Institute of Actuaries of India

Subject CA1-I – Actuarial Risk Management

March 2017 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:

- Property valuation can be done using discounted cash-flow approach.
- The cash flows valued should be net of all outgoes and should make explicit allowance for expected increase in rental income.
- The discount rate should depend on the level of riskiness of the investment.
- Discount rate can be estimated as risk free rate + risk premium + premium for lack of marketability.

Other factors to be considered:

- Current rent
- Rack rent
- Rent frequency
- Rent Review Frequency
- Legal fees if any
- Term of the lease if leasehold
- Running costs
- depreciation

[5 Marks]

Solution 2:

i) Funding is important because:

- The key purpose of funding pension liability is to ensure that at any point of time there are sufficient assets to pay off pension liabilities.
- There may be a regulatory requirement to keep assets backing pension liabilities.
- If assets are properly well matched with amount and term of liabilities from inception of the scheme, then it provides peace of mind to current employees/existing pensioners as well as sponsor of the scheme.
- The scheme rules may require that that the scheme should be funded

(2)

ii) Valuation may be necessary:

- Regulatory Requirement to value the assets/liabilities based on prescribed rules at regular intervals to check solvency of the scheme
- There may be financial reporting requirement to value the assets/liabilities to ensure that financial statements present a true and fair view of the scheme's and sponsor's financial position
- Employees may want to know the financial position of the pension fund and protection of their pension entitlement from time to time.
- Employers would like to know if current level of contribution is appropriate to receive a desired level of benefits or there is a need to increase their contribution the scheme.

- To analyse and evaluate relative movement of assets and liabilities and devise appropriate investment strategy
- Assets/Liabilities may need to be valued for taxation purpose.

(6)
[8 Marks]

Solution 3:

i) Yes, the first 2 reasons are likely to make the claims experience worse relative to peers. Fraudulent claims and large one off claim can be specific to the company. The impact of unexpectedly bad winter should impact peers as well, hence needs to be analysed further.

(2)

ii)

- Fraud is an operational risk and following controls should be in place for early detection of frauds
  - Robust claims underwriting process
  - Strong internal controls framework in terms of doer/checker, random spot checks of claims etc
  - If claims management is outsourced look at in-sourcing some of the process to ensure better control
  - Regular Claims MIS to detect any adverse trends in claims experience split by geography, channel, type of claim etc
  - Regular review of adequacy of premium and benchmarking against competition

- Large one off claim mitigation
  - Purchasing Risk Excess of loss of reinsurance which would protect the company from large individual claims on individual risks , especially where …
  - There are no upper limits on claim amounts and are subject to judicial intervention like Motor Third party liability.

- Motor pile up
  - Bad winter can occur which can lead to an aggregation of claims for eg. the motor pile up.
  - Each claim may be small in size but collectively the claims can be damaging
  - Risk can be mitigated by purchasing an aggregate XoL which covers the aggregate of losses above an excess point sustained from a defined peril, over a defined period.

(6)
[8 Marks]

Solution 4:

Product design factors

- Interest and needs of customers- what is the need of the customer in terms of full financing or partial financing, minimum and maximum term of loan etc.
- Coverage -types of vehicles that could be covered – new only or second hand purchases
- Benefit and charges- Fixed or floating rate loans
- Target market-
    - Will it be a mass market product- for eg- motor cycles or small cars , or only cars above a certain value
    - preferred customer profile- salaried above a certain income level or small business owners as well
- Early repayment terms
- Penalty terms for late payment of EMI
- Pricing in the context of loan means setting the terms of loan - Loan interest rate should be based on risk free rate + risk margin to reflect level of risk and reflect shareholder required rate of return
- Regulatory Capital requirement in terms capital required to be held to back the risky assets –i.e the loans
- Expenses need to be allowed for in setting loan interest rate/terms.
- Loan Int rate/margins should reflect the expected rate of defaults which should be determined based on own internal data and publically available date
- Re sale/Salvage value of seized vehicles
- Expected new business form the new product – should be adequate enough to cover product development and system development costs
- Need for some level of cross subsidy from long term to short terms loans, large loans to small loans etc.
- Competitor price and terms – the product should neither be too cheap not expensive
- Ability of admins systems to deal with product- for eg can floating rates be managed

[12 Marks]

Solution 5:

The key risks to consider are-

- Underwriting risk- which covers
    - Premium risk- in adequacy of premiums charged due to poor underwriting standards
    - Reserving risk- inadequacy of reserves held
    - Catastrophic risk- Exposure to CAT risks- epidemic/pandemic

  - Expense risk- higher than expected maintenance/ claims expenses, and expense inflation risk
  - Lapse risk – low customer retention leading to selective withdrawals and higher than expected per policy expenses

- Market risk- impact of market movements on assets and liabilities of the company
  - Interest rate risk- impact on value of assets and liabilities of changing interest rates
  - Equity risk- fall in value of equity investments
  - Property risk- - fall in value of property investments
  - Spread risk- widening of spread between yield on corporate bonds and Government securities
  - Ill-liquidity risk- big risk of lack of cash to pay claims, meet expenses and forced to liquidate assets

- Credit risk – risk of default by counter parties-
  - External Vendors/suppliers
  - Reinsurers
  - Corporate bonds

- Operational risk
  - Failure of systems, process,
  - fraud,
  - Reputational risk

[12 Marks]

Solution 6:

i) Since the group does not have capital- Advantages

- It is a start up venture, banks are unlikely to give loans to start ups, with no track record
- Besides in the initial years there are unlikely to be any profits and hence servicing loans could be difficult
- Equity participation is a better option as long term equity finance provides a solid capital base for future growth.
- The IT professional is able to provide practical advice and assistance to the company based on his past experience
- The IT professional will also has a network of contacts in many areas that can add value to the company.
- The IT professional may be capable of providing additional rounds of funding should it be required to finance future requirements

Disadvantages

- Considering that the IT professional is bringing in money he might like to have significant say in the business strategy which means loss of control for the young entrepreneurs
- They will become a minority owner as 60% owner ship is lost- have to give up ownership of business
- Choice of whether to run your own business or just be a partner in a larger set up

(8)

ii)

- Long term investment – it is a start up and significant time could pass for the venture to be profitable. Exit could be post 5-7 years
- It is a high risk /high return investment –
  - it is a start up,
  - new untested idea,
  - down side risk is significant.
  - If successful the returns can be extremely high
- Lack of liquidity- Investment will be locked up for some time till the venture is successful and investor can exit through a sale or through listing of venture through an IPO

(4)
[12 Marks]

<u>Solution 7:</u>

i) Following points relate to investment characteristics and returns:

1. **<u>Volatile:</u>** Direct property values tend to be less volatile than property shares in the short term.

2. **<u>Smoothed Returns:</u>** Property shares are in a company therefore the price will depend on the value of the company itself which is only partly dependent on the value of the underlying properties. The company can smooth the return to investors through its dividend policy.

3. **<u>Financial Geared:</u>** Property companies usually are financially geared, direct property is not usually geared. Financial gearing increases the risk from property shares but could increase the long term expected returns.

4. **<u>Stable Returns:</u>** In the longer-term property shares, may provide greater stability as they provide diversification that may not be possible with direct investment due to the large size of individual properties.

5. **Higher Returns:** Property companies undertake higher value added property investment activity, such as development, providing higher returns longer term than direct property.

6. **Higher Returns:** Property shares may provide higher returns by being bought at a discount to net asset value.

7. **Loss on forced sale:** Property shares may be subject to losses if the property company has a cash flow problem, however, direct property is only exposed to forced sale losses if the investor becomes a forced seller.

8. **Marketable:** Property shares are much more marketable than direct property, which may affect the return.

9. **Tax:** The tax treatment of direct property and property shares may differ, depending on the territory concerned and tax rules, impacting the returns achieved.

10. **Cost savings:** Property shares may provide economies of scale and so provide cost savings compared with direct property.

11. **Control:** Direct investment may allow the investor greater control over management costs and so generate extra return.

12. **Greater Diversification:** For the same out lay greater diversification can be achieve by purchasing property company shares rather than a direct investment.

(8)

ii) Factors to consider-

a. **Size of investment**- direct property would require significant outlay on one property hence degree of diversification that can be achieved could be limited if investment outlay is small. From a diversification perspective property shares could give greater diversification as property company could invest in several properties across various geographies
b. **Objectives of the fund** – is to provide lump sum at retirement and the fund would grow through regular interest credits. Rental yield/dividend yield from will be low compared to yield on fixed interest securities. If the intent is to provide regular interest credits, how will capital appreciation in property value /share price be passed to members?
c. **Expenses of management**-Direct property investment requires a lot of expertise and resources and is expensive for management for eg,-
    i. Maintenance and upkeep
    ii. Collecting rent
    iii. Finding tenants or vacant properties etc.

    Equities involve lower transaction and maintenance costs.

d. **Expertise-** In both cases, the Club may not have expertise in direct property investment/investing in stock market or stock selection. Hence relative cost of purchasing advice also matters.

(4)

[12 Marks]

Solution 8:

i)

- Property and equity both offer some protection against inflation in the longer run, hence to that extent both are similar, but there are differences as ….
- Legal hassles in property investment- high property taxes , restrictions in raising rents etc
- Property maintenance costs could be raising,
- obsolescence
- Risk of voids, difficulty in finding good tenants
- Property location losing its prominence reducing value of property
- Lack of diversification as capital tied up in one investment
- Property prices are attractive and hence sale makes sense
- Stock markets offer more diversification than direct property for same level of investment
- Transaction costs of investing in shares are low and liquidity and marketability higher compared to direct property which could be attractive
- Tax benefits could be more attractive for stock market investments

(4)

ii) It is where short term liquid instruments are traded.

- The money market is not a physical market.
- It relies on screens trading systems.
- Its participants are government and official dealers/ market makers. Sometimes the unofficial inter-bank market is also considered to be a part of the money market.

(2)

iii)

- Sale and purchase of treasury bills (or other short term government debt usually a note issued at a discount),
- Sale and purchase of other eligible bills (CDs, CP, FRNs) ,
- Repurchase agreements for the bills, Lending and borrowing of short term funds in the inter-bank markets

(3)

iv)

- Equity markets are volatile but over the long term can give higher returns compared to other nominal assets

- And if the customer is not looking at short term speculative gains….
  and equity is expected to perform in the long term, then it makes sense to invest immediately
- Know that it is difficult to time the market
- Investing in money markets depress returns and is what the investor obviously wants
- Better that shop keeper builds a diversified portfolio of stocks spread across industries, geographies ,etc

(3)
[12 Marks]

Solution 9:

i) Risk Budgeting is a process of establishing how much risks should be taken and where it is most efficient to take the risk (to maximise the return).

(1)

ii)

- The portfolio liabilities will be the regular annuity payments plus the regular expenses
- Risk budgeting helps in controlling investment risks by putting constraints on the total risks of the portfolio.
- Constraint is that total risk must stay at or below a target level
- Risk budget requires allocation of budget between strategic risk (taking risk relative to liabilities) and
- Active risk(the extent to which investment managers are allowed to deviate from their benchmark portfolio)
- Risk budget ensure that portfolio allocation are not only based on asset's expected return but its risk contribution to the portfolio
- Risk budget ensures that portfolio managers pay attention to low correlation investments
- This will reduce total risk in the portfolio through diversification.

(4)

iii)

- The purpose of Asset Liability Model is to project assets and liabilities related to the portfolio (annuities and other vehicles of retirement income) in future years.

Projection of Assets:

- First of all, bifurcate all the existing assets in major asset classes (govt. bonds, corporate bonds, equity and property etc) and assign expected future returns from each asset class. In case of bonds, also take into account maturity date of the bonds.

- While projecting asset values, we need to make following assumptions:
  - ✓ Future interest rates
  - ✓ Future inflation
  - ✓ Future real yields
  - ✓ Rental yields and future Rental growth rates (for property)
  - ✓ Dividend yields and future dividend growth rates (for equities)

- The projection of assets includes both income (coupon/dividend/rent) and maturity proceeds, if any.

Projection of Liabilities:

- First of all, identify the type of liabilities e.g. annuity amount, expenses, taxes etc. net of any expected premiums.
- Outgoes can be fixed, variable, index linked, discretionary etc. depending on the annuity products sold to the policyholders.
- Expenses are usually linked to price inflation or salary inflation. Estimate the expected expenses for the portfolio.
- Benefit payments, expenses and premiums will be denominated in local currency.
- The term of outgoes depends on likely timing of the payments.
- Choose appropriate model points which reflects underlying portfolio.
- Need to take assumptions regarding level of longevity, level of annuity increase, taxes etc.
- we can then estimate the expected outgoes in each year.

The ALM model can be deterministic or stochastic depending on the purpose of modelling.

(6)

iv)

- First specify the objective which could be to “determine an investment strategy such that the probability of insolvency over the next x years is z%”
- Solvency could be defined as statutory solvency level or internal solvency target level
- Since annuity business is very sensitive to investment return assumption, hence it is appropriate that the investment return and inflation should be modelled stochastically
- A trial asset allocation is selected and a number of simulations (say 5000) can be used to run the model and then to arrive at average investment return assumption.
- Then for each year asset and liabilities can be compared and solvency tested
- The results of the model will be compared to the objective
- If objective is not met then a different asset allocation is chosen,

- Several potential suitable investment strategies can be tested to observe the impact of asset liability matching position and the impact of the same on solvency.

(4)

v)

- The risk appetite of the shareholders
- The financial strength of the Company
- Level of free assets
- Availability of asset classes with suitable nature/duration
- Dealing costs involved
- Regulations enforcing asset classes to held
- Size of the portfolio (larger the portfolio, more mismatching can be considered)
- Company's investment expertise
- The need of diversification

(4)
[19 Marks]

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