

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

November 2025

CM2 - Economic Modelling (Paper B)

Time allowed: 1 Hours 45 Minutes

Total Marks: 100

Q.1) A pension fund invests in three fixed-coupon bonds, each paying annual coupons and redeeming at par. Assume simple annual compounding (not continuous). Ignore taxes and transaction costs. Unless otherwise stated, take face value = 100.

- a) Calculate the price of each bond using the given YTM. (6)
 - b) Using the spot rates, calculate the price of Bond A. Compare your result with your answer in part (a) and briefly explain any difference. (10)
 - c) Determine the one-year forward rate from year 2 to year 3, implied by the spot rates. (4)
 - d) Using the given spot-rate term structure, calculate the price of Bond B and comment on whether it is consistent with the quoted YTM for Bond B. (10)
- [30]**

Q.2) You are provided with a cumulative claims development triangle in the excel. The data shows cumulative paid claims by accident year over 6 development years. The chief actuary tells you the triangle is affected by:

- A change in inflation regime resulting in higher inflation from 2022 onwards
 - An exchange rate depreciation of 15% from 2022, with 30% of claims FX-sensitive
- a) Calculate the development factors for each development year using unadjusted data. (5)
 - b) Adjust the triangle to real 2019 terms. (12)
 - c) remove the FX shock on the FX-sensitive share of claims. (8)
 - d) Recalculate the development factors. (5)

One of the years has a significantly large claim. Your manager recognizes this as a one-off claim and asks you to adjust the triangle.

- e) Identify the outlier in the one of the accident years using development factors. Explain your reason for picking that particular cell in the triangle. Determine by how much this outlier is causing a spike in development factors. (6)
 - f) List some ways in which you can adjust for this outlier. There is no need to perform any calculations. (4)
- [40]**

Q. 3) You are analysing the risk of an equity investment. The dataset provides 36 monthly returns.

- a) Calculate the mean, variance, standard deviation, and 95% historical Value-at-Risk (VaR) using the full dataset. (10)
 - b) Recalculate the mean, standard deviation, and 95% historical VaR excluding the outlier in the returns data. (7)
 - c) Comment briefly on the impact of the outlier. (3)
- [20]**

Q. 4) Two investors are considering the same gamble:

- Investor A: $U(W) = \sqrt{W}$ and Investor B: $U(W) = \ln(W)$
- Initial wealth = 100
- Gamble: +50 with probability 0.6, −30 with probability 0.4

a) Calculate the expected wealth, expected utility, and certainty equivalent for A and B. (7)

b) Calculate the risk premium for each investor. Comment on the nature of each investor. (3)

[10]
