

The Covariations of Equity Markets: An Exploration of the Nordic and the Japanese Markets

Chikashi TSUJI

Graduate School of Systems and Information Engineering
University of Tsukuba
1-1-1 Tennodai, Tsukuba, Ibaraki, Japan

Abstract

In this paper, the developments of the time-series covariations of stock returns between the Japanese equity markets and the Nordic stock markets are empirically analyzed. We inspect the covariations by dividing sample periods into several periods that are before and after the US Lehman Shock. In this paper, it is firstly revealed that the connections of stock returns between the Japanese markets and the Nordic markets recently gradually increased. Furthermore, it is secondly clarified that right after the Lehman Shock in the US, the comovements between stock returns in Japan and those in several Nordic countries highly increased.

Keywords: International stock market integration, Nordic stock markets, Japanese stock markets, Stock return comovements, Welch's test.

1. Introduction

International comovements of stock returns are more and more paid attention to both by academic researchers and practitioners. This is one of the important research topics in the field of business, economics, and finance. There are already exciting studies regarding the international stock return covariations. These researches are, for example, the studies of Errunza et al. (1992), Bekaert and Harvey (1995), Rouwenhorst (1999), Grinblatt and Keloharju (2000), Henry (2000), Longin and Solnik (2001), Brooks and Del Negro (2004), Lesmond (2005), Hardouvelis et al. (2006), Carrieri et al. (2007), Bekaert et al. (2009), Pukthuanthong and Roll (2009), Boyson et al. (2010), and Billio et al. (2012). However, as far as we know, there seem to be few academic researches that test the stock return covariations by focusing on the relations between the Japanese stock markets and the Nordic markets. Furthermore, we consider that, there may be little article which investigates the above relations by dividing sample periods into several terms before and after the Lehman Shock in the US. With these backgrounds and motivations, in this paper, we aim to analyze and discuss how the stock return time-series connections between the Japanese equity markets and the Nordic stock markets have progressed. This is our objective in this paper and in order to test these relations, we exploit the indices of the Morgan Stanley Capital International (MSCI) for four Nordic stock markets with the Tokyo Stock Price Index (TOPIX).

Our empirical studies in this paper derived the following contributions. First, we statistically found that the time-series connections of stock returns between the Japanese markets and the Nordic markets recently gradually increased. In addition, this paper also empirically derived that right after the period of the US Lehman Shock, the time-series connections between stock returns in these markets in two regions generally increased. Regarding the organization of this paper, the rest of the paper is in order, Section 2 describes the data, Section 3 explains our research design, Section 4 documents our empirical results, and Section 5 concludes the paper.

2. Data

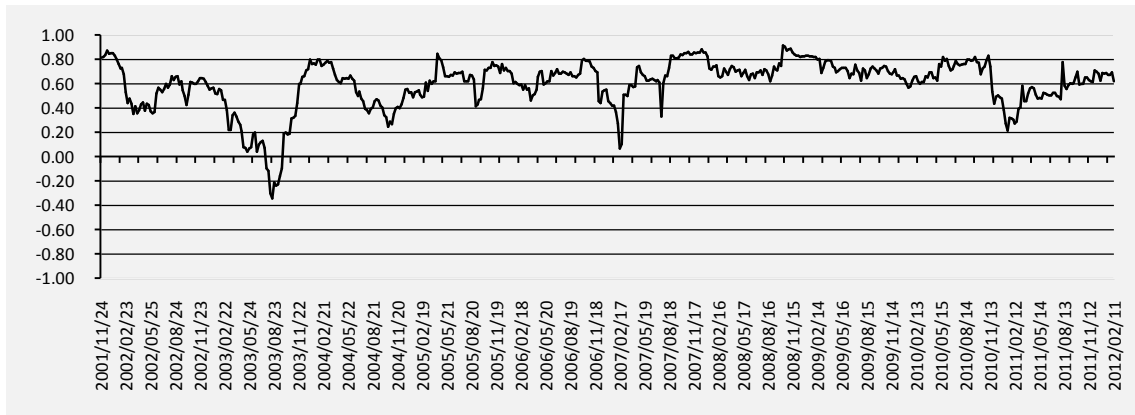
Regarding the data, we exploit the weekly stock returns derived from the MSCI Indices and derived from the TOPIX. These data are both supplied through the Nikkei Inc. In this paper, we statistically test the stock return correlation coefficients between the Japanese and the Nordic stock markets. More specifically, the focus in our analysis is on four Nordic stock markets of Denmark, Finland, Norway, and Sweden in addition to the Japanese markets.

3. Research Design

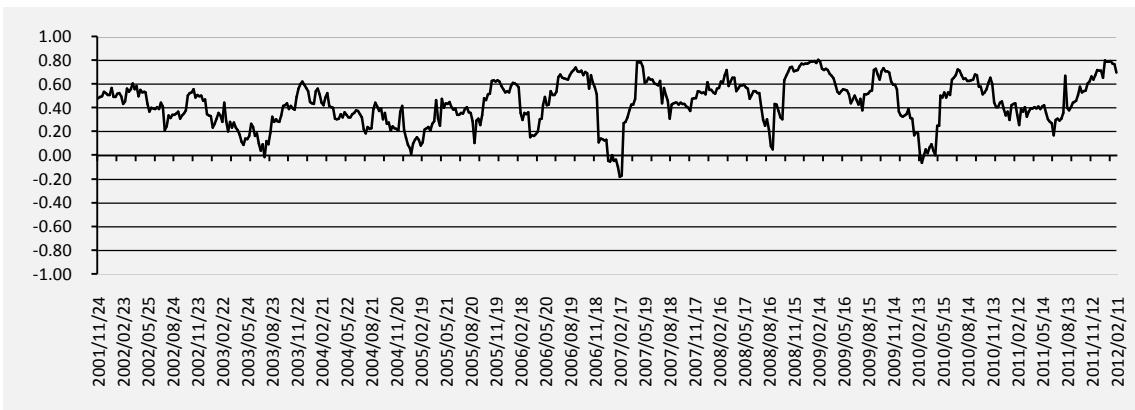
In this section, we explain our research design. By using the full sample period from 24 November 2001 to 11 February 2012, in order to perform our empirical analysis, we first set the following four sub-periods.

Namely, they are two 178 week terms which are before the US Lehman Shock, one 178 week term which is after the Lehman Shock, and one 30 week term which is also after the Lehman Shock. That is, they are (a) from 24 November 2001 to 16 April 2005 (Hereafter, we call this period as ‘the first term’); (b) from 23 April, 2005 to 13 September 2008 (Hereafter, we call this period as ‘the second term’); (c) from 20 September 2008 to 11 February 2012 (Hereafter, we call this period as ‘the third term’); (d) from 20 September 2008 to 11 April 2009 (Hereafter, we call this period as ‘the LS term’). The last 30 week period is the short-term period right after the US Lehman Shock, which is the most influenced by the Lehman Shock.

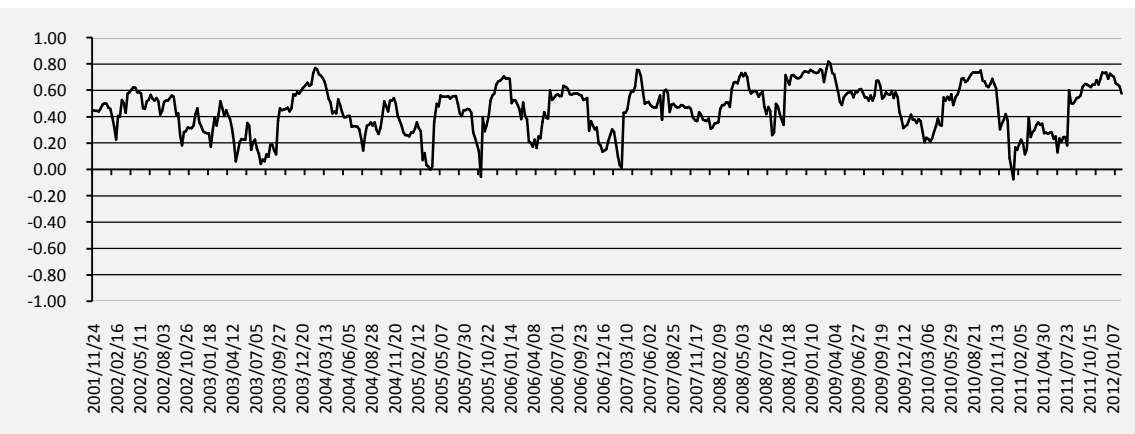
Panel A Denmark



Panel B Finland



Panel C Norway



Panel D Sweden

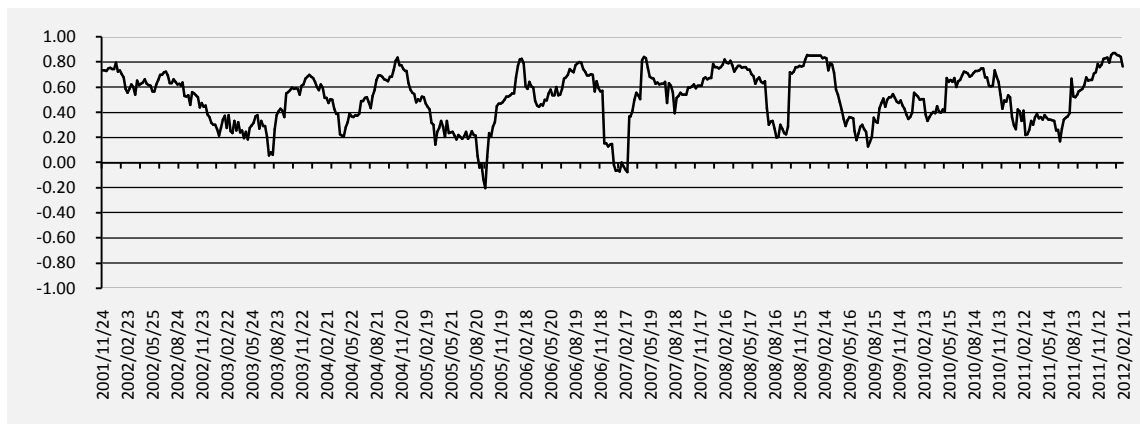


Figure 1. Correlation Coefficients between the Nordic and the Japanese Stock Markets

Table 1. The results of Welch’s tests: the linkage with Denmark, Finland, Norway, and Sweden

Panel A Means and Standard Deviations of Correlation Coefficients of Returns for Four Periods					
Sample Periods	Statistic	Denmark	Finland	Norway	Sweden
November 24, 2001 to April 16, 2005	Mean	0.4085	0.3507	0.3918	0.5041
	SD	0.1858	0.1437	0.1650	0.1754
April 23, 2005 to September 13, 2008	Mean	0.5197	0.4556	0.4629	0.5012
	SD	0.2433	0.1965	0.1568	0.2481
September 20, 2008 to February 11, 2012	Mean	0.5535	0.5134	0.5143	0.5360
	SD	0.2070	0.1979	0.1925	0.2012
September 20, 2008 to April 11, 2009	Mean	0.8239	0.6959	0.6907	0.7160
	SD	0.1122	0.1321	0.1125	0.1844
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					
<i>t</i> -value for Welch’s tests		4.8491***	5.7502***	4.1681***	-0.1312
<i>p</i> -value		0.0000	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					
<i>t</i> -value for Welch’s tests		6.9569***	8.8766***	6.4471***	1.5906*
<i>p</i> -value		0.0000	0.0000	0.0000	0.0563
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					
<i>t</i> -value for Welch’s tests		16.7720***	13.0721***	12.4658***	5.8613***
<i>p</i> -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 September 13, 2008 < The Mean Value of the Correlation Coefficients of Returns for September 20, 2008 to April 11, 2009					
<i>t</i> -value for Welch’s tests		11.0919***	8.5058***	9.6245***	5.5857***
<i>p</i> -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					
<i>t</i> -value for Welch’s tests		10.5230***	6.4466***	7.0259***	4.8799***
<i>p</i> -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 Japanese markets and in the Nordic markets. Further, ‘SD’ means the standard deviations of 20 week historical correlation coefficients between stock returns in the Japanese markets and in the Nordic 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.

Exploiting four periods defined above and the data also explained above, we perform the Welch's tests. This is in order to compare the stock returns' correlation coefficients between the Japanese and the Nordic stock markets in specific periods. We use the correlation coefficients which are those of past 20 weeks. The null hypothesis in our Welch's tests is that the correlation coefficients' mean value of two markets' returns are equal in two compared terms, while the alternative hypothesis in our Welch's tests is the correlation coefficients' mean value of two markets' returns are not equal in two compared terms. More concretely documenting the alternative hypotheses of our five Welch's tests, they are as follows: (a) The correlation coefficients' average value in 'the first term' is smaller than the correlation coefficients' average value in 'the second term'; (b) The correlation coefficients' average value in 'the first term' is smaller than the correlation coefficients' average value in 'the third term'; (c) The correlation coefficients' average value in 'the first term' is smaller than the average value in 'the LS term'; (d) The correlation coefficients' average value in 'the second term' is smaller than the average value in 'the LS term'; (e) The correlation coefficients' average value in 'the third term' is smaller than the average value in 'the LS term'. In addition, the time-series dynamics of the correlation coefficients of stock returns between the Japanese and four Nordic countries of Denmark, Finland, Norway, and Sweden are shown in Panels A to D in Figure 1.

4. Empirical Results

The empirical results are explained in this section. (a) Firstly, it is shown in Panel B of Table 1 that the correlation coefficients between stock returns in the Japanese markets and the Nordic markets increase in 'the second term' than in 'the first term'. The only one exception here is the result of Sweden. (b) Secondly, it is indicated in Panel C of Table 1 that the correlations between the Japanese markets and all four Nordic stock markets are higher in 'the third term' than in 'the first term'. (c) Thirdly, it is exhibited in Panel D of Table 1 that the correlations between the Japanese markets and all four Nordic markets are higher in 'the LS term' than in 'the first term'. (d) Fourth, it is indicated in Panel E of Table 1 that the correlations between the Japanese markets and all four Nordic markets are higher in 'the LS term' than in 'the second term'. (e) Finally, it is shown in Panel F of Table 1 that the correlations between the Japanese markets and all four Nordic markets are higher in 'the LS term' than in 'the third term'.

To sum up, our empirical analysis derived that the stock return covariations between the Japanese markets and the Nordic markets recently gradually increased. Further, in the period right after the Lehman Shock, these time-series connections increased in particular.

5. Conclusions

In this paper, we empirically inspected the time-series connections of stock returns between the Japanese markets and four Nordic markets of Denmark, Finland, Norway, and Sweden. In our examinations, we particularly focus on the difference of the correlation coefficients in the periods that are before and after the US Lehman Shock. Our empirical examinations implemented in this paper offered the novel contributions as follows.

1. Firstly, we statistically revealed that the correlations of stock returns between the Japanese and the Nordic equity markets gradually increased in the recent period.
2. Secondly, we empirically derived that in the analyzing period right after the US Lehman Shock, time-series connections between stock returns of the Japanese markets and the Nordic equity markets generally increased.

As above, our evidence derived by the formal statistical tests in this research will contribute to the body of academic research in business, economics, and finance. We consider that the future related researches by exploiting our findings and related other data may be also valuable, and these are our future works.

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