Institute of Actuaries of India

Subject SA1 – 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).
(a). The steps in using an asset – liability model are:
- Project liability outgo in each future time period
- Project asset proceeds in each future period
- Compare the two for each future period
- Re-run the comparisons using different assumptions
- Decide whether the asset proceeds are appropriate for the liability outgo
- If not, investigate alternative asset distributions

(b).   **Uncertainty**
One of the problems facing the investment manager of an insurance company is the high level of uncertainty of the timing and amount of the outgo, with occasional large unexpected claim payments (eg major epidemics of medical costs).

Term
Some health and care liabilities are very short term (for example, PMI), ie to be settled within the next year or so. However, for most classes the liabilities stretch into the medium and long term.

Nature
Health and care insurance claim liabilities are generally one or other of:
- Guaranteed in money terms
- Guaranteed linked to prices index or similar
- Indemnity
- Investment – linked

For liabilities guaranteed in money terms, there is no uncertainty in the individual amounts payable, only in the frequency of those amounts (eg the number of critical illness claims).

For liabilities guaranteed in terms of an index of prices or similar, there is uncertainty as to the future values of that index.

For indemnity (eg PMI), both the amount and frequency of future claims are uncertain and dependent on the costs incurred in receiving treatment covered by the policy, which in turn is prone to inflationary influences. (So this is similar to an index-linked liability.)

For investment-linked products, the (unit) outgo is directly determined by the value of the investment underlying the contracts.

The treatment of inflation-linked liabilities depends on the term of the claim outgo:

Where the claim payments are due within the next year, unexpected inflation will not be a major problem. First, there is not long for inflation to affect the liabilities.

Secondly, inflation over the next year is unlikely to deviate much from the expected value. Therefore, for very short-term liabilities subject to inflationary increases, the liabilities are often taken to be fixed in monetary terms.

Where the claims payments are likely to stretch several years into the future, then inflation is likely to be a major consideration.

Currency
Most liabilities s of an insurer are likely to be in the currency of the country where it operates. However, overseas liabilities may arise if the insurer underwrites overseas risks or if it writes business overseas through an overseas branch.

Expenses

Liabilities for expenses in respect of the business already written are for the expenses of servicing that business, eg handling claims. These expenses will be:
- Less uncertain than claims
- Subject to inflation, predominantly wage inflation
- Mostly in sterling.

(c) Material to be added

(d). When deciding on the types of assets needed to cover the Required Margin of Solvency (RMS) an insurer should avoid all significant risk. In fact, the insurers are expected to be even more cautious and to plan their finances, including the structure of their investment portfolio, with the aim of holding may be twice the statutory minimum even though the regulations do not require them to do so. The safest option is to hold fairly short-dated gilts because they offer:
- Security of payment because of their UK government guarantee, and
- Low volatility of capital value in the market because of their imminent maturity date.

(e). Some of an insurance company's free reserves must be held securely to cover the RMS – perhaps doubled. The excess will be available to invest in a way that is likely to produce a good long-term return, for the shareholders in a proprietary insurance company, or for the policyholders in a mutual insurance company.

The way in which an insurer chooses to invest the assets supporting these reserves will be influenced by their size.

It is important to realize that an insurer has a duty to the policyholders to invest wisely to protect its ability to meet its liabilities to them .However, a proprietary insurer also has a duty to its shareholders to sustain and enhance the return it achieves on the assets over and above those that it retains as the minimum solvency margin. This means that it needs to invest some of its free reserves long

term in equities, both UK and overseas, and perhaps in direct property investment as well if the scale of the funds available for investment is sufficient for it to build a diversified portfolio.

The solvency margin enables the insurer to exercise a freer investment strategy than if the assets merely equaled the liabilities. However, the extent to which that freedom may be exercised will depend on the actual level of the solvency margin relative to any statutory requirements.

Both implicit and explicit margins in the technical reserves are essentially part of the free reserve and so provide greater investment freedom in a similar way to the explicit solvency margin. However, as thee exact extent of the margins will be uncertain, some degree of caution must be added to the investment policy. The investment freedom provided will not, therefore, be as great as is provided by an explicit solvency margin.

(f).   Cash might be probably the best single asset category.
       Reasons.
       - No problems with marketability or asset values
       - Secure in money terms
       - There is a link between short-term interest rates and inflation, so some limited inflation protection.
       A portfolio of short-term index-linked gilts might also be acceptable.

       For a company with very low free reserves, cash is the only acceptable answer.

       For a company with very large free reserves then the fund manager could put he whole lot into equities (and hope that there's not a repeat of 1974's crash!).

(g).   Reasons equities are not most suitable for PMI are that:
       - Equity values may fall dramatically in the short term causing a shortfall to meet claims, or even insolvency
       - Equities are not as liquid or marketable as cash, and cash is usually needed in the short term for these liabilities
       - Large sales of equities needed to pay claims may depress the market price causing a shortfall
       - There may be admissibility problems.

       Equities may form a significant proportion of a health insurer's portfolio because:
       - The company may have large free reserves and be seeking higher expected returns.
       - The majority of liabilities may be in respect of long-term business (egg pre-funded LTC) and be best matched by equities providing inflation protection
       - Proprietary companies may have a preference for franked income

- The company may have predominantly unit-linked long-term contracts, with unit funds invested in equities with little risk to the company.

(B).

(i). The analysis of new business and lapse by distribution type will give a key indication as to profit generated by each form of sales medium. The analysis may compare the expected against actual movement rates, or may compare embedded value generated against that anticipated or some other measure. This will feed into the formulation of future company sales and marketing strategy.

Lapses at renewal (short-term business)
 Lapse rate= no. lapses for period x / no. renewals invited for period x

Lapses from a particular period, by definition, can stem only from those policies actually invited for renewal in that period. The best way of measuring lapses is therefore to express them as a percentage of the renewals invited in that period.

This may be done both in total and for specific sub-groups.

Lapses will normally be monitored on a monthly basis. Care needs to be taken to allow for the time lag between the renewal date and the point at which it becomes apparent that a policy has lapsed. This lag might be estimated from recent past experience, but it cannot necessarily be assumed that such an estimate is accurate for current experience.

The renewal rate is the complement of the lapse rate because all policies invited for renewal either lapse or renew (although this depends on how you treat those upgrading or downsizing cover).

Lapses (long-term business)
The number of policies lapsing in any period will be compared to the relevant portfolio exposed to risk to produce lapse rates. A key area for analysis for a long-term insurer will be the duration from entry. This will enable the office to ascertain its susceptibility to loss as measured by the degree to which the capital outlay in writing a policy has not been repaid by the premiums received prior to lapse.

(ii).   To calculated lapse rates for a group policies, you will need a basis for estimating the notification and processing delays for lapses. Let's suppose that for one group, our past experience with lapses has been as follows"

	Proportion of lapses processed by end of month				
Month	0	1	2	3	4
Proportion	37%	68%	89%	97%	100%

The time period here is between the renewal date and the date the policy is recorded as a lapse. In practice, it may take much longer than four months for all the lapses to be processed.

From this table, we can estimate that, for example, of all the lapses relating to potential renewals in June, 68% would be processed by the end of July and 100% by the end of October.

At the start of June we carry out an analysis of lapses for the last 9 months. The numbers of renewals invited for each month and the number of lapses amongst them to date are as follows;

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Renewals Invited	795	806	853	602	945	791	812	880	853
Lapses	158	163	159	101	163	223	218	177	104

What can we conclude from these data? Using our estimates of delays in processing lapses, we can estimate the total expected number of lapses for each month, from which we can estimate lapse rates for each month.

Calculating the estimated lapse rates for the other months leads to the following results:

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Estimated Lapses	158	163	159	101	163	230	245	260	281
Lapse rates	20%	20%	19%	17%	17%	29%	30%	30%	33%

From this analysis, it appears that there was a sudden change from February onwards. The two most likely explanations for this are:
- There has been a change in the way that lapses are processed, which invalidates our estimation basis.
- Between January and February, the competitiveness of our premium rates for these policies suddenly deteriorated. This might have been caused by:
    o An increase in our own rates in February
    o A reduction in competitors' rates.

You should not assume that the increase in lapses in necessarily bad. It might be that the company decided that it would make more profits by writing fewer policies at higher premium rates.

C. Long-term insurance
- Prospective premium reserve- the discounted value of future cash flows.
- Claims reserve – the discounted value of claims in payment including claims that have arisen but have not yet been settled.
- Option reserve – additional costs that need to be set aside for the eventuality that a particular option is exercised.
- In a group risk context, the concepts of unearned premium reserve, unexpired risk reserve and incurred but not reported reserve will also apply (see below)

Short-term insurance
- Unearned premium reserve – the balance of premiums received in respect of periods of insurance not yet expired.
- Unexpired risk reserve – reserve for unexpired period of cover where it is felt that the unearned premium reserve is inadequate.
- Outstanding reported claims reserve – reserve in respect of reported claims that have yet to be fully settled.
- Incurred but not reported reserve – reserve in respect of claim events that have occurred but have yet to be notified to the insurer.
- Incurred but not enough reported reserve –adjustment to the reserve for reported claims where early reserve estimates are too low or too high.
- Equalization and catastrophe reserve – reserve 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 – reserve in respect of claims reported but not assessed, or not recorded.

2 (a). Bank customers include mortgage customer, individuals deposit holders, small businesses. IP and CI products could meet following needs:
To meet specific needs
Repay loans
CI lump sum
IP meet repayments
Replace income – IP
Key person cover
Compensation for loss of profits
To pay for a replacement

To provide cash
CI Lump sum
More than cost of immediate concern
CI provides cash to repay loans whilst p/holder is still alive
For a change in lifestyle
IP income stream
Proportional benefit if part time work

To allay fears
Provide financial comfort
Help prevent financial hardship for dependents
Pay for domestic help

To pay for medical fees
Home modification
Recuperation benefits
For employers, as an employee benefit, to attract staff
Partnership dissolution on CI

(b). **Badging**
Advantages
- Benefit from professionals expertise in all areas
- Particularly relevant for IP claims
- Medical underwriting expertise
- No current experience so can benefit from all of this
- Historically poor income protection experience
- Potentially cheaper for them to do than the insurer
- Can concentrate on distribution
- Can be a speedier installation than own product or subsidiary
- Additional profit sharing
- Cross-selling of life products, maybe bank products to H&C insurer.

Disadvantages
- Lack of synergies with internal operating procedures
- Linking to the 3rd party systems etc
- Loss of control over policy process and claims administration will possible resulting reputational risk.
- May be less profitable in long run
- Loss of economies of scale
- Skill needed in drafting service level agreements, other contract issues
- Loss of link between sales staff and u/w
- Actuarial control cycle more difficult to apply
- Counterparty risk

(c)   Investigations for pricing own product business include:
Morbidity / Mortality
Analysis of the company's experience over 3-5 year period
    Long enough to have reliable data and short enough to be homogeneous
    Stand – alone, acc
    Make allowance for any change in underwriting standards

In addition, and particularly if the company has insufficient data
    Industry data (such as CMI reports in the UK)
    Data from reinsurer
    Published tables

Published data will probably need adjustment for the particular circumstances of the company and its products

Need to consider trends in experience especially for morbidity

For critical illness, would reconsider illnesses and conditions covered.
    If sufficient data may analyse by specific disease.

For income protection, consider claims inceptions
    And claim terminations experience
Look at partial recoveries

Claims data would be subdivided as follows:
- Age at inception
- Sex
- Smoker status

If sufficient data, may analyze by :
- Current age (elapsed duration of policy)
- Duration of claim
- Policy term
- Deferred period
- Occupational group
- Ratio of benefit to income
- Type of sickness and injury
- Date of termination of claim
- Reason for termination of claim
- Sales channel
- Geographic location

Because of doubts over morbidity rates the company is likely to reassure a large proportion of this business.

Rates included in reassurance terms would probably be follows.
AIDS projections are available, but only as industry-wide data.

Data needs to be interpreted with care. Deaths from critical illnesses covered will be irrelevant, because a claim will already have been paid. Other deaths release reserves as no benefit is paid. This is a different situation from the type of policy the data were collected from.

Assess credibility of data in each cell and group accordingly exposure and claims data must be collected and subdivided consistently.

Comparison of the proposed target market and that in the data is important

Almost certainly likely to use the experience to generate an adjustment to a standard table.

Investment returns
This should reflect the expected return on the underlying investment

Expenses
The company should have an analysis of expenses over recent years.

A series of analysis helps to identify trends to use in assessing future rates.

Expenses should be split into acquisition, maintenance and claims and between contract types. For income protection, the expenses may also be split between claims inception and claims maintenance. The level of detail will depend on the size of the company.

Need to allow for any specific one-off costs an any expected additional costs (e.g. regulations0.

Expenses might also be analyzed into those which are contract size related and those that are policy related.

If the company's expense investigation does not provide credible data down to the particular contract type, broader averages may have to be adjusted.

Probably with input from reassurers.

Inflation needs to be allowed for from the date of investigation up to the date the rates will be used and allowance made for nay expected trends in future inflation assumptions.

Launch expenses

Commission
The rates and structure that the company intends to pay can be loaded directly into the basis.

Expense inflation
National data on inflation of prices and earnings.
Expected future rates of inflation – possibly measured by the difference in returns on government fixed interest and index-linked securities

The expense inflation rate will be chosen to be consistent with the investment return assumption

Withdrawals
The company should have an analysis of experience available relating either to this contract or to broadly similar contracts.
Limited industry aggregate data may be available but will have to be adjusted to meet the particular contract and target market.
The analysis may need to be adjusted because it has been affected by unusual economic circumstances over the period the data were collected.
Adjustments may also be needed if the intended target market or sales channel are different from those in the data analyzed.

Analyse lapses by duration, product, sum assured, age, sex

Tax
Suitable assumption will need to be made taking into account the company's current and future tax position.

Profit
Risk discount rate/profit criteria set according to the company's requirements.
Wider margin for risk as fist time and inherently more risky than life an investment

Market rates
Analysis would also be made with competitors products and rates

Other
Mix of business
Margins in rates generally

(d).   Actuary needs to understand how the with-profit distribution operates in the company under consideration.

Do any health and care products share in the distribution; if so, how? In a <u>UK</u> context this is very unlikely.

To what extent do the with-profit policyholders share in the profits of the health and care operation?
The Actuary will be particularly careful where the size of the health and care book is significant in its contribution to distributional surplus.

Policyholders Reasonable Expectations – Profits from a health and care operation do not emerge on a smooth basis; the actuary should be cautious in promulgating any profit expectations from the health and care area.

Smoothing – The distribution of any surpluses from the health and care operation will be volatile; the actuary will determine such profit as does emerge on a smoothed cautious basis.

Reversionary or terminal – any profit arising from the health and care operation are likely to be small in relation to other component parts of the insurance business. The impact on bonus distribution will therefore be less significant and may be only a small addition to the bonus rate. It is usually perceived that terminal bonus is used to take up the slack from more volatile past contributions to surplus when allocated to a class of maturing policies. This might be the case with the one-too-regular profits from health and care insurance but their relative size would normally suggest distribution on a reversionary basis.

With-profit guide
Principles and practice of financial management (PPFM)
Treating customer fairly (TCF)

(5)

(e).   Advantages
- Some claimants should return to work sooner
- Should improve claims terminations
- Claims notified during deferred period may also return to work sooner
- Improving claims inceptions may also discourage borderline claimants from claiming
- Could provide positive PR for company.

Disadvantages
Professionals are expensive
- Average benefit levels may be low and so the benefits of doing this may not be worthwhile doing
- Maybe seen as trying to say no to valid claims
- Note these are customers of the bank
- Health professionals, if not employed directly, may advise people to stay of work who would otherwise have returned to work

In general, only worthwhile for large claims due to the expenses.

(f).   products price too high so only attracting those customers who would be rated by
        other companies.

        Medical underwriting standards may be worse than competitors
        Financial underwriting standards may be worse than competitors
        Claims admissions rules more generous than average
        Non-identification of fraud / non-disclosure
        Claims management – less active than average
        The replacement ratio (benefit relative to income) may be higher than average –
        less incentive to return to work.
        Customer segment poor
        Policy design encouraging anti-selection e.g. high replacement ratio
        Weak disability definition
        Pricing wrong – e.g. no occupation rating
        Distribution channel – anti selection high risk for IFAs
        Inflation higher than allowed for in the premium rates.
        Economic factors may have led to higher claims
        Threat of redundancies
        Directors information could be wrong
        Random fluctuation
        Over conservative reserving
        Concentration of risk
        Medical advances may prolong claim (instead of death)
        Change in attitude to claim
        Anti-selective lapses.

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