Combine GARCH Model and Neural Networks to Forecast Value at Risk (VAR) in the Futures Market

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Abstract
This study proposes a hybrid model that combines GARCH and Neural Network for estimating VAR in S&P 500, Nasdaq 100, and Dow Jones futures index markets. Empirical results demonstrated that the hybrid method has outperformed conventional methods (historical simulation (HS), variance/covariance and the Monte Carlo simulation) in estimating VAR. In terms of accuracy, the hybrid method is superior to any of the conventional methods, especially in the Nasdaq 100 futures index market. In terms of conservativeness, the hybrid method was superior to the HS method in all three markets and to the conventional methods in the Nasdaq 100 futures index. In addition, the hybrid method was more efficient than the HS method when applied in all three futures indexes and to the conventional methods in the Dow Jones futures index.

Keywords: Neural Networks, GARCH Model, Value at Risk

1. Introduction
The conventional methods used to estimate Value at Risk (VAR) include historical simulation (HS), variance/covariance (VCV), and Monte Carlo simulation (MCS) methods (These methods will be illustrated in the next section). Jorion [22] documented the fact that VAR summarizes the worst expected loss over a target horizon and within a given confidence interval. Linsmeier and

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