

Institute of Actuaries of India

Subject CA1 – Paper II Core Applications Concepts

November 2008 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.

Q.1

(i)

About the analysis

- ? We will need the complete analysis to conclude
- ? The results shown are for one age term combination (male aged 40 for 100,000 for 10 yrs term). The conclusion might not be true for all age terms
- ? Credibility of the analysis; usually the level of information available to these analyst might be limited
- ? May be they are comparing different products of the various companies. E.g.
 - ✍ Group Vs individuals
 - ✍ Smokers Vs non smokers
 - ✍ Underwritten product Vs non-underwritten
 - ✍ Different geographic regions or social segments

Loosing market share over last one year

- ? Was price the only reason for loosing market share over the last one year? We need to take a closer look at our business with events in the market, which could have been the reason for the loss.
 - ✍ Did we have any problems with our distributors during this period?
 - ✍ Did we launch any other product, which was more popular among policyholders or distributors?
 - ✍ New market player entering with heavy marketing push

Others

- ? Lower rates will impact the profitability of the product
- ? What is our profitability margin in the pricing, can we afford to go lower?
- ? Are we looking at this product as loss leader?
- ? Which market segment do we want to be profitable? We can lower rates only in those segments.
- ? We should try other ways to regain the market share

(ii)

Slashing premium rates by 30% across will impact:

- ? Marketability and competition – lower rates will definitely make our product more marketable and competitive.
- ? Analyze if we are loosing business due premium rates only
- ? It could be due to change in distributor or new market player entering with aggressive marketing strategy or some bad publicity (due to some claim refusal, etc)
- ? Need to decide if we really want to be the lowest by the premium rates
- ? Can we try alternate methods to gain market share instead of reducing the premium rates. E.g. by offering attractive product features such as rider benefits
- ? Profitability – Even after reducing the rates the premiums should be enough to cover the benefits, expenses and our expected profits
- ? Solvency of the company – by lowering the premiums too much, will it endanger the solvency of the company. Then we will not be able to honour the commitments made to the policy holder
- ? Capital requirement – lower premiums will increase the NB strain and hence the need for more capital
- ? There is a risk of writing too much business on unprofitable basis
- ? After such a reduction in premiums, the existing customers might feel unfair

- ? It could lead to lots of lapsation in your existing portfolio which will impact the profitability of our existing business
- ? Some could take the new product but others might not, this will impact the overall business
- ? Discontinuities – if we reduce rates only for certain age term segments and not for others, discontinuities will arise. This can make it difficult to market the product to those segments.
- ? It will lead to unfairness between
 - ⌘ Different segments of customers (by gender, smoker status, etc)
 - ⌘ New & existing customer
 Could result in complaints, bad publicity and in loss of business
- ? Sales force will find it difficult to explain the pricing anomalies to existing and new customers
- ? Such arbitrary price reduction may be difficult to justify to the regulators
- ? Administration systems will need to take care of the change in premium rates

(iii)

Other ways to increase market share:

- ? Product innovation – by adding features like
 - ⌘ Conversion
 - ⌘ Extension of cover
 - ⌘ Rider benefits
- ? Change or add new distributors
- ? Alter the distributors incentives to make it more attractive for him to sell this product compared to your other products (this will impact the market share in other products)
- ? Innovative marketing campaign

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Q2.

- (i) The reasons why life insurance companies need capital are to:
- ? fund the new business strain: which arises from the initial premium being insufficient to meet initial expenses and the reserves that must be set up
 - ? manage the cashflow timing mismatch that occurs. Benefit and expenses may need to be paid before sufficient premiums have accumulated
 - ? Offers options and guarantees: solvency margins requirements are more onerous
 - ? demonstrate financial strength to individuals, intermediaries and credit rating agencies, which help to attract new business
 - ? enable more investment freedom (in the pursuit of higher expected returns)
 - ? achieve strategic aims e.g.
 - o developing new products
 - o developing a new sales channel
 - o mergers & acquisitions
 - o capital projects to increase efficiency e.g. new IT systems
 - ? meet exceptional expenses, any legal fees
 - ? smooth reported profits and/ or bonuses
 - ? payout more than asset share on maturity on with profit policies
 - ? demonstrate and/ or improve solvency to the regulator
 - ? cover risks, such as
 - ⌘ policy guaranteed biting more than expected e.g. guaranteed annuity options, guaranteed maturity values
 - ⌘ persistency and expense risks including the effects of inflation

- ✍ poor investment returns
- ✍ operational risks e.g. fraud
- ✍ mortality risks, especially increasing longevity

(ii)

Regulatory capital is required to demonstrate solvency under the regulatory regime applying to a provider, i.e. to protect against the risk of statutory insolvency
Economic capital is the amount of capital that a provider determines it should hold given its assets, its liabilities and its business objectives.

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Q3.

(i) Written document is important:

- ? to avoid ambiguity associated with verbal agreements.
- ? responsibilities can be well defined
- ? timelines and deliverables can be clearly specified
- ? there is a clarity on the objective of the project to all the concerned
- ? can be easily distributed to several parties, even those who have not attended all the meetings
- ? it is good corporate practice
- ? it serves as a basis for future projects

(ii) the written strategy should contain:

- ? a clear statement of the **objectives of the project**
- ? **statements on how these objectives will be met** – comprehensive statements of the required functionality, data storage & flexibility requirements
- ? **acceptable quality standards for meeting the objectives**– how will achievement of the objectives be assessed?
- ? **The project sponsor's role** – what information & resources they will supply?
- ? **The role of any third parties**, e.g. consultants employed, external IT providers
- ? **The financial & economic objectives** – how will this project benefit the merged companies and how will success be measured?
- ? Details of the **expected cost of the project** – the range of costs
- ? **financing policy** – how will the costs be split between the insurance company & the bank?
- ? **The policy for dealing with legal issues** – e.g. data protection regulation
- ? **A structured breakdown of the work** to be completed under the project
- ? The **key milestones for reviewing** the project
- ? The **risk management policy**
- ? The **communication policy** – by what means & how frequently will people communicate, e.g. development staff, users, project management team, senior management
- ? **List of stakeholders** involved in the project
- ? The **information technology policy**

[10]

Q4.

A good asset liability model has the following features:

- ? The model being used must be valid, rigorous enough for its purpose
- ? It should be adequately documented
- ? The model chosen should be capable of adequately reflecting the risk profile of both the:
 - ✍ Assets, i.e. the risk of default & the volatility of returns, and
 - ✍ Liabilities, i.e. taking into account the risks of each product sold

- ? The parameters used must allow for all those features of the assets & liabilities being modeled that could significantly affect the resulting investment strategy
- ? The inputs to the parameter values should be appropriate to the assets and liabilities being modeled and take into account any special features of the provider and the economic & business environment in which it is operating
- ? The behavior of assets within the model should be consistent with generally accepted economic principles
- ? In particular, the generated results should be arbitrage free
- ? The workings of the basic model should be easy to appreciate and communicate and the results should be displayed clearly
- ? The model should exhibit sensible joint behavior of model variables. e.g. assumed rate of investment return should be consistent with the assumed rate of inflation
- ? The outputs from the model should be capable of independent verification for reasonableness & should be communicable
- ? The model however should not be overly complex while retaining the most important features of the problem
- ? The model should be capable of development & refinement for any future changes
- ? A range of methods of implementation should be available to facilitate testing, parameterization & focus of results, so providing increased flexibility to the modeler

[7]

Q5.

(i) Three types of excess of loss reinsurance are:

Risk XL – This type of excess of loss reinsurance relates to individual losses. It affects only one insured risk at any one time. This is to protect against large individual claims on individual risks (like large liability claim on an individual motor policy)

Aggregate XL – This is an extension of the risk XL, it covers the aggregate losses above the excess point and subject to an upper limit, sustained from a defined peril(s) over a defined period, usually one year. Aggregation of claims might be by event (eg motorway pile up), by peril (eg subsidence) or by class of business (eg all motor policies)

Catastrophe XL – the aim of catastrophe reinsurance is to reduce the potential loss, to the ceding company, due to any non-independence of the risks insured. The reinsurance company will agree to pay out if a “catastrophe” as defined in the reinsurance contract occurs.

(ii)

Claim	Claim amount	Treaty A	Treaty B	Treaty C	Total
(a)	700,000	200,000	200,000	-	400,000
(b)	380,000	80,000	-	-	80,000
(c)	900,000	200,000	300,000	100,000	600,000
(d)	2000,000	200,000	300,000	1200,000	1700,000
(e)	3080,000	200,000	300,000	2000,000	2500,000
(f)	150,000	-	-	-	-

[9]

Q6.

(i)

Advantages of a stochastic model in product designing:

- ? A large number of simulations can be run to identify which eventualities are and are not profitable for the product being designed
- ? Due to its random nature, identify a potentially poor scenario for the product that would not have been thought of under a deterministic model
- ? Takes account of the co-variability of the model parameters
- ? The output would be in the form of a distribution of values from which statistics such as the mean and the variance of the output can be calculated
- ? Such information is useful in understanding the risks inherent in the product design

Disadvantages of a stochastic model in product designing:

- ? Run times can be long
- ? The output may be difficult to interpret
- ? May be difficult to communicate
- ? The model output is only as good as the input & the results depend on the choice of probability distribution & its parameters for the stochastically modeled variables
- ? Whilst a stochastic model is a useful tool for making sure that all eventualities have been tested, there is no substitute for experience
- ? In practice, it will be impossible to design a product that remains profitable under all eventualities, as the cost would be prohibitively high making the product unmarketable

(ii) Steps involved in a deterministic model:

- ? Specify the purpose of the investigation
- ? Collect, group and modify data
- ? Choose the form of model, identify its parameters and variables
- ? Ascribe values to the parameters using past experience and appropriate estimation techniques
- ? Construct a model based on the expected cash flows
- ? Check that the goodness of fit is acceptable. This can be done by running a past year and comparing the model with the actual results
- ? Attempt to fit a different model if the choice does not fit well
- ? Run the model using selected values of the variables
- ? Run the model using estimates of the values of variables in the future
- ? Run the model several times to assess the sensitivity of the results to different parameter values
- ? Also could run under different scenarios to test the robustness of the results to many parameters changing at the same time

[10]

Q7.

(i) Information required

XYZ will be mainly concerned with assessing the likely cashflows to shareholders for example, sales, expenses, investment income/ gains, tax.

ABC's accounts (current & previous years) are required – these will provide information necessary for the calculation of:

- ? future profits available to shareholders, net of tax
- ? the current value of all surplus assets
- ? the cost & timing of loan or redemption payments

the information available will depend on whether the ABC is listed or unlisted information will also be required on ABC's personnel, for example:

- ? the level of salaries compared to those of rival firms
- ? the benefits offered in the pension scheme compared to those of rival firms
- ? the funding level of the pension scheme
- ? any other benefits offered compared to those of rival firms
- ? acceptable redundancy terms
- ? ease of recruitment of extra staff
- ? as assessment of whether there have been any industrial relations problems in the past

other information:

- ? current share price of ABC, since this will form a floor for the deal
- ? the form of deal that is most likely to be acceptable (cash, equity or other securities)
- ? the reaction of the market if the bid is being anticipated i.e. favourable or not?
- ? Whether there are likely to be any other bidders
- ? Who the other shareholders are and their likely reaction to the bid

(ii) Valuation of the target company & associated difficulties:

In order to value ABC, XYZ will need a cashflow model

the key components to be calculated in valuing a company are:

- ? the present value of future profits available to shareholders, net of tax
- ? the current value of all surplus assets (including goodwill), less
- ? the value of loan or redemption payments

If XYZ believes that the acquisition will result in expense savings, then these should be reflected in the expense assumptions used in the model

Theoretically this valuation will form the upper limit on what XYZ is prepared to pay XYZ will want to model a range of scenarios:

- ? running ABC as a going concern
- ? selling ABC at various dates in the futures
- ? selling off parts of ABC's business and running others

the valuation looks at assessing: $\text{Net gain} = \text{gain on merger} - \text{cost of merger}$

a lower limit on the bid is provided (usually) by the current share price

the bid price will also be influenced by whether there are other bidders and how much they will be prepared to pay

one of the problems XYZ will encounter relates to a lack of information

in particular, this will be the case if ABC is unlisted. Even if ABC is listed there can be important information that is not in the domain.

Lack of information will lead to difficulties in assessing the

- ? value to place on surplus assets
- ? level of additional investment required to support the business
- ? value to be placed on goodwill
- ? terms & value of existing contractual arrangements with customers & suppliers
- ? extent of any employee- relation problems
- ? extent of financial obligations, minority issues and tax implications

In addition, XYZ may have difficulty in assessing areas of ABC's operation with which it is not familiar

Or in assessing the value of multiple activities undertaken by ABC Ltd.

Q8.

The degree of accuracy is determined by the

- ? financial significance of the assumption concerned
- ? purpose for which the assumptions are required

Mostly the overall accuracy of the basis is crucial than the accuracy of the individual parameters because the relationship between the variables are more important than the absolute value of each of the variables.

In certain circumstances, a actual payment or outflow is involved & once the outflow happens it is not possible to adjust it in the light of future experience. In such situations the accuracy of the assumptions is important.

It is important that the actuary uses the best estimate of the future experience for such situations.

[5]

Q 9.

The benefit illustrations should

- ? show the likely level of pension benefits that could be provided
- ? show the likely level of fund at retirement
- ? show the return the individual is likely to obtain on contributions
- ? show the effect of charges on the likely return
- ? take account of individual circumstances, for example
 - ✍ age
 - ✍ gender
 - ✍ level of contributions
 - ✍ expected retirement age

The projections must show the levels of benefits under a range of events. For example

- ✍ different rate of accumulation (interest rates)
- ✍ if the contributions are discontinued but the pension commences from the original normal retirement date
- ✍ surrender value (if allowed) at each point in time, under the different rates of accumulations

The projections should aim to:

- ? be simple to understand
- ? be transparent (i.e. all key assumptions are stated)
- ? enable comparisons to be made by the member between providers
- ? not be misleading

[8]

Q10.

(i) Advantages of risk management are:

- ? avoid surprises
- ? improve the stability & quality of their business
- ? improve their growth & returns by exploiting risk opportunities
- ? improve their growth & returns through better management & allocation of capital
- ? identify opportunities arising from natural synergies
- ? give stakeholders in their business confidence that the business is well managed

(ii) Good management control systems can reduce a provider's exposure to risk. These systems include:

- ? data recording
 - ✍ company holds good quality data on the risks it insures
 - ✍ Though this does not reduce or eliminate the risk, it helps make adequate provisioning & reduce operational risks of having poor data
- ? Accounting & auditing
 - ✍ Good accounting & audit procedures enable proper provisions to be established & give confidence to the providers of the capital to its financial position
- ? Monitoring of liabilities taken on
 - ✍ To protect against aggregation of risks
 - ✍ At the time of NB to make sure the risks are within the provider's capacity to accept (resources)
 - ✍ Ensure the business mix is as expected, where there is cross subsidy in the premium rating from one class to another
 - ✍ If any of these change the profitability of the contract may be at risk.
- ? Options & guarantees
 - ✍ Monitor as options & guarantees could become valuable if market & other conditions change

[9]

(Total Marks 100)

*****END*****