International Review of Social Sciences and Humanities
Vol. 3, No. 2 (2012), pp. 197-204
www.irssh.com
ISSN 2248-9010 (Online), ISSN 2250-0715 (Print)

A Test of the Connections of Stock Returns: The Case of the Asian Emerging and the Japanese Stock Markets

Chikashi Tsuji
Graduate School of Systems and Information Engineering
University of Tsukuba,
1-1-1 Tennodai, Tsukuba, Ibaraki 305-8573, Japan
E-mail: mail_sec_low@minos.ocn.ne.jp

(Received: 28-3-12 / Accepted: 24-4-12)

Abstract

This research aims to reveal the time-series changes of the relationships of stock returns between Asian emerging markets and the stock markets in Japan. Our contributions in this paper are as follows. First, we statistically revealed that the relationships between stock returns of Asian emerging markets and returns of the Japanese equity markets recently gradually increased. Second, our empirical tests also revealed that right after the Lehman Shock, the linkage between the stock returns in two kinds of markets particularly increased.

Keywords: Emerging markets, Stock return comovements, Welch's test.

1. Introduction

Stock market integration and stock return comovements are important research topics in finance. There exist several exciting preceding and new studies such as Kang and Stulz (1997), Choe et al. (2005), Dvorak (2005), Chan et al. (2007), Pukthuanthong and Roll (2009), Bae et al. (2012), and Billio et al. (2012). As far as we know, however, there seems to be few studies which examine the stock return comovements by focusing on the linkage between Asian emerging markets and the Japanese markets. Further, viewing these studies, there seems to be little study which explore by dividing sample periods into two periods that are before and after the US Lehman Shock. Considering these backgrounds and motivations, we aim to clarify how the stock return covariations between Asian emerging markets and the Japanese markets have changed. This is our objective in this study. For this purpose, we exploit the indices of the Morgan Stanley Capital International (MSCI) for eight Asian emerging stock markets with the Japanese stock index.

The followings are this paper's contributions. First, we revealed that the covariations of stock returns between Asian emerging markets and the Japanese markets recently gradually increased. Next, we empirically showed that right after the period of the US Lehman Shock, the covariations between stock returns in these two kinds of markets particularly increased.

The rest of the paper is organized as follows. First, Section 2 documents the data and our research design, Section 3 demonstrates the results of our empirical tests, and Section 4 concludes the paper.

2. Data and Research Design

In our empirical tests, we exploit the stock return data derived from the indices of the MSCI and derived from the Tokyo Stock Price Index (TOPIX). These data are weekly and supplied by the Nikkei Inc. In this paper, we investigate the stock return correlations between the Japanese and Asian emerging markets. More specifically, the focus in our empirical analysis is on eight Asian emerging stock markets of China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, and Thailand.

Next, we set the following four sub-periods to analyze: (1) The period of 178 weeks before the US Lehman Shock that spans from November 24, 2001 to April 16, 2005 (We call this period as 'the sub-period I'); (2) The period of 178 weeks before the US Lehman Shock that spans from April 23, 2005 to September 13, 2008 (We call this period as 'the sub-period II'); (3) The period of 178 weeks after the US Lehman Shock that spans from September 20, 2008 to February 11, 2012 (We call this period as 'the sub-period III'). In addition to the above three periods, we also use 30 week period, right after the US Lehman Shock, which spans from September 20, 2008 to April 11, 2009 (We call this period as 'the Lehman Shock period').

Exploiting the above data, we statistically compare the stock return correlation coefficients between the Japanese and the above Asian emerging markets. We compute the correlation coefficients for past 20 weeks. That is, we implement the Welch's test. In the test, the null hypothesis is that the mean values of the correlation coefficients of returns in two markets are equal in two compared periods, while the alternative hypothesis is the mean values of the correlation coefficients of returns in two markets are different in two compared periods. More concretely, followings are the alternative hypotheses of our five Welch's tests: (1) The mean value of the correlation coefficients in 'the sub-period I' is lower than the mean value of the correlation coefficients in 'the sub-period II'; (2) The mean value of correlation coefficients in 'the sub-period I' is lower than the mean value in 'the sub-period III'; (3) The mean value of correlation coefficients in 'the sub-period I' is lower than the mean value in 'the Lehman Shock period'; (4) The mean value of correlation coefficients in 'the sub-period II' is lower than the mean value in 'the Lehman Shock period'; (5) The mean value of correlation coefficients in 'the sub-period III' is lower than the mean value in 'the Lehman Shock period'. Moreover, the time-series dynamics of correlation coefficients of stock returns between the Japanese and eight Asian emerging countries are exhibited in Panels A to H in Figure 1.

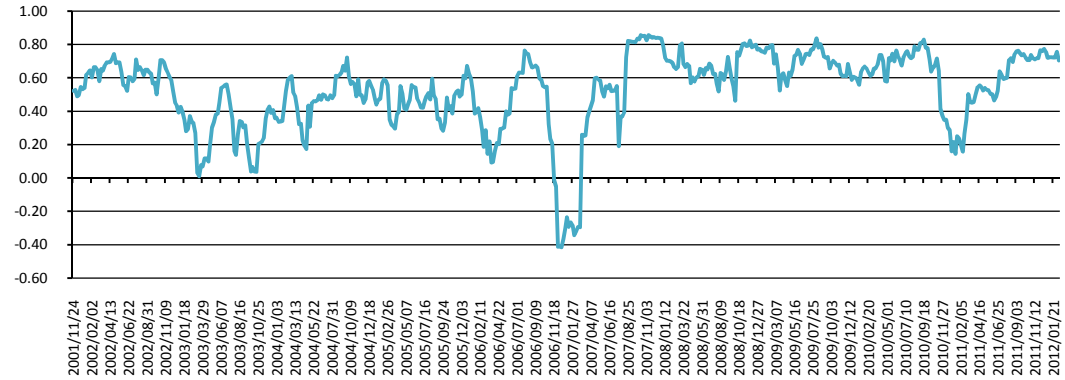
3. Empirical Results

This section documents our empirical results. (1) First, Panel Bs of Tables 1 and 2 show that the correlation coefficients between stock returns in Asian emerging markets and those in the Japanese markets increase in 'the sub-period II' than in 'the sub-period I' except for the cases of China, Malaysia, Taiwan, and Thailand. (2) Second, Panel Cs of Tables 1 and 2 indicate that the correlations between all eight Asian emerging markets and the Japanese markets are higher in 'the sub-period III' than in 'the sub-period I'. (3) Third, Panel Ds of Tables 1 and 2 exhibit that the correlations between all eight Asian emerging markets and the Japanese markets are higher in 'the Lehman Shock period' than in 'the sub-period I'. (4) Fourth, Panel Es of Tables 1 and 2 indicate that the correlations between all eight Asian emerging stock market returns and the Japanese stock returns are higher in 'the Lehman Shock period' than in

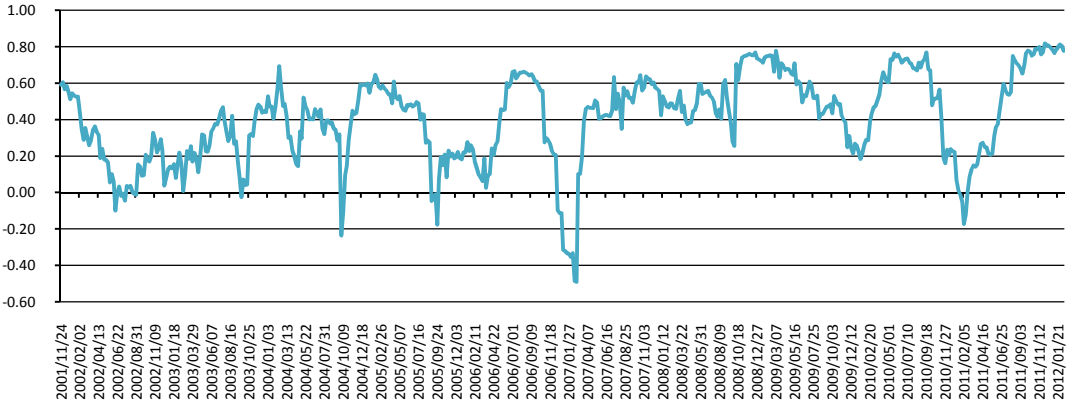
'the sub-period II'. (5) Finally, Panel Fs of Tables 1 and 2 show that the correlations between all eight Asian emerging markets and the Japanese markets are higher in 'the Lehman Shock period' than in 'the sub-period III'. To sum up, the stock return covariations recently gradually increased and particularly, in the period right after the Lehman Shock, these comovements strongly increased.

Figure 1. Correlations between Stock Returns in Asian Emerging Markets and in the Japanese Markets

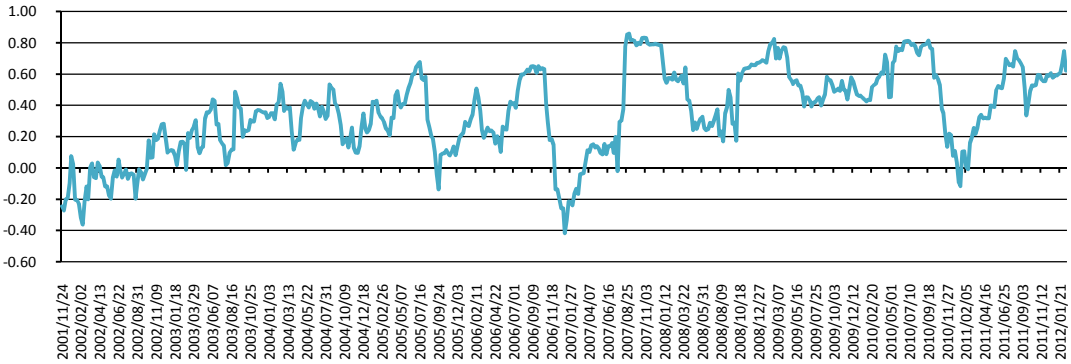
Panel A China



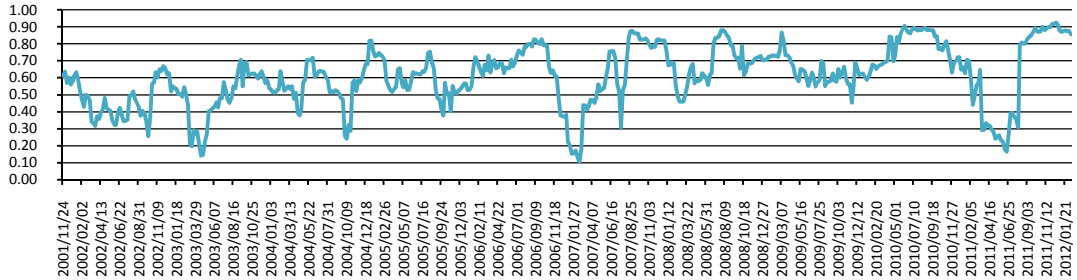
Panel B India



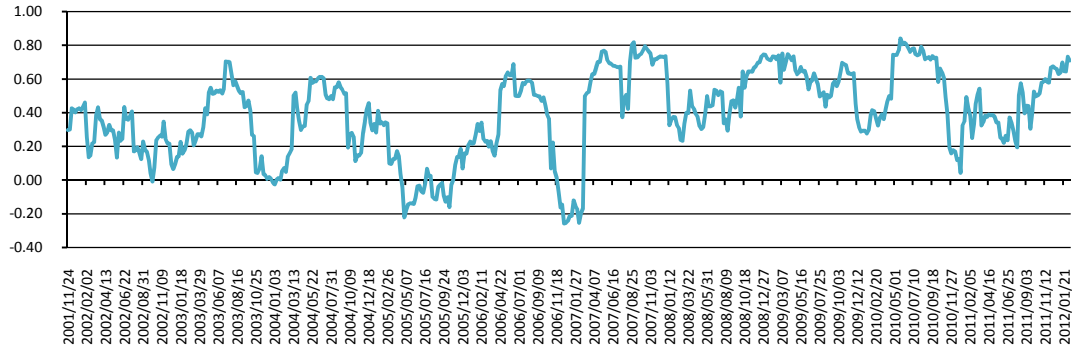
Panel C Indonesia



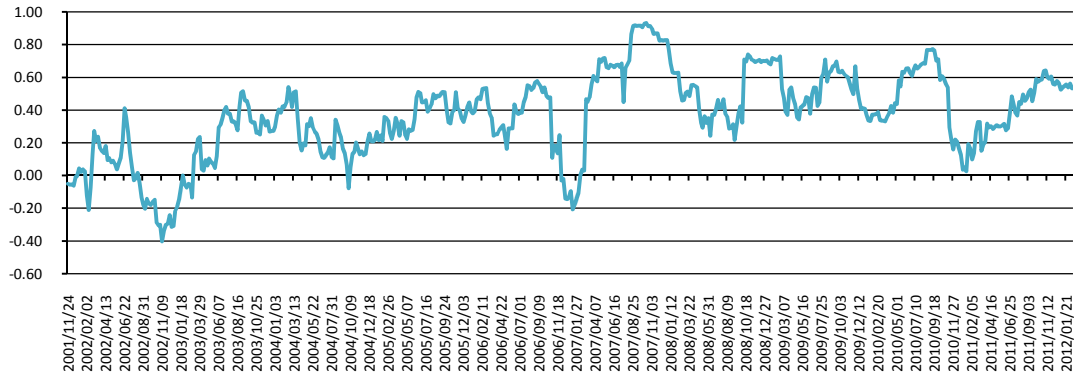
Panel D Korea



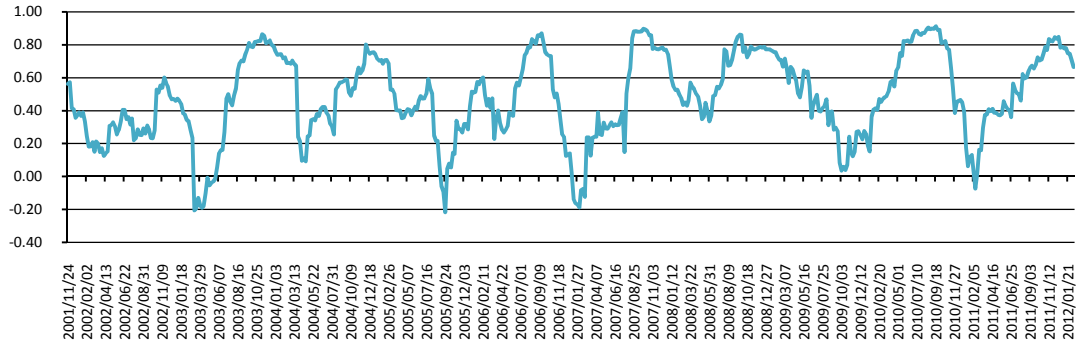
Panel E Malaysia



Panel F Philippines



Panel G Taiwan



Panel H Thailand

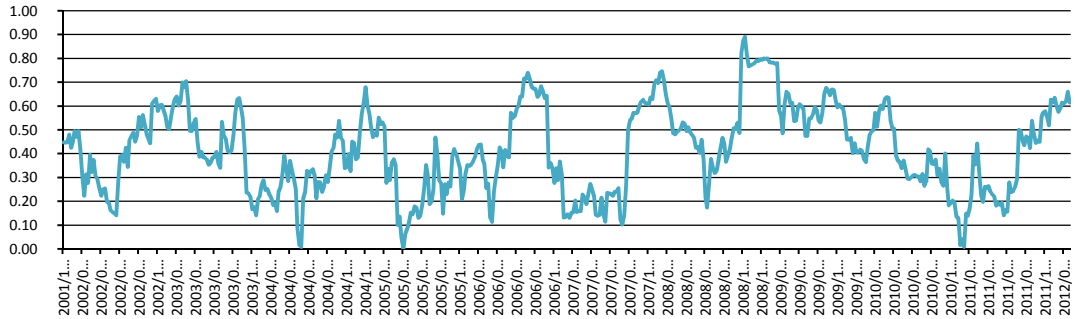


Table 1. The Results of Welch's Tests: Relations with China, India, Indonesia, and Korea

Panel A Means and Standard Deviations of Correlation Coefficients of Returns for Four Periods					
Sample Periods	Statistic	China	India	Indonesia	Korea
November 24, 2001 to April 16, 2005	Mean	0.4640	0.3142	0.1781	0.5148
	SD	0.1742	0.1894	0.2010	0.1344
April 23, 2005 to September 13, 2008	Mean	0.4771	0.3723	0.3424	0.6293
	SD	0.2928	0.2473	0.2840	0.1665
September 20, 2008 to February 11, 2012	Mean	0.6497	0.5343	0.5310	0.6809
	SD	0.1470	0.2318	0.1954	0.1796
September 20, 2008 to April 11, 2009	Mean	0.7208	0.6831	0.6470	0.7195
	SD	0.0973	0.1343	0.1499	0.0481
Panel B Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for November 24, 2001 to April 16, 2005 < The Mean Value of the Correlation Coefficients of Returns for April 23, 2005 to September 13, 2008					
t-value for Welch's tests		0.5154	2.4893***	6.3013***	7.1410***
p-value		0.3033	0.0066	0.0000	0.0000
Panel C Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for November 24, 2001 to April 16, 2005 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to February 11, 2012					
t-value for Welch's tests		10.8718***	9.8120***	16.7963***	9.8817***
p-value		0.0000	0.0000	0.0000	0.0000
Panel D Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for November 24, 2001 to April 16, 2005 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009					
t-value for Welch's tests		11.6485***	13.0252***	15.0082***	15.3230***
p-value		0.0000	0.0000	0.0000	0.0000
Panel E Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for April 23, 2005 to September13, 2008 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009					
t-value for Welch's tests		8.6294***	10.1151***	8.7841***	5.9072***
p-value		0.0000	0.0000	0.0000	0.0000
Panel F Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to					

February 11, 2012 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009				
t-value for Welch's tests	3.3996***	4.9521***	3.7371***	2.3975***
p-value	0.0006	0.0000	0.0003	0.0088

Notes: In panel A, 'Mean' denotes the mean values of 20 week historical correlation coefficients between stock returns in the emerging markets and those in the Japanese markets. Further, 'SD' means the standard deviations of 20 week historical correlation coefficients between stock returns in the emerging markets and those in the Japanese markets. In panels B to F, *** denotes the statistical significance at the 1% level, ** denotes the statistical significance at the 5% level, and * denotes the statistical significance at the 10% level, respectively.

Table 2. The Results of Welch's Tests: Relations with Malaysia, Philippines, Taiwan, and Thailand

Panel A Means and Standard Deviations of Correlation Coefficients of Returns for Four Periods					
Sample Periods	Statistic	Malaysia	Philippines	Taiwan	Thailand
November 24, 2001 to April 16, 2005	Mean	0.3114	0.1482	0.4334	0.3942
	SD	0.1788	0.2064	0.2520	0.1457
April 23, 2005 to September 13, 2008	Mean	0.3362	0.4571	0.4594	0.3760
	SD	0.3083	0.2427	0.2602	0.1858
September 20, 2008 to February 11, 2012	Mean	0.5390	0.4921	0.5605	0.4687
	SD	0.1789	0.1739	0.2443	0.1944
September 20, 2008 to April 11, 2009	Mean	0.6674	0.6169	0.7421	0.7208
	SD	0.0871	0.1336	0.0658	0.1194
Panel B Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for November 24, 2001 to April 16, 2005 < The Mean Value of the Correlation Coefficients of Returns for April 23, 2005 to September 13, 2008					
t-value for Welch's tests		0.9586	12.9385***	0.9586	−1.0250
p-value		0.1692	0.0000	0.1692	−
Panel C Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for November 24, 2001 to April 16, 2005 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to February 11, 2012					
t-value for Welch's tests		4.8338***	17.0019***	4.8338***	4.0955***
p-value		0.0000	0.0000	0.0000	0.0000
Panel D Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for November 24, 2001 to April 16, 2005 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009					
t-value for Welch's tests		13.7917***	16.2256***	13.7917***	13.3957***
p-value		0.0000	0.0000	0.0000	0.0000
Panel E Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for April 23, 2005 to September13, 2008 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009					
t-value for Welch's tests		12.3400***	5.2509***	12.3400***	13.3270***
p-value		0.0000	0.0000	0.0000	0.0000

Panel F Results for Welch's Tests: The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to February 11, 2012 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009				
t-value for Welch's tests	8.2899***	4.5116***	8.2899***	9.6128***
p-value	0.0000	0.0000	0.0000	0.0000

Notes: In panel A, 'Mean' denotes the mean values of 20 week historical correlation coefficients between stock returns in the emerging markets and those in the Japanese markets. Further, 'SD' means the standard deviations of 20 week historical correlation coefficients between stock returns in the emerging markets and those in the Japanese markets. In panels B to F, *** denotes the statistical significance at the 1% level, ** denotes the statistical significance at the 5% level, and * denotes the statistical significance at the 10% level, respectively.

4. Conclusions

This paper examined the covariations of stock returns between eight Asian emerging markets and the Japanese equity markets. In our analysis, we focus on the difference of the correlations in the periods before and after the US Lehman Shock. Our empirical studies implemented in this paper supplied the following novel contributions.

- First, we statistically revealed that covariations of stock returns between Asian emerging markets and the Japanese markets recently gradually increased.
- Second, we empirically derived that in the period right after the US Lehman Shock, covariations between stock returns of Asian emerging markets and those of the Japanese markets particularly increased.

As above, our derived evidence demonstrated in this study will contribute to the body of academic research in finance. We consider that future related research exploiting our findings and related data may be also valuable, and these studies with more technical tools are our future works.

Acknowledgement

This work was supported in part by the Japan Society for the Promotion of Science. The author greatly thanks the Chief Editor for the repeated kind paper invitations to write to this Journal.

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