TD-Computational Finance Research Partnership Project
Value at Risk for Stochastic Volatility Model under Bivariate Mixtures of Normal Distribution - Part I: Univariate Modeling

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Abstract

In the firt part of the project, we construct Value at Risk measures for a single asset from a Stochastic Volatility model under discrete bivariate Mixtures of Normal distribution assumption and with so-called leverage effect. A general closed-form expression for moment condition is derived to further examine the statistical properties of the model and reduce the required computational burden. Three groups of Monte-Carlo simulations are conducted to assess the performances of VaR measures obtained from various model specifications. The results show that the VaR measure obtained from our proposed mixture-of-normals stochastic-volatility model dominates the VaR measures obtained from various competing models. In addition, We also apply our model to S & P 500 and CRSP market indices. In both exercises, we construct several measures to evaluate the performances of the VaR estimates obtained from various models. These measures are: [i] the Number

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of Violations, [ii] the Average Size of Violations, [iii] the Sum of Square of Violations, and [iv] the Expected Size of Violations, Using these measures, we find that the VaR measure obtained from our proposed model performs substantially better than those obtained from the other competing models.

Key Words: Value at Risk, Stochastic Volatility, Mixture of Normals, GMM, MCMC