



The University of Chicago
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Master's Seminar

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Empirical Study of Parametric and Non-parametric VaR Models

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ABSTRACT

In this paper, we implement 6 Value-at-Risk (VaR) models for 3 well-known stock indexes. The parametric models we considered include Gaussian, GARCH, GPD model based on Extreme Value Theory. Among the three non-parametric models, two use the same kernel estimator of conditional quantile, but different methods for selecting optimal bandwidth. The VaR are computed under different combinations of confidence levels and window sizes. In the backtest, exceedances are recorded, and a binomial test is conducted to evaluate the performance of these VaR models.

For S&P 500 and FTSE 100, all parametric models and the Historical Simulation work reasonably well at 95 percent confidence level. The EVT-based GPD model produces a more accurate VaR at 99 percent confidence level. In both cases, a 2-year rolling window is preferred over the 5-year window. For the HSI data, we recommend the kernel-based non-parametric models to compute VaR at 95 percent confidence level, while EVT-based GPD model is preferred for VaR at 99 percent confidence level. Again, the 2-year rolling window should be used.