INSTITUTE OF ACTUARIES OF INDIA

CA1 – PAPER II (INDICATIVE SOLUTION)

MAY 2012 EXAMINATION

Solution 1 :

(i)

VaR – VaR generalizes the likelihood of underperforming by providing a statistical measure of downside risk.

- VaR assesses the potential losses on a portfolio over a given future time period with a given confidence interval.

- For example, a VaR of INR 10mn over the next year with a 95% confidence interval would mean that there is only a 5% chance of the underperformance being greater than INR 10mn over the next year.

(ii)

TailVaR – TailVaR is defined to be the expected loss in a portfolio's value given that the loss is occurring at or below the p*th*-quantile . It gives the expected value of the portfolio in the worst *p%* of cases under consideration.

For example, if the average loss on the worst 5% of the possible outcomes for a portfolio is INR 5mn, then the TailVaR is INR 5mn for the 5% tail.

[4]

Solution 2 :

(i) In a life insurance context, discontinuance may mean:

- Surrender – the policy ceases, there is no further cover and the policyholder receives a lump sum payment (the surrender value).
- Lapse – the policy benefits are stopped because customer has failed to pay contractual premium on time, there is no further cover(some policies may have non-forfeiture benefits) and no payment is made to the policyholder by the insurance company. However, a lapsed policy can be revived by paying the back log premiums usually with a penalty
- Paid-up – here the policyholder ceases to pay premiums but the policy continues to offer the policyholder some reduced cover. The benefit is reduced to reflect that there are no more premiums and this benefit is called the paid-up value.

- The other term frequently used is withdrawal. Withdrawal encompasses both surrender and lapse. The implication is that, in both cases, the policy does not stay in force and therefore it has been withdrawn.

(ii) Discontinuance benefits are not offered in protection contracts (protection against dying early or living too long).Such contracts usually work on the concept of pooling of risks and there will be degree of cross-subsidy from healthy to unhealthy lives in case of term contracts and vice versa in case of annuity contracts.

Generally company may not provide any discontinuance lump sum benefit in term insurance products as

- there is no survival benefit, the asset share is very low and in early years it can even be negative.
- Asset share can be positive (especially for Single premium and limited products), but the risk of anti-selection would be very difficult to cost for. The surrender value could look un-attractive any way.
- The customer may select against the company when they believe that their health is good .Terms products tend to have very competitive market and hence the risk of lapse and re-entry of healthy lives is high compared to other products.If healthy lives lapse, the company will be left with a portfolio of non-standard/healthy lives which would impact portfolio profitability. Offering no discontinuance benefits will protect the company to some extent

Company may not provide any discontinuance lump sum benefit in immediate annuity product.

- It is the risk of anti-selection that is difficult to cost for when setting lump sum discontinuance terms.

- For example, annuitants may decide to discontinue their annuity because they believe they are not going to survive for much longer. In the lump sum discontinuance benefit calculation, we would have to make an assumption regarding future life expectancy of annuitants. The longer that we assume the annuitant will live for, the higher the benefit.

- Therefore, there is a risk that company is too optimistic in its assumptions and pay out a lump sum that is greater than the true present value of the actual annuity payments that would be made to such individuals if the contracts were not to be discontinued.

- Offering discontinuance terms will lead to risk of being left with a pool of healthy lives whose longevity would be much higher than priced for leading to a loss

- Moreover, policyholders are likely to opt for surrender during time of increasing interest rates when value of existing asset portfolios are likely to fall. There will a be loss on sale and hence surrender is a significant financial option offered to a policyholder.Any

surrender value offered in a falling interest rate scenario could be very low(due to falling asset values) leading to angst among customers any way.

[7]

Solution 3 :

(i) Commercial property

(a) Purpose – Commercial property includes office, shop, factory etc.

The purpose of such a cover is to indemnify policyholder against loss or damage to their property. The cover may also include Business Interruption cover.

(b) Benefit – this would be the amount indemnified for loss or damage.

The company would typically specify limits or excess.

(c) Perils – Fire would be the principal risk.

Cover would also include explosion, lightning, theft, storm and flood and business interruption.

Travel Insurance

Purpose: The product intends to cover losses arising from events occurring during

periods of travel (either during holidays or during business trips).
The product could also cover expenses involved in cancelling travel arrangements for

certain specified purposes e.g. illness.

It could also provide benefits to indemnify costs due to hospital stay during a travel,

Or fixed benefits for personal injury, death claims etc.

Benefits : Could be indemnification for loss or damage (for eg. loss/damage of luggage during travel, medical expenses for expenses incurred during travel) or be fixed benefit for personal injury claims, death claims .

Perils covered- Loss of luggage, Delay of baggage, Repatriation after an accident/illness, Theft of cash/personal belongings/baggage, Loss of travel documents, Additional expenses from delay to travel, Cash benefit for hospital stay, Personal accident, Death benefit.

(ii)

Factors to be considered- The main factors to be considered are

- Destination (location)
- Climate condition of the destination
- Level of cover
- Duration of stay
- Reason for travel- business or pleasure
- Current health of the insured
- If it is group travel Number of person/s in the group
- Age and sex of person/s in the group
- Quality of tour operator if it a travel for pleasure
- Duration of travel time (likely time to be spent in air etc.)
- Any deductibles or excesses

[9]

Solution 4 :

(i) Variations in the level and form of the benefits relating to a term assurance product may include:

- variations in the amount of the sum assured- increasing benefit(linked to an index) or level or decreasing for eg. a mortgage related insurance.
- additional rider benefits to be offered such as critical illness
- waiver of premium benefit, *eg* in the case of sickness, accident, unemployment
- premiums could be made reviewable after a few years
- a renewal option at the end of the term, with or without further underwriting.

- A convertible option during the term/at the end of tem to convert to an endowment/whole life contract without underwriting.

(ii) Possible sources of such surplus / profit (deficit / loss) include:

- Lighter Mortality which would lead to
    - Lower claim payments than expected leading to mortality profits, lower claim management expenses, higher profit commission on reinsurance portfolio, greater expense recoveries than expected leading to expense profits.
    - If lighter mortality is accompanied by high CI claims(early diagnosis increasing CI claims but decreasing mortality claims) this would lead to more number of claim payments sooner than expected (though at 50% of Sum Assured) with balance 50% later than expected (as CI is diagnosed it results in lighter post CI incidence mortality). This could lead to higher profits than expected.
    - Higher CI claims than expected accompanied by lighter mortality claims could still lead to higher claim management expenses (CI claims involve more scrutiny/underwriting than a death claim).
  - Lower post CI mortality than expected
    - Leading to non-payment of balance 50% of Sum Assured on post CI death and resulting in profits.
- Higher Early lapses/withdrawal than expected
    - could be highly selective in nature leading to poor experience on the balance portfolio.
    - Non recovery of high initial expenses – term/CI product underwriting expenses could be high.
  - Higher maintenance/claim management expense than expected , higher expense inflation will lead to a loss.
- new business levels-
    - Significant development expenses are usually involved in developing CI products. Lower business volume than expected will lead to non-recovery of development expenses, higher unit costs than expected. Hence a loss.

- investment income and gains
    - Not a primary source of loss/profit as reserves are likely to be small.

[9]

Solution 5 :

(i) Identification of the risks

Start with a high-level preliminary risk analysis.

This should confirm whether the project is too high risk to continue.

Could investigate whether the necessary finance can be raised.

where it is likely to come from and who is managing the process of raising it.

Hold a brainstorming session of project experts and senior internal and external people.

for example, experts in project management, government relations, financing and person with experience in such similar projects, expert on logistics, urban planners, experts on customer/passenger behaviors and railway passenger's data analysis etc.

The aim of brainstorming is to identify all project risks both likely and unlikely.

The meeting will discuss these risks and their severity, frequency and interdependency.

Also initial mitigation options, eg outsourcing, insuring or removing the risk.

Use a desktop analysis to supplement the above by identifying further risks.

mitigation options should be identified, similar projects should be researched.

further discussion with experts should take place.

Set out all the identified risks in a risk register.

with cross references to other risk where there is interdependency.

A risk matrix could also be used.

Consider upside risks as well as downside risks.

(ii) Major risks

For this particular project the major risks would be:

- underestimation of costs in the planning and construction phases, eg higher than expected costs of clearing / preparing the site, labour costs, material costs, .
- delay in finalizing an acceptable building design, delay in getting approval for the design from the municipal authorities,.
- events leading to delays in the planning and the construction phases, eg strikes, problems with planning permission, if required, bad weather etc.
- overestimation of the usage of the parking space after construction by:

– daily passengers

– one off flyer passengers

… this may be due to an unattractive design, inadequate facilities e.g. proper entry and exit option etc.

- Overestimation of the amount of parking fee that could be charged from passengers, risk of interference from municipal authority on setting low customer friendly fees.
- underestimation of the costs of running the parking place, say requirement of security and admin staff to run the parking place.
- The chance of theft, fire of vehicles within the parking lot.
- political risk, eg opposition from local residents or from others in the city, due to costs, location, environmental impact say, may require to cut down few trees, etc
- problems in raising the necessary finance initially/sponsor default by debtors like material supplier etc.
- crime, eg fraudulent activities by workers.

Risk mitigation

- Underestimation of the cost of clearing the site – research the likely costs under different scenarios, sub-contract to a third party.
- Underestimation of the labour costs – sub-contract to a third party, agree a fixed price

contract in advance.

- Underestimation of the cost of materials – consult with experts, sub-contract to a third party, enter into forward agreements.
- Overestimation of usage by daily passengers – conduct surveys to identify the wants/needs of daily passengers, encourage them to sign up for membership in advance, offer attractive packages, advertising.
- Underestimation of running costs – research the costs incurred in other similar projects, consider future increases in costs .
- Political risk – consult with local residents and others living in the city to gain support, research issues fully, develop a favourable media relationship.
- Problems raising finance – profit-sharing deals, use several sponsors to diversify risk,
- insure against credit risk, ensure financing is in place at the start,
- ensure there are procedures to follow if costs overrun.
- Crime – research the backgrounds of all key contractors and personnel.
- Take the help of general insurance company to insure against theft and fire.

[12]

Solution 6 :

(i) The main benefits of reinsurance to a general insurance company are

- reduction in claims volatility and hence
  - smoother profits
  - reduced capital requirements
  - increased capacity to write more business and achieve diversification
- the limitation of large losses arising from
  - a single claim on a single risk
  - a single event
  - cumulative events
  - geographical and portfolio concentrations of risk

and hence

- reduced risk of insolvency
- increased capacity to write larger risks
- access to the reinsurer's technical expertise – product design and pricing, contract wordings etc.

The reinsurer may be able to offer very competitive terms for administration, actuarial services and other insurance advice if a reinsurance contract is purchased. There is, therefore, often a financial advantage to many small providers in purchasing reinsurance.

(ii)

A general insurer might take out ART contracts for

- provision of cover that might otherwise be unavailable through traditional insurance or reinsurance eg., cat risk cover,
- stabilization of results
  - **a.** e.g. through use of integrated risk covers
  - **b.** Diversification using securitization (risks are passed to more uncorrelated capital markets) which reduced volatility of results
- cheaper cover eg.
  - **a.** Even if traditional reinsurance might be available it might be expensive or premium rates may be very volatile
  - **b.** Securitisation arranged through the capital markets. Since insurance risk is uncorrelated with typical market-related risks, the capital markets may require a lower return on capital than reinsurers.
  - **c.** Using integrated risk covers, an insurer can help ensure that it is not overinsured.
- tax advantages of alternate risk transfer - It is possible that any of the products could be structured to exploit tax loopholes.
- Higher capacity- transfer of risk to higher capacity banking or capital market sector eg., there may not be a single reinsurer who has the capacity to meet the needs of an insurer due to capacity issues ;
- greater security of payment

a. for eg., there is risk of insurer and reinsurer being exposed to similar risks while transferring risks to financial markets diversification of risks can be achieved ,

b. Under securitisation, *eg* a catastrophe bond, the capital is provided to the insurer up-front.

- management of solvency margins e.g. through discounted covers.
- more effective provision of risk management for eg., ART products, such as integrated risk covers can be tailored to the requirements of the insurer, and over-insurance is avoided.
- as a source of capital

a. Post-loss funding can be used as a source of capital – the terms for raising the capital are agreed prior to a specific loss event occurring.

b. Securitisation is a source of capital, since the liability does not have to be accounted for in the statutory returns.

(iii)

Liability covers especially employer liability cover are long tailed business -
I,e, claims are characterized by delay in reporting. Many diseases e.g. asbestosis, take a very long time to develop fully – this leads to extensive reporting delays with this line of business.

- Even reported claims could take time to settle as usually judicial intervention might be required.
- General insurance companies, typically calculate the value of liabilities using non-discounted value of the outstanding claims.

- Discounted covers are reinsurance arrangements used by general insurers to help them reduce their claims liabilities.
- Under such arrangements the reinsurance premium is the value of the discounted claims reserves.
- The reinsurer assumes the risk of claims materializing faster than expected.
- Discounted covers may enable the insurer to reduce its liabilities by the amount of the *non-discounted* claims, but only has to reduce assets by the reinsurance premium, *ie* a discounted figure.
- For long-tailed classes of business (such as employer's liability) the discounted value of claims is significantly different from the non-discounted value.

[15]

Solution 7 :

(i) An employer may provide benefits because:

- compulsion or encouragement from the State.

The State may offer tax incentives to employers to encourage provision.

- a desire to look after employees and their dependents financially beyond

the level provided by the State or by themselves.

- a desire to attract and retain the services of good quality employees.

Employers may attract and retain good quality employees by:

– providing pension benefits that employees perceive to be attractive.

– providing benefits that are at least in line with those offered by competing employers.

– rewarding certain classes of employees, eg loyal staff .

- Employees will benefit from pooled arrangement in terms of costs and better managed investments than if they were to purchase personal pension plans.
- To increase the company's reputation or brand value.
  - It may be a tax efficient way of increasing employee compensation.

(ii) Factors to consider in the recommendation

- Decide on the target benefit that the employer wishes to pay after an agreed period of service.
- The target benefits should seem to be fair in the hands of employees.

Other considerations would be

- The effective target accrual rate.
- Definition of pensionable salary.
- Does salary include only basic or basic plus any other allowances.
- Integration with the level of any state benefit.
- Any Level of pension increases post retirement.
- Any lump sum death benefits for death while in service.
- Amount of spouse/dependant's pension as percentage of member pension
- Affordability – what can the employer afford?

- How much an employee can contribute?
- Competition - What are the contribution under pension schemes of similar companies?
- Consider volatility of earnings for determining what pensionable pay is included.
- Once total contribution has been determined the split between employer and employee needs to be defined.
- Tax implications for employers as well as for the employees of the foxed contribution rates.
- Nature of contribution to be fixed-The contribution could be fixed amount or percentage of salary, which will then be of increasing nature as it will increase along with salary increase.
- Once the contribution rate has been fixed it may not be possible to change in future without changing the scheme rules.

(iii) Economic Assumptions

- typically the assumptions will be Best Estimates – without margins.
- Prudent assumptions would require employer to provide more generous benefits than intended and would hence be more expensive.
- There should be consistency between the assumptions – this would matter more than the absolute value
- The value of the investment return assumption (i) will depend on the mix of assets that is expected to be held.
- The value of earnings inflation (e) will depend on how you expect productivity to improve in future.
- Historical difference between (i –e) will give some indication of the real rate to assume for the future.
- (i - pension increases) would depend on the level of pension increases that you would like to provide for the employees.

[16]

Solution 8 :

(i)

The following factors need to be considered when finalizing the design-

- customer needs
    - Assess the need for such a product in the market, market size, future growth potential
    - the design should meet customers requirement. Carrying out customer surveys, looking at popular competitive products in the local/world market is a good starting point
    - client's need would be determined on the basis of how much he can afford and level of sophistication in understanding health products
    - Here the target market is the key, looking at the product design , it looks highly complex with far too many layers of benefits, If the company is looking at low income group the product could be pretty expensive and difficult to understand

- Level and Form of benefits
    - Should the cover be fixed or increasing with each year to allow for inflation.
    - When will the claim amount be settled. In most cases the policyholder will have to pay up front to the hospital and then submit claim to the insurance company for settlement, can a cash less service where benefits adjusted against hospital bills be looked at.

- Impact on stakeholders
    - Training team- this a new segment for the company, how much time and effort will be required to train sales/ops/call center staff etc
    - Operations team, call center executives– how to deal with customer queries (this has a NCB, reviewable premium and complex benefits). Additional staff and training requirements may be necessary
    - Claims department- setting up new claims management system (this is not a simple death benefit), how to prevent fraudulent claims and inflated claims (for eg. was 24hrs stay really required , was stay in ICU required, note day care surgery is not eligible for any benefit)
    - Underwriting team- Set up of new underwriting standards for the health product (this would typically be very different than a standard life insurance contract), set up claim underwriting standards
    - actuaries will want to assess the impact of the design on cost & reserving implications, they would also need to develop new skills or hire new people to deal with issues like how to calculate NCB, review of premiums every 5 years,
    - legal department will want the contracts to say what is intended , are extra manpower required to address customer grievances
    - Marketing team- decide on crucial selling points, publicity and ad campaigns required and marketing budgets

- Management has to decide on how to balance sales, customer and shareholder expectations- sales people may demand high commission as this is a very complex product to explain to customers and get their buy in, customers –products should be friendly and contain attractive features like options and guarantees and shareholders will be worried about investing in this new line of business

- options and guarantees
  - while getting into a new product line it is very critical to decide what options and guarantees would you want to provide and its onerousness.
  - Here there is no limit on the maximum limit in terms of number of days- a max could control costs and premiums.
  - Premiums are guaranteed for 5 years, is reinsurer also providing similar guarantees otherwise a risk. Product likely to be highly reinsured.
  - no claim bonuses to be provided- how will it be calculated and communicated.
  - definitions guaranteed, only listed surgeries covered – cannot be reviewed or scale changed. It is likely that some surgeries which are major now could become day care or minor and it may make more sense to have some flexibility in definitions. Some surgeries which are rare now could become common in future.
  - Day care not covered, what if some surgeries become day care in future (eg. eye surgery) consider giving some benefit day care benefits.
  - Policy premiums can be renewed after 5 years - what does it mean it terms of PRE, regulatory requirements, competitive environment.

- terms and contract conditions
  - should be clear, un-ambiguous[
  - easy and simple wording, proper definition with less interpretation differences
  - Exclusions if any clearly mentioned
  - Premium Reviewability clause/NCB appropriately captured

- profitability
  - premiums charged should be enough to cover benefits & expenses plus an expected level of profitability for the capital providers.
  - This is a new product line for the company and investments might be required in system, hiring people with skills in this area etc. Do the expected business volumes justify the up-front investment that is required.
  - the balance between the profitability and marketability need to be considered- what will be expected business volume, average premium size.

- marketability
  - How if the design Innovative/different compared to others in the market and how should it be highlighted to customers.
  - How do options & guarantees compare to similar products in the market. Is it too onerous or too low.

- competition
  - What is the competition doing or expected to do

- regulatory requirements
  - any requirement relating to premium reviewability (for eg. needs to be approved by regulator or there are limits)
  - any restriction on exclusions that can be had in a contract (for eg. mandatory to cover pre-existing illnesses)
  - and what are the reserving/solvency requirements relating to health products, policy options and guarantees
  - are there any investment restrictions as per regulation?

- financing requirements
  - what is the expected business volume and capital requirement
  - how much capital is available
  - Is there any other business/product opportunity

- risk characteristics
  - may want to reinsure substantial portion, what are the terms and cost, impact on solvency of reinsurance
  - since it is first ever health product, the risk may be difficult to quantify easily and price for, decide on getting technical support from reinsurance

- extent of cross subsidies
  - between large & small contract

- administration systems
  - can the existing system cope with health products
  - how quickly can we buy or develop those features in the system

- Others
  - risk of fraudulent claims – how can they be controlled
  - should the company outsource some functions- claims investigations, operations etc.

ii) Company may provide the no claim bonus for the following reasons:

- Fairness to the customer -a form of profit sharing – it is new product and the company may have been prudent in pricing hence it is only fair to share experience profits with customers;
- Possible incentives not to claim especially for short stay in hospitals;
- One type of cost control as it would discourage the customer to make smaller claim;

- Competitors may be providing similar benefits
- Claim bonus will increase the benefit amount and hence may be seen as offering protection against inflation

(iii) No Claim Bonus benefit structure:

- No claim bonus may be based on the initial fixed benefit per day as daily hospital cash benefits as offered.
- At every Policy Anniversary, the initial fixed benefit would be enhanced by a simple percentage, say, 5% p.a. for a claim free year.
- There may be an upper cap of this increase, say up to a maximum of 50%, provided there has been no claim in the previous Policy Years.
- In the event of any claim the enhanced fixed benefit could be decreased by a percentage, say, 10% on the next anniversary.
- However the decrease in fixed benefit shall be such that it will never go below the initial fixed benefit.
- All other benefits i.e, ICU, listed surgical, etc. are linked to fixed benefit and hence increased or decreased as per the change in fixed benefit.

(iv)

In case of No Claim Discount (NCD) on premium, this may be worked out as-.

- NCD is a form of experience rating where policyholders are allowed a discount from the basic premium according to a scale that depends on the number of years since the most recent claim.
- At every Policy Anniversary, original premium, i.e. the premium at the commencement of the policy or as at the last renewal would be reduced by some percentage, say, 1%, for a claim free year. There may also be cap of this reduction in premiums, say up to a maximum of 12%, provided there has been no claim in the previous Policy Years.
- In the event of any claim, the premium for the following policy year will increase by a percentage, say 2% of the original premium, on the next anniversary.
- However the increase premium should be such that it never higher than its original premium which was locked at previous renewal or inception.

(v) Factors

- In no claim bonus, the premium would remain unchanged till the next renewal term i.e. till the end of 5 years of the policy. Hence customer is sure of his outgo. In NCD the premiums may go up/down

- It is simple to communicate to customers. On premium reviewability after 5 years the bonus increase in fixed benefit, if any, can be carried forward on renewal. The premium applicable on renewal will be based on the age and premium rates applicable, at the time of renewal on the initial fixed benefit.

- The NCB is very easy to administer and the communication is required to be done only at point of sale.

- Life insurance product premiums are generally level regular premium, so in case of NCB the premium would always be regular during the term other than renewal. It could be easier to train sales force on NCB than NCD.

- In case of NCD at each policy anniversary the renewal premium notice is required to be calculated and communicated as per the previous claim status.

- One of the practical problems is that generally renewal premium notices are sent before the premium due date, and by that time some claims may not have been intimated.

- It is possible, that the company provides the premium notice with a discount, which is actually not applicable at the due date as the customer may intimate claim only after the receipt of renewal notice but before the premium due date.
- This will require some adjustment in next year's premium or some demand for excess premium as the customer may have paid premium as per renewal notice.

- Generally NCD is perhaps more appropriate in case of yearly renewable contracts, however in case of premiums reviewable every 5 years NCB may be more practicable or value to the customer.
- Check whether the competitors whether the NCB or NCD is providing by them.
- NCB could provide inflation protection and may be perceive more valuable than NCD.

- Though NCD could be seen as offering some protection against increase in premium on review, being a 5 years renewable product, the increase in premium due to experience and age of the customer could be more than the NCD on premium.

- This may lead to the assumption that the customer has not get any benefits in premium discount as the renewal premium would very likely be more than last paid premium even after premium discount.

- The company should consider any regulatory issues on offering the NCB or NCD.

[28]

[Total Marks – 100]

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