

Institute of Actuaries of India

Subject CA3 – Communications

May 2009 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

Solution 1

Memorandum

To: [Manager Name]

From: [Actuary]

Date: 1 May 2009

Subject: Comparison of Products A and B

Introduction

This memorandum covers several aspects of the two product proposals being considered by the Product Development Group. In particular it focuses on:

- Comparing and contrasting the two designs;
- Comparing and contrasting the charging structure of the two products;
- Allocation charge;
- Administration charge;
- Death benefit and mortality charge; and,
- Maturity guarantee.

Design

Products A and B are both examples of regular premium unit-linked insurance plans which incorporate insurance benefits along with savings elements through investment in unit-linked funds. Unit-linked products pass the investment risk to the policyholder, although there are some products which explicitly provide a form of investment guarantee.

Product A offers higher death benefit through two elements:

- Sum assured being ten times the annual premium compared to five times for Product B; and,
- Death benefit being the aggregate of the fund value and the sum assured compared to Product A where it is the higher of the fund value and the sum assured.

Product B offers an investment guarantee at maturity equal to the total premiums paid.

Product A has a protection slant by offering higher death benefit whereas Product B has a wealth accumulation and wealth protection slant by offering lower death benefit and an investment guarantee at maturity.

Charging structure

Both products have the same types of charges although their quantum and incidence varies:

- Premium allocation charge
- Administration charge
- Mortality charge
- Fund management charge
- Surrender charge

Product A has lower premium allocation charge and these are restricted to three years compared to ten years for Product B. Product A also has lower administration and fund management charges.

Table 5 and 6 illustrate the impact of lower charges for Product A with the customer IRR being higher under both the 6% and 10% scenarios.

Allocation charge

Allocation charge is deducted from the premium before it gets invested in the unit-linked funds. Subsequently, a higher return achieved on the fund implies a greater opportunity cost as the premium deducted for the allocation charge does not participate in those gains. This explains the increased reduction in customer IRR when the hypothetical interest rates increases from 0% to 10%.

Product A has an allocation charge, expressed as a percentage of premium, totaling 60% spread over the first three years compared to 65% spread over ten years for Product B. By spreading the charge over a longer duration and lowering the charge in the initial years Product B achieves a lower reduction in yield under the 10% scenario.

Administration charge

This charge is expressed in monetary amounts, increasing at a fixed rate of 5% every year. Thus, when the returns on the fund are higher the administration charge is a smaller percentage of the fund and therefore its impact in reducing customer IRR is lower.

Death Benefit and Mortality charge

Mortality charge is deducted from the fund value to cover for the cost of providing insurance. It is arrived at by multiplying the sum at risk, defined as the death benefit less the fund value, with an annual rate. The death benefit for Product A is the aggregate of the fund value and the sum assured and therefore the sum at risk is constant and equal to the sum assured. There is no need to assume an interest rate on the fund to arrive at the mortality charge for Product A.

Product B on the other hand has a sum at risk dependent on the fund value and therefore differs for the three hypothetical rates of interest.

Maturity guarantee

Product B offers a maturity guarantee equal to the aggregate premiums paid over the policy term. In the example given in Table 6, the maturity guarantee is 250,000. The fund value at 0% interest rate is 203,708 and therefore the guarantee comes into play. In this instance the deficit of 46,292 is funded by the Company which ensures that the customer IRR will not go below 0% irrespective of the fund returns. A negative reduction in yield indicates the positive contribution of the guarantee to customer returns.

Product A does not offer maturity guarantee and therefore illustrates a negative customer IRR at 0% scenario.

Summary

Product A has a protection slant with lower charges whereas Product B has a wealth accumulation and wealth protection focus. The incidence of charges has bearing on the customer returns. Guarantees such as on maturity provide downside protection in certain scenarios.

Marking guide

Marks are split as follows –

Meeting objectives	Upto 12 marks
Presentation	Upto 24 marks
Contents	Upto 24 marks

Meeting objectives

Has the script met the overall objective of:

- Explaining the design of the two products?
- Contrasting the charging structure of the two products?
- Explaining the impact of death benefit on mortality charge?
- Explaining the impact of maturity guarantee on customer IRR?

Will the reader:

- Understand the explanations?
- Be satisfied with the answer?

Presentation

- Clear statement of purpose
- Logical structure
- Appropriate language used
- Suitable sentence length
- Ideas grouped appropriately in paragraphs
- Suitable ending
- Correct grammar
- Correct spelling and punctuation

Contents

- Design, including comments on overall product focus
- Charges, including their impact
- Impact of allocation charge incidence on customer IRR
- Administration charge
- Death benefit
- Mortality charge
- Maturity guarantee and explanation of negative reduction in yield

Penalties

Cut marks for

- Very poor grammar, spelling or punctuation
- Requests for more information
- Speculative statements
- Excessive waffle

[60]

Solution 2

Dear Ram,

Economic capital

I explain below the concept of economic capital and the various challenges in calculating it for a life insurance company.

What is economic capital?

Economic capital is the amount of assets that a company needs to hold above the market-consistent value of its liabilities today to be able to be sure that in the future (typically a year's time) the market value of its assets continue to exceed the market-consistent value of its liabilities.

A one year timeframe is chosen as it is assumed that the policies of the insurer can be sold onto another company in a year's time if required. Furthermore given the nature of events we can never be totally certain that assets will exceed liabilities in the future so the calculation is done assuming a certain probability level. For example, a company may choose to be 99.5% certain of assets exceeding the liabilities in a year's time. The probability level chosen is often linked to the credit rating that the company desires with different ratings having different probabilities of solvency associated with them.

We go onto discuss the key challenges in the economic capital calculation which include the calculation of the market-consistent value of liabilities and the choice of stress tests.

Market-consistent value of liabilities

Unlike assets insurance liabilities are not traded instruments having readily observable market prices. Therefore to arrive at the market value of liabilities extensive modelling needs to be carried out capturing the random nature of economic parameters such as equity market prices and interest rates which involves the production of many economic simulations.

The model producing the simulations needs to be tested for its consistency with market prices and this is done by using the model to price financial instruments such as derivatives and seeing how close the model's answer is to the market price. In less developed countries this is a particular issue as such derivative instruments are often not available.

Also it is important to ensure that economic assumptions and non-economic assumptions are linked especially in the case of guarantees and options. Suppose the policyholder has a unit-linked policy offering financial guarantees on maturity of the policy and the equity markets drop sharply. Then the policyholder's unit account may be well below the level of the guarantee and we would expect that less policyholders would surrender their policies in anticipation of picking up the guaranteed amount at maturity. Failure to reduce the surrender rates in this adverse scenario would lead to an understatement of the liabilities

Choice of stress tests

The ultimate aim of economic capital is to ensure the company is still solvent under adverse conditions. Therefore the company's balance sheet needs to be subjected to various stresses including economic stresses (e.g. fall in equity markets, decline in interest rates) and also non-economic stresses (e.g. sharp rise in mortality due to an epidemic, sudden increase in policyholders surrendering policies).

The level of the stress test chosen (e.g. 40% fall in equity markets versus 60% fall) has a large bearing on the economic capital calculation. These therefore have to be carefully chosen based on the desired level of confidence.

I trust the above satisfactorily explains the concepts and challenges behind economic capital.

Regards/Madhu

Marking guide

Marks are split as follows –

Meeting objectives	Upto 8 marks
Presentation	Upto 16 marks
Contents	Upto 16 marks

Meeting objectives

Has the script met the overall objective of:

- Explaining the concept of economic capital?
- Explaining how market-consistent value of liabilities are computed?
- Explaining the role of stress tests?

Will the reader:

- Understand the explanations?
- Be satisfied with the answer?

Presentation

- Clear statement of purpose
- Logical structure
- Appropriate language used
- Suitable sentence length
- Ideas grouped appropriately in paragraphs
- Suitable ending
- Correct grammar
- Correct spelling and punctuation

Contents

- Definition of economic capital
- Explanation of confidence level
- One year timeframe
- Process of valuing liabilities
- Market consistency of scenario generator
- Linkages between assumptions for guarantees
- Variety of stress tests
- Calibration of stress tests

Penalties

Cut marks for

- Very poor grammar, spelling or punctuation
- Requests for more information
- Speculative statements
- Excessive waffle

[40]

[Total 100 Marks]
