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RELATIOSHIP BETWEEN STOCK PRICES AND ECONOMIC ACTIVITY IN TURKISH ECONOMY

This study investigates the short and long-run relationships between Istanbul Stock Exchange Index and some measures of aggregate real activity including GDP, treasury bills rates, exchange rates in Turkish economy over the period of 1990:1–2008:2. The Johansen's cointegration procedures suggest a long-run equilibrium relationship between stock prices and other macroeconomic variables. In the short run a causality relation running from stock prices (ISE100 index) and real effective exchange rate toward GDP is documented but any causality relation from treasury bills rate towards GDP is not observed. The impulse response functions and variance decompositions reveal that major contribution to real GDP comes from stock prices, and over time the exchange rates' contribution appears. Moreover, the treasury bills rate has negative effects in both short and long run.

Keywords: *stock prices; economic activity; Istanbul Stock Exchange; Johansen co-integration; causality.*

JEL Codes: G10, G12, O16.

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ВЗАЄМОЗАЛЕЖНІСТЬ МІЖ ЦІНОЮ АКЦІЙ ТА ЕКОНОМІЧНОЮ АКТИВНІСТЮ: ЗА ДАНИМИ ТУРЕЧЧИНИ

У статті досліджено короткостроковий і довгостроковий зв'язок між індексом Стамбульської фондової біржі (ІСФБ) і показниками реальної економіки, включаючи ВВП, ставки казначейських векселів та валютні коливання в Туреччині у період 1990–2008. Застосування методу коінтеграції Йохансена довело, що існують довгострокові рівноважні відносини між цінами акцій та макроекономічними змінними. У короткостроковому періоді встановлено залежність ВВП від ІСФБ і реального обмінного курсу, залежність ставок казначейських векселів від ВВП не виявлено. Статистичний аналіз показав, що основний внесок у реальний ВВП формують ціни на акції, а з часом також має місце вплив обмінного курсу. Крім того, ставка казначейського векселя чинить негативний вплив як у короткостроковому, так і в довгостроковому періодах.

Ключові слова: *ціна акцій; економічна діяльність; Стамбульська фондова біржа; коінтеграція Йохансена; причинність.*

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ВЗАИМОЗАВИСИМОСТЬ МЕЖДУ ЦЕНОЙ НА АКЦИИ И ЭКОНОМИЧЕСКОЙ АКТИВНОСТЬЮ: ПО ДАННЫМ ТУРЦИИ

В статье исследованы краткосрочная и долгосрочная связи между индексом Стамбульской фондовой биржи (ИСФБ) и показателями реальной экономики, включая ВВП, ставки казначейских векселей и валютные колебания в Турции за период 1990–2008. Применив метод коинтеграции Йохансена выявлено, что существуют долгосрочные равновесные отношения между ценами акций и макроэкономическими переменными. В краткосрочном периоде установлена зависимость ВВП от ИСФБ и реального обменного курса, зависимость ставок казначейских векселей от ВВП не обнаружена. Статистический анализ показал, что основной вклад в реальный ВВП делают цены на акции, а с течением времени также имеет место влияние обменного курса. Кроме того,

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ставка казначейского векселя оказывает негативное воздействие как в краткосрочном, так и в долгосрочном периоде.
Ключевые слова: *цена акций; экономическая деятельность; Стамбульская фондовая биржа; коинтеграция Йохансена; причинность.*

Introduction

Savings and investments are the two key ingredients in economic growth. Financial system directs scarce resources of the economy from savers to investors. Coordinating saving and investment behavior has a significant impact on the growth prospects of any economy. This established connection between real and financial sectors stimulates the research on the link between stock prices and economic activity. The most fruitful analysis of the mentioned relation was performed during the Great Depression. While some studies claim that the cause-effect relationships run from real economy to stock market, other studies reveal a causality running from stock prices to real economy. The implication is that stock market may have comovements with real economic variables and may provide valuable information about future economic activity but stock market is not a perfect measure (Mauro, 2003). The literature on the relationship between macroeconomic variables and stock returns has mixed results that cause the issue to be prevalent and a focus of our interest. Although, there exists a vast literature on the relationship between macrovariables and stock market for the US (Fama, 1991; Chen, 1991; Laopodis, Sawhney, 2002), this relationship is not well documented for developing countries. However, in developing countries where financial markets are shallow (as in Turkey), macroeconomic variables may provide more valuable information as compared to the countries with efficient markets (Sengul ve Onkal, 1992).

The main purpose of this study is to analyze short- and long-run relationships between Istanbul Stock Exchange Index (ISE100) and some macroeconomic variables; precisely, to find answers to the following questions: Is there any long-run equilibrium relationship between ISE100 and some macroeconomic variables? Is there a short- and long-term causality relations between these variables? Moreover, what is the sign and the direction of this causality? How much the changes in one variable could be explained by other variables? In the search to answer these questions the rest of the paper is organized as follows: the second section outlines some of the studies on this issue, the third section describes the data set and the econometric methodology, and section four presents the findings. The last section presents summarizes and conclusions.

Related Studies

The relationship between stock returns and macroeconomic variables has been modelled in various ways. One strand of research is following an asset pricing perspective. The asset-pricing perspective is consistent with the traditional notion that stock prices reflect the fundamental strengths and weaknesses of the real economy. In other words, stock prices reflect the present discounted value of all future cash flows which is closely related to real economic activities. Thus, the causalities are running from real activities to stock prices. In this perspective of research Chen et al. (1986), Morelli (2002), Erdem et al. (2006), Kocherlakota (1997), Cashin and McDermott (1998), Chen (2003) and Alkan (1997) could be given as examples.

Another direction of research that takes considerable attention in financial literature is the Tobin's q theory of investment. This theory asserts that, the valuation of

firms by stock market relative to the replacement cost of firms' physical capital, is the key variable explaining aggregate investment. When stock prices are high compared to the replacement costs of capital, firms are more likely to increase their economic activities by increasing investment expenditures. In other words, Tobin's q theory of investment is usually employed to study the impact of stock price swings on economic activity (Morck et al., 1990; Blanchard et al., 1993).

Other hypothesis on the relationship between stock prices and real economy is the wealth effect through the consumption function and some other uncertainty channels. Hence, stock prices convey information about market expectation of future economic activities and managers substantiate market expectations via making investment decisions relying on this information (Mauro, 2003).

A similar emphasis could be found in the literature that explores the relationship between stock prices and expected inflation in the spirit of the Fisher effect. The generalized Fisher's hypothesis asserts that movements of real variables are independent from inflation. But generally in the economy nominal and real variables move together and therefore stock returns and inflation should move in the same direction. Fama (1991) claims that the negative relationship between inflation and stock returns is quite misleading. While Geske and Roll (1983) argue that negative relation between stock returns and inflation results from central bank interferences, Ram and Spencer (1983) suggest a one-way causality running from inflation to stock returns. Although an efficient protection role against inflation is expected from stock markets, it is not unusual to observe decreases in stock returns during inflationary periods.

Some studies prefer some sort of "letting the data to speak themselves" approach instead of the structural approach that considering the underlying theoretical link or model. Thus, the relationships between leading macroeconomic variables like inflation, exchange rate, production index, GDP, interest rate etc., and the stock prices or returns taken as an empirical question in nature. Kwon and Shin (1999) (using cointegration and Granger causality by tests) has investigated the relation between real economic activities and stock returns for Korean economy. The results suggest a cointegration relationship between stock prices and some macrovariables, namely production index, exchange rate, trade balance and money supply. However, they reach the conclusion that stock prices are not a leading indicator of macroeconomic variables and Korean stock market differs from the US or Japanese markets in terms of investor behavior (p. 79–80). According to the results of the study carried by Kargi and Terzi (1997) on Turkish economy, stock returns seem to be sensitive to the changes in inflation and move in the same direction. Moreover, interest rates explain a substantial part of change in both inflation and industrial production. They conclude that the main source of change in ISE is not the change in the real sector but inflationary pressures. Similar studies have been conducted on the relationships between stock returns and exchange rates. Amihud (1994) has tested the hypothesis that changes in exchange rates inversely affect stock returns and found that only if additional lags added to the model, the results become statistically significant. Amihud (1994) has tried to clarify this result by relying on the delay in availability of data about the exchange rate and firms profitability. Bartov and Bodnar (1994) also find significant relationship between the stock return and exchange rates when they add additional lags to the series.

Data and Econometric Methodology

In analyzing the relationships between asset prices and macrovariables, the selection of series should encompass money, goods, assets and labor markets. Each market is usually represented by one or more variables. In this frame, Walras' Law asserts that if there is *n* market in any economy and if *n-1* markets are in equilibrium then all markets shall be in equilibrium. The implication of this law is dropping one market from the system. Analogously, in most cases labor market is dropped out and some variables representing other 3 markets are used in this type of analysis. In this study, 4 variables are used, namely real gross domestic product (GDP) representing the goods market, the treasury-bill rate (TBR) representing the money market, ISE100 index and the real exchange rate (RER) representing the asset markets and its interaction with the rest.

This study used the quarterly data of stock market and some macroeconomic variables on Turkish economy for the period of 1990:Q1 and 2008:Q2. The ISE100 index that represents the assets market is deflated by using the quarterly wholesale price index. The real gross domestic product (GDP), real exchange rate (RER) and real treasury-bill rate (TBR) are used as proxy for real economic activity. The data have been obtained from Istanbul Stock Exchange (ISE), Turkish Statistical Institute, Undersecretariat for Treasury and the Central Bank of Turkey. All the variables except the real treasury-bill rate entered the model in their natural logarithmic forms.

The multivariate vector autoregression (VAR) based modelling techniques are a very useful alternative to conventional structural modelling approaches. In VAR modelling all variables are treated as endogenous. However, the integration and cointegration properties of series have crucial importance. The empirical findings demonstrate that most economic time series are not stationary in levels and usually cointegrated. The main characteristics of non-stationary series may lead to many problems such as spurious regressions. Moreover, long-term equilibrium relationships could not be established between non-stationary time series. Whereas in economic theory there is a prevailing belief that macroeconomic variables move together and they have a long run equilibrium relationship(s) (Dickey et al., 1991).

In analyzing short- and long-run relationships between time series, Vector Auto Regressions (VAR) and their restricted form, Vector Error Correction (VEC) models have found vast application in economic and financial analysis. In initial application of these models some F-type tests have been widely used. But if the series are not stationary, these tests would not be normally distributed and they lose their validity. In the latter studies, depending on the integration and cointegration properties of non-stationary time series, different techniques of analysis have been suggested. For example, if the series are integrated of order one, that is I (1), and if there exists a sufficient cointegration relationship between them, then causality could be tested by using either a VAR type model in levels or a VEC type model of the first differences of series. On the other hand, if the series are I (1) but if they are not cointegrated, the analysis can be conducted by using a VAR model with the first differences. Therefore, the initial step in causality analysis is the determination of integration and cointegration properties of time series (Hamilton, 1994).

The tests of integration and cointegration properties of series reveal that all the series are non-stationary in levels and stationary in first differences. In other words, all the series are integrated of order one, that is I (1). To determine the long-run coin-

tegration relationships between the variables a VAR-based Johansen cointegration test is used. The short- and long-run causality relationships are examined via a multivariate vector error correction model (VEC).

In this respect, the following four-variables model, for the period 1990:Q1–2008:Q2, is constructed and used in the analysis.

$$X_t = f\left(GDP_t, ISE_t, RER_t, TBR_t\right)', \quad (1)$$

where *GDP* is the real gross domestic product, *ISE100* is the index of the Istanbul Stock Exchange, *RER* and *TBR* are the real exchange rate and the treasury bills rate respectively. To investigate the long-run relationships between the variables (1), Johansen and Julesius (1992) type multivariate cointegration procedures are used, which is equivalent to determine the number of cointegrating relationships. Thus, the cointegration can be tested by Johansen's multivariate procedures:

$$\Delta x_t = \omega x_{t-i} + \sum_{k=1}^{p-1} \pi_i \Delta x_{t-i} + \varepsilon_t, \quad (2)$$

where, x_t is the vector of the I(1) variables (GDP;ISE100;RER;TBR), Δ represents the first-difference lag operator of the relevant series, ω represents the matrix of parameters, π, the short term concert between variables in the system and the white noise (ε_t) error terms. The hypothesis of the cointegration between the variables is formulated as a test of the rank (ω), which equals to the number of cointegrating vectors. This is usually decomposed as long-run parameters (β) and short-run speed of adjustments coefficients (α), that is $\omega = \alpha\beta'$. Here, β expresses the long term coefficient matrix and α expresses the matrix of adjustment parameters. Mainly two tests could be used in testing the cointegration relationships: maximum Eigen value (λ_{Max}) and trace statistics (λ_{Trace}). The Eigen-value (λ_{Max}) test has a sharper alternative hypothesis and it is usually preferred to pin down the number of cointegrating vectors. Therefore, the maximum Eigen value test has been preferred (Enders, 2010).

Empirical Results

In analyzing the long-run relationship between the variables by using Johansen's procedures, all the relevant variables entering the model must be integrated of the same order. To determine the order of integration within the series an Augmented Dickey-Fuller (ADF) unit root test is used and the results are summarized in Table 1.

Table 1. **Unit Root Tests (Augmented Dickey-Fuller, ADF)**

Series As Level			
Variables	ADF-Test Statistic	MacKinnon Kritical Values (%5)	Lag Number (k)
GDP	-0,97[b]	-2,86	5
ISE100	-0,71[b]	-2,86	5
RER	1,31[a]	-1,95	5
TBR	-0,32[a]	-1,95	6
First Differences of the Series (Ä)			
ÄGDP	-8,29[ab]	-3,41	1
ÄISE100	-4,53[ab]	-3,41	2
ÄRER	-8,95[ab]	-3,41	1
ÄTBR	-7,34[ab]	-3,41	1

Note: Lag numbers are determined according to Schwartz and Hannan-Quinn information criterion. The presence of deterministic components (constant and/or trend) entering the equation is determined via the procedures outlined in Enders (2010, pp. 267-69). [a] The model without intercept and trend; [b] The model with intercept but no trend; [ab] The model with both intercept and time trend.

The unit root tests verified that each series are integrated of order one; that is I (1). Since all the series are integrated of the same order, the long-run relationships between the series can be examined by using a VAR based Johansen multivariate cointegration procedures. In this frame, it is important to determine the number of lags and the deterministic variables that should enter the autoregressive model since the true data generating process is unknown. The lag length is determined by relying on some information criterion, namely Akaike (AIC), Schwartz (SC), and Hannan-Quinn (HQ). Moreover, the diagrams of the autocorrelation functions of error terms are examined to choose a lag length that eliminates autocorrelations. Similarly, care is taken in choosing the lag length that ensures keeping the inverse roots of the characteristic AR polynomial within the unit circle. The information about lag length determination according to the information criterion is summarized in Table 2.

Table 2. **Determining Lag Lengths in VAR**

Variables: RGDP ISE100 RER TBR					
Lag	LogL	LR	AIC	SC	HQ
0	-54.11	NA	1.71	1.83	1.76
1	227.32	521.48	-6.09	-5.45*	-5.84*
2	244.14	29.17	-6.12*	-4.94	-5.65
3	257.95	22.35	-6.05	-4.36	-5.38
4	266.20	12.369	-5.82	-3.61	-4.95
5	289.56	32.29*	-6.04	-3.30	-4.96
6	300.14	13.38	-5.88	-2.62	-4.59

Source: Calculated by the authors

The information criterion suggests one or two lags for the four-variable VAR model. However, the likelihood ratio (LR) suggests a lag of 5. Nevertheless, after analyzing the inverse roots of AR characteristic polynomials and the autocorrelation functions of the residuals a lag length of two is selected and used in the realized cointegration tests.

In Johansen cointegration procedures, besides determining the lag length, verifying the deterministic components namely the intercept and/or the time trend is very crucial. For this purpose, in literature the so-called Pantula Principle is used to determine the rank and the deterministic components of the cointegration relation simultaneously. This principle is applied by estimating 3 models that fits economic and financial data in most cases. The results of these estimated models are presented beginning from the most restrictive model to the least restrictive one. The first model (Model 2) includes intercept in the cointegration relation; the second model (Model 3) allows deterministic trends in levels; and the third model (Model 4) allows for trend in the cointegration space. The test procedure is applied by starting from the most restrictive (Model 2) to less restrictive models (Models 3 and 4) and at each stage comparing the maximum Eigen value (λ-max) test statistics to its critical value. The selection process stops at the model where the null hypothesis is not rejected (Harris, 1995).

Beginning from the most restrictive model which is Model 2 and setting the null as $r = 0$, the maximum Eigen value statistic (34.79) is greater than the critical value (28.59) so the null hypothesis is rejected. We move to Model 3, again the maximum Eigen value and its critical value is compared to the null ($34{,}77 > 27{,}58$) and also rejected. Although Model 4 should not be taken into consideration because it con-

tains quadratic trend but economic and financial data do not have such a trend, and also the null hypothesis (35,45 > 32,12) is being rejected. We go through the second line and testing the null hypothesis that there exists at least one cointegrating relationships ($r < 1$) could not be rejected for Model 2. Similarly, the null of there is at least one cointegration vector in Model 3 couldn't be rejected. Briefly, Model 2 seems to be the best model fitted our data in which an intercept exists in the cointegration equation and a long-run equilibrium relationship appears among the variables (Table 3).

Table 3. **Cointegration Tests (GDP, ISE100, RER, TBR)**

	Model 2		Model 3		Model 4	
H_0	$\hat{\lambda}_i$	λ_{Max}	$\hat{\lambda}_i$	λ_{Max}	$\hat{\lambda}_i$	λ_{Max}
0	0,3874	34,79	0,3872	34,77	0,3931	35,45
1	0,1596	12,35	0,1304	9,92	0,2296	18,52
2	0,1205	9,11	0,0303	2,18	0,1071	8,04
3	0,0301	2,17	0,0035	0,25	0,0286	2,06
		CV %95		CV %95		CV %95
0		28,59		27,58		32,12
1		22,30		21,13		25,82
2		15,89		14,26		19,39
3		9,16		3,84		12,52

Note: Determination of cointegration rank and the deterministic components of the cointegration model: Model 2, the level data x_t have no deterministic trends but the cointegration equation have intercepts; Model 3 contains linear trend in levels of the data (x_t) and intercepts in the cointegration space; Model 4 enables linear trends in both the level data and the cointegration space.

Briefly, unit roots and cointegration tests suggest that the series are integrated of order one and they have one cointegrating vector. The normalized Eigenvector is given in (3) below (t-statistics are in parenthesis):

$$GDP = -9.89 - 0.049ISE - 0.29TBR + 0.048RER$$
$$[-14.8]\ [-5.64]\ [-6.39]\ \ [0.32] \qquad (3)$$

The long-term coefficient of the cointegration equation implies a negative and statistically significant relationship between ISE100 and GDP. The treasury bills rate affects real GDP negatively as expected. Similarly, a positive relation between the real effective exchange rate and real GDP is observed but this relation is not statistically significant.

Since the series are not stationary in levels and cointegrated, a restricted VAR model, namely a vector error correction (VEC) model, can be used to examine the short- and long-run causality relationships between the variables. In this context, the study proceeds by estimating the vector error correction (VEC) model given in (2). The VEC model provides information about the short-run dynamics as well as long-run equilibrium relationships between the variables. The short-run causality relations are inferred by the hypothesis testing the differenced series regressions coefficient and from the error correction terms of the vector error correction model. Nevertheless, the long-run causality relations are inferred through the significance of the t-tests of the lagged error correction terms (ECT) obtained from the long-run cointegration relation. Test statistics obtained from the error correction model relevant to Granger short- and long-run causality relations are given in Table 4.

Table 4. **Vector Error Correction (VEC) Model**

Short Run Causality	ΔGDP	ΔISE100	ΔTBR	ΔRER
Dependent Variables				
ΔGDP	-	4,64 [0,013]	0,78 [0,46]	5,11 [0,009]
ΔISE100	1,30 [0,28]	-	2,36 [0,102]	3,42 [0,039]
ΔTBR	0,62 [0,53]	0,65 [0,52]	-	2,68 [0,076]
ΔRER	1,56 [0,22]	0,133 [0,87]	0,65 [0,52]	-
Long Run Causality				
Error Correction Term (ECT)	-0.092677 (-1.90)	-0.477427 (-1.73)	2.936816 (6.16)	-0.259802 (-2.38)

The values in brackets are probability values.
The values in parenthesis are t-statistics.
Source: Calculated by the authors.

Short-run causality findings suggest a statistically significant causal relationships running from the real exchange rate and stock prices to real GDP but there seems to be no causal relations running from the treasury bills rate to GDP. However, there is a meaningful causality relationship running only from real effective exchange rate to stock prices. The causality from treasury bills rate through stock prices is significant only at the 10% confidence level. Similarly, a causality relation from the exchange rate toward the treasury bills rate is observed in the short run. Variables in the model do not affect the real exchange rate in the short run.

Long-term causality relations can be accessed through the sign and the significance of the error correction terms. Error correction terms of real GDP, ISE100 and RER equations have negative signs as expected. The negative sign of the error correction terms reveals that in case of any external shock to the system the variables adjust to restore the long-run equilibrium. However, error correction terms of real GDP and ISE100 equations are only significant at 10% confidence level. The exchange rate has the expected negative sign and it is statistically significant. Accordingly, 25% of the deviation from the long-run equilibrium would be adjusted to each period. The treasury bills rate seems to be statistically significant and has a positive sign, which means that it works to depart from the long-run equilibrium path (Table 4).

The inference gathered from the F and t statistics of the predicted coefficients of the error correction model provide information about the exogeneity and endogeneity of the dependent variables within the sample period. But they do not provide any information about the dynamics and the degree of exogeneity/endogeneity out of the sample period. For further inspection of the dynamic casual relations, generalized variance decompositions (GVD) are used. GVD enables us to determine the relative importance of the variable as a source of fluctuations in other variables (Ratanapakorn, Sharma, 2007).

The variance decomposition results are summarized in Table 5. The ISE100 index and RER seem to be the leading indicators in the system. In other words, the ISE100 is relatively exogenous because approximately 81% of the forecast error variance of ISE100 is explained by its own shocks even after 10 quarters. The forecast error variance that can be explained by their own shocks of the variables are 79% for exchange rate, 56% for GDP and 43% for treasury bill rates. Accordingly, the ISE100 index and the exchange rate are relatively exogenous variables and the adjustments towards the equilibrium are comprehended by other variables, namely treasury bills

rate and real GDP. It is observed that the adjustment mechanism substantially works through the treasury bills rate and through real GDP.

Table 5. **Variance Decomposition Table**

Period		GDP	ISE100	TBR	RER
1	GDP	100.00	0.00	0.00	0.00
2		86.95	7.97	0.33	4.73
3		77.77	11.76	2.36	8.09
5		66.52	15.14	7.90	10.42
7		60.50	18.29	9.89	11.30
10		56.20	21.24	10.25	12.29
1	ISE100	1.14	98.85	0.00	0.00
2		0.47	96.08	3.23	0.20
3		0.63	90.48	6.65	2.22
5		1.40	87.06	7.02	4.50
7		2.52	84.22	6.90	6.34
10		3.17	81.56	7.40	7.85
1	TBR	20.95	7.26	71.78	0.00
2		18.10	13.99	64.17	3.72
3		17.81	14.46	63.18	4.53
5		30.41	11.66	53.40	4.51
7		38.00	9.86	45.57	6.56
10		40.32	8.94	43.42	7.31
1	RER	5.91	9.67	7.98	76.42
2		5.07	12.34	6.72	75.84
3		7.68	11.64	4.74	75.92
5		5.33	12.29	4.33	78.04
7		4.13	12.73	4.01	79.12
10		3.44	13.66	3.05	79.83
Ordering: GDP ISE100 TBR RER					

Source: Compiled by the authors.

The variance decomposition results reveal the dynamic interaction between the variables. ISE100 is relatively the main source of contribution to GDP. The real effective exchange rate also seems to affect the real GDP for a long period of time. Since the analysis of variance decompositions provides information about the dynamics of the system out of the sample period, the results illustrate that the forecasted variance error of GDP is mainly explained by innovations in stock prices and the exchange rate.

Conclusion

This study aims to examine the short- and long-run dynamic relationships between stock prices and real economic activity in Turkish economy for the period of 1990:1–2008:2. Considering the time series properties of the variables, a long-run empirical relationship has been examined by using the Johansen's multivariate cointegration procedures. The findings support the presence of the long-run equilibrium relationships between the variables. According to the normalized cointegration equation; in the long run while stock prices and interest rates negatively influence GDP, the real exchange rates have positive effects on GDP. However, the coefficient of the exchange rate is not statistically significant.

In the frame of the predicted error correction model, short and long run causality relations have been examined and the following findings are obtained: In the long-run, except the treasury bills rate, the error correction terms of the variables are neg-

ative. The negativity of the error correction term implies that in case of a shock to the system the variables respond to return back to the long run equilibrium. Briefly, the treasury bills rate results are moving away from the long run equilibrium. On the other hand, in the short run a causality relation running from stock prices (ISE100 index) and real effective exchange rate toward GDP is documented but any causality relationship from treasury bills rate towards GDP is not observed. As a matter of fact, there is a significant causality relation only running from real effective exchange rate towards stock prices. The causality from treasury bills rate toward stock prices is significant only at the 10% level. Similarly, a causality relationship running from exchange rate toward interest rate in a short term draws attention. In the short term the variables in the model do not affect the exchange rate that the exchange rate is a relatively exogenous variable.

Generalized variance decompositions reveal that major contribution to real GDP comes from stock prices, and overtime the exchange rates' contribution appears. Moreover, the treasury bills rate has negative effects in both short and long run.

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