may be an important factor to staff concerned about any further reduction in staff numbers.

**Option 2**:

- It may be the case that the additional benefit is affordable for the expected future membership of current scheme members, and new members will have to pay more or not be eligible for the benefit.

- It would be necessary to consider the perceived value of the pension increases. Although the long term inflation proofing guarantee is valuable, it may be that in the short term pension increases may even be expected to be below 3%.

- The employer may feel no duty of care to former employees, and reject any proposal to improve their benefits.

- Past decisions on distribution of surplus will influence expectations of employees.

- It will also be necessary to consider scheme rules, legislation and regulation, and the scheme's investment strategy.

**[10]**

**[Total Marks-19]**

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