

THE STUDY OF RELATIONSHIP BETWEEN ASIAN STOCK EXCHANGES AND NEW YORK STOCK EXCHANGE

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Original scientific paper

This paper investigates the linkages between equity markets of 5 Asian countries, including Malaysia, Indonesia, the Philippines, Japan and Turkey and those in USA employing correlation analysis and Vector Auto Regressive (VAR). We used monthly data for the period 1995 ÷ 2010. The US stock markets were correlated with all Asian stock markets and Japan was correlated least strongly with the other Asian markets. The VAR results show significant multilateral returns interactions among the markets. Overall, the results show that historical returns, either own or from other stock markets, help explain market current returns. This is in contrast to weak form efficiency. Additionally, we found a significant spillover effect from the US equity market to all 5 of the Asian markets. In block exogeneity test we found that USA is the most exogenous. But the influence of the US on the stock markets of Japan is relatively weak.

Keywords: *Asian stock markets, linkage, spillover effect, co-movement*

Proučavanje odnosa između azijskih burzi i burze u New Yorku

Izvorni znanstveni članak

U ovom se radu istražuju veze između tržišta kapitala 5 azijskih zemalja, uključujući Maleziju, Indoneziju, Filipine, Japan i Tursku, i onih u USA uz primjenu korelacijske i Vektorske Auto Regresivne analize (VAR). Koristili smo mjesečne podatke za razdoblje 1995. ÷ 2010. Američke su se burze uspoređivale sa svim azijskim burzama dok je najslabija bila korelacija japanskih i azijskih tržišta. Rezultati VARa pokazuju interakcije multilateralne dobiti među tržištima. Ukupno, rezultati pokazuju da prošla dobit (povijesna), bilo vlastita ili drugih burzi, pomaže u objašnjavanju postojeće dobiti na tržištu. Ovo je u suprotnosti s učinkovitosti slabog oblika. Osim toga, ustanovili smo značajan učinak preljevanja američkog tržišta kapitala na svih 5 azijskih tržišta. "Block exogeneity" testom smo ustanovili da najviše vanjskog utjecaja dolazi iz američkih burza. No njihov utjecaj na japanska tržišta kapitala je relativno slab.

Ključne riječi: *azijske burze, veza, učinak preljevanja, zajedničko kretanje*

1 Introduction

The central theme of this paper is co-movement between Asian financial markets and USA returns. These kinds of analysis are key issues in finance because it has significant practical implications in risk management as well as asset allocation. Also the recent US financial crisis and its contagion showed that the co-movement among stock markets needs more attention.

Knowledge of the degrees of relationship and co-movement among international financial markets and specially stock exchanges can help both individual and corporate investors to manage their portfolios for maximizing their risk and return trade-off. Similarly, co-movements between two countries can affect the pattern of their economy. For example, if international financial markets are integrated, will the changes in major developed equity markets have a major influence on other equity markets or not?

2 Literature review

Today, developments in financial markets trade-off have led to interest in studying the contagions and linkages in financial markets. Early studies on international linkages of financial markets occurred in the early 1970s and these were motivated by the need to determine the possibility of gains from international diversification [1 ÷ 4]. Whilst the common finding of these early researches was that international financial markets were less harmonized, recent findings reveal increased co-movement and interdependence of financial markets.

Various studies have found that market co-movement is currently higher. This increased co-movement can be attributed to the increasing market integration in relation to the close economic and financial links. However, market integration may not fully explain this co-movement, and contagion may, in part, contribute to the process. World economies and financial markets are becoming increasingly interconnected in today's world. The globalization process helps to speed up this interconnection (see for instance Taylor and Tanks [5] and Kasa [6]).

Stock exchanges co-movement has been the subject of considerable empirical investigation. Because expected returns and variances are required to construct optimal risk and return portfolios, investors, portfolio managers, and financial market regulators especially in markets can benefit from new insights into the co-movements among equity markets.

Using monthly excess returns for seven major European countries from 1970 to 1990, Longin and Solnik [7] find that cross-country stock market correlations increase over time but are larger when large shocks occur.

In a subsequent study, Karolyi and Stulz [8] investigating daily return co-movements between Japanese and US stocks from 1988 to 1992, find evidence that correlations and co-variances are high when markets move a lot. This suggests international diversification does not provide as much diversification against large shocks to national equity markets as expected.

Bekaert and Harvey [9] study the impact of capital market integration on stock market correlations using a set of case studies while Quinn and Voth [10] look at the

same impact over a very long period (more than 100 years) for developed countries. Eizaguirre and Biscarri [11] look at the effects of financial liberalization of emerging markets in terms of volatility.

Graham, Kiviahio and Nikkinen [12] examined the integration of 22 emerging stock markets with the U.S. market and find a high degree of co-movement at relatively lower frequencies between the U.S. and the 22 individual emerging markets. Their results show that the strength of co-movement, however, differs by country. For example, they reported a high degree of co-movement between the U.S. and Brazil, Mexico and Korea, but low co-movement between Egypt and Morocco. Their findings implied that investing selectively in emerging markets may provide significant diversification benefits which, invariably, depend on the investment horizon. Jarrett and Sun [13] examined the time series characteristics of stock price indices for New York and Shanghai during the period of 1991 to 2009. Specifically, they calculated the rate of return and the volatility of return for two markets and estimated the serial correlation and co-movement of the two markets. They found that the Shanghai stock prices are positively serially correlated with the New York stock prices. In the multivariate regressions, they found that there is little evidence to show that either the rate of return in Shanghai would affect the rate of return in New York or the rate of return in New York would affect the rate of return in Shanghai. It suggested that the two markets were not integrated. Finally, they studied and made a conclusion concerning the volatility of the New York and Shanghai indices in relation to each other. Li [14] found that asymmetric co movements exist between the US stock market and the stock markets of Canada, France, Germany, and the United Kingdom, but the data were unable to reject the symmetric co movements between the US and Japanese stock markets.

3 Data and methodology

3.1 Data

The countries covered in this paper include the USA and 5 countries in the Asian region.

The choice of the US stock market is due to the fact that it is the world's largest market. Japan was chosen because it is world's second largest stock market and Asian leading equity market, whilst Malaysia, Indonesia, Turkey and Philippine are relatively the Islamic Asians fastest growing emerging economies. The following indices were used for the respective stock markets: *TOPIX* for Japan, *PSEIndex (PSEi)* for Philippine *SE*, *JSX Composite Index* for Indonesia, *ISE 100Index* for Turkey, *FBM EmasIndex* for Malaysia and *NYSEEuronext(US)* for United States of America. The choice of these indices has been motivated by the fact that they are the most recurring in empirical studies. All the indices were obtained from the 1995-2010 Financial statistic of *WFE* website.

The existence of co-movements between stock markets has been tested several times and also documented (see for example [15, 16, 17]). These kinds of researches use different econometric methodologies, like Malliaris and Urrutia [18] that used the Granger causality and Koch and Koch [19] that employed

simultaneous equations, but there are some problems, for example we know the existence of significant Granger causality does not necessarily imply that there is a causal relation between stock markets. Another problem is about simultaneous equations. It can only be useful if there are only two stock markets under study and it also has problems with regard to identification [20]. The VAR has been suggested as a better alternative to these methodologies, thus this study will use this approach for examining return linkages.

3.2 Methodology

This study utilized vector Autoregression (VAR) model. This model shows how returns and volatility are transmitted from one market and it is appropriate for multivariate time series analysis. Also this model has proven to be especially useful for describing the dynamic behavior of economic and forecasting.

Our study will express the VAR model as follows:

$$X_t = C + \sum_{s=1}^m A_s X_{t-s} + \varepsilon_t, \quad (1)$$

where X_t is a 6×1 column vector of equity market returns for the six stock markets under consideration, C is the deterministic component comprised of a constant, A_s are respectively, 6×1 and 6×6 matrices of coefficients, m is the lag length and ε_t is the 6×1 innovation vector which is uncorrelated with all the past X_s . In this study the VAR is extended with block exogeneity and variance decompositions, because VAR estimates are weak in determining about transmission of shocks.

3.3 Block exogeneity/VAR Granger causality

The VAR can be considered as a means of conducting causality tests, or more specifically Granger causality tests. Granger causality really implies a correlation between the current value of one variable and the past values of others; it does not mean changes in one variable cause changes in another. By using a F-test to jointly test for the significance of the lags on the explanatory variables, this in effect tests for 'Granger causality' between these variables.

The block exogeneity test attempts to separate the set of variables that have significant impacts on each of the dependent variables from those that do not. This is done by restricting all the lags of particular variables (X_{it}) to zero and then testing for the significance of eliminating these variables. This joint significance test follows an F-distribution [21], and is analogous to testing for Granger causality [22].

4 Empirical results

4.1 Descriptive Statistics and Simple correlation test

Tab. 1 provides the summary statistics, namely, sample means, maximums, minimums, medians, standard deviations, skewness, kurtosis and the Jarque-Bera tests with their P-values for the Index series return from January 1995 – December 2010 for 6 countries.

Whilst it is clear that all the statistics show the characteristics common with most financial data, for instance non-normality in the form of fat tails, there are a number of noticeable differences. For example USA has

the largest monthly returns and Japan is the second one. Also these countries have the most standard deviation between developed markets.

Table 1 Descriptive statistics for returns

	Malaysia	Turkey	Philippine	Indonesia	USA	Japan
Mean	0,109951	0,03436	0,007007	0,053244	0,056291	0,021846
Median	0,008967	0,02787	0,005187	0,011492	0,010822	-0,002984
Maximum	5,656681	1,034337	0,743866	7,830157	9,296022	5,630278
Minimum	-0,864543	-0,835535	-0,25837	-0,84144	-0,19537	-0,753745
Std. Dev.	0,821007	0,178153	0,106082	0,583825	0,675095	0,414941
Skewness	6,399413	0,992148	2,718928	12,48042	13,52976	12,99196
Kurtosis	43,39042	11,98245	20,0042	166,67	185,6561	176,6482
Jarque-Bera	14286,77	673,4485	2377,069	218145,3	271343,1	245346,3
Sum	21,00061	6,562841	1,254198	10,16963	10,75158	4,172604
Sum Sq. Dev.	128,07	6,030287	2,003106	64,76175	86,59317	32,71344
Observations	191	191	179	191	191	191

Table 2 Correlation matrix for returns

		Iran	Malaysia	Turkey	Philippine	Indonesia	USA	Japan
Iran	Pearson Correlation	1	-0,009	-0,017	-0,016	-0,006	0,005	-0,02
	Sig. (2-tailed)		0,9	0,81	0,831	0,933	0,945	0,759
	N	191	191	191	179	191	191	191
Malaysia	Pearson Correlation	-0,01	1	-0,014	0,006	0,002	-0,01	-0,07
	Sig. (2-tailed)	0,9		0,851	0,933	0,977	0,895	0,331
	N	191	191	191	179	191	191	191
Turkey	Pearson Correlation	-0,02	-0,014	1	0,430**	0,111	0,057	0,210**
	Sig. (2-tailed)	0,81	0,851		0	0,127	0,432	0,004
	N	191	191	191	179	191	191	191
Philippine	Pearson Correlation	-0,02	0,006	0,430**	1	0,194**	0,09	0,491**
	Sig. (2-tailed)	0,831	0,933	0		0,009	0,232	0
	N	179	179	179	179	179	179	179
Indonesia	Pearson Correlation	-0,01	0,002	0,111	0,194**	1	-0,003	0,116
	Sig. (2-tailed)	0,933	0,977	0,127	0,009		0,965	0,11
	N	191	191	191	179	191	191	191
USA	Pearson Correlation	0,005	-0,01	0,057	0,09	-0,003	1	0,055
	Sig. (2-tailed)	0,945	0,895	0,432	0,232	0,965		0,449
	N	191	191	191	179	191	191	191
Japan	Pearson Correlation	-0,02	-0,071	0,210**	0,491**	0,116	0,055	1
	Sig. (2-tailed)	0,759	0,331	0,004	0	0,11	0,449	
	N	191	191	191	179	191	191	191

The next step in our empirical analysis is to examine the extent of returns linkages among the stock markets. In order to understand the returns and volatility co-movement, it is important to analyze co-integration. Co-integration between series can also be viewed as a long term or equilibrium phenomenon, since the co-integrating series may deviate from the relationship in the short run, but would return to equilibrium in the long run [23]. In this study, co-integration analysis will be carried out by bivariate co-integration analysis that will be used to examine the long run relationship between the USA equity markets and each of the stock markets under study. As it is shown in Tab. 2, we can conclude that time series are co-related and we can use multivariable methods for analysing the time series.

As is evident from this Table, there are correlations between the stock markets returns. When we examine the correlation coefficients between the U.S. and 5 Asian countries, Turkey evidences the highest values, at over 0,8, whereas Japan has the lowest, at 0,280. The correlation coefficients of other Asian markets with the US have a range between 0,423 and 0,436. Across Asian countries, Japan exhibits profound correlations with other Asian countries, ranging over 0,2, and Malaysia is also strongly correlated with Turkey, with coefficients of 0,647, respectively. In fact, Asian countries except Japan

evidence correlation coefficients of over 0,4. Japan was correlated least strongly with the other Asian markets. The correlation coefficients between Japan and the other Asian countries are below 0,3.

One of the most important results noted in Tab. 2 is the correlation coefficients across the neighbouring countries. Among the ASEAN countries, the correlation coefficients across Malaysia, Indonesia, and Philippine are all greater than 0,5, reflecting strong co-movement of these three markets.

We should say that correlation matrix cannot provide any empirical answer to the question about influence on the other markets, since correlation does not imply causality [24]. Furthermore, correlation merely provides insight into short run market linkages, but fails to account for long term arbitrage activities in stock markets [25]. We therefore need to infer this from other empirical tests.

4.2 Examining dynamic returns linkages

Having established that the equity market moves with some of the world stock markets in the long run, we now test if this is also the case with return linkages between the USA equity markets and Asian capital markets using the VAR model. An important step before the VAR analysis is to test for the stationarity of the series. Thus

our unit root/stationarity tests use the ‘no trend and no intercept’ deterministic trend assumption. As in the previous case we use the *ADF* and the *KPSS*. The results are reported in Tab. 3.

Table 3 Unit Root/Stationarity test (Within intercept and trend) for returns

Series name	ADF		KPSS	
	level	1st Difference	level	1st Difference
Malaysia	-1,956	-19,63	0,463	0,24
Turkey	-2,32	-15,03	0,129	0,041
Philippine	-1,45	-12,05	0,441	0,0374
Indonesia	-2,53	-13,61	0,126	0,031
USA	-1,72	-12,08	0,178	0,048
Japan	-3,71	-12,4	0,139	0,033

As can be seen from Tab. 4, results from both the *ADF* and the *KPSS* show that the returns series are stationary at level (1). Thus our VAR analysis will proceed with returns series.

4.3 Vector autoregressive results (VAR)

Lag length should be determined before estimating a VAR model. The three ways for lag length determination include: economic theory [22], use of higher lag length [26]. In this study, we employ the Akaike, Hannan-Queen and Schwarz Information Criteria. At first diagnostic checking has been done to ensure that the final lag selected will give robust results with white noise residuals. It started with a VAR lag length of 2 and the lag length and then it was increased step by step until serial correlation was eliminated. The results for the serial correlation diagnostic test are reported in Tab. 4.

Table 4 Lag Length selection criteria

Lag length	LM (χ^2) Statistic	Probability
2	61,23	0,0876
3	87,63	0,008
4	60,02	0,0786
5	42,38	0,6978

Table 5 VAR Results returns linkages

	Malaysia	Turkey	Philippine	Indonesia	USA	Japan
Malaysia (-1)	0,038			0,028		0,026
Malaysia (-2)			0,005	0,100		0,086
Malaysia (-3)	0,082	0,039			0,070	
Malaysia (-5)	0,006	0,071	0,025		0,014	0,074
Turkey (-1)				0,012		
Turkey (-2)			0,049			
Turkey (-3)		0,021	0,092	0,030	0,083	
Turkey (-4)	0,092	0,067			0,043	0,007
Philippine (-1)		0,002		0,017		
Philippine (-3)	0,068					0,022
Philippine (-5)		0,094	0,004		0,085	0,077
Indonesia (-1)	0,073		0,040	0,049	0,005	0,063
Indonesia (-2)	0,039		0,031		0,068	
Indonesia (-3)	0,009	0,037	0,060	0,011		
Indonesia (-4)			0,021	0,005		0,062
USA (-1)		0,013	0,011	0,042	0,061	
USA (-3)		0,029				
USA (-5)	0,018			0,020	0,094	0,016
Japan (-1)	0,065	0,035		0,097		0,001
Japan (-2)			0,070	0,088	0,067	

It is evident in Tab. 4, that lag 2, 3 and 4 show evidence of serial correlation. Serial correlation only disappears at lag 5. Thus we estimate our VAR using a lag order of 5 and the results for the significant lags are reported in Tab. 5.

Table 6 Block exogeneity for returns linkages

Dependent variable: Malaysia			
Excluded	Chi-sq	df	Prob.
Turkey	14,21	9	0,289
Philippine	20,62	9	0,024
Indonesia	20,69	9	0,037
USA	821,25	9	0
Japan	18,41	9	0,378
all			0
Dependent variable: Turkey			
Excluded	Chi-sq	df	Prob.
Malaysia	16,21	9	0,489
Philippine	10,62	9	0,724
Indonesia	11,69	9	0,737
USA	811,25	9	0
Japan	17,41	9	0,478
all		90	0
Dependent variable: Philippine			
Excluded	Chi-sq	df	Prob.
Malaysia	24,21	9	0,0289
Turkey	12,62	9	0,324
Indonesia	24,79	9	0,037
USA	748,22	9	0
Japan	17,41	9	0,278
all			0
Dependent variable: Indonesia			
Excluded	Chi-sq	df	Prob.
Malaysia	24,21	9	0,0389
Turkey	17,62	9	0,074
Philippine	20,69	9	0,0217
USA	752,52	9	0
Japan	18,41	9	0,124
all	647,12	90	0
Dependent variable: USA			
Excluded	Chi-sq	df	Prob.
Malaysia	4,23	9	0,547
Turkey	2,51	9	0,689
Philippine	3,64	9	0,624
Indonesia	8,67	9	0,437
Japan	5,48	9	0,598
all	47,12	90	0
Dependent variable: Japan			
Excluded	Chi-sq	df	Prob.
Malaysia	10,26	9	0,0487
Turkey	15,65	9	0,272
Philippine	16,72	9	0,329
Indonesia	12,69	9	0,064
USA	784,1	9	0
all	894,36	90	0

In analysing returns linkages using a VAR, it is important to distinguish between the influences of own-returns and those of returns from other markets. Since we are concerned with determining which of the stock markets has the greatest impact on the other market returns, our discussion is mostly concerned with the influence of the stock market returns on each other, rather than how all the markets influence each other.

The VAR results show significant multilateral returns interactions among the markets. Overall, the results show that historical returns, either own or from other stock markets, help explain market current returns. This is in contrast to weak form efficiency. However, as noted earlier, although the VAR analysis is a useful tool to test for examining ‘spillovers’ and linkages between markets,

the fact that there are so many coefficients and that coefficients of certain variables may change sign with different lags raises issues regarding interpretation.

Additionally, the VAR estimates do not allow us to determine very much about the transmission of shocks across the system or the period of time that it takes these shocks to work through the system. Thus, weak exogeneity and variance decompositions are employed to examine the dynamic links between the markets and the transmission of the returns shocks. Results are significant at 1 % and 5 %.

4.4 Block exogeneity

It tests bilaterally whether the lags of the excluded variable affect the endogenous variable. In this study we use the block exogeneity test for testing which of the stock markets truly influence other stock exchange returns and volatility. Block exogeneity will also be used to identify which of the stock markets are the most exogenous and endogenous in returns and volatility linkages. Finally, this test will allow us to determine whether the developed equity market truly influences volatility and returns of other stock markets.

In this part we use VAR Granger Causality. As we noted before the Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another ordinarily, regressions reflect "mere" correlations, but Clive Granger argued that there is an interpretation of a set of tests as revealing something about causality.

The null hypothesis: the lagged coefficients are significantly different than 0. All: joint test that the lags of all other variables affect the endogenous variable.

As we can see in Tab. 6, these results are clear:

- 1) USA and Indonesia influence Malaysia
- 2) USA influences Turkey
- 3) Philippine is affected by Malaysia, Indonesia and USA
- 4) Indonesia is affected by Malaysia and Philippine
- 5) Japan is affected by Malaysia and USA.

As we can see no stock exchange can affect the USA stock exchange but actually the New York stock exchange influences all developed markets. So USA is the most exogenous market in the world.

4.4 Variance decomposition

The variance decomposition analysis seeks to address the question with regard to the proportion/percentage of the movements in the stock market returns that are due to its 'own' innovations, against those that are due to shocks to other stock markets. As noted earlier, the returns are ordered by trading sequence of the markets.

Brooks and Tsoalacos [27] and Mills and Mills [28] stress the importance of ordering variables in the decomposition arguing that it is as good as putting restrictions on the primitive form of the VAR. In line with Mills and Mills [28], we adopt two orderings as follows:

Order I: Malaysia, Turkey, Philippine, Indonesia, USA, Japan and Order II: Japan, USA, Indonesia, Philippine, Turkey, Malaysia.

The variance decomposition results are reported in Tab. 7. As evident from Tables the variance decomposition differs across the two orderings.

However, there are certain common features that seem to be evident. Firstly, the US is the most exogenous in that its innovations tend to explain the variations in returns of some markets better than other innovations explain its returns. Also Indonesia and Malaysia international influence 70 % of the variations in their returns are explained by foreign innovations the highest of all markets and 30 % are about internal and domestic factors.

5 Conclusion

According to the result of co-relation matrix for stock exchanges returns, we concluded that time series are co-related and it showed that we can use multivariable methods for analysing the time series and we did it.

Correlation between markets is positive, which tends to indicate that there is a common trend/factor that is driving the markets in the same direction.

The VAR results show significant multilateral returns interactions among the markets. Overall, the results show that historical returns, either own or from other stock markets, help explain market current returns. This is in contrast to weak form efficiency. USA returns, which in every case is a dominant market that influences most markets.

In Block Exogeneity in Return Linkage, the US was found to be the most exogenous. Also these results are achieved for Asian markets, USA and Indonesia influence Malaysia, and also USA influences Turkey.

The Philippines are affected by Malaysia, Indonesia and USA while Indonesia is affected by Malaysia and the Philippines, while Japan is affected by Malaysia and USA.

As we hinted above, no stock exchange can affect the USA stock exchange but actually the New York stock exchange influences all developed markets. The explanation for the US is the fact that it is the largest and most dominant market in the world. We should note, it is assumed that stock exchanges have reflected all of macroeconomic variables effects. For example, some studies examined the impact of international capital flows on stock returns and subsequent linkage to co-movements and stock market integration. So we should point out this study does not attempt to investigate or quantify economic variables that could affect co-movements and stock market integration. One of the ideas for this study originates from the fact that globalization is an important trend. Significant contribution of globalization for the financial markets comes from the Modern Portfolio Theory, which allowed all international investors to diversify globally in order to reduce their portfolio's systematic risk level to a level lower than their home country's systematic risk level. Existence of herding in the financial markets during the crisis is experienced all over the world. Mentalities are characterized by a lack of individuality, causing people to think and act like the general population in the world.

Table 7 Variance decomposition for returns linkages

Variance decomposition of Malaysia 1												
Period	I	II	I	II	I	II	I	II	I	II	I	II
	s.e.	s.e.	Ma1	Ma1	Tu1	Tu1	Ph1	Ph1	In1	In1	Ja1	Ja1
5	0,37	0,37	68,7	59,8	0,23	0,24	1,28	3,1	4,3	3,3	3,6	3,2
10	0,37	0,37	68,7	59,8	0,23	0,23	1,28	3,1	4,3	3,3	3,6	3,2
20	0,37	0,37	68,7	59,8	0,21	0,22	1,28	3,1	4,3	3,3	3,6	3,2
Variance decomposition of Turkey 1												
Period	I	II	I	II	I	II	I	II	I	II	I	II
5	1	2	1	2	1	2	1	2	1	2	1	2
10	0,24	0,24	0,069	0,16	76,3	69,1	1,12	2,3	1,4	3,1	0,93	1,41
20	0,24	0,24	0,069	0,16	76,3	69,1	1,12	2,3	1,4	3,1	0,93	1,41
Variance decomposition of Philippine 1												
Period	I	II	I	II	I	II	I	II	I	II	I	II
5	0,71	0,71	0,068	1,42	0,08	1,31	71,9	69,4	2,9	0,2	2,67	1,79
10	0,71	0,71	0,068	1,42	0,08	1,31	71,9	69,4	2,9	0,2	2,67	1,79
20	0,71	0,71	0,068	1,42	0,08	1,31	71,9	69,4	2,9	0,2	2,67	1,79
Variance decomposition of Indonesia 1												
Period	I	II	I	II	I	II	I	II	I	II	I	II
5	0,67	0,66	0,31	2,1	0,05	1,6	0,09	0,48	75,6	67,4	1,74	0,38
10	0,67	0,67	0,31	2,1	0,05	1,6	0,09	0,48	75,6	67,4	1,74	0,38
20	0,67	0,67	0,31	2,1	0,05	1,6	0,09	0,48	75,6	67,4	1,74	0,38
Variance decomposition of Japan 1												
Period	I	II	I	II	I	II	I	II	I	II	I	II
5	0,57	0,57	0,106	0,69	0,01	1	0,01	0,42	0,75	0,23	71,9	65,2
10	0,57	0,57	0,106	0,69	0,01	1	0,01	0,42	0,75	0,23	71,9	65,2
20	0,57	0,57	0,106	0,69	0,01	1	0,01	0,42	0,75	0,23	71,9	65,2

For example when people hear some news about financial crisis in USA, investors quickly pull out from financial markets without drawing any distinction between them. Also the atmosphere of financial market is affected by the news, because the economic and political news influence supply and demand of the listed companies stocks, so prices are sensitive to these news. The findings of this study have important implications for policy and investment strategies. From this study, it has also been found that shocks from the US stock markets should be of primary concern for the variations in Asian markets returns and volatility. Therefore, developments in these markets need to be closely watched both by policy makers and portfolio managers. However, this does not necessarily mean developments in other markets should be completely ignored. For a further research this topic can be explored with other models, with other available software.

Thus, further research in this area could employ another model and compare the results with ours. For the sake of comparison, different data frequencies could also be employed.

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