Investigation of relation
between foreign portfolio investments and stock prices:
Time varying asymmetric causality analysis

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Abstract. *In this research, causality relationship between Istanbul Stock Exchange prices general level and foreign portfolio investments was investigated. Under the assumption that investors' reactions to positive and negative shocks are not same, this relationship was investigated with time varying asymmetrical causality analysis. Through this analysis, it is aimed to obtain more effective results about whether causality relationships are consistent, or not. The practice in the research was done with 124 monthly data sets involving June 2015 and September 2015. The obtained findings support existence of a consistent causality relationship for negative shocks from Istanbul Stock Exchange towards foreign portfolio investments.*

Keywords: Foreign Portfolio Investments, Time Varying Causality Analysis, Stock Exchange Istanbul.

JEL Classification: C22, G12, G14, E22.

1. Introduction

Foreign portfolio investments, since they can react fast to fluctuations in economies, are from the effective factors for both liquidity level and equity share prices general level. Since liquidity level in an economy affects financial risk degree, it affects equity share prices general level, too. This condition was stated by Doğukanlı and Çetenak (2008) as "foreign portfolio investments cause liquidity increase in market, shared and decreased risk because of increased liquidity causes decrease of capital cost; and as a result of that, share prices increase" (Doğukanlı and Çetenak, 2008). Therefore, risk, share prices and foreign portfolio investments are, as being three important variables, which are causes and results of each other, one of important subjects of economic researches.

According to Base Broadening Hypothesis which emphasizes that there is a direct relationship between foreign portfolio investments and share prices, investor number within financial markets increases considerably with addition of foreign portfolio investors. Accordingly, increase of investors provides active risk share and causes increase of equity share prices (Merton, 1987). Clark and Berko (1997) stated that in case of early prediction of increase of foreign portfolio investors, this expectation would affect share prices, and thereby, in case of unexpected foreign portfolio investors, because of increased liquidity, prices general level would start to increase.

In the strategies called as following trends or momentum investment, it is emphasized that foreign portfolio investors who have less market knowledge follow trends. In other words, it is accepted that foreign investors make purchase following rising terms, and make sale following declining terms. Froot, O'Connell and Seasholes (2001), in their research done by using daily data, state that foreign investors prefer developing markets considering their excessive yields. In addition, they state, in case of decline of market, foreign investors tend to pull out of the market with the same rate.

Adabag and Ornelas (2005), in their research for Istanbul Stock Exchange, they relate the rise of this market with increase of foreign investors in Istanbul Stock Exchange in the related term. Albeni and Demir (2005) state that purchases belonging to foreign portfolio investors, increase share general prices level in related market; and sales decrease share general prices level. This case, at the same time, can be considered as an imply to that purchase-sale behaviors of foreign portfolio investors affect share general prices level in related market. In other words, in this research it is emphasized that foreign portfolio investments influence equity share prices.

Share general price level is used as an important decision parameter by foreign portfolio investors. This case is supported by studies in literature also. When this case is investigated with regard to both increase of investors and level of market information, there is a direct relation between foreign portfolio investors and share general price level. However, at this point, the question of how they influence each other or affected each other comes into prominence.

Doğukanlı and Çetenek (2008) in their study, state that share earnings are granger causals for foreign portfolio investors. At the same time, they reach some findings that foreign portfolio investors decide to buy or sell looking at general price levels of shares. Anayochukwu (2012) emphasizes that foreign portfolio investors have a meaningful and

positive relationship with share earnings. And it is determined that, like Doğukanlı and Çetenek (2008), this relation have only one direction from share earnings to foreign portfolio investments. Demireli and Hepkorucu (2014) investigated how foreign investors influence capital markets price mechanism. Evaluating obtained data, the findings which explain earnings of BIST-100 Composite Index based on dollars and Turkish liras at a high level were obtained.

The examined academic researches reveal that there is a relationship between foreign portfolio investments and share general price levels. However, in existing literature, this case was investigated under the assumption that investors react in the same way to both positive and negative changes in examined variables. Though, it is known that investors react differently to positive and negative shocks. Hence, in this study, causality relationship between foreign portfolio investments and share prices were investigated both for positive and negative shocks. The research differs from existing studies in the literature at this point. Also, any research was not found about that whether the findings about causality relationship are consistent or transient. In this study, the relationship between foreign portfolio investments and equity share prices with time varying asymmetrical causality analysis. In other words, existence of causality relationship for both foreign portfolio investments and share prices was investigated separately for positive and negative shocks. Thereby, whether there is a relation between decline of foreign portfolio investments and share price decline was examined with time varying asymmetrical causality test. This process was repeated for rising cases. By this way, reaction of investor to positive and negative shocks was examined in detail for foreign portfolio investments and equity share prices general level. In addition, it was tried to determine whether existence of causality relationships obtained based on analysis applied is consistent or transient. In this direction, the study was organized as 4 chapters. After general literature evaluation in introduction part, data and methodology is presented in the second chapter. In the third part, the obtained findings are explained and general evaluations are done in the last part.

2. Methodology and Data Set

2.1. Methodology

In the research, time varying causality relationship between Istanbul Stock Exchange prices general level and foreign portfolio investments; was investigated with Hatemi asymmetrical causality analysis. In this asymmetrical causality test, like in Granger - Yoon (2002) cointegration analysis, it is aimed to find hidden structure which helps to understand dynamics of series and provides making possible future oriented predictions. Assume that causality analysis between two integrated series, i.e. y_{1t} and y_{2t} is tested:

$$Y_{1t} = Y_{1t-1} + \varepsilon_{1t} = Y_{1,0} + \sum_{i=1}^{t} \varepsilon_{1i} \tag{1}$$

$$Y_{2t} = Y_{2t-1} + \varepsilon_{2t} = Y_{2,0} + \sum_{i=1}^{t} \varepsilon_{2i} \tag{2}$$

Here, $y_{1,0}$ and $y_{2,0}$ shows initial values. Positive and negative shocks can be shown as below.

$$\varepsilon_{1i}^{+} = \max(\varepsilon_{1i}, 0), \ \varepsilon_{2i}^{+} = \max(\varepsilon_{2i}, 0), \ \varepsilon_{1i}^{-} = \min(\varepsilon_{1i}, 0), \ \varepsilon_{2i}^{-} = \min(\varepsilon_{2i}, 0), \ \varepsilon_{1i} =$$

$\varepsilon_{1i}^{+} + \varepsilon_{1i}^{-}$, $\varepsilon_{2i} = \varepsilon_{2i}^{+} + \varepsilon_{2i}^{-}$. According to this, by regulating (1) and (2) numbered equations, positive and negative shocks present in each variable are expressed in cumulative form as below:

$$Y_{1t}^{+} = \sum_{i=1}^{t} \varepsilon_{1i}^{+}, Y_{1t}^{-} = \sum_{i=1}^{t} \varepsilon_{1i}^{-} \tag{3}$$

$$Y_{2t}^{+} = \sum_{i=1}^{t} \varepsilon_{2i}^{+}, Y_{2t}^{-} = \sum_{i=1}^{t} \varepsilon_{2i}^{-} \tag{4}$$

In Hatemi (2012) test, assuming y_i^{+} variable is equal to Y_{1t}^{+}, Y_{2t}^{+} couple, causality relationship between these components is tested using p delayed vector autoregressive model (VAR):

$$y_i^{+} = \alpha + A_1 Y_{1t}^{+} + \ldots + A_p Y_{p-1}^{+} + u_t^{+} \tag{5}$$

y_i^{+} shows variable vector, α and u_t^{+} show variable and error term vectors. A_1 is parameter matrix which is determined by using delay distance information criteria.

VAR model, shown in this equation, can be defined as below, with the aim of obtaining Wald statistics which will be used for testing the main hypothesis that shows there is not Granger causality between the series:

$$Y = \widehat{D}Z + \hat{\delta} \tag{6}$$

The expressions in this model might be explained in order like that

$Y: (y_1, \ldots . y_T)(nXT) matrix$

$\widehat{D} \coloneqq (\hat{\alpha}, \hat{A}_1, \ldots \ldots, \hat{A}_p, \ldots \ldots \hat{A}_{p+d})(nX(1 + n(p + d))))$

$$Z_t \coloneqq \begin{bmatrix} 1 \\ Y_t \\ Y_{t-1} \\ . \\ . \\ . \\ Y_{t-p-d+1} \end{bmatrix} \qquad ((1+n(p+d))X1 \text{ matrix for t=1,\ldots,T,}$$

$Z: = (Z_0, \ldots . , Z_{T-1})((1 + n(p + d))XT) \ matrix,$

$\hat{\delta} \coloneqq (\hat{u}_1, \ldots . , \hat{u}_T)(nXT)$

The main hypothesis which shows there is no Granger causality between the series can be tested through Wald statistics below:

$$\text{MWALD} = (C\beta)'[C((Z'Z)^{-1} \otimes S_U)C']^{-1}(C\beta) \tag{7}$$

Here, $\otimes$ shows Kronecker product, C shows indicator function, which involves constraints. Here, β = vec (D), and vec expresses column accumulation operator. If q

shows delay number existing in every VAR equation; S_V shows variance-covariance matrix calculated for unconstraint VAR model, as $(S_V S_V)/(T-q)$ (Hatemi, 2012).

In time varying asymmetrical causality test, firstly Hatemi (2012) causality test is applied for the space between 1st and 20th observations. At the second step, the first observation is disregarded, and this test is applied to (20+1) observation range with second observation; and at every new step of the test, the first observation is disregarded and continued till the last observation existing in data range, by adding a new observation to the last one at each step. The values are shown in a graph in order to comment obtained Wald test statistics. In the graph, the values above "1" line shows the necessity of rejecting the main hypothesis that shows there is not asymmetric Granger causality (Yılancı and Bozoklu, 2014).

2.2. Data Set

In the research in which this methodology will be used, as data set, BIST 100 Index and Foreign Portfolio Investments' total amounts were used. Foreign Portfolio Investments were used as representative for foreign investors in Istanbul Stock Exchange, and BIST 100 Index was used as representative for general price level of Istanbul Stock Exchange. The information related to foreign portfolio investments was taken from Central Bank EVDS system, and index data was taken from www.investing.com. The practice of the research was realized with 124 monthly data involving June 2015 and September 2015.

3. Empirical Findings

Table 1 shows Hatemi (2012) asymmetrical causality test results between Istanbul Stock Exchange prices general level and foreign portfolio investments.

Table 1. *Hatemi (2012) Asymmetrical Causality Test Results*

|		W Stat.	Critical Values			Causality
			%1	%5	%10	
BIST-Foreign Portfolio Investment	Positive Shocks	0.089	6.989	4.017	2.899	NO
	Negative Shocks	9.075	6.066	3.915	2.696	YES
Foreign Portfolio Investment-BIST	Positive Shocks	0.813	6.802	3.971	3.044	NO
	Negative Shocks	1.028	7.288	4.052	2.663	NO

According to findings obtained, there is causality relationship between Istanbul Stock Exchange's general price level and foreign portfolio investments in this market only for negative shocks. However, the same case is not valid for positive shocks. In addition, there is not any causality relation for positive and negative shocks from foreign portfolio investments to Istanbul Stock Exchange. In other words, negative shocks in Istanbul Stock Exchange are Granger causality for negative shocks in foreign portfolio investments. As a result, asymmetrical causality analysis verifies that there is a one way causality relationship only for negative shocks from BIST 100 Index to foreign portfolio investments. In order to check whether these obtained results are consistent or transient, time varying asymmetrical causality test was applied. The results obtained are shown in Figures 1, 2, 3 and 4.

Figure 1. *Time Varying Causality Analysis Results for Foreign Portfolio Investments- Istanbul Stock Exchange in Positive Shocks*
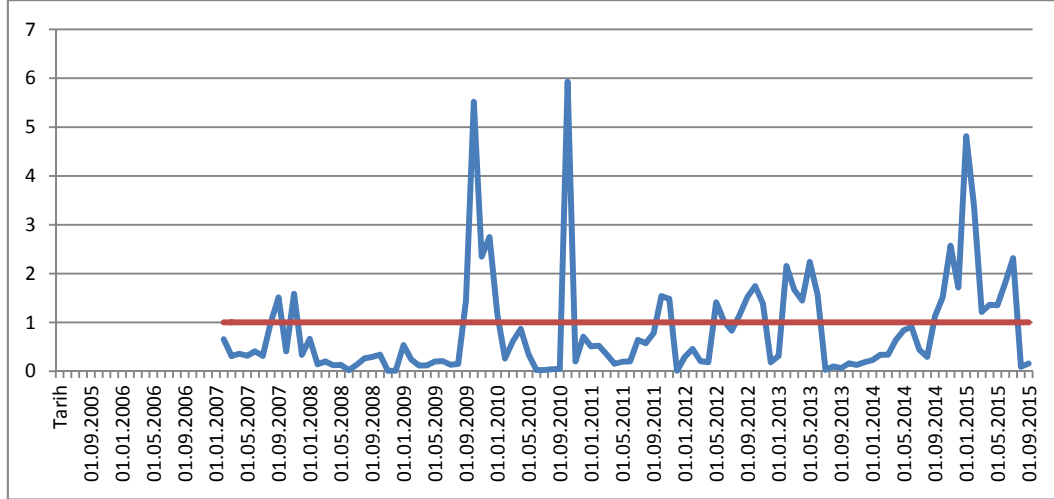
Investigating Figure 1, in 2007, 2009, 2010, 2012, 2013 and 2015, positive shocks happening sometimes become Granger causals for Istanbul Stock Exchange general price levels. However, this causality relationship is not consistent. Political events in those terms affected foreign portfolio investments and thereby, affected Istanbul Stock Exchange. And thereby, the mentioned causality relationship is transient.
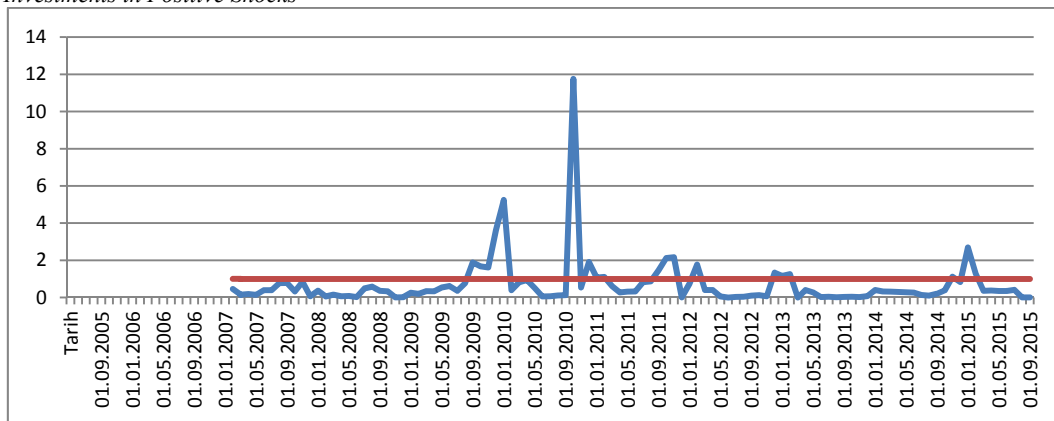
Figure 2. *Time Varying Causality Analysis Results for Foreign Portfolio Investments- Istanbul Stock Exchange in Negative Shocks*
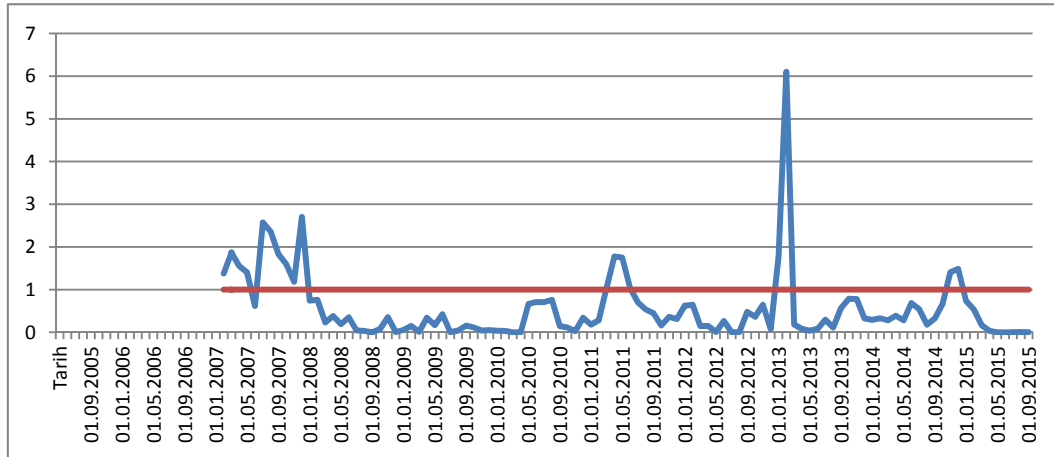
When Figure 2 is investigated, it is seen that in some terms of 2007, 2011 and 2013, causality relationship between foreign portfolio investments and Istanbul Stock Exchange for negative shocks. However, this causality relationship is also not consistent. As time varying causality analysis results that was applied for foreign portfolio investments show, foreign portfolio investments is not a Granger causal to explain formation of Istanbul Stock Exchange general price levels for both positive and negative shocks.
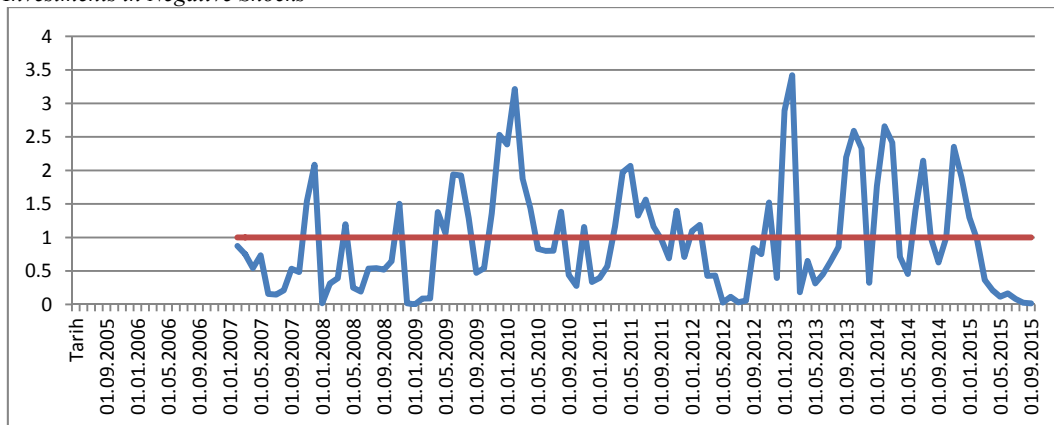
The findings about consistent existence of time varying asymmetrical causality relationship for both positive and negative shocks in one way from foreign portfolio investments to Istanbul Stock Exchange general price levels could not be reached. This case was investigated in Figure 3 and Figure 4 for positive and negative shocks in the way that is from Istanbul Stock Exchange toward foreign portfolio investments.

Figure 3. *Time Varying Causality Analysis Results for Istanbul Stock Exchange- Foreign Portfolio Investments in Positive Shocks*

Investigating Figure 3, it is seen that some important political and social events in 2010, again, affected foreign portfolio investments and thereby, influenced Istanbul Stock Exchange prices general level. However, this causality relationship is not consistent like the others.

Figure 4. *Time Varying Causality Analysis Results for Istanbul Stock Exchange- Foreign Portfolio Investments in Negative Shocks*

Some findings about existence of time varying asymmetrical causality relationship were reached for negative shocks from Istanbul Stock Exchange toward foreign portfolio investments in Figure 4. This condition supports the existence of time varying causality relationship from Istanbul Stock Exchange to foreign portfolio investments for negative shocks. In other words, it supports that negative shocks in Istanbul Stock Exchange general prices changes provide useful information to explain negative shocks occurring in foreign portfolio investments. Also, this causality relationship in negative shocks is consistent.

6. Conclusions

The aim in this study, is to investigate time varying asymmetrical causality relationship between foreign portfolio investments and Istanbul Stock Exchange general price level. For this aim, time varying asymmetrical causality analysis was applied to the monthly data set between June 2015 and September 2015 terms. The most important reason for using asymmetrical causality analysis is that the reactions of investors are different for positive and negative changes in markets. In addition, it was also examined that whether the determined causality relationships are consistent or not with this analysis. According to the obtained findings, causality relationship exists between Istanbul Stock Exchange prices general level and foreign portfolio investments for negative shocks. Only the causality relationship between Istanbul Stock Exchange prices general level and foreign portfolio investments for negative shocks is consistent; and in all other cases, causality relationships are transient. Thereby, the findings obtained support the findings in studies of Froot, O'Connell and Seasholes (2001), Doğukanlı and Çetenak (2008), Anayochukwu (2012); and are different from results of Albeni and Demir (2015). Also, this results can be evaluated as an indicator to that foreign portfolio investments which easily enter and exit to markets react very fast to declines and rises in markets that are occurring depending on social, political or economical events in the country. In other words, this case supports that investors are more sensitive to negative shocks and react much faster and consistent.

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