Modeling and Forecasting Volatility of the Malaysian and the Singaporean Stock Indices using Asymmetric GARCH Models and Non-normal Densities

Abu Hassan Shaari Mohd Nor & A. Shamiri
1Faculty of Economics and Business
2Faculty of Science and Technology, Universiti Kebangsaan Malaysia
43600 UKM Bangi, Selangor, Malaysia
E-mail: ahshaari@yahoo.com

ABSTRACT

This paper examines and estimates the three GARCH(1,1) models (GARCH, EGARCH and GJR-GARCH) using daily price data. Two Asian stock indices KLCI and STI were studied using daily data over a 14-years period. The competing models include GARCH, EGARCH and GJR-GARCH using the Gaussian normal, Student-t and Generalized Error Distributions. The estimates showed that the forecasting performance of asymmetric GARCH Models (GJR-GARCH and EGARCH), especially when fat-tailed densities are taken into account in the conditional volatility, are better than symmetric GARCH. Moreover, it was found that the AR(1)-GJR model provides the best out-of-sample forecast for the Malaysian stock market, while AR(1)-EGARCH provides a better estimation for the Singaporean stock market.

Keywords: ARCH-Models, Asymmetry, Stock market indices and volatility modeling
JEL classification: G14;C13;C22.

INTRODUCTION

Traditional regression tools have shown their limitation in the modeling of high-frequency (weekly, daily or intra-daily) data. The assumption that only the mean response changes with covariates, while the variance remains constant over time has often revealed to be unrealistic in practice. This fact is particularly obvious in series of financial data where clusters of volatility can be detected visually. Indeed, it is now widely accepted that high frequency financial returns are heteroskedastic.

Modeling financial time series is not an easy task because they possess some special characteristics (Tsay, 2002). They often exhibit volatility clustering (i.e. large changes tend to be followed by large changes and small changes by small changes), leptokurtosis (i.e., the distribution of their returns is fat tailed) and leverage effect (i.e. changes in stock prices tend to be negatively correlated with changes in volatility which implies volatility is higher after negative than after positive shocks of the same magnitude). In order to capture the first two characteristics of financial time series, Engle (1982) proposed to model time-varying conditional variance with the Auto-Regressive Conditional Heteroskedasticity (ARCH) processes that use past disturbances to model the variance.