

INSTITUTE OF ACTUARIES OF INDIA

Subject SA2 – Life Insurance Specialist Applications

May 2008 Examination

INDICATIVE SOLUTIONS

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

Question 1

a) Accumulating with-profits product design

- Identifiable current benefit
- May not be currently realisable
- Adjusted by an amount explicitly related to the amount of premium paid
- Additional benefits added from participation by additions related to the current benefit
- Can look and operate like a unit-linked contract
- Most important difference relates to the way that the company determines the price of units
- Not necessary for the contract to be unitised.
- Can look and operate like a conventional with-profits contract with recurring single premiums.
- May specify a guaranteed minimum rate of accumulation
- Guarantees under conventional with-profits likely to be greater
- Price of a unit remains constant.
 - Company allocates additional units to each contract
 - Usually annually at the bonus declaration.
 - Guaranteed addition could be zero
 - Bonus addition could also be zero
 - Number of bonus units determined at the discretion of the company.
- Unit price changes usually daily.
 - The increase is made up of a guaranteed part and a bonus part
 - Guaranteed part could be zero
- Under both methods bonus additions are akin to the regular bonus given to a conventional with-profits contract.
- May add on to the bid price of the units a terminal bonus when the insured event happens.
- On surrender value the company may retain the right to apply a market value reduction determined at the discretion of the company.
- Under-pinning sum assured payable on death.
- Premiums payable as a single lump sum, recurring lump sums, or as regular monthly or annual amounts.
- The charging structures may be any combination of:
 - Policy charge or fee taken from either the premium or the fund
 - Percentage allocation during an initial period
 - A different percentage allocation after the initial period
 - Bid/offer spread

- Charge for risk benefits
- Annual management charge.
- Taken implicitly through the bonus rate

b) Risks from the insurer's perspective

- Policy guarantees relative to investment performance
- Expenses
- Adverse publicity
- Depletion of capital or free reserves.
- Surrenders but market value reduction should mean that the company can avoid a loss, provided that the earned asset share of the contract is non-negative.
- Policyholder expectations and commercial considerations may lead to the company not applying a market value reduction
- Losses mitigated by taking them into account in setting future bonus rates provided this is consistent with treating customers fairly.
- Risk of non-compliance significant with policyholders not understanding the nature of the contract

c) Pricing

- Traditionally, conventional with-profits contracts have been priced using an equating present values approach
- This approach fails to quantify the rate of return that the company hopes to achieve by investing in the sale of such contracts.
- Discounted cash flow enables a company to measure the expected return that the providers of capital will receive. Sensitivity of the profit to variations in experience can be investigated so as to determine appropriate margins for the parameter values.
- Need to set up reserves and meet solvency requirements can be allowed for
- Cash flows can be used to assess the financing requirements for a new contract, by using them to build up a model of the expected new business. Incorporating this into a model of the existing business, the impact of the financing requirement on the company as a whole can be investigated.
- Can allow more easily for withdrawals and conversions to paid-up.
- Can cope with complex charging and benefit structures, in particular where charges and benefits depend on future assumptions.
- Options and guarantees can be modeled more appropriately
- Allowance can be made for complex reinsurance arrangements
- Easier to incorporate assumptions that vary over time, including stochastic assumptions.

- The risk discount rate can take account of the term structure of interest rates.
- Tax can be allowed for more appropriately.

d) Indian Context

- Surplus in par fund can be used as a source of capital for further new business.
- Surplus can also be used to support the Required Solvency Margin
- Surplus used in this way is being put 'at risk' and is potentially depleting the security and bonus prospects of other participating policyholders.
- Allowance for this risk should be taken into account when determining a 'supportable' level of bonus for the new product.
- Shareholders will benefit to the extent of one ninth of bonuses declared
- Their return on capital will be infinite provided the surplus in the fund is adequate to fund new business
- At some point the rate at which capital is being used to fund new business could cause surplus to fall to levels that do not permit a reasonable level of bonus to be declared
- Existing PRE might be that bonuses would not be reduced on account of business volumes
- Shareholders might feel able to transfer assets into the fund to enable a reasonable level of bonus to be declared
- Such transfers might require IRDA approval – not necessarily forthcoming
- Capital also needed to cover Required Solvency Margin but this need not be held in the par fund
- Shareholders would need to assess the proposition from their perspective – transfers of capital into the fund to create adequate levels of surplus compensated by one ninth of cost of bonus from larger volumes of business than would otherwise be the case
- In addition they might be providing capital to fund the RSM outside the par fund
- Traditional product level model points do not give the required perspective and a model office type approach is necessary.

e) Assumptions

Mortality

- Standard table in India is Indian Assured Lives Mortality 94 – 96
- IRDA generally expects mortality assumptions to be expressed relative to this table
- Derived from experience of the Life Insurance Corporation of India
- Rates reflect the broad overall markets in which the LIC operates
- Mortality rates in India vary significantly across various sectors of the population and would be relatively light amongst affluent people living in major cities and towns
- General level of mortality in India has improved since 94 – 96
- No explicit allowance for selection in IALM 94 – 96
- Assumption 60% / 70% / 80% of IALM 94 – 96 in years one, two and three and over respectively.

Investment return on reserve

- Consider monetary yields under fixed-interest Government securities.
- If higher-yielding assets or equities are likely to be used to back reserves, then a higher assumed rate of return might be appropriate but consideration needs to be given to higher credit risk and lower liquidity of these assets as well as the risks associated with equity investments.
- Current conditions (April 2008): 7.5% on 10year Gsecs; margin of x% on A rated corporate bonds; equity risk premium 5% – 7%

Expenses

- Starting point is results of expense investigations used to justify current product pricing and valuation assumptions
- Need to consider that expenses might differ from existing par business as many cost drivers are similar to those for unit linked.
- Need to allow for overhead and development costs and the extent to which additional amounts will be allocated to par business as the business mix changes
- Needs to allow for the expected volume of business and average size of contract, based on the target market.
- Structure of expense assumptions should reflect the likely incidence of costs, eg the allocation of initial and maintenance costs, in order to reduce cross-subsidies.
- Future inflation allowed for at a rate consistent with the basis on which the investment return assumption has been assessed.

- Assumptions
 - Initial
 - Commission - as applicable
 - Overrides – as applicable based on agent remuneration principles
 - Per new policy – Rs 1,000
 - % of first years premium - 5.0%
 - Per Rs 1000 face amount (underwriting allowance) - 1.5
 - Renewal
 - Renewal Commission - as applicable
 - Per policy per annum – Rs 300 increasing with inflation
 - Per claim – Rs 1,500 increasing with inflation
 - % of reserves (investment expense allowance) - 0.25%

Lapses and Withdrawals

- Starting point is results of lapse investigations used to justify current product pricing and valuation assumptions
- Need to consider that experience might differ from existing par business as propensity for policyholders to behave might be closer to unit linked
- Consider that policyholders might be sold product as an ‘overreaction’ to current market conditions and might wish to revert to a more equity oriented unit linked product in longer term
- Consider likely financial impact of lapses at various durations depending on benefit provided at those points eg real loss in months following issue as asset share is negative, significant profit at points where no value is paid (eg up to three years) although positive asset share exists, profit or loss at later durations where value is paid which might be below or above asset share particularly if market value of assets are depressed on surrender
- Also need to consider ‘premium persistency’ where premiums due not paid but policy continues in force.
- Assumptions
 - High initial rate then reducing with duration eg 25% in first year, 10% in second year, grading down to 5% after five years and constant thereafter
 - Covered by lapse rate for durations up to which policy will lapse if premiums not paid; thereafter assume $(95\%)^t$ of premiums due are paid where t is the policy duration less the duration when the policy first acquires a surrender value.

f) Capital Planning

- Need to consider two perspectives – where capital is provided by the par fund itself and where shareholder capital is required.
- Par Fund

- Writing new style of business will cause surplus that might otherwise be carried forward as part of the par fund 'estate' to be reduced
 - Although this reduces par fund policyholders' security, adequate reserves plus the Required Solvency margin will always provide an acceptable level of security using general public interest principles unless PRE has been created that company will go beyond the prescribed level.
 - Reduction in the estate reduces capacity to pay bonuses, the existing reserves would include an allowance for future bonuses consistent with the company's bonus policy and with PRE specifically required to be taken into account.
 - These arguments suggest that the cost of capital might be low ie dissipation of the surplus is of little consequence
 - Alternatively that this surplus constitutes an inherited estate
 - This is a controversial area, overseas supervisory authorities have accepted that provided interests of existing policyholders are not being harmed, companies have been allowed to earmark part of their inherited estate to shareholders.
 - In India it would be appropriate to discuss this issue with the IRDA before proceeding
 - A prudent approach that reduces the risk of dissipating the estate and aligns shareholder / policyholder conflicts would be to deem the cost of capital to be equal to the cost of shareholder sourced capital – see below
- Shareholder Capital
 - This will determined ultimately by the shareholders but a rational shareholder would follow a systematic approach and take into account the risk context
 - Starting point would be a prevailing risk free rate
 - To this needs to be added a risk premium
 - A CAPM model might be used
 - CAPM includes 'beta' that reflects the relative volatility of a particular share price relative to the market
 - Limited data in India as to how the market perceives investment in life insurers
 - Empirical evidence that certain promoters in India are using a risk premium of around 5.5% on top of a risk free rate of 7.5% to produce discount rates of 13% to determine discount rates to assess value of new business
 - But they expect positive value creation at these rates so that the realistic cost of capital needed to support equity share price increase is greater
 - Investing in par business provides a relatively stable shareholder income stream as cost of bonus itself is stable
 - Adverse experience in other areas – expense, mortality and lapses – can be offset against each other and this further reduces risk
 - This suggests a modest further margin over a CAPM type rate – say 15% in total.

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Question 2

a) Types of Risk

Heading 1 - Credit risk

Nature of Risk

- Exposure to loss if a counterparty fails to perform its contractual obligations and closely related to capital management

Control Processes

- Internal systems to monitor exposure to credit risk.
- Restrictions on exposure to different counterparties and assets
- Prudent exposures consistent with regulations and its own risk appetite and capital resources
- Diversification of exposures
- Factors to be recognised:
 - Counterparty exposure - amount of loss if a counterparty were to fail to meet its obligations
 - Asset exposure - amount of loss if an asset or class of identical assets were to become worthless
 - Adequacy of diversification in spreading credit risk
 - Likelihood of default
 - Period for which exposure continues.
- Management information which reflects importance of credit risk monitoring

Heading 2 - Market risk

Nature of Risk

- Exposure to fluctuations as a result of market movements:
 - Income from assets
 - Value of assets,
 - Amount of its liabilities.
- Sources of general market risk include movements in:
 - Interest rates,
 - Market values of equities,
 - Exchange rates
 - Real estate prices.
- None of these sources of risk is independent of the others and correlations are important.
- Linked to aspects of solvency monitoring

Control Processes

- Monitoring market risk and impact on solvency more frequently than required by the annual solvency investigation.

- Controls include:
 - Governance arrangements and authorisation levels around investment management decisions
 - Understanding of the management of the sensitivity of the liability calculations to movements in market values
 - Definition of management actions in the event of movements in the level of key market indicators.
- Management information that reflects the importance of market risk monitoring and will generally contain measures related to market risk.
- Approximate results of simplified solvency calculations on a regular basis.

Heading 3 - Liquidity risk

Nature of Risk

- Risk arising from short-term cash flows which could result in asset realization at a loss.

Control Processes

- Controls that identify when volatility of claims payments and the options available to policyholders might cause mismatch between short-term cash flows.
- Annual investigations into the financial condition of the insurance funds will generate this information.

Heading 4 - Operational risk

Nature of Risk

- Losses from inadequate or failed internal processes, people and systems, or from external events.
- Examples include:
 - Internal and external fraud
 - Mis selling
 - Failure to comply with employment law or meet workplace safety standards
 - Damage to physical assets
 - Business disruptions and system failures
 - Transactional processing failures

Control Processes

- Will vary with scale, complexity and nature of operations.
- Boundaries between operational risk management systems and other systems and controls blurred.
- Determination of operational risks that can be accepted and those that cannot, including consideration of risk tolerances.
- Analysis of operational risk profile

- Overview of the people, processes and systems that are used.
- Management information that contains statistics on operational risk,.

Heading 5 - Insurance risk

Nature of Risk

- Fluctuations in timing, frequency and severity of insured events, relative to expectations; examples include
 - Variations in mortality and persistency of policyholders
 - Possibility that guarantees could bite that adversely affects finances of an insurer and its ability to treat policyholders fairly.
 - Potential for expense overruns relative to pricing or provisioning.
- Insurance risk closely linked to solvency monitoring, capital management and financial reporting.

Control Processes

- Business plan
- Monitoring to determine how activities compare with plan for accepting new insurance risk and managing existing insurance risk.
- Documented policy for insurance risk, including determination of risk appetite; will include
 - Classes and types of risk accepted,
 - Limits on the amount of business
 - How expense levels will be managed,
 - Approach to dealing with the exercise of discretion.
 - Use of reinsurance
 - Managing persistency risk
- Appropriate escalation procedures for breaches of defined limits.
- Management information on insurance risks and impact on solvency and profitability; may include:
 - Statement of profits or losses for each class of business that it writes
 - Analysis of how these have arisen and variance analysis from plan or budget.
 - New business written
 - Business lapsed or cancelled.
 - Trends in persistency and expense levels.

b) Basic equity principle of unit pricing

- Basic equity principle of unit pricing: the interests of unit-holders not involved in a unit transaction should be unaffected by that transaction.
- For a policyholder relevant prices are those at which units are allocated and redeemed.

- Movement in price between these two events should depend only on the performance of the assets backing the unit and the charges deductible
 - Should not be affected by the creation or cancellation of other units, otherwise cross-subsidies between unit-holders will arise
- c) Unit pricing as a source of risk**
- Systems may carry out of date or inaccurate information, for example, on:
 - Asset values,
 - Accrued income,
 - Expenses and management charges deducted from the fund
 - Management fee rebates credited to the fund.
 - A risk to the company that it does not change the basis when it needs to
 - Costly to correct an error in unit pricing which remains undetected for a period of time; such errors may also lead to losses for the company.
 - Where company allows surrenders to occur at a preceding price, anti-selective surrenders may occur if the current unit price would be lower due to a fall in the underlying value of assets.
 - Basis used to calculate the unit prices will depend on whether the company is a net allocator or redeemer of units in each fund.
 - Different generations of policyholders will not be treated equitably and reasonable expectations will not be met, due to:
 - Errors in the calculation of the prices at which units are allocated to or de-allocated from policyholders.
 - Errors in the calculation of the prices at which units are created or cancelled.
 - The way that compensation for errors or inequities of a material size is determined.

d) Impact of current conditions

Impact on unit pricing processes

- Unit prices could be determined as an Appropriation price or an Expropriation price according to whether the company is buying or selling assets in the market.
- *Appropriation price* determined as
 - Market “offer price” value of the assets held by the fund
 - Plus the expenses that would be incurred in the purchase
 - Plus the value of any current assets,
 - Less the value of any current liabilities,
 - Plus any accrued income, such as interest income from fixed interest securities and deposits,
 - Net of any outgo, such as fund charges.
 - Divided by the number of units at the valuation date before any new

units are created

- *Expropriation price* determined as
 - Market “bid price” value of the assets held by the fund
 - Adjusted as referred to for Appropriation price
 - Divided by the number of units existing at the valuation date before any units are cancelled.
- As the company moved from being a net buyer to a net seller of assets and vice versa on a day by day basis it will shift from Appropriation pricing to Expropriation pricing and back again

Impact on Unit Prices and Policyholders

- As the company shifted from appropriation to expropriation price and vice versa there would be a discontinuity in pricing because of the different bases for valuing assets
- The discontinuity would be increased because the offer and bid prices in the market have also increased.
- Basic equity principle of unit pricing: the interests of unit-holders *not involved in a unit transaction* are unaffected by that transaction.
- Policyholders paying premiums when the company is a net buyer of assets would see the value of their units fall should other policyholders redeem units to the extent that company moved to an Expropriation price
- Policyholders cancelling units when the company is a net seller of assets would in retrospect have received more cash if they had waited until the company became a net buyer of assets
- This situation may be perceived as unfair by the policyholders involved in the transactions and give rise to adverse publicity especially if they were inadequately informed

Special Measures

- A technical defence would be if this approach had been mandated by the IRDA [*Note: The IRDA currently mandates a unit pricing approach via its Guidelines on Unit Linked Insurance Policies; as the question makes clear, demonstrated knowledge of the Guidelines is not required for full marks; students are however, expected to be familiar with generic unit pricing issues as set out in the Core Reading*]
- An alternative approach would be bid and offer prices for individual transactions derived from the appropriation price if the company was a net buyer or the expropriation price if a net seller.
- ‘Profits’ from these adjustments would accrue to the fund and be taken into account in subsequent unit prices
- A further alternative would be a “broad equity” approach under which basis only changed if there is a significant cashflow movement against the existing basis or a gradual transition from a fund level offer to bid price approach or

vice versa

- This approach would reduce price volatility.

e) Free Look

- Fifteen days to review the terms and conditions of the policy
- Option to return the policy stating the reasons for objection
- Entitled to a refund of the premium paid
- Subject to a deduction of a proportionate risk premium for the period on cover, any expenses incurred on medical examination and stamp duty
- *For unit linked policies units repurchased at the price on the date of cancellation.*
- Policyholders could feel aggrieved if the unit price had changed significantly because of a move from Appropriation pricing to Expropriation pricing

f) Financial Reinsurance

Conceptual Definition

- Reinsurance that has the effect of increasing available capital
- Increasing assets by more than liabilities or reducing the liabilities by more than the corresponding assets

Main types - reinsurance commission

- Reinsurance commission paid as part of original terms reinsurance, or added to other forms of reinsurance eg risk premium

Main types - surplus relief

- Means of allowing the insurer immediate access to the expected future profits contained within a block of new or in-force business.
- Block of business is reinsured
- Reinsurance premium equal to the reserves held by the insurer.
- Reinsurer advances a capital sum to the insurer in return for a first call on expected future surpluses from the reinsured block.
- Capital advance will be repaid from the future surpluses if and when they arise.
- Contingent nature of the insurer's repayments removes any need for insurer to set up reserves against the capital advance.
- Assets have been increased without any corresponding liability.
- Reinsurer will impose a profit/risk loading either by a margin in assessing the capitalised value of future surpluses or by direct charging of a fee.
- Normally be effected on without-profits business, rather than with-profits business as arrangement relies on arising surpluses being paid to the reinsurer rather than to policyholders.

Main types - Virtual capital

- Designed to improve the solvency position where “surplus relief” was not permitted by regulators – in particular for with-profits business.
- Block of with-profits liabilities chosen and that part of the liability relating to policies of the longest term reinsured, say Rs Cr X of reserves.
- Insurer reduces reserves by Rs Cr X in anticipation of eventual claim recoveries from the reinsurer.
- No cash transactions at this stage.
- Reinsurance cover written off using surpluses within the insurer as they arise.
- Reinsurance cover will be increased each year with interest and written down by a pre-determined amount over, say, 5 to 7 years (before any actual claims on the policies of the longest term would arise).
- Pre-determined amount is subject to a maximum of the insurer’s arising surplus, with the result that no related reserves need to be held by the insurer.
- Overall, liabilities have been reduced without any corresponding loss of assets.
- The pre-determined amount referred to above will, in practice, be limited to a fraction (typically less than 10–15%) of the expected arising surplus. This would be so as to reduce the risk to the reinsurer.
- Reinsurer’s profit/risk loading either a margin in the interest rate added to the reinsurance cover or by the addition of a fee.
- Straightforward way of improving the solvency position, with hardly any systems or administrative implications.

g) Reinsurance Regulations

- Summary of program certified by the Appointed Actuary filed with the IRDA every year
- IRDA empowered to direct changes in the programme.
- The reinsurer to have a credit rating of Standard and Poor BB or equivalent
- No reinsurance on original premium basis unless the IRDA approves
- No reinsurance with a promoter company or its associate/group company, except on terms which are commercially competitive in the market and with the prior approval of the IRDA.
- Satisfy the following criteria:
 - Involve a genuine transfer of risk
 - Legally enforceable
 - A reinsurer which the regulator regards as a financially sound counterparty in the transaction

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