

INSTITUTE OF ACTUARIES OF INDIA

Subject SP5 - 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) Forward guidance (1)
 - ii) Competition policy (1)
 - iii) Legal owner (1.5)
 - iv) Self - regulation (1)
 - v) Ethical investment (1.5)
 - vi) Prescriptive (1.5)
 - vii) Market practice (1.5)
 - viii) Household (1)
- [10]**

Solution 2:

- i)
- a) **Both dividend and share buyback is based on reserves build up on after tax profit**
 - b) Dividend is paid to all shareholders but in buyback, shareholders have an option to not participate.
 - c) Share buyback is treated as:
 - long term capital gain if the holding period is greater than a certain period
 - short term capital gain if the holding period is less than 6 certain period
 - Overall, it is subject to a ceiling tax rate of 20% as per the table
 - d) An individual would have to pay short term capital gains even if his income is below the lower income tax threshold but is not subject to long term capital gains in this scenario.
 - e) Dividend is taxed as an income and taxed at the respective income tax bracket with a ceiling of 45% for very high-income individuals.
 - f) For an individual in the highest tax bracket, share buyback is a better alternative than dividend since capital gains tax is lower than income tax.
 - g) For an individual below lower threshold for income tax, dividend is a better proposition if holding period is less than 6 months.
 - h) Given there is an option for the individual to participate, from a pure tax perspective, buyback is a better deal than dividend.
- (1 mark for each point, total 8 marks)

ii)

- a) Consistency over previous years
 - b) Market expectation
 - c) Shareholder expectation
 - d) Desire to consolidate promotor control
 - e) Desire to immediately or eventually de-list
- (0.5 marks for each point, max 2 marks)

[10]

Solution 3:**i)**

a) Default risk

- risk of nonpayment of interest & principal
- arises from poor loan underwriting & classification practices
- its impact can be reduced/aggravated depending on the efficiency of residual management practices undertaken after the default of the loan

b) Prepayment risk

- risk of paying earlier than committed date
- could impact hedging strategy and result in reinvestment risk, which is basically that the reinvested account yields a lesser return than the original account
- usually arises when there is a downward trending interest rate curve along with an option to pay back the due without significant penalty clauses

c) Concentration risk

- the risk of geographical or cohort concentration within the loan portfolio
- arises from a catastrophic event like earthquake, flood, riots etc that could lead to mass default at the same time
- increases the risk of bankruptcy and capital requirement

d) Operational risk [systems, process and people failure]

- the risk from failure of systems, processes and people
- arises because of poor management control practices & information systems
- can lead to poor underwriting practices, adverse selection, sub-optimal residual management and fines from the regulator

e) Unhedged loan disbursement

- risk due to asset mismatched with liability in terms of nature, term, currency and uncertainty
- could lead to a liquidity crisis when there are sufficient funds but not enough liquid funds to pay back the liabilities (deposits or debt used to fund the loan disbursement) as and when they arise

(1.5 mark for detailing each risk, max 7 marks)

ii) Liability driven investment is an approach of investment in assets that can generate the cashflows to align with the financial obligations or liabilities (1)**iii)** Advantages:

- a) Lower volatility in asset-liability differential
- b) Closely replicated cashflows
- c) Reduced risk of insolvency

d) Reduced capital requirements

Disadvantages:

- a) Compromising on returns to align with liabilities
- b) Matching assets may not be available in nature & duration of liabilities
- c) Could be an expensive affair with need to constantly rebalance portfolio
- d) Requires continuous monitoring (5)

iv)

- a) For institutions, self - funded defined benefit pension plans
 - b) For individuals, aligning investment for the long-term financial goals (for eg: desire to make children study abroad) with nature, term & currency (2)
- [15]

Solution 4:

- a) It doesn't consider the timing. A depressed stock could be depressed for a long period of time.
- b) Ignores growth companies that are just taking off which are not yet profitable.
- c) Book value will be low for services companies or companies that have little physical assets.
- d) High dividend payout may indicate maturation of the business and no further avenues of expansion within the company
- e) Book value is a historical measure and does not reflect current market value. Actual market value of the company's assets could be vastly different than what is quoted in the books.
- f) This analysis takes the ratios as at a particular date and does not consider the direction of growth of the business. If profitability ratios are falling
- g) This analysis lacks other information that could affect the business such as competition, ESG, regulatory influence etc.
- h) This sort of an analysis could lead to concentration in one or two sectors where all stocks in that sector exhibit this behaviour.
- i) Since this information is available to everyone, it's unlikely that if an inefficiency exists, it's already not been priced into by the market already.
- j) Overall, the analysis is very simplistic and requires a more holistic and critical narrative to justify the choices. [10]

Solution 5:

- i) Both CFDs and futures are OTC and non-standardized (2)
- ii) Forward: no margin, no marked to market, physical delivery, fixed expiry and contract closure
CFD: margin, marked to market, no physical delivery, they do expire but can be rolled over (4)

iii)

- a) Since CFDs are over the counter, counter party default constitutes the main non-market risk. However, this is minimized to an extent by the existence of a marked-to-market margining system. (2)
- b) Liquidity of the CFD is another risk to consider. (1)
- (3)
- [9]

Solution 6:

- i) Arbitrage Funds are hybrid funds that leverage arbitrage opportunities in the market. These can be a pricing mismatch between two exchanges, different pricing in the spot and futures market, etc. The fund manager of an arbitrage fund buys and sells the shares at the same time and earns the difference between the selling price and the buying price of the share. (2)
- ii) **Advantages:**
- a) Taxation advantages
- b) Diversification and low beta relative to market
- c) The portfolio will primarily contain hedged exposures.
- d) Such funds are the only low-risk investment that thrives in a volatile market

Risks:

- a) Improper hedge exposure due to modelling or parametric risk
- b) Tendency to underperform during low volatility periods (4)
- [6]

Solution 7:

- i) Equity 2%, corporate bonds 4%, govt bonds 6%, total = 2%+4%+6% = 12% (2)
- ii)
- a) Strategic risk = st dev of (strategic benchmark returns – matching benchmark returns)
= 1.85% (3)
- b) Information ratio = mean(relative return between portfolio & strategic benchmark)/stdev(relative return)
= -4.2% / 14.10% = -0.2978 (3)
- iii)
- a) To account for 2.5% probability,
- Loss of \$5m at a probability of .04%
- Loss of \$6m at a probability of 2.46%
- Expected shortfall = (.04% * 10) + (2.46% * 6) = \$6.064 million (2)

b)

Expected shortfall for the joint portfolio:

- With probability $0.98 \times 0.98 = 96.04\%$ each bonds loses \$1 million, and the total loss is 2 million

- With probability $2 \times 0.98 \times 0.02 = 3.92\%$ one bond loses \$1 million and the other bond loses \$5m, for a combined loss of \$6 million

- With probability $0.02 \times 0.02 = .04\%$ both bonds lose \$5 million, overall loss \$10m

(5)

[15]

Solution 8:

i)

Period	Portfolio Value	Cash Inflow/Outflow	Benchmark Portfolio	R(p)
0	156	0	6078	0.00%
1	121	20	4167	77.56%
2	134	-43	3475	95.04%
3	110	52	4039	120.88%
4	200	0	5060	123.46%

TWRR 10.01%

MWRR/Year 2.24%

MWRR Full Period 9.24%

Benchmark Portfolio -16.75%

(3 marks for TWRR, 2 marks for MWRR)

(5)

ii) The benchmark return in this period has reduced in value by 16.75%. The fund manager is correct in his statement regarding outperformance of the benchmark in both time as well as money weighted terms.

(2)

iii) Example of a rule (**Alternative relevant answers to be accepted**):

a) Calculate the difference of cumulative percentage difference (say % difference in price from 1 April 2023 of share A/% difference in price from 1 April 2023 share B) between two shares in the same sector from a particular period.

b) Set an upper and lower threshold using back testing

c) If upper threshold is breached, then share A is expected to be overvalued in comparison to B. Hence short A & buy B in a delta hedged portfolio. Vice versa if the lower threshold is breached.

(3)

[10]

Solution 9:

The financial group companies are the various industries making up the financial services industry, eg banks, general insurance companies, life assurance companies, investment trusts and real estate (property) companies.

The key distinctive feature of financial group companies is that they tend to be capital intensive.

Banks are highly geared and have volatile profits small changes in the difference between saving and lending rates can have a big impact on shareholders' profits. Also, provisions for bad debts during a recession can wipe out profits entirely. Note that higher interest rates have two effects on banks: 1.

- a) their profits will tend to be reduced because they will have to increase their provision for bad debts.
- b) profits will tend to increase due to the 'endowment' effect, i.e. they benefit from higher interest on lending whilst the interest on some of their borrowing (e.g. your current account balance) remains at zero or at very low levels.

General insurers also have volatile profits and virtually no borrowings. This is because of the volatile nature of general insurance claims.

Life insurers have stable profits and low gearing Profits are realised gradually over the life of their contracts which are long-term)

Labour costs are important for many companies in the group. For the insurance contingent (life, composite and brokers) staff costs form a large proportion of the total costs. Staff costs are also significant for banks if compared with the difference between interest earned and interest paid. However, for property companies the cost of labour should be minor.

The domestic market is most important but there is increasing internationalisation. This trend has been driven by the deregulation of capital markets. Reinsurance companies have a higher proportion of overseas contracts.

[5]

Solution 10:

- i) Absolute: discounted cash flow
Relative: black Scholes model (2)
- ii) Compared to a traditional actuarial valuation, ALM provides much more information in three (or more) extra dimensions:
 1. providing projections into the future (time dimension)
 2. providing some estimate about the range of likely outcomes (probabilistic dimension)
 3. indicating the effect of changing investment strategy (asset mix dimension). (3)
- iii)
 - a) PV01 measures the sensitivity of the value of liabilities to changes in interest rates. Assets can be selected in a way that replicates the calculated sensitivity via PV01. (2)
 - b) Modified duration = $2.5/(1+.0525/2) = 2.43$ years (1)
DV01 = $2.43*97.25 = 236.90$ (2)

(3)

[10]
