

Institute of Actuaries of India

Subject ST1 – Health and Care Insurance Specialist Technical

May 2010 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) Product design and pricing will often be an iterative procedure as each is adjusted in turn so that all the various targets can be met:
- customer acceptability
 - regulator requirements
 - needs of distributors
 - price competitiveness
 - adequate profitability/return on capital
 - company culture in product style and price
 - systems and other internal constraints
 - underwriting methodology.
- (ii) Conflicts:
- price competitiveness v/s adequate profitability e.g. competitive pricing means an IRR of 6% whereas desired IRR is 10%
 - system constraint v/s customer acceptability e.g. customers want guaranteed options whereas system cannot support such options
 - u/w methodology v/s customer acceptability e.g. customers want “no medical” whereas u/w process requires medical examination
 - needs of distributors v/s profitability e.g. distributors want 10% commission whereas target profitability criterion means only 5% commission can be paid
- (iii) In a monopoly, the insurer would be less concerned about price competitiveness and probably needs of distributors (if they are dependant only on the health insurer for distribution).

Subject to regulatory restrictions, the insurer would be able to charge high premium and also pay less commission to the distributors.

(iv)

Profitability

- Profit comes from charges less expenses and non-unit related claim costs. Therefore the company will want to ensure that the charges are sufficient to cover these costs and make a profit.

Marketability

- The product must meet a consumer need or else there may be no demand.
- Sales commission structure will need to appeal to the channels through which the product will be sold.
- If there are any features (eg additional critical illnesses) or guarantees that set this product apart from other available products, marketability may be improved.
- On the other hand, making the charges reviewable might be attractive to some potential customers because charges will be less initially, and might reduce in the future.
- However, if the product is too complicated, this may be a deterrent to sales, and so the target market needs to be carefully considered.
- Without additional features, the marketing will have to be mainly on price and overall value for money.

Competitiveness

- The company should examine similar products available from competitors. Good features may be copied. It may not want to depart too far from the terms offered elsewhere in the marketplace, or else there may not be a demand for the product.

Financing requirement

- The importance of capital efficiency will depend on the availability of capital. For the company in this question, this is not a problem, but it will still want to minimise its financing requirement as this will maximise the return on capital (all else being equal).

Guarantees

- The company will want to retain the flexibility to alter its expense and morbidity charges.
- If the charges allow for the cost of guarantees, this will lead to a higher sum at risk, due to the slower build up of the unit fund. This will mean a higher cost of cover for the policyholder.

Level of risk

- The company needs to consider the acceptability of the level of risk associated with the proposed contract design. It will be important for the company to minimise risk in order for it to achieve a high return on its capital with a high degree of certainty, and so gain access to the additional capital funding.
- The company should ensure that, for example:
 - there are good underwriting and claims control procedures in place
 - there are appropriate, well-worded exclusions and claim definitions (eg a survival period could be required in order for a CI claim to be payable).
- The company will wish to reduce the risk of policyholders being “forced” to lapse if their fund becomes insufficient to meet morbidity charges. Premiums (not just charges) could be reviewed at regular intervals to alert the policyholder to take action should a problem be anticipated
- Appropriate reinsurance should also be considered as a means of mitigating risk.

Sensitivity of profit

- As mentioned above, the company will wish to secure a high return on its capital, and so the sensitivity of profit to the various items of experience should be reduced, for example by use of an appropriately matched charging structure.

Extent of cross-subsidies

- The company has to decide how much cross-subsidy it wants to accept.
- For example, without a cross-subsidy from large to small policies, the terms derived for small policies may be unmarketable due to the allowance required for fixed expenses.
- On the other hand, a high degree of cross-subsidy leads to a risk of selling more small policies than anticipated, and so making less profit than required.
- It may also choose to have a fixed policy fee (or a high minimum premium), to reduce the need for cross-subsidies.

Systems requirements

- The company will want to choose a product design that can be administered by the existing systems as far as possible. It will want to keep the cost of systems changes down to a minimum.

Consistency with other products

- If the design is similar to that of other existing products sold by the company, staff training will be much easier. However, if the product is too similar to the company’s other products, sales of these other products may be adversely affected.

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Solution 2

This is a process whereby a broker or insurer representative obtains permission from the employer to address the workforce en masse and sell health and care products. For example, the insurer might be given the opportunity to send mailshots to all of an employer’s workforce or to advertise in the employer’s staff newsletter. The intricacy of the cover suggested depends on the sophistication of the staff being targeted, but generally the intention is to offer simple products with a view to attracting those who have not made their own insurance provision for healthcare needs.

Comparison with agency force

- saving on admin and marketing costs
- need to employ own sales staff to interact with companies
- No commissions
- Access to volumes through large employers
- Cross- sales opportunity for other financial services products
- Need sophisticated sales staff to deal with companies
- Less opportunity for 1-1 interaction with individuals
- Only simple products can be sold
- Employers may be reluctant to allow marketing in their premises

[6]

Solution 3

- review distribution expenses
- are employees over paid? Salary freeze or retrenchment can be considered
- Claims management expenses can be rationalized
- Move office to other location with cheaper rentals
- Under utilized office space can be given on rent
- Rationalize branch offices based on volumes and profits
- From CEOs perspective, reserves are an expense in P&L. Any excessive prudence in reserving can be taken away
- Vendor selection can be more rigorous viz open tenders
- Are the underwriting expenses recovered from the policyholders? Product structure could be rationalized to ensure profitability
- Freeze on business class travel, parties and other unproductive expenditure
- Variable expenses would increase with business and fixed expenses are not linked to business momentum. If business is declining, fixed expenses need to be monitored and managed. It may be examined whether majority of the expenses can be made variable
- Expense management can be brought in as KRA of all staff

[5]

Solution 4

The insurer would presumably seek to adjust the data in forming its assumptions, but there will be many factors that it will not be able to allow for with certainty.

These include:

- industry experience may have changed in the period since the data were collected, or be expected to change in future
- the data may be inaccurate, incomplete or otherwise unrepresentative of the market as a whole
- there may not be sufficient data for credibility, although this is much less likely with industry data than it is for a single company
- the market data might not be suitable for use by this company, because of such things as:
 - different approach to initial underwriting or claims control
 - different definition of sickness
 - differences in other policy conditions, such as the maximum proportion of pre-sickness income payable under the contract
 - different distribution channels and target markets
 - format of data may be unsuitable, eg insufficient detail
 - different contract designs
- the insurer will not have any data of its own with which to check the above points.

[5]

Solution 5***No underwriting for group policies***

Clearly there is a risk of anti-selection because unhealthy lives will be accepted.

The anti-selection risk is lower with a group (due to the “healthy worker” effect), but is still present, especially as the benefit is optional.

Also the risks are not independent from individual to individual and so there is a potential “catastrophe” risk (eg from several employees contracting the same disease from a work-related cause, or simply through increased mutual contact).

Equally, though, there should be greater homogeneity in the group than in a collection of individual risks. The claims experience should be more predictable as a result.

Costs would be reduced by not underwriting. The key point is whether this is more than offset by the greater claims cost that would be expected.

Offering the benefit for free

The economies of scale for group business are unlikely to pay for removing the charge completely, although it might lead to a reduced cost compared with individual business, especially if free cover limits are introduced.

If offering the free benefit were to boost sales significantly, it might pay for itself, by reducing the per scheme cost of the fixed expenses.

However, it would be risky to rely on this. Might consider how many schemes currently have waiver of premium. This gives an indication of its popularity and hence whether or not it is likely to increase sales.

Would there be pressure from brokers to introduce it for business in force? If we offer free waiver to business in force then the cost will be much higher.

Anti-selection and heterogeneity are most likely in smaller groups. If combined with no underwriting, the level of any free cover should be made dependent on group size, and might be zero for very small groups.

[8]**Solution 6**

(i) The following risks arise out of inaccurate or incomplete policy records:

- Inadequate reserving. The impact would depend on the nature and size of error. In the extreme, an insurance company might declare itself to be solvent when it was insolvent, or vice-versa. Less serious errors could still lead to incorrect decisions, for example through underestimating the capital available to fund new business.
- Wrong business decisions e.g., early trends in claim experience could be ill-analyzed and hence inappropriate pricing/underwriting decision made
- Wrong administration e.g., over/under payment of claims leading to loss/reputation damage

(ii) Possible causes of poor data quality

- Outdated legacy data systems
- Low priority assigned to data collection
- Lack of understanding of the necessity for data collection
- Less than ideal administrative checking of data
- Difficulty in receiving the data in the format desired (e.g., per member rather than per admit)
- Computer file and vendor support issues
- Human error
- Lack of regulatory requirements

(iii) Steps to mitigate the data issues

- Perform additional training for those who enter/process data in order for them to understand the importance of accurate data capture
- Introduce or enhance data validation systems e.g. flag ‘male pregnant’

- Validate data by data entry clerk to identify sub-standard work
- Request system enhancements to make data capture more user-friendly
- Reconcile data with audited numbers
- Select data samples to audit and review in detail
- Review data monthly for patterns of errors and work with the operations department to address
- Analyze suspicious books in details
- Take conservative approach to relying upon data if there are known problems or data cannot be confidently validated
- Use market information or international experience to validate
- Return to the source policy document for correct information
- Use ratio estimates to complete missing information

[11]

Solution 7)

(i) Types of reserve

Individual IP

- Discounted value of future cash flows in respect of lives that are currently healthy, including the cash flows arising out of exercising any policyholder options and guarantees offered. This is required if level premiums are charged for a risk which is not uniform across age. As age increases, disability incidence rates increase and value of disability insurance benefits decreases.
- Claims in payment - Discounted value of claims that have been admitted, need to estimate the likely length of the claim at the beginning and monitor regularly to review the adequacy of the reserve set up.
- Claims in transit - Discounted value of claims that have been reported but not yet admitted. Here we need assess the probability of the claim being admitted and the likely length once admitted.
- Mostly statistical estimates are used for the whole portfolio of claims and only small volumes of claims are assessed on a case by case basis.

Group IP

- UPR – Unearned Premium Reserve - the balance of premiums received in respect of periods of insurance not yet expired – a prospective approach
- URR – Unexpired Risk Reserve – reserve in respect of the above unexpired insurance premium where it is felt that the premium basis is inadequate
- Outstanding claims reserve – reserve in respect of claims notified to the insurer but not yet settled
- Incurred but not reported (IBNR) – reserve in respect of claims that have arisen but which have yet to be notified to the insurer
- Incurred but not enough reported (IBNER) – as above but where it is felt that not all details have yet been submitted and a provision needs to be established for the remainder.
- Equalization and catastrophe reserves – reserves where it is felt that the current year is atypical and amounts will have to be held back for abnormal events.
- Claims in transit – reserve in respect of claims reported but not assessed, or not recorded

(ii) Larger reserves than the minimum required by supervisory authorities

- Reduces the risks of inadequate reserving if the statutory minimum is not prudent enough considering the specific risk circumstances of the insurer. The risks of holding inadequate reserves include:
 - the insurer may distribute too much money as “profit” and thereby be left short of money to pay contractual benefits in the future
 - the insurer, thinking it has more free assets than it really has, may pursue more risky strategies in other areas, for example in selling greater volumes of new business or following a more risky investment strategy, which in turn could have serious consequences for future solvency

- the insurer shall be seen financially sound which might
 - o increase sales volumes by independent intermediaries recommending the insurer's product
 - o allow slightly higher premium to be charged and potentially higher profits
 - o allow better rating by credit rating agencies and hence increase investor's confidence
 - the company would have fewer free assets and would therefore
 - o have less investment freedom leading to lower expected investment returns
 - o less capital to fund new business growth
 - o defer emergence of its profit and hence defer the distribution of profit
- (iii) The data would be analyzed by
- type of contract
 - age
 - sex
 - duration from entry (or from start of claim for sickness terminations)
 - smoker / non-smoker status
 - underwritten status
 - source of business
 - cause of claim
 - occupation, or industry for group business
 - length of deferred period
 - definition of incapacity
 - by income replacement ratio
 - geographical location
 - size of group (for company contracts)
- (iv) Consider each of the principal elements of the pricing basis:
- Claim inception and termination rates*
- Experience might be heavier than that of competitors, due to (eg):
- weaker underwriting
 - different target market
 - different distribution channel
 - vague claim definition
 - higher income replacement ratio
 - no split by occupation
 - poor claim management
- So, the company could:
- strengthen underwriting
 - change target market
 - change distribution channel (e.g. use specialist brokers)
 - reword claim definition to reduce scope for misinterpretation
 - reduce income replacement ratio to create enough financial incentive to return to work
 - introduce differential rates for different types of occupation to avoid anti-selection
 - pro-active claim management through early-intervention
 - use claim counseling and rehabilitation to encourage return to work
 - more frequent check-in on continued validity of claims (especially the long duration ones)

Alternatively or in addition, the company could take a less conservative view in setting the claim inception and termination rates assumption, if this can be justified by evidence, eg from own data, industry or reinsures, or by offering cover on a reviewable basis.

Expenses

- May be higher than those of competitors
- Could look to reduce commission (may be paying above market rates)
- Reduce sales costs by more efficient marketing and increasing sales force productivity
- Try to improve admin efficiency and reduce overheads
- May be able to achieve lower price if total profits improved by increased volumes

Withdrawals

- Experience may be worse (heavier) than that of competitors.
- Try to improve persistency through improving sales methods and training of sales staff
- Withdrawal rates may differ due to different target market and/or distribution channel, and so could try to change these

Profit target

- Profit requirement could be too high relative to the market, so re-price at reduced level of target profitability.
- Consider how much contribution is required from this business to overheads; reducing the required contribution will reduce price

(v) *Mis-selling*

- Ensure the promises made are consistent with the conditions in the insurance contract.
- For example, a diagnosed condition may be critical but no payment will be made if that condition is not on the list of covered conditions
- Ensure that salesmen are not encouraging policyholders to lapse policies with a view to taking out others (with the same or a different insurer) and thus undergoing a second set of initial charges.
- This can happen when there is a lapse and re-entry opportunity or your terms are not competitive.
- Ensure an adequate process of commission clawback. Commission clawback is a process whereby in the event of a policy lapsing, part of the commission already paid to the salesperson or intermediary is paid back to the insurer.
- This discourages mis-selling and helps to ensure that the customer's needs are met
- Ensure that the record of sales agents is analysed for volumes written and for persistency
- Check for complaints against (and compliments about) each agent. Capturing this information means that it is essential that your data systems also capture the "agent code" on each sale
- Ensure that the commission is commensurate with the sales effort so that the commission does not encourage over-selling
- Ensure that the commission is matched with clawback controls on early lapse
- Sales staff must be trained to put the needs of the customer first and their ability to pay, on the understanding that only in this way can contracts be retained and further policies sold
- Ensure that literature to support the product and its sale is customer friendly, clear and appropriate (*ie* does not over-sell).

[30]

Solution 8)

- (i) Surplus over quota share
- + Allows the insurer to accept risks that would otherwise be too big (more effectively than quota share)
 - + more efficient at targeting the morbidity risk. To avoid high risk concentration, and yet to maximise profits, this arrangement reinsures a high proportion of its very large risks, but none at all of its small cases.
 - + Reduces concentration of risk per life and so reduces claims volatility
 - - A company has less control of its protection against parameter risk than under quota share, as its overall share of the risk will be dependent on the sizes of the policies taken on.
 - - Less suitable for financing arrangements

(ii) Determining retention limit

Consider the total of:

- (a) the cost of financing an appropriate risk experience fluctuation reserve, and
- (b) the cost of obtaining reinsurance – the reinsurer naturally incorporates an expense and profit loading in its reinsurance terms, and the ceding company incurs administrative expenses.

As the retention limit increases, (a) will increase and (b) will decrease, and a retention limit can be adopted which minimises the total (a) + (b).

The steps involved are:

- Decide on some criterion for claim volatility beyond which the company cannot go. For example you might want to have only a 1% chance that the net loss from claims is at least Rs 25m
- For differing retention limits, having sounded out reinsurers on terms available for your business, model the function “{total claims net of reinsurance} less {total risk premiums net of reinsured risk premiums}”. This modelling will be done stochastically, varying the risk experience
- The function is therefore: $X = [C(g) - C(r)] - [P(g) - P(r)]$
 Where $C(g)$ = gross claims
 $C(r)$ = claims recovered from reinsurer
 $P(g)$ = risk premium available (from policy) to insurer
 $P(r)$ = risk premium paid to reinsurer

The criterion would therefore be that $\Pr(X > 25m) = 0.01$

- Look at the results of this modelling to choose the retention limit that will satisfy your criterion.
- We could use this as a retention limit (if the cover is available in the market at an acceptable price). However, we could also check if this protection can be achieved more cheaply using a risk experience fluctuation reserve.
- To do this we might assume that some of the cost of the risk premium reinsurance is instead going to be spent on financing a risk experience fluctuation reserve. The cost of holding a reserve of size M is equal to: $M(j - i)$ where j is the expected rate of return from the company's capital, and i is the expected rate of return from the assets that will back the reserve. This follows from the fact that, by tying up some of its capital in a risk experience fluctuation reserve, the company is unable to use that capital to finance other ventures, from which it would have expected to earn a return of j . Instead, it will earn an expected return of i , hence the difference is the cost (*ie* loss of expected return) to the company over one year

- If we decide to redirect, say, 60% of the reinsurance risk premium to the risk experience fluctuation reserve, then (if $j = 9\%$ and $i = 7\%$, say) the amount of risk experience fluctuation reserve purchased (for one year) is:

$$M = 0.6 \times P(r) / [0.09 - 0.07] = 30 P(r)$$
 We now have only $0.4 P(r)$ left with which to buy reinsurance, so we will have to have a somewhat higher retention level in order for the cost to be only $0.4 P(r)$
- Now model the distribution of X under this new arrangement, noting that we now have a higher retention level (so the claims recoveries from the reinsurer will be lower) and X is now calculated as:

$$X = [C(g) - C'(r)] - [P(g) - P(r)] - M$$

$$= [C(g) - C'(r)] - P(g) - 29P(r)$$
 where $C'(r)$ = claims recovered from reinsurer at new level of retention
- Compare the protection offered under this new construction against that offered by the previous arrangement, ie recalculate $\Pr(X > 25m)$. If this probability is less than the 1% previously obtained, then using a risk experience fluctuation reserve (to the extent assumed) is cheaper than using reinsurance, and would therefore be the preferred strategy
- Try this for other levels of reinsurance / risk experience fluctuation reserve. Then decide on which combination offers the most protection for a given cost. If the degree of protection is increased by use of a risk experience fluctuation reserve then we can determine (probably by trial and error) the actual amounts of risk experience fluctuation reserve and retention level that are necessary to meet our desired ruin criterion, with lowest cost to the insurer

(iii) Invest the risk experience fluctuation reserve in equities

- Historical experience suggests that equities outperform most of the other assets in the long term. So, the director's suggestion has a point because the reserve would otherwise have been employed in the business hopefully making higher returns.
- However, equity is a highly volatile investment and so may defeat the purpose of setting up the reserve. When you need money to pay the large claims the market may be so low that you will be forced sell the equity at a lower price. This again partly depends on how diversified your portfolio is. The insurer is small and therefore will have little resilience to the market shock.
- The size of the insurer's free assets will also influence the proportion that can be invested in equities. The higher the free assets the greater the investment risk that the insurer can afford.
- We should also have regard to any regulatory restrictions on investing this type of reserve. Even if there are no specific restrictions, the regulator may expect that insurer exercises similar caution to that applied for statutory reserves.
- The insurer is small and so the claim experience is likely to be more volatile than that of a large insurer. So, it is prudent to have less exposure to equities till the time insurer portfolio grows big.
- The hospital cash and critical illness products are not long-tailed and so equities may not be the appropriate investment backing the products.
- So, while there is some merit in the director's suggestion, a full flown asset-liability modelling needs to be carried out in order to determine the appropriateness and level of the equity investment.

[15]

[Total marks 100]
