The Hong Kong University of Science and Technology
School of Business and Management

PhD Thesis Presentation

Multivariate GARCH Modeling with Applications to Financial Markets

by

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Date: December 14, 2007 (Friday)
Time: 2:00 – 3:30 pm
Venue: Room 4379 (4/F Conference Room, Lifts 17/18)

Abstract

Volatility is the core of finance theory. And volatility modeling is an important tool to estimate the changing volatility as well as correlation in financial time series. Generalized Autoregressive Conditional Heteroscedasticity (GARCH) type and Stochastic Volatility (SV) are two representative models in finance and econometrics literature. Recently, MGARCH with time-varying correlations models have been popularized mainly because of its capability in capturing the dynamic structure of volatility and correlation.

The thesis presents both simplifications and extensions of Multivariate GARCH (MGARCH) models. In multivariate modeling, the interdependence effect across and with assets over time can be captured. The major concerns in the multivariate modeling are the capability to capture some important features such as changing volatility and correlation, and the number of parameters to be estimated. Engle (2002) and Tse and Tsui (2002) proposed MGARCH models with dynamic correlations with parsimony structure. Nonetheless, the total numbers of parameters in both models are growing in the power of the number of assets. Two approaches in simplifying the varying conditional correlation MGARCH model are suggested such that the total number of parameter only increases linearly with the number of assets. Thus, it can be more applicable in high dimensional financial data.

In addition, this thesis discusses two extensions of MGARCH model with time-varying conditional correlations. The first extension considers an extension of MGARCH model to capture the mean, volatility and correlations asymmetries in return series. Threshold nonlinearity is incorporated into the mean, volatility and correlation specifications of the MGARCH model.

As the original formulation restricts all dynamic correlations having the same dynamic structure, the second extension of MGARCH model is to explore a cluster pattern such that similar correlations or financial returns can group into clusters for better understanding the interdependence of different returns while maintaining the parsimony of the original dynamic formulations. Finally, Bayesian methods are adopted for parameters estimation, model comparison in this thesis.

❖ ***All interested are welcome!*** ❖