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Option Pricing and Risk Analysis using Stochastic Models

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Abstract: This project applies stochastic models in quantitative research and analysis to accurately price options and assess associated risks. Leveraging historical financial data, it encompasses data preprocessing, model selection, parameter estimation, option pricing, risk analysis, and sensitivity analysis. Selected models like Black-Scholes-Merton and Heston are calibrated using optimization techniques. Accurate option prices and key option Greeks are calculated based on estimated parameters and underlying asset prices. Risk analysis utilizes Monte Carlo simulation to evaluate metrics such as VaR and ES. Sensitivity analysis explores the impact of changing model parameters. The project emphasizes documentation, resulting in a comprehensive report. It showcases expertise in option valuation, risk assessment, and quantitative analysis, demonstrating proficiency in data preprocessing, model implementation, and advanced quantitative techniques.

Contents

1 Data Collection

2 Data Preprocessing

2.1 And subsequent

2.1.1 Sub-sections

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3 Stochastic Model Selection

3.1 The Black-Scholes-Merton Model

For a European Call Option, the theoretical price C of the option is given by

$$C = S_t N(d_1) - Xe^{-rT} N(d_2) \tag{3.1}$$

where S is the current price of the underlying asset, X is the strike price of the option, r is the risk-free interest rate, T is the time to expiration in years, $N(x)$ is the cumulative standard normal distribution function, and ...

3.2 The Heston Model

A Some title

Please always give a title also for appendices.

Acknowledgments

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Note added. This is also a good position for notes added after the paper has been written.

References

[1] Author, *Title*, *J. Abbrev.* **vol** (year) pg.

[2] Author, *Title*, arxiv:1234.5678.

[3] Author, *Title*, Publisher (year).