

# ACTUARIAL SOCIETY OF INDIA

EXAMINATIONS: MAY 2006

## Subject SA2 – Life Insurance Specialist Applications

### INDICATIVE SOLUTIONS

1.

- a) Comment on the design of the product and describe the risks to the company with launching this product. A discussion about the general risks affecting the industry is not required.

(This solution is more detailed than might be expected in the time allowed, but candidates are expected to comment and describe, and not to merely present a list of points.)

#### Design comments:

- ? The high minimum premium, high equity exposure and unit linked design indicate that the target market will be sophisticated high net worth individuals.
- ? The short period of 5 years, the capital guarantee and high equity exposure are attractive features of the contract.
- ? The limited application dates are intended to give consumers a feeling of urgency (before the end of the 31 March tax year) and scarcity (the product is available for less than 2 months).
- ? The charges under the contract appear very low.
- ? The product should have appropriate fund management charges say around 1.5% per annum. In addition there should be a charge for the maturity guarantee.
- ? The procedures for handling applications at the cut off date need to be specific. How will applications near the cut off date be handled? According to date received, date cheques are cleared, or date insurance cover is accepted?
- ? The surrender penalties if any need to be set. Penalties will be difficult to justify as there are no un recouped charges to recover and the policy value is clearly related to the market value.
- ? The terms for switching, partial withdrawals and tops ups need to be specified.
- ? Solvency reserving requirements are quite high compared to the low charges.
- ? ULIP guidelines require that there be no surrender value for three years, and there may be some conflict with the 4:15pm rule for allocation of monies.
- ? Tax treatment – while the product should qualify for the Rs 1,00,000 deduction under Sec 88, policyholders need to understand that benefit payments will be taxable.

#### Risks:

- ? ALM risk  
Principal risk is the maturity guarantee equal to the entire premium paid considering the high exposure to equities. Assuming a return of 6.0% pa on the fixed interest portfolio:

Then for the 60% equity fund:

$$0.975 x (0.4 x 1.06^5 + 0.6 x (1-x)^5) \leq 1$$

Solving shows that if  $x \leq -4.0\%$  pa (or  $-18.5\%$  over the 5 years) then the guarantee will have effect.

And for the 80% equity fund:

$$0.975 x (0.2 x 1.06^5 + 0.8 x (1-x)^5) \leq 1$$

Solving shows that if  $x \leq -1.1\%$  pa or (-5.4% over the 5 years) then the guarantee will have effect.

The level of investment risk is high, especially for the 80% equity fund. It should be noted that any additional charges will increase the value of the maturity guarantee. An active and expert investment strategy is required.

Two months is a fairly long period for significant market changes to happen. Conversion of moneys into units as and when received and investing them immediately and not accumulating till 31 March could significantly reduce the risk. This would also stagger the maturities over two months, thus reducing risk further.

? Expense risk

The only stated charge is the allocation charge of 2.5% of the single premium. This has to cover:

- commission of perhaps 1% or 2%
- product development costs
- initial expenses
- renewal expenses
- investment management expenses
- claim expenses
- stamp duty
- mortality charges
- cost of maturity guarantees

It appears that the charges are very low and some additional charge (probably a fund management charge on the value of assets) will need to be introduced. In addition, a charge towards the maturity guarantee is also required. Even so, the profitability of the product is heavily dependent on the expenses.

Expense inflation is a small risk because of the short 5 year term of the product.

? Mortality

Anti selection is unlikely because the sum at risk is low compared to the single premium.

This is a high net worth product however and for very large single premiums the sum at risk may still be significant. If the non medical limits relate to the *sum assured* rather than to the *sum at risk* then there is probably little added risk from the increased non medical limits.

Reinsurance may still be necessary for very large single premiums.

No maximum age has been specified and this will be necessary because of the risk cover.

? Market risk

Although there is no surrender value guarantee, there is a market risk from the 15 free look period which is magnified because all investments will be made at a single date on 31 March.

There is also a market risk if the investment performance is poor which may lead to mass surrenders or poor publicity.

As there is no maximum premium there is a possibility of jumbo cases which may attract negative publicity if returns are poor.

? Termination risks

With the product charges described, there is not much termination risk because there are no unrecovered charges on termination. In fact profitability may even improve because actual maintenance expenses are reduced if a policy surrenders.

If a significant surrender penalty is introduced to improve product profitability, there is a risk that the penalty will discourage terminations and so the hoped for profits will not materialise.

? New Business risk

If new business plans are not achieved, then product development and promotion costs may not be recovered.

[15]

b) Describe briefly the two principal methods used to price products and state why one of them is preferable.

#### **Formula method**

Under the formula method, the present value of all future benefits and expenses is equated to the present value of all premiums so as to solve for the premium rate. Traditionally, commutation functions are used for the formula method. The method can allow for bonus loadings and a variety of expense structures, but it is not practical to allow more complex items such as lapses and cost of capital.

[1½]

#### **Cash flow method**

Projected cash inflows and outflows are modeled over the term of the contract, and the premium rate is varied until the desired profit criteria are met. (The initial trial premium may well be set using the formula method.)

[1½]

The cash flow method is widely preferred because it allows for greater complexity, flexibility and the explicit treatment of many variables.

- explicit profit criteria
- allows for shareholder transfers under with profits policies
- allows for sensitivity and scenario testing as well as being adaptable for stochastic modeling
- allows for interdependent variables
- explicit treatment of statutory reserving and solvency margins
- specific allowance for tax
- capital requirements and liquidity position can be accurately modeled
- suited to modeling at a policy level as well as at a portfolio level
- allowance for lapses, surrenders, paid ups and other change of status can be made
- ability to vary parameters (in particular interest rates) over the term of the contract
- monthly projections are feasible
- riders, options and the impact of guarantees can be modeled
- generally better suited for flexible and complex products

[ 8]

c) State the legislative provisions on limitation on management expenses of a life insurance company and how they apply to the pricing of products.

#### **State the legislative provisions:**

The relevant legislation is Sec 40B of the Insurance Act 1938, and Rule 17(D) of the Insurance Rules, 1939. As Sec 40B defines “management expenses” to include commission, Sec 40A – Limitation of expenditure on commission - is also relevant.

The Brokers and Corporate Agents regulations prescribe the maximum remuneration payable to them.

Sec 40A prescribes commission ceilings. Broadly these are:

On single premiums: 2%

On deferred annuity – regular premiums: FY 7.5%; subsequently 2%  
Other assurances – regular premiums: FY 35%, 2<sup>nd</sup> and 3<sup>rd</sup> yrs:7.5%; thereafter 5%  
Slightly higher commissions can be paid in the first 10 yrs of a new company. There are various provisos to the section.  
Brokers & Corporate agents: Similar to agents with some changes

Sec 40B prescribes maximum expenses that could be incurred by a Life company. This read with rule 17D broadly prescribes a first year cost ratio of 90% and renewal expense ratio of 15%. Relaxations apply in the first 10 yrs for a new company. Where the premium paying period is less than 12 years, the first year expense ceilings are restricted to 7.5% multiplied by the premium paying term. There are various provisions and administrative provisions in the section.

### **Application to pricing of products:**

While setting commission and expense assumptions for a new product, the actuary needs to take into account the provisions of Sec 40B and Rule 17D. The maximum commission scales prescribed under Sec 40A should not be exceeded. The maximum expenses including commission allowed under R.17D depend on the premium paying term e.g. the maximum first year expenses for a policy where premiums are payable for only 3 years is  $3 \times 12.5 = 37.5\%$  in the first year and the actuary has to ensure that a product where under only 3 premiums are payable is priced taking this into account. Although the expense ratio is computed on the entire portfolio of business, it would help if the ceilings are adhered to in pricing for each product/term. Note that when the proportion of short term business is high, the average premium paying term of the portfolio shortens and the expense ratio may worsen.

Sec 40B(1) requires the actuary to furnish (in a prescribed form) the premium basis used for new business to the IRDA giving details of expense loadings as well as mortality, rate of interest and bonus loadings. It is under this Section that the “File and Use” procedure operates, and the IRDA has the power to refer the “File and Use” documentation to an actuary of the IRDA’s choice for certification, with or without modification.

[Total 8]

- d) The marketing department has since suggested the following modifications:
- ✍ Split the investment up into ten identical policies, which may each be surrendered separately from the others, and guarantee the terms for surrender.
  - ✍ Extend the offer period to two months, in order to capture more money. Pay 4% pa interest on the investment during this period.

Discuss these suggestions.

### **Split into 10 policies:**

- ? In general it is risky to guarantee surrender value at every point of time. Given the high equity exposure, even if guarantees are low, it could still be onerous. This will also have impact on the investment policy.
- ? Currently (mid May 2006) markets are high with the BSE sensx around 14000. This adds to the risk as markets tend to correct over time.
- ? the split into 10 policies will undoubtedly appeal to some policyholders and agents because of the increased flexibility and higher guarantees
- ? but this increases the value of the guarantee substantially as there will now be a guarantee at every point in time over the five years, and not just at maturity
- ? the profitability of the product will go down, and the capital requirements will go up
- ? some penalty on early surrenders will still be needed to allow for the 2.5% allocation amount
- ? it is not clear whether the split to 10 policies will improve retention or not - customers can now surrender a few policies instead of withdrawing the entire amount, but will customers who would have kept the policy for the full 5 years now be tempted to make some part surrenders?

- ? underwriting will still be based on the aggregate sum at risk for the 10 policies combined
- ? there are major systems and administration implications:
  - o ability to link 10 policies and keep track of them at a customer level
  - o increased administration load from 10 benefit illustrations, 10 policy issues, 10 stamp duty payments, 10 annual policy notices, 10 benefit payments on surrender, death and maturity, policy assignments, policy loans, reinsurance etc
- ? customer and agent understanding of the product: there will now be requests for single policies for premiums of anything between Rs 10,000 and Rs 1,00,000
- ? technically this will reduce per policy costs BUT the expense loading per policy will be correspondingly increased so there is no advantage to be gained here

[4]

**Extend offer period to 2 months:**

- ? is the intention to change the offer period to 1 Feb to 31 March, or from 8 Feb to 8 March?
  - o if 1 Feb to 31 March, can the product launch still be on time?
  - o if 8 Feb to 31 March, will the urgency of the 31 March tax deadline be diluted?
- ? this could lead to slightly higher volumes of business and the minimum expected could well be reached.
- ? although the increase in the period is only one week, this does increase the exposure to possible turbulent market conditions and the impact these will have on sales and on the 15 day free look period
- ? are there any legal or tax implications of paying interest before the contract is actually issued?
- ? will the interest be payable if the proposal is withdrawn or declined, or on a refund under the 15 day free look period?
- ? does the policy administration system support this feature?
- ? will interest be credited from the date that the proposal is received or the date that the customer's cheque is cleared?
- ? is the 4% interest to be calculated on the gross premium or the 97.5% allocation amount?
- ? while the marketing impact of the interest payment should not be underestimated, the amount of interest is significant compared to initial policy expenses, as it amounts to  $1/6^{\text{th}} \times 4\% \times \text{Rs } 1,00,000 = \text{Rs } 666$ , and arrangements must be made to maximize the amount of pending monies which are actually invested to earn interest

[Total 8]

- e) The benefit illustration for the product has been prepared and you are seeking approval of the Board of Directors for releasing this. A new director questions why a life company would issue a benefit illustration and what should be the underlying principles to be followed by the life company.

Draft a reply to the new director. Your reply should cover regulatory and other professional requirements in this regard.

“Dear Director,

**Benefit Illustrations**

You have asked me to comment on why a life insurance company would issue benefit illustrations, and what principles should be followed by the company in doing so.

*The need for benefit illustrations*

Benefit illustrations are a very important tool to protect and inform potential policyholders as well as protecting the life insurance company itself.

- ? disclosure of essential product features and conditions
- ? establish Policyholder Reasonable Expectations especially regarding amount and volatility of investment returns
- ? protect the insurance company and policyholders against misselling
- ? benefit illustrations are obligatory under the following instruments
  - o IRDA (Policy Holder Protection) Regulations 2002
  - o Life Insurance Council circulation: Industry Self Regulation Code of Conduct and Sound Practice
  - o ASI Professional Guideline GN5 - Appointed Actuary and Principles of Life Insurance Policy Illustrations and associated checklist and questionnaire
  - o ASI GN1 Appointed Actuary and Life Insurance Business

**[4 marks for reasons]**

*Principles for benefit illustrations*

The following list summarises the principles with which benefit illustrations must comply:

- ? appointed actuary has an obligation to see that policyholders are not misled by point of sales materials and benefit illustrations
- ? a specific illustration must be issued to each client at the point of sale
- ? brochures are to be simple and unambiguous
- ? any reference to past investment performance shall include a statement that “past performance may not be a guide to future performance which may be different.”
- ? the illustration must distinguish clearly between guaranteed and non guaranteed benefits and state that the quantum of non guaranteed benefits may vary
- ? all illustrations must be made in consultation with the appointed actuary and be authorized by the management of the company
- ? illustrations must be given at two rates of investment return, a higher rate and a lower rate as set from time to time by the Life Insurance Council
- ? companies may use a lower rate but not a higher rate
- ? a statutory warning in prescribed wording must appear on all illustrations to the effect that some benefits are guaranteed and some are non guaranteed, that benefits will depend on the future performance of the company, that illustration rates are not upper or lower limits etc
- ? the illustration rates are gross and fund management fees and policy charges must be deducted
- ? the illustrations must be reviewed at least once a year in April
- ? the process of issuing illustrations is to be controlled to ensure that customers receive only the company’s official illustration
- ? all policy fees, fund management and other policy charges must be shown in the illustration
- ? the illustration must describe the company’s policy on surrender values, it is option show the surrender values, but it must be stated whether or not surrender values are guaranteed

**[7]**

I trust this is the information that you are looking for. If you need any further information, please contact me.

Yours sincerely,  
Appointed Actuary”

**Total [50]**

2. A newly established proprietary life company in its first year of operation writes with profits endowment, money back and whole life contracts together with a range of rider benefits. In preparation for the first declaration of bonuses, the company now needs to formulate its bonus policy.

In the long term the company intends to invest 25% of the with profits fund in equities and the balance in fixed interest. The proposed bonus strategy is to declare a stable rate of reversionary bonus with the hoped for returns on equities in excess of the gilt rate to be distributed by way of a more volatile terminal bonus rate.

- i) Describe the investigations the actuary would need to make in order to recommend the initial reversionary and terminal bonus rates.
- ? Usually the starting point would be experience investigations into investment returns, expenses, mortality and morbidity, lapses and product mix.
  - ? As this is a new company, only limited experience investigations can be carried out.
  - ? What will be more relevant will be the business plan (or premium basis) assumptions.
  - ? Need to establish applicable tax rates and shareholders' entitlements to surplus.
  - ? **Bonus earning capacity** of each product line must be established.
  - ? The bonus earning capacity should also consider different model points (age, term, duration, policy size) to verify that a single bonus rate (or at least a simple scale of bonus rates) is broadly equitable for all classes and cohorts.
  - ? This bonus earning capacity is established by comparing projections of the **bonus reserve valuation** with the **asset shares**.
  - ? The **current solvency position** after the cost of new bonus must be established.
  - ? Consider whether current policy values on death or surrender compare favourably with asset shares.
  - ? **Model office projections** of future solvency, free assets and investment earnings (including capital appreciation on equities) to establish
    - ? sustainability of reversionary bonus rates
    - ? equity and ability of terminal bonus rates to deliver maturity values which are comparable to asset shares
    - ? sensitivity to asset value fluctuations,
    - ? free assets and investment freedom, and
    - ? future capital requirements.
  - ? **PRE** which has been established by benefit illustrations, marketing literature and policy documents.
  - ? Impact of declared bonus rates on benefit illustrations for new business.
  - ? Sources and uses of future capital.
  - ? Contribution to surplus from rider benefits (in India riders to with profits basic benefits form part of the with profits fund). This can be done by modelling the rider benefits explicitly, although at the early stage of development of this office it may be sufficient to assume an appropriate percentage of total surplus will arise from rider benefits.
  - ? **Competitive considerations**, what are competitors doing and how do our benefit illustrations compare using the declared bonus rates.
- [15]
- ii) The company wishes to formulate its policy on smoothing of bonuses. Discuss how the smoothing policy will be impacted by:
- ? policy holder expectations
  - ? the asset allocation, and
  - ? the extent of the free assets of the company

**Policyholder considerations:**

- ? Policyholders generally probably have an expectation that reversionary bonuses will be stable and maintained implying either a low level of reversionary bonus rates or a high level of smoothing.
- ? Policyholders probably expect a more volatile terminal bonus but wide fluctuations near to maturity are unlikely to be acceptable, so some degree of smoothing of terminal bonus rates may still be required.
- ? Naturally, the smoothing policy should not contradict what has been communicated to policyholders through benefit illustrations and marketing material.
- ? The competitive position of the company must be maintained.

**Asset allocation considerations:**

- ? The company intends to invest up to 25% of the with profits fund in equities. This should provide higher long term returns, but as equities are more volatile than fixed interest, this implies a higher degree of smoothing.
- ? The company is only a year old, but from its projection models would want to see that terminal bonuses could be reduced enough to absorb adverse falls in asset values without putting pressure on reversionary bonus rates.
- ? With a significant exposure to equities, the company may consider reviewing terminal bonus rates more frequently than annually.

**Free asset considerations:**

- ? Free assets can arise from accumulated undistributed surplus or from shareholder capital.
- ? To the extent that there are large free assets, there can be more smoothing and the company can afford to pay maturity benefits that may exceed the asset shares, on the understanding that when asset values recover maturity benefits may be less than asset shares.
- ? If there are no free assets, then smoothing reserves have to be created by holding back surplus and paying benefits which are well below asset shares.

[7]

- iii) a) List the sources of surplus for distribution and discuss for each source the suitability of the company's proposed structure of reversionary and terminal bonuses.

**Sources:**

- |   |              |
|---|--------------|
| ? Investment income on surplus                      | reversionary |
| ? Release of bonus loadings                         | reversionary |
| ? Expense surplus                                   | terminal     |
| ? Mortality and morbidity surplus                   | terminal     |
| ? Withdrawal surplus                                | terminal     |
| ? Surplus from riders etc                           | terminal     |
| ? Capital appreciation and other investment surplus | terminal     |
| ? Mismatching surplus                               | terminal     |

**Suitability:**

- ? Surplus should not be distributed **before** it emerges, and ideally should be distributed **at the same time** as it emerges.
- ? Stable sources suit distribution through reversionary bonuses, irregular sources through terminal bonus

[8]



b) The company's business plan projects substantial expense overruns for at least the first five years of operation (although for marketing reasons the directors wish to declare bonuses from inception). Discuss the considerations the actuary faces in dealing with the expense overruns when making his recommendations on bonus rates.

- ? Expense overruns will be very large and in fact are likely to exceed all other sources of surplus for some years. There will be a deficit arising rather than a surplus.
- ? Expense overruns have to be financed by shareholder capital and recovered by future shareholder transfers.
- ? The company will never be able to recover the expense overruns from the initial policyholders, and will depend on a high rate of growth so that the company reaches a critical mass and becomes viable.
- ? Some directors may feel that the cost of expense overruns is a sunk cost which can never be directly recovered but which can be justified by the growth in the embedded value of the company.
- ? The actuary will need to exclude the expense overruns in setting bonus rates for current policyholders.
- ? The actuary will however allow for expense overruns in his model office projections to ensure that at a macro level the expense overruns can be justified in the long term.

[5]

iv) One of the directors has been studying the requirements of the Insurance Act 1938 and regulations framed there under as they relate to the allocation of surplus to shareholders. The Director has asked you to explain:

- a) The difference in the treatment of reversionary and terminal bonuses when determining the amount of surplus to be allocated to shareholders.
- b) The effect of any changes in the solvency valuation basis on the amount and timing of allocations to shareholders.
- c) The difference between the prescribed shareholder allocations actually made and the value of these allocations under the company's realistic valuation basis.

Draft your reply to the Director. (3 marks will be awarded for drafting style.)

“Dear Director,

Allocation of surplus to shareholders

You have asked me to comment on a number of aspects relating to the distribution of surplus to shareholders. You will have noted that the regulatory position is that 1/9<sup>th</sup> of the value of surplus distributed to policyholders (declared bonuses) may be transferred to shareholders. The statutory gross premium bonus valuation reserve method is used to determine the value of the declared bonuses and the valuation assumptions are prudent ones that include a margin for adverse deviation.

*Treatment of reversionary and terminal bonuses*

With reversionary bonuses, the value of the distribution to policyholders is the present value of the bonus now declared, whether it becomes payable on surrender, death or maturity.

Terminal bonuses are declared for only one year at a time. The value of terminal bonus now declared is therefore the amount of terminal bonus actually paid out to

those policyholders who actually surrender, die or mature in the ensuing year. In the early years therefore the cost of terminal bonus is very low, and the shareholder's allocation in respect of terminal bonus is even smaller. Of course terminal bonus payments grow and eventually become large.

Overall, reversionary bonuses bring shareholder allocations forward, while terminal bonuses defer them. [2]

#### *Changes in the statutory solvency valuation basis*

I have already noted that statutory solvency basis used to determine the value of policyholder distributions is a conservative one. This has the somewhat contradictory effect that if the basis is strengthened (because of adverse experience), the calculated value of the cost of bonus will increase and so will the shareholders' allocation. On the other hand, the additional capital required to support the strengthened reserves may have to come from shareholders, and so a higher return to shareholders may be appropriate. [2]

#### *The company's realistic valuation basis*

The company uses a realistic basis for the purposes of pricing products, profit reporting and financial projects. The assumptions under this realistic basis are weaker than the conservative statutory basis and give rise to lower policy reserves. Similarly, the cost of bonus (value of policyholder distributions) on the realistic basis will be lower than on the statutory solvency basis.

This means that the amount of shareholder allocations allowed by regulation are in fact more than 1/9<sup>th</sup> of the cost of bonus as determined on the realistic basis. [2]

Yours sincerely, etc"

[9]

v) Discuss the implications of the three types of bonus (under the "additions to benefits" method) as regards:

a) the asset liability matching process, and

(The three types of bonus are

- regular reversionary bonuses
- special reversionary bonuses
- terminal bonuses)

- ? Where benefits are fixed, the assets need to be appropriately matched (unless there are free assets to cover any mismatching).
- ? Where benefits have a discretionary element (after allowing for policyholder reasonable expectations) and can be adjusted in line with changes in asset values, the need for asset-liability matching is reduced.
- ? The split between reversionary bonuses (regular and special) and terminal bonuses sets the rate at which guaranteed benefits build up and correspondingly the need for matching.
- ? Special reversionary bonuses usually arise because of one off positive experience items, such as windfall investment gains or capital gains, which are judged to be permanent. If a high proportion of such gains have been converted to a special reversionary bonus then this indicates a high level of asset-liability matching.

- ? The extent of smoothing (whether of reversionary or terminal bonuses) also affects the asset-liability issue. The more smoothing, the more closely the assets should match the liabilities.

[3]

**b) the policy liabilities and hence capital requirements.**

- ? Under the gross premium bonus reserve valuation method used for solvency valuations in India, it is standard practice to reserve for all future bonuses at the same rate as the declared reversionary bonus. A small increase in the bonus rate therefore has a multiplier effect on policy liabilities and hence on free assets and capital requirements.
- ? There are at least three types of regular reversionary bonus; simple, compound and super compound. Simple bonuses distribute surplus earlier, while super compound bonuses defer distribution of surplus the most. Earlier distribution of surplus of course reduces free assets and increases capital requirements the most.
- ? For terminal bonus on the other hand, reserves allow only for accrued terminal bonus to date and so unless they are heavily smoothed, terminal bonuses do not have much impact on capital requirements.

[3]

**Total [50]**

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