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A Network Time Series Model and its Applications

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摘要

This study employs a network autoregressive model with GARCH effects, denoted by NAR-GARCH, to describe the dynamics of different market indices jointly. We propose to filter out the GARCH effects inherent in each index and obtain the associated standardized residuals marginally at first. A NAR model with the standardized residuals is adopted to accommodate other indices' most updated information by defining a suitable adjacency matrix. We propose using the Granger causality test to determine the lags of cross correlations between different indices and further testing whether the correlations of sharp upward or downward movements associated with the lags are significant for constructing the adjacency matrix. We apply the NAR-GARCH model to the log-returns of 20 global stock indices from 2006 to 2020 and investigate its prediction performance. The numerical results reveal that the NAR-GARCH model has satisfactory prediction results, especially for sharp upward or downward movements.

關鍵詞：adjacency matrix, GARCH, Granger causality test, network autoregressive model.

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