THE UNIVERSITY OF CHICAGO

Department of Statistics

MASTER'S THESIS PRESENTATION

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Methods Comparison of Value at Risk (VaR) Models in Simulations and Empirical Data

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ABSTRACT

Value at risk (VaR) and Expected Shortfall (ES) are two useful risk measure, and they estimate the possible investment loss given certain probability. In this paper, we will introduce four kinds of VaR and ES estimation methods. The basis of these estimations is to separate daily return into volatility and daily shocks. The volatility will follow the GARCH model, while the shocks will be estimated by four methods: Normal distribution, Cornish-Fisher method, Extreme Value Theory and Filtered Historical Simulation. To test these estimations' efficiency, we involve three kinds of statistics tests: VaR violation based test, VaR independence test and ES zero mean tests. The main idea of these tests is to use likelihood ratio of empirical and theoretical of binomial distribution. An appropriate estimation should pass these tests with higher p-values. In the simulation part, we generate and test four kinds of ordinary processes: Gaussian, AR, MA and ARMA in two kinds of window size. These estimations (one-day forward) could have better results in longer window size, which has the same conclusion with the empirical tests. The empirical analysis would have two kinds of reality data: Standard & Poor 500 and Financial Times Stock Exchange 100 Index. Though all methods could be used in the estimation from the results graphs and tests, GARCH-EVT has better performance in VaR and GARCH-FHS has better results in ES. We also mention a further topic of multivariate filtered historical simulations compared with univariate filtered historical simulations.