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Co-movement of Asia-Pacific with European and US stock market returns: A cross-time-frequency analysis

Lixia Loh*

EDHEC-Risk Institute – Asia, EDHEC Business School, 1 George Street, #07-02, Singapore 049145, Singapore

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ABSTRACT

We investigate the co-movement of 13 Asia-Pacific stock market returns with that of European and US stock market returns using the wavelet coherence method. Our results show consistent co-movement between most of the Asia-Pacific stock markets and that of Europe and the US in the long run. We also uncover evidence of a wide variation in co-movement across the time scale of the financial crises. The co-movement dynamics of the Asia-Pacific markets with that of Europe and the US are different during the two financial crises. The difference in the co-movement dynamics could be the result of the different natures of the financial crises or a change in regime.

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1. Introduction

Before the sub-prime financial crisis, many have argued that Asia would decouple from the European and US markets. The argument was that the rise of China and an increase in intra-regional trade and financial transactions would lead to more integrated markets within the region. However, the sub-prime financial crisis and the European debt crisis have shown that Asia-Pacific's economy remains

* Tel.: +65 6631 0030.
E-mail address: lixia.loh@edhec-risk.com

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strongly tied to the global economy. The Asia-Pacific stock markets were volatile during the financial crises and have traded closely with the global markets during these periods.

Most studies on the co-movement of Asia-Pacific stock markets concentrate on linkages among these stock markets and the linkages between these markets and the US market. A prominent effect of the US stock market on the Asia-Pacific stock market resulted in large literature on the topic. Limited studies examine the co-movement between Asia-Pacific stock markets and European stock markets. However, the recent European debt crisis has presented a unique opportunity to study the co-movement between European and Asia-Pacific stock markets. The Asia-Pacific stock markets have traded more closely with the European market since the European sovereign debt crisis threatened to turn contagious. Understanding and estimating the dynamic co-movement between global financial markets have important consequences on stock market return predictability, asset allocation and portfolio diversification.

Limited studies exist on the relationships between stock markets at different investment horizons because of the lack of an appropriate analytical tool to analyse data for different time scales. The stock market is a complex system consisting of investors with different investment horizons, and they collectively form aggregate market co-movements. Time scale (investment horizon) is an important aspect that affects trading behaviour (Müller et al., 1997; Lynch and Zumbach, 2003). Taking into account that many heterogeneous investors make decisions over different time scales and perform each movement on different time scales, market co-movement would vary across different time scales according to the investment horizons of different investors. Candelon et al. (2005) argued that the short-term investor is more interested in co-movement at higher frequencies while the long-term investor is interested in co-movement at lower frequencies. International investors who hold diversified portfolios are concerned with stock market co-movement at different investment horizons to diversify their portfolios more effectively. Policy makers are interested in knowing the co-movement of stock markets at different time scales for policy-making decisions. The application of the wavelet method in finance makes it possible to study the dynamics of market co-movement at different time scales. Gencay et al. (2003, 2005) and Masih et al. (2010) found that systematic risk is multi-horizon in nature. Rua and Nunes (2009) showed that co-movement between the stock markets of the US, the UK, Germany and Japan change in time and vary across frequencies. A recent study by Graham et al. (2012) found that co-movement between the US and the emerging markets varies with respect to time and frequency.

This paper extends the existing literature on stock market co-movement between Asia-Pacific with that of Europe and the US. Unlike Hyde et al. (2007), we study the co-movement between Asia-Pacific stock markets and European and US markets in both time and frequency domains using wavelet coherence. The advantage of wavelet coherence is that the analysis allows a better understanding of the dynamics of the co-movement. Instead of collective co-movement, we are able to examine co-movement of stock markets at different time scales. Our work is closely related to, but different from, Graham et al. (2012) in several ways. We examine co-movement of 13 Asia-Pacific national stock markets with European and US markets. We also compare the differences in co-movement between stock markets during the two financial crises that originated from outside the Asia-Pacific region.

The paper is structured as follows. Section 2 briefly reviews the related literature on stock co-movement. Section 3 introduces the wavelet method used in the paper. Section 4 describes the data used in the analysis. Section 5 analyses the empirical results on co-movement between Asia-Pacific and European stock markets followed by results on co-movement between Asia-Pacific and US stock markets. Section 6 summarises the findings and their implications.

2. Literature review

Vast literature exists on stock market co-movement. One branch of literature on co-movement of stock markets studies the evolution of correlation over time. Kaplanis (1988) found stability in correlation but not in covariance for 10 industrial countries from 1972 to 1987. By contrast, Long and Solnik (1995) found that both covariance and correlation were unstable among developed countries between 1960 and 1990. Correlations between international markets have been found to increase since the mid-1990s and the degree of co-movement was not constant over time (Brooks and Del Negro,

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