

## Co-Movement between Financial Assets: An Empirical Study on Effects of the Depreciation of Yen on Asia Markets

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**Abstract :** In recent times, the dependence and co-movement among international financial markets have become stronger than in the past, as evidenced by commentaries in the news media and the financial sections of newspapers. Studying the co-movement between returns in financial markets is an important issue for portfolio management and risk management. The realization of co-movement helps investors to identify the opportunities for international portfolio management in terms of asset allocation and pricing. Since the election of the new Prime Minister, Shinzo Abe, in November 2012, the yen has weakened against the US dollar from the 80 to the 120 level. The policies, known as “Abenomics,” are to encourage private investment through a more aggressive mix of monetary and fiscal policy. Given the close economic relations and competitions among Asia markets, it is interesting to discover the co-movement relations, affected by the depreciation of yen, between stock market of Japan and 5 major Asia stock markets, including China, Hong Kong, Korea, Singapore, and Taiwan. Specifically, we devote ourselves to measure the co-movement of stock markets between Japan and each one of the 5 Asia stock markets in terms of rank correlation coefficients. To compute the coefficients, return series of each stock market is first fitted by a skewed-t GARCH (generalized autoregressive conditional heteroscedasticity) model. Secondly, to measure the dependence structure between matched stock markets, we employ the symmetrized Joe-Clayton (SJC) copula to calculate the probability density function of paired skewed-t distributions. The joint probability density function is then utilized as the scoring scheme to optimize the sequence alignment by dynamic programming method. Finally, we compute the rank correlation coefficients (Kendall's  $\tau$  and Spearman's  $\rho$ ) between matched stock markets based on their aligned sequences. We collect empirical data of 6 stock indexes from Taiwan Economic Journal. The data is sampled at a daily frequency covering the period from January 1, 2013 to July 31, 2015. The empirical distributions of returns indicate fatter tails than the normal distribution. Therefore, the skewed-t distribution and SJC copula are appropriate for characterizing the data. According to the computed Kendall's  $\tau$ , Korea has the strongest co-movement relation with Japan, followed by Taiwan, China, and Singapore; the weakest is Hong Kong. On the other hand, the Spearman's  $\rho$  reveals that the strength of co-movement between markets with Japan in decreasing order are Korea, China, Taiwan, Singapore, and Hong Kong. We explore the effects of “Abenomics” on Asia stock markets by measuring the co-movement relation between Japan and five major Asia stock markets in terms of rank correlation coefficients. The matched markets are aligned by a hybrid method consisting of GARCH, copula and sequence alignment. Empirical experiments indicate that Korea has the strongest co-movement relation with Japan. The strength of China and Taiwan are better than Singapore. The Hong Kong market has the weakest co-movement relation with Japan.

**Keywords :** co-movement, depreciation of Yen, rank correlation, stock market

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