

Institute of Actuaries of India

Subject SA5 – Finance

May 2015 Examinations

INDICATIVE SOLUTIONS

INTRODUCTION:

The indicative solutions provided are very detailed in nature for the benefit of students and the examiners are not expecting the students to provide such in-depth details under examination conditions. However the students are expected to cover all the fundamental principles to demonstrate their understanding of the subject.

Solution 1 : (i)**ALM:**

1. To ensure that the assets and liabilities are managed consistent with the investment policy of the Company
2. Examine the durations of assets and liabilities and likely mismatch in the duration and suggest methods to minimize the duration mismatch.
3. Assess the likely cash flow mismatches and ensure that the company's likely liquidity position is adequate to meet all the expected claims
4. Advise the management on the management of assets & liabilities such as the likely product portfolios the Company may need to have given the ALM mismatches and if required, advise the management to set up mismatch reserves
5. Advise the company to revisit the investment policy, if necessary, to minimize the mismatch risk

WP:

1. The Committee is headed by an Independent director and has an independent actuary as member to ensure the objectivity of the Committee.
2. The independent actuary is also expected to provide objective advice as she/he is not involved in the company's day to day actuarial work.
3. The participating policyholders are entitled for 90% of the profits. The key role of WP committee is to ensure that the PREs of the policyholders are always met.
4. WP may review the illustrations given at the time of selling the participating products and ensure that the PREs provided in the illustrations are diligently followed.
5. The Committee would be required to examine the asset shares of the entire portfolio and ensure that the liabilities are set up adequately in line with the asset shares
6. The WP would need to recommend the bonuses to be declared taking into consideration the asset shares and the PREs
7. The WP may also examine the allocation of the operating expenses to the participating segment to ensure that the company does not allocate disproportionate level of expenses to the participating segment

8. The WP may review the quality of assets backing the portfolio of these liabilities
9. The WP to ensure that the assets are appropriately segregated [12]

(ii)

- The investment risk is carried by the company as the returns to policyholders have a minimum underlying guarantees both in participating and non-participating segments.
- However the risk maybe lower in case of participating segments since the company has the ability to adjust the bonuses upwards/downwards based on the asset shares
- The equities are marked to market and if there is a market loss, it would immediately impact the bottom line and consequently solvency
- The Company's current solvency ratio is at 200% and the free assets are about Rs.1000 Cr. At 5-10% of the non-linked assets amounts to about Rs.400-800Cr.
- Equity markets are known to be highly volatile and there have been instances when the markets have fallen by about 30-40% in a year. In such scenario, the loss may amount to Rs.150-300Cr which would put a significant strain on the solvency and the shareholders may need to bring in capital to maintain solvency levels at a comfortable level
- Various sensitivities over a 3-5 year horizon may need to be presented to assess the impact on investment income and the solvency
- Consider assets from Participating fund to be invested in equities given that bonuses are not guaranteed and can adjusted in line with the returns.
- However, the leeway for adjusting bonuses would be limited as the company would need to take into account the PREs
- After examining all the sensitivities, the CIO, in consultation with the AA and CFO may recommend an appropriate proportion of participating fund to be invested in equities.

[8]

(iii)

- The liabilities of life insurance companies are long term in nature.
- The policies written in a typical year would have high initial expenses in terms of commissions, the sales and setup costs etc., which would be recovered over the policy term. Therefore in the year in which a new policy is written, there may be losses due to

high initial expenses and the liabilities to be set up to take care of expected claim payouts.

- From renewal premiums on these policies, the surplus may arise which would start giving surplus.
- The insurance companies would assess the value of the in-force policies, i.e., the policies which are on books as on a particular date known as embedded value (EV).
- The company would also take into consideration the value of future sales that are likely to occur and assess the value accruing from these future sales.
- The cash flows of in-force and new business sales are projected and discounted to the present day at an appropriate risk discount rate
- The sum of the value in-force and future sales would be the total value of the company

Key factors:

1. For evaluating the in-force policies/new business sales the following factors would be taken into consideration:

Lapse rate

Investment rates

Mortality/death rates

Maintenance expenses

The solvency requirements

Cost of capital

2. Assessing the future New Business sales:

- a. General Economic environment
- b. Industry environment and growth potential
- c. Regulatory environment
- d. Distribution potential
- e. New business acquisition expenses including commissions and other distribution costs

- f. Future administrative expenses
- g. Competition
- h. Future products and likely profitability of these products
- i. Business mix between unit-linked and traditional products
- j. Solvency requirements
- k. Cost of capital

[15]

[35 Marks]

Solution 2 : (i)

A prescriptive regulatory framework is one which contains fixed rules which must be followed, with little or no consideration of whether or how the rules apply to a particular situation. In contrast, a principle-based regulatory framework contains limited or no fixed rules, but instead is based on guiding principles which the regulator must consider how or whether to apply in a given situation.

Advantages of a prescriptive approach:

- Clarity of expectation of the regulator so that the entity/person being regulated can easily understand and comply. Lesser scope for misunderstanding what the regulator requires. This implies better outcomes, a less confusing regulatory environment and easier compliance
- Uniformity in application. The lower scope for confusion enables the regulator to apply the same rules to different entities it regulates. Consequently, the decisions may be more objective and easier to defend and apply. Precedents could also be used more easily, thus enabling a better regulatory environment.
- Improvement in quality of regulation as the regulators can get familiarized with the processes and over time become experts at identifying the objective criteria they look for in each entity.

Disadvantages of a prescriptive approach:

- Limited scope for tailoring the regulatory approach for the specific situation of a regulated entity. The one-size-fits-all approach may have to be compromised, which would undermine the expectation of uniformity which was an advantage. Simpler entities

Page 5 of 16

that may require fewer regulations may still have to undergo lots of unnecessary procedures/examinations, and complex entity that require many more regulations may go under regulated

- “Sticking to the manual” There may be little scope for the regulator to consider whether further investigation may be required, if the regulator follows a set manual and does not have the freedom, time or discretion to deviate from the processes mentioned there.
- Reduction in quality of regulation as the set processes may reduce the role of judgments, which may result in regulators “going through the motions”
- New unforeseen events or risks may go unnoticed if regulators focus only on a limited list of to-check items.

Similarly, advantages and disadvantages of a principle based approach would mirror the disadvantages and advantages of a prescriptive approach respectively.

[7]

(ii)

- a) Risk assessment:** Risk assessment consists of an objective evaluation of risk in which assumptions and uncertainties are clearly considered and presented. Solvency II regulation requires companies to indulge into thorough risk assessment process which reflect the nature, scale and complexity of the business. There is emphasis on not only on existing risks but also on emerging risks which is either developing or their exact impact is unknown.

Risk identification is a key component of a robust risk management framework. As an initial step in this process company should ensure that they have a clear understanding of their risk universe. This can be defined as documenting the various types of risk the business may face.

An effective risk identification process would typically:

- identify the significant risks to the achievement of the business objectives;
- identify all types of risk, associated major components and controls currently in place, from all sources, across the entire scope of the managing agent’s activities;
- identify risks around opportunities as well as threats, to increase the managing agent’s chance of maximizing the benefit of those opportunities when they arise;
- focus on the root causes and influencing factors of risk, both internal and external, as well as its effects and outcomes: financial, reputational and other; and
- Look forward, as well as drawing on past experience, by including elements such as horizon scanning.

They should consider carefully the risk categories that they adopt and there should be clarity over how these map to Solvency II risk categories.

b) Capital computation:

Solvency II adopts a balance sheet focused approach, with the SCR consisting of a series of stresses against the key risks affecting all balance sheet components (assets, as well as insurance liabilities), together with a charge in respect of operational risk.

This comprises the economic balance sheet (EBS) against which the components are stressed to assess the SCR requirements. Importantly, Solvency II requires an assessment of the balance sheet's ability to withstand a 1-in-200-year event, so the EBS becomes the cornerstone of all Solvency II reporting. Capital (termed Own Funds under Solvency II) starts with the excess of assets over liabilities as determined by the EBS. Qualifying subordinated debt is then added to this and the combined amount is known as Basic Own Funds (BOF). The quantitative requirements under Pillar 1 can effectively be broken down into six components:

1. Valuation of assets and liabilities -Assets and liabilities need to be valued on market consistent basis.
2. Technical Provision: The calculation of technical provisions will be based on their current exit value. They will be established as best estimate liabilities plus a risk margin, With respect to non-hedgeable risks, the risk margin is calculated using the so-called cost-of-capital method.
3. SCR – Under Solvency II, the EEA insurers will have to calculate both assets and liabilities on a market-consistent basis, as well as MCR and SCR. The SCR is a more risk-sensitive and sophisticated approach to calculating solvency requirements, which will be more dynamic and is designed to project the economic balance sheet in one year's time following a 1-in-200-year loss event occurring. The SCR covers at least the major risks, insurance, market, credit, and operational risk, and will take full account of any risk mitigation techniques that can be demonstrated and would be applied in times of stress. The SCR may be calculated using a standard formula set out in the Directive or by using an internal model preapproved by the regulator for this purpose.
4. MCR – While the SCR remains the target capital requirement under normal market conditions, the MCR is also included. MCR is designed to be the lower solvency calculation, corresponding to a solvency level, below which policyholders and beneficiaries would be exposed to an unacceptable level of risk, if the insurer were allowed to continue its operations.
5. Own funds
6. Investments

c) Stress testing:

Companies should use stress and scenario tests as tools in their risk assessment process to determine the expected financial consequences of adverse circumstances and events arising. The overall approach should include stress tests, scenario analyses and reverse stress testing.

Stress tests are generally defined with reference to movements in key financial parameters (such as interest rates, asset values or liability values), whereas scenario tests may make reference to the cause of the adverse developments, such as material natural catastrophe or major industrial incident.

Stress tests should be tailored by the company to their risk profile. To this purpose companies should identify possible short and long term risks and possible events or future changes in

economic conditions that could have an unfavorable effect on their overall financial standing and determine their capital impact.

Scenario analyses should be based on a range of events, including extreme but plausible events, and take into account any material second order effects which may arise.

Reverse stress tests are those that require a company to assess scenarios and circumstances that would render its business model unviable, thereby identifying potential business vulnerabilities. Reverse stress testing starts from an outcome of business model unviability and identifies circumstances under which this might occur. This is different to general stress and scenario testing which tests for outcomes arising from particular events or changes in circumstances..

d) Regulatory reporting:

All firms will be required to prepare and submit quarterly returns to the regulator, annual returns to the regulator, a Solvency and Financial Condition Report (SFCR), which will be available to the general public, and the Own Risk and Solvency Assessment (ORSA) which will include a projection of the future solvency position.

In addition, there is reporting for Financial Stability purposes which every National Competent Authority (NCA) is required to collect on behalf of EIOPA. The NCA for the UK is the PRA.

There are different requirements for the reporting of individual entities and the reporting of Groups.

Brief about each report is below:

Financial Stability report:

The firms required to complete this are firms with technical provisions in excess of €12bn, and other firms which may be designated to ensure that the reporting by each NCA covers 50% of the local market. All other firms are exempt.

Quarterly & Annual Reporting to the NCA

Firms are also required to submit a Regular Supervisory Report. This will supplement the numerical information provided in the reporting templates and the information provided in the SFCR

Own Risk and Solvency Assessment (ORSA)

While this is what it says it is – the firm's own assessment of its risks and solvency - there are a number of requirements for firms to meet if the ORSA is to pass the NCA's inspection.

e) Market disclosures

The scope of the third pillar of Solvency II is to enhance disclosure requirements in order to increase market transparency. Insurers have to give information to their regulator and the market in the form of private and public reports for effective, risk-based and proportionate supervision.

The two key Pillar 3 reporting requirements, the Solvency and Finance Control Report (SFCR) and the Regular Supervisory Report (RSR), constitute a change to current reporting regimes in terms of content and frequency. The narrative for both reports is expected to follow a similar structure to enable comparability between undertakings along the following five domains:

1. Business Performance
2. System of Governance
3. Risk Profile
4. Capital Management
5. Valuation for Solvency Purposes

[15]

(iii)

(1) Risk classes and capital requirements	<ul style="list-style-type: none"> • Mainly asset risks (market and credit risk) and operational risk • Only MCR, moving towards two-level approach in <i>Basel III</i> by way of introducing a countercyclical buffer 	<ul style="list-style-type: none"> • Aims at a comprehensive approach taking into account all major risk, that is underwriting risk, market risk, default risk, operational risk • Two-level approach – SCR and MCR
(2) Risk measure and calibration	<ul style="list-style-type: none"> • Value at Risk-type measure • Capital requirements specified for each risk class separately • Varying confidence level for different risk classes, that is 99% for market risk and 99.9% for credit and operational risk • Capital requirements intended to cover unexpected losses within each risk category with a given probability 	<ul style="list-style-type: none"> • Value at Risk • Capital requirements based on exposure at company level • Aims at confidence level of 99.5% for the insurance company as a whole • Capital requirements intended to ensure a given 1-year solvency probability for insurance company as a whole

(3) Time perspective	<ul style="list-style-type: none"> • Retrospective • More frequent recalculation, that is, twice a year or daily in case of an internal model for market risk 	<ul style="list-style-type: none"> • Prospective • Recalculation in principle only once a year, but solvency must be ensured at all times
(4) Solvency assessment typology	<ul style="list-style-type: none"> • Choice between two to three levels of sophistication, for example standard formula or IRBA for credit risk • Restrictions concerning the use of internal models for credit risk • Only risk factor-based approach in the standard model 	<ul style="list-style-type: none"> • Choice between five levels of sophistication – from full internal model to standard formula with simplifications • No restrictions concerning internal models • Scenario-based and risk factor-based approaches in the standard model
(5) Risk aggregation and dependencies	<ul style="list-style-type: none"> • Only Level 1 diversification benefits are acknowledged 	<ul style="list-style-type: none"> • All levels of diversification benefits are acknowledged
(6) Valuation basis	<ul style="list-style-type: none"> • Market-based (market risk) and accounting based (credit risk) 	<ul style="list-style-type: none"> • Purely economic balance sheet

[4]

(iv)

1. Procyclicality: Higher capital requirements during crisis periods when Banks don't have capital, and lower capital requirements when the going is good [Lower counterparty defaults, lower market volatility etc.). Basel III introduces a counter-cyclical buffer to ensure Banks set aside more capital during times of boom and can utilize this during downturns.
2. Quality of capital was not good: Basel III increases better standards for capital to be qualified as High quality (Tier I). It also disallows certain instruments from being accounted for as capital.
3. No focus on liquidity risk: Basel III introduces concepts of Liquidity Coverage Ratio and Net Stable Funding Ratio to enable adequate monitoring of both the short term and the long term liquidity position of the Bank
4. Excessive risk posed by systemically important financial institutions: Basel III introduces an additional capital buffer that SIFIs have to maintain, requiring them to be better capitalized than average. This enhances the stability of the Banking system as a whole

[4]

[30 Marks]

Solution 3 : (i)

The theoretical rationale underlying the suggestion is based on the Modigliani and Miller [MM] Dividend Hypothesis. This hypothesis states that the market valuation of a company is independent of its dividend policy.

This theory is based on the assumption of perfect capital markets – there are no transaction costs or taxes and that the market is efficient.

According to this theory, if a company offers dividends lower than an investor requires, the investor will sell some of his shares to raise cash. Since the market is perfect, the amount realized on selling these shares reflects the true value of these shares. Given this situation, the investor will be indifferent between a company paying high or low dividends. In other words, the market valuation will be unaffected by the company's dividend strategy.

However in practice, the following factors will influence the dividend strategy of a company.

The company's target dividend payout ratio over the long term

The dividend level will be influenced by the level of regular dividends which can be supported by the long –term sustainable earnings of the company

Administrative and processing costs which means that it is not cost-effective to pay a small dividend

The company may want to pursue a relatively smooth dividend policy in order to meet shareholders' expectations. This means that the company may want to maintain a dividend level which is consistent with its past dividend track record.

The company will be concerned about the information content [signaling aspect] of its dividend strategy. This is particularly important where the market places significant weight on the dividend payout as an indication of the company's fortunes.

Level of competitors' dividends

Restrictions in Regulations and / or restrictive covenants imposed by lenders regarding dividend payout

Cash flow requirements is of course a critical factor

[7]

(ii)

The possible reasons can include the following:

The acquisition might be contemplated as a part of its conglomerate diversification strategy in order to reduce the risk of its overall business portfolio

The acquisition might be contemplated because Visionary believes that the business prospects for Taurus are very good particularly after it launches its advanced banking software in the target market.

To benefit from complementary resources particularly the software expertise available in Taurus or to utilize the client base of Taurus for cross-selling any other services or products offered by Visionary

Utilization of unused tax benefits if any in Taurus like carryforward depreciation tax shelters.

Enhancement of earnings per share which can happen if Taurus is trading at a lower price earnings ratio. The earnings per share of the combined entity will increase if the merger reduces the total number of shares in existence without affecting the total earnings.

To gain protection from the threat of takeover by increasing the size [albeit modestly] of the business of Visionary

Benefit from lower financing costs which are available to large companies. This is probably of minor significance in this case

Utilization of surplus funds – If Visionary has surplus funds and few alternative investment opportunities which are as profitable as the proposed acquisition, then Visionary may want to acquire Taurus and revive its operations by easing its cash flow problems.

[6]

(iii)

The steps involved are as follows:

The first step will be to engage an investment bank or an intermediary specializing in Investment Advisory Services to determine a fair price for the outstanding shares of Taurus and advice on the methods for raising finance for purchasing the outstanding shares

The shareholders of Visionary need to be approached if the funds are to be raised by way of a rights issue

A full offer document needs to be prepared which needs to explain the need for acquisition and the advantages of this deal from the standpoint of the remaining shareholders of Taurus.

This offer document needs to be discussed with the Board of Taurus and if the Board of Taurus agrees to recommend the offer to the shareholders of Taurus then it would be put forward as an agreed bid

If the Board of Taurus rejects the offer, then Visionary will be either compelled to take the bid directly to the shareholders of Taurus as an aggressive bid or abandon the offer.

The offer document should also specify whether the outstanding shares of Taurus will be acquired using cash or the shares of Visionary or by issuing loan stock or a combination of these instruments.

The key accounting issues are likely to be:

How the tangible and intangible assets of Taurus will be valued?

How goodwill will be treated in the consolidated accounts?

What will be the effect of the acquisition on the reported earnings [EPS] of Visionary?

The key legal issues will be:

Compliance with Competition and Anti-Monopoly Legislation

Compliance with Stock Exchange Rules such as

- Holder of the controlling block of shares making a reasonable offer to buy out other shareholders
- Treating all stakeholders of the target company fairly and equitably
- Complying with the prescribed time tables that applies to such offers

The key tax issues can be:

- Whether the acquisition is a taxable acquisition or a non-taxable acquisition. In the UK context, a taxable acquisition will mean that the remaining shareholders of Taurus are deemed to have sold their shares and hence will be taxed on capital. On the other hand, under a non-taxable acquisition, the shareholders of Taurus will be deemed to have exchanged their shares for their holding in the acquiring company and hence are not taxed on the transaction.
- Access to the tax shelters of Taurus from the standpoint of Visionary
- Tax implications of the acquisition in the hands of Visionary particularly when the assets acquired are either written up or written down.

The other issues to be addressed will include:

- Existing contractual arrangements with the suppliers of Taurus
- Problems of staff relationships and redundancies following the acquisition
- Service contracts with key personnel of Taurus
- Integrating the pension plan and other employee benefit plans of Taurus with the corresponding employee benefit plans of visionary
- Other outstanding financial obligations of Taurus like any other debt obligation, outstanding tax liability and contingent liabilities.

[12]

(iv)

The option pricing model is used when the structural approach is adopted for determining the value of debt of a company.

This approach assumes that the value of a company's debt plus the value of the equity shares of the company is equal to the value of the company's underlying assets.

By determining the value of the assets of the company and deducting the value of equity shares, we can determine the value of the debt.

The value of the equity shares will be the market value which in turn is assumed to reflect the economic value of the shares.

Under this approach, the equity shareholders are viewed as holders of a call option on the underlying assets of the company.

The exercise price for buying these assets is the nominal or face value of the debt.

The debt is assumed to be a non-coupon bearing in order to simplify the application of the option pricing model like the Black-Scholes Model.

There is also a further assumption that there is only one tranche of debt.

Applying the Black-Scholes Model, we can express the value of equity as:

$$E = V * N(d1) - D * e^{(-rt)} * N(d2) \quad \text{-----} \quad \text{Equation A}$$

Where

$$d1 = (\ln(V/D) + rt + \text{Variance of } V * t / 2) \text{ divided by Std Dev of } V * t^{0.5}$$

$$d2 = d1 - \text{Std Dev of } V * t^{0.5}$$

In the above equations:

V denotes the current value of the company's underlying assets

E denotes the current market value of the equity shares

D denotes the nominal value of debt to be repaid at time t

Std Dev of V denotes the annualized volatility of

In situations where it is difficult to estimate V [because of the practical difficulties in valuing the assets of the company] and Std Dev of V, the typical approach used is to find Std Dev of E using historical data and use the following relationship [derived by using Ito's Lemma]:

$$\text{Std Dev of } E * E = N(d1) * V * \text{Std Dev of } V \quad \text{-----} \quad \text{Equation B}$$

Equations A and B involve two unknowns – V and Std Dev of V- which can be solved to find V and Std Dev of E

[10]
[35 Marks]
