Institute of Actuaries of India

Subject CA1-I – 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 :

- Restrictions on the type of business an insurer may write-i.e., ban certain lines which are perceived to be risky, capital intensive or unsustainable
- Limits on the premium rates that may be charged to new customers and premiums charged on renewal,
- Restrictions on company's new investments, e.g., invest in safe investments like government bonds,
- exit from perceived risky investments e.g., unlisted shares,
- Requirements to provide information on more frequent basis than normal
- Control of sales outlets and scrutiny of new business growth plans. E.g., might ask company to review existing sales agreements to cut new business costs
- Restriction on management expenses,
- Restrictions on volumes of business that can be written or completely stop writing new business
- Restriction on type of reinsurance arrangement
- Review of profile of senior staff and directors and even ask for a change.

[5 Marks]

Solution 2 :

i) Anti selection:

- When people take out contract with an insurer when they believe their risk is higher than what the premium charged allowed for, it is termed as anti selection.
- Anti selection can also occur when a policyholder has the right to exercise an option or a guarantee. Those who will gain the most from the option or the guarantee are more likely to exercise it.

Moral hazard:

- Moral hazard is related to information asymmetry, where the party having more information causes action and the other party has to bear the consequences.
- They would behave inappropriately or less carefully than they would otherwise, leaving the other party to bear some of the consequences of the action.
- This is not same as anti selection which is also taking advantage of particular aspects of an insurance contract, but within the terms offered by the insurer.

[4]

ii) Examples of anti-selection:

- Insurability option, where a policyholder can increase the level of life cover without supplying medical evidence, are more likely to be exercised by lives in poor health. Healthy lives may find it cheaper to just buy a new policy subject to full underwriting.
- Household insurance, the policyholder may be aware of inherent risks in the quality of construction of the house (for e.g., Old wiring which increases the risk of fire and related risks)

- Option to surrender a policy for Guaranteed surrender value in a life policy which is exercised when the markets are on a down turn.

Examples of moral hazard:

- In Household insurance under-insuring contents, yet claiming full value for items lost / stolen
- Deliberately not revealing certain details about one's health (like Blood pressure, recent surgery, etc) in the insurance proposal form, as it might attract extra premium or rejection of the proposal.
- Behaving less carefully : After purchasing automobile insurance, some may tend to be less careful about locking the automobile thereby increasing the risk of theft or an accident for the insurer.

[3]

[Total Marks-7]

Solution 3 :

i)

- There are no shareholders and profits belong entirely to policyholders unlike proprietary where company is owned by shareholders.
- Proprietary companies may be subject to specific regulation about how to distribute profits between shareholders and any with-profit policyholders
- Mutual essentially involves someone lending the initial capital, but without any requirement for the loan to be repaid unless profits emerge.
- Shareholders provide the capital in proprietary companies and are compensated by dividend payouts
- Mutual societies can't readily raise finance by usual methods unlike proprietary companies which can make a rights issue to raise capital from existing shareholders or raise capital through public offering
- Mutuals may provide better benefits for the same cost (as proprietary) as no funds are diverted to provide a dividend stream to shareholders, but
- Product offering by mutual may be more restricted or more highly priced (especially those that are capital intensive) than proprietary companies
- Public limited proprietary companies have greater economies of scale and may Have more dynamic management than mutual

[6]

ii) The range of financial tools available to a mutual company to help them in their capital management include the following:

- Reinsurance – to reduce the amount of capital required
- Financial reinsurance (FinRe) – a reinsurance arrangement that provides capital, typically by exploiting some form of regulatory, solvency or tax arbitrage
- Securitization – which in its most general form involves converting an illiquid asset into tradable instruments

- Subordinated debt
- Banking products – including liquidity facilities, contingent capital, senior unsecured financing and derivatives
- Derivatives
- Internal restructuring – including merging funds, changing assets, weakening the valuation basis, deferring surplus distribution and retaining profits.

[2]
[Total Marks-8]

Solution 4 :

i) Main areas of risks are

- Investment returns are lower than expected
- The mortality rate is lower than expected
- Expenses to administer the scheme and data maintaining are higher than expected
- Costs of administration may turn out be high than expected. Administering such a scheme may be expensive - e.g., establishing claim eligibility.
- Expenses inflation is higher than expected
- Estimated cost of total funds requirement at the beginning is lower and hence lower share from the government
- Administration of the scheme may face several operational risks such as ensuring payout reaches family and fraudulent claims are detected.
- Data availability and data maintenance , as the same may not be available at the right time to payout benefits
- Risk of Fraudulent payments - Risk of scheme being abused- bogus claims, moral hazard

[4]

ii) The main objective of the investment strategy would be to meet liabilities as they fall due.

The investment strategy will need to consider the following aspects of its liabilities

- The nature of liabilities –it is fixed in monetary amount but some outgo may be inflation related for e.g., institution will incur expenses in maintaining its office and paying salaries to its staff.
- The currency of the liabilities would appear to be in local currency
- Term of liabilities is long and payout timing is also uncertain as benefit is payable on achieving certain qualification and marriage.

The charity should also consider the following tax aspects

- Its own tax position
- Tax treatment of different investments

Other issues that need to be considered

- The extent of risk it is willing to take on its investments
- the expertise and resources available to the charity to decide, implement and monitor an investment strategy

- It is likely that as a charity, the institution could be subject to statutory or legal limitations on the types of investments it could make.
- Further, the charity could have its own internal norms on allowed asset classes (e.g. ethical investments)
- Any benchmark return expected by the charity and any upper limits on portfolio turnover (i.e. switching between investments)
- The size of assets, both in relation to liabilities and absolute terms (this would be a factor in deciding on investing directly or via collective investment vehicles and also in diversification across asset classes)
- Existing assets held and the level of diversification within them
- Amount and timing of contribution incomes from governments
- Liquidity requirements (i.e. cash needed for short term outgoings)
- Expected return from various asset classes, risks and expenses associated with such assets
- Trustees of charity and other donators, if any, other than government attitude to risk.

[8]

[Total Marks-12]

Solution 5 :

i) The actual benefits available on transfer are likely to be predetermined as part of the scheme's benefit structure. It is the basis for calculating the (present) value of those benefits that is to be reviewed.

The underlying principle is that the transfer value should be equitable between members leaving the scheme and members who stay.

This suggests using a best estimate basis.

There may also be regulations, or actuarial guidance on the basis used for valuing benefits for transfer out of the scheme.

In order to calculate a transfer value, assumptions will be needed for:

- investment returns
- inflation
- mortality – pre- and post-retirement
- salary growth.

The value should take into account the expenses of administering the transfer.

It may not be necessary for each assumption to be best estimate, as long as the overall result is appropriate.

If the scheme is underfunded, then consider reducing the transfer values that would otherwise have been payable so as to reflect the reduced level of funding.

In such a situation, the member should be made aware of the reduction and given the option of retaining the benefits in the scheme, *i.e.,* as vested rights.

Consideration should be given to not changing the approach used to calculate transfer values too much from that used previously.

This will help to not incite bad publicity arising from inconsistencies.

The valuation approach chosen should be easy to calculate and explain to members.

Consider any computer system alteration issues.

Consider the transfer values offered by the pension schemes of peers.

[7]

ii) Advantages of Prescriptory regulation:

- Ensures consistency between different schemes
- Ensures consistency between actuaries
- Ensures consistency over time
- May aim to ensure appropriate assumptions are used
- May ensure confidence of sponsors

Disadvantages of Prescriptory regulation:

- The assumptions may not be suitable for valuing all schemes
- The assumptions may become outdated over time
- It takes time to change regulation so it can be difficult to ensure the assumptions are up-to-date.
- Expertise of the regulator on specific scheme valuation would may have impact.

Advantages of actuarial judgement

- Allows actuaries to include factors that are specific to the individual scheme
- Allows actuaries to exercise their professional judgement
- Can easily be updated over time
- The requirement for disclosure ensures accountability

Disadvantages of actuarial judgement

- Assumptions may not be appropriate and may be manipulated
- There will be costs if the regulator checks the appropriateness of the assumptions used.
- There may issues of conflicts of interests

[7]

[Total Marks-14]

Solution 6 :

i) In the case of sickness benefits, waiting period is the period beginning at the policy inception during which the life insured is not allowed to make a claim. **[1]**

ii) If the company is completely new to this market then it would have obtained information from sources outside the company to determine the claim inception and termination rates.

This will include obtaining information from reinsurers and from other publicly available information, if any.

The assumptions need to be relevant to future experience, and thus any investigations would need to be recent and credible.

Trends in results need to be allowed for, and projected into the future allowing for advances in medical science.

Alternatively, the company might have compared its final set of premium rates with those of its competitors to assess the competitiveness of its pricing basis overall.

If the company had previous experience in this market and is launching a variation of a product it has sold previously, then it is likely to have used the sickness assumptions from that product as a starting point.

The assumptions would then have been modified to allow for differences that are anticipated due to a different distribution channel being used to market the product.

The assumptions may also have been modified to allow for different terms and conditions (e.g. higher free cover levels, different deferred periods) and so on.

[4]

iii) For claims on which insurer would be required to make payment, we are concerned with date of sickness and date of recoveries.

Date of intimation is not relevant for this purpose other than the information on date of falling sick and when the claim is being intimated to the insurer.

The claim B and F are within the waiting period of 6 months, and hence these claims are not payable.

Hence we are only interested in claims A, C, D and E.

Policies have a 3 month deferred period.

Claim C has recovered during the deferred period and should be excluded even though it is a valid claim.

So the insurer is required to pay for claims A, D and E. **[3]**

iv) Reinsurance payment

Types of claim	Annual Sum at risk	Annual Reinsurance sum at risk	No of months sick	No of months benefits to be paid	Reinsurance payments of benefits
A	30,000	15,000	6	3	1/12 X (3 X 15,000)
D	50,000	25,000	4	1	1/12 X (1 X 25,000)
E	50,000	25,000	5	2	1/12 X (2 X 25,000)
Total	1,30,000	65,000	15	6	10,000

So, reinsurance payment is INR 10,000. **[3]**

v) Appropriateness of the reinsurance program-

- If company has limited experience then this arrangement could be appropriate as reinsurer would provide pricing and product development support, underwriting support and claims management support.
- Since it is a medium sized company quota share agreement would lead to a reduction in capital requirement and increase free capital.
- Free capital could be invested in new lines of business or new distribution channel which would provide a better return.
- The potential for accumulations of claims, does the business that the company writes mean that there is too much exposure in one industry/company? Individual excess of loss will not address this and so the company may decide that it needs more quota share in order to write a wider range of risks but maintain similar levels of net exposure.wider range of risks but maintain similar levels of net exposure.

- Quota share is on 50% basis and hence significant profits are shared with reinsurer.

- If reinsurance is done with highly rated reinsurers then they may charge more for the cover, hence,

- Reinsurance may not provide real value for money if company has limited bargaining power.

- Product may be perceived to be expensive compared to competitors who may opt for higher retention, but

- Reinsurance program could impact market reputation of the company, as if placed with a strong reinsurer could lead to a perception of increased security of benefits.

[5]

[Total Marks-16]

Solution 7 :

i) Policy data

- Start date of cover
- End dates of cover
- Dates of changes in cover
- All rating factor details
- All exposure measure details including limits, excesses etc.
- Source of business
- Details of premiums charged
- Commission payments.

Claim data

- Date of claim event
- Date of claim reported
- Date of claim settled
- Date of claim reopened
- Dates payments (including recoveries & expenses),
- Amounts of payments (including recoveries & expenses),
- Amounts outstanding
- Other types of estimates (e.g. factor estimates)
- Rating factor details i.e. link between claims and policy details
- type of claim
- details of payee
- type of peril

[5]

ii) May charge incorrect premium rates, which may result in larger than planned volumes at loss making rates / worse than expected.

Or smaller than planned volumes leading to insufficient coverage of fixed / start-up costs

Or have incorrect rating structure resulting in adverse selection.

May result in early solvency pressure at a time when capital is most scarce.

May result in loss of regulator confidence leading to subsequent business restrictions /closure.

May result in loss of market confidence with longer-term business retention implications.

Inappropriate reinsurance purchased.

May result in loss of reinsurer confidence

[3]

iii) It may be necessary to make adjustments to the base data before it can be used in a rating exercise because of the following reasons:

Unusually heavy or light experience:
- Claims experience tends to go in cycles
- and for some classes unusually heavy or light years may be experienced in isolation
- Especially if the risk is affected by climate
- If experience is untypical then choose another base year
- Or aggregate more years' experience
- Or apply an adjustment factor to the base year
- Which would obviously be subjective
- Although industry data may be available.

Large or exceptional claims:
- May be left in the data
- Or truncated and spread
- Or removed
- Depending on the extent to which similar claims are likely to occur in the future

Trends in claims experience
- If trends are detected in the base data, it is important to attach more weight to recent experience
- Allowance for inflation
- Trends should also be investigated to see whether or not they are likely to continue into the future
- Or if they are the results of a one-off change in company or market practice.
- If they are expected to continue then an assumption will be needed to allow for them.
- It may be necessary to adjust past data.

Changes in risk:
- Changes in risk can be difficult to deal with.
- They may show up as trends and be dealt with as such.
- Alternatively, major elements of the risk could be separated in the base data
- And projected separately
- And combined with an assumption about the future mix of risks.

Changes in cover:
- Changes in cover can be difficult to allow for. Major changes are likely to involve the perils covered or the limits and excesses applied to each claim.
- They may also arise from changes to underwriting or to claims settlement procedures.
- If a peril is no longer to be insured It may be possible to exclude these claims from the data.
- If a new peril is to be insured, it may be necessary to use external data Such as market statistics, consumer or manufacturer data, government statistics.
- Changes to limits or excesses are more complicated. If there is a detailed database allowing all claims to be separately considered, it may be possible to adjust each claim to the original gross amount and project the gross data to the new rating period. Otherwise it will be necessary to make more approximate adjustments Based on any knowledge of the underlying claims cost distribution. Either way the information will be incomplete as many insured will not notify claims below or near the excess points.
- Future changes in the risk environment other than normal trends will need to be identified.

Others:
- It will be necessary to allow for changes in reinsurance cost.
- Maybe necessary to incorporate IBNR
- Allow for Errors in data
- Changes in claim definition **[10]**

[Total Marks-18]

Solution 8 :

i) In life insurance, it is common for contracts to make a loss in their first year. This is commonly known as *new business strain*.

New business strain arises because the premium received in the first year may be less than the sum of the initial expenses, the initial commission paid and the initial increase in provisions (or reserves) that are often established on a prudent basis.

This typically occurs when the policy is issued, since:
- Initial expenses may be high (eg commission and underwriting costs)
- Supervisory provisioning (reserving) requirements tend to be prudent.

[2]

ii) Contract features that could be used to reduce the new business strain include:
- low guarantees
- less costlier options
- charges that match the expenses by nature and by timing
- low initial expenses
- low initial commission
- low statutory provisioning requirements
- single premium
- higher average premium

[2]

iii) New business strain can occur on writing single premium business (although it is generally less onerous than that associated with regular premium business).

In single premium policies, there is a need to meet any initial expenses including initial commission *and* establish provisions in respect of future benefit payments and future expenses.

As the provider must be able to demonstrate *supervisory* solvency, the provisions established will usually need to be determined on a *prudent* basis.

The pricing decision will also have been made on the basis of assumptions about future experience, *eg,* mortality, longevity, withdrawal rates, investment returns and inflation.

However, this pricing basis will almost certainly be less prudent than the basis used to determine supervisory provisions because of the need for competitive premium rates and the extra prudence associated with the supervisory solvency assessment.

In this case, although the single premium may be enough to meet expected future outgo on the pricing basis, it may not be enough to meet expected outgo on the more prudent supervisory solvency basis.

[3]

iv) In the pricing process, assumptions will have been made for the portfolio in aggregate about:

- Average case size
- Persistency
- Per policy expenses.

If you "reward" favorable experience in one part of the portfolio by enhancing terms, then by implication you should worsen terms where experience has been worse than assumed unless the new arrangements actually alter the above features.

The company will wish to maximize its total profit. As total profit is the product of profit per unit and sales volume, increased sales at the expense of lower unit profit could increase company’s overall profits.

Unless there are huge surrender penalties which can be the source of revenue provided the market and regulatory restrictions on this are not applicable.

The better that persistency is, the more revenue should accrue to the company over time and hence, all other things being equal, profit per policy should be higher.

Hence the company will be prepared to pay this new sales incentive to those intermediaries from whom it expects greater volumes of profitable business. This would help protect its market share.

Acquisition expenses will comprise commission, sales related costs, new business processing costs and contributions to fixed overheads and profit. The first two are likely to vary in proportion to the premium, and so average case size will have no effect on them.

New business and renewal processing costs are likely to be largely fixed per policy. For a higher than average case size, this implies lower expenses as percentage of premium, and higher profit per case.

Additional sales of business with better persistency and higher average case size will lead to different averages from those assumed in the pricing basis and the changed averages will result in higher average profit per case.

Introducing sales incentives to some of the business will increase average per policy expenses. This will bring the average profit per case down again, but as long as the total profit for the company increases, after allowing for the increased sales, the result is acceptable.

If the company pays sales incentive at a greater rate than is loaded into the product pricing then it accepts the risk that loadings may not cover all expenses if the anticipated business volumes are not written. This risk could be reduced by paying the additional incentives as an override depending on the volume of business actually written.

If on the other hand the product is priced such that the highest level of sales incentives the company pays is loaded for, then it may be that the product will appear uncompetitive.

The company might also offer these sales incentives to intermediaries that it expects to introduce business with better persistency (lower lapses) than the average. Here the company is giving the intermediary a share in the benefits of improved persistency.

Similarly higher average premium sizes might attract higher commission rates as well as sales incentives. If fixed expenses are recovered by size related charges, there is a benefit that might be shared with the intermediary.

The obvious risk is that the persistency or average premium size deteriorates (or does not live up to that expected). It is thus necessary to monitor the performance of each intermediary.

To avoid this, additional sales incentive could be paid as renewal commission, or some years after commencement, or the sales incentive could be clawed back if the business proves not to be of better quality.

If other intermediaries discover this deal, they may try to negotiate similar terms. If you refuse, they may place their business elsewhere, reducing overall new business levels.
Ultimately, pressure may build across the whole market for this type of incentives.

Improvements in persistency might be secured by offering renewal commission terms, rather than introducing new sales incentives which are payable along with the initial commission.

It might be market practice to pay this sales incentive, and hence, there is a risk of losing business if intermediaries think they are not getting the additional incentives.

As a minimum, the revised terms should ensure that the business covers its marginal costs, and makes a positive contribution to overheads and profit. It is thus worthwhile writing the business.

However, you cannot price ALL your business in this way, or you will fail to cover all your expenses, and ultimately solvency will be threatened.

The proposal deserves investigation and sounds reasonable, as long as projected sales volumes justify the effort involved.

[13]

[Total Marks-20]

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