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The Stability of Chinese Stock Network and Its Mechanism

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HIGHLIGHTS

The price network, multi-scale network and risk network are built.

Risk network is shown to be more robust.

Granger causality exists between stock market volatility and network stability.

Relationship between international stock market volatility and network stability is investigated.

Probit model is applied to forecast abnormal fluctuations of China's stock market network.

ABSTRACT

Based on the multi-fractal properties of financial time series, Value-at-Risk (VaR) and price fluctuation correlation, we construct China's stock market networks and analyze empirically three networks' topological features, their stability and their relationship with international stock market indices. The results show that: (1) In the three types of networks, the stock price network does not have scale-free features, multi-scale network and risk network both have small-world and scale-free characteristics; (2) The stock market volatility and the network stability coefficient are Granger causality, the early changes of the stock market volatility can effectively explain the changes of the network stability coefficient, the network connectivity and clustering coefficient are negatively correlated with the stock market volatility, the volatility of the international stock index in Hong Kong, Japan, and the United States has a positive effect on the network stability coefficient, and the international gold or crude oil markets has a negative effect on it; (3) By applying the probit binary selection model test, we found that the network structure is more capable of explaining abnormal fluctuations than international market factors, and that the stock network with higher network stability coefficient and higher eigenvector centrality of financial institutions indicates that downward fluctuation of stock price will intensify in the future. From the empirical results, we see that the risk network is more robust and provides a reference for the analysis of the short-term risks and stability of the Chinese stock market. In order to maintain the stability of the stock market, the regulatory authorities should pay a close attention to internal and external factors, increase network connectivity and integration, and actively guard against the risk spillover effects of financial institutions.

Keywords: Price network; Multi-scale network; Risk network; Robustness; Stability coefficient; Probit model

1. Introduction

The application of complex network methods in financial markets has become increasingly widespread. Due to the large number of stocks in the stock market, closely related price volatility, and complex network structures [1], the economic and financial fields have attracted network researchers [2-3]. In recent years, the relationship between international financial markets has become increasingly complex. Institutional investors have a close relationship with each other. Any external unfavorable factors will lead to the continuous accumulation of systemic risks in the stock market. When the risk accumulates to a certain limit, it will damage the financial system stability. With the development of globalization, the spillover effects of price fluctuations among international financial

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