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Modelling Financial Market Data from the Johannesburg Stock Exchange Using Extreme Value Theory

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Introduction

This paper explores the application of Extreme Value Theory (EVT) to model the behaviour of financial market data from the Johannesburg Stock Exchange (JSE). EVT is a statistical approach widely used in finance to assess the tail risk of extreme events, making it particularly relevant for understanding and managing risks in financial markets. The study focuses on analysing the tails of the distribution of JSE stock returns and estimating extreme quantiles to provide insights into potential tail risks. The Johannesburg Stock Exchange is a key player in the global financial landscape, and understanding the extreme behaviour of financial market data is crucial for risk management and decision-making. Extreme Value Theory, rooted in probability theory, focuses on modelling the tail distribution of extreme events, making it a valuable tool for financial analysts and risk managers. Previous studies have employed various statistical methods to model financial market data, including EVT. EVT has been successfully applied to assess the tail risk in various financial markets worldwide, providing valuable insights for risk management and regulatory purposes. However, there is a need for specific studies on the JSE to understand the extreme behaviour of its stock returns [1].

Description

The study employs EVT to model the tails of the distribution of JSE stock returns. The dataset includes historical daily stock returns spanning a significant period. The Peaks Over Threshold (POT) method is utilized to extract extreme observations, which are then used to fit the Generalized Pareto Distribution (GPD), a fundamental component of EVT. The GPD parameters are estimated using maximum likelihood estimation. The analysis reveals key insights into the tail behaviour of JSE stock returns. The fitted GPD distribution provides estimates of extreme quantiles, allowing for the assessment of tail risk. VaR (Value at Risk) and CVaR (Conditional Value at Risk) are calculated using the EVT model, offering valuable risk metrics for financial decision-makers [2].

The findings indicate the presence of tail risk in the JSE stock returns, emphasizing the importance of incorporating extreme values into risk management strategies. The EVT model enables a more accurate assessment of extreme events and their potential impact on the financial market. The results also provide insights into tail risk dynamics, aiding in the development of robust risk mitigation strategies. Based on the findings, the essay outlines policy recommendations to strengthen the resilience of health financing systems in the face of macroeconomic uncertainties. These may include building contingency funds, diversifying funding sources, and implementing flexible fiscal policies [3,4].

Examining specific case studies from European countries allows for a nuanced analysis of the diverse approaches taken to tackle macroeconomic uncertainties in health financing. By comparing successful and less successful strategies, policymakers can draw lessons for future preparedness. Based on the findings, the essay outlines policy recommendations to strengthen the resilience of health financing systems in the face of macroeconomic uncertainties. These may include building contingency funds, diversifying funding sources, and implementing flexible fiscal policies [5].

Conclusion

This study demonstrates the applicability of Extreme Value Theory in modelling the behaviour of financial market data from the Johannesburg Stock Exchange. The EVT model enhances the understanding of tail risk, providing valuable information for risk managers, investors, and policymakers. As financial markets continue to evolve, incorporating EVT into risk management frameworks becomes increasingly crucial for ensuring stability and resilience. Further research could explore dynamic modelling approaches and assess the impact of macroeconomic factors on extreme events in the JSE.

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Conflict of Interest

There are no conflicts of interest by author.

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