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Hierarchical structure and time-lag correlation in Worldwide Financial Markets

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Recently, many studies indicated that the minimum spanning tree (MST) network whose metric distance is defined by using correlation coefficients have strong implications on extracting information from return time series. However in many cases researchers may hope to investigate the strength of interactions but not the directions of them. In order to study the strength of interaction and connection of financial asset returns we propose a modified minimum spanning tree network whose metric distance is defined from absolute cross-correlation coefficients. We had investigated 69 daily financial time series, which constituted by 3 types finance assets (29 stock market indicator time series, 21 currency futures price time series and 19 commodity futures price time series). Empirical analyses show that the MST network of returns is time-dependent in overall structure, while same type financial assets usually keep stable inter-connections. Moreover each asset in same group show similar economic characters. In other words, each group concerned with one kind of traditional financial commodity. In addition, we find the time-lag between stock market indicator volatility time series and EUA (EU allowances), WTI (West Texas Intermediate) volatility time series. The peak of cross-correlation function of volatility time series between EUA (or WTI) and stock market indicators show a significant time shift (> 20days) from 0.

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