INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

23rd November 2023

Subject SP5 – Investment and Finance

Time allowed: 3 Hours 15 Minutes (10.15 – 13.30 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. ***Please read the instructions inside the cover page of answer booklet and 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. ***Attempt all questions beginning your answer to each question on a separate sheet.***
4. ***Mark allocations are shown in brackets.***
5. ***Please check if you have received complete Question Paper and no page is missing. If so, kindly get new set of Question Paper from the Invigilator.***

AT THE END OF THE EXAMINATION

Please return your answer book and this question paper to the supervisor separately. You are not allowed to carry the question paper in any form with you.

Q. 1)

i) ENVIO bank has just launched an ESG focused equity mutual fund. They believe their social, compliance and environmental focus can generate better returns than a non-ESG focused investment portfolio in the long run and they in fact stand at a clear advantage. Your friend has approached you, an Investment Actuary, claiming this is counterintuitive and does not make sense, given that the ESG focus immediately means they stand at an apparent disadvantage due to restricted choice of companies to select from, and these companies possibly having higher operational cost of running their business? Justify why ENVIO bank could be correct in their stance? (6)

ii) List some examples of bad corporate governance practices of companies that you as an Investment Actuary would flag to not pursue investing in that company. (3)
[9]

Q. 2) A trader decides to sell an at the money call option and an at the money put option while simultaneously buying an out of the money call option and an out of the money put option.

i) What is the main rationale behind this move? (2)

ii) Draw the payoff diagram, specifically marking the key inflection points in the graph. (3)
[5]

Q. 3)

i) What is cost of carry? (1)

ii) What is convenience yield? (1)

iii) Value of a 3-month future contract is more the value of a 12-month futures contract for an agricultural commodity. What does this imply? Assume agricultural futures are permitted. (3)

iv) Discuss with reasons the impact on futures relative to spot if:

a) The Government is expected to introduce ban on the agricultural commodity exports.

b) Central bank rises repo rates to counter inflation. (4)
[9]

Q. 4) Calculate the price of a European call option on a five-year bond with a principal of 100 if:

- coupon is 18% per year payable annually
- life of the option is 1.5 years
- strike price of the option is 135
- forward yield volatility is 25%
- spot yields are flat at 5% with continuous compounding **[10]**

Q. 5) NEO Ltd is a newly formed commercial bank that caters to medium to high-risk corporate accounts that are not normally serviceable by traditional commercial banks. NEO Ltd to is interested in quantifying the value at risk as part of its credit risk modelling exercise.

i) List 4 distinct sources of credit risk for this bank. (2)

ii) Discuss how the commercial bank computing credit risk for the first time can go about creating a VaR model. (6)

[8]

Q. 6) List the primary behavioural bias discussed in each of the following scenarios:

i) Contrarian investor looking to profit from buying the worst performing banking stocks over the last 3 years while selling the top performing stocks. (1)

ii) Trend trader looking to profit from breakout of a non-profitable small cap stock that has a history of severe corporate governing issues. (1)

iii) A retail investor trying his hands at day trading following recommendations from a TV channel. (1)

iv) A middle-aged salaries employee trying to get a home loan from a bank of Rs. 50 lakh at 12% interest rate when having a fixed deposit for a similar amount with the same bank at 7% interest rate. (1)

v) A fund manager who has an alpha of zero during the year, credits the stocks that performed well in his portfolio to his stock selection skills while blaming of loss-making stocks on poor research inputs by the centralized R&D team. (1)

[5]

Q. 7)

i) Detail at least 4 tax considerations essential for an investor when evaluating domestic versus international investments to maximize returns after tax deductions. (2)

ii) An economic analyst is in discussions with a country's finance minister about tax reforms. The minister proposes to tax foreign income at a higher rate than domestic earnings and to provide tax breaks for start-up ventures. The objective of the finance minister is to bolster domestic entrepreneurship and ensure wealth is evenly distributed. Elucidate the potential flaws and unexpected consequences of this strategy. (4)

[6]

Q. 8)

i) Define what is meant by Active management of a bond portfolio. (1)

ii) Briefly explain the two approaches for actively managing a bond portfolio. (2)

iii) List three techniques to identify each of the approaches explained in (ii) above . (3)

iv) An investor has a significant portion of their portfolio in a Government Bond of a country X (XGB). The characteristics of the bond are XGB 3.5% September 2025 bond with a clean price of 117.50 and a Gross Redemption Yield (GRY) of 1.60%.

The investor is contemplating whether to switch to one of the following Government bonds available in the same market:

a) XGB 3% June 2025, clean price = 112.30, GRY = 1.70%
b) XGB 2.75% December 2040, clean price = 100.20, GRY = 2.75%

Analyse each of the cases mentioned above, identifying which approach the investor would be taking and provide appropriate justifications for each scenario. (6)

[12]

Q. 9) You are the Chief Actuary for a hedge fund that specializes in global equities. You have been presented with the annual returns data on two equity funds, the benchmark fund and the S&P Global 100 index (market), over the past ten years:

Year	Fund 1 (%)	Fund 2 (%)	Benchmark (%)	Market (%)
1	-6	-4	5	6
2	1	1	2	7
3	-6	8	4	3
4	13	-3	5	4
5	-4	8	7	3
6	13	10	1	2
7	-1	1	7	7
8	9	4	2	4
9	14	6	4	5
10	-7	8	3	7

The prevailing risk-free rate is 3% per annum and the average market return is 4.8% p.a.

i) Compute the Sharpe Ratio, Treynor Ratio, Jensen's Alpha, and information ratio for each fund. (7)

ii) Briefly explain the fund that needs to be targeted for investment based on the computations in (i) above. (2)

[9]

Q. 10)

i) Explain briefly what is meant by "Liability Hedging" as an actuarial technique in investment strategy. (2)

ii) Briefly elaborate on six different problems that can arise through Liability hedging strategy. (3)

iii) A multinational corporation with operations in three regions (Region A, Region B, and Region C) wants to hedge against currency fluctuations impacting their net present value of future revenue streams. The table below shows the expected annual revenue in local currency units (LCU) for each region and the cash flows from a cross-currency swap they're considering:

Year (t)	Swap Cash flows (LCU)	Region A Revenue	Region B Revenue	Region C Revenue
1	20	18	10	9
2	20	5	22	20
3	20	10	25	28
4	20	50	45	42
5	200	180	175	170

Assumptions:

All revenues are received annually in arrears.
The discount rate, considering currency fluctuations, is 5% per annum.

Which region would benefit most from the cross-currency swap to achieve the corporation's hedging objectives?

Provide a comprehensive breakdown of your calculations. (6)

[11]

Q. 11)

i) What is the main assumption behind the various asset pricing models? (1)

The following data is provided:

Risk-free rate: 3%
Market risk premium: 5%
SMB (Small Minus Big): 3%
HML (High Minus Low): 2%
Asset's beta: 1.1
Asset's sensitivity to SMB: 1.3
Asset's sensitivity to HML: 0.8

ii) Calculate the expected return of the asset using all the data given, by giving the appropriate name to the model (2)

iii) If you use this model, instead of the standard Capital Asset Pricing Model to compute the value of an asset (all other values remaining the same), state with reasons whether the value of the asset be higher or lower? (3)

[6]

Q. 12) The Cosmic Wealth Preservation Fund (CWPF) is at the forefront of securing the retirement benefits of beings across different galaxies. Traditionally, CWPF's investment benchmark has been to allocate 60% of its funds in Universal Bonds, tracking the "Cosmic Bond" Index, and 40% in planetary real estates, specifically tracking the “Galactic Real Estate” Index.

Given the recent surge in the value of rare cosmic minerals, the Chief Investment Officer (CIO) of CWPF anticipates a higher return from mining these minerals compared to traditional real estate investments. She decides to allocate 55% of the INR 5000 crore fund into Universal Bonds and 25% into cosmic mineral mining ventures, with the remaining 20% still invested in traditional planetary real estates. All incomes, whether from bond coupons or mining royalties, are immediately reinvested into their respective sectors. The fund undergoes rebalancing at the close of each Galactic Year (GY). The provided data is as follows:

Asset Class	GY 1 (INR Core)	GY 2 (INR Core)	GY 3 (INR Core)	Benchmark Return GY 1 (%)	Benchmark Return GY 2 (%)	Benchmark Return GY 3 (%)
Universal Bonds	2750	2980	3200	6.0	6.5	7.0
Cosmic Mineral Mining Ventures	1250	1410	1580	10.0	11.0	12.0
Planetary Real Estates	1000	1060	1120	4.5	4.0	4.2

By the end of GY 3, the fund value in Universal Bonds stands at INR 3,428.6 crore, in Cosmic Mineral Mining Ventures at INR 1,770.6 crore, and in Planetary Real Estates at INR 1,166.4 crore.

i) Calculate the difference in returns between the actual portfolio (considering the 55-25-20 allocation) and the benchmark portfolio (60% Universal Bonds and 40% Planetary Real Estates). (4)

ii) Determine the excess return achieved by investing in cosmic mineral mining ventures compared to the benchmark's planetary real estates. (2)

iii) Comment on the CIO's decision to invest in cosmic mineral mining ventures. (4)
[10]

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