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Wavelet-based multi-resolution GARCH model for financial spillover effects☆

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Abstract

This study proposes a wavelet-based multi-resolution BEKK-GARCH model to investigate spillover effects across financial markets. Compared with traditional multivariate GARCH analysis, the proposed model can identify or decompose cross-market spillovers on multiple resolutions. Taking two highly correlated indices, the NASDAQ (U.S.) and TWSI (Taiwan composite stock index) for analysis, the empirical results show that the NASDAQ returns strongly predict the movements of TWSI on the raw data level, but via wavelet-based multi-resolution analysis we find that the prediction power unevenly spreads over each time scale, and the spillover patterns are totally different as that revealed on the raw data level. The direction and magnitude of return and volatility spillovers significantly vary with their time scales. Considering the fact that heterogeneous groups of investors trade on different time horizons, the results of this study help investors to uncover the complex pattern of return and volatility spillovers on their own horizon, and make a good hedge on their risk.

Keywords: Wavelet analysis; Spillover effects; BEKK-GARCH model; Multi-resolution decomposition; Financial risk

1. Introduction

With the continued liberalization of cross-border cash flows, international financial markets have become increasingly interdependent. Investors are highly exposed to the exchange risk and equity price fluctuations over the world. In order to manage such risks, return and volatility spillovers across financial markets are the most important mechanism to analyze. However, international investors are heterogeneous in their trading strategies. Each group of investors operate on their only time horizon. As a result, the transmission and causal relationship between stock markets are different on each time scale. Prior research adopted multivariate generalized autoregressive conditional heteroscedasticity (GARCH) models (McAleer [24]; McAleer et al. [25]) for the analysis. Multivariate GARCH models capture market information on aggregate level. To address these issues, this study proposes a new strategy based on wavelet analysis to improve multivariate GARCH models on the investigation of complex transmission or spillover mechanism across financial markets.

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