Abstract

Generalized autoregressive conditional heteroscedasticity framework proposed by Engle (1982) and Bollerslev (1986) provides a robust procedure for modeling volatility of daily or low frequency data. However, for the high frequency data, these models are not appropriate as studies on high frequency show that results obtained by these models are in contradiction with the theoretical predictions. In particular, existence of recurring and consistent intraday patterns in return volatility may cause distortions in estimating the GARCH parameters (Andersen and Bollerslev, 1997).

The purpose of this dissertation is to examine the importance of intraday periodicities in volatility modeling for high frequency returns, and to examine the determinants of the daily realized volatility. In our study, we use 10-minute interval data for more than five years from 2005 to 2010 for crude oil, gold, silver, copper, zinc, mentha oil and cardamom, which are the most liquid futures contracts traded at Multi Commodity Exchange India Limited (MCX).

Our findings show that filtration of intraday periodicities from raw returns reveals long run dependence property in high frequency return volatility. Recurring and consistent intraday patterns in return volatility induce distortions in estimating the GARCH process and GARCH model should be applied only after the adjustment of intraday periodicities while modeling volatility for high frequency data. Further, we examined whether modeling interday and intraday periodicities in commodity futures improve in-sample fit and out-of-sample forecasts. We find that conditional volatility models such as sequential estimation approach of Andersen and Bollerslev (1997) and PGARCH model of Bollerslev and Ghysels (1996) which are designed to adjust the

periodicities in volatility provide better in-sample fit and out-of-sample forecasting performance.

Finally, we investigate the determinants of volatility which includes time to maturity, spot volatility and net order flow and other market microstructure variables. Two theories – 'Samuelson hypothesis' and 'State variable hypothesis' - explaining the systematic change in volatility of futures contracts prices over time, have been tested. We find strong evidence in favor of the state variable hypothesis, as information flow from the underlying market explained a major part of the variation in realized volatility of all futures contracts. We also find evidence supporting the Samuelson hypothesis for crude oil, gold, silver and cardamom futures. Other microstructure variables such as seasonality, volume, open interest, net order flow and spread also explain the variation in realized volatility. Results from the 'negative covariance hypothesis' indicate that net carrying cost cannot be claimed as a justification in support of the maturity hypothesis. These findings may have implications for margin settings, asset pricing and risk management.