Causality between stock price and GDP in Turkey: An ARDL Bounds Testing Approach

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ABSTRACT

The study investigates the dynamic relationship between stock prices and GDP in Turkey using quarterly data from 1989Q2-2014Q2. The study investigated the interrelationship between the variables via auto regressive distributive lag (ARDL) framework and ECM to analyse the existence of a long-run equilibrium relationship between gross domestic product and stock prices. The results provide strong evidence that both the stock prices and GDP are strongly cointegrated in the long-run. The empirical estimation indicated a significantly positive relationship between GDP and stock prices. The robustness of the ARDL model was confirmed by using Johansen and Juselius's cointegration test (1990). The Granger causality test results indicate a long-run bidirectional causality between stock prices and GDP, and also a uni-directional causality from GDP to stock prices in the short-run. Both the stock prices and the economic growth are directly linked with each other. The reliability and validity of our estimations are confirmed by the diagnostics and the CUSUM test.

Key Words: *ARDL Model, Granger Causality, GDP, Stock price.*
JEL Classification: *C22, G10*

INTRODUCTION

There is a vast amount of theoretical and empirical literature available on the relationship between financial markets and economic development. Schumpeter (1912) argued that well designed and well-functioning financial markets enable investors and entrepreneurs to post higher profits, which promotes economic development. The relationship between stock prices and economic growth has been an important subject in the literature. This debate in the literature is supported by the fact that stock price movements may influence economic growth. This leads to the question of whether a long-run or short-run relationship exists between stock prices and economic growth or if a causal relationship exists between economic growth and financial development (Deb and Mukherjee, 2008). The stock market helps to mobilize savings by providing incentives to the savers to create portfolios that consist of attractive securities, which have maximum return and minimal variance.

Financial markets are characterized by the trading of different securities that depend on their period of maturity. The concept of fund raising has been a burning issue in the field of finance and its relationship with economic growth is also an important topic. The investor plays a pivotal role in improving the stock prices of a company in a given country by investing in its particular stocks. The investor invests in a company by purchasing shares, which are issued by the company to finance itself. There are several modes that can be used as a better source to attract the investors to buy the stocks. If the investment opportunity seems to be an attractive proposition for the investors, they will buy stocks in order to achieve maximum return at the lowest possible risk. This results in an overall increase of stock prices, which is a positive sign for a country to attract more investors to improve its economic growth on one side, and the profitability for the stock issuing company on the other. Conversely, the investor will not invest in those stocks that promise little or no return with maximum risk, which results in a decrease in the price of stocks. Pearce's (1983) study suggested that the stock prices indicate the prospect of economic growth, with rising stock prices increasing the domestic expenditures, which can in turn lead to an improved GDP. The stock prices and GDP relationship can vary and has drawn the attention of researchers, economists and experts in finance. For example, Gupta and Hartley (2013) studied the relationship in South Africa between growth and stock prices. However, no mutual consensus has been derived in the literature regarding a causal relationship between economic growth and stock prices. Ritter (2005) conducted a study on stock prices and GDP, and the empirical estimations confirmed that stock prices and economic growth have a negative relationship at the company level. A positive relationship was identified between stock prices and economic growth by Kim and ln (2003), Cole *et al.* (2008) Beck and Levine (2004), and Zhou *et al.* (2012).

The linkage between macroeconomic variables and stock market prices has been widely studied in the literature. Some studies have analysed the stock market indexes and some of them have analysed the stock return. However, most of the studies do not consider the bivariate relationship between stock market prices and economic growth. This study investigates and analyses the interaction between economic growth and stock prices in Turkey. Specifically, a bivariate form of co-integration is used to analyse the relationship between the two variables. The main goal of the study is to identify the direction (unidirection or bi-direction) or causation between economic growth and stock prices in Turkey. This study aims to investigate whether, in the case of Turkey, both the real GDP and stock prices may have any long-run relationship by applying the auto regressive distributed lag model (ARDL). This study can also be useful in identifying the direction of causality for short-run and long-run dynamics for stock prices and economic growth by applying an error correction model (ECM). The rest of the article is organized as follows. Section 2 explains the literature review. Section 3 describes the data, model specification and econometric methodology. Section 4 analyses the emperical results and discussion and Section 5 explains the conclusion of the study.

LITERATURE REVIEW

Hassapis and Kalysitis (2002) studied the causative relationship between real growth and stock prices for the period 1949 to 1998 in the G7 countries by employing the VAR model. The results of the VAR model show that a strong association exists between economic growth and stock returns. Binswanger (2004) also investigated the relationship between the growth of real economic activity and stock returns between 1960 and 1999 in the G7 countries by analysing the quarterly data. The VECM model was employed and demonstrated a strong correlation between stock return and GDP.

Mauro (2003) analysed the correlation between real interest rates, GDP, money growth and stock returns in emerging market countries, which included Argentina, Mexico, Korea, India, Greece, Chile, Thailand and Zimbabwe as well as developed countries that included Austria, Switzerland, Australia, Canada, Denmark, France, Belgium, Italy, Germany, Netherlands, Norway, Japan, Singapore, United Kingdom, Sweden, USA and Spain for the period from 1971 to 1988. The study employed panel regression and the results indicated a strong correlation between economic growth and stock returns in both emerging market countries and developed countries. The asset price was determined as a strong predictor for GDP in both emerging market countries and developed countries.

Siliverstovs and Duong (2006) investigated the relationship among the stock market, GDP and interest rates in five European countries including Germany, France, Italy, Netherlands and UK by taking the quarterly data from the period ranging 1985 Q1-2004 Q4. The VAR model was used to investigate the relationship between the above-mentioned variables. The results indicated a positive correlation between stock prices and GDP in those five countries. In addition, share prices demonstrated a significant relationship with GDP.

Mun *et al*. (2008) examined the interrelationship between economic growth and stock prices for the period 1977 to 2006 in Malaysia. Both VAR and Granger causality were employed and the results indicated a uni-causal relationship between two variables, which means the stock prices affected/caused the economic growth in Malaysia.

Enisan and Olufisayo (2009) examined the long-term association between stock markets and economic growth in Egypt and South Africa for the period 1980 to 2004. The newly developed autoregressive distributed lag (ARDL) model was employed to find the relationship. The study found that economic growth and the stock market were positively affecting each other in Egypt and South Africa.

Olweny and Kimani (2011) employed the VAR model and Granger Causality to study the causal relationship between the stock market and economic growth in Kenya for the period 2001-2010. The result showed a uni-causal relationship between economic growth and stock prices, i.e. economic growth Granger causes stock prices.

Budden *et al.* (2010) investigated the effect of stock prices on inflation in Brazil as well as the currency exchange and deficit spending by the government on GDP for the quarterly period from 1996Q3-2009Q3, by employing multiple regression techniques. The study determined that stock prices, Government spendings positively affect GDP. However, inflation negatively affects the GDP.

Ikoku (2010) investigated a causal relationship between the stock prices index and GDP by using the quarterly data for the period 1984Q1-2008Q4 in Nigeria. The study analysed the long-run relationship by using the co-integration test on both stock prices and GDP. The VECM model and Granger causality showed a causal relationship exists between stock prices and GDP. The study also found that the share prices have a positive and significant relationship with GDP.

Taiwo *et al.* (2012) investigated the effect of all stock prices, interest rates and exchange rates on the Nigerian economy for the period 1980 to 2010. The VECM model that was applied indicated that oil prices, stock prices, exchange rates and interest rates affect the economic growth of a country. Omowunmi and Oluseye (2011) examined the effect of economic growth on the stock market in Nigeria for the period 1985 to 2009 by applying the multiple regression model. The results showed that the stock market significantly affected the economic growth. Various studies examining different countries have been conducted to find the direction of causality, but the problem has still been unresolved. The fundamental valuation model argues the dependence of the stock price based on the expectations of the future economy. In this case any expected changes in the real income in an economy may cause the stock price to change. While wealth effect on other hand, argues that it is because of the stock price that causes variations in the economy. This study is undertaken with the aim of determining whether both the stock prices and GDP are cointegrated followed by Granger causality test under the framework of ECM for the period 1989Q2-2014Q2.

METHODOLOGY OF THE STUDY

Data

The bivariate framework includes gross domestic product and stock prices. For empirical analysis, the quarterly data for GDP and stock market indices from the second quarter of 1989 to the second quarter of 2014 is employed. The data was collected from the IMF international financial statistics. Seasonally adjustment was applied in order to remove the seasonal component, by taking out the irregular components and trend-cycle.

Model Specification

Various studies have been conducted to find the relationship between GDP and stock prices by using different econometric models. Many authors have utilized different econometric models for different countries. However, to the extent of our knowledge, no study has been conducted on the long-term and causal relationship between GDP and stock prices for Turkey by using the ARDL bounds testing approach. Turkey was selected on the basis of its tremendous growth over the last 12 years, including its foreign trade and gross domestic product. The study will be very beneficial and a valuable literature resource. As discussed in the literature review, the estimated Equation in logarithm[1] form will be:

$$lnGDP = \alpha_0 + \alpha_1 lnSP + \varepsilon_t \qquad (1)$$

Where GDP is the gross domestic product, and SP is the stock price. According to the literature and theory, is expected to be positive. For estimation, the newly econometric ARDL bounds testing approach was applied, as suggested by Pesaran et al. (2001).

3.3. Unit root

The unit root is used to examine the stationarity of the data; however, selecting the appropriate unit root test is very difficult when it comes to estimation. To improve the robustness of the selected variables, (gross domestic

1. The data is converted to log lessen the effect of heteroscedasticity and eliminate variation in time series data.

product and stock prices), several unit root tests can be applied. Enders (1995) argued in his study that it is beneficial to perform more than one unit root test at the same time, i.e. the Augmented Dickey and Fuller (1981) and Phillips-Perron (PP) tests (1988). If both the unit root tests give the same results then we are certain about the order of integration of series. The Augmented Dickey Fuller and Phillips-Perron (PP) tests are the two most widely used unit root tests for stationarity of data in literature.

3.4. Bounds test of cointegration

The ARDL bounds testing approach used in this article have been developed by Pesaran *et al.* (2001). The ARDL bounds testing is a new approach for cointegration. The test can be performed by using the F-statistics or Wald test to check the significance of the lagged co-efficient in the un-restricted correction model (UECM). The ARDL model can act efficiently for small sample sizes in time series data. The ARDL bounds test approach consists of three main steps. The first step is to determine the long-run cointegration among the variables in the equation. The F test or Wald test can be used to determine this long-run relationship among the variables. The Wald test or joint significance test is performed by equating all the coefficients of the lag variables to zero, as shown in Equation 2 (Tang, 2003).

$$\Delta lnGDP_t = \beta_0 + \sum_{i=1}^{n1} \beta_{1i}\, \Delta lnGDP_{t-i} + \sum_{i=1}^{n2} \beta_{2i}\, \Delta lnSP_{t-i} + \lambda_1\, lnGDP_{t-1} + \lambda_2\, lnSP_{t-1} + vt, \quad (2)$$

Where "*vt*" is an error term and represents the first difference. The estimated F statistic is then compared with the bounds critical values in the table created by Pesaran *et al*. (2001) at significance levels of 1%, 5% and 10%. The Pesaran *et al*. (2001) critical values are comprised of the upper and the lower bounds values. If the calculated F statistics value is greater than both the upper and lower bounds critical values, then the null hypothesis of no co-integration can be rejected. This means that the variables in the model do have long-term co-integration. If the calculated F statistics value lies between the upper and lower bounds critical values, then the decision is inconclusive. If the calculated F statistics lies below the upper and lower bounds critical values, then it suggests the evidence of no cointegration among the estimated variables in the model.

The next step is to estimate the elasticity of the long-run relationship and short-run relationship to determine their impact on the dependent variable. The estimation of the elasticity of the long-run relationship depends on the first step after predicting a long-run relationship among the variables in the series.

$$ln(GDP)_t = \alpha_0 + \sum_{i=1}^{p} \emptyset 1_i \, ln(GDP)_{t-i} + \sum_{i=0}^{p} \beta 1_i \, ln(SP)_{t-j} + \mu_t \quad (3)$$

$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{k} \emptyset 1_i \, \Delta lnGDP_{t-i} + \sum_{i=0}^{l} \beta 1_i \, \Delta lnSP_{t-j} + \psi ECT_{t-1} + \vartheta t, \quad (4)$$

The short-run elasticity is estimated from the short-run coefficients of the differenced variables by using Equation 4. When there is more than one short-run coefficient, then the Wald test can be used for the joint significance of the short-run coefficients toward the long-run, where ψ represents the coefficient of error correction term in Equation 4. The sign of coefficient of the error correction term should be negative and significant, and the value should be between 0 and 1, showing the convergence of the system of equations to the long-run equilibrium after a short-run shock.

The robustness of the ARDL bounds test of cointegration can be confirmed by using the Johansen and Juselius (1990) maximum livelihood estimation to test for sensitivity. The series is integrated of the first order, which is a pre-requisite to employ the Johansen and Juselius test to examine the presence of cointegration. The Johansen procedure is carried out under the unrestricted vector auto regressive (VAR), in which the restrictions are imposed on the coefficients by cointegration in the unrestricted VAR system.

3.5. ECM Granger causality test

After the confirmation of cointegration by the Johansen and Juselius (1990) test in the unrestricted VAR, a long-run relationship was indicated amongst the dynamic regressors. The existence of cointegration among the variables suggests that there must be Granger causality among the variables in at least one direction. We employ ECM Granger causality to find out the direction of causality between GDP and stock price. Sargan introduced ECM in 1964, but when it was later modified by Engle and Granger (1987), it became more popular. The ECM is used to correct the disequilibrium for testing the causality in the cointegrated variable for the short and long-run.

$$\Delta LGDP = \delta_0 + \sum_{i=1}^{p} \lambda_{1i} \, \Delta LGDP_{t-1} + \sum_{i=1}^{q} \lambda_{1i} \, \Delta LSP_{t-1} + \varphi_1 ECT_{t-1} + e_{1t} \quad (5)$$

$$\Delta LSP = \delta_0 + \sum_{i=1}^{q} \lambda_{2i} \, \Delta LSP_{t-1} + \sum_{i=1}^{p} \lambda_{2i} \, \Delta LGDP_{t-1} + \varphi_2 ECT_{t-1} + e_{2t} \quad (6)$$

Where ECT_{t-1} represents the lagged error correction term and represents the first difference to capture the short-run disturbances. Also, e_{1t} and e_{2t} represents the error term that should be white noise and serially uncorrelated. An ECM distinguishes between both the short-run and long-run Granger causality. The statistical significance of the short-run is tested by using the individual coefficients of the lagged terms. The statistical significance of the coefficient of the ECT_{t-1} indicates the long-run causality. The value of the ECT must be between 0 and 1 with a negative sign indicating the convergence of the system back to equilibrium. The joint causation of both long-run and short-run can be tested to check for joint significance.

To check the reliability and validity of the estimation of the ARDL model, several diagnostic and model stability tests are performed. The diagnostic test examines serial correlation, heteroscedasticity and serial correlation. The structural stability of the model can be examined via CUSUM Test, proposed by Brown *et al.* (1975).

EMPIRICAL RESULTS AND ANALYSIS

4.1. Unit Root Test for Stationarity

It is not important to perform a unit root test in the ARDL model because ARDL bounds testing can be applied to any series, irrespective of their order of cointegration. The regressors can be $I(0)$, $I(1)$ or mutually co-integrated but none of the variables must be $I(2)$. Enders (1995) suggested using both the Augmented Dickey Fuller (1981) and Phillips-Perron (PP) unit root tests (1988). The unit root tests were estimated both at level and first difference with intercept and trend. The lag selection was carried out by using the Schwarz information criterion, as recommended by (Pesaran and Shin, 1997). Table 1 specifies the summary of the ADF unit root test, in which both LSP and LGDP at level are non-stationary, and become stationary after the first difference at 1% level of significance. The PP Test confirms the results, given by ADF, as shown in Table 2.

Augmented Dickey Fuller Unit Root test

Table 1

Country (Sample Period)	ADF	ADF
Turkey (1989Q2,2014Q2)	Level	First Difference
LGDP	0.2709 (0)	-9.1358***(1)
LSP	-0.6941(4)	-7.0869***(3)

Note: (i) E-Views 9 has been used for performing the unit root tests. (ii) The Augmented Dickey Fuller unit root test was performed both at level and first differenced (the trend and intercept) (iii) The figure in the parenthesis represents the lag selection by using the Schwarz info criteria (SIC). (iv)*, **, *** represents significance at 1%, 5%, and 10%.

Philips Perron (PP) Unit Root test

Table 2

Country (Sample Period)	PP	PP
Turkey (1989Q2,2014Q2)	Level	First Difference
LGDP	0.0543 (5)	-9.4236*** (5)
LSP	-1.7364 (3)	-6.7824*** (4)

Note: (i) E-Views 9 has been used for performing the unit root tests with Newey-West using Bartlett Kernel.. (ii) The Phillips-Perron unit root test was performed both at level and first differenced (trend and intercept) (iii) The figure in the parenthesis represents the lag selection by using the Schwarz info criteria (SIC). (iv) *, **, *** represents significance at 1%, 5%, and 10%.

A summary of the ADF and PP Tests is given in Tables 1 and 2, which concludes that none of the variables is *I* (2), so the long-run relationship can be predicted by using the bounds test or F test proposed by Pesaran *et al*. (2001).

Results of Bounds test of Co-integration

Table 3

Estimated Model	F_{LnGDP} (LnGDP/LnSP)			
Optimal Lag Length (AIC)	(3,0)			
[1]F-Statistics (Bounds Test)	7.0584***			
Critical Values	1 Percent	2.5 Percent	5 Percent	10 Percent
Lower Bounds I(0)	4.94	4.18	3.62	3.02
Upper Bounds I(1)	5.58	4.79	4.16	3.51

NOTE: *** represents 10 % significance level. The above table shows the different F-statistics values for Turkey by using AIC. The CV's are taken from Pesaran et al. (2001).

Table 3 illustrates the results of the computed F statistics value, which is compared with the *F* lower and *F* upper critical values and strongly suggests the existence of the long-run relationship among the variables in the estimated model. The computed F statistics value suggests that the gross domestic product and the stock prices have a long-run co-integration, where both the variables move together.

After the confirmation of the long-run relationship, the next step is to estimate the confirmation of the error correction term, which must be smaller than the unity in absolute term and should be negative and statistically significant. This condition is satisfied and the error correction term exists and is

1. The ARDL model is estimated by using restricted intercept and no trend.

significant as well. This means that divergence from the long-run equilibrium is corrected in the short-run, depending on the speed of adjustment. The coefficient of the error correction term in Turkey is -0.0384. This suggests that 3.84% of the disequilibria from the previous quarter is converged and corrected back to the long-run equilibrium in the current quarter. In this case, the findings indicate that the speed of adjustment is very slow and it will take time for the system to get back to the long-run equilibrium after a short-run shock. The next step is to estimate the long-run coefficient by using AIC[1] criterion to select the optimum lag.

ARDL Long-run and short-run results

Table 4

Dependent Variable: $LnGDP_t$	ARDL(3,0)		
Long-run results			
Variable	Coefficient	Standard Error	t-Statistics
Constant	23.7540	1.0336	22.9815***
LnSP	0.7392	0.1614	4.5780***
R^2	0.99	Adjusted R^2	0.99
F-Statistics	50036.22***	DW	2.11
Sum Squared resid	0.3300	S.E of regression.	0.0595
Short-run results			
Variable	Coefficient	Standard Error	t-Statistics
Constant	0.7986	0.4276	1.8673*
D(lnSP)	0.0329	0.0346	0.5902
ECM_{t-1}	-0.0384	0.0082	-4.6587***
R^2	0.46	Adjusted R^2	0.44
F-Statistics	19.9045***	DW	2.07
Sum Squared resid.	0.3328	S.E of regression.	0.0598

Note: *, ** and *** represents significance level at 1%, 5%, and 10% level respectively.

Table 4 represents the estimated long-run coefficient of the independent variable. Table 4 shows that an increase in the stock prices contributes to an increase in the gross domestic product. More precisely, a 1% increase in the stock prices leads to a 0.7392% increase in gross domestic product. The sign of the stock price is positive and in accordance with the theory. This means that there is a positive long-run relationship between GDP and stock prices, which is also confirmed by the studies of Kim and In (2003), Cole *et al.* (2008), Beck and Levine (2004), and Zhou *et al.* (2012).

1. The AIC criterion was selected because, as W. Ender (1995) suggested, the AIC performs better in small samples then in SBC, as the AIC is biased in selecting the over parameterized model.

The validity and reliability of our estimation results are confirmed by the diagnostic tests. The diagnostics tests include the Breusch-Godfrey serial correlation LM test, the Arch Test and the White test for heteroscedasticity. The results of all the diagnostics tests are displayed in Table 5.

Diagnostic Tests (Long-run)

Table 5

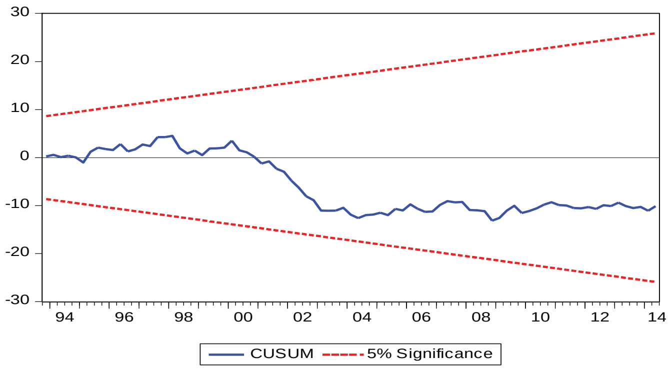
Diagnostic Test	χ^2sc	$\chi^2 w$	χ^2AR
Turkey	3.1933 (0.2026)	16.6707 (0.1180)	0.2611 (0.6093)

NOTE: χ^2sc , $\chi^2 w$, and χ^2AR are the Lagrange multiplier value for serial correlation, White test and Arch tests for heteroscedasticity based on the regression of squared residuals on squared fitted values respectively. The numbers in the brackets are the P-Values.

From the results of the diagnostic tests, it is clear that there is no serial correlation among the residuals as we check the second order correlation in the ARDL model. The Arch test and White test for heteroscedasticity in our estimation confirm that the residuals are homoscedastic. The diagnostics tests further strengthen and confirm the reliability and validity of our estimation results. To check the stability of the long-run of the coefficient of the estimated variables in the model, the cumulative sum (CUSUM) tests are used. The CUSUM are plotted against the plotted lines at 5% level of significance. If the plot of the CUSUM lies inside the critical bounds at 5% level of significance, this indicates that the regression model is stable.

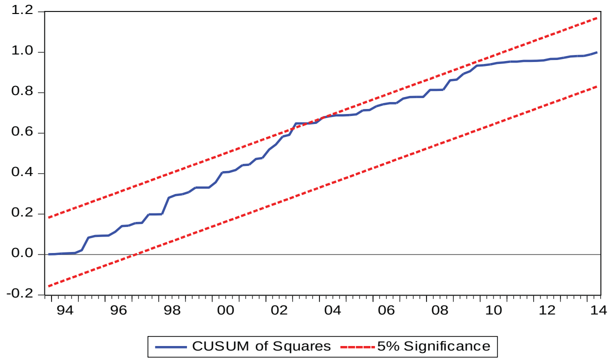
Plots of cumulative sum of recursive residuals

Figure 1



Plot of cumulative sum of squares of recursive residuals

Figure 2



Note: The straight line is in between the critical bounds at 5% significance level, indicating the stability of the model.

As seen in the figures for the CUSUM, the estimated CUSUM lines within the critical bounds at 5% level of significance, suggesting that the estimated model is stable.

The robustness of the ARDL model can be tested by using Johansen and Juselius's (1990) maximum likelihood cointegration approach as showed in Table 6. Both the variables at level were estimated in the unrestricted VAR for the optimum lag and found lag 5, selected on the basis AIC, FPE, LR and HQ criterions. The same lag length is checked for serial correlation by performing the serial correlation LM test, which found that the residuals are white noise at lag 5. Table 6 shows that a cointegrating relationship exists between GDP and stock a price, which confirms the results of the Pesaran et al. (2001) cointegrating approach. The normalized cointegrating equation has been revealed in Table 6 and the sign is positive, confirming a positive relationship between GDP and stock prices, as we expected.

Johansen and Juselius's maximum likelihood cointegration results. (intercept and no trend)

Table 6

Hypothesized No. of cointegrating vectors	H_0	[a]Trace statistics	Critical Values		Max Eigen	Critical Values	
			5%	1%		5%	1%
None	R=0	20.4496***	15.41	20.04	13.0284	14.07	18.63
At most one	R≤1	7.4211***	3.84	6.65	7.4211***	3.76	6.65
Normalized cointegrating equation: GDP = 21.89+ 0.9722 Stock price							

Note: [a] The trace statistics is the $\lambda_{maximum}$ value. *** show the significance at 1% level. The lag length was selected by using the Lag criteria. The Autocorrelation LM tests was performed and found no serial correlation problems.

4.2 Results of the Granger causality

Table 7 reveals the results of the causality test. Several tests have been performed for Granger causality: (1) Short-run causality - this includes the sum of the lagged coefficients of each independent variable by joint *F* test; (2) The long-run causality can be investigated by taking the t-test into account to examine the significance of the error correction term; (3) The joint significance of the sum of the lagged terms of each independent variable and the error correction term (ECT) by joint *F* test for analysing the short-run adjustment to rebuild the long-run equilibrium.

As the estimations in the table reveal that the lagged error correction term is statistically significant indicating a long-run causality that runs via the error correction term from stock prices to GDP, which confirms the results of the bounds test. In addition, there is another long-run Granger causality, which runs interactively via the error correction term from GDP to stock prices. Therefore, bidirectional causality exists in the long-run. This indicates that both the variables can come back to the long-run equilibrium after a short-run shock that confirms the system stability. The convergence back to equilibrium position depends on the speed of adjustment. However, short-run causality is only found from the GDP to stock price, and not vice versa. That means there is a short-run uni-directional Granger causality, which implies that economic growth contributes to the development of stock market. Consequently, the stock market develops as the economy of Turkey develops in the short-run. This further implies that growth is a good indicator for predicting stock returns in the short-run proving the validity of adaptive expectation model that utilize the past values of GDP to explain the future stock prices. However, a bi-directional causality has been confirmed in the long-run, as well in joint (short-run and long-run) which suggests that stock market development and economic growth are causing each other in the long-run as well as in joint Short-run and long-run. This indicates that the stock markets play an important role in explaining the predictions about an economy, assisting the investors in making accurate expectations about the future economy. Furthermore, the growth also is a good indicator that predicts stock prices implying the validity of adaptive expectation model. Both the stock market (stock prices) and the economic growth are directly linked with each other. Our estimated results are in line with the study conducted by Comincioli (1995) and show that the stock prices can be used as a sign of prospective economic growth. The results of the Joint (short-run and long-run causalities) are shown in Table 7.

Results of Granger Causality

Table 7

Dependent Variable	*F*-Statistics (Probability)		Long-run	Joint (Short-run and long-run)	
	ΔLGDP	ΔLSP	ECT_{t-1} (*t*-statistics)	ΔLGDP.ECT_{t-1}	ΔLSP.ECT_{t-1}
ΔLGDP		1.6039 (0.1681)	-0.05 [-1.8747]*		2.1973 (0.0512)*
ΔLSP	5.8989 (0.0001)***		-0.16 [-2.5789]***	6.4546(0.000)***	

Note: *,*** represents the significance level at 1% and 10%, respectively.

F-Statistics probabilities and t-ratios are given in parenthesis and square brackets, respectively. The optimal lag chosen is lag 5, based on the lag criteria (AIC, LR, FPE and HQ) estimated under the unrestricted-VAR. The residuals are white noise at lag 5 estimated via VAR residual serial correlation LM test. The Godfrey LM tests have been applied and the estimation confirms the absence of serial correlation in the ECM.

CONCLUSION

The study aim was to investigate the dynamic relationship between stock prices and GDP for Turkey using the quarterly data from 1989Q2 - 2014Q2. The empirical method implied in the study was the recently developed bounds testing approach to cointegration developed within the auto-regressive distributive lag (ARDL) framework and ECM to examine the existence of a long-run equilibrium relationship between gross domestic product and stock prices. The results provide strong evidence that both stock prices and GDP are strongly cointegrated and have a long-run relationship. The empirical estimation suggests that there is a significantly dynamic and positive relationship between GDP and stock prices. This means that if the stock prices increase (fall) the GDP of turkey will also rise (fall), which is also confirmed by Kim and In (2003), Cole *et al.* (2008), Beck and Levine (2004), and Zhou *et al.* (2012) in their studies. When the elasticity of the stock prices in Turkey rise by 1%, then the GDP will also rise by 0.73%. The parameter of the error correction term (-0.0384) is smaller than unity in absolute term and negative, indicating the existence of a long-run relationship among the variables in the estimated model. This suggests that if the level of GDP is above or below the equilibrium level, it adjusts by 3.84% per quarter. The parameter of ECT shows the speed of adjustment, which is very slow in countering the short-run shock and converges back to the long-run equilibrium, indicating the stability of the system.

The Granger causality test result indicates a long-run and as well in Joint (short-run and long-run) bidirectional causality between stock prices and GDP, suggesting the importance of both growth (Fundamental valuation model) and stock price (wealth effect) helps in predicting and accurate forecasting to preclude the economy from confronting the crises in future. Both fundamental valuation model and wealth effect explains that stock market usefulness in predicting the economy. A short-run uni-directional causality running from GDP to stock price, was found suggesting that growth is a good indicator for predicting stock returns in the short-run proving the validity of adaptive expectation hypothesis that utilize the past values of GDP to explain the future stock prices that has been ignored in most of the studies undertaken. The estimation based on the stock prices represents the real economic activity of any country. Both the stock prices and the economic growth are directly linked with each other. This indicates that policy makers can use stock market information and past values of economic growth by making accurate predictions about potential crises by formulating efficient policies to offset and prevent them. However, future studies can be conducted by including exchange rates, inflation and other relevant micro-economic variables.

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