Mid-Term Assignment

Course : IT Application in Banking and Finance

Question 1: (***5 marks***) Using the any package to download any three series of the categories : financial market index, foreign exchange rate, commodity market index, stock price and crypto currency to answer the following questions:

1.1 Construct an equally-weighted portfolio of the three series downloaded (***1 mark***)

1.2 Using the portfolio above to calculate returns, absolute returns, squared returns of the series and provide neccesary plots, descriptive statistics, ACF. Give some comments (***2 marks***)

1.3 Perform the normality, Ljung-Box tests to check if the series is normally and independently distributed. Report the test statistic, the *p*-value and comment on your results. (***2 marks***)

Question 2: (*3 marks*) Using the three series above :

2.1 Estimate the EWMA, GARCH (1,1), GJR(1,1,1) models with Student's *t* distribution assumption. Report the estimation result and some comments. (***1 mark***)

2.2 Select the best model among the EWMA, the GARCH (1,1) and the GJR models using AIC and SBIC. (***1 mark***)

2.3 Perform backtesting on the VaR estimated on the best model above. (***1 mark***)

Question 3: (*2 marks*) Using the data above to fit to the multivariate GARCH frameworks such as BEKK, DCC, ADCC, cDCC, etc.

3.1 Estimate and report the results. (**1 mark**)

3.2 Backtest the multivariate models using the VaR approach (**1 mark**)

<u>Submission:</u>

- 9am, 29.05.2024 on MsTeams. Late submissions will be deducted by 10%.
- You need to submit the assignment in one PDF file that includes your results and comments and in one jupyter notebook.