

Institute of Actuaries of India

Subject SA6 – Investment

October 2009 Examination

INDICATIVE SOLUTION

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable

Answer 1 A:

Defined benefit retirement plans have clearly defined liabilities regarding payment of retirement benefit to its members. The risk on investments is clearly on the plan sponsor / employer.

Nature :

- a. The benefits are typically based on salaries at the time of retirement. Thus the liabilities are real in nature linked to the salary inflation.
- b. Benefit structure. The benefit payment after retirement may be structured in a manner wherein they are fixed in rupee terms, may have a fixed increase of x% or may be again linked to the some inflation factor.
- c. Age distribution of the scheme members may be a factor in determining what proportion of pension liabilities are real and what are fixed in rupees terms or have fixed increases at some level. Thus for a scheme which defined fixed benefit payment linked to salary at retirement if the age of the population in the scheme is young (immature schemes) then most liabilities can be considered to be real in nature since they would increase as the salary of this population increases whereas if the members are close to retirement or have a large proportion of retirees (already retired and drawing pension) then the liabilities may be more nominal / fixed in nature and not real.

Term:

The liabilities would be quite long term in nature. For young members in the scheme the liabilities are very long term since there would be an accumulation phase and then a payment phase. To give an example if the population average age is around 35 years and retirement age is 60 years with average life span being around 85 years the liabilities can be said to be for almost 50 years.

Thus we find the following are important determinants of the term of the pension plan liabilities.

- a. the age of the employees
- b. their retirement age
- c. the ratio of employees currently working (the active lives) and the pensioners (people who have already retired).
- d. the expected life span of the retired lives
- e. whether the pension plan is a going concern or is a closed scheme expected to terminate.

Liquidity Requirements:

The liquidity requirements would depend on the contributions coming to the fund from the plan sponsor (employer) and the benefit payments made to beneficiaries. Thus the liquidity requirement would depend on the following:

- a. Ratio of the employees currently in work vis-à-vis the number of pensioners. Schemes which have more younger employees in workforce who have not retired as compared to the number of pensioners would have more contribution and hence higher liquidity available.
- b. Features like early retirement or early payout of benefits on ill-health ground etc.
- c. Unexpected outgo like bulk transfers wherein payments are made to another scheme. This can happen if there is a sale of a subsidiary, merger or takeovers etc.
- d. Lump-sum withdrawals allowed at the time of retirement. This may require more liquidity at the time of such withdrawals.

Investment Freedom:

The investment freedom is a function of the risk appetite of the Plan sponsor and the trustees of the scheme. The Plan sponsor would like to seek the best possible returns since that would minimize his contributions to the scheme but the investment freedom would be constrained by the following:

- a. The surplus of assets over liabilities in the pension plan.
- b. The financial strength of the Plan sponsor. A more profitable plan sponsor can take more investment risks in managing the pension plan assets.
- c. Age of the workforce. If the workforce is young then the liabilities are many years away and hence more investment freedom.
- d. Smaller correlation between the business operations of the Plan sponsor and the pension plan assets would mean more investment freedom for managing the pension plan assets.

Answer 1 B:

- a. The main investment objective for a defined benefit plan is to pay the retirement benefits as promised.
- b. The returns must at least be equal to the actuarial discount rate used to calculate the present value of the pension plan liabilities.
- c. But the plan sponsors would expect higher return generation so that their contribution requirement can be reduced or higher benefits may be offered to the scheme members.

Answer 1 C:

- Funding status implies whether the assets are in surplus to the liabilities or not. Any underfunding means there would be more effort to match assets and liabilities and lack of cushion leads to lower risk tolerance. Higher investment risk cannot be taken since that may increase the pension plan deficit (the underfunding) requiring more contributions from the PSU to the pension plan assets.

On the other hand if there was a surplus of assets over liabilities then that cushion would have provided more investment freedom to the fund manager to manage the assets. The plan surplus in case of the PSU bank means it can take greater investment risk in the management of the pension plan assets to generate more returns in future which may reduce the contribution requirements of the PSU. Thus we can say a surplus in pension plan means the risk tolerance level is high.

- The average of employees being 40 years the liabilities are of fairly large durations. There are 20 more years till retirement (at age 60 years) and thereafter the average life span being above 80 years there would be a payment of the pension for a further period of 20 years or more. We also have some immediate liquidity requirements since one fifth of the workforce has already retired and is receiving pension. But overall the time horizon is quite long. A longer time period implies more investment freedom for the fund manager and higher risk tolerance as far as pension assets are concerned. On the other hand we have to see the availability of assets for such a long duration and the reinvestment risks involved.
- The PSU is profitable and has lower operating risk as indicated by a low operating leverage. The balance sheet is also strong as indicated by low financial leverage. Thus it can take higher investment risk in managing the pension plan assets (though within the limits permissible by the regulator). Thus profits and financial strength means higher risk tolerance in managing pension plan assets.

- PSU being a bank is also into fund management business. It has a MF subsidiary whose earning through the fund management charges are linked to the asset performance. Thus we find that the pension plan assets of this PSU are highly correlated to the business of the PSU. Any adverse market movements whether interest rate or equities may adversely impact the fortunes of the PSU as well as its pension plan assets. A high correlation in the operation of the PSU and its pension assets implies lower risk tolerance and lesser investment freedom for the manager looking after the pension plan assets.
- The early withdrawal facility in case of any illness etc means there would be more liquidity requirements due to the uncertain nature of illness and thus lesser investment freedom and lower risk tolerance. Though this can act to reduce the duration of the liabilities which are otherwise very long term in nature and the Indian markets do not have adequate assets for such long term. This may reduce the reinvestment risks.
- A lumpsum withdrawal facility at maturity means there would be a liquidity requirement at the time of retirement etc when benefits fall due. But in Indian market where assets are not available for very long durations it serves to reduce the average duration of liabilities and reduces the reinvestment risk. For the portion of likely lump sum withdrawals we are concerned with the only 20 years left till retirement and not the next 20 years post retirement when pension payments will be made. Thus investment assets can be of shorter durations and they would be available in the market. Thus though there is a liquidity risk the impact of reduction the reinvestment risk is likely to be more in the Indian markets thereby increasing the risk tolerance of the pension assets.

Answer 1D:

The objectives can be stated as follows:

- i) The pension plan assets must earn a minimum of 7% return (which is equal to the actuarial discount rate applied for the valuation of the liabilities).
- ii) A desirable income of 8% is stated thus we can say that the least the firm should earn is 7% but the realistic target over long term is to get 8%. This is less than 9.25% earned in the past few years.
- iii) The plan is overfunded and thus may have lesser requirement of contribution from the employer. If the fund assets keep earning a return which is higher than the actuarial discount rate then the contribution requirement each year would be lower or the company may decide to enhance the benefits offered to employees. Thus the stated objectives may include earning higher than actuarial discount rate so as to effectively reduce the future contribution requirement.

Answer 1E:

The risk tolerance level can be regarded to be above average. The various reasons for the same include the following:

- i) Average age of employees is low and there are more members contributing than pensioners thus liquidity problems are not there.
- ii) The company is profitable and has a stable balance sheet position with low financial leverage.
- iii) The longer duration of liabilities allow more flexibility to include risky assets like equities which are expected to generate higher returns in the long term.
- iv) The actual earned income over the last few years has been higher than the expected return of 8%.

Answer 1F:

	Asset Type	Expected Return	Existing Allocation	Suggestions (Increase / Decrease/ Unchanged)	Explanation as to why it is to be increased, decreased or kept same.
1	Equities (Index stocks)	12%	45%	Decreased	A large part is into equities which will meet the Bank's objective of generating higher returns and minimizing contributions but the equity selection should move to identifying other good stocks which may outperform in the long term rather than passively investing in index stocks
2	Equities (Mid-Caps)	14%	5%	Increased	The mid-caps will generate higher returns over the long term and need to be increased in the portfolio by reducing the weight of index stocks so that overall equity exposure may still remain at 50%
3	G-Secs <=5 yrs	7%	20%	Decrease	The short term liabilities are small and the liability duration is 20 years and above. Thus even though the short term bonds are less volatile, maintaining a large portfolio of short term bonds with lower expected returns is not advisable.
4	Long term G-Secs	8%	20%	Increase	The liabilities are pretty long term in nature thus increase would lead to better matching of assets and liabilities and long term bonds would have the advantage of generating higher returns too.
5	Money Market	5%	10%	Decrease	The return on Money market would be lower. Though a little liquidity is required since 20% of the workforce has started receiving pension a large part of this liquidity requirement can be met by the contributions from the bank for the current workforce. The current contributions would be larger than the payouts thus a smaller money market proportion is required.

Answer 1G:

The earnings generated during the year = $725 - 500 - 78 - 96 = 51$

The average fund value during the year = $500 + 78 * 8/12 + 96 * 4/12 = 584$ crores (the 78 cr of cash-inflow was invested for 8 months and 96 cr was invested only for 4 months).

Thus the TWRR (Modified Deitz method) = $51 / 584 = 8.73 \%$

Answer 1H:

The expected monthly return is $9\%/12 = 0.75\%$

The size of the assets at the end of February = 710 crores

The monthly SD = $18\% / 12^{0.5} = 5.1962\%$

The z value at 95% confidence interval = 1.645

Thus VAR for the portfolio = $(0.75\% - 1.645 * 5.1962\%) * 710 = 55.3635$ crores

Answer 1 I:**DB schemes:**

- For DB scheme the Plan sponsors (Employers) bear the liability for the benefit payment. The benefits are clearly defined and are usually linked to salary and number of years of service etc. The Plan sponsor runs the investment risks since the liability to make good any underfunding and / or the onus to maintain Plan surplus remains with the Plan sponsor.

Hence there is a focus to minimize risks while trying to maintain the expected returns. There is an effort to match asset and liability durations. The assets have to be invested in a pre-specified manner as per regulations. For instances where insurance companies are acting as asset managers the insurance regulator IRDA has laid down rules for asset allocation. The regulations insist on fair share of government bonds to ensure stability of returns and limit the risk taking instruments like equities etc.

The beneficiaries (employees) would receive the entitled pension payment after retirement etc and do not bear investment risk in the portfolio.

DC Schemes:

- DC schemes are not risky for Plan sponsors from ALM point of view since the plan sponsors would need to contribute a pre-stated amount for every employee and thereafter if the investment of such contribution does not do well the plan sponsor is not called upon to make good the underperformance. The beneficiaries (employees) own the plan assets and can transfer their accumulated contributions to new employer as and when they may change jobs. Thus the investment risk is on the beneficiaries and they can take the investment decisions given the availability of investment vehicles.

The Plan sponsor's liability is limited to the annual contributions required to be made but they may be expected to provide alternative investment opportunities in terms of different entities managing the funds. For example the scheme may members may be given a choice of different insurers (or entities) where they can park their funds or within one insurer they may have a choice of different funds (equity, debt , money market and / or a combination of these).

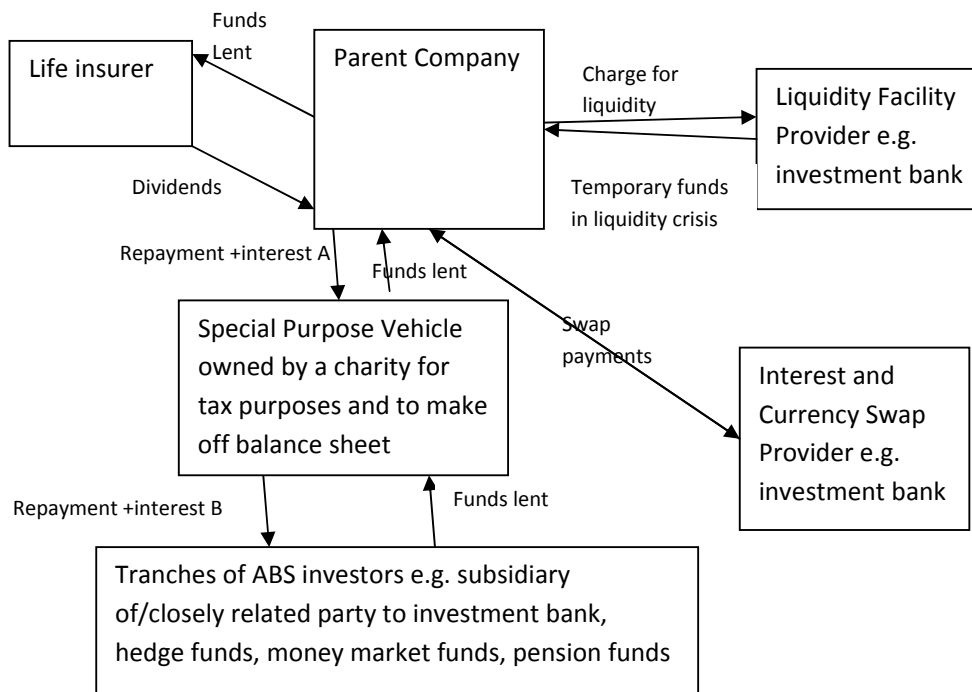
The Plan sponsor can also provide assistance to the scheme members in monitoring the plan assets and their performance. IT or system support to regularly monitor the value of investment can be an example.

[53]

Answers to Question 2:

2a) Asset backed securities result from the securitization of a revenue generating asset held by the borrower. The income from the asset, or more typically, pool of assets is repackaged as the repayments on an issue of bonds which are then sold in the market or placed in a private placement to a specific investor e.g. a conduit. The secured assets are ring fenced so other assets are not used to benefit ABS debt holders.

Cashflow diagram with SPV, as structured by an investment bank.



Different rates of interest (A, B) are charged to different entities in order to make a profit.

The largest ABS market relates to securitisation of mortgages, where the provision of mortgages to customers is a long term (e.g. 20 years) loan and can be at floating or fixed interest rates. The bank would borrow money from investors by issuing ABS(MBS) and lend the proceeds of such issuances to retail customer borrowers who were purchasing properties. The bank would repay its loan from the repayments the retail customers make in the future. The bank's payment would be dependent on the borrowers actually making their payments.

Different ABS investors will have different lending requirements e.g. currency, term, credit rating and so as to raise the funds at the least cost the ABS can be tailored to meet the risk/return profiles of various target market investors and this leads to a tranching structure.

ABS investors will loan for a shorter period e.g. 7-10 years (expected maturity as opposed to legal maturity) than the repayment term from the retail customer. Hence there may be a need for a liquidity facility provider to cover the period when initial ABS investors bonds are redeemed and second set of ABS investors provide capital.

Also the ABS investors may expect a floating rate return e.g. LIBOR + 200bp whilst the mortgage borrower pays say 8% flat. Hence there is a mismatch and an interest swap might be entered into with the investment bank.

Often different tranches can be denominated in different currencies and so a bespoke amortising swap is required to match the expected repayments of capital and interest.

Tranching is based on various models of default of underlying assets so AAA most likely to pay off and BBB or equity tranches least likely. Many deterministic scenarios considered based on historical asset defaults to meet rating agency criteria for rating of a particular tranche i.e. would cashflows with a certain default rate ultimately repay interest and capital of a particular tranche given the cashflows that were required to support a more senior tranche?

Examples of ABS – mortgages, credit cards, life insurance VIF, car loans, student loans, and the profits emerging from life insurance books.

In this particular case, the cash received from the issuance of the ABS by the parent company would be available to downstream to the life insurer when it required further capital to meet the new business strain (commission and initial expenses) from writing new business. If profits emerge from the defined book of business which has been ring fenced (if the same book of business as has been financed by the down streaming of cash it would be a new business securitisation, if not then in would be a Value In Force securitisation) then the parent company would make coupon and redemption payments to the ABS security holders. Definition of profits could be on a statutory basis or embedded value basis.

Once the ABS investors have been repaid with the agreed interest payments on their loan, subsequent profits from the securitised line of business belong to the life insurer/parent company.

Note that there is a potential liquidity strain at the parent company in this structure as there is no obligation on the life office subsidiary to make a dividend payment from profits emerging to the parent company. The parent company is still obligated to make a payment and so would need to find cash from other sources or use the liquidity facility.

b)

- The ABS structure raises cash for funding the group's expansion in the life insurance sector more cheaply than equity capital. However, it will be more expensive than issuing debt. If all cashflows follow their best estimates then the company has economically borrowed money to fund expansion and repaid that loan – so there are additional borrowing costs.
- Issuing more non-contingent debt may not be possible due to market/covenant reasons whilst such contingent debt may be permitted
- Many investors wish to participate more directly in the Indian insurance markets growth and such ABS would facilitate that participation
- Many investors/parent company might see such an ABS issuance as providing some guidance on the market valuation of such insurance cashflows and so aid the assessment of the market valuation of the insurer if it were to IPO in the near future.

- There is a potential risk that profits in the life insurer do not lead to dividends from the life insurer to the parent company e.g. if there were losses in other lines of business in the life insurer that had not been securitised (a liquidity trap) and so the parent company would have an obligation to make a payment but no asset from the life insurer with which to make that payment and so would have to use other resources to meet its obligations.
 - The tax consequences of such a transaction may be complicated.
- c) 1) Conventional With Profits – written in 90/10 gate
- Only 10% of profits belong to the shareholders and so are transferable to ABS investors
 - Investors would prefer as much certainty as possible to their payments and so would wish to avoid liquidity trap of the 90/10 gate (having dividends being payment from the life insurance company and additional liquid resources in parent company reduces the investors likelihood of not being paid)
 - Profits determined on a statutory valuation basis might change in the future making modelling of ABS investment difficult
 - Guarantees in with profits might bite due to market movements reducing transferrable profits.
- 2) Immediate payment Annuities (no payment on death) – written in the non - participating fund
- Profits emerging very susceptible to interest rate movements unless well matched. May be issues if matched on statutory basis but profits emerging for the transaction are calculated on an embedded value basis.
 - Exposure to longevity risk which is not so well understood. However, likely to give diversification of market risk so can be a benefit.
 - Expense experience should be within the control of the life insurance company but due to potential non-alignment of interests with investors, investors may want to cap expenses to be used in the profit calculation.
- 3) Unit Linked endowments with no guarantees – written in the non-participating fund
- Profits emerging from fund management charges are volatile as fund values change with market movements. However, ABS could hedge such equity/interest rate movements
 - Profits emerging very dependent on lapse experience, which may be correlated with market values
 - Expense experience should be within the control of the life insurance company but due to potential non-alignment of interests with investors, investors may want to cap expenses to be used in the profit calculation.
 - Mortality experience expected to be stable
 - Regular fixed fee deductions will add stability to cashflows
- 4) Unit Linked endowments with guarantees– written in the non-participating fund
- As 3)
 - Guarantees might bite due to market movements reducing transferrable profits

Recommendation to use 3) with perhaps some element of 2) to give diversification.

- d) i) It would be necessary to build a cashflow model of the selected lines of business which were to be securitised and then consider a number of deterministic scenarios of investment return, expense experience, mortality experience, lapse experience to see whether the loan would be repaid or not and over what timescales. Experience of other such transactions or insurance company experience would be helpful. Specific features of the transaction would also need to be stress tested including the lack of direct cash link between the life insurer generating profits and the cash payment required to be made by the parent company. The parent company might also need to be modelled for such a stress or liquidity facilities added to the contract to remove the risk.
- ii) Obtain a credit rating for the transaction; attempt to wrap the cashflows so that an AAA monoline insurer agrees to pay ABS investors in case the parent company does not pay. The parent company pays the monoline for providing this guarantee to the ABS investors as the cost historically was less than the benefit of reduction in borrowing costs.
- e) To determine a suitable investment strategy, it would be necessary to consider the following features of the liabilities
- Nature – cash payments to insurance subsidiary (cash lump sums to pay commission and initial expenses), dividends expected from life insurer, and payments to ABS investors
 - Term- expected life time of financing structure
 - Currency- The payments to and from the life insurer would be in Indian Rupees but the payments to ABS investors may be in other currencies.
 - Certainty – The outgo is uncertain to the extent that it depends on the life insurers business plan being met and profits emerging as expected and this will impact need for liquidity

An asset liability matching exercise could occur to ensure that liabilities can be met when they fall due.

The fund will probably wish to invest in sufficient liquid assets such as cash and short term GSECs/money market funds to make payments. The fund will also wish to meet its longer term liabilities by investing in longer dated GSECs. It is unlikely that equity would be an appropriate investment as ABS investors would probably view they have sufficient exposure to equity via the fund management charges and will require such a constraint in the bond documentation and the parent company would not wish to have lost the value of the loan when it needed to expand its life insurance business (as it too has an equity exposure via the fund management charge).

- f)
- reverse repos - a repo is an agreement whereby one party sells stock to another with a simultaneous agreement to repurchase it at a later date at an agreed price. A reverse repo is the opposite side of the agreement. A reverse repo is effectively a method of lending cash and the borrower giving collateral against that borrowing. The borrowing may be GSEC but in the USA prior to the crisis more exotic assets could be involved in repos. Collateralised Borrowing Lending Obligation is an exchange traded Repo where the Clearing Corporation of India Ltd holds the underlying charge on securities.
 - units in money market mutual funds – these funds invest in short-term money market instruments such as treasury bills, commercial paper, certificates of deposit. They can easily provide a diversification benefit but at a cost to be paid to the asset management company. Some funds are more liquid than others and careful analysis is required as to the fund manager's style and actual investments on a look through basis.
 - treasury bills – these are short term debt issued by the RBI on behalf of the Government of India with maturity of 91 days, 182 days and 364 days. The debt is issued at a discount

- commercial paper – short term unsecured notes issued directly by a company. Such notes are issued at a discount, usually for a term of a few months, but can typically be presented to the issuer (or to a dealer) for repurchase. Invariably the short term rating of the issuing company is P1.
- Bank time deposits and certificates of deposit – bank time deposits are deposits with a bank with a specified term – less than 3 years. The bank time deposit cannot be transferred and cash may not be obtainable immediately, or if it is there is a surrender penalty. A certificate of deposit is a transferable time deposit i.e. instead of surrendering it can be sold to another investor to present to the issuing bank at maturity.

To manage investment risk the manager may also request that his investment mandate allows him/her to invest in interest rate derivatives to hedge interest rate risk and currency swaps to hedge currency risk.

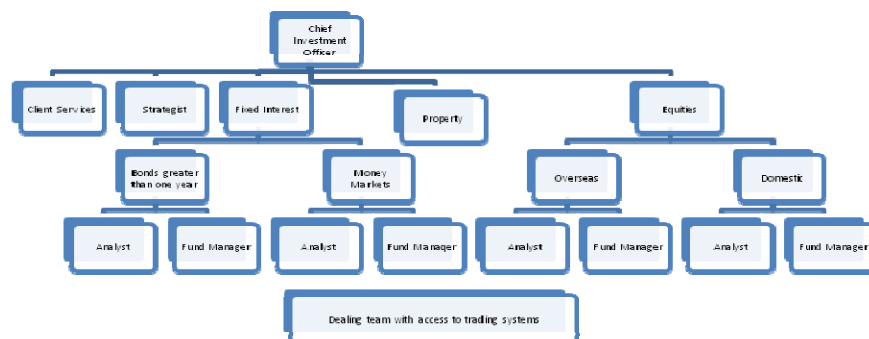
g) The manager will consider his benchmark and the need to meet cash outflows at certain times. The manager may decide that a passive index tracking (e.g. MIBOR overnight rate) or a more active policy given that cash outflows are likely to be known at least a month in advance.

The manager will also wish to consider diversification of assets with respect to liquidity, term, credit rating, industrial sector for CP and strategic asset allocations may be followed with tactical

deviations allowed. Some assets may not be allowed e.g. asset backed commercial paper.

Comparison with the fund manager's peer group will also be a factor in portfolio construction

h) A typical structure might be



Analysts will make recommendations to fund managers. The dealing team will deal for a number of fund managers as this allows for segregation of duties and often the timing of actual trades can be crucial. There will also be a back office department which interacts with counterparties to settle trades and keep records. There would also be a middle office reporting on risk exposures and departments responsible for legal and compliance issues. A property department will also manage any property including buying and selling of property given their rarity and uniqueness though property derivatives would be routed via the dealing desk.

[47]

Total 100 Marks
