The Institute of Actuaries of India

Subject SA2 – Life Insurance Specialist Applications

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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.

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Chairperson, Examination Committee

Q.1)

a) The Life Insurance Council's code on Sales Illustrations, the Guidlines on Unit Linked Life Insurance Products and the IRDA (Protection of Policyholders' Interests) Regulations, 2002 are all relevant here.

- unit linked probucts are complex and even sophisticated policyholders may not properly understand their working
- policyholders may have an expectation that any insurance product will have some form of assured investment returns
- even though the ULIP guidelines require specific reference to fluctuations in investment returns, the policy illustrations for the 30%, 50% and 100% equity investment funds do not show relative riskiness
- policy illustrations generally assume a constant rate of investment return over the policy term with no fluctuations at all
- the illustrative earning rates for the 100% equity investment fund are probably higher than those for the 50% and 30% investment funds, encouraging policyholders to choose the higher equity exposure
- even though the marketing material will explain that past performance is no guide to future performance, policyholders will still be influenced by past performance
- unit linked contracts have only been marketed in India for a few years which have coincidentally been a time of very strong equity returns and policyholders have yet to experience a bear market
- past performance is usually quoted as rates of return over 1, 3 or 5 years and this may or may not convey a degree of volatility
- where some form of guaranteed investment return is given, policyholders may not fully understand the nature and conditions of that guarantee (for example, many such guarantees are only applicable at maturity and if all premiums have been paid)
- regrettably life insurers are not able to fully control their sales people and inevitably misselling will exaggerate returns and misrepresent the risks
- although life insurers publish NAV prices regularly (usually daily) which demonstrates volatility, few policyholders will look at these
- generally unit statements are provided to the customer annually, which may be too long a period to show up the volatility of returns

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b) Unitised regular premium with profits endowment with smoothed investment returns:

- because there is a direct relationship between each premium paid and the additional amount of benefit which will result, the policyholder is better able to quantify the effect of investment returns than for say the regular premium endowment with reversionary bonuses
- the insurer has discretion over the bonuses granted, whether these are by way of additional units or by way of an increase in the unit price
- because of this discretion, the insurer can take a longer term view of investment returns and smooth the bonuses it declares
- policyholders will therefore expect that the bonuses declared will not be volatile and that the values of their accounts will increase steadily
- the surrender value will however generally be subject to a discretionary market value adjustment (compared to the unit linked product where the surrender value will be the value of the units possibly less a specified surrender penalty)
- policyholders' expectations regarding any market value adjustment will be set by the company's past practice
- market value adjustments are however seen as arbitrary and unfair

Hybrid single premium:
- the minimum benefit amount at maturity is *known* and *guaranteed* at outset
- the policyholder knows that at least he will get his capital back
- the conventional endowment sum assured implies a rate of return of $((1/0.7)^{1/10} -1) =$ 3.6% pa ignoring expenses
- if expenses are say 10% of the single premium, then the implied rate of return on the conventional endowment portion will be $((1/0.6)^{1/10} -1) = 5.2\%$ pa
- if the equity units perform satisfactorily over the term they might accumulate to 30% x $(1.10)^{10} = 77.8\%$ of the original single premium
- this represents an overall return of $(1.778^{1/10} -1) = 5.9\%$ pa
- although this is not a high rate of return compared to government bonds for example, the policy holder will probably regard this as a good return
- even if the equity units have a negative rate of return, the policyholder will tend view the entire equity unit proceeds as "something for nothing"
- in summary, the policyholder's risk tolerance on the equity units is high as a result of the guaranteed security of his initial capital
- there is however likely to be some surrender penalty on the conventional endowment portion of the contract, so it is not as liquid as the existing unit linked product

Participating regular premium endowment with reversionary bonuses:
- it is difficult for the policyholder to quantify the bonuses declared from time to time as they are not expressed in present values
- the level of guarantees would probably be higher than for the other proposed products because of the insurer's ability to reduce future bonuses if necessary and because of the amount of surplus held back for terminal bonuses
- naturally, the sum assured and declared reversionary bonuses are guaranteed, and policyholders would understand that this guarantee is only available at maturity (or death) and not on early surrender
- because there is not a direct connection between the investment earnings and the bonus rates, policyholders's expectations will be influenced by bonus rates declared in the past
- expectations will also be influenced by the levels of bonus rates declared by other companies
- in any case, the investment earnings underlying the revesionary bonus contracts are not visible to the policyholders
- surrender values are not guaranteed and generally do not offer good values when compared to premiums paid, however companies rarely change surrender values and so policyholders have an an expectation the surrender values will be maintained

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c) General aspects:
- obviously it is a good thing to offer customers solutions which may meet their needs better
- the problem is to establish exactlywhat the customers needs are
- the customer has already bought the unit linked product, it is now difficult to say to him that it isn't suitable after all and that new product A will be better for him
- who will advise the customer? - knowledge of both the current product and the new product will be necessary
- how will the salesman be rewarded? - commission has already been paid on the first product, and the customer can't be expected to pay for commission a second time

Unitised regular premium with profits endowment with smoothed investment returns:
- the initised with profits product will probably have no investment choices as this will be left to the discretion of the insurer
- typically the insurer would have decided on 20% to 40% exposure to growth assets including equities
- if a customer wants a high exposure to equities and is happy to live with the volatility then he should probably remain in the unit linked product
- customers who are nervous about volatility, and who are therefore also not suited to high equity exposure may well be more comfortable with the unitised with profits endowment
- conversion to the unitised with profits product will be simplified if this product is accepts to ups, if so, the surrender value on the unit linked product can be applied as a top up
- conversion from a regular premium contract to another will result in commission being paid again unless special terms can be arranged
- if the existing unit linked product is a single premium there is not much attraction in converting to a regular premium product

Hybrid single premium:
- this would probably be offered only to existing *single* premium policyholders and not to those with regular premium premiums
- the conversion terms are simple – the surrender value under the old unit linked product is applied as a single premium under the hybrid product
- as commission on single premium products is low, payment of a second commission to the salesman is less of an obstacle
- if the customer has the 30% equity unit linked product he will have the same exposure in the hybrid product but with the addition of a capital guarantee
- for policyholders with the 50% or 100% equity exposure a lot will depend on

    o the recent performance of unit prices, and
    o the individual policyholders' objectives

- if the equity markets have been rising strongly for some time then it may be a good strategy to sell out of the unit linked product and buy into the hybrid product, so locking in the gains
- if equity markets have been falling, the policyholder may not want to realise his losses, and anyway it may be a poor strategy to sell when markets are down
- the policyholder may particularly want a high exposure to equities taking into account his exposure to other asset classes in other investments which may not even be insurance products

Participating regular premium endowment with reversionary bonuses:
- it will not be practical to convert existing policyholders to a conventional regular premium product as this is the least flexible option
- the surrender value cannot be applied to reversionary bonus product
- if the customer is quite risk averse however, it may be a solution to apply the surrender value of the unit linked contract to buy the new hybrid single premium product, and redirect future regular premiums to the reversionary bonus endowment product
- any conversion to this product will result in the payment of commission again

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d)   *(Note that the question has two parts:*
- *describe investment strategy*
- *how returns to policyholders are to be determined)*

General aspects:
- it goes without saying that quality investements should be selected in each asset class and that there should be no overexposure to any one asset or sector
- IRDA regulations and norms must be followed

The existing unit linked product:
Investment strategy:
- the investment strategy for the unit linked product is quite straight forward, the most important principle is to invest in the same way that has been described to the policyholder and to keep within the ranges and limits set out in the marketing material

Determining returns:
- the returns to policyholders are directly linked to the segregated assets held for those policyholders through the NAV prices

Unitised regular with profits endowment with smoothed investment returns:
Investment strategy:
- the investment strategy would be to achieve real returns after inflation, which requires a moderate exposure to grwoth assets
- equity exposure of 20% to 40% would probably be suitable but this depends on
    o the level of smoothing which is envisaged
    o free assets and the surplus available in the participating fund; with more surplus a higher equity exposure will be possible
    o the proportions of declared bonus to terminal bonus

Determining returns:
- to determine the bonus to be declared, the actuary would first determine the actual investment earnings on the underlying assets
- the smoothing formula would then be applied e.g. average rate of return over a rolling 3 year period
- the proposed bonus would then be tested using projections of the portfolio and possibly stochastic simulations to assess the rsik of insolvency and the required resilience reserves

Hybrid single premium:
Investment strategy:
- for the conventional non profit endowment component, the investment strategy would be to match with a fixed interest asset of the same term, allowing for reinvestment of interest earnings
- the pricing basis will indicate the level of investment return below which the product is not viable and must be repriced
- the equity linked compenent will be fully invested in quality equities
- if allowed by the policy conditions and marketing materials, gains on the equity component could be realised over the term and locked in by reinvesting in debt

Determining returns:
- the return on the debt component is guaranteed to be equal to the single premium itself
- any profit or loss on the guarantee will accrue to the shareholders
- the returns to the policyholder on the equity component will be directly determined through the NAV pricing system

Participating regular premium endowment with reversionary bonuses:
Investment strategy:
- similar to the unitised with profits product, the investment objective would be to achieve returns in excess of the rsik free rate over the long term, which will require

some exposure to growth assets
- again similar to the unitised with profits product, an exposre to equities of 20% to 40% might be appropriate depending on the level of free assets, the level of smoothing and the proportions of reversionary and terminal bonuses
- the investment strategy would be to achieve real returns after inflation

Determining returns:
- the first step in determining returns is to calculate the policyholders' asset shares
- the declaration of bonus will follow the company's bonus policy, and give regard to the asset shares of each policy
- the company will have to take into account past bonus history and competitive pressures in setting the rate of bonus

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e) The two main approaches to analysis of surplus are the projection method and the formula method.
- Projection method
    o set assets equal to liabilities at the start of the year
    o project the assets and liabilities at the end of the year on the valuation assumtions, to arrive a t the surplus at the end of the year
    o repeat the projection sequentially changing one assumption at a time from its expected value to its actual value
    o the change in surplus resulting from changing one assumption is the contribution towards surplus from that item of experience
- Formula method.
    o formulae are derived for each item contributing to surplus
    o the items to be considered include interest, expenses, mortality, withdrawals
    o the formulae generally involve approximations (eg cash flows occur on average in the middle of the year)
    o the formulae are usually designed to be used at a policy group level

The projection method is straight forward for both conventional business and for unit linked business.

The formula method is complicated for unit linked business, and so it is usually only used for conventional business.

[4]

f) The essential features which distinguish participating and non participating products are that:
- participating products are entitled to share in surplus
- the company will have some discretion in deciding the extent of benefits for participating policies
- there is no discretion in setting benefits for non participating policies
- non par benefits may be specified in amount or in the way in which they are to be determined (eg unit linked policies)

Unitised with profits
With unitized with profits contracts, the unit price may be fixed at 1.00 and bonus units issued periodically, of the unit price itself may be increased regularly. In both cases the company determines the amounts at its discretion.
From the policyholder's point of view there is no direct link between the unit price and the value of a segregated pool of assets.
Because the unit price does not track asset values, there is usually a need for a MVA which again is determined at the discretion of the company.

Non participating single premium endowment
The benefits under the non par single premium endowment are fixed at issue by specifying the sum assured at maturity. Once set, the company has no discretion over the eventual benefit paid.
There will be no share in any surplus arising.
The benefit has been specified, not the method of determining the benefit, although for this type of product the sum assured is often specified as the accumulation of the single premium at a guaranteed rate of interest.

Participating regular premium endowment
The product is clearly stated to be entitled to share in the surplus of the company.
The premiums are fixed and the sum assured is fixed but the bonuses are set at the discretion of the company (subject to PRE).
The bonus structure itself may be discretionary, i.e. mix of reversionary (simple, compound, or super compound) and terminal.
Surrender values are not guaranteed and may be altered by the company.

[4]
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Q. 2)

a) The candidate is expected to show that the approach to reserving for each of these product types is different.

Supervisory reserves are described in some detail in the IRDA (Assets Liabilities and Solvency Margin of Insurers) Regulations 2000

- Participating reversionary bonus endowment and whole life policies
    - the gross premium valuation method must be used
    - discount future policy cash flows at an appropriate rate of interest
    - policy cash flows include
        - basic and rider premiums
        - basic and rider benefits
        - vested bonuses, bonuses now declared and future bonuses including terminal bonuses
        - commission payable (not for orphan policies)
        - future policy maintenance expenses
        - allocation of profit to shareholders
        - tax
    - policy options
    - minimum of surrender value

- Non participating level premium, level term policies
    - gross premium valuation method as for participating business
    - except of course that bonuses do not apply
    - reserve for any policy options

- unit linked savings plans with insured death benefit
    - unit reserve equal to the value of the units
    - plus, non unit or sterling reserve for
        - fund growth rates and management charges
        - mismatch in timing and amount between expenses and other policy charges
        - possible unearned premium reserve
        - mismatch in timing and amount between mortality charges and death claims
        - investment guarantees (resilience reserve)
        - options and other guarantees

- group life insurance
  - unearned premium reserve
  - incurred but not reported
  - premium deficiency reserve
  - profit share reserve
  - additional reserves for premium rates guaranteed for more than one year
  - options and other guarantees
- reserves for extra premiums may apply to all of these products
- reserve for lapsed policies under which a liability may arise
- no policy may have a negative reserve
- for some benefits and riders the actuary may use a method other than the gross premium method, but the reserve held should not be less than if the gross premium method were used (this will apply particularly to group life and possibly unit linked reserves)

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b)   Why MADs required:

General:
To protect the interests of policyholders
To meet PREs

Technical:
Cushion against - mis-estimation of the best estimate
                          - deterioration of the best estimate

Professional Guidance:
Low MAD: insufficient security
High MAD: Higher capital requirements; lower returns to PH and SH
Estimate net of MAD assumptions and provide an overall contingency reserve for
An appropriate level of prudence
To enhance the degree of protection to PH
Run series of projections – various adverse scenarios

The Actuary may:
  (i)   rely on the overall MADs rather than just the MAD that may have been associated with a particular parameter, but only to the extent that it can be held that the risk of coincident occurrence of adverse experience in several parameters is expected to have insignificant impact on the amount of the liability;
  (ii) have regard to the extent to which increases in liabilities may be offset by compensating increases in asset values;
  (iii) consider the ability of management to react to adverse experience, for instance by changing asset mix, reducing or eliminating bonuses (subject to maintenance of PRE), increase mortality and other charges where there is discretion to do so, or more extremely closing to new business with perhaps consequential reductions in expenses;
  (iv) consider the protection provided by reinsurance;
  (v)   consider the additional protection provided by the actual solvency margin held, only in the most extreme adverse scenarios, which should generally be highlighted to the Board as ones, which would require either further capital injections or the closure of the business after securing the interests of policyholders. In such extreme scenarios, only 10% of the free assets, if any, in the policyholders' participating fund can be assumed to provide the additional protection.

In constructing adverse scenarios the actuary must:
- (i) identify and give particular attention to the conditions or combinations of condition that will be the greatest threat to the security of policyholder interests;
- (ii) identify and consider the extent, to which falling or rising interest rates may threaten the ability of the office to secure policyholder interests and where such risks cannot be substantially matched or mitigated;
- (iii) consider more generally the interaction of liabilities and assets;
- (iv) consider all options, with a view to policyholders acting rationally to maximize their own interests, particularly where this may be to the detriment of shareholders or other classes of policyholders. For instance, if in an adverse scenario, interest rates fall below the levels underlying guaranteed annuity rate options, then while selecting the adverse scenarios, the Actuary must allow for the risk that a large proportion (commensurate with the actual experience of the company) of policyholders may exercise their options and then decide whether to provide for the additional reserve or not;
- (v) avoid being influenced unduly, by personal opinion held apriori concerning the future (of say mortality experience or interest rates), and ensure consideration of a full range of plausible adverse scenarios.

Consider past experience – in India and outside

Mortality, morbidity: Consider improving or deteriorating experience; options; selective withdrawals

MADs to provide for any investment guarantees.

Minimum adverse scenarios:

c) (Full marks awarded for covering at least half the points below)

Current solvency margins: A percentage of reserves plus a percentage of the sum at risk.
1.5 times for prudence
Similar to Solvency I, considered broad brush approach
Doesn't clearly provide an early warning to the regulator
Doesn't clearly lead to confidence in the financial strength of the company

Current requirement falls short of delivering an efficient economic outcome by imposing excessive burdens on firms and by contributing to distortions in the market place

Interaction of technical provisions and the solvency margin can create perverse effects where greater prudence in the technical provisions leads to an increased solvency margin

Asset risks are not recognised; instead restrictions are imposed that can distort portfolio choices

Diversification benefits not recognised

Consider a more comprehensive principles based system that uses a margin based on market consistent valuation

Unbiased valuation of liabilities = Best Estimate plus a margin determined by the cost of capital required by the market to bear the risk of holding the liability (fair or market consistent)- helps to understand how firms manage risks, transparency
Establish appropriate risk margins:

Explicit quantified margin using a confidence interval (75% - arbitrary proxy for fair value) approach or

Estimate the probability distribution

Determining 75% percentile is not straightforward

Inappropriate regulatory valuations – risk for small companies with less diversified portfolios higher than that for larger companies

Absence of secondary liquid market

Financial risks can be priced

For underwriting risks, no hedging available – pricing difficult – however implicit value on risks thro pricing products and reinsurance; cost of risk bearing capital set in the capital market

Appropriate Guiding principle for valuation: market consistency

Internal models to be developed by companies

Supervisory review and acceptance of internal models

[10]

d) Group term life market in India is currently extremely competitive and hence profit margins are thin

Pricing is based on old tables 1994-96 and the experience of the new companies is not reliable

Many schemes may have profit sharing and the residual profits to the Insurer may be small

Most schemes are re-broked every year having impact on persistency

The membership of a scheme may increase – assumption about size increase is difficult

Insurance cover linked to salaries – might increase every year

All these variable make calculation of EV very subjective

Projection based on individual members or schemes – may not be appropriate

The best that can be done is to start from a reasonable profit margin expected on the portfolio and project these cash flows using growth in size and cover and allowing for persistency of schemes

The factors mentioned above indicate that the business may be riskier than individual life and a higher Risk Discount Rate may be appropriate

Solvency margins and the cost of capital requirements for group term life are high and allowance for these would significantly reduce the EV

[4]

e) It is common to allow for reinsurance, for the purposes of reserving, to treat the unexpired reinsurance premium as prepaid expenditure (assets). This assumes that future cash flows considered for valuation are gross and do not take into account reinsurance.

In the calculation of EV, one can not assume gross premiums receivable and gross claims and one needs to take into account the cash flows net of reinsurance in respect of each policy.

A gross/gross assumption would mean the mortality margins on the entire cover (including the ceded amounts) accrues to the direct insurer and thus inflates the EV while actually the reinsurer gets these margins on the ceded amount.

An exact method could be:

Project the fund value of each Unit Linked policy each year over future, reduce by the

retentions, calculate the reinsured amount each year, estimate reinsurance premium outflows and reinsurance recoverable each year and hence work out the EV.

Similarly for conventional policies also work out future Sums At Risk reinsured and work out cash flows.

The above method is complicated; the company may review retentions from time to time; reinsurance premium rates may not be guaranteed over the entire future.

In the absence of any common understanding in the industry, broad adjustment that could be made is to have a margin in the mortality rates that could reflect the proportion reinsured and the margins lost (the reinsurer's loading for margins and expenses) to the reinsurer on a portfolio basis or on a policy by policy basis.

[4]

f) Possible tax relief in future of past losses; need to allow for expense overruns on current business and possible tax benefit.

The losses in the earlier years can be offset against profits in future years resulting in tax savings in those future years.

Based on business plans of the company, estimate the time at which such tax losses could be set off, work out the tax savings and use its present value as an addition to the EV.

The business plan might give an indication of future losses. Split these losses between that attributable to existing business and that attributable to future New Business. The losses attributable to existing business, allowing for timing, will reduce the EV. The present value of the tax recovery on these losses attributable to existing business allowing for the time of such recovery can be treated as an addition to EV.

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