Institute of Actuaries of India

Subject SA7-Investment and Finance

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INDICATIVE SOLUTION

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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) Negative equity returns and low interest rates in the early 2000s, and significant falls in asset values and historically low interest rates in the post-2008 credit crisis period, have resulted in deficits in the majority of Defined-benefit (DB) pension plans . As a consequence, firms have been struggling to maintain their DB pension plans as both contributions and liabilities increase. DB pension plans are now often seen as a source of financial risk and part of inside debt. [1]

Firms are expected to face greater payment obligations in the future as pension plans mature and longevity increases. In addition, pension obligations limit firms' financial management options and current investment capacity, as earnings may have to be used to honour pension promises made to employees by previous management. Hence, firms with DB pension plans are increasingly focusing on reducing pension obligations to alleviate their impact on investment and strategic decisions, which in turn reduces the risk exposure of the shareholders. [1]

De-risking is an important tool for effective management of an employer sponsored defined benefit pension plan. De-risking may take several forms. Employers may choose to retain all assets and liabilities and manage volatility by aligning a portion of the plan's assets (generally allocated to fixed income) to a portion of the liability. Alternatively, employers may choose to entirely eliminate the volatility and the interest rate and longevity risk by transferring the liabilities and assets to a third party. [1]

Various DB pension de-risking strategies are available to firms. Traditional methods, such as soft and hard freezing, aim to transfer pension obligation, and investment and longevity risks from the firm to its' employees. [1]

Innovative strategies, such as pension buy-ins, buy-outs and longevity swaps, allow firms to transfer some pension obligation risks to third parties (i.e. insurers) by paying a premium up-front. [1]

Hard freezing and pension buy-ins are more likely to be implemented when pension plans have longer investment horizons, indicating higher levels of risk exposure owing to investment uncertainty. [1]

Pension plans that are exposed to more investment risk are more likely to engage in pension buy-ins. Firms that have higher market capitalisation and capital expenditure are more likely to implement innovative de-risking strategies. [1]

Firms that are financially constrained may go for *longevity swaps*. Implementing pension de-risking strategies reduce firm risk. However, the effectiveness varies with *buy-ins* being the most effective in reducing risk. [1]

De-risking strategies have both advantages and disadvantages from the employer's point of view. An analysis of the risk/reward from transferring the risk of the obligation to another party is essential. The analysis should:

- Identify business goals and objectives of the risk transfer
- Determine if any impediments exist that restrict or limit the transfer
- Evaluate the financial risk/reward from both a cash flow and accounting perspective o Calculate the "settlement" accounting charge or credit and determine the change in the projected benefit obligation and pension expense
    - Determine the change in cash funding requirements
    - Estimate administrative and professional service fees associated with implementation
- Identify and evaluate any non-financial factors such as communication challenges Identify optimal timing of risk transfer and impact of potential delay [2]

[Max 10]

ii)

a) A number of developments have meant that bond management is becoming an increasingly important issue for institutional investors. On the supply side, the growth of the corporate bond market has meant that bond investors now have a much wider range of investment opportunities. On the demand side, a number of factors have increased the interest in bond investing in the developed countries. [1]

- developments in actuarial thinking have lead to a broader acceptance that bonds are a natural asset to match pension fund liabilities;
- Negative equity returns and low interest rates in the early 2000s , and significant falls in asset values and historically low interest rates in the post-Great Financial Crisis (GFC) period led to reduced appetite for equity investing;
- pension schemes are maturing, especially due to the large number of schemes that are now closed;
- legislation has increased the level of guaranteed benefits, reducing the scope for discretionary benefits and hence the interest of trustees in trying to achieve equity out-performance;
- disclosure under IFRS of the pension mismatching volatility has caused finance directors to review their risks and to consider increasing the pension scheme investment in bonds; and
- Insurance companies have also raised their levels of bond investment in response to the solvency worries caused by falling equity markets. 1 mark for each point [4]

[Max 5]

b)

- **Fixed interest and index linked**

  The main distinction between these bonds is the basis on which interest is calculated.
  - The majority of bonds are issued on a fixed interest basis.
  - Some governments and a small number of other issuers have issued index-linked bonds.
  - Whilst these index-linked bonds are freely traded, they are much less liquid.
  - An even smaller market is the corporate index-linked one. The main reason for this is that
  - very few issuers enjoy incoming cash flows that are known in real terms (utility companies being notable exceptions in the UK, e.g. gas prices being set using an “RPI-X” formula).
  - It is also true that accounting for fixed interest debt is easier than accounting for index-linked debt.
  - Currently, though, most index-linked corporate bonds trade at lower spreads than conventional bonds, although there are a few examples where illiquidity has widened the spread.
  - Given that inflation has fallen from historic levels, the question of what happens to indexlinked bonds in times of deflation becomes more important. Thus it is possible for coupon rates to fall or the final redemption payment to be lower than the face value in nominal terms

  1/2 mark for each point [2]

- **Investment grade and non-investment grade**

  - The most obvious form of credit risk is the risk that the borrower defaults on one or more payments. Generally government bonds are deemed to be very secure with little or almost no risk of default (the same cannot be said for the governments of less stable countries).
  - A further category of credit risk is the risk that the issuer’s credit rating is downgraded by the rating agencies.
  - If this is unanticipated the credit spread associated with the issue will usually increase and result in a decline in the price of the bond concerned.
  - Although there are a number of agencies that provide credit ratings for bonds, the two most

- widely used are Moody's and Standard & Poor's. Bonds that are rated (and not in default) are graded from AAA to CCC by Standard and Poor's, and Aaa to C by Moody's.
- Anything with a Standard and Poor's rating of BBB or above (Baa for Moody's) is classed
- as investment grade; anything with a rating lower than this is classed as high yield.
- Bonds that are given different ratings by different agencies are classed as having a split rating.

1/2 mark for each point [2]

- **Actual and synthetic**

  - Actual bonds are directly issued by government and corporates and have typical features like coupon, maturity dates and assets backing the bonds that are specified in the bond document.
  - Synthetic bonds are other types of bonds that are repacked from fixed or contingent cash-flow streams into fixed interest security.
  - E.g. CBO'S are essentially portfolios of bonds repackaged as a single fixed interest security.
  - MBSs are instruments issued by housing loan companies, where the repayment on the bonds is contingent on the repayment of housing loans originated by the loan companies – mortgages are effectively packaged together and issued on the open market as debt.
  - Using some specific swaps, it is possible to create synthetic bonds – for example buying a corporate bond and then swapping the coupons for inflation linked payments in effect creates a corporate bond with inflation linked cash flows.
  - Alternatively you can create a synthetic sterling bond from a US or a euro-denominated bond by using currency swaps 1/2 mark for each point [2]

- **High yield debt and Emerging market debt**

  - High Yield bonds (and indices) include bonds with ratings below investment grade, which therefore means a credit rating of BB+ / Ba1 or below.
  - High Yield bonds are much less liquid than investment grade bonds, meaning that bond pricing can be less accurate, and also adjustments are often made to the spreads.
  - The main high yield index providers are MSCI and Credit Suisse and JP Morgan.
  - Emerging Markets are usually defined as countries with lower than average per capita income.
  - For example, JP Morgan use the World Bank-defined "middle income" per capita upper level (in US$) as one of their criteria.
  - Also, having had their debt restructured may allow a country to be eligible for entry into an Emerging Market Index which help in providing liquidity and price stability to these bonds.
  - Emerging Market bonds can be in local currency markets, although these usually consist of shorter maturities as emerging bond markets are often quite small in their domestic currency and do not usually have a wide range of maturities.

1/2 mark for each point [2]

[Max 8]

iii) The majority of the pricing models used by portfolio managers are complex multidimensional surface models that consider the outstanding term, yield, credit rating, default probability, expected recovery values and sector of an issue. [1]

Portfolio managers attempt to derive their own estimate of "fair-value" for a bond based on their views on the features of the issue. Their models then attempt to identify any anomalies between their assessed "fairvalue" and the price the bond is trading at in the market, as well as any anomalies between the issue and related swaps or forward contracts. [1]

- Number of bonds ; In comparison with equities, there are a vast number of bonds in issue and one corporate
- Group may have in issue a number of different securities with different credit ratings, seniority and issued by different entities within the group.
- Market size and liquidity; These vary between issues. For example in the treasury market the most recently
- issued securities, referred to as “on-the-run”, tend to trade far more actively than older issues or those that are “off-the run”
- Market makers risks; The amount of risk that a market maker is required to take to make a book in a particular issue will be reflected in the bid offer spreads that they quote, particularly in illiquid issues.
- Factors affecting price: There are a large number of factors affecting the price of an issue, one of which is often the fact that an issuer has several bonds that can be purchased. These factors lead to matrix pricing and to the multi-dimensional models referred to above.
- Counter party trading: The lack of pricing transparency caused by counter party trading (as opposed to exchange trading for equities) creates an informational imbalance. At any one time there is no one agreed market price for a corporate bond even though bond pricing is increasingly more widely available thanks to electronic trading.
- Additional features: Features, such as interest rate caps and floors and credit step-ups, can be difficult to evaluate.
- Supply and demand: Supply and demand vary and are not always predictable. Possible discontinuities are very difficult to assess.

[Max 5]

iv)

a) A benchmark is a standard or measure that can be used to analyze the allocation, risk, and return of a given portfolio.

- Risk levels usually vary across equity, fixed income, and savings investments.
- As a rule, most investors with longer time horizons are willing to invest more heavily in higher-risk investments. Shorter time horizons or a higher need for liquidity–or ability to convert to cash–will lead to lower risk investments in fixed income and savings products.
- With these allocations as a guide, investors can also use indexes and risk metrics to monitor their portfolios within the macro investing environment.
- Markets can gradually shift their levels of risk depending on various factors. Economic cycles and monetary policies can be leading variables affecting risk levels.
- Active investors who use appropriate benchmarking analysis techniques can often more readily capitalize on investment opportunities as they evolve.
- Comparing the performance and risk of various benchmarks across an entire portfolio or specifically to investment fund mandates can also be important for ensuring optimal investing.
- Portfolio managers will generally choose a benchmark that is aligned with their investing universe. Active managers seek to outperform their benchmarks, meaning they look to create a return beyond the return of the benchmark.
- And lastly, benchmarks can have the effect of modifying the behavior of fund managers else they would have deviated from investment strategy in search of Alpha by taking on more risk than expected.

[Max 3]

b) Notional Portfolio

- The notional portfolio for a pension scheme is that portfolio of bonds & equities which most closely matches the liability characteristics
- Under certain economic and demographic assumptions, the cash flow pattern for larger pension schemes can be predicted with a reasonable degree of accuracy
- provides the appropriate benchmark against which to judge all other available investment strategies
- is easy to manage and less time consuming if liabilities are predictable/less volatile to economic and demographic assumptions

Disadvantages;

- Needs re-balancing of portfolio of economic / demographic assumptions have changed
- no surety of nonperformance of actively managed funds
- may require frequent re-balancing
- more time consuming as trustees have to spend time on re-balancing the notional mix due to change in liability profile
- For many pension schemes, a substantial (and growing) proportion of the liabilities increases in line with Limited Price Indexation (LPI) in payment, but there is limited availability of LPI assets

1/4 mark for each point [1.5]

Index Portfolio

- An index fund is a portfolio of stocks or bonds designed to mimic the composition and performance of a financial market index.
- Index funds have lower expenses and fees than actively managed funds.
- Index funds follow a passive investment strategy.
- Index funds seek to match the risk and return of the market based on the theory that in the long term, the market will outperform any single investment.
- By having the suitable sub index, can mimic any type of liability.
- Can be time consuming in construction but easy to manage thereafter 1/4 mark for each point [1.5]

[Max 3]

c)

- Corporate bond and government bond indices have not changed fundamentally for 15 years.
- A recent phenomenon is using indices based on credit default swaps, which are rapidly overtaking corporate bonds as the most liquid way to trade corporate credit.
- The leading product in this area is TRAC-X from JP Morgan and Morgan Stanley, which is a family of indices across regions.
- The advantage of these products is that they are actually tradable and hence truly reflect the market.
- Already many other banks are trading these products and their predecessors

1/2 mark for each point [2]

The criteria necessary for the construction of a good index include the following:

- Transparent: There should be clear rules on methodology, index changes and eligibility criteria.
- From an experienced provider: The provider should have suitable knowledge of the market, with a commitment to calculating and supporting their index.
- Replicable: Detailed data of the index, including its constituents, construction and performance, must
- be widely available to market participants.

- Representative: The index should be a fair representation of the major characteristics of the market sectors included. Diversification is also relevant given the asymmetry in bond returns.
- Investible: Bonds within the index should meet basic liquidity criteria and be available for investment by a wide range of investors.
- Flexible: Investors can construct customised strategies using sub-indices.
- Reflective of investor needs: The index should provide a fair basis for peer group comparison.
- Consistent: The index rules should remain stable Bonds will be removed or added in line with index

1/4 mark for each point [2]

[Max 4]

v)

a) The objective of indexed fixed income funds is to produce returns that mirror those of a specified benchmark index;

- Portfolio will achieve virtually the same return as the broad market
- Outperforms the majority of actively managed funds
- Low turnover in indexed funds together with lower management fees leave more of the money to be invested
- Broad diversification: Index funds tend to hold a great breadth of securities, minimising non-systematic, or issuer specific risk to a portfolio
- Less time-consuming: Trustees will generally spend less time monitoring a passive manager
- Rule based investment decision-making process: Indexed portfolios are managed according to an objective process based on quantitative models and strict rules to track an index's performance

1/4 mark for each point [1]

Arguments against passive management include;

- Anomalies in index construction
- Inefficiencies in corporate bond markets
- The corporate bond market is extremely inefficient compared to equity markets
- Sampling challenges; The problems identified above have led passive managers down the sampling route, attempting to replicate the index with a "mini-index" containing far fewer stocks

1/4 mark for each point [1]

Key success factors:

- A thorough understanding of the market environment, including issuance patterns, maturity structure and taxation issues, is needed.
- The manager should have detailed knowledge of the benchmark indices, including index rules, and the ability to anticipate, understand and reflect within a portfolio all index changes.
- It is essential to have a portfolio construction methodology that is rigorous, objective, scientific and robust. Efficient trading
- Efficient trading practices that limit transaction costs help to keep costs down and aid tracking.
- There should be daily monitoring, performance attribution and analysis in place. This should feed through to a joint focus on minimizing tracking error while minimizing costs

1/2 mark for each point [2]

[Max 4]

b) Full replication

- Full replication is a process whereby the fund manager buys all the bonds that make up an index
- The strategy is simple to execute: Hold every bond in the index in the same weight as the index
- A full replication strategy is advantageous only when you're dealing with indexes that can be easily replicated.
- It provides broad exposure to the index, ensuring better diversification and lower turnover costs.
- On the flip side, these advantages disappear when dealing with complex or illiquid markets, such as emerging market bonds
- Replication is the preferred index portfolio construction method for indices comprised of a small number of bonds and where portfolio turnover is low.
- The cost of buying all the stocks in such an index is minimal, and the tracking error only creeps in when there are index changes – this is where experienced portfolio management and trading teams are important.

1/2 mark for each point [2]

Stratified sampling

- Sometimes, it's not possible to buy all the components of a leading market index. That's where stratified sampling technique comes in handy.
- As the name implies, a stratified sampling strategy invests in a 'sample' of holdings from the underlying index. The combination of 'sampling' and 'optimization' means the portfolio gains exposure to certain segments of the index to provide an acceptable level of risk versus reward.
- Sampling and optimization are beneficial because they provide the most representative sample of the index based on key metrics like exposure, risk, and correlation. But unlike the full replication strategy, sampling and optimization could leave you under-exposed to the index you are trying to track, which could lead to subpar returns
- The rebalancing may be required if characteristics of bond in sub group changes – this is where experienced portfolio management and trading teams are important.

1/2 mark for each point [2]

The index is broken down into sub-groups or cells sharing similar characteristics.

- index portfolio construction then buys small number of bonds within each of these sub groups and tries to remain within limits set for each sub-group
- The cost of buying all the bonds in such an index may be larger as very few bonds will fall within each sub group and have trading/volume and market liquidity issues. 1/2 mark for each point [1]

Cells/sub groups are constructed according to the following characteristics:

- duration;
- sector/industry;
- credit rating; and
- liquidity. [0.5]

The following average statistics are calculated for each cell:

- weight in the index;
- average duration;
- average yield;
- average option adjusted spread; and
- average convexity. [0.5]

The sample is stress tested to see if it will react in the same way as the cell from which it is taken. Each sample is stress tested against changes in the yield curve such as:
- Parallel shift (a change in yield of the same amount at all durations);
- Butterfly shift (a change in yield in one direction at a medium duration and in the opposite direction for long and short durations); and
- twist (a change in the difference between yields at long and short durations). [1]

When sampling bonds from each cell, care needs to be taken to diversify across issuers, and to keep issuer weights in the sampled portfolio in line with index weights. Issuer diversification in a portfolio minimizes tracking error caused by event risk. [1]

[Max 8]

[50 Marks]

Solution 2:

i) Under current ULIP regulations, ULIPs do not have minimum guarantee returns and policyholders have to bear all of the risk.
- using derivatives, the downside risk could have been managed but it may violate other regulatory requirements related to cost particularly maximum Fund management charges and maximum reduction in yield gaurantee
- The equity derivatives market is not fully evolved and options are available for short durations and have significantly high premiums for term higher than earliest option maturity date.
- Thus they seems to be not suitable for long term hedging without undue cost towards buying options on regular basis.
- Similarly, the swaps may have been used to hedge interest rate risk but given the liquidity profile of ULIP, it will be very difficult and costly to manage the swap hedging portfolio and may have higher cost to offer such products to the customers. 1/2 mark for each point

[Max 2]

ii) Insurers can enter Forward Rate Agreements (FRAs), Interest Rate Swaps (IRS), Exchange Traded Interest Rate Futures (IRF) to "hedge" Interest Rate risk on forecasted transactions, for Life, Pension & General Annuity Business and General Insurance Business. Interest Rate Derivatives are not permitted for ULIP Business. [2]

Participants can undertake different types of plain vanilla FRAs/IRS. IRS having explicit/implicit options features are prohibited. [0.5]

Insurers are allowed only as "Users" (protection buyers) of Credit default swaps(CDS). [0.5]

The CDS are permitted as a "hedge" to manage the Credit Risk covering the credit event and not for managing spread risk. The category of the investment will not change pursuant to buying CDS on such underlying. [1]

[Max 2]

iii) Interest rate derivatives with implicit and explicit options are not permitted because;
- they have higher costs than plain vanilla instruments
- being sold in low volumes means trading/liquidity issues
- these derivatives may be difficult to wind up/ closed as option value may become significant in some scenarios.
- accordingly, will be difficult to rebalance the portfolio with relative ease as possible with vanilla swaps.

1/2 mark for each point
[Max 2]

iv) Exposure to Interest Rate Derivatives

Exposure to Interest Rate Derivatives are permitted for hedging for forecasted transactions mentioned below:

i. Reinvestment of maturity proceeds of existing fixed income investments
ii. Investment of interest income receivable;
iii. Expected policy premium income receivable on the Insurance Contracts which are already underwritten [2]

The overriding principle of any use of the above listed derivatives is that they must be used only for hedging to reduce interest rate risk. The Insurer should have a system to clearly track the Interest rate risk. [1]

To consider expected policy premium income for hedging, Insurers shall document and justify persistency assumptions as part of the hedge program development process approved by the management. [1]
[Max 4]

v) Regulatory Exposure and Prudential Limits for measuring exposure

a) Counter parties shall necessarily be Commercial Banks and Primary Dealers (PDs) as permitted by RBI for FRAs and IRS. [0.5]
b) Insurers dealing in FRAs and IRS have to arrive at the credit equivalent amount for the purposes of reckoning exposure to counter-party. [0.5]

For the purpose of exposure norms, Insurance companies shall compute their credit exposures, arising on account of Interest rate derivative transactions using the Current Exposure Method (CEM) as detailed below:

- The Credit Equivalent Amount of a market related off-balance sheet transaction calculated using the current exposure method is the sum of current credit exposure and potential future credit exposure of these contracts. [1]
- Current credit exposure is defined as the sum of the gross positive mark-to-market value of these contracts. [1]
- The Current Exposure Method requires periodical (at agreed periodicity) calculation of the current credit exposure by marking these contracts to market, thus capturing the current credit exposure. [1]
- Potential future credit exposure is determined by multiplying the notional principal amount of each of these contracts irrespective of whether the contract has a zero, positive or negative mark-to-market value by the relevant add-on factor indicated below according to the nature and residual maturity of the instrument. [1]

[Max 5]

vi) Internal Risk Management Policy & Processes, Exposure & Prudential Limits

Each participant should, before taking exposure to Interest Rate derivatives, frame detailed pre-approved risk management policy by the Board of Insurer, which shall cover the following minimum: [1]

- Insurer's overall appetite for taking risk and ensure that it is consistent with its strategic objectives, capital strength etc.
- Define the approved derivatives products and the authorized derivatives activities.
- provide for sufficient staff resources and other resources to enable the approved derivatives activities to be conducted in a prudent manner;
- ensure appropriate structure and staffing for the key risk control functions;

- establish management responsibilities;
- identify the various types of risk faced by the Insurer and establish a clear and comprehensive set of limits to control these
- establish risk measurement methodologies which are consistent with the nature and scale of the derivatives activities;
- require stress testing of risk positions;
- detail the type and frequency of reports which are to be made to the board (or committees of the board);
- Applicable VAR limits.
- Circumstances for termination and closure of the contract.
- accounting treatment of the proposed derivatives in the company, and
- Solvency / capital impact due to the use of derivatives. 1/2 mark for each point [4]

[Max 5]

[20 Marks]

Solution 3:

i) Mortality bonds are designed to offload mortality risk beyond a tolerance level from an underlying block of life insurance policies. These bonds protect issuers from actual mortality claims pay-out being higher than a defined limit. [0.5]

If an "event" does not occur, investors receive their principal back at the end of the term. If the event does occur, the investors will lose part or all of their investment, which is paid to the insurance company to offset some or all of its loss. The bond issuer must set the underlying mortality used, the trigger point for an event, the grading from a partial payment to a total loss of investment and the rate of return paid to investors. [0.5]

The principal repayment of the bond on maturity is subject to the level of mortality being lower or higher than a defined limit.

Investors receive coupons at a predefined frequency and at predefined levels e.g. 3 months LIBOR plus 110 basis points. [0.5]

However, the principal is unprotected and depends on what happens to a specifically constructed index of mortality rates.

The principal is repayable in full if the mortality index does not exceed a defined level e.g. 1.2 times the base level during any of the years of the tenure of the bond.

The principal is reduced by X% for every Y% increase in the mortality index above the threshold of 1.2, and is completely exhausted if the index exceeds say 1.6 times the base level. [1]

The mortality index can be for a country or multiple countries or for insured lives or based on population mortality. [0.5]

Total [3]

There are numerous differences between mortality bonds and corporate bonds. The key differences are as below:

1. Under mortality bonds the principal payment is contingent on the level of mortality at the maturity of the bond. Such contingent principal payment does not exist in the case of corporate bonds.

2. All other things being similar, mortality bonds offer higher yields compared to corporate bonds given that investors take the additional risk of principal amount repayment being continent on the levels of the mortality index.
3. Mortality bonds are a type of securitized instrument and corporate bonds are not.
4. The motive of the mortality bond issuer is to protect from excessive levels of mortality and the motive of corporate bond issuers is to raise additional capital.
5. Mortality bonds market is much smaller as compared to corporate bonds, and the corporate bonds market is much more liquid. Total [2]

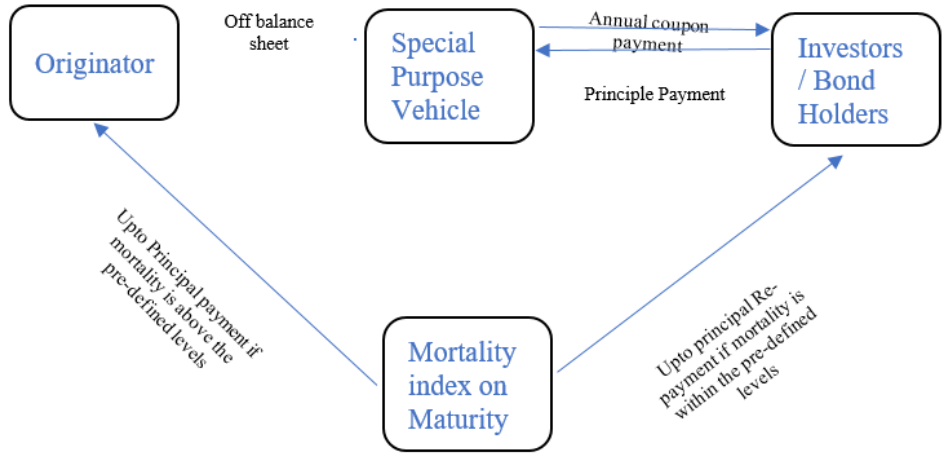
The common needs of investors in mortality bonds are as below:

- A pension fund invests in mortality bonds to protect from the longevity risk i.e. should the levels of mortality be lower than the pre-defined index the pension house earns higher yields from the mortality bonds thus protecting it from the longevity risk
- A fund house could purchase these bonds to enhance the yields at a lower risk and the investment is low beta i.e. low correlation with standard financial market risk factors.

The common needs of the issuers of mortality bonds are as below:

- The bond helps the issuer to unload some of the extreme mortality risks that it faces.
- The issuer of the bond (bank) is mindful of its credit rating and desires to reassure rating agencies about its mortality risk management by offloading extreme mortality risk.
- Further, by issuing the bond itself, issuers are not dependent on the creditworthiness of other counterparties (e.g. reinsurers) should an extreme mortality event occur.
- Thus, the bond gives the issuer some protection against extreme mortality risk, without requiring that the company acquires any credit risk exposure in the process.
- Another approach is to purchase a simple high-limit stop-loss cover. The drawbacks to this tool are it is relatively expensive and it usually has exclusions (such as terrorism, nuclear, biological). Mortality bonds has no exclusions and thus offer greater protection to issuers. Total [3]

Operational structure: The operation structure of a mortality bond is similar to any other securitized bond. Typically involving three parties – Originator (Issuer), Special Purpose Vehicle (SPV) and investors (bondholders).



[2]

There are many possible types of mortality bonds, but they fall under two broad categories. The first is 'principal-at-risk' mortality bonds. These are bonds in which the investor risks losing all or part of the principal if the relevant mortality event occurs. The second is the 'coupon-based' mortality bond. These are bonds in which the

coupon payment is mortality-dependent. [2]

[Max 12]

ii) The block of life insurance business with the bank is an illiquid asset that can be converted into securities that can be bought and sold in the financial market. [0.5]

Individual life insurance policies are illiquid and individual life insurance policies can be pooled together to form an income stream. The marketable securities i.e. bonds can be created from this stream of income. By securitizing the block of policies, the bank can release the embedded value. [0.5]

The main purposes of this type of deal are to release capital to reinvest into core businesses, to prove to regulators and rating agencies that the present value of future profit from a block of business is a liquid asset and to increase the return on equity for the underlying business. [0.5]

Like other securitized assets, the bank will need to create a special purpose vehicle (SPV) to issue marketable securities made from the insurance block. [0.5]

Securitizing this block the bank can de-risk itself from the insurance block and investors can get access to the profits emerging from this block. Investors would expect higher returns from the bonds given that the risk of the underlying blocks is transferred to the bondholders. [1]

The bank can engage SPV in two ways either by transferring the entire insurance portfolio subject to regulatory requirements or transferring profits only emerging from the block. If the bank is transferring an entire portfolio, then the SPV will have to maintain and serve the entire block of policies and incase of transfer of the underlying income the portfolio and policy servicing will still be with the bank, and income generated will be transferred to SPV. The SPV can create a variety of bonds from the insurance portfolio: [1]

High coupon yielding bonds:

The bond is an annuity (or amortizing) bond with floating coupon payments. The coupon rates are dependent upon the profitability of the underlying insurance block. SPV will declare annual coupon rates based on the profits emerging from this block. The coupon rate will depend upon the performance of the underlying block. The performance of the underlying block depends upon many parameters such as investment returns on the reserves, levels of mortality claims, expenses, policy lapses, etc. [1]

The coupon rate will be higher should the experience from all these parameters is favorable e.g. much lower levels of mortality than assumed into reserves or above average returns from the underlying reserves. [0.5]

The proceeds from the bonds issued will be transferred to the bank and on the maturity of the bonds bank will transfer the proceeds back to the SPV to make the payment to bondholders.

Zero coupon bonds: where the yearly profits (income stream) emerging from the block of business are accumulated over the tenure of the bond. The accumulated income stream and principal amount are paid back to investors on the maturity of the bond. [0.5]

A low-rated institution can still issue high-rated bonds:

The assets being securitized permanently shift from the originator's balance sheet to that of the SPV. The SPV is set up such that it is bankruptcy-remote, meaning that the underlying asset pool is held separately from the other assets of the originator (bank). In effect, the SPV and its assets are protected from insolvency or

bankruptcy of the originator. In other words, the originator's credit rating and financial status become almost irrelevant to the bondholders when assets are held within an SPV framework. [1]

To further boost the credit quality of the SPV, the process of securitization often involves credit enhancements. The term refers to methods used to improve the credit profile of the SPV to make the securitized assets on sale more marketable. One form of credit enhancement occurs in the form of a third-party guarantee of performance. Notes issued by an SPV that has obtained a third-party guarantee are often rated at investment grade and up to AAA grade. In this way, the low-rated institution can still issue high-grade security using securitization. [1]

[Max 8]

iii) A mortality swap is an agreement to exchange one or more cash flows in the future based on the outcome of at least one (random) survivor or mortality index. [0.5]

Mortality swaps bear considerable similarity to reinsurance contracts. Both often involve 'swaps' of anticipated for actual payments (or claims), and both might be used for similar purposes. However, there are major differences between them. Most especially, mortality swaps are not insurance contracts in the legal sense of the term and therefore not affected by some of the distinctive legal features of insurance contracts (e.g. indemnity, insurable interest, etc.). [0.5]

Mortality swaps have certain advantages over mortality/longevity bonds. They can be arranged at a lower transaction cost than a bond issue and are more easily cancelled. They are more flexible and they can be tailor-made to suit diverse circumstances. They do not require the existence of a liquid market, just the willingness of counterparties to exploit their comparative advantages or trade views on the development of mortality over time. [1]

This enables pension plans to partially or wholly hedge their longevity risk without having to purchase annuities or hedge insurance companies from extreme mortality events such as a pandemic. The instruments are structured in a similar way to interest rate swaps. For example, the pension plan receives a series of variable payments that reflect 'actual' mortality patterns (often called the floating leg), in exchange for paying a series of fixed payments to the counter-party (often called the fixed leg). This arrangement is designed to provide certainty to the pension plan regarding the mortality rates of the covered population. [1]

In plain vanilla mortality swaps in which the preset rate leg is linked to a published mortality projection, and the floating leg is linked to the counterparty's realized mortality. [0.5]

Bearing in mind that swap payments would be conditioned on particular time periods and reference populations, firms could use such swaps to manage their exposures across both reference populations and across the 'mortality term structure'. For example, firms in different countries could enter into such swaps to diversify their longevity risk exposures; alternatively, firms might enter into such swaps to alter their 'mortality term' risk exposures. [0.5]

The bank can earn from being a party to the swap arrangement or being a deal maker earning a commission by bringing parties together. [0.5]

[Max 3]

iv) Counterparty risk is referred to the risk of potential expected losses that would arise for the bank on account of default on or before the maturity of the derivative contract by another counterparty to such a derivative contract. It is prevalent in all types of transactions when they are undertaken through over-the-counter (OTC).

[0.5]

Each security involves a number of different counterparties, and the success of the contract relies on establishing sufficient confidence that contracted cash flows will actually be paid. In some cases, such as longevity bonds, these cash flows are as far as 25 years into the future. [0.5]

The primary role of longevity bonds and other mortality-linked securities is to give holders the opportunity to hedge their systematic longevity risks. These investors do not seek exposure to alternative market risks or to additional credit risks. Where any of the key participants carry a risk of default, we therefore also have to consider structures to mitigate this risk. These can make a difference to the price which will be paid, and even to the willingness of investors to participate in the first place [0.5]

Credit risk might be mitigated using a credit insurance arrangement, such as a financial guaranty or surety bond: a firm might purchase such insurance to protect itself in the event that its counterparty defaults; or a firm might make itself a more attractive counterparty by purchasing insurance for its counterparty to protect the latter from loss in the event of its own default. However, such insurance can be expensive. [0.5]

Credit risk might be mitigated using credit derivatives (e.g. credit default swaps) which promise payments if specified credit events occur (e.g. such as the default or downgrading of a counterparty). However, the reference credit events need to be chosen carefully if they are to avoid serious basis risk problems, and, as with credit insurance, credit derivatives can be expensive. [0.5]

Counterparty credit exposures can also be managed using standard credit enhancement methods such as collateral agreements, collateralization with marking to market (so that positions are periodically marked to market, and collateral reassessed accordingly in line with pre-agreed formulae), recouping (in which cash is exchanged when exposures hit pre-agreed limits and payment schedules are re-set to bring the swap value back to zero), credit triggers (in which a counterparty suffering a specified credit downgrade is obliged to close out its swap position and to settle its outstanding debts), and mutual termination options (giving either party options to terminate a swap agreement). [0.5]

Each of these methods has proven to be useful in helping firms manage the counterparty credit risks of existing types of the swap, and they are especially useful when the swaps are very-long dated ones as would typically be the case with mortality swaps.

Another commonly used way of mitigating credit risk is through a special purpose vehicle (SPV)

[Max 3]

v) Investments in technology companies seek long-term growth of capital. The technology companies that the CIO believes can bring long-term capital growth are those driving technological innovation or benefitting from the enablement of technology. [0.5]

Key risks with investment in tech companies are as below:

Valuations: The tech companies carry high valuations, measured in the form of a high price-to-earnings ratio. The valuation for many emerging tech companies is high even though the earnings are in red territory. High valuations are formed based on tech companies' potential to grow and being cost-effective to produce high positive earnings. Should the company fail to achieve targets the value of such company crashes leading to a massive loss on investments. [0.5]

Crowding: Investors have crowded into a handful of tech leaders. Crowding is a risk because it may mean that

even a relatively minor negative news event for a tech leader could trigger a sell-off and a sharper-than-expected downdraft for the broader market. [0.5]

New Tech Companies are new and unproven: Tech companies are vulnerable because of their relative newness. Most new tech companies haven't been around long enough to prove themselves to investors, making it tough for investors to predict how they'll fare (or even whether they'll pull through) during a market slump. [0.5]

Inflation: the current rising level of inflation has led to a rise in the expected interest rate. This higher expected interest rate has a negative effect on stocks that are sensitive to future growth expectations, such as stocks in tech companies. Higher interest rates impact the spending ability of consumers and that can hit hard the projected growth of the tech companies. Most smaller companies have an aggressive plan for growth, but actually meeting those targets is another question altogether, especially in a time of rising interest rates which can severely cause valuation issues. [0.5]

Risk management in the case of tech companies:

Diversification: The best way to manage risks is to run a diversified portfolio so that the few winners can offset the many losers." That's a labor-intensive process and difficult for the average investor to manage. [0.25]

Consider reducing tech exposure by adding to other sectors, such as financials, industrials or materials. [0.25]

Index: It is easier to see the development of a theme than to pick a single winning company. An index approach to investing in tech is more likely to succeed than buying one or two stocks. [0.25]

Investing in tech companies with multi-products. [0.25]

Investing in tech companies where management must have and able to demonstrate a clear path to profitability. [0.25]

Being informed and changing investment focus e.g. many of the biggest ideas in technology over the past decade have centered on how people communicate, consume, transact and travel. Over the next decade, however, it could be the most profound innovations — and investment opportunities — could be on factory floors, in operating rooms, at mining sites, and energy facilities. To change the investment direction with the expected change in the sector. [0.5]

Investment can focus on market leaders who typically are more likely to be profitable, generate stronger cash flows, have "higher barriers to entry" in their respective spaces, and have a better chance to withstand volatility or a market correction. Those companies also have the ability to "buy out" smaller companies entering the domain of the market leaders or that have complementary technology platforms. [0.5]

[Max 4]
[30 Marks]

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