Institute of Actuaries of India

Subject CP1 – Actuarial Practice (Paper A)

December 2022 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:

i) Underwriting refers to the assessment of potential risks so that each can be charged an appropriate premium. This process includes the assessment of whether the risk is acceptable at all as well as appropriate premium amount and any special terms and conditions of the cover if it is accepted (2)

ii)

1) It can protect a provider from anti-selection risk
2) It helps classify risks into homogeneous groups for which a standard premium can be charged.
3) Adequate risk classification within the UW process will help to ensure that all risks are rates fairly
4) It helps identify risks for which special terms need to be quoted.
5) It helps provider choose the risks that it wishes to write as per its risk appetite and decline the risks that do not fit into its business strategy or rating matrix.
6) For substandard risk, UW process help identify the most suitable approach and level of extra premium and terms to be offered
7) It helps in ensuring that claims experience does not depart too far from that assumed in the pricing of the contracts being sold.
8) For larger proposals, the financial UW process will help to reduce the risk of over insurance against the company

(3)

[5 Marks]

Solution 2:

a. Published account:
   - 1.1 Reflect legislative and accounting principles
   - 1.2 True and fair view so best estimate may be preferable
   - 1.3 Going concern or break up basis is to be used depending on the status of the company

b. Supervisory Solvency:
   - 1.1 Reflects regulatory requirements and guidance
   - 1.2 Can be prescribed by the regulator or can be left to Actuarial judgement with disclosures
   - 1.3 Are mostly on prudent side, the extent to which will depend on the regulator.

c. Discretionary benefits:
   - 1.1 Can be either best estimate or prudent but are mostly prudent so as to avoid overstating the surplus position

d. Discontinuance benefits:
   - 1.1 Best estimate for fairness
   - 1.2 Other bases or experience analysis may also be used to calculate the same

e. Disclosure to beneficiaries:
   - 1.1 Reflect legislation
   - 1.2 Typically best estimate assumptions with a range of results in provided

f. Liability transfer:
   - 1.1 Best estimate for fairness for all parties and to gain agreement
   - 1.2 Some margin for security/adverse deviation is allowed for
   - 1.3 Relative power and willingness of the parties will play a role in setting of the assumptions.

[7 Marks]

Solution 3:

i)

1) Independent hospitals may overestimate the cost of treatment to increase their own profits which adds to the cost of claim to the insurer.
2) With its own chain of network hospitals, multiple estimates will not be required and will help rationalize the cost of reviewing the claims. Smaller claims can be accepted without question, there by bringing down the operational cost of claims settlement
3) Customer satisfaction will grow which is expected to bring in higher new business thereby reducing the overall expense ratio for the company.
4) Having network hospital will ensure that illness or diseases not related to the ones covered are not billed along with the current claim. This should bring down the average claim amount for the company.
5) A large chain of hospitals may help in achieving economies of scale

6) Such hospitals can also be used as a sale distribution centre thereby increasing the presence of the company without any extra cost related to business expansion.
7) Profits sharing agreements can be entered into with the network hospitals which will help strengthen the financial position of the company

(3)

ii)

Risk considerations and other issues before proceeding:

1) Does the chain of hospitals have nationwide coverage, or what arrangements can be made in uncovered areas?
2) Will any disclosure of this claims practice in advance be required, and if so will it affect sales volumes or customer satisfaction?
3) Will the practice impact any pricing assumptions?
4) Will the practice impact any underwriting practice, and will it help save cost?
5) Will the practice impact the claims settlement?
6) Will the hospitals be able to cope with the additional workload?
7) Apart from these specific items, the insurer will have to assess the acquisition as it would any other equity type investment (as they will effectively be buying shares in the hospitals). A full risk / reward analysis will be carried out.
8) It would have to review profitability, operational methods, staff contracts and costs.
9) It would also have to consider premises costs and the capital requirements of holding stocks of parts, equipment, and medical supplies.
10) How will the company manage the doctors' contract and ensure competent doctors are empaneled?
11) All these assessments would use past data from the hospitals, adjusted for the changed circumstances and the additional work generated.
12) Consideration would be given to the actions (and reactions) of competitors.
13) The insurer would need to consider whether the benefits justify the costs involved, particularly bearing in mind that running hospitals is not a core activity for an insurance company. Risk considerations and other issues before proceeding. Any regulatory approval that may be required both from insurance and medical regulator
14) Accounting and tax aspects related to management of profits, expense etc. of the hospital business.
15) What is the expected upside in the IPO that can be expected?

(5)

[8 Marks]

Solution 4:

Diversification

Lines of business e.g. [½]

- o Age group (under 14s, over 65s) [½]
- o Frequency of travel (single, multi-trip) [½]
- o Purpose of travel (business, winter sports etc) [½]
- o Number of lives (single, family, groups) [½]

- Sales channel [½]
- Geographical areas of business [½]
  - o o Travel location (domestic, continent, worldwide) e.g. restrict covering certain geographies based on the risks [½]

- Reinsurance provider [½]
  - o o Use reciprocal quota share reinsurance [½]

- Investment asset classes e.g. [½]
  - o o Bonds, Cash [½]

- Investment asses held within a class e.g. [½]
  - o o Government bonds, Corporate bonds [½]

[Max 3 Marks]

Underwriting (at the proposal stage)

- Prevents anti-selection [1]

- Enables the insurance company to classify risks into homogeneous groups for which a standard premium can be charged [½]
  - o A whole range of rating factors is used to determine granular data regarding the risk [½]
  - o Ensures that all risks are rated fairly [½]
- Identifies risks for which special terms need to be quoted [½]
  - o Special terms for certain activities e.g. sky diving trip [½]
  - o Insurer may simply decline risks e.g. pre-existing medical conditions [½]
- Helps ensure that actual claim experience not too far from that assumed in the pricing [½]
- Reduces risk of over insurance e.g. [½]
  - o Very high level of medical expenses covers for someone who is terminally ill [½]

[Max 3 Marks]

Claims control/ Claims underwriting

- Mitigates consequences of a financial risk that has occurred [½]

  - E.g. maximum cap on lost luggage to avoid dispute on the quality of luggage bag and the contents inside
  - use of excesses to reduce costs/admin of small claims
  - Provide refund on trip cancellation if it's backed by a Medical Certificate
  - use of exclusions/extra premiums for specific high value items eg cameras/laptops [3]

- Guards against fraudulent or excessive claims [½]
- E.g. have a prescribed list of overseas hospital and/or medical service providers [½]
- Costs of implementing and maintaining a control system must be compared with the benefits gained from it [½]
- By providing sub-limits to medical treatments [½]
- Tight policy wordings
  - to be able to impose exclusions/other conditions

  o but need to balance against competitiveness of product [1½]

[Max 3 Marks]

Management Controls:

- Data recording [½]
  - o Ensure adequate provisions are established for the risks [½]
  - o Reduce the operational risks from having poor data [½]

- Accounting and auditing [½]
  - o Can't change the risks accepted but enables proper provisions to be established [½]

- Monitoring of liabilities taken on [½]
  - o Protects against aggregation of risks of a specific type to an unacceptable level [½]
  - o E.g. request flight dates and times from policyholders so the insurer can cross-reference against events and be aware of any risk sooner [½]
  - o Check business mix is as expected

    regularly monitor claims especially by location travelled to

    feedback into future pricing and reserving [1½]

- Insurer also needs to be aware of high impact but low probability risks, e.g. plane crash/disease outbreaks, taking into account its own risk tolerance [1½]
- These can only be diversified in a limited way [½]
- Can use CAT reinsurance/related ART to transfer away [½]

Other types of reinsurance/ART/derivative (need to be specifically named) could also be used *(need to explain usage to get credit).* This includes for example use of currency derivatives for paying claims in foreign currency, weather derivatives for flight delays. [1]

[Max 3 Marks]

[Max 10]

Solution 5:

i) The main functions of a regulator are typically:

1) influencing the government policy for ease of business
2) vetting and registering firms and individuals authorised to conduct certain types of business
3) supervising the prudential management of the organisations under its jurisdiction
4) supervising the conduct of financial businesses, and taking enforcement action where appropriate
5) enforcing regulations, investigating suspected breaches and imposing sanctions , providing information to consumers and the public.
6) Creating public awareness and developing the industry

(3)

ii) Pros:

1) New asset class which has the ability to provide significant higher returns compared to other asset classes thereby increasing the expected portfolio return
2) If the cost of trading of this asset class is lower than others, then it will result in lower investment expenses
3) Means to provide diversification in the portfolio thereby reducing the credit risk
4) It will be helpful in matching any overseas liabilities of the company
5) As it is being allowed by the regulator, there could be possible tax benefits on the invested amount by the government
6) It is a globally traded asset class and is not restricted to any geographical region. This ensures good availability of this asset class.
7) Higher returns will ensure lower liability valuation, which in turns will help increase company's
    - Profit
    - Solvency position
8) Improved financial position will ensure more money can be invested in new business growth leading to further increase in profits and company's valuation
9) Company can launch aggressive premium products on the back of this asset class which can help consolidate its market share.

Cons:

1) Very volatile asset class
2) Valuation will be difficult as these are not well traded
3) Mark to market valuation may lead to significant booking of losses due to market movement
4) Loses can threaten the solvency position of the company
5) Company may be expected to keep a higher solvency capital for the extra risks that these asset classes bring.
6) Volatile returns on such assets will impact the calculation of liability valuation as it is difficult to calculate the return
7) These are mostly OTC contract and hence significant counterparty default risk is there
8) They may not be aligned with the nature of the underlying liability.
9) These are complex asset structure hence difficult to understand.
10) Operationally difficult to manage due to different accounting norms that may needed to be followed if cryto is bought from companies situated in different countries.

(10)

[13 Marks]

Solution 6:

i)

Central banks are public institutions of a unique nature: they are independent, non-commercial entities tasked with managing the currency of a country , monetary policy etc., for example, Reserve Bank of India

They have exclusive powers to issue banknotes and coins, control foreign reserves, act as emergency lenders and guarantee the good health of the financial system.
A central bank's prime mission is to ensure price stability. This means they need to control both inflation – when prices go up – and deflation – when prices go down.
Deflation depresses the economy and fuels unemployment, so every central bank sets a target of moderate, positive inflation – usually central bank sets a band say between 2% to 5%– to encourage gradual, steady growth.
But when inflation begins to skyrocket, the central bank steps in to take suitable steps to moderate the inflation. Excessive inflation can rapidly shatter the benefits reaped in previous years of prosperity, erode the value of private savings, and eat up the profits of private companies. Bills become more expensive for everybody: consumers, businesses, and governments are all left to scramble to make ends meet.
When a commercial bank gives back what it borrowed from the central bank, it has to pay an interest rate. The central bank has the power to set the benchmark interest rates at which banks can borrow from the central bank and also repo rate at which it can deposit the money with the central bank. These benchmark rates effectively determine the price of money
and central banks are currently raising these rates to tame the inflation.

If the central bank charges higher rates to commercial banks, commercial banks in turn increase the rates they offer to households and businesses who need to borrow.

As a result, personal debt, car loans, Personal Loans, and mortgages are more expensive thus taming the demand .Companies, that regularly take loans to make investments, begin to be cautious and may postpone such decisions thus slowing down the investments and increase in capacities..

Tighter financial conditions inevitably lead to a fall in consumer spending across most or all economic sectors. When demand for goods and services decreases, their price tends to decline.

This is exactly what central banks intend to do now: curb spending to curb inflation.

(7)

ii)

As with all drivers of financial assets, a very rapid move is generally not a good thing. The markets are interconnected, so if one input changes too quickly, it dislocates other areas. For example, if interest rates were to rise very quickly, it would yield dramatic, negative effects on bond prices and currencies, and stunt growth in the real economy. Companies would suddenly and unexpectedly be hit with higher borrowing costs. This would hurt earnings, increase their cost of capital, and dampen investment.

Impact on Assets and Liabilities on rising interest rates:

Rising rates impact all segments of the economy. Businesses in particular suffer greatly from a rise in the average interest rate. Higher rates have both direct and indirect effects on companies, all of which trickle down into the balance sheet. This is called Paradoxical Effect i.e. If the rise in rates is excessive, companies may actually see a decline in the total sum of loans carried on their balance sheets. This is because loans may become outright unaffordable, resulting in less borrowing and less investment. In such cases, the assets will also decline, since companies obtain assets when they borrow. Even if the borrowed sum is kept as cash, total cash, which is an asset, will rise on the balance sheet. Many companies borrow to invest in assets such as machinery, buildings and raw materials, all of which are recorded as assets. So in extreme cases, higher rates may result in lower liabilities as well as assets on the balance sheet.

Impact on the Equity Market

The stock market is affected by many factors, including corporate earnings and investor sentiment. Low interest rates tend to provide a tailwind for growth, earnings and equity valuations, while high rates present more of a challenge. The economy's condition is important too. As the benchmark interest rates increase, the bond yields increase which may lead to more investments in fixed income securities thus lesser funds being available for equity markets. In addition, with higher interest rates, the investments may slow down coupled with increased borrowing costs thus leading to lower profits and hence dividends leading to lower values for equities.

Impact of Interest Rates on Employment

Higher interest rates may discourage the investments thus slowing down the hiring associated with business expansion. They also cap employment by restraining growth in consumption. If demand drops, businesses may reduce output and cut jobs.

Impact on the Bottom Line

The Central Bank sets the economy's benchmark interest rates to promote economic growth while keeping inflation low and stable. If the Central Bank identifies high inflation as the most serious threat to those objectives, it may increase rates quickly enough to significantly slow growth or cause a recession.

(7)

iii)

Rising interest rates

If interest rates are increasing, then gross redemption yields on fixed-interest bonds will tend to increase and prices of fixed-interest bonds will therefore fall.

This may be an opportunity for long term investors like pension funds, life insurance companies to lock-in higher yields as most of their assets are held to maturity. Further when the economy takes a positive turn with likely decline in interest rates, there is an opportunity for capital gains.

The equity market might suffer a fall in market values due to an increase in interest rates as higher interest rates will generally depress economic activity and reduce companies' profits.

On the other hand, many investors who correctly anticipate an increase in interest rates (when other investors have not) may choose to hold cash to wait for directions on the economy before committing large chunks of money for long term investments . If they have short term liabilities especially, they may prefer to hold cash rather than suffer a capital loss.
The higher nominal income from higher interest rates might also be attractive.

Start of an economic recession:

If a country starts to move into a period of recession, then the domestic stock market is likely to perform badly. Share prices are unlikely to increase if companies are struggling to maintain profitability. There might be some fears that government borrowing would increase during a recession, leading to a larger supply of government fixed-interest bonds and so to reductions in the prices of fixed-interest bonds. However, recessions are often followed by reductions in short-term interest rates, which could themselves lead to lower gross redemption yields and higher prices for fixed-interest stocks. So, cash investments might be more attractive than bonds and equities at the start of a recession. Cash would give a reasonable income stream combined with no risk of capital loss, unlike equities and fixed-interest investments, which might fall in value.

On the other hand, bottom of the recession period may give an opportunity for value investing in equity markets and realise capital gains on fixed interest rate assets when the economy starts to improve (as central banks at this stage are expected to reduce the interest rates from peak inflation period!).

Therefore the investors appetite for taking risk, the ALM and nature of their liabilities determine how much to hold cash and how much to invest in such volatile periods.

(4)

[18 Marks]

Solution 7:

i)

The main risk for term assurance products is mortality risk. In particular, the risk of a higher number of deaths than expected. This could be due to aggregation or concentration of risks and a related catastrophe event e.g. a pandemic. Aggregation and catastrophe risk are increased for group business.

Anti-selection risk is an issue for the individual version of the contract, but this is much reduced for the group version. The level of anti-selection risk is linked to the level of underwriting employed by the company.

There will also be a mortality risk from selective withdrawals. In particular, the risk that those who withdraw from (or do not renew) the contract are those with lighter overall mortality experience and so the average mortality experience of those remaining increases.

There is a financial risk from higher than expected withdrawals at times when the asset share is negative or if lapses occur before the initial expenses are recouped.

Especially in the case of decreasing term assurances, if the cost of benefit exceeds the premium being charged early in the term.

At later times, if lapses are expected to lead to profits to the insurer (since no payment is made) there is a risk of fewer than expected such lapses.

There is an expense risk i.e. that the actual costs of administering the contract are greater than the amounts loaded into the premium. This may also be due to higher than expected inflation.

The basic reserves for term assurance contracts are relatively small and fixed interest assets are likely to be held to back them, so investment risk is not likely to be significant. However, there is still a risk that investment returns are lower than expected. There would also be a risk of counterparty default if corporate bonds are held.

There is a risk of having inadequate data on which to price the business, particularly mortality data which needs to be relevant to the target market.

There is a risk of selling an adverse mix of new business if cross-subsidies exist in the pricing e.g. selling smaller sum assured business than expected.

There is a risk of selling a higher volume of new business than expected, which can cause unexpected capital strain. This is because initial capital strain can arise for regular premium policies due to high initial expenses and solvency capital requirements. Higher than expected new business can also result in administration strain.

There is also a risk of selling lower new business volumes than expected, resulting in overheads and fixed expenses not being recovered.

New business volume risks are closely linked to risks relating to the actions of competitors e.g. a new entrant taking away market share or an existing company materially reducing its term assurance prices.

If options are offered (e.g. convertible term assurances), there is a risk of misestimating the take-up rates if the option is costly to the insurer. And similarly of mis-estimating the level of mortality, allowing for anti-selection, amongst those who convert.

There is a risk that the board makes decisions which are not in the long-term interests of the insurer e.g. cutting term assurance premium rates to an unprofitable level.

There may be a risk that the distributors mis-sell the business, which could impact the reputation of the insurer. There may be other reputational risks such as the company not paying out on a claim.

There may be a risk that policyholders are encouraged by distributors to lapse and re-enter.

There may be a risk of non-recovery of outstanding premium balances held by distributors.

There is a risk of failure of the underlying systems, e.g. the claims payment There may be operational risks relating to poor pricing models.

Poor documentation or badly worded terms and conditions may result in the company having to pay out on more claims than anticipated.

There may be liquidity risk e.g. when unexpectedly having to pay out on a large claim payment.
There is a risk of default of a reinsurer, if reinsurance is used.

There is a risk of adverse regulatory changes in relation to term assurances,
e.g. introduction of maximum premium rates.

There is a risk of adverse taxation changes, e.g. inheritance tax changes can reduce the attractiveness of some term assurance products.
There may be a risk of fraudulent activity, e.g. false death claims

(Each point ½ mark. **Max 6)**

ii)

There are three uses the bank could have for term assurance:

- A group version can be used by this company, to provide a benefit on the death of a customer equal to the balance outstanding on a Personal Loan. This would be needed if no other payment protection was in place and no estate available to pay the debt.

- To provide protection against the financial loss that might arise on the death of a key person within the organisation.

- A group equivalent of the term assurance contract can be used to provide a benefit to dependants on the death of a customer whilst in employment

(3)

iii)

The specified benefit amount is paid out on the death of the specified individual(s) within the specified term of the contract.

For group term assurance the sum assured will vary by each individual customer and it is usually based on a multiple of the customer's salary. For the Personal Loan protection, the sum assured will be based on the potential outstanding balance for each customer.

This may be the maximum credit limit, or some proportion based on previous experience

There may need to be options for all these products to review the sum assured regularly e.g. due to salary raises for group term assurance or increased credit limits for Personal Loan protection.

For key person cover the sum assured will be based on the expected financial loss to the company if that person was to die. This may vary depending on the position and experience of the key person. It may include expected recruitment costs for a replacement.

The term will vary by life insured. For the key person the terms are likely to be based on the time to retirement date. For the customer group benefits the policy is likely to be set up on a one-year renewable basis. For the Personal Loan protection, the term is likely to be substantially shorter possibly with extension options.

It is likely that a conventional without profits basis would be used for all purposes here though an index-linked version would potentially reduce the need to review sum assureds.

There is no benefit paid on lapse.

Underwriting is performed on key person insurance but little underwriting performed on the others.

The product may be compulsory for group death in service benefit.

The products are usually regular premium, though as the customer group benefits are likely to be on a one-year renewable basis this is effectively a recurrent single premium.

(Each point ½ mark. **Max 6)**

iv)

The main risk to the Bank is that the amount of benefit provided turns out to be insufficient. This is more relevant for the key person and personal loan protection products, as the end beneficiary of the group term assurance is the customer's family.

Given the potential long-term nature of the contracts, this risk is exacerbated by the effects of inflation over time. If an index-linked version is used, the risk is that the index does not replicate the rate that the benefit needed to increase by.

A further risk is that if there is no ability to review sum assureds regularly then a gap between the amount insured and amount required will grow over time.

A subsidiary risk is that the insurer (Here it's the Bank itself unless the Insurance company is a separate entity which is independent of the Banks' fortune or vice versa) becomes insolvent and unable to meet the guaranteed benefits in full.

The bank carries other risks such as default, interest rate risks if the loans are fixed, capital risks etc. which are not covered by the term insurance products.

In addition, there is a mis-selling risk, i.e. the risk that the Bank does not fully understand when each of the policies would pay out and so would not be covering the risks it intended to cover.

There is a risk of over-insurance on the personal loan cover since the risk is diminishing and part payments may be allowed.
And last but not the least, there is a legal risk that the insurance amount may not be used to repay loan as there are beneficiary/nominee issues.

(4)
[19 Marks]

Solution 8:

Regulatory:

1) Approval for the transaction from the regulator
2) All area of regulatory compliance
3) If the company is listed, then additional requirement of reporting to Market Regulators and other relevant authorities

Investor:

1) If the company is listed, then additional requirement of reporting
2) Revised business plan and expected returns post- merger
3) Proposal of the merger along with all the projected cash flows.
4) Capital requirement to fund the acquisition and the options available to raise the same.

Business side:

1) Review of business plan projection
2) Projection of profitability and company valuation over the next 5 years
3) Integration of distribution channels
4) Changes to agent remuneration, if any
5) Review of business practices if some of them are not aligned with company's current practices.
6) Integration of product suites and Product strategy allowing for new products that may come from the smaller company

Operation side and Systems and IT infrastructure:

1) Review of system integration
2) Review of all key processes like UW, Claims, Policy issuance, Customer service etc.

Actuarial side:

1) Review of current ALM position and expected gaps and opportunity
2) Current Derivative hedging positions if any
3) Calculation of portfolio return
4) Calculation of liability provisions
5) Assessment of solvency position
6) Assumptions backing liability valuation as different products portfolios will get merged.
7) If company writes Par business, then how the FFA or Estate will be consolidated
8) Any discretionary benefits that need to be paid out
9) Cost of options and guarantees, especially of the small company and its impact on overall cost of option and guarantee reserves
10) Review of pricing models
11) Review of all assumptions and assess the impact of merging of the products
12) Review of reinsurance agreement and retention amount

Financial side:

1) Solvency projection and impact of the acquisition
2) Current level of provisioning and any requirement that may arise
3) How to consolidate the accounts?
4) Expected cost ratios of the merged entity
5) Opportunities for cost rationalization
6) Any future requirement of capital of the combined entity
7) Retention or severance pay proposal and it impact on the P&L and BS

Employee side:

1) Compensation structure review
2) Rationalization of the work force
3) Cultural integration
4) Review of grading system to accommodate different grades of the two companies

Others:

1) Communication to customers, vendors, agents, employee and to media outlet for larger audience
2) Any additional reporting requirements that may arise
3) Review of overall risk governance and risk policies.
4) Departmental integration and Day 1 project plan and its implementation

[Each Sub-area Max 3 marks. ½ mark for each point, **Max 20]**

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