

Abstract

The main objective of the thesis is to implement the maximum likelihood estimation (MLE) procedure in stable distributions and compare against constrained indirect inference method by conducting a simulation study. In order to carry out the MLE procedure, we studied the key characteristics of stable distribution as well as other parameter estimation methods, namely McCulloch quantile-based method and Kogon's regression method; which we will utilise to provide an initial estimate for the MLE procedure. Subsequently, we investigated and adapted various optimisation methods to carry out MLE. After comparing the optimisation methods, we decided to use quasi-newton method for the MLE procedure and compared our results against the constrained indirect inference estimates. To deepen our understanding of the ML estimates in stable distribution, we investigated the asymptotic variance estimates and empirical variances; and followed up with an analysis of the coverage of asymptotic 95% confidence intervals for each parameter estimate. We wrapped up the thesis with applications of stable distribution to Singapore's financial dataset to display the relevance of our study.

Author's Contribution: I adapted and implemented various optimisation methods for the MLE of stable distribution parameters in Section 3; notably, the GLP search schedules, sequential grid search and sequential quasi-newton methods are novel. In Section 4, the simulation study comparing ML estimates and constrained indirect inference estimates; as well as the study of variances and coverage are new. In Section 5, I demonstrated the applications of stable distribution in the generation of VaR from the SGD/USD series. All the R programme codes were written by me.