

INSTITUTE OF ACTUARIES OF INDIA

SA7 - Investment and Finance

May 2026 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 examiners have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution 1:**a) Macroeconomics and Solvency****i)****Equities vs. Bonds Correlation:**

- A geopolitical energy shock creates a severe supply-side macroeconomic contraction.
- Input costs surge, compressing corporate profit margins and driving equities down.
- Central banks aggressively hike interest rates to anchor rising inflation expectations.
- Higher discount rates drive bond prices down; hence correlation becomes strongly positive as both drop together.

Gold vs. Financial Assets Correlation:

- Gold acts as a traditional safe haven and inflation hedge during crises.
- Real yields on bonds struggle against inflation, increasing gold's relative attractiveness.
- Expected correlation of gold with equities/bonds turns negative (moves inversely).

Trade Deficit/CAD Impact:

- Structurally high oil prices heavily inflate India's import bill.
- Seasonal surges in gold imports further compound the widening merchandise trade deficit.

Currency Pressure:

- Widening Current Account Deficit (CAD) puts severe depreciation pressure on the INR.
- RBI must maintain tight domestic liquidity to prevent capital flight, exacerbating the bond/equity sell-off.
- Weaker INR makes imported gold more expensive domestically, reinforcing its price rise and negative correlation.

[6]**ii)****Asset Side:**

- The Fair Value of Assets drops sharply across the board.
- Both fixed income and equity backing the surplus decline simultaneously.
- The anticipated SAA diversification benefit between bonds and equities fails entirely.

Liability Side:

- Higher risk-free discount rates must be applied to value the liabilities.
- This higher discount rate mathematically reduces the Best Estimate Liability (BEL).
- This reduction is pronounced for non-participating guaranteed savings products with fixed cash flows.

Net Solvency Impact:

- The liability reduction partially offsets the mark-to-market asset losses.
- However, statutory reserves are subject to a minimum regulatory floor.
- Reserves cannot be reduced below the guaranteed surrender value of the policies.
- Assets backing the free surplus and shareholder capital take an unhedged valuation hit.
- Consequently, the overall Available Solvency Margin (ASM) declines in absolute terms.
- The overall regulatory Solvency Ratio of the insurer will drop significantly.

[6]**b) Behavioral Finance & Governance****Availability Heuristic:**

- Committee members overweigh recent, highly salient news events.

- Global war and supply chain collapses are easily recalled and dominate discussions.
- This cognitive shortcut leads to a severe overestimation of extreme tail events.
- Consequently, the committee irrationally penalizes domestic sectors that remain fundamentally sound.

Loss Aversion:

- The psychological pain of recent portfolio drawdowns is felt more intensely than potential gains.
- This emotional response induces panic selling or "de-risking" to cash at market bottoms.
- It prevents the committee from executing counter-cyclical rebalancing into cheap equities.
- Ultimately, this behavior locks in temporary mark-to-market losses as permanent capital impairments.

Independent Oversight:

- Mandate the inclusion of Independent Directors on the Investment Committee.
- Independent directors provide objective, external oversight and challenge.
- This structure actively prevents dominant executive groupthink during crises.
- Aligns directly with IRDAI's corporate governance guidelines for board-level committees.

Independence of Control Functions:

- Ensure the Chief Risk Officer (CRO) function operates completely independently of the CIO.
- The CRO must have the authority to stress-test and veto Investment Committee (IC) decisions.
- This fulfills regulatory mandates for strict separation of risk-taking and risk-oversight.
- Provides a formal channel to challenge aggressive de-risking or risk-seeking behaviors.

Systematic Triggers / Red Teaming:

- Institute hard-coded, systematic SAA rebalancing rules linked to specific thresholds.
- This removes emotional discretion and forces buy-low/sell-high discipline.
- Formally assign a "Red Team" member or sub-committee.
- Their explicit role is to construct data-driven counter-narratives to the prevailing consensus view.

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c) ALM and Hedging the Loyalty Commission

i)

Nature of Liability:

- The liability is a complex, long-duration synthetic obligation.
- It is not a fixed nominal amount but is explicitly linked to inflation and equity indices.
- The insurer is effectively taking a short position on both domestic inflation (CPI) and the equity market (Nifty).

Embedded Optionality:

- A "zero-floor" commission structure prevents the payout from becoming negative during market crashes.
- This asymmetric payoff acts as an embedded call option granted to the distributor.
- The mathematical payoff profile is $\max(0, \text{index amount})$.
- The insurer must hold reserves for both the intrinsic value and the time value of this option.
- The time value of this option spikes significantly during periods of high market volatility.

[4]

ii)

Base Component:

- Calculate the Present Value (PV) of the expected base commission payout.
- Invest this PV in a 5-year zero-coupon Indian Government Security (G-Sec) for exact duration matching.
- Under *Ind AS 109*, if the business model is 'hold to collect', classify as Amortised Cost.

- Alternatively, classify as Fair Value Through Other Comprehensive Income (FVOCI) if held to collect and sell.

Nifty Leg:

- Purchase 5-year Nifty 50 call options to replicate the exact non-linear equity upside.
- Alternatively, utilize a dynamic rolling strategy of short-term Nifty index futures.
- Under *Ind AS 109*, these derivatives must be classified as Fair Value Through Profit and Loss (FVTPL) unless strict hedge accounting applies.

CPI Leg:

- 5-year Inflation-Indexed Bonds (IIBs) are highly illiquid in the Indian market.
- Therefore, the insurer must use proxy hedges like Gold ETFs or commodity futures.
- Under *Ind AS 109*, these proxy trading instruments must be classified and measured at FVTPL.

[5]

iii)

CPI Proxy Basis Risk:

- Gold or broad commodities are highly imperfect proxies for domestic CPI.
- Domestic CPI is heavily weighted towards local food and housing prices.
- These local components can diverge significantly from global commodity price trends.
- This divergence leaves the insurer exposed to significant unhedged liability (basis risk).

Dividend Drag:

- The Nifty Total Return (TR) index explicitly includes reinvested dividends.
- Standard Nifty futures price out expected dividends, meaning they will consistently under-hedge a TR-linked liability.

Liquidity Risk:

- Rolling short-term futures incurs ongoing frictional transaction costs.
- During extreme volatility, the insurer is exposed to large, cash-draining margin calls (liquidity risk).

[4]

d) GIFT City, FinRe, and Tokenisation

i) Asset Permissibility:

- Operating from IFSC bypasses strict DTA domestic investment pattern rules.
- It removes the mandatory requirement to hold large proportions of Indian government securities.
- Allows the IIO to invest heavily in global alternative asset classes.
- Permits direct investment in foreign derivatives without extensive domestic regulatory approvals.

Currency Diversification:

- Investments and operations in GIFT City are denominated in freely convertible foreign currencies (e.g., USD).
- Provides direct exposure to hard currency assets.
- Acts as a natural macro-hedge against domestic inflation.
- Protects the group's overall balance sheet against severe INR depreciation.

[4]

ii) Mechanics:

- The domestic (DTA) entity enters into a quota-share reinsurance treaty.
- The counterparty is its own related-party IFSC IIO.
- The DTA entity cedes a defined share of future premium and profit margins to the IIO.
- In exchange, the IIO pays a large upfront "Reinsurance Commission" to the DTA entity.

VIF Monetization:

- The domestic entity holds intangible Value-in-Force (future expected profits) which doesn't fully count towards capital.
- The upfront commission effectively converts this intangible VIF into immediate cash.
- Cash is an admissible asset under IRDAI valuation rules.
- This transaction instantly boosts the DTA entity's Available Solvency Margin (ASM) and solvency ratio.

[4]

iii) Transfer Pricing:

- The transaction will face high scrutiny from both IRDAI and tax authorities.
- Regulators will rigorously check if the reinsurance commission is priced at an arm's length market rate.
- There is regulatory risk if the treaty is viewed merely as an artificial capital extraction tool.

Capital Fungibility/Trapping:

- In a severe systemic crisis, IFSC authorities may impose capital controls.
- IFSCA may restrict the repatriation of IIO capital back to the domestic parent.
- This could trap capital in GIFT City, leaving the DTA parent short of liquidity during a domestic run.

[3]

iv) Unified Ledger:

- The IIO could hold and trade tokenised global assets on a unified ledger concept (per BIS).
- Programmable smart contracts could automatically execute FinRe collateral transfers.
- Derivative margin calls can be settled instantaneously via atomic settlement.
- This completely eliminates counterparty settlement risk during volatile crisis periods.

Wholesale e-Rupee:

- Leverage the Central Bank Digital Currency - Wholesale (CBDC-W) framework.
- Transactions between the DTA and IIO banks can occur directly on the CBDC platform.
- This bypasses traditional, slower correspondent banking networks like SWIFT.
- It drastically reduces cross-border frictional costs, settlement times, and expensive liquidity float requirements.

[4]

[50 Marks]

Solution 2:

a) M &A Valuation, IBC, RBI AT1, and Ind AS 117

i) Mark-to-Market (MtM) vs Mark-to-Model (MtMdl):

- MtM fails as observable prices reflect irrational fire sales.
- True liquidity has completely dried up in the distressed market.
- MtMdl (Discounted Cash Flow (DCF)) is required to estimate fundamental value.
- DCF is highly subjective regarding Probability of Default (PD) and Loss Given Default (LGD).

Ind AS 109 ECL:

- Requires point-in-time, forward-looking impairment modeling.
- Must incorporate forward-looking macroeconomic overlays.
- Distressed assets trigger Stage 3 (lifetime) Expected Credit Loss impairment.
- Pinnacle must heavily provision and write down these assets immediately upon acquisition.

IBC Amendments:

- Tighter thresholds (90% CoC approval) to withdraw insolvency applications.
- Makes out-of-court restructuring much harder for real estate developers.
- This structurally delays the timeline for any cash recovery.
- The delayed timeline significantly increases the modeled LGD in the DCF valuation.

RBI Basel III AT1:

- AT1 bonds have deep subordination clauses.
- At the Point of Non-Viability (PONV), regulatory triggers can be activated.
- These bonds face permanent principal write-down or mandatory coupon cancellation.
- The valuation must apply a severe discount to par to account for this extreme regulatory trigger risk.

[8]

ii)**Ind AS 117 Impact:**

- Introduces market-consistent valuation of insurance liabilities.
- Establishes the Contractual Service Margin (CSM) to defer unearned profit recognition.
- Increases P&L volatility due to regular assumption un-locking.
- This delayed profit emergence reduces the immediate Embedded Value (EV) of the target.

RBC Impact:

- Introduces explicit, granular capital charges for credit and ALM mismatch risks.
- Shifts from flat factors to risk-sensitive metrics, raising the absolute Required Capital.
- Higher required capital increases the Cost of Residual Non-Hedgeable Risk (CRNHR).
- This frictional cost of holding higher capital directly depresses the target's EV.

[4]

b) PE Manager Selection & SEBI AIF 2012**i) Illiquidity and Stale Pricing:**

- PE funds rely on smoothed, quarterly mark-to-model valuations.
- This lack of daily pricing artificially suppresses perceived portfolio volatility.
- Consequently, historical risk-adjusted return metrics like Sharpe ratios are mathematically overstated.

Attribution Fallacy:

- Past success may simply reflect high macro beta.
- For example, zero interest rates historically inflated exit multiples across the board.
- These returns are often incorrectly attributed to the manager's specific skill (alpha).

[3]

ii) SEBI AIF 2012 Permissibility:

- Category I AIFs (SME, Infrastructure, Social ventures) are permissible investments.
- Category II AIFs (standard PE and Debt funds) are permissible for insurance surplus.
- Category III AIFs include hedge funds employing complex leverage and derivatives.
- Cat III funds are strictly prohibited for most long-only institutional portfolios.
- The DD team must rigorously verify strict Cat I or Cat II registration status.
- They must also ensure the fund's specific mandate doesn't violate IRDAI exposure norms.

DD Framework:

- Evaluate Alignment of Interests by checking the General Partner's (GP's) personal capital commitment ("Skin in the game").
- Scrutinize fund economics, particularly management fees versus carried interest.
- Ensure strict, high hurdle rates are in place before performance fees are paid.
- Assess qualitative factors like core team stability and turnover.
- Review the GP's succession planning mechanisms.
- Evaluate the strength and exclusivity of their proprietary deal-sourcing networks.

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iii)

J-Curve Effect:

- PE funds typically report negative returns in the early years of the fund life.
- This is due to immediate management fees drawn on committed capital before underlying investments mature/exit.

Internal Rate of Return (IRR):

- Time-weighted return metric.
- Accounts for the specific timing of capital calls and distributions.
- *Limitation:* Assumes all distributions can be reinvested at the same high IRR, which overstates actual realized money returns.

Multiple on Invested Capital (MOIC):

- Total Value divided by Paid-In Capital.
- Provides a simple cash-on-cash return multiple.
- *Limitation:* Completely ignores the time value of money (e.g., a 3x return over 4 years vs 15 years looks mathematically identical).

[4]

c) ALM and Derivatives for ULIP Guarantees

i)

Delta:

- Represents the first derivative of the option/guarantee value.
- Measures the sensitivity or rate of change of the guarantee liability value.
- Measured with respect to a small 1-unit change in the underlying equity index.

Gamma:

- Represents the second derivative of the option value.
- Evaluates the rate of change of Delta itself.
- Measures the convexity or non-linearity of the liability profile.

[3]

ii)

Delta Hedging:

- The insurer must first calculate the aggregate delta of the entire guarantee liability block.
- The insurer then takes an offsetting derivative position.
- Typically, this involves shorting Nifty index futures.
- The goal is to perfectly zero out the net delta of the combined asset-liability portfolio.

Rebalancing:

- As the underlying market moves, the liability's delta will change due to Gamma effects.
- The initial hedge will quickly become mismatched.
- The insurer must continuously buy or sell futures to re-adjust the hedge ratio.
- This continuous adjustment is required to keep the net delta at zero.

Regulatory Compliance:

- IRDAI guidelines explicitly mandate that derivatives can only be used for strict risk mitigation.
- Speculative derivative positions are entirely prohibited.
- The strategy must be fully codified in a formal, Board-approved derivative policy.
- This policy must detail permissible instruments, counterparty limits, and margin protocols.

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iii)

Transaction Costs:

- Dynamic hedging requires continuous rebalancing as markets fluctuate.
- In choppy, volatile markets, this results in massive frictional costs.
- The insurer constantly pays brokerage fees and bid-ask spreads.
- This "volatility drag" slowly bleeds the overall surplus over time.

Gap Risk:

- During a sudden, extreme market crash, asset prices may "gap" down abruptly.
- The market price jumps past the insurer's pre-set rebalancing triggers without executing trades.
- The insurer cannot trade fast enough to adjust the short futures hedge.
- This leaves the insurer exposed to massive, unhedged downside losses.

[4]

d) Performance Measurement & Attribution

i)

Model Concept:

- It is a standard mathematical framework used in performance attribution.
- It decomposes the active return of a managed portfolio against a specified benchmark.

Asset Allocation Effect:

- Measures the value added by the manager's macro-level decisions.
- Evaluates the impact of systematically over-weighting or under-weighting broad asset classes.
- Measures this relative to the strategic benchmark weights.
- Formula first part: Calculates active weight ($w_{\text{portfolio}} - w_{\text{benchmark}}$).
- Formula second part: Multiplies by sector active return ($R_{\text{benchmark_sector}} - R_{\text{total_benchmark}}$).

Security Selection Effect:

- Measures the value added by the manager's micro-level stock-picking skills.
- Evaluates the ability to pick individual outperforming securities within a specific asset class.
- Assumes the sector weight matches the benchmark to isolate selection skill.
- Formula first part: Takes the benchmark weight $w_{\text{benchmark}}$.
- Formula second part: Multiplies by relative sector performance ($R_{\text{portfolio_sector}} - R_{\text{benchmark_sector}}$).

[6]

ii) Pricing Frequency Mismatch:

- Public market indices (like Nifty) are marked-to-market and priced daily.
- Private Credit and PE funds are typically valued only quarterly or semi-annually.
- Private valuations rely on subjective, backward-looking mark-to-model techniques.
- This mismatch artificially smooths private asset volatility, breaking comparative attribution.

Return Math Mismatch:

- Standard Brinson attribution mathematically requires Time-Weighted Returns (TWR).
- TWR assumes the manager has no control over cash inflows/outflows.
- PE managers explicitly control cash flows via capital calls and distributions.
- This makes Money-Weighted Returns (IRR) more appropriate, breaking standard Brinson arithmetic formulas.

Lack of True Benchmarks:

- There are no easily investable, passive indices for private equity or private credit.
- Comparing a highly illiquid, leveraged PE fund to a liquid public equity index is flawed.

- It introduces massive liquidity, leverage, and duration mismatches.
- This renders standard relative performance metrics (like tracking error) highly misleading.

[6]
[50 Marks]
