

Project Proposal

Baysien Option Pricing Using Mixed Normal Heteroskedasticity Models

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1. Introduction

The option pricing using asymmetric mixed normal heteroscedasticity models help us better fit actual observed prices. We consider to perform inference and price options in a Bayesian framework through compute posterior moments of the model parameters by sampling from the posterior density. The method unlike classical inference that need conditions on maximum likelihood estimates, it will be computed using the risk neutral predictive price densities by product of the Bayesian sampler. An application is using the real data on the S&P 500 index and index options. We plan to perform Bayesian inference on a two component asymmetric normal mixture model by using the available data. In section 2, we will introduce what data we use and what condition we set up. In section 3, we describe the model and explain how to use it to simulate data. Finally, in section 4, we outline the goals and anticipation of this project.

2. Data for S&P 500 index

In this project, we use data on call options on the S&P 500 index. Our data covers 10 years period from Dec, 31, 2006 to Dec, 31, 2016. We also impose the following restriction on our sample: First, we only consider weekly data and choose the Wednesday. Second, we include the risk free rate for each year. In total, we end up with a sample of 252 call options.

3. Mixed normal heteroskedasticity models

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model introduction and gibbs sampler mentioned

4. Conclusion

For this project, we plan to explore the mixed normal heteroscedasticity models and using Bayesian inference to simulate the data of S&P 500 stretch across 10 years. We will simulate the data by using Gibbs Sampler and we anticipate the result should be when pricing a rich sample of options on the index, Bayesian methods yield similar pricing errors measured in dollar and implied standard deviation losses, and it turns out that the impact of parameter uncertainty is minor. Therefore, when it comes to option pricing where large amounts of data are available, the choice of the inference method is unimportant.

References

- [1] Rombouts, J. and Stentoft, L.(2014) “Bayesian option pricing using mixed normal heteroskedasticity models” in Computational *Statistics & Data Analysis*, 76,588-605