

Institute of Actuaries of India

Subject CA1 – Actuarial Risk Management (Paper II)

November 2011 Examinations

INDICATIVE SOLUTIONS

1. i) The primary objective of catastrophe reinsurance is to reduce the potential loss due to any non-independence of the risks insured

It also smoothes the results and lowers the probability of ruin in most future scenarios

It reduces volatility and avoids possible deteriorations in the solvency position of an insurer.

- ii) The main features of catastrophe reinsurance are:

- It is non-proportional reinsurance;
- it is usually negotiated on an annual basis
- The reinsuring company will agree to payout if a catastrophe occurs.
- There is no standard definition of a catastrophe. It is based on the reinsurance treaty agreed between the parties. There needs to be a minimum number of claims arising from a single incident occurring within a specified time of that incident for catastrophic reinsurance to take effect.
- The reinsurance treaty would cover all the terms and conditions
- The cover would usually exclude wars, terrorism, epidemics and nuclear risks.
- Catastrophe reinsurance would apply on the amount retained by the ceding company after applying all other original terms/ risk premium reinsurance
- The reinsurer will pay the total claim amount (net of amounts reinsured under other treaties) in excess of the catastrophe retention limit, as agreed in the treaty
- There would be a maximum amount specified in the treaty. For covering any amount in excess of this limit, the ceding company will have to take a next layer of cover.

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2.

- (i) Main methods used to fund benefits are:

- a. In advance
- b. Regular contributions
- c. Pay as you go

- (ii) Main factors for deciding the funding method are the need of various parties

- members/ trustees would want security of the benefit; the more advance the benefits funded the more secure they are
- sponsor will want

- flexibility of contribution – regular contribution might be flexible compared to lump sum funding
 - Opportunity cost – what other use can the sponsor put the money to. Any other projects and the corresponding return on those
 - Sponsor will want predictability of outgo to avoid a cash flow or liquidity problem for the sponsor- regular funding will be better for cash flow and liquidity.
 - Under pay as you go, cash flow can potentially become a problem due to non-uniformity of the outgoes.
- Realistic cost of the benefit- having too low contribution rate in the beginning and higher contribution later, can set wrong expectations for the cost of the benefit
 - Solvency of the fund i.e. if the fund is in deficit than a lump sum funding in advance might be necessary
 - Size of the fund/ contribution in relation to the size of the company will also decide the type of funding- for eg. If the contribution is very small relative to fund/company size, the sponsor may opt for pay as you go.
 - Financial condition of the sponsor, if the sponsor is going through cash crunch then he is quite likely to adopt pay as you go than regular funding/advance funding.
 - External factors like any regulation specifying any minimum funding method to be followed
 - Any tax benefits that are available to the sponsors for the contributions made

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3. **Strengthen the existing underwriting process**

- Benchmark underwriting criterion with competition to check whether company is being too lenient
- Check previous claims history of the policyholder at inception at the time of underwriting
- Check whether any new rating factors need to be introduced- geographical area in which the vehicle operates, goods carried etc.

Strengthen claim management process

- Liase with policy and other authorities to catch fraudulent customers
- Offer rewards to garages or brokers/agents for deducting fraud
- Strengthen claims admission process- large claims being assessed by senior officials.

- Conduct spot checks on claims of large sizes
- Increase / introduce excesses to discourage small trivial claims
- Use in-house / appointed loss assessors
- Allow use of approved garages for repairs or if un approved is used, settle claims on suitable verification
- Ensure claims personnel are well trained and claims manual and process are well documented and followed to discourage subjective decisions

Analyze existing experience

- Look for multiple claims from the same claimant. Assess reason for same
- Check accuracy of claims data- is it giving wrong information,
- Check whether more than usual claims is associated with a specific sales personnel/Channel
- Compare experience with other companies to check that worsening loss ratio is not a general trend

Strengthen internal control process

- Conduct internal audits to check effectiveness of internal control process
- Strengthen anti-fraud department by recruitments if necessary
- Share and spread information on fraud cases as a source of learning for sales staff, claims personal, operational risk team and senior management
- Strengthen policy wordings and increase penalties for fraud if required
- Can look at increasing the premiums generally or for certain targeted groups, that would not though stop the fraud but it would reduce its effect.
- Will have to reject very unprofitable business where there is a high incident of fraud (certain ages, occupations, locations, etc)

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4. (i) The main reasons for high surrender profits could be:

- Higher surrender numbers than expected in valuation
 - This could be because at the time of valuation the surrender rates were prudently taken
 - Extremely good fund performance in respect of unit linked products, participating business so that even high penalties were not a deterrent
 - Economic crisis, which might have forced many customers to withdraw even at a financially disadvantage situation
 - Tax changes ,which would have made continuing some insurance products untenable for customers
- Surrender payments were less than expected (reserved for)
- For example, reserved for no surrender profit

- Higher penalties on unit linked business
- Less than full payment of bonuses on with profit policies
- Any change in method of analysis of surplus
- Any change in assumptions on withdrawals in valuation –lowering prudence margin

(ii) Advantage of stochastic model over deterministic model for this task

- It is not just assumptions that have a big impact, but actual experience can vary a lot with a big impact on profits. Deterministic model can't capture actual variation and what affects it.
- Withdrawal assumption has a strong correlation with economic scenario. A stochastic approach is useful compared to a deterministic model, since it can more closely replicate the pattern of investment returns, policyholder behavior under various scenarios in the real world.
- It allows for the random nature of the variables and correlation between them
- In addition, the output of running the model indicates the range of likely outcomes with associated probabilities, therefore providing additional information i.e, range of profits can be easily seen.
- It is useful for assessing the financial impact of surrender guarantees, if any

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5.

(i) Benefit risks in unit linked pension product:

- Investment risk with policyholder –risk of lower than expected investment returns leading to lower accumulation at vesting date
- Higher than expected expense charges (if charges are not guaranteed and are variable at discretion of insurer) leading to lower than expected accumulation at vesting date
- Poorer than expected annuity purchase terms at the time of vesting-even though open market option is available
- The policyholder may not have adequate expertise in
 - i. making appropriate investment choices leading to erosion in value of unit linked fund
 - ii. shopping for a suitable annuity product given lots of different options available
- Risk of default by the insurer

- General mismanagement by the insurer of investments leading to poor returns
- Risk of poor pension on death early in retirement

(ii)

- Advantages and Disadvantages:
- Provide a minimum return guarantee to policyholders till vesting date/death.
 - i. Policyholders know the minimum benefit that they can claim at the vesting date
 - ii. Minimum benefit protection to dependent in case of death of policyholder
 - iii. Any guarantee has a cost, which has to be paid by the customer and hence will correspondingly reduce returns to customers
 - iv. Guarantee is on contribution less charges. By using high charges, it becomes easy for the company to play with the actual guarantee to customer
 - v. It is likely that all insurance companies will be constrained to offer limited fund choices- with high debt exposure. A 100% equity linked fund is unlikely to be offered or will have a high guarantee charge.
 - vi. All customers irrespective of age, time to vesting date and risk appetite will be constrained to choose similarly structured funds (with high debt exposure)
 - vii. Guarantee may be trivial if a high interest rate regime prevails – customers may be benefited if guarantees are linked to some benchmark rather than an absolute figure
- Option to take 1/3rd unit fund balance as cash
 - i. On vesting/death 1/3rd fund balance is available immediately which will offer some liquidity and enable the policyholder to use lump sum to pay off debts like a mortgage, other contingencies and at the same time having an upper limit will ensure that adequate amount is left to purchase a pension
 - ii. Only one annuity option is available which may not be suitable for all policyholders for eg, no spouse pension, which may not be suitable to all policyholders
 - iv. There may be a tax advantage in taking the 1/3rd unit fund balance in cash
 - v. Compulsory annuitization on death- dependents may be relatively young and life annuity rates offered may be unattractive.
 - vi. Also, the amount available to purchase annuity may be trivial to provide a reasonable annuity amount at younger ages.

- The annuity can only be purchased from the same insurance company as that which manages the accumulation phase of the product.
 - i. Beneficial for those who lack expertise in this area. No hassles as they need not shop around for best annuity rates.
 - ii. Customers may not always get the best deal as they have to mandatorily stay with the same insurer for the payout phase as well ie no pressure to keep charges low.
 - iii. Insures may also not feel the requirement to offer competitive annuity rates as they know that their existing customers have no choice and neither can they attract new customers from other pension plans.
 - iv. On the other hand if insurers know that their customers have to stay with them only, they can also spread their expenses and profits over a much longer term of the policy- customers can benefit from lower charges if this happens.
 - v. Customers may be locked in for the long term and so caught with low accumulated funds and poor annuity rates. On the flip side, if the company knows that the customer will not move out over the long term, then it might be comfortable offering guarantees (eg on annuity rates) and better options at the pre-vesting stage

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6. Factors to be considered:

- Bonus would include reversionary, cash, one off and terminal bonus
- Level of bonuses will depend on the surplus arising over the year
- In a good year, it might be possible to award a higher level of discretionary benefit
- However the company might prefer to smooth the experience over time. So that in good years it will hold back some profits so that it doesn't have to reduce it during bad years
- How much surplus the company retains would also depend on the source of the surplus. If the surplus arising was due to a one off difference in the expectation and experience, then the company may not want to distribute it.
- Some profits will also be held back for distribution as terminal bonus
- Company's plan for growth. If the company is planning to grow faster, it might choose to distribute less and retain a higher proportion to finance new business
- However the level of surplus retained depends on
 - Policyholder expectations and
 - Existing regulation and internal targets for solvency ratio and free capital
- Policyholder's expectation is set based on

- Past bonuses declared
- Bonus rates on similar products
- Disclosures given in benefit illustrations, sales literature, etc
- What competitors are declaring
- The split of the surplus between the policyholder and the shareholder might be prescribed in the company's memorandum or regulation. Hence bonus declarations will also influence surplus transfer to shareholders. Hence it is necessary that any surplus transfer should be seen as fair and reasonable

(ii) Information supplied in conjunction with a bonus recommendation could cover:

- Give the details of the investigations performed for arriving at the appropriate level of discretionary benefits
- Any data issues faced; incompleteness or how the accuracy was ensured
- More than one suggestion could be made or a range of discretionary benefits could be presented. The suggestions should be presented in an unbiased manner.
- Impact of each of the alternate suggested for each of the stakeholders
- Impact on the competitive position in the market
- Brief details of tests that have been run to test the robustness of bonuses recommended under a range of economic scenarios
- You should also specify if there are any grouping or implicit decisions you have taken while arriving at the discretionary benefits
- Any background information necessary to understand the recommendation should also be covered in the report
- Any risks should be identified, like over distribution could have an impact on the security of the existing benefits
- Any conflict of interest in the multiple roles you are playing
- It is important to highlight that the recommendations are using the given set of assumptions/ economic scenario and the same might not be valid if circumstances change
- Any regulatory constraints or compliance should be mentioned in the report
- Any thing prescribed under the professional guidance or legislation (i.e. any penal action from expected from regulators)

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7.

(i)

- To provide a new instrument to investors that offers hedging against inflation risk.
- Investors may have index linked liabilities that need to be matched
- Regulations may imply that low risk real assets are needed to help with solvency provisions leading to demand for IL bonds
- To collect money for developmental purposes and to meet the budgetary deficit.
- To enhance the credibility of anti-inflationary policies. Government would like to bring such type of an instrument only when it is sure of containing the inflation and expects that the cost to the Government would be less than the instrument with no inflation protection.
- To provide an estimate of inflation expectations.
- Create an additional avenue for fund deployment- to offer a range of different types of securities so as to attract a range of different investors and thus be able to issue at the lowest possible cost
- To facilitate widening of Government securities market with instruments attracting diverse class of investors and to provide depth and liquidity in the market

(ii) In principle,

- the index linked bonds should be linked to any available index for prices such as Retail Price Index (RPI) which captures the impact of inflation on investors' budget more closely.

An index should-

- It should fulfill the hedging requirements of both the issuer and the investor.
- It should closely track inflation
- It should be a widely accepted indicator of inflation
- It should be available to the public
- It should have high periodicity or frequency of release
- It should be available for all commodities and for major groups, sub-groups and individual commodities. It will be still better if it covers non-commodity producing sectors like services.

- It should broadly capture the interplay of effective demand and supply forces in the economy at frequent intervals. This will be facilitated if the price indices have a high periodicity of release.
- (iii) Technically all payments in the index bonds need to be perfectly linked to inflation on contemporaneous basis. However the time lags between the actual movements in the price index & actual payment in bonds exists which distorts the inflation proofing properties of index bonds.

Time lag between the two could be on account of two reasons:

- Lag could be on account of some delay with which the inflation figures are published
- It could arise due to institutional arrangements for trading and settlement of bonds between coupon payment dates. The buyer of the bond in addition to the clean price also needs to compensate the seller for the coupon accrued till date. As the accrued coupon is computed on a pro-rata share of the next coupon payment, it becomes essential that the next coupon payment rate is known with certainty. For this purpose, the bond issuing authority needs to announce the next coupon rate on/before the existing coupon payment date. Thus for a bond offering semi-annual coupon payments the indexation lag on account of institutional factor would be at least six months.

(iv)

Traders

- Traders take market positions in expectation of earning profits. Their time horizon is therefore short.
- Traders cannot be expected to buy and hold long dated IL bonds but if markets were liquid and volatile with high turnover they could deal in them

Banks

- Banks do not normally have long term liabilities and would prefer short term bonds to long term bonds.

However, long dated IL bonds could be attractive to banks as-

- Banks may trade in IL bonds or they could use them as the basis for derivative products etc.
- IL bonds could also help banks with regulatory capital due to low volatility or
- IL bonds may also encourage IL saving products to be issued by banks.

- Also as short term interest rates may rise with inflation, IL bonds could be a useful asset to cover money market deposits etc held by their customers

Life Insurance Company

- For an insurance company, liabilities are long term- eg., expenses which are linked to inflation..
- A regular supply of these bonds in future, would allow life companies to offer inflation linked products like index linked annuities, index linked unit fund etc.
- Index linked bonds may also be suitable for pension products during the accumulation phase or for participating products where customers could expect returns in line with inflation. Index linked bonds will provide an additional source of real returns with higher security compared to equity or property. They also provide diversity to other real assets and could also outperform other real assets in certain cases.
- If a company has limited free assets or shareholders have limited risk appetite, index linked bonds would be preferable compared to other riskier real assets

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8.

- Size, market share, solvency position, regulatory compliance record, reputation and brand awareness of the insurance company [1 1/2, if at least 4 points are mentioned]
- What has been the performance of the insurer vis-à-vis market over the last few years,
 - how does its product portfolio compare with competition,
 - future product strategy and prospective demand for the products
 - how does its service standards fare against competition ,
 - fund /investment performance/bonus performance/return to customers and comparison with competition,
- What is the likely level of competition that bank is likely to face from other intermediaries eg. Brokers, independent financial advisors who are also likely to target HNI customers.
- It is a tied agency focused insurer. Does it have the ability to service a MNC bank with HNI customers, in terms of products, fund offerings, service requirements, system requirements (a faster Turnaround time for policy issuance for instance, faster response on complaints) [1 ½, ½ if specific examples are given]

- How does its current client base compare with that of the insurer- is the client segment of insurer more mass market will insurer then have to create a more specialized vertical to service bank customers- for eg. English speaking call centre manned by financial experts
- Review the premium targets agreed to-
 - How have the premium targets been arrived at. Do they appear reasonable and achievable based on country growth and industry prospects
 - business mix, volume assumed in arriving at the premiums targets
 - likely future impact of competitors on the market share of the company
 - what are the growth prospects of the insurance company , is it likely to expand its agency channel
- What is the basis of the 20% upfront payment –
 - Is it not fair to assume that experience for the products sold through the bank will have better mortality experience, , better persistency, higher average ticket size which will lead to higher profits; and
 - Is it fair to assume that insurance company will also experience lower costs when using this new sales channel? And does bank have similar arrangements or know of them?
 - The life company is also going to make savings from increased sales volumes and hence lower per policy costs.
 - Does the 20% share reflect a fair share in profits. how does the latest profitability reports published by company (profitability on writing new business etc.) look like.
 - How does payout compare with other such deals in the market
 - How has the risk discount rate been arrived at in determining Present value- how does it compare with Bank's own internal IRR targets and company Risk discount rate used in any published embedded value report,
- Claw back
 - Will it be in cash or reduction in future commission payouts – bank could face liquidity issues at the end of 10th year if lump sum has to paid
 - Is there scope to review the agreement in case of changes in external environment impacting sales (e g. Regulatory changes prohibiting sale of certain products)
 - What if the low sales are fault of the insurer e.g. product not developed or marketed properly
- Estimate of expenses that bank will incur in setting a new insurance sales vertical.-

- bank now needs to have a bank sales team in place. It will need to assess if suitable staff is available internally or if it needs to recruit them and what will be the cost of transferring people internally/recruiting people from outside.
- It will also need to incur IT costs, training costs, overheads etc.
- Estimate the total return to bank from this deal –how does it compare with its internal return targets –check return under several scenarios if required
- How soon can the agreement be executed- does the insurance company need time to put in place systems and process, is it reasonable time frame
- How much tax the bank will have to pay on the lump sum amount. Is it a better proposal as compared to a smoother, gradual release of profits
- – An up front payment means bank can keep it and delay dealing with claw back but it could also be that more regular payments could give bank some up side potential
- Lump sum payment will also have a positive impact on bank’s solvency and available capital. The lump sum payment may be preferable to gradual payment in spite of tax implications
- Is a bank allowed to work as a distribution partner for more than 1 insurer. If so, does it make business sense to tie up with only one insurer for 10 year
- What are the regulatory issues that need to be considered

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9.

(i) The affected parties due to the levy charged on DB schemes would be:

- Scheme Sponsors – who will have to pay the levy
- Employers – who’s performance will be affected due to this additional levy
- Trustees – who’s funding and investment decision would be affected
- Scheme beneficiaries (members / dependents) – who will want the levy to be as high as required to secure their benefits
- Tax payers who would be worried if the fund is not able to meet the liabilities taken over.
- Regulator – want to ensure that appropriate levy is charged (not too high and not too low); so the fund doesn’t need any extra support

(ii) Conflict could arise if the actuary has one or more of the below roles besides being the advisor to the "Insolvency Pension Fund":

- Consultant to a defined benefit scheme
- Member of a DB scheme
- Employee of a company which runs a DB scheme
- Shareholder of a company which runs a DB scheme
- As a tax payer
- Trustee of a scheme

(iii) To manage the above:

- (a) It will be very difficult for the fund to find an actuary who has none of the above conflicts
- (b) The fund might have to look for an overseas actuary
- (c) Or an actuary with least of the above conflicts
- (d) The actuary should leave the other assignment if this job is big enough
- (e) Or can become a full time employee of the "Insolvency Pension Fund"
- (f) All the potential conflict must be disclosed to all the relevant parties
- (g) Controls and checks should be put in place to for strict confidentiality

(iv)

When a scheme goes insolvent, than its assets and liabilities would be taken over by the Insolvency Fund. Any levy determined should allow for-

- Probability of default by a scheme
- Level of funding/support that a pension scheme will require post default (excess of liabilities over assets)
- Costs of running the insolvency Fund

By this reasoning any fund which has a consistently poor record of scheme surplus, weak sponsors is likely to go insolvent compared to others and hence must pay a suitably high levy.

However, charging them a higher levy is likely to make them default faster than others as well.

Hence a certain degree of cross-subsidy from well funded to poorly fund schemes is unavoidable.

However, it should not be so high as to create unhappiness among well managed funds. The levy shouldn't encourage moral hazard whereby schemes are deliberately mismanaged because of the knowledge that the IPF will come to the rescue.

(v)

Basic investment principle would be to

- (a) Invest to match by nature/ term and currency of the liabilities and

(b) To maximise returns subject to an acceptable level of risk

- Need an assessment of the nature, term and currency of the liability to decide the suitable assets .
- The funds obligations could largely be real in nature and linked to wage inflation except for fixed pensions in payment
- Benefits for pensions in payment are likely to be fixed or with an RPI link, i.e not all real liabilities would be wage linked
- Investment strategy should also consider term of the liabilities both real/RPI linked and fixed and the currency of the outgo as well
- Ideally for all liabilities linked to wages (deferred pension), investments should be in real assets – property, equity or inflation linked bonds
- IL bonds/ fixed interest securities may be required to back any pensions in payment.
- The levy will imply uneven inflows and hence there may be issues with shortfalls and buying large tranches of assets at any point of time. Large investment purchases would impact market prices of assets/move markets . This is also true when new scheme enters. Hence this needs to be considered when finalizing an investment strategy.
- When its takes over an insolvent pension fund (both assets and liabilities) there is a risk that the asset and liability cash flows are mis matched.
- In such a case the Insolvency fund should look at the liability profile and create a matching portfolio with fixed/real assets.
- The robustness of this matching portfolio should be assessed by sensitivity analysis or stochastic modelling.
- The cost of converting from the actual asset to the desired asset portfolio will have to be considered.
- At any time, due to uncertainties on withdrawals there could be uncertainty in the cash flow estimates. Hence the fund should maintain investments in short term liquids assets as well.
- The Insolvency fund could look at option of purchasing annuities for pensions in payment or deferred annuities for early leavers.
- The Fund needs to look any investment restriction that the fund has to follow?
- Can purchase insurance where ever available and is cheaper than holding the reserve in own books - for death in service benefits, ill- health retirement etc.
- While constructing a matching portfolio, fund needs to consider equity between members, because those who would gain from positive additional returns are different from those who would lose if the returns are negative.
- Need to constantly review and monitor the investments
- Tax impact will have to be factored in.

[23]
