Abstract

In this thesis, the performance of volatility forecasting models for predicting stock price volatility using daily SENSEX data has been studied. It will start with a theoretical discussion which familiarizes the reader with Volatility and its various stylized facts. Application of the known models will be explained, time series analysis with theories and tests for financial time series are also discussed. For evaluating different forecasting estimates state space methods will be described and discussed.

The empirical part of this research starts with the model selection process for the preferred GARCH models. The time-series of SENSEX with total return index ranging from 1/1/2006 to 22/8/2013 (8 years of data) is analyzed. The selected model is restricted to GARCH and Stochastic Volatility(SV) models. Forecast model verification based on estimated statistics and autocorrelation are employed to evaluate for the model specifications. The model parameters of different GARCH models are estimated using maximum likelihood estimation (MLE). An alternative way of modeling the volatility based on the state space form of the GARCH process using the Kalman filter is proposed, which is further evaluated against the out-of-sample forecast capabilities. The relative out of sample forecast accuracy of the methods are presented and summarized.

The objective of this thesis is to examine state space models for forecasting stock market volatility of the SENSEX index. The important models considered here are the GARCH(1,1), GARCH-KF and SV models. After estimating the models using SSM and E4 toolbox in Matlab, out-of-sample forecasts performance were compared. Additionally, an approach was verified to model the GARCH model in state space form and estimation was performed using Kalman filter (GARCH-KF). The empirical results of this thesis provide strong support for the application of the state space model in the Indian stock market.
The thesis verifies the forecasting applications of the Kalman Filter, which has proved useful to forecast in the Indian stock market data. The results of the study also confirms the volatility forecasting capabilities using linear gaussian state space models.

Next in the analysis part, which model performs better in the out-of-sample forecast for h-step ahead forecast is assessed. Forecast errors of the volatility were found in favour of SV model estimated with state space methods for a 30-day ahead forecast. This also shows that Kalman filter can be used for better estimates and forecasts of the volatility using state space models to improve upon the volatility models.

Finally, the numerical results make evident the effectiveness and relevance of the proposed state space estimation. The result also shows that the GARCH models can be estimated using Kalman Filter approach to model the volatility and are accurate than the traditional estimation using Maximum Likelihood methods. This fact is verified using out of sample forecast.