

# **Institute of Actuaries of India**

**November 2010 EXAMINATION**

**Subject ST2 — Life Insurance**

**Specialist Technical**

**MARKING SCHEDULE**

**Solution 1**

(i)

- An offer pricing basis is the pricing basis used when the company is a net creator of units.
- Under this basis, both the bid and offer prices are based on the appropriation price, i.e. the total cost of creating a unit. This is the cost of buying the underlying assets and any purchase expenses.
- A bid pricing basis is the pricing basis used when the company is a net canceller of units.
- Under this basis, both the bid and offer prices are based on the expropriation price, i.e. the net receipt when canceling a unit. This is the value received from selling the underlying asset, less and sale expenses.

(ii)

May be advantageous if:

- The life office loads for lower trading expenses than would be incurred by an investor investing directly in the underlying market (where they will pay for trading on the purchase, and again on the sale, of the asset).
- The life office may be using a favourable pricing basis at the time of paying the premiums and receiving the benefit, e.g.
  - If units are bought and sold under the same pricing basis i.e. both appropriation/expropriation price), the policyholder is effectively not paying trading expenses on the underlying asset
  - If they buy units under a bid basis and sell under an offer basis, they actually gain.
- It may also be the case that the trading expenses paid by the life office, as a large investor, may be lower than those that an individual policyholder would pay if trading in their personal capacity.
- There may be tax advantages of investing through a life office.
- A unit linked product could give efficient access to life insurance cover as well as cover against other adverse events such as disability, critical illness or hospitalization.
- These gains need to be offset against the other initial/renewal charges which the life office is likely to have that would not be incurred when trading directly in the underlying assets.
- Because of its size, a life office would be able to invest in a wider range of assets than an individual investor, who might suffer very high expenses of managing a portfolio of a large number of very small holdings.
- A diversified portfolio spreads risk.

**[5]****Solution 2**

(ii)

Addition

s include

- Premiums paid in
- Investment income earned
- Capital appreciation of investments

Deductions include all expenditure associated with the contract(s), in particular:

- commissions paid and direct expenses incurred (net of tax)
- the cost of providing all benefits – both life cover and any options granted
- possibly on a smoothed, rather than current cost, basis

- tax on investment income including any provisions made for future tax liabilities
  - transfers of profit to shareholders
  - the costs of any capital necessary to support contracts in the early years
  - a contribution to the free assets which will be the source of future bonuses.
- (ii)
- Calculation of surrender value scale
  - Declaring bonuses for participating business

[5]

**Solution 3**

- i.
- There are two distinct risks here. The company is already taking a risk as to the level of mortality that is primarily dependent on the occupation profile of the group
  - Additionally age is one of the most prominent drivers of mortality and hence offering a single age independent rate for a term product could be very risky
  - It can argued that for a one year contract, age profile of the client company is not going to change substantially during the year and hence it is a less risky proposition
  - However for a rapidly growing company the age mix could seriously vary during the year increasing the risk for the insurer. The insurer can chose to not offer a single rate to such companies or it might build in excess prudence in its premium rate
  - There might be some high profile exits or joining during the year that might skew the average (Sum assured weighted) age experience
- ii. Premium offset option
- There is a mis-selling risk where the sales staff might sell the product to the customers citing this option and giving out an impression that P/Hs need not pay premiums beyond a certain point
  - If the economic and demographic conditions were to change than there is a risk that dividends declared would be lower and P/Hs would not see their premiums ‘vanish’
  - This could invite backlash from P/Hs and the insurer should make sure all relevant disclosures are adequately highlighted at the sales stage
  - The cash dividend option has its own issues where the company needs to consider competitive landscape because cash dividends are readily comparable
  - Some policyholders might not want cash but instead want their money to stay invested and get a payout later on maturity
  - This might mean that company offers both options – cash and addition to benefits to the P/Hs
  - Paying out cash dividends would also upfront the distribution of surplus and hence reduce free assets
  - This might interfere with the company’s ability to write new business as per plans
  - It might also curtail the investment freedom of the fund thereby reducing expected returns on the fund
  - Paying cash dividends would mean extra expenses
  - With a combination of reasons like reduced investment freedom, difference in distribution of surplus pattern and policyholder preferences, the company might chose to maintain different funds for the two options

- This would however mean maintaining different policyholder funds
- And would invariable increase administrative complexity
- There might be management limitations to manage this structure

[9]

#### Solution 4

(i)

Appropriate level of retention

- Analyze your in-force book of business to determine the distribution of expected claims, e.g.:
  - the average sum insured (& whether policies have sum insured increases built in)
  - average age of policyholder, smoker status, etc.
- Decide whether your future new business is likely to be similar to your in-force business, and if not what impact this will have on your risk.
- Investigate how appropriate the existing level of reinsurance has been,
- and how profitable it has been for the reinsurer.
- Speak to the board to get an indication of its appetite for risk.
- Analyse the level of the company's free assets (high free assets would support higher retention limits)
- Ascertain the importance attached to stability of its free asset ratio (this could reduce the freedom provided by the free assets)
- Ascertain the confidence (& familiarity) of your company in the underwriting of the book of business – the more confident it is the lesser the need for reinsurance.
- Establish how competent the company's claims department is at identifying invalid claims.
- Determine the terms on which reinsurance can be obtained (incl. any profit sharing)
- price is obviously a factor to consider in determining your retention.
  - and the dependence of such terms on the retention limit (it may be possible to vary retention limits slightly to take advantage of favourable rates)
  - the existence of a profit-sharing agreement in the treaty
- Check the impact on the company's regulatory capital requirements of increasing the retention limits.
- Perform a stochastic simulation to obtain probabilities of total loss, for example, using retention strategy X the company should only suffer losses of more than  $x$  once every  $y$  years. This should be consistent with the Board approved risk appetite.
- Attempt to determine the likely impact of the various options on expected profitability.
- Also consider the opinions of the reinsurer, as they should have experience in this regard.

(ii)

Which reinsurer to choose

- Ability (capacity) of reinsurer to provide the required cover.
- Since there is some cost to changing reinsurers, how well has your existing reinsurer served you over the last five years.
- Managing more than one reinsurer involves administrative complexity
- Any past knowledge/experience of other reinsurers.

- Should you go with only one reinsurer (administratively simpler) or more than one (more access to expertise, and keeps reinsurers on their toes)
- It is important to recognize that reinsurance implies transfer of mortality parameter and/or claims fluctuation risk, but it introduces a reinsurer default risk. This can be managed by
  - Looking at the financial strength of the reinsurer.
  - More than one reinsurer also helps to diversify this risk
- Cost of reinsurance from each company will be a key factor.
- What expertise is each reinsurer willing to bring to the table.
- Does any reinsurer have a particular expertise in your target market.
- What terms and conditions does each reinsurer impose, e.g.
  - underwriting and claims referral limits
  - onerous administrative conditions
  - arbitration rules
- Do the reinsurers offer profit sharing, and at what level.
- Is the reinsurer in the same city as you. If not, is this an issue.

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### Solution 5

(ii) Principles:

- Consider any legislative requirements/restrictions and market practice in the country.
- The company will want to ensure that its surrender value scales are affordable. Hence, on average, the maximum surrender value would be the asset share (after deducting the costs of the surrender).
- The company should treat withdrawing and continuing policyholders equitably.
  - Thus on surrender of a non-profit contract the office may try to recoup the same amount of profit as it would had the contract not been surrendered – however this is not always possible (or desirable).
- The values should be consistent with policyholder's reasonable expectations (PRE). This could include:
  - consistency with quotations at outset
  - reasonableness of early surrender values relative to premiums paid
  - running smoothly into maturity values (which may on occasion involve paying more than asset share – which should only be done where absolutely necessary owing to the principle of affordability)
  - having regard to competition and auction values (if any)
- Practical Issues:
  - the method should be simple to apply and easy to explain
  - the scale should not change too frequently owing to the administrative work involved
  - anti-selection should be avoided, and surrender values should take account of financial conditions
  - surrender values, in conjunction with new business premiums, should not encourage lapse and re-entry
  - surrender values should be stable, i.e. small differences in policies should produce small changes in surrender values

- whether any “blending” is required between the old and new surrender values

(ii)

Why would a policyholder want to make a policy paid up

- They can't afford the premiums anymore, but they don't want to lapse the policy and be left with no cover.
- They may not need the full sum insured anymore (circumstances may have changed) but reduced cover is adequate.

Why would an insurer prefer this over a surrender:

- They want to prevent the policyholder surrendering completely, and thus will continue to make some profit on the reduced sum insured.
- They still have the policyholder on their books which may allow them to do further business with them in future.
- As the policy remains in-force it reduces the impact of selective withdrawals.
- It avoids the insurer having to realize assets at an inappropriate time.

[9]

### Solution 6

i)

- The amount of home loan and hence the cover is likely to be very high. The cover is also for a relatively longer duration (20 years) and hence the level of mortality risk is likely to be high under this contract.
- The mortality risk is likely to be also dependent on level of U/W. The insurance company is not carrying out any medical U/W which is likely to increase the risk of anti-selection.
- This would also be dependent on the level of take up rates of this form of insurance by the bank borrowers.
- Although it is assumed that financial U/W would be carried out by the bank before advancing the loan
- Because this is a single premium contract, there is likely to be an element of investment risk as well in this contract.
- Level of take up rates (and hence the volumes) is also going to determine the adequacy of expenses loaded in the contract.

ii)

Benefit and risks to the bank

- The bank would not only get paid a profit over its home mortgage but would also be paid a fee (commission) for selling this contract by the insurer
- The biggest risk to the bank would be a prolonged credit risk. Under a usual home mortgage, the EMI's would be set such that both principal and interest get written down over the duration of the contract and hence the borrower credit risk is decreasing over time under the usual version
- Under this version however, the bank's principal would be at risk throughout the duration of the contract. Hence the bank not only faces P/H credit risk, it additionally acquires insurer insolvency risk

- There is a risk of policy persistency in the event the borrowers do not pay their premiums and hence the policy would not reach up to the value of home mortgage principal and would get foreclosed
- Even if all premiums were paid, investment returns might drop and hence maturity values (including bonus) would be lower than the principal at maturity
- The sum assured including all bonuses at maturity is illustrated to be equal to the loan principal. This means that even if all premiums were paid and experience is in line with illustration assumptions, policyholder death before maturity will result in a claim payment less than the principal because not all the bonuses will have been declared.
- If Bank's sales process did not explain this to the customers properly, there might be a reputation problem on account of mis-selling

#### Benefit and risks to the insurer

- The insurance company would benefit from higher sales, more premiums and hence higher margins (if priced appropriately)
- The contract is participating in nature and hence mortality, investments, persistency and expense risks under this contract can largely be passed onto the policyholders.
- However, there is a risk from PRE which might have been set as being able to meet the principal amount at maturity
- Also policyholders might be led to believe that in event of death their liabilities would be taken care by this contract which might not necessarily be true
- The anti-selection risk becomes lower for the insurance company because now it is selling an endowment contract bundled with life cover

#### Benefit and risks to the borrowers

- The biggest risk to the borrowers is that they need to repay their loan and not save and then repay their loan
- Their repayment of loan under this version would be routed through the insurer and hence introduction of another intermediary might mean the borrowers paying out additional margins
- Non payment of premiums would imply termination of insurance contract and the cash values might be poor
- Non payment of EMI under the usual home loan version instead could have more benign terms in the sense that the bank might allow extension of loan term, EMI holiday
- For a usual home mortgage borrowers know their EMI's well in advance which are good to pay off interest and the principal
- Under this version, consumers might end up paying a variable amount to the bank if the bank sets its interest (only) basis to be floating
- Also, despite paying regular premiums to the insurance company, the maturity amount might not be enough to pay off the principal due to poor investment returns or any other demographic experience

#### iii) Suggested mitigants

- To lower the credit risk the bank might ask policyholders to compulsory assign the policy to the bank.

- Hence the cash value under the policy would be available to the bank in case of policy foreclosure, and would ensure the bank gets the money on death or maturity.
- However the cash values might still be quite low when compared to premiums paid during initial years of the policy
- Also this would not mitigate the insurer insolvency risk
- To counter the risk of non payment due to borrower's mortality, the insurance contract can be designed with a minimum mortality cover (Sum Assured) equal to the loan principal.
- However this might result in too much protection (and hence a price for it) because death benefit payable would be SA plus accumulated bonuses
- The insurance contract might be designed so that even in adverse economic conditions loan principal could be paid out at maturity. An extreme scenario would be the one where maturity value of the policy excluding policy bonus is designed to pay off the loan principal
- The down side of this arrangement is that insurance premiums vis a vis EMI's otherwise could be too high to be affordable
- Both the bank and insurance company should take extreme care in their sales process so as to not create any false policyholder's expectations
- Additionally the legal contract wordings must be watertight
- The insurance company must adopt an investment strategy for this fund that is in line with stated objective of paying off the policy loans at maturity.
- This essentially implies being able to generate investment returns as close as possible to the current market returns with minimum fund fluctuations.
- This would curtail investment freedom under this fund resulting in lower expected returns

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### Solution 7

- i. The differences could be due to
  - The statutory reserves can be thought of as being composed of best estimate liabilities plus any extra margins for prudence
  - The basic difference between reserves and PVFP is the best estimate liabilities. BEL is an estimate of reserves that should get consumed over life time of the policies on an expected basis
  - Any additional margins for prudence in reserves (due to MADs or flooring individual policy reserves to zero) should be released in future and be equivalent to PVFP.
  - But PVFP is measured net of risk margins which is another source of difference. These margins are estimated in a top down fashion when using a traditional EV approach with discounting being higher than the earned rate. So for example if there is delay in emergence of profits due to prudence in reserving they would be discounted at a higher rate thereby reducing the value.
  - whereas in an MCEV approach these are measured by evaluating individual risks as part of the cost of non hedge able risks
  - Other differences could include taxes that might not be included in reserving but PVFP would be net of taxes
  - Treatment of Participating fund estate. Participating reserves would not treat estate as a policyholder liability whereas in PVFP entire estate can not be assumed to belong to the shareholders
  - Other frictional costs might be included in calculation of PVFP

## ii. Merits and de-merits of factor based solvency approach

### Merits

- Factor based solvency approach is easier to calculate as it is based on simple drivers
- The drivers viz. reserves and Sum at risk are volume linked and hence solvency margin would increase with volume of business which is a desirable feature
- The factors do vary with product categories which implies an allowance is made for varying degree of product level risks
- It is easy for the regulators to compare and contrast solvency margins for different companies

### Demerits

- The method does not capture all risks and their drivers. For example, reserves and SaR are a better guide to investment and mortality risk but not all other risks
- The method may lead to double counting if there is already prudence in reserving basis. Reserving based solvency margin would further increase on top of excess reserves
- Even if the reserves and Sum at Risk are similar for two companies their quality of business and the variability in outcomes could be too different.
- The method does not adequately differentiate between better and poorer companies w.r.t. risk management and practices.
- This would not encourage companies to invest and build their risk management capabilities

## iii. Financial Reinsurance

### Insurance company

- The reasons for taking out financial reinsurance. This will in turn decide the amount and approach to financial reinsurance
- The cost of financial reinsurance. Typically the provider would charge a fee for this and the extent to which this fee is lower than the insurer's cost of capital would be a measure of capital efficiency achieved
- The insurer would have to decide on a block of business on which this transaction would be carried out
- This would be very complex for participating business where discretionary bonus distribution might come in way of objectively defining the future surplus that is available to 'repay' the capital
- For UL business, surplus available is more objectively defined. However, any 'reinsurance advance' might not be easily deemed to back UL reserves as this will lead to reserve mismatching. This may not be allowed by regulations or a mismatch reserve might need to be kept
- The insurer would also need to see whether there is short term need of capital in which case existing portfolio may be used for financing purposes
- The risk is that there might be a short term spike in the insurer's accounts
- To drive continual capital efficiency the insurer may choose new business financing
- The company would also need to look at term of the financing i.e. the period after which the 'advance' gets paid off

- This in turn would dependent upon the profile of profits emerging from the portfolio year on year
- And the opinion of auditors as to what duration of asset of this nature would be allowed for in the insurer balance sheet
- There is a certain degree of risk transfer and hence the re-insurer credit rating is an important factor

#### Re-insurers

- The re-insurer is advancing its capital to the direct writer and is expecting it to get paid back over a period of time
- It would definitely want to look at the emergence of profit profile from the insurer's business. This would include
  - a. Stress testing the business to market and underwriting shocks to ascertain the resilience of profits
  - b. Time profile for emergence of profits
- This would help the reinsurer in deciding
  - a. How much to finance? Reinsurers would practically never finance 100% of PVFP of business. They would apply a percentage for example 70%
  - b. For how long to finance? i.e. period over which financing runs off
  - c. Fee to be charged
- There would be an inter play amongst these three factors itself i.e. more financing might increase the risk and hence higher fee
- Reinsurers would want to have a proper legal treaty with the direct writers
- They would especially want the line of business and surplus emerging to be clearly defined.
- Most items of surplus are clearly identifiable with a certain line of business. But allocation of expenses and certain corporate overheads is discretionary in nature

#### Regulators

- The regulators would want to make sure that a certain degree of real risk transfer is taking place in the transaction
- They would want to make sure that the direct insurer does not have deep capital concerns so that they might actually go insolvent and the insurer is not using financial reinsurance as a tool a mask deep capital issues
- They might want to look at certain ratios like what is the proportion of reinsurance financing as percentage of total balance sheet
- They would look at reinsurer rating
- Reinsurer's country of jurisdiction and regulatory framework
- Whether there might be a hair cut that needs to get applied on the reinsurance financing for solvency purposes
- For participating fund, they would want to make sure that policyholder bonuses in accordance with PRE are met
- They might put restrictions or even expressly disallow this arrangement for participating business due to discretionary nature of participating fund

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**Solution 8**

(i)

Possible contract design regulations:

- Types/designs of policies permitted
- Max/min premiums/charges
- The requirement for certain benefits such as surrender values or paid-up values – which are not common on the intended contracts
- Prevention of certain exclusions

Possible distribution regulations:

- Distribution channels which may be used
- Commission levels
- Minimum broker training and registration requirements
- Advertising restrictions
- Certain key information (or advice) which must be provided to policyholders or potential policyholders
- Restrictions on benefit illustrations
- Cooling-off periods

(ii)

Reasons why withdrawal benefits are unlikely:

- Term assurances have low reserves, as there are no maturity values and only death benefits need to be reserved for, and so there is little scope to pay worthwhile withdrawal benefits.
- Such a benefit would increase the risk of selective withdrawals.
- Offering such a benefit would increase withdrawal rates, which reduces profitability
- Premiums would need to increase if additional benefits were to be paid, reducing the effectiveness of the product as the cheapest form of life cover.

(iii)

(a) Mortality:

- the risk is that the life office underestimates mortality
- this is the most significant risk for these term assurance products
- the office has no experience in this particular market and so needs to source appropriate assumptions elsewhere, e.g. from a reinsurer
- the work on the farms could be hazardous, making it more difficult to estimate mortality
- the extent of the risk will depend on how applicable the data used are to the said lives
- the lack of underwriting will add to the uncertainty in estimating mortality
- anti-selection may be a risk owing to the lack of underwriting. Weekly cash payments imply that Sum at risk and hence anti-selection could be more than usual when compared to regular premium term insurance contracts.
- selective withdrawals are also a risk
- accumulation of risk, e.g. all insured exposed to a single major incident (e.g. a fire or explosion or a catastrophe), or from living in a high-density housing

Expenses

- the risk is that the expense loadings are too low

- the level of expenses will be quite uncertain because the office is entering a new market (admin. costs, development costs, etc.)
- commission structures will be known and can be loaded for
- owing to the uncertainty associated with new business volumes, it will be difficult to load for fixed expenses accurately
- changes in the mix of business (e.g. between larger & smaller policies) from that anticipated is also a problem as there are likely to be cross-subsidies involved in the expense recouping
- the costs associated with premium collection may be significant, and may increase above price inflation
- higher than anticipated inflation may be a big concern as the term of the cover may be very long and expenses are likely to constitute a major part of the total office premium
- with small policies there may come a time when expenses exceed the premium being collected

#### Withdrawals:

- the greatest risk of loss is associated with early withdrawals when asset shares are negative
- even though no withdrawal benefit is provided this can be a significant risk
- withdrawal rates may be higher than expected, and more difficult to predict, due to:
  - policyholders being financially unsophisticated and thus more likely to buy something which is not ideal for them, or may be unaffordable
  - premiums being collected weekly in cash
- the decreasing nature of the benefit (and level premiums) means that near the end of term the value of future premiums may exceed the value of future benefits, implying that the office will lose profits from withdrawals at that time . Although such withdrawals are likely from a rational perspective, the financially unsophisticated target segment might reduce this possibility
- the company has no experience of withdrawal rates in this market which exacerbates the risk
- higher withdrawals than expected will mean higher per policy expenses for policies remaining in force

(iv)

Market share may be being lost due to:

- Premiums may have become uncompetitive
- May not have the “bells and whistles” on their contracts which competitors have, e.g. conversion options
- More, or more effective, marketing by other companies
- Competitors may offer sign-up gifts or loyalty programmes
- May pay lower commission than major competitors
- The company may be focusing its efforts on other products
- Reputation for inefficient admin (to deal with policy queries, etc.)
- Reputation for inefficient payment of claims
- Their target market may have low average disposable income and may be less able to afford assurance under present economic conditions
- Underwriting may be stricter than competitors’ underwriting
- Loss of reputation in the market, e.g. scandal
- May have smaller free assets than major competitors and thus appear more insecure
- May not be in a position to expand new business:

- may not have sufficient capital, or
- may not have the staff/systems to handle expansion without jeopardizing service levels

(v) Possible actions:

- consider whether premiums can be reduced as non-profit term assurance is sold almost entirely on price
- expense loadings may be reduced by better expense management or by introducing deliberate cross-subsidies with other product categories.
- reduce the profit required per policy in order to sell more
- may even consider selling policies at a loss to increase market share, e.g. if the market is at the bottom of a cycle
- reinsurance may offer attractive risk premiums which could allow the term assurance premiums to be reduced
- reduce the level of underwriting (e.g. review medical limits) to improve cost effectiveness and marketability
- introduce “bells and whistles” to distinguish product in the market, for example include a conversion option to a savings contract at the end of the term
- introduce sign-up gifts or loyalty programmes
- increase commission rates in order to make more sales
- introduce more (or more effective) distribution channels
- increase advertising budget, e.g. improve brand awareness
- consider ways to expand target market, e.g. such as the current proposal
- improve after sales service and staff training to improve name and reduce lapses
- reinsurance may offer financing on good terms, which could provide capital for expansion if this was a constraint

[24]

[Total Marks 100]

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