# Institute of Actuaries of India

## Subject SA2 – Life Insurance

## May 2011 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

You are the Appointed Actuary of a medium sized privately owned life insurer operating in India in early 2011. The insurer has a well diversified product portfolio with unit-linked, participating and non- participating business both in force and open to new business. The insurer currently writes business through its tied individual agents as well as corporate agents that include banks. The IRDA has introduced restrictions on the charges that may be levied on unit linked products. These restrictions have led to discussions in your company relating to the company strategy going forward including the amount of new business that may be generated from unit linked business. The company has decided to close down 20% of branches for individual agents in order to reduce expenses. You are considering the implications of these changes on the valuation of liabilities.

(i)
State the specific considerations of the IRDA (Assets, Liabilities and Solvency Margin of Insurers) Regulations 2000 on the valuation of liabilities. Valuation of liabilities must be carried out separately for each policy contract. Use of a prospective method of valuation. Method of valuation must take into account all prospective contingencies under which premium or benefits may be pay able Level of benefits take into account PRE with regard to bonuses Cost of any options or guarantees must be taken into account Determination of amount of liabilities should be based on prudent assumptions of all parameters using insurer's experience including an appropriate MAD Level of MAD to reflect degree of confidence in the expected level and determined in accordance with GNs of IAI Policy liability to be floored to the higher of zero and guaranteed surrender value Use of Gross premium method but alternative method allowed when deemed appropriate subject to value being at least as high as that obtained from GPV Valuation method should not be subject to arbitrary discontinuities Valuation assumptions should not be subject to arbitrary discontinuities Must take into account the nature of liabilities and assets representing those liabilities and their value Prudent provision against changes in value of assets Policy cash flows to include premiums, basic benefits, rider benefits, bonuses vested, bonuses arising out of current valuation, future bonuses including terminal bonuses, Commission and other remuneration. No allowance for non payment of commission for orphan policies. Policy maintenance expenses Allocation of profit to shareholders for Par business Consistency of assumptions

(ii)
Describe the considerations on the valuation of liabilities arising from professional guidance applicable to you that have a particular relevance to the current circumstances faced by your Company. Relevant guidance contained in GN1, GN2 and GN7 Need to consider whether the valuation maintenance expenses are based on current unit levels or a projected unit level based on say, the Business Plan of the Company If based on projected unit costs then there may be a need to consider more prudent projection of new business to derive unit maintenance expenses in light of the recent changes affecting unit linked business and a reduction in agency branch network Appropriate level of MADs particularly in relation to maintenance expenses Need to consider closure to new business as set out in GN1 - associated level of new business for the next year No need to reserve for future new business strain GN1 requirement to assess whether the projected volumes are realistic and inform the Board on capital requirements associated with new business Satisfy that if the new business strain will be a problem the reserves and solvency

margin requirements will be met from the shareholder funds Consider the possibility that preferential service agreements might be altered or terminated needs to be allowed for

(iii)

Arising from the revised strategy, a new business plan has been drafted. The business plan projects a slowing down of new business compared to the existing projections. What considerations will you have in setting the valuation assumptions for maintenance expenses and satisfying yourself that these are prudent and in accordance with Regulations and professional guidance applicable to you. Key considerations that have a bearing on the valuation maintenance expenses include: Lower new business volumes projected in the Plan Whether even these lower level of projected volumes are realistic in the current circumstances As new business slows down the composition of operating expenses will naturally have an increasing proportion of maintenance expenses Closure of 20% agency branches and the impact this may have on maintenance expenses. Need to consider any on going expenses that may arise from these branches eg to continue servicing business and any one time Whether the maintenance assumptions are based on current level of expenses or projected level in the future Current level of expenses do not rely on future new business. Need to consider the savings resulting from the closure of new business In case projected level of maintenance expenses have been used additional considerations will be: level of overruns year by year and the total quantum of maintenance expense overruns the yearin which maintenance expense overrun is eliminated. How many years forward is this compared to the current valuation date? How much uncertainty does this projection bring in the valuation assumption and is the MAD appropriate in light of this uncertainty Is this appropriate in light of the changed circumstances or should the valuation assumption be based on a more near term, and therefore certain amount? The degree of realism of the business plan, and the company's past record in achieving its plans would be significant considerations in this regard. At a more granular level one would need to consider the valuation maintenance expense by line of business.Are these appropriate for unit linked, participating and non participating business in the new circumstances? Is the product mix assumed in the business plan realistically achievable in the new circumstances? If not what implications does this have on the unit expenses by line of business? Any on going expenses associated with the closed branches would need to be considered? Is the business plan taking appropriate allowance for these including the need to service the policies generated from these branches? Consideration of a closure to new business reserve based on new business ceasing after one year. Future new business that would generate future economies of scale in renewal expenses cannot be assumed.

(iv)

You prepare an annual Financial Condition Report. The CEO advises you that at the next Board meeting the changed circumstances warrant a revised and supplementary Financial Condition Report. What considerations will you havein drafting the revised report taking into account the current circumstances facing the Company? What additional scenarios would you carry out? GN3 sets out the requirements from the profession on FCR Assessment of

current and future solvency position business Distribution channel mix would be another consideration given the challenges facing the Agency channel and the closure of branches. This will have an impact on expenses This should consider aspects such as agent productivity, ability to attract and retain agents and agency managers Effect on projected balance sheet of lower margins from unit linked business and potentially higher product mix from non ULIP business should be considered Additional scenarios would include: New business profitability and sensitivities given the charge restrictions on unit linked products Differing product mix in future new business to simulate the impact on the Company's current and future solvency margin requirements in particular. This should cover the impact of any significant new business strain, the need to set up adequate reserves, impact on Par Fund and future profitability Scenario focussing on Par business as it may gain prominence - the strength of the Par Fund, its ability to fund new business strain or otherwise Scenario to consider varying mix of future new business by distribution channel. For eg the existing FCR may have assumed a certain mix by distribution channel which would need to be altered. In the above scenario it would be useful to consider profitability of each line of business by distribution channel. Loss of confidence amongst a section of tied individual agents and employees that may impact volume of future new business Loss of a distribution channel for eg a corporate agent to avoid being associated with a Company that is closing branches Along with these it would be relevant to consider the impact of the external economic environment Policyholder behaviour may change for eg in choosing more conservative investment options or through increased lapses and surrenders Consider the need to combine two or more individual scenarios eg volumes, margins and persistency

(v)

GN1 covers the relevant professional guidance The liablities cover existing business and do not consider future new business In determining the liabilities adequate provision for future expenses including the need to consider closure to new business one year after the valuation date No requirement to reserve for future new business strain GN1 requires the Appointed Actuary to consider that reserves and capital will be adequate to cover new business strain including advice to the Board on limts of new business volumes and availability of capital Statutory capital in India is based on the required solvency margin which in turn is a function of the reserves and sum at risk Both reserves and sum at risk do not account for future new business strain.

(vi)

FCR: Considers both the current and future solvency requirement Future solvency requirement takes into account future new business strain Considers various sensitivities and scenarios that may have a varying degree of new business Three addition financial measures: Value of New business to provide commentary on the long term financial impact of writing new business Expense overruns split between acquisition and maintenance by year. Useful to consider overruns split by lines of business as well Projected Embedded Value year on year to consider the combined impact of writing new business, expense overruns and the unwind of in force book

(vii)

Any one appropriate definition (the Reading Material on EC and MCEV defines three possible definitions) Economic capital is defined as sufficient surplus available to cover potential losses, at a given risk tolerance level, over a given time horizon Alternatively it may be defined as the excess of market value of assets over fair value of liabilites required to ensure that obligations can be satisfied at a given level of risk tolerance, over a specified horizon Market value of assets typically observed directly, alternatively marked to model for certain assets eg corporate bonds Fair value of liabilities are not typically available directly hence need other techniques to estimate their value Common technique used is market consistent valuation that involves defining a set of assets that replicate the value of liabilites and then using the market value of those assets When traded prices are not available option prices are used to estimate the implied prices Define risk categories that lead to capital Economic capital determination requires specifying both the time horizon and the risk measure to be used For eg a value at risk measure at 99.5th percentile over one year EC determined for each risk category - typically by using stress tests with reference to the risk measure and the impact on the difference between Assets and Liabilities Par business will need to allow for dynamic approaches to bonus rates and the equity backing ratio Par business will need to allow for a cost of capital charge on the asset share to allow for the burn through costs EC is aggregated from individual amounts for each risk category to the enterprise level using techinques that take into account the fact that all risks won't happen at the same time ie takes diversification benefit into account

(viii)

Specific risks
*Market risk*
Potential interest rate risk as the duration and convexity of liabilities may change significantly due to the current challenges
*Insurance Risk*
Policyholder behaviour risk - increased propensity to lapse due to closure of offices, agents leaving including negative media coverage *Operational Risk* Organisation changes leading to employee turnover - may cause strain on processes, vacancies or new staff may not be able to cope well. Additional stress in case this is coupled with high lapsation
*Liquity Risk*
Consider stress situation where mass surrenders occur; potentially along with a reduction in the market value of assets / increase in interest rates leading to lower bond values

**[50]**

**Q. 2**
(i)
New product will give the chance to Company to establish new PRE without being constrained with existing expectations There is no clear category for the solvency margin requirement for UWP in the IRDA ( actuarial report) regulation 2000, however, the capital requirement for UWP may be smilar to CWP There is an implicit investment guarantee in CWP business through fixed future premium, whereas this may not apply in UWP. UWP products are generally more flexible than CWP products. It’s relatively easier to cope with the varying premium levels, change to benefit levels and addition of rider benefit. This should make them more marketable. Given above, company may be able to write higher volume of business. This implies that fixed cost such as marketing cost can be spread over

more policies, resulting in higher bonuses and shareholder profits. UWP have readily identifiable current benefits, which makes them easier for the policyholders to understand. Co therefore will have relatively less trouble in explaining the surrender values.

**Advantages to the policyholders:**

Flexibility as mentioned above will be popular Regular bonus is expressed as % of current units, it may be easier for the policyholders to relate to, than the reversionary bonus on CWP business. The charging structure is more transparent than CWP business and hence protect the policholders from expense overrun risk.

(ii)
To protect the company and the remaining policyholders, if the surrender profits are shared with the policy holders, against selective withdrawals The unit value of the UPW policy, even with a surrender penalty deducted, may at times be above the value of underlying asset share, due to smoothing effect of the bonus rates. In absence of MVA policyholders can choose to leave the UWP when the assets values are depressed, resulting in a loss to the fund. If many policyholders leave the fund when assets values are depressed, the impact can be large. Financially sophisticated customers should be able to workout the best time to leave the fund, by monitoring the performance of the underlying assets MVA facility enables company to make deduction from value of units, so that the payout is closer to the asset share The company will be free to impose appropriate MVA it deems appropriate, however, it should be according to disclosures and the terms of the policy that sets the PRE. The policyholders are able to choose to surrender and switching (if allowed), the company will reserve the right to impose an MVA on either of these options being exercised Death and maturity are not anti-selective no MVA will apply in these cases.

(iii)
**Proposal of additional bonus rate in the first year of the contract**:
Accumulation rate is the key marketing aspect of the UWP bond; therefore, a higher rate is likely to lead to higher volume of new business Higher additional bonus is better than a higher standard rate, as it looks like a special offer and policyholders shouldn't be surprised when additional bonus is not available next year. If higher single rate were to be declared initially and cut after one year, it could be perceived poorly and might trigger a rise in surrenders. The nature of additional bonus should be clearly communicated to policyholders so that they are not surprised when this is removed at the end of the year. There is a risk that the policyholders may extrapolate the initial accumulation rate to get an idea of how their investment will grow over several years. An alternative marketing enhancement could be to offer bonus units at some points in future. Higher accumulation rate increase the chance of asset share falling below the value of units. Although, this is likely to happen early on, due to high initial expenses, however, the risk is increased. The company should be concerned about the risk of reaching the first anniversary at the time of depressed asset values and suffering a mass surrender when the total accumulation rate decreases. This risk will be more important, the lower the size of the free assets, and because these policies were sold over shorter period, the risk is concentrated on a very narrow interval. The risk would be mitigated if the product were sold over a longer period and if the surrender profits/losses could be shared with policyholders. i.e the risk of mass discontinuance
To control this risk company will want to apply a MVA. Co could invest in less volatile assets; however, this will reduce the overall return. So the policyholders effectively will lose out as a result of additional bonus. Even if the assets mix were not changed, the extra bonus rate may not lead to higher payout at termination. A terminal bonus is likely to be added to the guaranteed benefit to bring it to the level of smoothed asset share. Another PRE risk is that returns are compared virtually

with the risk free investments, such as deposit accounts. Although, this may not be appropriate and the nature of risks and returns should be explained.

**No MVA on 6th policy anniversary**

This can be popular and may well increase the sales of this product. However, there is risk that this may turnout to be a 6 year product and may be significant risk to the EV of the company later. If the asset shares are below the value of units at the 6th policy anniversary, there are likely to be large number of selective withdrawals, depending upon the target market and the distribution channel. This will result into loss to the fund.

The significance of the risk will be influenced by:

The duration of zero MVA guarantee; if its one day only, the risk will be less than if extends for a month either side of the 6-year mark. The accumulation rate; higher the rate, greater the risk The asset mix; the more volatile the returns, the greater the risk The risk could be reduced by moving the spot guarantee out to 10 years. Although, it might not be so marketable, it will allow more time for terminal bonus cushion to build up The co will have to reserve for the guarantee which could be onerous, in turn increasing the new business strain. Setting up the cost of guarantee reserve would require stochastic model and looking at the distribution of outcome. To avoid making a loss, the company may have to charge for the cost of guarantee within the asset share calculations. Again, stochastic calculations will be required. While policyholders will appreciate the guarantee they might not be happy paying the cost of it.

One option is to offer two version of the product ;

§ with guarantee and

§ without guarantee

This way cost will be clear to the policyholders, who in turn can make informed choice. If the company were to go for this, it is important to make appropriate charge for the guarantee and explain the risk being taken by each group and any cross subsidies.

(iv)

The Free Estate of a company are realistic assets minus realistic liabilities. The realistic with profit liabilities will include an allowance for the policyholder's reasonable future bonus expectation. IRDA requires company to have separate funds for par and non par business so it is expected that non-par business will be written outside par fund.

**<u>This Free Estate may be used to</u>**

**Modify benefits:**

Payout may be augmented to trigger larger shareholders transfer This will accelerate shareholder's transfer and therefore increase shareholder value.

However, augmented payout will require high reserves to be established; hence will tie up more of free assets.

**Write new business**

Provided the expected return on the capital used to write new business is greater than the return on free estate, writing new business should increase the EV of the company. This could boost the returns to both with profit policyholders and shareholders. One of the key indicators of the financial strength of the company is "Free Asset Ratio". With higher free assets ratio the company may be perceived as being financially strong.

**Improve product design**

Free Estate may be used to fund new product development, which may result into increased market share and profitable new products With more capital co may be able to write more capital intensive products, if there is a market for this. The company will still want to ensure that it earns appropriate

return on the capital.
**Withstand adverse experience:**
Higher estate means ability to withstand adverse experience and hence less need for reinsurance. Reinsurance would expect to make a profit from reinsurance deals, so less the need for reinsurance more the profit that can be earned by stakeholders.
In case of adverse experience, if the PRE of the participating policyholders is not met by the free estate, shareholders will be required to makeup the short fall. In this situation the option from shareholder's perspective is at fund level rather than at policy level and is referred to as burnthrough cost. Higher free assets help to reduce the burnthrough cost.
The greater the free estate, greater the scope for smoothing bonuses, which means a steadier profit stream for shareholders. Since shareholders like the stability of dividend (i.e. earnings) this may increase perceived value of the company. Free estate provides cushion against the volatility of the investment returns Large free Estate may be used to justify a more risky investment strategy in pursuit of the higher overall long term return and hence higher bonus for policyholders and shareholders transfers
**Inorganic growth: Buy or develop**
Develop New distribution channels/partners Training existing distribution channels to sell the participating products Develop a virtual distribution platform e.g. web based distribution channel The aim of any of these is to generate higher profits in long run to benefit the par policyholders and hence shareholders value should be increased via higher expected future shareholder transfers.

(v)

The actual transfer to the shareholders' account is equal to
Actual transfer = X% of cost of bonus (COB) + surplus transferred from the 0/100 account
**X% of the cost of bonus (COB) can be different from predicted for the following reasons:**
As per IRDA (distribution of surplus ) regulation,2002, 1/9th of the cost of bonus shall be appropriated to the shareholder's account. However, it may be diferent from this, with prior approval of IRDA, provided **NOT** more than 10% of the actuarial surplus is allocated to shareholders. Hence, the % of distributable surplus awarded to shareholders might be anywhere between 0 to 10%. **This could have changed from predicted, however, is under company's control, although there may be some shareholder pressure not to reduce the percentage**.
The reversionary and/or terminal bonus rates declared may be different from the predicted The company decides what rate to declare, but this will reflect the investment return and other experience, however, PRE must be considered. Reversionary bonus rates are expected to be stable and so will not be changed in a hurry in response to current years' experience. Therefore, the difference from this source is expected to be small However, depending upon the smoothing policy of the co, terminal bonus rates might be changed more dramatically and so lead to larger difference in shareholder transfer The number of policies coming on the books via new business and going off the books via maturity, death and surrender will each be different from estimated So even if the bonus rate is same as that anticipated the cost will be different from expected, due to the number of policies to which it applies Policy alterations performed (e.g. PUP, extended term; increase in sum assured) on the policies will also lead to a difference The co has no control over the number of death claims; however, reinsurance may be used to control the impact on the co. It has very limited controls over the volume of surrender and alterations, however, can seek to influence the surrender volume by the terms and conditions & the quality of services it offers. volume by the terms and conditions & the quality of services it offers Shareholders transfer may change due to change in the valuation basis For example a change in the mortality basis will change the timing of expected bonus payment and a change in the valuation interest rate would change the discounted value of those bonuses and hence

the shareholder's transfer The Appointed Actuary must comply with the Insurance act, IRDA regulations and professional guidance notes, however, there will still be some scope to exercise control over the valuation bases. More control is possible if stronger valuation basis used, although valuation method changes need to be justified and can not be changed frequently

**Surplus transferred from the 0/100 account:**

The surplus arising in the 0/100 fund is equal to the increase in the value of assets less the increase in the value of liabilities and may be different from predicted due to following reasons:

Any item of experience may be different than expected, leading to change in surplus In Unit linked products, investment return in passed on to policyholders, however, this will impact value of any fund related charges Return may be different from expected due to absolute level or change in mix of funds. The company has no control over this, however, may reduce the impact by concentrating more on rupee-related charged for new product development Expenses may be different from expected. The co may not have any control on general inflation, but has more control over salary inflation. If required it could embark on a cost cutting exercise. The link between the charges and expenses is more important. If charges can be increased in line with the expenses, this will reduce the impact on the surplus to just a timing difference. However, there is an upper limit on the charges as per IRDA cap on charges guidelines and PRE may also limit any increases. As seen in 90/10 business, policy movements will affect the surplus in 0/100 business. Co has some influence on new business less over surrenders and alterations and no controls over deaths. Appropriate terms in the product can help reduce sensitivity to these movements.

Volume and mix of new business can be influenced by marketing campaign, remuneration scale change for the distribution channel and special offers Increased new business volume will depress shareholder transfer for the year due to initial valuation strain.

**The valuation basis may change for 0/100 fund.**

If valuation basis is strengthened it will lead to one off decrease in surplus, but future surplus should be higher, all other things being equal.

other things being equal Subject to complying with the insurance act, IRDA regulations and guidance notes issued by the profession, the company has control over valuation basis for 0/100 fund

**[50]**

**[Total Marks – 100]**

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