

INSTITUTE OF ACTUARIES OF INDIA

SA7 - Investment and Finance

May 2024 Examination

INDICATIVE SOLUTION

Introduction

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

Solution 1:

i)

1. **Sustainability Objective Statement:** The IPS should start with a clear declaration of the fund's commitment to sustainability, defining specific environmental, social, and governance (ESG) criteria.
2. **Risk Management Framework:** Incorporate ESG risk factors into the overall risk management strategy, highlighting how sustainability risks are identified, assessed, and managed.
3. **Asset Allocation Guidelines:** Specify guidelines for including ESG-focused investments and outline restrictions on non-sustainable industries like coal, tobacco, and gambling.
4. **Investment Selection Process:** Describe the process for selecting investments based on ESG criteria, utilizing integration, thematic investment, and screening approaches.
5. **Monitoring and Reporting:** Detail procedures for monitoring ESG performance of investments and reporting to stakeholders on sustainability impacts and financial returns.
6. **Review and Adjustment Protocol:** Establish protocols for regularly reviewing and adjusting the IPS in response to evolving sustainability goals, market conditions, or regulatory changes.
7. **Stakeholder Engagement Plan:** Outline approaches for engaging with stakeholders on ESG investment decisions and performance.
8. **Governance Structure:** Define the governance structure overseeing ESG integration into investment decisions, including roles and responsibilities.
9. **Compliance with Regulations:** Ensure the IPS aligns with current and anticipated regulations related to sustainable investments.
10. **Training and Education:** Commit to ongoing training for the investment team on ESG issues, trends, and analysis techniques.

(0.5 marks for each point, Max 5)

ii)

1. **Liability-Driven Investing Focus:** Emphasize how the IPS prioritizes matching the duration and cash flows of assets to liabilities, especially through the use of ESG-aligned investments.
2. **Risk Tolerance Alignment:** Discuss the alignment of the fund's risk tolerance with sustainable investment strategies, considering both financial and ESG risks.
3. **Expected Rate of Return:** Specify how the IPS integrates expected financial returns with ESG impact, balancing the dual objectives of sustainability and financial viability.
4. **Diversification Strategy:** Highlight how diversification is used to manage risk, including diversification within ESG investments.
5. **Asset-Liability Matching:** Explain strategies for asset-liability matching, particularly through investments in green bonds and other ESG-focused assets that align with the fund's liability profile.
6. **Inclusion of ESG Investments:** Rationalize the inclusion of specific ESG investments for their potential to contribute to the fund's long-term sustainability and financial objectives.
7. **Portfolio Rebalancing Criteria:** Define criteria and thresholds for rebalancing the portfolio to maintain alignment with long-term liabilities, risk tolerance, and sustainability goals.
8. **Performance Evaluation Metrics:** Establish metrics for evaluating the performance of the portfolio, including both financial returns and ESG impact.
9. **Regulatory Compliance Assurance:** Ensure strategies are in place for the fund to remain compliant with evolving regulations related to sustainability and investment practices.
10. **Flexibility for Future Adjustments:** Emphasize the importance of flexibility in the investment strategy to adapt to changing market conditions, ESG factors, and regulatory requirements.

(0.5 marks for each point, Max 5)

iii)

1. Integration Approach

The integration approach merges ESG factors with traditional financial analysis. Investors assess how ESG issues can affect a company's financial performance and risk, aiming to choose companies that manage these aspects well for better long-term returns. It's a holistic view that considers ESG elements as integral to evaluating a company's overall health and prospects. (2 Marks)

2. Thematic Investment Approach

Thematic investing focuses on specific ESG themes, such as clean energy or social equality, to guide investment choices. This approach invests in sectors or companies expected to grow from these global ESG trends. It aligns investments with broader social or environmental goals, potentially generating positive impacts alongside financial returns. (1.5 Marks)

3. Screening Approach

Screening applies filters to include or exclude companies based on ESG criteria. Negative screening avoids companies engaged in undesirable activities (like tobacco or fossil fuels), while positive screening selects companies with strong ESG practices. This method can also include best-in-class screening, where investors choose the top ESG performers within each sector.

Each approach provides a different pathway for investors to incorporate ESG considerations into their portfolios, whether through a broad integration of ESG factors, focusing on specific sustainability themes, or applying ESG-based filters to investment selections.

(1.5 Marks)

(5)

iv)

1. **Diverse Asset Mix:** Create a diversified portfolio that includes a mix of traditional asset classes (equities, fixed income) and ESG-focused investments. The aim is to achieve a balance that not only provides financial returns but also contributes positively to environmental and social outcomes.
2. **Green Bonds Allocation:** Allocate a significant portion of the fixed-income segment to green bonds. These bonds finance projects with environmental benefits, such as renewable energy, pollution prevention, and climate adaptation, aligning with the fund's sustainability goals.
3. **Renewable Energy Investments:** Dedicate a part of the equity allocation to companies in the renewable energy sector, including wind, solar, and hydroelectric power. This supports the transition to a low-carbon economy and taps into the growth potential of clean energy.
4. **ESG-Focused Assets:** Incorporate other ESG-focused assets, such as investments in companies with strong records in social responsibility and governance. This includes firms with practices that promote gender diversity, employee well-being, and ethical governance.
5. **Risk Management:** Ensure that the inclusion of ESG-focused investments does not compromise the fund's risk profile. Use ESG ratings and analyses to assess the risk and return profile of these investments, aiming for an optimal risk-adjusted return that meets the fund's long-term liabilities.
6. **Regular Review and Rebalancing:** Establish a mechanism for the regular review and rebalancing of the asset allocation to adapt to changing market conditions, advancements in sustainable investing, and shifts in ESG criteria and ratings. This ensures the fund remains aligned with its sustainability commitment and financial objectives.
7. **Stakeholder Engagement:** Engage with stakeholders, including beneficiaries, about the strategic asset allocation strategy. Communicate how the fund's commitment to sustainability is reflected in its investment choices and how these choices impact financial returns and contribute to broader environmental and social goals.

This strategic asset allocation strategy demonstrates the fund's commitment to sustainability by thoughtfully integrating green bonds, renewable energy investments, and other ESG-focused assets with traditional investments, ensuring a balanced approach that seeks to optimize both financial returns and positive ESG outcomes.

(1 mark for each point, Max 7)

v) Expected Impact of the Chosen SAA [8 Marks]

1. **Private Equity (10%) - Actively Contributing to Sustainable Goals:** Allocating 10% to private equity focused on sustainable goals reflects a strategic move to invest in companies driving positive environmental and social change. This can potentially offer higher returns due to the growth prospects of sustainable industries. However, it introduces liquidity and valuation risks, balanced by the long-term growth potential of green technologies and sustainable business models.

(1 Mark)

2. **Private Debt (15%) - Transitional Industries:** Investing 15% in private debt within transitional industries signifies the fund's commitment to supporting sectors moving towards more sustainable practices. This approach aims to yield stable returns from investments in industries adapting to environmental norms, albeit with moderate credit risk and potential for transformational impact.
(1 Mark)
3. **Public Equity (17%) - Diverse Allocation:** Diversifying public equity across normal assets (2%), transitional industries (5%), and those actively contributing to sustainability (10%) enhances the portfolio's growth potential while aligning with ESG principles. The varied allocation allows the fund to benefit from broader market growth while specifically targeting sectors with high sustainability impact, though it exposes the portfolio to market volatility.
(2 Marks)
4. **Public Debt - Investment Grade (50%):** The significant allocation to investment-grade public debt (50%) serves as the foundation for stability and risk mitigation within the portfolio. It ensures a steady income stream to meet liabilities while maintaining a low-risk profile. This conservative approach prioritizes capital preservation and liquidity, essential for meeting the fund's long-term obligations.
(2 Marks)
5. **Public Debt - Sub-Investment Grade (8%):** Including a smaller portion of sub-investment-grade debt introduces a calculated risk for potentially higher yields. This segment targets higher returns but comes with increased credit risk, justified by the diversification benefits and the potential for outsize gains from underappreciated assets.
(1 Mark)
6. **Impact on Long-Term Performance and Risk Profile:** Overall, the SAA aims to balance risk and return by mixing growth-oriented investments with stable, income-generating assets. The focus on sustainability and transitional industries positions the fund to capitalize on future trends, with a keen eye on ESG principles, potentially enhancing long-term performance.
(1 Mark)
7. **Liability Matching Considerations:** The emphasis on investment-grade public debt aligns with the fund's need for liability matching, ensuring sufficient liquidity and predictable returns. This allocation strategy supports the fund's obligations to its beneficiaries by prioritizing assets that offer security and stability, crucial for a pension fund's long-term liability management.
(1 Mark)

(9)

vi)

1. **Objective Assessment:** ESG ratings reveal financial stability and sustainability practices together, aiding in selecting companies that are both environmentally responsible and financially sound, thus promising lower risk and potential for higher returns.
2. **Risk Mitigation:** High ESG scores typically indicate lower risk, as well-managed companies face fewer fines and disruptions. This contributes to more stable and predictable returns for the fund.
3. **Sectoral Analysis:** ESG ratings help identify sector leaders in sustainability who often achieve better financial performance due to their competitive edge, aligning investment with both profitability and sustainability goals.
4. **Performance Correlation** Historical trends show that companies with high ESG ratings often outperform their peers financially, suggesting that integrating ESG considerations can enhance long-term financial returns alongside positive environmental and social impact.
5. **Strategic Diversification:** Using ESG ratings enables diversified investments across various sectors, balancing exposure to risks and opportunities for both sustainability and competitive market returns.

(1 mark for each point, Max 4)

vii) While ESG ratings are valuable for integrating sustainability into investment strategies, several issues can arise, particularly regarding long-term performance monitoring:

1. **Inconsistency Across Providers:** Different ESG rating agencies may use varied criteria and methodologies, leading to inconsistent ratings for the same entity. This inconsistency can complicate the assessment of a company's true ESG performance over time.
2. **Lack of Transparency:** ESG rating processes and the specific data used can sometimes lack transparency, making it challenging for investors to understand how ratings correlate with actual sustainability impact and financial performance.
3. **Data Quality Concerns:** The quality and availability of ESG data can vary significantly across companies and sectors, potentially leading to inaccurate ratings that do not fully reflect a company's sustainability practices or risks.
4. **Short-Term Focus:** ESG ratings may not always capture long-term sustainability risks or opportunities, as they can be overly influenced by short-term events or achievements, leading to a misalignment with the long-term investment horizon of a pension fund.
5. **Governance and Bias Issues:** The subjective nature of some ESG assessments can introduce biases, and governance standards within rating agencies themselves may impact the neutrality of ratings. This can affect the reliability of ESG ratings for making long-term investment decisions and monitoring performance.

(1 mark for each point, Max 5)

[40]

Solution 2:

- i) Several emerging technologies could significantly improve the operations of investment funds by enhancing efficiency, transparency, and security:
1. **Blockchain Technology:** Offers a decentralized and secure ledger system for recording transactions, reducing the risk of fraud and enhancing transparency in asset management. (1.5 Marks)
 2. **Robo-Advisors:** AI-driven investment platforms can automate and optimize asset allocation, providing data-driven insights to improve decision-making and efficiency. (1.5 Marks)
 3. **Smart Contracts:** Automated contracts executed over blockchain ensure faster, error-free agreements between parties, streamlining operations like fund distribution and compliance. (1.5 Marks)
 4. **Digital Identity Verification:** Enhances the security and speed of customer onboarding and compliance processes by leveraging advanced digital verification methods. (1.5 Marks)
 5. **Distributed Ledger Technologies:** Beyond blockchain, these technologies provide alternatives for secure, real-time transaction and asset management, minimizing counterparty risks and improving settlement times. (1 Mark)
- (7)

ii) **Inclusion of Digital Assets in the Portfolio**

The inclusion of digital assets like cryptocurrencies and NFTs (Non-Fungible Tokens) into a pension fund's portfolio requires a balanced analysis of potential benefits against associated risks and regulatory challenges:

1. **Diversification:** Digital assets can offer portfolio diversification benefits due to their unique risk-return profiles and low correlation with traditional asset classes. (1.5 Marks)
2. **Volatility and Security Risks:** The high price volatility of digital assets and potential security issues, such as hacking and fraud, pose significant investment risks that need careful management. (1.5 Marks)
3. **Regulatory Landscape:** The evolving regulatory framework for digital assets affects their feasibility as an investment. Regulatory uncertainty and compliance requirements must be thoroughly evaluated to ensure alignment with legal standards and protect the fund's interests. (1.5 Marks)

Incorporating digital assets into a pension fund's investment strategy could offer new opportunities for growth and diversification but necessitates diligent risk assessment and regulatory compliance to safeguard the fund's long-term objectives and responsibilities to its beneficiaries.

(1.5 Marks)

(6)

iii) Analysis of High PE Ratios and Foreign Capital Inflow into the Indian Equity Market

1. **Growth Expectations:** The high PE ratios largely reflect investors' optimism about India's economic growth and corporate earnings potential, driving valuations higher as the market anticipates robust future performance.
2. **Global Low-Interest Rates:** With global interest rates at historic lows, investors are drawn to the higher returns potential in emerging markets like India, increasing demand for Indian equities.
3. **Liquidity Surge:** Global monetary policies have injected significant liquidity into financial markets, part of which has flowed into the Indian equity market, pushing up stock prices and PE ratios.
4. **Sector-Specific Demand:** Certain high-growth sectors such as technology have attracted significant investment, contributing to the overall high market valuations.

(1 mark for each point, Max 4)

Impending Risks

1. **Correction Risk:** Elevated PE ratios heighten the risk of a market correction if future earnings do not meet expectations, potentially leading to significant price adjustments.
2. **Inflation and Interest Rate Risks:** Rising global inflation and potential interest rate hikes could dampen the attractiveness of equities, possibly reversing the inflow of foreign capital.
3. **Regulatory and Political Risks:** Any adverse regulatory or political developments could impact foreign investor sentiment and lead to capital outflows, affecting market stability.

In summary, while the Indian equity market's high valuations signal confidence in future growth, they also introduce risks of corrections, alongside concerns over changing global financial conditions and domestic policy shifts. Investors should proceed with caution, considering these factors.

(1 mark for each point, Max 3)

(7)

[20]

Solution 3:

i) Nature and Types of Liabilities

1. **With-Profits Policies Liabilities:** These policies combine investment with insurance, offering policyholders a share of the profits in addition to guaranteed benefits. Liabilities here include guaranteed annuity rates and bonuses declared. The guarantees can put pressure on the company's reserves during downturns, as the insurer must provide the promised returns regardless of market performance.

(1.5 Marks)

2. **Non-Profit Policies Liabilities:** Non-profit policies provide a fixed benefit and involve lower risk since they don't share in the insurer's profits. The primary liability is the sum assured, along with any additional guaranteed benefits like death or maturity benefits, which are known and can be planned for.

(1.5 Marks)

3. **Unit-Linked Policies Liabilities:** In unit-linked products, policyholder funds are invested in various units of investment funds, with returns directly linked to market performance. The main liabilities include the management of the unit fund and the minimum death benefit guaranteed, exposing the company to market risk as the asset value fluctuates.

(1 Mark)

Associated Risks

1. **Market Risk:** This is particularly relevant for with-profits and unit-linked policies, where liabilities are closely tied to market performance. Poor investment performance can strain the company's ability to meet guaranteed returns or benefits, impacting profitability and solvency.

(1 Marks)

2. **Interest Rate Risk:** Changes in interest rates can affect the value of both assets and liabilities. For policies with guaranteed interest rates, falling market rates can make it challenging to generate the returns needed to meet these guarantees, potentially leading to a mismatch in asset-liability durations.

- (1 Marks)
3. **Longevity Risk:** For policies with annuity guarantees, longer-than-expected lifespans of policyholders increase the period over which payments must be made, potentially straining the insurer's financial reserves if not adequately anticipated. (1 Mark)
 4. **Regulatory Risk:** The insurance industry is heavily regulated, and changes in regulatory requirements can impact the reserves needed for liabilities, the valuation of liabilities, or the capital required to back these liabilities. This can necessitate adjustments in investment strategy or product offerings to remain compliant. (1 Mark)
- (8)**
- ii) Stochastic modelling represents a sophisticated approach to understanding and managing the myriad risks faced by an insurance company, especially under a principles-based reserving (PBR) or Solvency II (SII) framework, where capital adequacy is critically evaluated. Here's how stochastic modelling aids in this context:

Understanding the Impact of Market Conditions and Capital Adequacy

1. **Comprehensive Risk Assessment:** Stochastic modelling allows for the simulation of a wide range of market conditions and their potential impact on the insurance firm's assets and liabilities. By generating thousands of possible future scenarios, it provides a detailed risk profile that includes both expected outcomes and tail risks. (1 Mark)
 2. **Confidence Level Determination:** One of the key benefits of stochastic modelling is its ability to quantify the confidence level or the probability that the firm will meet its liabilities under various conditions. For example, a 99.5% confidence level under the Solvency II framework means the firm is expected to cover its liabilities 995 times out of 1000, given the modelled risk scenarios. (1 Mark)
 3. **Correlation of Risks:** Stochastic models can capture the correlation between different types of risks (e.g., market, credit, operational risks). This is crucial because risks are not independent; their interplay can either amplify or mitigate the overall risk profile. Understanding these correlations helps in devising more effective risk management and capital allocation strategies. (1 Mark)
 4. **Time Horizon of Risks:** Insurance liabilities often span several decades, making the time horizon of risks a critical factor in capital adequacy assessments. Stochastic modelling allows firms to assess how capital requirements might change over different time horizons, considering the potential for long-term trends, such as inflation or changes in mortality rates, to impact liabilities. (1 Mark)
 5. **Principle-Based Approach (PBR/SII) Compatibility:** Moving from a factor-based to a principle-based approach for calculating regulatory capital, as seen in PBR or SII, requires a deep understanding of the nature, magnitude, and management of risks. Stochastic modelling provides the necessary analytical depth to evaluate ALM risks and capital requirements under this advanced regulatory framework, aligning capital adequacy assessments with the actual risk profile of the firm. (1 Mark)
- (5)**
- iii) Stochastic modelling offers a dynamic method for estimating the liabilities associated with insurance guarantees in a base scenario by acknowledging the complexity and uncertainty inherent in financial markets.
1. **Risk-Neutral Valuation:** By employing a risk-neutral scenario projection, stochastic modelling calculates the present value of future pay-outs associated with guarantees without assuming any risk preferences, leading to a mathematically robust valuation.
 2. **Reflecting Volatility:** This approach captures the volatility of underlying assets over time, offering a more accurate estimation of liabilities by considering the full range of possible market movements that impact the guarantees year on year.

3. **Flexibility in Modelling:** Unlike closed-form solutions, which may be constrained by their simplifying assumptions, stochastic modelling allows for the incorporation of various complex inputs and assumptions, providing a comprehensive view of potential liability variations.
4. **Scenario-Specific Forecasts:** Stochastic models can forecast a multitude of economic scenarios, reflecting the potential variability in guarantees, which is particularly useful when the guarantees are sensitive to multiple risk factors that may not be accurately captured by a closed-form approach.
5. **Adjustment for Model Risk:** Given that closed-form solutions may not fully capture the nuances of guarantee-related liabilities, stochastic modelling offers a more nuanced approach that can be adjusted for model risk, leading to potentially more reliable estimations of liabilities.
(1 mark for each point, Max 5)

iv) Assessing Portfolio Resilience Using P&L and Balance Sheet Projections

Assessing the resilience of a portfolio through P&L and Balance Sheet projections under various scenarios allows for an evaluation of how changes in market conditions might affect the financial health of the insurance firm.

1. **Visibility on Variability:** Regular P&L projections help to visualize the variability of the portfolio's performance over time, reflecting how changes in market conditions may affect profitability.
2. **Asset-Liability Matching:** Balance Sheet projections can illustrate the efficacy of the firm's asset-liability matching strategy, showing whether the assets are adequate to cover the liabilities under various conditions.
3. **Assumption Sensitivity:** By altering assumptions in the projections, the sensitivity of the portfolio to different risk factors can be analysed, offering insights into areas of potential vulnerability.
4. **Cash Flow Timing:** Scenario projections help to estimate the timing and magnitude of cash flows, both in and out, providing a clear picture of the fund's liquidity under various market conditions.
5. **Guarantee Assessment:** Regularly projecting the P&L and Balance Sheet allows the firm to assess the sufficiency of funds set aside for guarantees, ensuring that these obligations can be met without impacting the overall stability of the portfolio.

(1 mark for each point, Max 5)

- v) The Liability Driven Investment (LDI) strategy is designed to minimize market risk by aligning investment returns with liability pay-outs. Below outlines how various derivatives can be used in LDI strategies:

LDI Strategies Using Derivatives

1. **Bonds + Swaps):**
 - **Duration Matching:** Use a combination of short-term bonds that provide higher returns and interest rate swaps to manage duration mismatches. The swaps can be used to convert the asset returns to match the fixed rate of return required by the liabilities.
 - **Cash Flow Matching:** Align bond maturities with liability pay-outs to ensure that cash flows from the assets coincide with the outflows required by policyholder obligations.
 - **Yield Enhancement:** Select bonds that have higher yields but may not match the duration of liabilities; use swaps to transform these yields into the desired duration, thereby maintaining the portfolio's return requirements.

(1 mark for each point, 3 marks)

2. **Swaptions:**

- **Interest Rate Lock-In:** Purchase swaptions to secure the right, but not the obligation, to enter into an interest rate swap at a future date. This can lock in interest rates for liabilities that are sensitive to rate changes, such as future annuities vesting, ensuring the company can set aside the right amount of funds today for future pay-outs.
- **Flexibility in Strategy:** Use swaptions to retain flexibility in adjusting the investment strategy based on how interest rates move. If rates move unfavourably, the company can exercise the swaptions to mitigate losses on guaranteed annuity products.

(1.5 mark for each point, 3 marks)

3. **Total Return Swaps**

- **Fixed to Floating Returns:** If asset returns are floating and liabilities are fixed, enter into total return swaps where the company pays the floating rate and receives a fixed rate. This can hedge the risk of interest rate movements affecting the returns required to meet the fixed nature of policyholder benefits.
- **Credit Risk Transfer:** Use total return swaps to synthetically gain exposure to higher-yielding assets without taking on additional credit risk. This strategy can enhance the returns of the portfolio without compromising the quality of the assets.
- **Liquidity Management:** Since total return swaps do not require a significant initial investment, they can be used to gain exposure to certain asset returns while maintaining liquidity to meet short-term liabilities.

For longer-term non-profit liabilities, these LDI strategies can be tailored to ensure that the company invests in assets that offer higher returns without exposing the firm to undue duration or interest rate risk. The use of swaps, swaptions, and total return swaps allows the company to fine-tune its asset allocation and risk exposure to match the specific characteristics of its liabilities, securing its financial position against market volatility.

(1 mark for each point, 4 marks)

[10]

vi) **New Risks Introduced by LDI Strategies:**

Counterparty Risk: When using derivatives like swaps or swaptions in an LDI strategy, there is the risk that the counterparty to the derivative contract may default, particularly during times of financial stress. This could result in losses or additional costs to replace the contracts.

Liquidity Risk: LDI strategies often involve locking in assets to match liabilities, which can reduce the portfolio's liquidity. The company might find it challenging to meet unexpected cash flow needs without incurring significant costs.

Mismatch Risk: There is a risk that the derivatives used in LDI strategies may not perfectly match the liabilities they are intended to hedge. Small discrepancies can accumulate over time, especially with complex products or in changing market conditions, potentially leading to an imperfect hedge and exposure to market risk.

These risks underscore the importance of careful risk management and due diligence when implementing LDI strategies. While they are designed to mitigate market risk, the complexity and dependencies they introduce need to be closely monitored and managed.

(1 mark for each point, Max 3)

vii)

PV 01 of index linked	-2.72	=duration x exposure/-10000
Liability PV 01	-10	
IE01 of liabilities	-7	
IE01 of assets	-2.72	=PV01 asset/PV01 of liabilities
Hedge ratio of interest rate	27%	
Inflation hedge ratio	39%	

(4)

[40]
