

Institute of Actuaries of India

Subject SA2 – Life Insurance

November 2010 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

Question 1

(i) Discuss the principal considerations in determining the interest rate to be credited each year.

- A set of assets should be hypothecated to these liabilities.
- The assets would be a subset of the controlled fund and need not be ring-fenced for regulatory purposes.
- The return on these assets should be measured both on book and market value bases.
- Whether the interest rate credited is benchmarked to the book or market value return will depend on the company's risk management strategy and its policyholders' reasonable expectations.
- These may be defined principally by advertising material and policyholder communications, in particular, the benefit illustrations and the policy document itself.
- For the purpose of statutory solvency, the assets will effectively be taken at historical or book value, and hence the company may choose to manage its liabilities by reference to the investment returns achieved on a book value basis.
- However, the actuary should also be aware of the persistency risks, in particular of mass discontinuance, if the market value of the assets backing the liabilities is less than the face value of liability. Such a situation may arise if book value returns are the benchmark for the interest credited.
- The actuary should have regard to policyholders' reasonable expectations in deriving the credited interest rate from the earned investment return.
- The earned return should be adjusted applying the same principles as those assumed in the benefit illustration, e.g. application of a spread, treatment of investment expenses such as brokerage, custodian fees, asset management.
- The actuary should also have regard to competitor companies' actions in this regard.

(ii) Discuss whether the product should be participating or non-participating, and the principal implications of the decision

- A participating contract is characterised by the sharing of surplus with the policyholder.
- This is typically through the mechanism of a bonus distribution.
- If the crediting of the interest rate is taken to be a distribution of surplus (principally investment surplus) then it will be participating.
- Otherwise it will be non-participating.
- If there is the intention to, for example, distribute persistency surpluses to surviving policyholders, the product will be participating.
- Whether the credited interest rate is a distribution of surplus will depend on whether it is already provided for in the liabilities. If it is already provided, it will be met from the reserves and there should be no requirement to distribute surplus in order to meet PRE or to satisfy the contractual terms.
- One significant implication of the decision will be the tax payable. If the policy is deemed to be participating, the surplus emerging will be taxed and the distribution will be from net of tax surplus. The policyholder return will thereby be diminished.
- The other significant implication will be on shareholder profitability since only 1/10 of the distributed surplus would be available for appropriation to the shareholder fund.

- (iii) Assuming it to be non-participating, describe how you would reserve for the product and draw reference to how and why it would differ from reserving for a unit linked product.
- The reserves would be calculated as a gross premium valuation.
 - The future benefits projected would be net of charges but with an allowance for the future crediting rate consistent with the valuation rate.
 - The actuary should have particular regard to present value of any projected spread between the earned rate and the credited rate of interest. A fixed spread will have a higher value at a lower valuation rate, and could reduce the total reserve. Therefore a low valuation rate may be imprudent in this context.
 - There is no regulatory requirement to split the reserve between face value and a reserve for other cash flows.
 - This is unlike unit linked business where the unit reserve is held in full, and a non-unit reserve held in respect of other cash flows, with a floor of zero for the latter.
 - As a consequence, future charges may be capitalized and serve to reduce the reserve.
 - Therefore the actuary must have regard in particular to the persistency assumption made, since future charges will depend on persistency. Hence a high persistency assumption may be imprudent.
 - As a result of capitalising future charges, the gross premium reserve may be less than the face value. The actuary must set a floor of the surrender value.
 - The actuary should also consider the circumstances in which future valuation strains may arise. If for example, net of surrender penalty, the surrender values floor is low, but the surrender penalty applies only for a limited duration, low persistency could give rise to future valuation strain.
 - While avoidance of future valuation strain is not a regulatory requirement, the actuary should be aware of the risks to future statutory solvency.
 - The reserving may in addition allow for an explicit cost of guarantees, calculated using stochastic techniques.
 - This is because the deterministic technique of the gross premium valuation cannot capture the time value of the guarantee offered to the policyholder, nor any dynamic interaction between market behaviour, management actions on crediting rates and policyholder behaviour.
 - To use stochastic techniques, a stochastic asset model is required. This may be calibrated in a risk neutral manner, to give an assessment of the fair value of the guarantee, or it may incorporate risk premiums (with an appropriate distribution) if the expected value of the guarantee is sought.
 - Margins for adverse deviation in respect of risk benefits and expenses should be incorporated in the reserving basis.
 - If charges in respect of risk benefits and expenses are not guaranteed, the reserving basis may incorporate assumptions of management actions in respect of these charges, but these must be consistent with PRE.
- (iv) Given that the account value is guaranteed on surrender, discuss the principal considerations in construction of an investment strategy for the product. You should consider in particular how to balance the requirements to:
- (a) manage the risks arising from the guarantees, and
 - (b) generate an attractive return for long term policyholders.

- The assessment of the capital at risk may be made on a regulatory basis or on a realistic basis.
- The realistic balance sheet of the company may be modelled as an embedded value.
- The capital at risk may be assessed on the basis of deterministic stresses or by considering the tail of some stochastic simulations and calculating a conditional tail expectation.
- The investment strategy should seek to optimise returns to policyholders subject to the constraint of maintaining the financial strength of the company.
- Note that it is by optimising the policyholder return that the funds under management will be optimised and hence the charge income to the shareholders, levied through the spread between earned and credited rates of interest.
- However, whether any uplift to shareholder value is recognised at inception or as any risk premium is earned will depend on whether a traditional or market consistent embedded value is used to model the realistic balance sheet.
- It may be expected that in the long term, some equity exposure would serve to generate higher returns as a risk premium would be earned.
- However, this would be compensation for the risks arising from exposure to a volatile asset class.
- On a regulatory basis, since the account value is guaranteed on surrender, and the surrender value is a floor for the reserve, exposure to volatile assets would make the solvency position and year-on-year earnings volatile.
- On a realistic basis, some assessment would be required of policyholder behaviour in extreme market conditions.
- If one were to assume rational policyholder behaviour, one would assume low persistency during periods when the guaranteed surrender value bites, for the policyholder could then reinvest the surrender value when market values of assets are depressed.
- However, such rational behaviour requires considerable sophistication. The charges in the product may also discourage such behaviour.
- Therefore the realistic capital at risk due to the guarantees may not be significant.
- In practice, regulatory capital is likely to be more constrained than realistic capital. Furthermore, the Board's tolerance of the volatility of statutory earnings must be recognised.
- The investment strategy must be such as to satisfy the Board's risk appetite in respect of regulatory and realistic capital at risk.
- Hence the ability to offer an attractive asset mix to policyholders could be constrained by the Company's appetite for earnings at risk.

[30]

Question 2

- (i) List the information you would request from your counterpart at ABC Life, giving reasons.
- A reasonable price, assuming that no new business is to be written is the embedded value.
 - Therefore, detail of the embedded value basis of assumptions will be sought, in particular:
 - economic basis:

- risk discount rate
- expected returns on assets by class of asset
- expense inflation
- tax assumptions, in respect of rates and applicability
- treatment of any deferred tax asset
- non-economic basis: :
 - unit expense assumptions, split by:
 - initial and renewal, since only renewals will affect the embedded value
 - overhead and direct, since overheads may be assumed to be saved on acquisition
 - with profits and non-profits, since savings on with profits expenses will be of limited value given the 90:10 gate
 - actual unit expenses, split identically, so that overruns may be assessed. by:
 - persistency assumptions (surrenders and premium discontinuance, separately), split by:
 - principal lines of business, since different lines may have different lapse risks because of different charge structures
 - issuance year to see if the quality of business has changed over time
 - duration in force, since charging structures will influence policyholder persistency
 - actual persistency experience, split identically, in order to validate the basis
 - mortality assumptions, split by
 - principal lines of business
 - issuance year, to assess any secular trend in the quality of sourcing of business
 - duration in force to assess impact of the quality of underwriting
 - actual mortality experience, split identically, in order to validate the basis
 - assumptions made regarding future bonus distributions basis
 - assumptions of nature of surplus to be distributed, e.g. only investment and bonus loading or also lapse, expense, etc.
 - treatment of any other emerging surpluses
- Significant aspect of the method:
 - Whether method is fully compliant with CFO Forum EEV or MCEV Principles
 - Treatment of the estate in the with profits fund and treatment of any fund for future appropriation in the linked funds, in particular,
 - whether any cost of capital charge is applied to reflect the degree of encumbrance
 - and whether these capital resources are assumed to cover capital requirements.
 - Most recent analysis of movement of the embedded value for validation of assessments of experience relative to expectations.
 - Treatment of hedgeable risks, e.g. investment guarantees in with profits business
 - Any explicit allowance made for non-hedgeable risks, so that any credit for diversification in the combined entity may be estimated.

(ii) Discuss the principal factors that would affect the embedded value of the combined entity.

Expenses:

- Need to consider whether any synergy may emerge from merging of operations.
- Whether sufficient synergy would be created to enable XYZ to reach its expense targets.

- Synergy would require migration of business from one platform to another
- and some greater economy of scale from merging of operations.
- Cost of migrations and retraining of staff in unfamiliar products (like with profits) would have to be offset against any expected synergies

Persistency:

- Whether the change of company would be well received by existing policyholders, or would there be a significant risk of mass discontinuance?
- If ABC's existing distribution cannot write new business for the combined entity, will they be poached by some competitor? If so there will be substantial risk that ABC's book will be churned.

Tax:

- Whether deferred tax asset is transferable.
- Whether taxable status of the company would change, e.g. from a company that makes tax allowable losses to one that makes taxable profits.
- Whether there is any change in the period over which any existing deferred tax asset is to be written off.

Non-hedgeable risks:

- If market consistent embedded values are used, as per CFO Forum's Principles, a cost of capital approach may be used to assess the discount arising from the capital at risk to non-hedgeable risk.
- The capital at risk to non-hedgeable risk is dependent on
 - the marginal capital at risk to each risk
 - the diversification benefits taken in respect of non-hedgeable risks.
- The assessments of marginal capital at risk may change but that of diversification will change in the combined entity.

(iii) Suppose now that the combined entity continues were to continue to write ABC Life's lines of business through ABC Life's sales force. How would this affect the appraisal value of the combined entity?

- An assessment needs to be made of the value of new business that will be contributed by ABC Life's sales force
- A multiple of the value would be taken in the appraisal value. The multiple would reflect the growth prospects of ABC Life's lines of business
- ABC Life's tied agency has higher agent productivity than XYZ's. By retaining the sales force, it may be possible to improve XYZ's agent productivity by adoption of better management practices.
- This may enable XYZ to reach its acquisition expense targets.
- Note however that higher agent productivity does not necessarily imply higher overall efficiency as other parameters such as ratio of employees to agents need to be considered.

(iv) Following the acquisition of ABC Life by XYZ, describe briefly the analysis you would undertake of the movement in the embedded value in order to assess whether your assumptions in respect of the combined entity were sound and the extent to which expected management actions, such as rationalisation, have been effective.

Movement in embedded value consists of:

- shareholders' free surplus
- required capital
- present value of in-force

The movement in respect of each should be analysed by contributions from:

Operating variances

- assumption change
- value of new business
- unwind of risk discount rate and return on net worth
- expense variance
- persistency variance
- mortality and morbidity variance
 - separate analysis for the two books in respect of demographics

Other variances

- investment
- shareholder injections
- dividends
- Assumptions should be reviewed in particular wherever significant variances are observed to occur
- It may not have yet been possible to implement all expected management actions, from the start of year, in which case some overrun would be expected.
- Furthermore, expenses may have been incurred to generate future savings, which will also contribute to overruns, to the extent they were not anticipated in the opening EV.

[35]

Question 3

- (i) The Member Actuary has asked you to prepare a report on the financial issues facing the new companies in the Indian Insurance Industry.

Expense Management:

- Young insurance companies invariably have difficulty getting to acceptable expense levels. Factors resulting in this are:
 - (a) Costs associated with attracting talented staff to a new company
 - (b) Difficulties attracting sales agents
 - (c) Gradual build-up of tied agency business, with significant investment on the way
 - (d) Lack of sufficient scale to run a cost-effective client servicing team. Firstly to capture new business and later to maintain in-force policies.
- Rapid expansion is invariably a source of expense overruns. The process of opening new branches will not immediately yield acceptable productivity
- Cost control is often quite poor in new companies
 - (a) The Insurance Act (1938), Sec 40B puts some restriction on expenses but these restrictions are not sufficiently tight given typical pricing bases
 - (b) To the extent that expenses are allocated to with profit policyholders, it will result in lower bonuses
 - (c) It also causes a drain on capital

Asset Liability Management

- The bulk of business sold by new players is Unit Linked without guarantees, for which there are no matching challenges.

- However, the recent emergence of UL products offering a guarantee of Highest NAV during the first seven years has introduced a real need for matching.
- Fortunately these funds usually have a single maturity date, which makes it easier to match the liability.
- The addition of fixed loyalty benefits to Unit Linked business adds a significant mismatch risk. These benefits should be treated like non-par endowment liabilities, and matched with appropriate bonds.
- With profits policies can have a range of supporting investments, depending on the bonus structure. However, duration matching is clearly difficult because of the range of maturity dates in one fund. Fortunately, bonds need not be valued at market value, as they are treated as “Held to Maturity”.
- Non-par savings and annuity business should be closely matched, but it may not be possible to get sufficiently long bonds to match the liabilities.
- Furthermore, it appears that insurance companies have very different approaches to default risk, with some players sticking to Government bonds, and others relying heavily on corporate bonds to increase returns.
- Restrictions on the use of equity derivatives make hedging of guarantee risk more complicated and expensive.

Risk Based Capital:

- Historically capital requirements have been based on fixed factors set by the IRDA.
- Discussions about introducing Economic Capital have been held, but the method has not been prescribed.
- The IRDA needs to ensure that all insurers are being consistent (i.e. higher risk is reflected in higher capital).
- A general concern about most Risk Based Capital calculations is that the capital requirements typically increase after a market crash, at a time when capital has been eroded. Some degree of discretion needs to be given to the IRDA to prevent the failure of insurance companies in such circumstances.
- The biggest challenge is probably with determining operational risk, where past results are a poor indicator of the future, especially given the growth of many insurance companies and the lag before problems emerge.

Valuation of Insurance Companies for IPO:

- The prospect of shares in insurance companies being sold to the public and other companies creates a need for a fair valuation method.
- The treatment of expense overruns needs to be clarified.
- Embedded Value may be too conservative, but insurance companies should not present an assessment of Appraisal Value, as the multiple of VNB is a matter of opinion.
- Even the basis for calculating EV needs to be clarified, with European Embedded Value likely to be replaced by Market Consistent Embedded Value.

Price cutting in Group Business:

- In attempts to increase total sales through large transactions, insurance companies will reduce the rates on Group Term Insurance, and the Fund Management Charges on Fund Business.
- This could potentially be threatening the solvency of the life office, and at the very least can mislead potential investors.

Financial Reinsurance:

To what extent can Financial Reinsurance be used by new companies? In order to reduce capital injections by direct insurers, reinsurers offer initial commission based on expected future profits.

Capital Management

With the “cap on charges”, and the new circular on UL plans, the strain arising from new business has increased. This will translate to higher capital requirements.

Taxation of Life Insurance Company

What is the taxation basis for life insurers? The old taxation basis was drafted at a time when the LIC was the only life insurer, and does not recognize the presence of shareholder surplus in addition to policyholder surplus.

Other reasonable issues regarding financial position of an insurer

(ii) In the light of some very low premium rates being offered to large employer groups for Group Term Insurance, you have been asked to recommend minimum premium rates. Discuss the drivers of group rates, and the difficulties with setting minimum premium rates.

- Group Term Insurance rates depend on expected mortality, expenses, cost of capital and profit loading.

Mortality in turn is dependent on:

- Selection process followed by the employer (pre-employment medicals).
- Income levels of employees (influences ability to afford health care).
- Education levels of employees (influences adherence to medical advice).
- Gender mix of the group (generally women’s mortality lower).
- Age composition of the group (mortality increase with age).
- Policy of employer when employees get sick (if employer encourages sick to resign, mortality of group will be lower).
- Location in which employees work (impacts on availability of good health care, of safe public transport, and healthy climate).
- Nature of the job and risks associated with it – e.g. poisonous materials, dangerous machines, flammable materials.
- Level of life cover – very high cover may encourage sick people to join the employer.
- Medical evidence required to get cover (including Free-cover limit, age at which new entrants must give evidence).
- Statistical fluctuations in individual and group experience.

Expenses vary significantly, depending on:

- Whether a broker/agent is involved in the sale – amount of commission.
- Whether stamp duty has been recovered or not – depends on renewal or new business, increase in cover, growth in the group.
- Level of expenses at the insurance company – scale of operations will mean lower costs.
- Approach of insurer to cost recovery – % of premium versus fixed Rupee.

Charge for capital will depend on:

- Shareholders’ required return on capital.
- Approach to capital – statutory or risk based capital.
- Diversification of risk for the Insurer as a result of this deal – what other clients does the insurer cover.

Profit loading may also vary depending on:

- The approach of the insurer to profit targets for group business – percentage of premiums or percentage of sum assured.
 - The amount of profits targeted (e.g. 5% of premium).
 - The extent to which other business from the same client is making profits – e.g. significant volume of Fund business.
 - Based on all the above parameters, it is difficult to find a single premium rate that will work as a minimum for all groups.
 - If the minimum rate is low enough to recognize all the favourable factors for a good group, it will be too low to constrain a less attractive group.
 - If the minimum rate is based on average factors, it will create too much of a constraint on a good group whilst creating no constraint on a bad group.
- (iii) The Cap on Charges has left guarantee charges out of the calculation of reduction in yield. The Member Actuary is concerned that in some companies the charge for guarantees on Unit Linked business is very high in relation to the risk taken by the insurance company. What information would you ask for from insurers, so that you can assess whether the guarantee charge is reasonable?
- What is the nature of the guarantee provided? (minimum return on net premiums or minimum return on gross premiums and the level of minimum)
 - What is the timing of the guarantee? (maturity only, or surrender and maturity)
 - What is the mandate of the fund, for cash, bonds, gilts and equities?
 - What strategy (if any) is followed to determine the allocation of the funds between these asset classes?
 - What is the spread of different maturity dates within a fund?
 - What methods were used to assess the cost of the guarantee?
 - What assumptions were made for volatility, returns and correlation for each asset class?
 - Provide the model used to assess guarantee costs and the results obtained from it.
 - What return do shareholders expect on their capital?
 - What has been the asset mix since the inception of the fund?
 - What has been the performance of the fund to date, and how often has the guarantee applied? Although many years experience would be needed to get a sense of the fair cost of the guarantee.

[35]

Total Marks [100]
