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The Dynamic Behavior Of Turkish Stock Market Before And After Lehman Collapse

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Abstract

Lehman Brothers slump was taken as base point and changes in pricing mechanisms of BIST100, MSCI EM and Dow Jones were tried to be understood before and after crisis. While daily closed data was used, VAR, Impulse Response, Variance Decomposition and Granger Causality tests were used. According to results, Turkish markets are weaker than other developing countries and react more quickly to negative developments and Dow Jones returns have more explanatory power over BIST100 returns with respect to MSCI EM in pre-crisis period. In post-crisis period, volatility of Turkish markets decreased much more than other developing countries due to inherent growth dynamics. In addition, the influence of MSCI EM in pre-crisis period over Dow Jones is not effective, but in post-crisis period has become more effective. This can be regarded as a sign of an increase in dominance of developing countries in global economies in post-crisis period.

Keywords: Lehman Brothers, VAR, Impulse Response, Contagion Effect, MSCI EM, BIST100

1. Introduction

There are many studies in the literature about the integration and contagion effect of developed and emerging stock exchanges. Generally, the long-term relationship is measured by Engle-Granger, Johansen and Gregory-Hansen methods, correlation is used for short term relationship. Basically, the purposes of the studies are to provide portfolio diversification and to determine arbitrage opportunities.

With the globalization, financial openness and fund flows among the countries have increased. Technological development is also effective in this case. (Korkmaz, Zaman, & Cevik, 2009, p. 41) While it is observed that a complete consensus cannot be reached in the studies that measure the relationship between financial development and economic growth, some studies bolster that the financial openness for Turkish economy has a positive effect on growth. (Türedi & Berber, 2010, pp. 312-313). Aslan and Küçükaksoy (2006) reached the similar results.

In addition to examining the effects of financial integration on economic growth, financial openness is an important concept in terms of portfolio diversification. For international portfolio managers, emerging markets offer significant opportunities in terms of diversification. This is because the level of correlation between the stocks of developing countries and those of developed countries is low. (Tastan, 2005, p. 2). The direction and magnitude of the relationship between the stock exchanges is also vital in terms of arbitrage opportunities. (Vuran, 2010, p. 155) The lack of correlation between stock markets is crucial in determining the level of diversification as well as the degree to which the indices are independent. (Benli Y. , 2014, p. 19)

The correlation between stock indexes can be determined by the correlation coefficient. However, the correlation coefficient can only determine short-term relationship. (Narayan & Smyth, 2005, p. 233) In some studies for the Turkish market, it is observed that the volatility during the period of 2006-2008 declined during the period after the collapse of Lehman, 2008-2013. (Iltas, Arslan, & Kayhan, 2017, p. 273) This studies point out that the fragility of the Turkish stock market after the crisis of 2008 decreases. One of the main motivations in this work is the testing of the fragility of Turkish market.

One of the most severe financial crisis in world history has started with the collapse of Lehman Brothers' in 2008. Academicians have conducted many researches to find out the possible reasons that lie behind the crisis. However, instead of focusing on the reasons that cause such a severe crisis, in this paper we tried to understand the results of the crisis over markets and tried to figure out what kind of structural breaks can happen to start to exist.

Following major global crises, there have been significant structural changes in the global economic system. In the name of delving into the detail, we can surely say that one important conclusion of global economic crisis is that the impact of the 2008 crisis on the world economy of developing country economies have increased. The reasons for this situation are that the economic growth of developed countries have more slowed down than the slowdown of economic growth rate of developing countries due to the increased debt burden and the economic measures taken in order to repay the debt. Indeed, we can say that the new debt amounts that emerged in developed countries due to global economic crises, it may take some time for developed countries to catch up the growth rates in the pre-crisis period. In other words, we think that the changes that took place in Dow Jones should be more sensitive to the changes in emerging economies like Brazil, like China in the coming years.

One of the most severe consequences of the financial crisis was the drop in growth rates and the increase in unemployment rates. Turkey's economy shrank 9.2% in 2009, while unemployment rose to the level of 13-14%. With the positive effect of young and dynamic population structure

and resistive consumption habits, Turkey begin to reach positive growth rates just after two years of the beginning of the global financial crisis. After just two years, Turkey has achieved high GDP growth rates and exchange rate risk was diminished because of fund flows to emerging markets because of decreasing uncertainty and low credit costs. Due to these reasons Fitch and Moody's has hiked Turkey's Foreign Currency Denominated Credit Rating to investment grade. The rapid economic growth achieved in the post-crisis period, decreased political risks and suitable demographic and consumption structure can be expected to make Turkey stronger than average among emerging markets in terms economic power. Therefore, it can be expected that the developments in BIST100 after the global crisis are less sensitive to the events happening in the world.

The vector auto regressive (VAR) model was used to perform the analysis to prevent having bias results as the variables in the model may be endogenous, ie they may affect each other. The article is organized as follows: Chapter 2 contains a brief discussion of data and methodology. In section 3, lag selections are made for the VAR regression analysis. Section 4 contains the estimation results.

2. Literature Review

In the literature, the relationship between stock markets has been tried to be measured in a long and short term, and the level of financial integration and contagion effect has been examined in terms of both portfolio diversification, arbitrage opportunities and economic growth. It is necessary to divide the studies into two parts, abroad and domestically.

Kasa (1992) found that there is a long-lasting relationship between the US, Japan, UK, Germany and Canada stock exchanges. The study of Jochum, Kirchgässner, and Platek (1999) said that while Eastern European stock exchanges displayed cointegration effect before 1997 crisis, this effect weakened after the crisis. Hussain and Saidi (2000), using the data from 1988-1993 and the Engle-Granger method, have established a long-lasting relationship between the Pakistan stock market and American, British and Japanese stock exchanges. Scheicher (2001) examined the spillover effect among Hungary, Poland and the Czech Republic with the VAR-GARCH model and determined a significant spillover effect in terms of return and volatility between Hungary and Poland.

Baharumshah, Sarmidi, and Tan (2003) found that Asian stock markets have strong contagion effect both among themselves and with American and Japanese stock exchanges. Worthington and Higgs (2004) claimed that the Japanese stock market has a pronounced spillover effect for Hong Kong, Indonesia and Korea stock exchanges. When looking at overseas studies Vo and Daly (2005), found that after the euro currency, contagion effect was wiped out in Europe, while finding a significant relationship between European and US markets before moving to common currency in Europe. This implies structural breaks in long-term relationships, and even developed economies can be used to diversify portfolios for each other.

Chang, Nieh, and Wei (2006) examined the data between 1998 and 2001, and found that there was no long-term relationship between the Taiwanese stock market and the stock exchanges in France, Germany, the Netherlands and the UK. Mavrakis and Alexakis (2008) examined the impact of German, UK and US stock exchanges on Greek stock exchange and argued that portfolio diversification may not be healthy due to long-term cointegrated impact. This can be interpreted as the fact that large stock exchanges in relatively advanced economies are able to influence smaller markets more easily.

According to An and Brown (2010), a strong contagion effect was observed between US and Chinese stock exchanges during the period of 1995 and 2009, while the impact of American

stock markets on other emerging stock markets was low. This means that Chinese index is not an important portfolio diversification tool for institutional investors. It is also clear that the relationship between US and China, in terms of commercial and bond markets, is also manifest itself in the effect of contagion effect. This relationship can sometimes be a significant proof of why the growing political tension between the United States and China has been cut off after a certain period of time.

At domestic works, it is observed that there is a mighty literature on the determination of the level of cointegration between the Turkish stock market and both developed and emerging stock markets. Tastan (2005) implementing VAR and GARCH models reached increasing relationship between the Turkish stock exchange and the EU and US stock exchanges after Custom Union Agreement. The rise of financial openness of Turkish economy supports this phenomenon during this period. Ceylan (2006) examined the period of 1988-2004 and claimed that cointegration between the G 7 country indices excluding the Japanese stock exchange and the Turkish stock exchange occurred. After 2002, the level of cointegration soared.

Cıtak and Gozbası (2007) examined the relationship between Turkish stock market and developed and developing country stock exchanges using data between 1986-2006 period. According to the results of the study, a long-lasting relationship between the Turkish stock market and the indices of England, America, Germany and India has been observed. According to Korkmaz, Zaman, and Cevik (2009) while pronounced contagion effect was determined between Turkish stock market and developed markets, if structural breaks are taken into consideration significant association between emerging markets and Turkish stock markets was detected. This confirms the work of Tastan (2005). Structural breaks come forward in relations with other stock markets of Turkish stock markets. Because developing countries are subject to political, economic and political fluctuations.

Vuran (2010) examined the long-run relationship between Turkish Stock Exchange and developed and developing country stock exchanges in the study of 2006-2009 period by the Johansen test. It has been observed that the Turkish stock market is affected by German, British, Brazilian and Mexican stock markets. Benli, Bascı, and Degirmen (2012) examined contagion effect between Turkish stock market and the EU countries by applying the Johansen cointegration test and found the long-term spillover effect. According to them international investors can view that the Turkish stock market could not be seen as a portfolio diversification tool for European stock exchanges. Benli (2014) examined the period of 1994-2013 with the Johansen test and found no cointegration between the Turkish stock exchange and emerging market exchanges except Mexico and Colombia.

It is seen in the literature that structural breaks are generally crucial in determining the level of cointegration. This is more valid for developing countries which have unstable markets. While the long-lasting relationship between the US and Chinese markets draws attention, it is observed that in even developed economies relatively smaller economies are more influenced by other markets. It is noteworthy that the Turkish stock market has been affected by the European stock market in general, but the severity of the impact has augmented after 2002. In aforementioned period, financial openness and integration of Turkish economy to global system soared. If considering structural breaks, it is also notable that a long-term relationship between the emerging markets and the Turkish markets has been observed.

3.Data

Data has been analyzed in the first part, were collected from the dates beginning from 01.01.2005 to 15.09.2008. Lehman Brothers collapsed by September 2008 which was the turning and most severe point of 2008 Global crisis and, in our opinion, collapse of Lehman Brothers

has changed the behavior of the markets permanently. Post-crisis period data consist of daily returns between 15.09.2008 and 31.12.2015. The post-crisis period began with the collapse of Lehman Brothers and ended in December 2015 which is first rate hike of FED took place. While filtering the sample period we eliminated the days if at least one of the three indexes is not traded for that day. So, our data consists of the dates in which all of the three indexes were traded. All data derived from the data providers namely Reuters, Bloomberg and Forex. The reason for using the returns of the data is that the data should be mean reverting and stationary so that the VAR method can be applied. Otherwise, the results of the F-test will be biased and therefore the results of the Granger Causality test may be unreliable.

4.Model & Methodology

4.1. Lag Order Selection Criteria Pre and Post Crisis Period

We have used VAR methodology to understand the relation among the variables Dow Jones Index, MSCI and BIST100. In order to estimate equations in a correct manner by OLS, we have employed reduced form of VAR. To apply unrestricted VAR we have used the same number of lags for variables and to determine the lag length, for the pre-crisis period we have utilized the Akaike's information criterion (AIC) and for the second part we have utilized Hannan-Quinn and Schwarz information criterion.

Within the framework of the VAR system of equations, the significance of all the lags of each of the individual variables is examined jointly with an F-test. Since several lags of the variables are included in each of the equations of the system, the coefficients on individual lags may not appear significant for all lags, and may have signs and degrees of significance that vary with the lag length. However, F-tests will be able to establish whether all of the lags of a particular variable are jointly significant.

After analyzing we have found that for the pre-Lehman period third lag is the lag in which the minimum AIC is achieved. There exists criterions other than ACI which is used to determine the right lag length such as Schwarz and Hannan-Quinn information criterion second lag is more appropriate for pre-crisis period however since none of these criterions are superior among themselves, we have chosen AIC criterion to apply. To sum up according to AIC criterion it is understood that at three days past data affect tomorrows data at most.

With respect to AIC criterion, appropriate lag length that affects the data at most is 19 at post-crisis period. However, including 19 lags into the model to determine the total effect of past data over future is unpractical and against the principle of parsimony. And also we know that none of these criterions are superior among themselves, we have decided to use 2 lags which are appropriate lag lengths according to Hannan-Quinn and Schwarz information criterion. As we can notice the appropriate lag length in post crisis period is smaller than pre-crisis period. This can be regarded as a sign for more mature and efficient market because past data has less information for the possible paths of future data.

5.Results

5.1. Var Results For Pre-Crisis Period

Table 1 Before Lehman's Slump Relations Among Dow Jones, BIST and MSCI

	BIST Return	MSCI Return	Dow Return
BIST Return (-1)	-0,14 *	0,31 ***	0,00
	(-2,71234)	(11,14112)	(0,04156)
BIST Return (-2)	-0,06	0,07 *	-0,03
	(-0,98741)	(1,96411)	(-0,80963)
BIST Return (-3)	-0,08	-0,02	0,02
	(-1,30875)	(-0,27101)	(0,30156)
MSCI Return (-1)	0,12	-0,11 *	0,05
	(1,53187)	(-2,53145)	(1,02001)
MSCI Return (-2)	0,11	-0,05	-0,07
	(1,27985)	(-1,32087)	(-1,48141)
MSCI Return (-3)	0,04	0,08 *	-0,02
	(0.57189)	(2,20014)	(-0,83147)
Dow Return (-1)	0,74 ***	0,53 ***	-0,12*
	(8,21184)	(10,4134)	(-2,82162)
Dow Return (-2)	0,23*	0,43 ***	-0,07
	(2,15112)	(7,21451)	(-1,48496)
Dow Return (-3)	0,06	0,23 **	0,10
	(0,52001)	(3,66441)	(1,68147)
Adj. R Squared	0,104	0,47	0,021
F Statistic	7,8	52,0	2,3

As we can see BIST100 is the dependent variable while the other two namely MSCI and Dow Jones are independent. According to regression results above Table (1) daily return of dependent variable is only affected by its first lag and first two lags of the independent variable Dow Jones significantly. In other words, since the coefficients of MSCI are insignificant for all lags, we can say that MSCI does not have any effect over BIST100 in pre-crisis period. Results of Granger Causality tests are in compliant with the results of the VAR that is with respect to Granger Causality test results MSCI does not granger cause to BIST100 but Dow Jones.

In case of the regression equation where the dependent variable is BIST, the coefficient of BIST100 is statistically significant and negative so we understand that if BIST100 closes positive in a day then in general it closes negatively in following day. Main reason for this results may be if these indexes increase in a day then short term oriented investors will consider this increase as a profit opportunity and sell the indexes in the following day to take profit. In fact according to finding s of some researchers market is in the tendency of gaining value after the week in which bad news dominate the market and market loses value. The reason for this phenomenon may be related with this case. We see that first two lags of Dow Jones are statistically significant and positive. In the same manner if we interpret the sign of the coefficients of DOW Jones, that means that if we neglect the effect of other factors, Dow Jones affect BIST100 in a positive manner. Therefore, having positive lag coefficients in fact mean that if Dow Jones closes by increasing in a day then most probably BIST100 will increase in the following day.

When we examine the results of regression equations in which the MSCI and DOW Jones are dependent variables we see that the coefficients of first lags of these indexes are negative that means same results are also true for MSCI and DOW Jones. In other words, if MSCI and Dow closes positive in a day then in general it closes negatively in following day as BIST100.

One crucial point of the results is that while only the first lag of BIST100 is affecting itself, the first two lags of Dow Jones have significant effect over BIST100. According to the results we can understand that in the pre-crisis period MSCI does not have any significant effect over BIST100. The reason for this result is may be that in the pre-crisis period emerging markets are mostly affected by global events rather than local developments and is that Turkey economic conditions were weaker and more vulnerable to global events due to current account deficit and persistent inflationary pressure therefore in most of the time BIST100 react before than the emerging markets on the average. Foreign investors entering the countries via short term portfolio inflows tend to realize their investments rapidly and leave the country in case of negative news. In this sense, Turkey reaction to negative news earlier on average compared to other developing countries may be considered as a sign of higher proportion of short term investors with respect to other developing countries on the average. Another result that can be derived from earlier reactions of Turkey with respect to emerging markets to global developments may be pointing to more unstable economic conditions and higher volatile market with respect to other developing markets in pre-crisis period.

In case of the regression equation where the dependent variable is Dow Jones, all lags except the first does not have significant influence over itself. This result is also proved by the results of Granger Causality tests as we will see in the rest of the paper. Therefore we can model the behavior of Dow Jones by AR(1). This result say that Dow Jones is a more efficient market with respect to emerging markets and only the first lag has information about the possible paths of the index.

In case of the regression equation where the dependent variable is MSCI index, first and third lag of MSCI, all first three lags of Dow and first lag of BIST100 have influence over MSCI. These results may indicate that MSCI index has more information in its and Dow Jones lag values which can be considered as a sign for more inefficient markets with respect to Dow Jones and BIST100. In other words, if we want to determine the possible future paths of MSCI, we may use the information lie in its and Dow Jones past values to make better predictions. However, making predictions for Dow Jones is much more difficult because its path resembles to a random walk.

5.2. Augmented Dickey Fuller Test

In this part we have analyzed whether the time series data for all three variables are stationary. To understand the existence of stationarity unit root tests with structural breaks of Augmented Dickey Fuller (1981) and Phillips and Perron (1988) and Lee and Strazicich (2003) have been performed. According to analysis results1 time series data of all three variables are stationary and results can be seen at appendix.

[1] Because of the free space issue , we didn't show ADF,PP and LM test results in table form.

5.3.VAR Results for Post-Crisis Period

Table 2 After Lehman's Slump Relations Among Dow Jones, BIST and MSCI

	BIST Return	MSCI Return	Dow Return
BIST Return (-1)	-0,03	0,24 ***	0,02
	(-1,11679)	(7,06501)	(0,46985)
BIST Return (-2)	0,05	0,13 **	0,01
	(1,44078)	(3,52001)	(0,26101)
MSCI Return (-1)	0,15 *	-0,12 **	0,07*
	(3,53958)	(-3,95875)	(2,63478)
MSCI Return (-2)	-0,06	-0,08*	0,00
	(-1,59101)	(-2,64023)	(0,16013)
Dow Return (-1)	0,28 ***	0,57 ***	-0,07
	(5,65147)	(14,10475)	(-1,94002)
Dow Return (-2)	-0,22**	0,23 ***	-0,07
	(-3,95965)	(5,29244)	(-1,84745)
Adj. R Squared	0,07	0,47	0,01
F Statistic	12,0	52,1	2,1

In case of the regression equation where the dependent variable is BIST100 index, the most important difference with respect tor pre-crisis period is that lag values of BIST100 does not have any explanatory power over itself anymore and lag values of MSCI have statistically significant influences over BIST100. The reason for this change may be that in the post-crisis period Turkey economic conditions have become more resistive and more dynamic with respect to other emerging markets on the average. In the post-crisis period because of Quantitative Easing (QE) cautions, interest rates of developed countries has fallen to near zero levels and increasing liquidity in the market has enhanced the level of fund flows. Since current account deficit and lack of enough funds for providing growth were the vulnerable points of Turkish economy, with the help of QE, Turkish economy has improved more than and faster than other emerging markets. The decline in interest rates in developed countries have triggered an increase in long term fund flows to Turkey and some other emerging markets. The increase in the long-term fund share has reduced the risk over exchange rate because it diminished the inflationary pressures. Indeed, in the history of Turkey in May of 2013 benchmark bond yield fell to it historic lowest levels namely below 5% in Turkey. Parallel to these developments, Turkey's foreign currency credit rating has been upgraded to investment grade by Moody's and Fitch.

Some other difference in the regression results of post-crisis period is that BIST100 and Dow Jones are influenced by the lag values of MSCI which were not true in pre-crisis period. This change in fact can be considered as a proof of enhancing dominance of emerging markets in global economy. That is after the financial crisis a new era may have started that developed economies are not developed enough anymore. With respect to the Granger Causality results, we see that; MSCI does granger cause to BIST100, Dow Jones granger cause to BIST100 and MSCI, BIST100 granger cause only to MSCI. These results are suitable with the post-crisis VAR results.

5.4. Granger Causality Test Results of Pre-Crisis Period

Regarding the results of pre-crisis Granger Causality tests, we see that; Dow Jones but not MSCI granger cause to BIST100, BIST100 and Dow Jones granger cause to MSCI and Dow jones is not granger caused by any of BIST100 and MSCI. Results are compatible with pre-crisis VAR results.

It is important to be aware of the fact that "Granger Causality" does not mean that for example "Factor A" affect the behavior of "Factor B" in a direct manner. In other words, according to "Granger Causality "test results it can be seen that "Factor A" granger causes to "Factor B" but in fact it may be the situation that "Factor C" but not "Factor A" influences "Factor B". Since "Factor C" and "Factor A" may move parallel to each other, it can be seen that "Factor A" influences "Factor B" mistakenly. This is the reason for being cautious about telling that it may be different from direct causality. If we consider the above results, we see that BIST100 granger cause to MSCI but this does not mean that BIST100 directly affect MSCI but some other factor which may move parallel with BIST100. In other words, granger causality should be considered as a chronological ordering of movements of series. That is we can state that movements of BIST100 occur before than the movements of MSCI.

Table 3 Before Lehman Slump Granger Causality Test Outcomes

Dependent Variable: BIST Return

Excluded	Chi-sq	df	Prob
MSCI Return	4.120145	3	0,2501
Dow Return	67.13245	3	0.0000
All	69.87502	6	0.0000

Dependent Variable: MSCI Return

Excluded	Chi-sq	df	Prob
BIST Return	123.9785	3	0.0000
Dow Return	140.0123	3	0.0000
All	451.0245	6	0.0000

Dependent Variable: Dow Return

Excluded	Chi-sq	df	Prob
BIST Return	0.871245	3	0.8414
MSCI Return	4.392475	3	0.2314
All	5.314278	6	0.5101

5.5.Granger Causality Test Results of Post-Crisis Period

Regarding the results of post-crisis Granger Causality tests, we see that; MSCI granger cause to BIST100 and Dow Jones. This change in fact can be considered as a proof of enhancing dominance of emerging markets in global economy. That is after the financial crisis a new era may have started that developed economies are not developed enough anymore.

Table 4 After Lehman Slump Granger Causality Test Outcomes

Dependent Variable: BIST Return			
Excluded	Chi-sq	df	Prob
MSCI Return	15.20451	2	0,0006
Dow Return	60.11256	2	0.0000
All	67.65111	4	0.0000
Dependent Variable: MSCI Return			
Excluded	Chi-sq	df	Prob
BIST Return	57.99423	2	0.0000
Dow Return	205.0012	2	0.0000
All	494.4325	4	0.0000
Dependent Variable: Dow Return			
Excluded	Chi-sq	df	Prob
BIST Return	0.310627	2	0.8601
MSCI Return	6.977148	2	0.0310
All	8.154245	4	0.0901

5.6.Impulse Response Functions for Pre-Crisis Period

Considering the impulse response function graph of the variables BIST100, MSCI and Dow Jones, we see that the effect of shocks of the variables over themselves just show their influence in the first step ahead and then quickly disappear which can be considered as assign for stationary. In case of any shock happened to be over Dow Jones, its effect over BIST100 is strong for two steps ahead and then it quickly fades away which also can be indication of model stationarity. Similarly, in case of any shock happened to be over MSCI, its effect over BIST100 is insignificant. So to sum up we can say that results of impulse response functions for all variables are compatible with the statistical significance of VAR regression results where the dependent variable is BIST100.

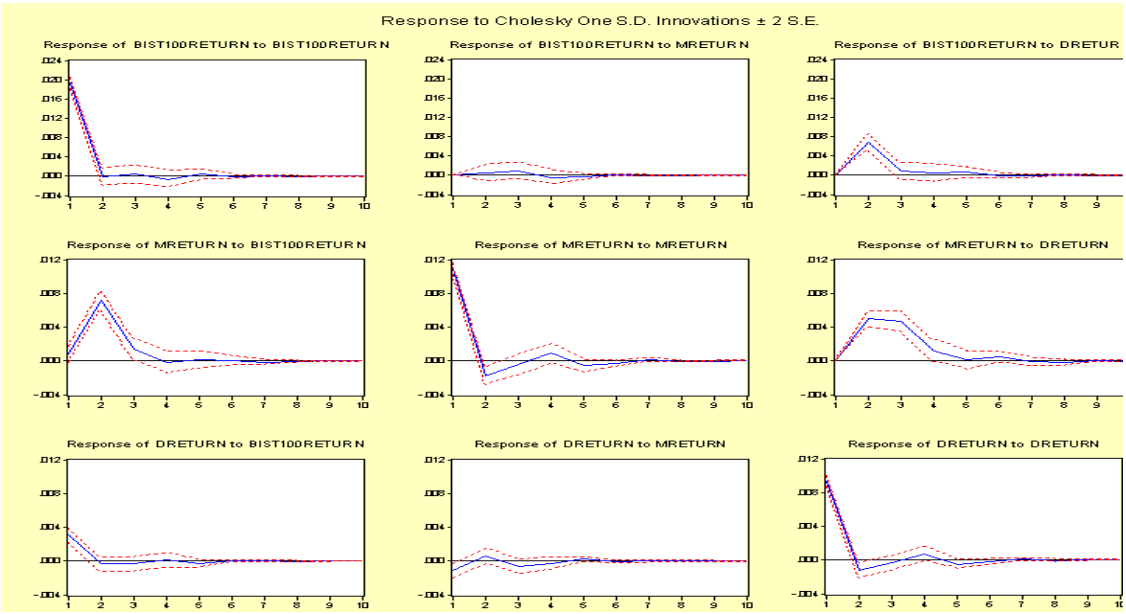

Figure 1: Impulse Response Function Before Slump

5.7. After Lehman Period Impulse Responses

We have found out parallel results from the impulse response functions for the pre-crisis period. Similar to VAR results of pre-crisis period, we see that response of the variables BIST100, MSCI and Dow Jones to their own shocks lose effect over themselves just after first lag. It can be seen from the impulse response function graph that response of BIST100 to the shocks is high in the first lag after the occurrence of the shock and then in the later lags we see that shock loses its power to zero showing that the model is stationary. This result is suitable with results of VAR results of pre-crisis period of BIST100. According to the results of impulse response functions if any shock is happened to be to Dow Jones, it influences BIST100 for the next three steps. If any shock is happened to be to MSCI, its influence over BIST100 is insignificant and this result is compatible with VAR results of post-crisis period. According to the impulse response functions of pre-crisis period, one important fact is that BIST100 influences Dow Jones for one step forward while Dow Jones is not granger caused by BIST100. However, any shock to BIST10 has an important effect over MSCI for the next four steps which is coherent with the fact that MSCI is granger caused by BIST100.

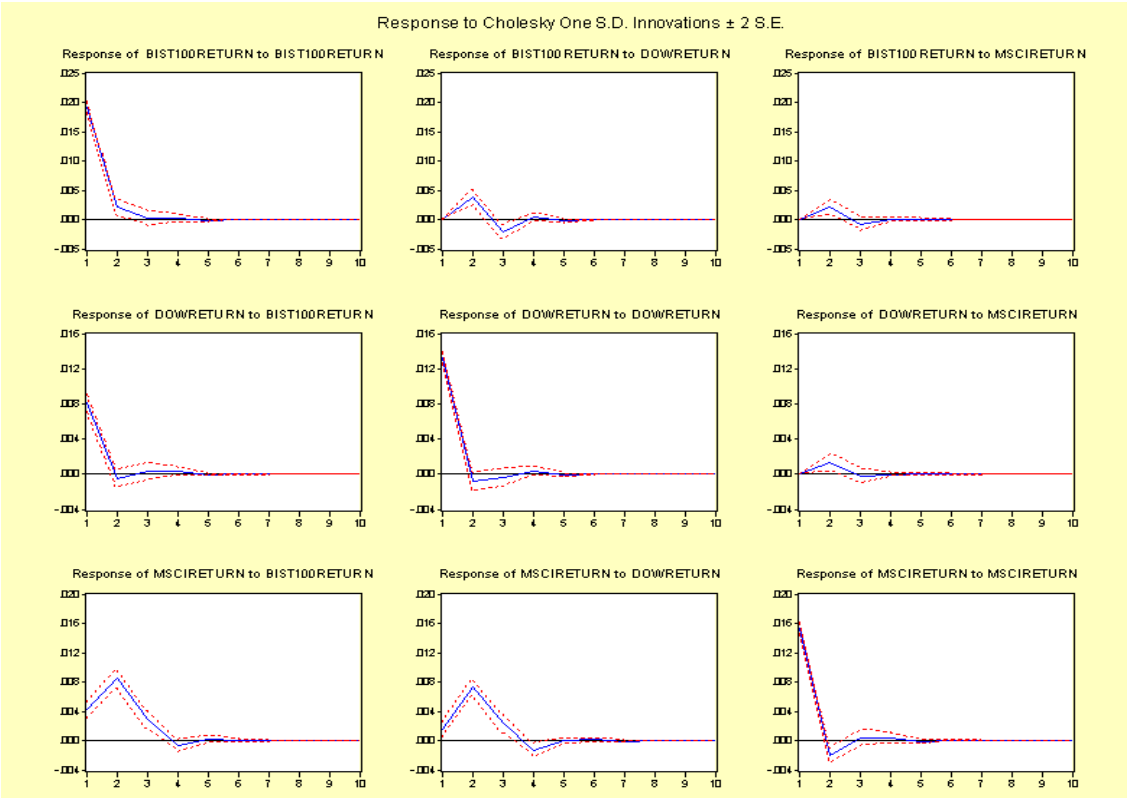

Figure 2: Impulse Response Function After Slump

5.8. Variance Decomposition Results for Pre-Crisis Period

It is important to note that ordering of the variables have significant effect over the results of impulse response functions, variance decompositions and granger causality tests. In our study clear arrangement of the variables are Dow Jones, BIST100 and MSCI. According to the results of the variance decompositions, we understand that; share of fluctuation, in the first lag after the occurrence of shock, that stems from the shock of the variable itself is %100. The proportion of variance of MSCI that stems from BIST100 is around %0,52 and also the variance of Dow

Jones that can be attributed to BIST100 is %9,53. This result is totally compatible with outcomes of the impulse response function of BIST100 for the period before Lehman collapse that is when we analyze the results of the impulse response function an unexpected movement of BIST100 returns significantly affect the next step behavior of BIST100 but an unexpected movement in MSCI and Dow returns does not have any significant influence over BIST100 in the next step. Additionally from the results of the variance decomposition functions we understand that before Lehman collapse most of the volatility of BIST100 returns mainly stem from BIST100 lag returns itself and Dow Jones lag returns but not MSCI.

Similarly according to the results of variance decomposition functions, we can see that volatility of MSCI is being dominated by the volatility of BIST100 and Dow Jones but mainly Dow Jones. However, as we can see from the conclusions, we see that the BIST100 volatility influences the MSCI volatility even more, if MSCI volatility BIST100 is not significantly affected. That is to say we can summarize in a nutshell that in the pre-Lehman period Turkish economics are weaker and more volatile with respect to the other emerging markets in the average and due to being in a weaker economic conditions we see that Turkish economics respond quicker to the negative events than other emerging markets and these remarks validate the results obtained from VAR equations. Additionally, it is understood that the main cause of the ripple in the Dow Jones index is caused by itself. It appears that the changes in MSCI does not have any significant impact over Dow Jones returns. This implies that the movements in the Dow Jones index originate from global economic events rather than economic changes in emerging economics in fact which are relatively less global.

Table 5 Variance Decomposition Simulations for Pre-Crisis Period

Variance Decomposition of BIST100 RETURN				
Period	**S.E**	**BIST100 RETURN**	**MSCI RETURN**	**DOW RETURN**
1	0,019450	100,0000	0,0000	0,0000
2	0,020685	88,709272	0,387239	10,903489
3	0,020749	88,354323	0,648197	10,997480
4	0,020790	88,266944	0,677611	11,055445
5	0,020825	88,175453	0,692516	11,132031
6	0,020845	88,173946	0,693441	11,132613
7	0,020884	88,166247	0,695417	11,138336
8	0,020884	88,165868	0,695697	11,138435
9	0,020884	88,165199	0,695872	11,138929
10	0,020884	88,164930	0,695903	11,139167
Variance Decomposition of MSCI RETURN				
Period	**S.E**	**BIST100 RETURN**	**MSCI RETURN**	**DOW RETURN**
1	0,010959	0,5253	98,0183	1,456337
2	0,014161	26,128578	59,633218	14,238204
3	0,015020	24,102257	53,124687	22,773056
4	0,015114	23,882476	53,063116	23,054408
5	0,015145	23,853895	53,115225	23,030880
6	0,015173	23,825154	53,074184	23,100662
7	0,015193	23,830203	53,066473	23,103324
8	0,015214	23,826072	53,058682	23,115246
9	0,015214	23,825911	53,058781	23,115308
10	0,015214	23,82584	53,05863	23,115530
Variance Decomposition of MSCI RETURN				
Period	**S.E**	**BIST100 RETURN**	**MSCI RETURN**	**DOW RETURN**
1	0,010070	9,535340	0,0000	90,464660
2	0,010313	9,470579	0,190005	90,339416
3	0,010425	9,532096	0,702963	89,764941
4	0,010533	9,488585	0,726038	89,785377
5	0,010629	9,539776	0,751356	89,708868
6	0,010707	9,534260	0,770898	89,694842
7	0,010784	9,533460	0,770966	89,695574
8	0,010861	9,533530	0,773938	89,692532
9	0,010861	9,533521	0,774385	89,692094
10	0,010861	9,533547	0,774435	89,692018

5.9. After Lehman Period Variance Decomposition Results

It is seen that the BIST100 volatility is more affected by Dow Jones volatility rather than MSCI with respect to pre-Lehman period but incidence of MSCI over BIST100 volatility increased in post-Lehman period. Additionally, although a significant portion of the fluctuation of Dow Jones has originated itself as in pre-Lehman period, it appears that the impact of MSCI over Dow Jones volatility has soared considerably.

Table 6 Variance Decomposition Simulations for Post-Crisis Period

Variance Decomposition of BIST100 RETURN

Period	S.E	BIST100 RETURN	MSCI RETURN	DOW RETURN
1	0,019310	100,0000	0,0000	0,000000
2	0,019978	95,130634	3,690178	1,179188
3	0,020153	93,830696	4,836408	1,332896
4	0,020195	93,806938	4,860644	1,332418
5	0,020236	93,79198	4,875884	1,332136
6	0,020236	93,791542	4,876034	1,332424
7	0,020236	93,791394	4,876183	1,332423
8	0,020236	93,791336	4,876222	1,332442
9	0,020236	93,791336	4,876261	1,332403
10	0,020236	93,791336	4,876261	1,332403

Variance Decomposition of MSCI RETURN

Period	S.E	BIST100 RETURN	MSCI RETURN	DOW RETURN
1	0,016091	6,7855	0,8690	92,345511
2	0,019765	23,0320	14,360456	62,607510
3	0,020152	24,2643	15,257654	60,478095
4	0,020247	24,2421	15,602142	60,155780
5	0,020288	24,2458	15,59893	60,155265
6	0,020326	24,2453	15,601098	60,153600
7	0,020364	24,2455	15,602556	60,151938
8	0,020402	24,2457	15,602614	60,151650
9	0,020440	24,2457	15,602614	60,151650
10	0,020478	24,2457	15,602614	60,151650

Variance Decomposition of MSCI RETURN

Period	S.E	BIST100 RETURN	MSCI RETURN	DOW RETURN
1	0,015622	27,337516	72,6625	0,000000
2	0,015746	27,150954	72,1590	0,690070
3	0,015774	27,14974	72,1392	0,711042
4	0,015792	27,162528	72,1273	0,710200
5	0,015792	27,163255	72,1259	0,710870
6	0,015792	27,16234	72,1258	0,711894
7	0,015792	27,16226	72,1257	0,712008
8	0,015792	27,16221	72,1257	0,712122
9	0,015792	27,16221	72,1257	0,712122
10	0,015792	27,16221	72,1257	0,712122

6. Discussion, Conclusion and Recommendations

As a result it can be concluded that before the collapse of Lehman Brothers, MSCI does not affect BIST100 movements because emerging market indexes is generally much more affected by global events rather than their local news flow during high volatile times. Additionally, it is also valid that since Turkey's economical condition is much more fragile mostly because of political instability and high current account deficit risk, BIST 100 reacts to global news more quickly than the emerging markets in this period. This may indicate that Turkey was the weakest link of emerging market chain during the pre-Lehman period. Thirdly we can derive from the results that proportion of short run foreign investments namely portfolio investments before the collapse of Lehman Brothers were higher with respect to other emerging markets. This can be considered as a sign and cause of unstable economic conditions and high volatile market.

According to the implications of the VAR analysis results of post-Lehman period, when we consider the regression equation in which BIST 100 is dependent variable, the most important change in the model is that BIST100 own lags does not affect itself anymore and MSCI is an explanatory variable for BIST100 return. What is the possible meaning of this change? In our opinion, this change can be considered as a sign that Turkey is not the weakest link of emerging market league anymore in fact it is maybe one of the strongest members in emerging markets. Most probable reasons for this change are that Turkey's economic conditions became more flexible and more resistive to global shocks due to strong recovery performance after crisis, diminishing political risks and tensions and resistive economic conditions, improving financial sources of current account deficit and increasing export volumes to regions other than Europe. As a result of these improvements proportion of long run foreign investments in Turkey after the collapse of Lehman Brothers increased with respect to other emerging markets. This can be considered as a sign of more stable economic conditions and lower volatile market. In fact recently Fitch and Moody's have hiked Turkey's ratings to investment grade and so these rate hikes confirm our derivations.

An additional outstanding result of post-crisis period VAR regression that should be noted is that MSCI becomes an explanatory index for both of Dow Jones and BIST100 after Lehman collapse period while this situation was not valid for pre-Lehman period. In our opinion this means that after 2008 crisis emerging markets effectiveness on global economic system have increased because of the fact that under heavy debt burden developed economies growth rates have declined significantly and austerity measures has slowed down the economic recovery in a more severe with respect to emerging markets. In fact when the amount of debt of developed countries is considered and growth dynamics of emerging markets, it is reasonable to anticipate that emerging markets growth figures will overperform the developed countries in the following years. That is to say it can be derived that becoming an explanatory variable of BIST100 and MSCI for Dow Jones is the effect of this rebalancing in financial markets.

During pre-crisis period when we consider the VAR equation in which Dow Jones index is dependent variable, we see that as expected only first lag of Dow jones affect itself and this conclusion is also verified by Granger Causality test. As a result since just one lag of Dow affects itself, one conclude that DOW can be modelled by AR (1) that means Dow Jones behave much more in a random walk manner than MSCI and BIST100. In other words this means that all past information has been priced so that it is enough to use first lag to make the best prediction for the future movement of Dow Jones and also one can conclude that Dow Jones market is more efficient than MSCI and BIST 100 because of its almost random walk property. Decrease in the lag number in VAR regression model with respect to pre-crisis period can be

considered as sign for evolving to an efficient market of BIST100 because in our opinion a model in which it incorporates all information in shorter memory, is more efficient and more close to random walk.

An interesting point to note is that the coefficient of first lag of BIST100 is negative and statistically significant meaning that if we consider the effect of BIST100 and neglect other factors when BIST100 closes the day positive one should expect that the probability of BIST100 to close negative in the following day is higher with respect to a negative close in the previous day. Similarly when we only consider the effect of Dow Jones, as expected, Dow has positive effect on BIST100 that is while Dow increases one should expect also a higher probability of an increase in BIST100 the following day. This situation also is valid for MSCI and DOW that means if one index increase then the other day index will most probably decrease. The reason for this fact is that we are dealing with daily returns that means short time period data so investors consider an increase as an opportunity to realize their profit and any decrease will be considered as potential for entering the market. In fact some of researchers has investigated that the market has a tendency to increase after the week of bad news release. The reason for this phenomenon may be related with our case.

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