Econometrics

Lecture: Modelling Stock Market Volatility

This laboratory focuses on forecasting stock market volatility using the DAX index, a key benchmark for the German equity market. The dataset provides information over the period extending from 3^{rd} January 2008 to 31^{st} December 2022, i.e. 3804 observations, one for each trading day. The DAX (Deutscher Aktien Index) is composed of the largest capitalized and most liquid German stocks listed on the Prime Standard segment of the Frankfurt Stock Exchange. This lecture aims to employ various econometric models and compare their performance forecasting stock market volatility. Specifically, we employ four well-known models: Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, GARCH in Mean (GARCH-M), Exponential GARCH (E-GARCH), and Glosten-Jagannathan-Runkle GARCH (GJR-GARCH)

1. Import data, compute log-returns and winsorize with $\alpha = 0.01$.
2. Test gaussianity, stationarity and null mean.
3. Plot autocorrelation and partial autocorrelation function for the time series and the time series squared.
4. Test ARCH effect for 1, 2 and 3 lags.
5. Estimate a GARCH(1,1) model and perform tests on the residuals.
6. Estimate a GARCH-M(1,1) model and perform tests on the residuals.
7. Estimate a eGARCH(1,1) model and perform tests on the residuals.
8. Estimate a GJR-GARCH(1,1) model and perform tests on the residuals.
9. Which model is the best one?