Institute of Actuaries of India

Subject ST1 – Health & Care Insurance

October/November 2007 Examination

INDICATIVE SOLUTION

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.

1.
a) Restrictions on

i) the type of contract that can be offered
ii) the premium rates or charges that can be used for some contracts
iii) the channels through which the contract may be sold
- specified procedures which must be followed
- information which must be given as part of the selling process
iv) the ability to underwrite
v) the types of asset that can be held
- the amount of investment in any particular asset
- admissibility of certain assets for demonstrating solvency

Requirements relating to the terms and conditions of contracts offered

(e.g. for specifying terms for claims payment, or how paid up or surrender value should be calculated)

An indirect constraint on the amount of business that may be written, through requirements of reserves and solvency margins
- which will decrease the available capital and increase the capital required to fund new business

b)

State providing care through its own establishments

Can keep a close eye on cost and claim control

The pricing will avoid margins for profits of commercial enterprises

State relying on commercial establishments

Can benefit from their expertise, experience and economies of scale

Can transfer much of the administration

May be more responsive to customer needs e.g introduction of new types of treatment

Benefits of competition from different providers

[Total 8]

2.

a) New business strain, which arises when the initial asset share i.e. premiums less initial expenses, is less than the sum of the supervisory reserves and the required solvency margin and new business strain has to be made good from the company's free assets.

Critical Illness – regular premiums

Due to high level of expenses incurred at the start of the contract, the asset share is normally negative in the early years

Initial expenses – commission, sales and marketing, underwriting and policy documentation

The reserves required will be at least zero, because of supervisory restrictions plus any solvency margins

Thus the value of liabilities will exceed the value of assets, resulting in new business strain

Immediate needs long term care insurance – single premium

New business strain will arise due to the valuation basis being stronger than the premium basis.

b) It could lead directly to a problem with supervisory solvency

Even if solvency is not immediately threatened, the reduction of capital could weaken the company's resilience to falls in asset values

It will reduce the company's financial strength, measured as free assets in relation to the reserves

It represents an opportunity cost – the company could use the same amount of capital to write more business which is less capital intensive

It could unexpectedly lead to a problem with statutory solvency

The company will be less at risk of adverse experience – if it uses capital to write a large number of non - capital intensive business rather than a small number of capital intensive policies

c) Most of health insurance products are protection rather than savings contracts

- the main risk to the insurer arises from the incidence and in some cases duration of claims

The claim payment may be large and guaranteed but the reserves are usually small relative to the benefit

Therefore, even if the investment returns on the reserves are much lower than expected, the financial impact on the company will be very small

Pre-funded long term care insurance is one health care business which usually requires large reserves

- a fall in investment returns could pose a significant risk

Whether or not it does pose a risk will depend upon the extent to which the policy is written on guaranteed terms

If benefits, premiums and charges are fully guaranteed, then the investment risk could be large

[Total 9]

3.

a) Term of the policy with the option: the longer the term of the contract, the longer the policyholder will have the option

- more likely that, at some time, his health will deteriorate, thus making the option appear worthwhile

Number of times the policyholder can exercise the option- at any time, every year, every five years

Conditions attaching to option – limiting the size of the option or restricting the choice of plans available under the option

Encouragement given to the policyholders to exercise the option

If take up rate is low possible selection – only those who have most to gain likely to exercise the option

Encouragement to more of healthy lives to exercise the option should be profitable to the company – lots of new policies to lots of good risks

Publicising the option can achieve greater take up rate by healthy lives

- care should be taken that the benefit is not outweighed by the risk of attracting bigger proportion of loss making high risk lives

Extra cost to policyholder who exercises the option : If the additional premium is very high healthy lives will shop around to get the same cover cheaper; loss of potential business and profit

Selective withdrawals – A healthy life may cancel a ten year renewable term policy after, say, two years, because he discovers that cover without options is cheaper.

In this case, the company has not collected the option premium for very long, but still left with unhealthy lives who are more likely to exercise the option

b)**Group Contract**

Experience rating – the premium for the group contract depends wholly or partly on the past experience of the group

The premium for the group is the weighted average of the insured's standard rate for the group risk and a rate based on some historical experience of the group itself

Relative weighting of own experience to standard rate is the "credibility" applied to the group

Larger, the more credible is the group's past experience data, the larger the credibility factor / weighting given to the group's own experience in the premium rate calculation

The result is to encourage good claims experience – rewarding the employer with lower premiums in the future

Individual policy

Under individual PMI policies, each policyholder charged book-rate premium appropriate to his current risk classification based on age type of cover etc.

On renewal in the second or subsequent years, the policyholder may get discounts applied to his premium, reflecting claim free year or consecutive up to the current policy year

Subsequent claims (one or more) will lead to partial or full loss of; future discounts will have to re-earned by having more claim free years

No claim discount may promote better claims experience; policyholders will only tend to claim only if the cost of treatment exceeds the increase in premium due to loss of future discount on claiming

In both cases, the policyholder bears some risk of poor claims experience – to the extent it is reflected in future premium

For group business, this risk is borne by the employer and in individual business, it is the claimant who suffers

In group business, no individual is penalized for claiming.

- Employer is encouraged to reduce claim costs in other ways, e.g. by promoting health and safety in the work place

[Total 10]

4.

a) Prospective premium reserves – the discounted value of future cash outflows.

This will be the majority of reserves, since the funds plus premiums are held to meet the benefits to be paid out in the future

Claim reserves – the discounted value of claims in payment, including claims that have arisen but not yet settled

These should be small – there are substantial benefits as regular payments rather than as lump sum or significant delays in paying claims due to claims verification process

If there are many claims which take time to be reported, reserve for claims which have been diagnosed but not reported could be substantial

Option reserves – reserves for the eventuality that a particular option becomes valuable to be exercised than discarded

Total reserves for the this business will be small, as this is a protection plan with little need to build up a fund

If the benefits are very likely to be paid i.e. very high claim frequency, or the contract is of savings type, then the reserves could be larger

b) **Critical illness inception**

Risk that incidence of illnesses involved not estimated correctly

The extent of the risk will depend on data available to the company for setting the rates;

in particular to what extent the data will apply to eventual policyholders and to the specific illnesses

Risk greater than for death benefits – because payment depends on a subjective diagnosis of some condition; "grey areas" where a similar but not identical condition is diagnosed one of the covered critical illnesses

Risk that policyholders will not disclose all relevant information at initial underwriting stage and will remain undetected at the time of claim; leading to higher claim incidence rates

Medical advances leading to earlier disease diagnosis rates; increasing the cost of claims to the company

The risks will be increased if there is no initial waiting period

Even if these rates are underestimated risk is not too severe as the company could raise them after 12 months

- but raising rates may cause problems with policyholders' expectations, leading to withdrawals or lower new business volumes

If the premium has been calculated just to cover the benefit, raising the charge could lead to the unit fund running out

Claim costs will be subject to random fluctuations – problem for a small company with low free reserves

Expenses

Risk that expense charges on the contract will not cover actual expenses

More likely if expense charge involves any cross subsidy of small policies by large policies and mix of new business different from that expected

Altering expense charges could lead to problems as in the case of raising incidence rates

No significant investment risk if unit fund monies are invested immediately; risk that low return on assets will lead to lower fund management charges, not covering the expenses intended to cover

Withdrawals

Offering a surrender value may encourage withdrawals – likely that policyholders who surrender may enjoy better health leading to worse than expected claims experience

Risk of loss on early withdrawals when asset share is negative

Marketing / PRE

Risk of misleading policyholders with a narrow range of critical illnesses

– policyholders not reading the fine print and get disappointed when affected by a critical illness not covered by the contract

[Total 12]

5. a) Changes in the target market or territory targeted

Whenever product is changed : different products will appeal to different people

Target market might change substantially for economic, fiscal or cultural reasons

Changes in the distribution channel
Changes in the impact of medical science
Rate of diagnosis of critical illness, health care provision, treatments/ cures, health education, nutrition

Changes in the state provision of healthcare benefits

Changes in the selective withdrawals

Changes in underwriting practice

Changes in claim control practice

Changes in policy wording

Changes to the economy

b) The policy will pay the claim amount only to the extent that it exceeds the "excess" specified under the policy

For example, if a policy provides for an excess of Rs 2500, and the policyholder incurs a medical cost of Rs 10000, the amount payable by the insurer will be Rs 7500.

"Excess" in pricing

One way would be to use data of policies with the same level of excess, possibly adjusted for inflation, to derive the incidence rates and average claimcosts, for the risk premium calculation

Alternatively, use data where no excess is applied and adjust as follows:

Reduce the incidence to allow only for proportion of claims expected to exceed the excess amount. (Need to assume that claim amounts follow a particular probability distribution to help assess this.)

Reduce the incidence further to allow for the fact that the excess acts as a disincentive to claiming, particularly if the excess is voluntary.

This reduction may be based on previous experience or arbitrary.

Adjust the average claims cost to allow for this excess. The reduction would not be for the full excess amount as some of the claims would have been for less than the excess.

c) The main items of expenses :

cost of administering payments
costs of monitoring claim validity and enforcing changes to benefit entitlement

(e.g. reducing benefits under income protection plan during recovery when some partial employment becomes possible, for the claimant)
costs of efforts made on rehabilitation

(e.g. helping income protection claimants to return to work)
costs of assessing claims to higher levels of benefits
(e.g. long term care insurance plan)

[Total 9]

6. a) Data for recent period would be subdivided into homogeneous risk groups, according to some or all of

Type of contract (comprehensive or budget plan), age of policyholder, sex of policyholder, number of past renewals, smoker status, underwritten status (exclusions), source of business (e.g. distribution channel , territory), occupation, hospital band, amount of excess, NCD level (if applicable),number of people covered

It would be necessary to combine groups, depending on volume of data in each cell and the degree of similarity between cells, so as to produce a credible amount of datain each combined cell.

Investigation period would be chosen suitably – best compromise between volume of data and ensuring that it is as upto date as possible.

Actual claim incidence rates would be calculated for each group, for each benefit / procedure class

By dividing the number of new claims by the exposure years in each cell

The rates would be compared with the rates according to pricing assumptions

Also necessary to analyse the claim amount experience

Calculate the average claim amount for each cell, further subdivided by type of benefit or procedure class

Compare these with the expected amounts

Further sub divisions may be possible according to requirements – e.g by hospital chain, individual surgeons or consultants involved

Examine trends – both claim incidence rates and claim amount experience

Investigate the trends in incidence rates- to ascertain whether or not they will continue

Compare increase in past claim amounts against standard inflation rates and in relation to market information

Investigate reasons for departure from expected.

b) Different policy conditions such as

- different deferred, linked claims and waiting periods
- different exclusion clauses
- different rehabilitation clauses

Different

- definitions of sickness,
- underwriting standards,
- sales methods and target markets,
- occupations and geographical location,
- claims control

Comparison may be with different contracts, such as

- group or individual
- unit linked vs conventional
- stand alone vs rider benefits

[Total 14]

7.a) The justification for underwriting should be in terms of cost of underwriting;

and the improvement in experience achieved

one possibility is to have re- underwriting as heavy as initially
It should have the positive feature of achieving very good experience

Cost of initial underwriting is unlikely to be justified. Health of many applicants would be similar to five years earlier; so much effort would be duplicated and wasteful; .

Re underwriting could be made lighter in many ways

e.g fewer medical questions or higher limits for doctor's report, medical examination and further tests.

E.g lifestyle questionnaire would be unlikely to yield different information in a significant number of cases; its use may be restricted.

The main information sought would be whether or not there have been any changes since last underwriting;;

and with further underwriting where this will be.

One possibility will be to have different level of underwriting at different points

e.g. first re underwriting will be light and the one after 10 years will be something more strict.

b) A policy that could be updated every five years should make cover more comprehensive and relevant.

But it is not the policyholder who will review the benefits offered and the premiums that must be paid. The insurer will undertake the review.

Policyholders may be concerned that the insurer might use each review to manipulate the policy to its advantage.

e.g. by increasing the premiums or by restricting the cover. Policyholder will be reassured if there were some restrictions on the insurer's actions.

Policyholders have the option not to accept the terms.

Range of benefits and level of premiums available in the market will be a check on the terms offered by the current insurer.
Those in good health would seek cover elsewhere; this would increase selection against the office

These would incentives for the insurer to keep the premium increases to the minimum and update benefits so that they matched those currently offered by other insurers.

[Total 8]

8 (a). **Availability of data**

As it is a new contract the following items would not be available for use:
Internal own price
Claims experience
Competitors' prices
Company accounts
Regulatory returns
Local published insurance statistics

Items available for use:
Data on claims incidence and on treatment costs may be available from separate sources

Reinsurer's data, knowledge
Data from actuarial and other consultants
Data from other countries such as USA, UK, other European countries
Other local experience
e.g. data from the XYZ hospital sector
Publicly collected Healthcare experience

(b). **Protect company from anti-selection**

Protect company from seriously impaired lives where it is impossible to assess risk accurately

Identify substandard lives to offer special terms
Identify most suitable approach for substandard lives
Identify most suitable premium for substandard lives
Accurate risk classification to ensure fair rating
Try to ensure experience does not deviate from that assumed in pricing of contracts.

(c). Policyholder offered immediate cover
No formal underwriting at point of acceptance

Blanket exclusion on pre-existing conditions – usually defined as conditions that have received treatment for a specified period prior to application (often 5 years)

Exclusions are waived after a period of time, usually2-3 years, if policyholder receives no treatment for condition during that time
Past medical history is examined at the time of claim

(d). Group policies will often have free cover limits – certain level of benefits available without individual underwriting. Those looking for benefits above the limit provide medical information or attend tests.

Typically insure will request that all insured members are actively at work on the day cover commences or a moratorium is applied, where no claim is paid for short period after start of cover for nee entrant.

Limited insured information. The following data are often not available:

- Numbers of lives
- Individual ages
- Sex
- Benefits

Often the insurer requests a deposit premium. This is adjusted at the end of period when details are available.

Reduction in anti-selection effect as schemes get larger

Premiums charged may be based on the experience of the group as a whole rather than as a result of individual medical underwriting – this would depend on the size and credibility of the scheme.

For the largest schemes medical history may be disregarded completely

Flex schemes have similar anti-selective characteristics as individual policies, so may underwrite increases in cover or apply strict limits.

Need to consider how to treat new-comers.

Need to consider influence of the intermediary. Increased potential for anti selection and limited supply of information due to increased purchaser knowledge

Dependants underwritten differently

Level of underwriting may depend on assumed take-up rates

Differences may be function distribution methods.

(e) **Material to be added**

[Total 20]

9 (a). The reinsurance sum at risk is

8000 x (3 – min(3 x 0.25, 1) +
1500 x (4 – min(4 x 0.25, 1) +
(1)
500 xX (5 – min(5 x 0.25, 1)

= 18000 + 4500 + 2000
= 24,500 lakhs

(b). To calculate the reinsurance premium, ignoring lapses

policies are age 35 next at outset. Assuming that the policy anniversaries are spread uniformly throughout the policy year than the average rate applied is (130+140)/2) = 135

Premium with no lapses is 24,500 (lakhs) X 0.135 per lakh
= 33,07,500
= 33.075 lakhs

Lapses are uniform, so on average 95% of business in force
Reinsurance premium = 0.95 X 33.075
= 31.42125 lakhs

- Assuming that premiums are paid on all policies that are in claim
- No changes in sum at risk
- Assume that lapse rates are independent of size of policy / sum at risk

(c) For claims on which the reinsurer would be required to make payment we are concerned with date sick during 2006. Date notified, date accepted or date claim payments commence are irrelevant if the claim is valid. Hence we are only interested in claims C, D, E and F. Policies have a 3 month deferred period. Claim D has recovered during the deferred period and should be excluded even though it has been accepted as a valid claim. So the answer is C, E and F.

(d). Reinsurer is liable for 75% of all risk increasing to 100% of any risk in excess of Rs 1 lakh

Claim C was sick for 7 months, so 4 payments.
Claim E was sick for 4 months, so 1 payment.

$$= \left(\frac{4}{12} \times 3 \times 0.75\right) + \left(\frac{1}{12} \times 3 \times 0.75\right) = 0.75 + 0.1875 = 0.9375$$

Total reinsurer's liability for claims C and E is Rs 0.9375 lakh

Claim F was sick for 30 months, so 27 payments .

$$= \left(\frac{27}{12} \times \left(5 - \min\left\{5 \times 0.25, 1\right\}\right)\right) = 9$$

Total reinsurer's liability for claim F is Rs 9 lakhs

Total reinsurer's liability for all claims is Rs 9.9375 lakhs

(e). Other factors: Claims information may be incomplete because of IBNR. Reinsurer needs to consider expenses, cost of capital, tax, profit criteria, volatility and investment earnings.

[Total 10]

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