

Bayesian Analysis of Intraday Stochastic Volatility Models with Leverage and Skew Heavy-Tailed Error in High-Frequency Commodity Market

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Intraday high frequency data of asset returns exhibit not only typical characteristics (e.g., volatility clustering) but also a cyclical pattern of return volatility that is known as intraday seasonality. In this paper, we extend the stochastic volatility (SV) model for application with such intraday high frequency data and develop an efficient Markov chain Monte Carlo (MCMC) sampling algorithm for Bayesian inference of the proposed model. Our modeling strategy is two-fold. First, we model the intraday seasonality of return volatility with a B-spline polynomial and estimate it along with the stochastic volatility simultaneously. Second, we incorporate possibly skew and heavy-tailed error distribution into the standard SV model by assuming that the error distribution belongs to a family of generalized hyperbolic (GH) distribution such as Laplace, variance-gamma and Student's t . As a demonstration of our new method, we estimate the proposed intraday SV model with 5-minute return data of gold futures in the Tokyo Commodity Exchange, and conduct a selection of model specifications with the deviance information criterion (DIC). The result shows that the SV model with Laplace error is the best, but it does not support the asymmetry of the return distribution. Intra-

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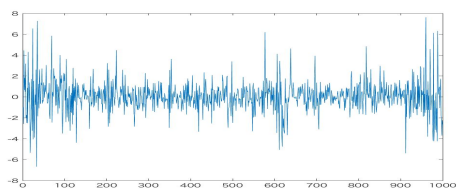


Figure 1: Time Series Plot for Normalized Gold Futures Returns in 2015

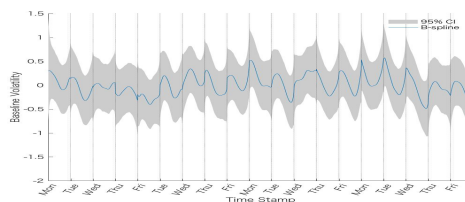


Figure 2: B-Splines of Gold Futures Data in January 2015