

Institute of Actuaries of India

Subject SA6 – Investment

November 2013 Examinations

INDICATIVE SOLUTIONS

Solution 1 :

i.

- a. LDI is an investment strategy that measures success with reference to the liabilities (like funding position or cash contributions, etc.). It is not whether the return on the assets beat a performance target or a peer group or a benchmark but whether it keeps pace with the changing value of the liabilities. It thus helps to reduce/ limit risk while giving returns required to meet the liabilities.

(1 Mark)

- b. Though bonds have a pattern similar to the benefits paid out by pension schemes, they suffer from a number of drawbacks.
- Bond yields are too low. And generally scheme sponsors would require some equity risk premium to pay off pension fund deficits/ reduce future funding.
 - Bonds are too short. A 'typical' pension fund has liabilities with duration of around 20-25 years whereas most of the bond portfolios would have duration of 10-15 years. This introduces mismatching and reinvestment risks.

Therefore a combination of matching assets (bonds) and return seeking assets (equities) is most optimal.

(1 Mark)

- c. According to the expectations theory of yield curve, a normal yield curve would be upward-sloping where the fixed income securities with shorter maturities trade at yields lower than that of yields of fixed income securities with longer maturities. This occurs when the economy is strong and the interest rates are expected to rise in the future. Strong economic growth will tend to pull up interest rates as
- Consumers borrow more money for cars, houses, etc.
 - Businesses borrow more money to finance expansion of inventories, new buildings, etc.
- Conversely, a falling yield curve occurs when the economy is expected to weaken (or possible going into recession soon) and the interest rates are expected to fall. A weak economy reduces consumers' and businesses' tendency to borrow in large amounts. This weak demand for loans tends to cause interest rates to drop as banks cut rates in order to attract new borrowers.

There is an inverse relationship between markets rates of interest and the price of the bonds.

Long-term bonds are more sensitive to changes in interest rates than short-term bonds.

If the rates are expected to go down in the future, an investor would prefer to invest in a long-term bonds because the price of long-term bonds will tend to go up more (based on the above two principles). The demand for short-term bonds will go down as these would have to be rolled over at lower rates of interest when they mature. This will cause the price of short-term bonds to fall and the price of long-term bonds to increase. But since the yields and the bond prices move in opposite directions, the short-term yields will increase and the long-term yields will fall. This will lead to a negative sloping yields curve.

(2 Marks)

- d. Historically, bonds were used as a partial hedge for the interest rate risks in pensions but the recent growth in LDI has focused on using gilt-based derivatives (repos), swaps, and synthetic bonds. Derivatives have following advantages over traditional securities:
- Ability to unbundle risks (Duration, convexity, FX, credit, equity risks etc)

- Greater flexibility
- Ability to replicate liability more closely
- Ability to dynamically amend risk profile
- Alpha generation (short positions)

Generally, swaps are preferred over government bonds as:

- Swap market is significantly more liquid than the gilt market
- Swap transactions are OTC
- Outstanding nominal is more than double of gilts
- Bid-Offer is tighter than gilts for long dated large size

A swaption is the right, but not the obligation, to enter into a swap. When interest rates are low, swaptions can be used to hedge the risk that they fall even lower, but at the same time allow the benefit from the upside if the rates rise.

The pension fund can buy the right, at any point in future, to enter into a swap at a rate at, say, 50bps below current market levels, at a level where the fund may be forced to de-risk due to deteriorating solvency.

However buying the swaption requires a premium to be paid. This premium can be funded by selling the right, over the same period, to be put into a swap at a rate say 50bps above current market levels, set at the target level where the fund is happy to hedge the liabilities.

The fund is thus protected, with a small premium paid, against a severe deterioration in funding levels, if rates fall beyond 50bps, and is automatically put into hedging strategies if its target level is reached, forfeiting any improvement in funding resulting from a rise in interest rates above its target levels.

(6 Marks)

[Total Marks: 10]

ii.

a. Pensions offer following options:

- Cash commutation on retirement
- Leaving service (for active members)
- Transfer values
- Early retirement (active and deferred members)
- Spouses and dependants pensions
- Option to give up pension for additional spouses pension
- Statutory underpins at some specific ages like 60 and 65
- Caps and floors on pension increases

(2 Marks)

b. Other factors that affect the hedging strategy are

- Duration of the liabilities: longer duration tends to favor hedging
- Assumed volatility of long term interest rates and inflation expectations: higher assumed volatility tends to favor hedging
- The nature of the risky assets held: more cash-like risky assets make liability hedging look more favorable
- Assumed volatility of the risky assets: lower volatility tends to favor hedging

- Correlation of the risky assets and the liabilities: low or negative correlation favors hedging

(2 Marks)

c. Process of Constructing a Liability Benchmark

1. Liability Analysis

- Determine which liability to match
- Understand the characteristics of the liability
- Quantify the sensitivity of the liability cash flows to yield curve

2. Investment Analysis

- Determine investment instruments to use: physical bonds, derivatives, both
- Quantify the sensitivity of the fixed income duration funds to yield curve movements

3. Create the Liability Benchmark

- Optimize a series of zero coupon swaps, interest rate futures, bond indices or a combination thereof as a proxy for the liability
- Optimization is based on minimizing the tracking error, i.e., the difference in the sensitivity to yield curve movements between the liability cash flows and the proxy

4. Rebalance & Monitor Risk

- Implement the desired solution
- Analyze daily yield curve changes
- Rebalance liability benchmark within duration funds based on client-specific threshold
- Update the liability cash flows and analysis annually

The principles behind LDI and liability hedging are relatively straightforward, but in reality implementation can be complex. Before embarking on a liability hedging strategy for your pension scheme, there may be several factors to consider.

The Market

Market dynamics can affect the implementation of LDI solutions in many ways. The balance between the strength of the trustees' view on the prevailing levels of interest rates and inflation and their risk appetite will typically determine the timing/extent of the hedge.

Depending on the circumstances, it could be worth either waiting or moving quickly to implement the best LDI solution for a pension fund. Some pension schemes put an LDI solution in place and establish market triggers. When the triggers are hit, the hedges are extended to take advantage of better conditions.

The choice of hedging instrument is also an important market factor. For example, the difference in yield between physical assets and broadly equivalent derivatives can change, making one better value than the other at different times.

In recent years it has become more economic to use gilts instead of swaps to hedge longer-dated liabilities, and many pension schemes are now using gilts to match their liabilities to take advantage of the cost benefit.

The Structure

If a pension scheme asks an asset manager to implement an LDI approach, they may opt for a pooled fund solution, where the scheme uses a range of pooled funds as building blocks to offset its liability risks, or a segregated mandate, where every factor is designed and implemented by the asset manager specifically for the scheme. The suitability of either solution will depend on a pension scheme's resources and requirements.

- A pooled fund LDI solution benefits from simple governance and low costs because it allows a pension scheme to use pooled funds as building blocks to construct a hedge for its liability risks. Pooled LDI solutions are flexible, adaptable and cost-efficient,

making them suitable for all kinds of pension schemes, but they generally offer a less precise liability hedge than would be possible under a segregated mandate.

- A segregated LDI mandate is highly flexible, capital efficient and easily adaptable to changing conditions. It can make use of a wide range of instruments and strategies (sometimes beyond interest rate and inflation hedging) and provide high levels of hedge precision. The mandate's capital requirements can be managed in the most efficient way for the scheme. It can also be managed and evolved to best capture market opportunities and adapt to changing circumstances. Such an approach is complex and requires a larger governance commitment from the client and their advisers, typically limiting such mandates to larger pension schemes with extensive resources.

The Asset Manager

LDI solutions are complex and can transform a pension scheme's entire investment approach. They require a manager with extensive knowledge of pension schemes' requirements, current market conditions and the range of market instruments available, especially in the fixed income and derivative markets.

Selecting the right asset manager could be the most important factor in a pension fund's decision to adopt an LDI approach.

(8 Marks)

- d. The trustees will have to consider the following factors while formulating an LDI strategy:
- The trustees will need to consider whether the scheme is a mature one or a relatively new scheme. A mature scheme will have more predictable cashflows; hence, better matching can be achieved via bonds or less-risky assets. On the other hand, if liabilities are largely unknown, a higher level of risk may be required to generate 'extra' return to overcome the uncertainty surrounding the exact level of their future member payments.
 - The trustees will have to consider the funding level of the scheme. While fully funded schemes can afford a matched approach, underfunded schemes may need to take more risk to reduce the funding gap. However continuing to take risk may also result in a worse position if the assets and liabilities perform very differently than expected.
 - A pension fund that is supported by a strong sponsor can afford to take more risk than its counterpart who has a financially weak or reluctant sponsor. By assessing the employer covenant, it is possible to find the level of investment risk that can be borne by the employer
 - The trustees will have to consider the time frame of the scheme. Schemes that have long time horizons can better afford riskier strategies with higher volatility in exchange for potentially higher long-term returns.
 - Trustees need to understand the extent of their own, the scheme's members, and their employer's risk appetite – how much pain are they prepared to accept in pursuit of higher returns.
 - How the overall performance target will be broken into index tracking and active fund management? For example, trustees may set a target of outperforming the liabilities by 2%, with 1.5% coming from sources of market returns and 0.5% from active investment management.
 - If the proposed LDI strategy required major changes, the trustee will have to decide whether the move will be carried out in one go or in a phased manner. Phasing reduces the risk of bad timing but exposed the scheme to other risks during the phasing period. Dynamic switching can also be used with the help of derivatives.

(3 Marks)

[Total Marks-15]

iii.

- a. Contingent assets can be particularly helpful in overcoming the potential conflicts that might exist between the pension fund and the corporate sponsor when setting investment strategy. They may therefore facilitate agreement on an appropriate liability-driven approach.

Contingent assets might:

- Provide a method of sharing the risks and rewards of an investment strategy, by allowing assets to pass back to the employer if investment risk is rewarded.
- Allow the corporate sponsor to gain greater control over asset allocation and/or risk management. The corporate might want to pursue either a more or a less risky strategy than the Trustees might otherwise pursue.
- Provide support to give the Trustees confidence to agree to riskier investment strategies.

(3 Marks)

- b. Disadvantages of setting up a contingency fund

- Salting away money into a contingency fund can seem like wasting money that could be used elsewhere, for example, for running the business, buying more assets, etc.
- It can be tempting to use the money in a contingency fund for other “emergencies” that are not actually defined for the use of the fund.
- Setting up a contingency fund will lead to additional administrative burden and costs.
- There could be legislative constraints or tax implications.

(2 Marks)

- c. Advantages of holding Fund beyond Solvency

- FBS acts as an extra cushion, over and above the regulatory capital requirements which can be used in case of emergencies.
- Since FBS is not regulated, it gives the shareholders an opportunity to generate higher returns (due to greater investment freedom) and therefore an incentive to put in more capital.
- FBS can help reduce the volatility in capital requirements.
- FBS allows the business to take more risks and expand.

(2 Marks)

[Total Marks: 7]

iv.

- a. LDI in pensions as compared to LDI for an insurance company offering bulk purchase

Background

The liabilities of an insurance company offering BPA will be similar to pension funds.

The one significant difference in insurance company liabilities, is that bulk purchase annuity buyouts are based on accrued deferred pensions, and do not offer a linkage to final salary prior to retirement. Instead pensions in deferment may be indexed with respect to RPI, e.g. with a floor of 0% and cap of 5% over the deferred period, depending on the scheme rules and the benefits secured.

Traditional Approach

Traditionally insurance companies have typically backed BPA liabilities with a portfolio almost exclusively of bonds, with perhaps a small amount (e.g. 5%) of property with bond-like characteristics (e.g. long-dated secure leases). Typically no equities are held.

The bonds used typically:

- are denominated entirely in local currency.
- have a high proportion of corporate credit, rather than government bonds.
- have been selected so that the bond cashflows match reasonably closely not only the duration but also the year-on-year expected cashflows from the liabilities.
- where liabilities are inflation linked, the bonds will be similarly inflation linked, which tends to require a higher proportion of Government index-linked bonds due to the relative dearth of corporate inflation linked issuance.

This contrasts to the traditional pension fund approach which typically held significant equity investments against pension liabilities and with bond holdings based on market benchmarks rather than the specific nature of the liabilities. Pension funds have also historically not invested significantly in credit, with bonds seen as a risk-free investment.

Reasons for Traditional Approach

The traditional insurance company approach is driven by a combination of good economic reasons and particular regulatory features.

In contrast to pension funds, insurance companies must hold sufficient assets at all times to meet their liabilities. They must also hold additional capital against asset-liability mismatches. This is because insurance companies cannot rely on the support of future contributions from an external sponsoring employer.

This has focused insurance companies, much more than pension funds, on the importance of asset-liability matching and on the cost – in terms of a cost of capital – of asset liability mismatches.

Insurers are also required to discount liabilities at rates that are based on current market yields using the full yield curve, consistent with the view that the pension liabilities are essentially bond like.

In particular, holding significant equity assets against essentially bond like liabilities leads to significant capital requirements which would typically render the business uneconomic.

Use of Credit Spreads

Credit can also be a good asset to back annuity business:

- Credit spreads historically have been very wide relative to historic default losses, leading to an expected credit premium above risk-free rates.
- Year-by-year cashflow matching is possible to a reasonable tolerance from available bonds.
- Available market yields and credit spreads can be used to drive pricing of new business

However, there are also specific features of the regulations that drive specifics of behaviour:

- The traditional regulatory valuation allowed life offices to capitalise part of the expected capture of credit spread when valuing liabilities. In addition, mark to market volatility on credit, arising from spread volatility, could be recovered via the liability valuation. Hence, and in contrast to the treatment of equities, taking risk through credit actually leads to a reduction in regulatory capital requirements.
- Life companies must hold resilience reserves against exposure to equity volatility and interest rate mismatches. In addition, most insurers hold additional cashflow

mismatching reserves, assuming prudent dis- and re-investment rates where asset and liability flows are not fully matched.

- Regulations strictly limit the extent of currency mismatching allowed.

Challenges

- Improved technology in terms of assets available, in particular from the derivatives market.
- Regulatory changes which treat credit consistently with other assets and focuses on the benefits of diversification.
- An influx of new entrants into the BPA market. These have often been funded by private equity capital and the owners and management teams may not have a traditional insurance perspective. The new entrants have also increased competition and hence the need to further enhance asset returns to compete.

(8 Marks)

b. Limitations of LDI

- Can be too risk-averse
- Impact of other risks like longevity risk, contribution risk, solvency risk, etc. is not properly accounted for in LDI
- Too complicated for open-ended pension schemes
- Matching assets are not always be available at the right price
- Has to be flexible and low-cost so that it can be reviewed periodically using updated cash flow projections in order to accurately track the changing liability structure
- Lack of clarity in regulations

(2 Marks)

c. Comparison of LDI strategies:

Duration Matching

- Feasible in practice
- Effective – gives approx 90% of the optimal solution
- Easily adapted for changing liabilities

Maturity Bucket Matching

- Less precise but more practical than duration matching
- Reduces the impact of non-parallel shifts to the interest rate curve
- Inaccurate in case of changing liabilities

Cashflow Matching

- Most precise matching technique
- Matches all higher-order interest rate sensitivities
- Difficult to implement in practice

(4 Marks)

[Total Marks: 14]

v.

- a. RAPM is a performance metric that assesses reward with some adjustment for risks, that is, the greatest expected reward for a given level of risk or, equivalently, the lowest risk for a given expected reward.

The reward can be revenue, profit, returns, etc. and risk can be measured as volatility, beta, value-at-risk, etc.

Alternatively RAPM can be defined as the firm's risk-adjusted return (revenues less expenses less reserves allocated to cover expected losses) divided by risk-adjusted capital (capital required to support unexpected default, interest-rate or market losses less capital released by correlations among the risk factors).

Some famous RAPMs include Treynor ratio, Sharpe Ratio, Jensen's alpha, Return on Capital (ROC), Risk-Adjusted Return on Capital (RAROC).

(1 Mark)

- b. Limitations of Sharpe ratio

- Uses standard deviation which is based on normal distribution. Hence, does not capture many real-world scenarios which exhibit non-normal or skewed behavior. Thus ignores tail risks.
- It treats all volatilities as same (whether positive or negative). This may not suit all investors. For example, to an investor looking for a potentially rewarding investment, sharp volatility to the upside is not necessarily a bad thing, yet the Sharpe ratio does not differentiate them, and thus the volatility would be penalized in the formula.
- Does not account for correlations across other assets
- Time dependent - rises with square root of time
- Illiquid holdings bias ratio upwards
- Ignores transaction costs
- Based on back testing results. Therefore, the ratio is only going to be as good as the back testing data that was used to calculate it.
- Tells you that one investment is better than the other comparing risk, but does not tell you how much better that investment is. In other words, there are no units to measure the added benefit from choosing one investment over another.

(3 Marks)

- c. Sortino Ratio is calculated as

$$\text{Sortino Ratio} = \frac{\langle R \rangle - R_f}{\sigma_d}$$

Where,

$\langle R \rangle$ = Expected Return

R_f = The Risk Free Rate of Return

σ_d = Standard Deviation of Negative Asset Returns

Sortino ratio is a modification of the Sharpe ratio, using downside deviation rather than standard deviation as the measure of risk — i.e., only those returns falling below a user-specified target or required rate of return are considered risky. Thus Sortino ratio penalizes only those returns falling below a user-specified target, while the Sharpe ratio penalizes both upside and downside volatility equally.

(2 Marks)

d. Challenges in implementing RAPMs and their proposed solution

Challenges in RAPM	Basic Principles for RAPM
Too complex Based on models that despite their increasing complexity do not fully replicate the reality of management and policyholders behaviors	A good balance between simplicity and representation of the reality (especially policyholders and management actions) should be achieved. Performance measurement should be aligned with pricing and expense decisions, measured in a real world or risk-neutral environment (depending on the indicator) and should include future business (with a distinction between in force business, renewals, and new business). Back-testing should demonstrate that behaviors are well replicated by the model.
Very sensitive to the parameters and assumptions used to derive the income (e.g. discount rate, future premiums, risk-margin measurement methods) and the capital. Very sensitive to short term market volatility	These challenges are hard to avoid. However, the RAPM methodology could be aligned among the industry and not change over the years. To increase confidence, all aspects of expert judgment should be identified and sensitivity testing to assess materiality should be provided.
Partially used to run the business	RAPMs should be sufficiently transparent to be easily understood by executives and staff. If not absolutely necessary, it should be avoided to produce different sort of RAPMs for the different standards (sometimes corresponding to different departments in a company), or for different lines of business.
Not always considered as relevant by investors and analysts which are not able to reconcile them with indicators produced in other industries	Basic information used to produce RAPMs should be published e.g. deterministic projection, timing of the cash flows, methodology to derive stochastic scenarios, impact of policyholders' behavior and management actions on the model. A reconciliation between similar indicators produced for prudential, accounting, or performance purposes, should be performed.

(2 Marks)

- e. RAPMs can be applied for:
- pricing of products
 - capital allocation for business development
 - investment strategy
 - employee compensation

(1 Mark)

[Total Marks: 9]

[55 Marks]

Solution 2 :

i.

a. Three methods of pension fund's equity valuation:

i) Market valuation

- Independent & objective. Easily explained or justified
- Values subject to high fluctuation Incompatible with long-term value of liabilities.
- Easy to arrive at values. Can be done by hooking up to on-line prices.
- Better suited as realizable value of the assets on that day.

ii) Discounted cash flow of the portfolio assets

- Subjective valuation. Can easily give rise to difference of opinion.
- Method is consistent in application and compatible with liability values
- Different values for different asset mix-ups. The asset-mix can be arranged to produce better valuations.
- Can be done for the portfolio or for each security.
- Difficult to estimate growth factors if each security is to be valued.
- Final figure may not justify the time and lab our involved.

iii) Notional portfolio

- Not subject to manipulation as actual assets are ignored
- Extremely subjective and difficult to explain
- Simple to perform with less effort.

(3 Marks)

b. The growth in the earnings of the firm will happen because of retained earnings and hence the growth rate expected for the firm

$$\begin{aligned}
 &= \text{Return on Equity (RoE)} * \text{Retention ratio} \\
 &= \text{Return on Equity} * (1 - \text{dividend payout ratio}) \\
 &= 13\% * (1-0.7) \\
 &= 3.9\%
 \end{aligned}$$

Cost of Capital

$$\begin{aligned}
 &= \text{Risk free rate} + \text{Beta} * (\text{Market return} - \text{Risk free}) \text{ [or Risk free rate} + \text{Beta} * \text{Risk Premium]} \\
 &= 7\% + 0.9 * (12\% - 7\%) \\
 &= 11.5\%
 \end{aligned}$$

Expected dividend yield

$$\begin{aligned}
 &= \text{current dividend} * \text{expected growth rate} \\
 &= 1.4 * (1 + 3.9 \%) \\
 &= 1.4546
 \end{aligned}$$

Thus value of each share of the firm

$$\begin{aligned}
 &= \text{Expected Dividend Yield} / (\text{Cost of Capital less Expected growth rate}) \\
 &= 1.4546 / (11.5\% - 3.9\%) \\
 &= 1.4546 / 0.076 \\
 &= \text{Rs } 19.14
 \end{aligned}$$

(3 Marks)**[Total Marks: 6]**

ii.

a. The reasons may be

- Reinvestment of coupon may not occur at 10.5%
- Default by issuer
- Return on overseas bond affected by currency movements
- Purchase price includes option premium, but option not exercised.
- Dealing costs
- Issuer exercises a call option against the investor.
- Note also that tax may sometimes even be payable by a tax-exempt investor (e.g. on overseas bond, where the withholding tax cannot be reclaimed or due to a change in tax rules).

(2 Marks)

b. Problems with using a single yield curve:

- Spread of coupons makes a single curve inappropriate due to investors who are taxed differently on income and capital gains (those taxed more heavily on income will prefer low coupon stocks)
- Spread of coupons makes a single curve inappropriate due to redemption optional dates
- Some government bonds have special features that may distort the yield curve

Problems with gross redemption yields:

- gross redemption yield assumes reinvestment of the coupon at the same rate
- stocks are not normally held until redemption
- net redemption yield is more appropriate for many investors.

(2 Marks)

c. How volatility varies with increases in:

i) Coupon: higher coupons mean that more of the present value of the government bond is received sooner, so volatility is lower.

ii) Term:

- a longer term to redemption means that volatility is higher.
- Some low coupon long dated stocks can have higher volatility than similar coupon undated stocks.

iii) Redemption yield: a higher rate of discount decreases the importance of later payments and thus volatility is lower.

When the conventional government bond has a long term and a low coupon relative to current yields, then it may be more volatile than an undated stock.

An increase in expected future inflation will lead to higher yields. The volatility is lower when yields are higher, so there is a reduction in volatility.

(3 Marks)

d. The economic factors influencing bond yields are as follows:

- Inflation: Inflation erodes the real value of income and capital payments on fixed coupon bonds. Expectations of a higher rate of inflation are likely to lead to higher bond yields and vice versa.
- Short-term interest rates: The yields on short-term bonds are closely related to returns on money market instruments so a reduction in short-term interest rates will almost

- certainly boost prices of short bonds. However, a cut in interest rates may be interpreted as a sign of monetary easing with inflationary consequences. Therefore long bond yields may fall by a small amount or even rise.
- Fiscal deficit: Fiscal deficit is often funded by the government issuing bonds which puts upward pressure on the yields. This will be particularly acute at the durations that the government is targeting with its bond issues.
 - The exchange rate: Changes in expectations of future movements in the exchange rate will affect the demand for bonds from overseas investors. In addition it will alter the relative attractiveness of domestic and overseas bonds for local investors.
 - Institutional cashflow: When an institution has an inflow of funds its demand for bonds will increase and hence bond yields can be affected accordingly. Changes to investment philosophy may significantly affect demand and hence bond yields.
 - Returns on alternative investments: The relative attractiveness of alternative investments will influence the demand for bonds and hence the yields that they offer. If other investments are attractively priced then demand for bonds will fall and the yield will rise.

(5 Marks)
[Total Marks: 12]

iii.

Product provides a 6 month return equal to
Max (0, 0.4R)

Where $R \rightarrow$ return on Index

Suppose S_0 is current value of the index and S_T is value at end of 6 months

When amount A is invested, return received at the end of 6 months is

$$A \max\left(0, 0.4 \frac{S_T - S_0}{S_0}\right)$$

$$= \frac{0.4}{S_0} * A \max(0, S_T - S_0)$$

This is $\frac{0.4 * A}{S_0}$ at the money European call options on the index. With the usual notation, they have value:

$$\frac{0.4 * A}{S_0} [S_0 e^{-qT} N(d_1) - S_0 e^{-rT} N(d_2)]$$

$$= 0.4 * A [e^{-qT} N(d_1) - e^{-rT} N(d_2)]$$

If $r = 0.08$, $\sigma = 0.25$, $T = 0.5$ and $q = 0.03$

$$d_1 = 0.2298$$

$$d_2 = 0.0530$$

$$N(d_1) = 0.5909$$

$$N(d_2) = 0.5212$$

Value of the European call option is

0.0325A

This is the present value of the payoff from the product. If you buy this product you avoid paying 0.0325A at time zero for the option. The cashflow is

Time 0 $\rightarrow -A + 0.0325A = 0.9675A$

After 6 months $\rightarrow +A$

Return with continuous compounding is $2 \ln (1/ 0.9675) = 0.066$ i.e 6.6% per annum.

Therefore the product is less attractive than a risk free investment.

(6 Marks)

iv.

a. SLB refers to a mechanism wherein investors can lend their idle shares to other investors through the clearing corporation/clearing house of stock exchanges to earn interest income. Lending and borrowing of shares is a vibrant segment in developed markets with many institutional entities actively participating in such trades.

(1 Mark)

b. It will help insurers generate extra yield on the securities held in their custody by lending securities. Insurance companies will benefit from this move as it allows them to earn risk-free return.

(1 Mark)

c. Important considerations for the Securities lending scheme

- Securities lent would be treated as if the insurance company owns such securities and all the benefits arising on such securities shall be available to the insurer only.
- Securities lent should not amount to creation of encumbrance, charge, hypothecation or lien on such securities.
- Lending fees shall be accounted on an accrual basis.
- Lending of securities is permitted only after obtaining approval of the investment committee.
- Investment policy of the company has to be suitably amended to put in place adequate risk management framework.
- SLB framework shall be governed by the guidelines issued by the Securities and Exchange Board of India from time to time in this regard.
- Disclosure requirements in respect of the securities are also provided in the circular.

(2 Marks)

[Total Marks: 4]

Answer 5**a. Category I & II AIFs**

AIF – Alternative Investment Funds are funds established or incorporated in India for the purpose of pooling in capital from India and overseas to be invested as per a pre-decided policy.

Life and general insurance companies were allowed to invest in category I AIFs, comprising infrastructure funds, SME funds, venture capital funds and social venture funds. Category II AIFs comprise private equity funds and debt funds.

Insurers have a wider investment opportunity in the form of private equity and debt funds. Usually returns from these investments are much higher. So it gives an opportunity for insurance companies with large funds to have alternates investments options. Insurance is one of the most important pool of capital. It also helps the economy when more of such funds become accessible for other smaller companies.

(4 Marks)

b. Private equity investment is a name given to a particular form of unquoted equity investment.

It covers such investment classes as

- Venture capital - Small companies in the early stage of their growth that would have difficulty raising finance in the traditional investment markets.
- Leveraged buy-outs - Management buy-outs and management buy-ins of subsidiaries of larger diversified companies.
- Development finance - Longer established companies that need to raise finance for the next stage of their growth
- Restructuring capital - Transactions that involve a small public sector company being sold into the private sector.
- Public/private transactions where a publicly quoted company is purchased by a group of private investors.

(3 Marks)

c. Risks involved with private equity fund

- Private equity investments are often small companies, which are still largely owned by the founder of the company. They have higher systematic risk.
- Life insurance company needs to have the expertise to understand the business ideas, scalability for that idea and eventual returns it is likely to achieve.
- Private equity investments often have lock-in periods during which the life company cannot withdraw their capital. This can add to the marketability risk.
- Such investments may not be admissible above certain limits for solvency calculations, and hence can be less popular.
- Such investments can be inefficient due to the lack of diversification ie too much concentration on certain sectors of the economy.
- There is often less information than is available in a publicly quoted company.
- Such investments also require more management time because of the close cooperation that is required between founder and life insurance company.

(5 Marks)

- d. Generally if the business is at an early stage then Business Angels are the most likely source of funding. Venture Capital firms may come on board at a later stage when the concept is proven and initial revenues obtained in order to more quickly expand the company.

Angel Investor

- An individual investor
- May be willing to invest in early-stage or start-up businesses, as well as established companies
- Investment amounts: 1 cr – 5 cr, sometimes a bit more,
- May Have experience and contacts to contribute
- May be willing to be "hands-off" or "hands-on"

Venture Capital

- A company or business rather than an individual
- Seldom interested in early-stage, unless compelling reasons (eg. high tech with already successful founders)
- Investment amounts: INR10 cr +
- Definitely Have contacts
- Require seat on board

(5 Marks)

[Total Marks: 17]

[45]
