

# **INSTITUTE OF ACTUARIES OF INDIA**

## **EXAMINATIONS**

**23<sup>rd</sup> November 2020**

**Subject SP5 – Investment and Finance**

**Time allowed: 3 Hours 30 Minutes (09.30 – 13.00 Hours)**

**Total Marks: 100**

- 1. Please read the instructions to examinees sent along with hall ticket carefully and follow without exception.*
- 2. The answers are not expected to be any country or jurisdiction specific. However, if Examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*
- 3. Mark allocations are shown in brackets.*

**Q. 1)** You are an analyst, in Risk Management department of a financial institution, monitoring and controlling market risk and credit risk (including counterparty risk).

You read an article on Modern Portfolio Theory (MPT) that states: “MPT was the first real attempt to use statistical techniques to show the benefit of diversification for investors. According to MPT, expected return and variance of return are all that matters and it ignores other key factors.”

- i) Show the benefits of diversification considering four independent assets; all having same expected return of 10% p.a. and same variance of return of  $\sigma^2$ . (2)
  - ii) List other key factors, ignored by MPT that might influence the investment decision in practice. (3)
  - iii) List two key factors in managing credit risk. (1)
  - iv) Discuss various ways of managing credit risk. (4)
- [10]**

**Q. 2)** You are working in product design team of a mutual fund house that intends to launch an innovative product. Your team designed a new product: a single contribution close-ended fund with term five years. Every day the fund value for all investors is recorded based on the number of units held and NAV (Net Asset Value) per unit of the new fund at the end of the day.

The new fund offers a relative investment guarantee where benefit payable (on pre-mature exit or maturity) to investor is higher of actual fund value or X% ( $70 < X < 90$ ) of the highest fund value recorded up to the date of benefit payment.

The new fund would start with 100% invested in hedged portfolio of Equity index and Put options on Equity index. Hedging strategy involves weekly monitoring and if required rebalancing the number of equity index-points and puts; and varying the strike price of the puts. The hedged portfolio provides significant upside potential. However, if index falls, the put options will become more valuable making the fund value greater than or equal to the guaranteed value (X % of the highest fund value recorded till date).

As long as the current fund value is greater than guaranteed value, the fund is 100% invested in the hedged portfolio of Equity index and Put options. If on any day, owing to any improper hedge and substantial fall in the equity index, the fund value hits guaranteed value or even goes below, then the shortfall in the fund is supplemented by capital injection from ALM mismatch reserve. Immediately after capital injection, the fund is switched fully into maturity matching ZCBs (Zero Coupon Bonds). ALM mismatch reserve is built by accumulating some proportion of FMC (Fund Management Charge) charged on daily basis.

You have performed extensive ALM exercise to determine various levels of shortfalls in future by varying:

- few variables deterministically like X %, FMC and pre-mature exit load
- few variables stochastically like index returns, index volatility and yields under 50,000 scenarios

You are going to give a presentation, on the new product design and ALM exercise results, to Product steering committee. The Product steering committee has to sign-off the new product / fund before sending it to the regulator for approval.

- i) Describe the key contents in presentation of the ALM results. (6)
- ii) Discuss the use of dynamic liability benchmarks. (2)

During the presentation, one of the members of Product steering committee asked the following three questions.

- iii) Suppose required number of put options is not available in the market, due to shortage or unwillingness of option writers, how would you perform similar (option like) hedging without using options? (2)
- iv) Mention advantages and disadvantages of option like hedging without using options. (4)
- v) Once the fund is switched fully into maturity matching ZCBs, the fund value may still be volatile due to changes in yields. Discuss various ways of managing the fund for any shortfall that may arise upon recording new higher guaranteed values over the remaining term. (8)

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**Q. 3)** An investment manager manages a fixed interest portfolio with a benchmark portfolio of 50% in All conventional Government bonds index and 50% in All Corporate bonds index. He is mandated to rebalance the portfolio annually to conform to benchmark split of 50:50. Any contributions or redemptions to the fund is done in 50:50 split. He can make a 10% deviation from benchmark split during a year. His current portfolio, as on 31st December 2019, consists of 56% in long-dated (>8 years) Government bonds and 44% in corporate bonds with term up to 10 years. He believes that the market's expectation on inflation is far too low.

- i) List the actions that manager might take to alter the portfolio to be more consistent with his views on inflation. (4)
- ii) What could be the possible reasons for the manager's current portfolio composition to differ from that of the benchmark portfolio? (3)

Below table provides manager's fund returns and the index returns over past five years.

Year	Manager G-Bonds	All G-Bonds Index	Manager Corp-Bonds	All Corp-Bonds Index
2015	5.2%	6.6%	11.1%	9.8%
2016	6.2%	5.9%	8.8%	9.4%
2017	6.1%	5.7%	9.7%	7.8%
2018	9.3%	9.6%	9.3%	11.8%
2019	8.9%	7.3%	7.5%	11.3%

- iii) Calculate mean relative returns and backward-looking tracking errors. (final answer is required ignoring the steps) (4)
- iv) Comment on Manager's performance without doing any further calculations. (4)
- v) Discuss the usefulness of estimating forward-looking tracking error. (3)

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- Q. 4)**
- i)** Comment on the statement: “A European option would always be costlier than an American option on the same underlying assets with the same strike price and same exercise date”. (3)
  - ii)** An investor purchases a put option with a strike price of Rs. 1,000 for Rs. 80 and a call option with a strike price of Rs. 1,100 for Rs. 70 on the same underlying asset, and with the same maturity date. The current price of underlying asset is Rs. 1,050. Explain the payoff from this strategy (diagram is not required). (3)
  - iii)** What could be the rationale behind strategy adopted in question (ii), above? (1)
  - iv)** Another investor buys a call option with a strike price of Rs. 1,100 for Rs. 70, another call option with a strike price of Rs. 1,000 for Rs. 90 and sells two call options with a strike price of Rs. 1,050 for Rs. 80 on the same underlying asset and with the same maturity date. The current price of underlying asset is Rs. 1,070. Explain the payoff from this strategy (diagram is not required). (3)
  - v)** What could be the rationale behind strategy adopted in question (iv), above? (1)
- [11]**
- Q. 5)** You are working in a listed Life Insurance Company. The Company has been distributing dividends to its shareholders for last several years. Your Company is deliberating to offer stock option to its executives. You have been asked to prepare a report on the merits and demerits of stock options to employees so that their interests are aligned with those of the shareholders.
- i)** Discuss the points you would include in your report. (6)
  - ii)** Outline the objectives of Good Corporate Governance. (2)
  - iii)** Discuss the impact of abolishment of dividend distribution tax and instead taxing the dividends in the hands of the shareholders at the tax rate applicable to them on your Company. (5)
  - iv)** Explain the theory of behavioural finance pertaining to overall macro-level market behaviour. (10)
- [23]**
- Q. 6)**
- i)** Calculate the 5-year zero rate with continuous compounding if a 3% coupon bond for similar term sells for Rs. 75 and a 6% coupon bond for similar term sells for Rs. 85. The face values of bonds are Rs. 100. (4)
  - ii)** Consider a 3-year bond with half-yearly coupons. Calculate the 3-year par yield where zero-rates with continuous compounding for 6-month, 12-month, 18-month, 24-month, 30-month and 36-month are 6.00%, 6.25%, 6.50%, 6.70%, 6.85% and 7.00% respectively. (2)
  - iii)** For the above question (ii), calculate the value of a forward rate agreement to the borrower that will pay 8% compounding half-yearly for the half-year period starting in 2 years on a principal of Rs. 1,000 crore. (3)
- [9]**
- Q. 7)** Outline the role of commodities as an asset class in an Economy. (7)

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