economies

MDPI

Article

Macroeconomic Determinants of Stock Market Fluctuations: The Case of BIST-100

Caner Demir

Department of Economics, Manisa Celal Bayar University, Salihli-Manisa 43500, Turkey; caner.demir@cbu.edu.tr

Received: 3 December 2018; Accepted: 28 January 2019; Published: 1 February 2019

Abstract: The purpose of this study is to analyze the impacts of some prominent macroeconomic factors on the Turkish Stock Market index, BIST-100 (Borsa Istanbul-100). For centuries, and mostly since the 20th century, stock markets are at the heart of economies. In our era, the largest economic crises arise from the stock market instabilities and thus, the stock markets are the focus of interest of the economy. Economists, investors, and policymakers try to predict the tendency of share prices, which substantially depend on foreign and domestic macroeconomic factors. Within this purpose, this study tries to investigate the impact of some selected macroeconomic factors on BIST-100 index over the 2003Q1–2017Q4 period. The findings obtained from the quarterly data via the ARDL Bounds Test suggest that economic growth, the relative value of the domestic currency, portfolio investments and foreign direct investments raise the stock market index while interest rate and crude oil prices negatively affect it. The results briefly reveal that the Istanbul Stock Exchange Market needs stronger domestic currency, higher international capital inflows, and lower energy and investment costs.

Keywords: stock market; macroeconomic indicators; borsa istanbul; autoregressive distributed lag (ARDL) bounds test

JEL Classification: C32; E44; G10

1. Introduction

Stock markets have been at the center of economies for centuries. Any instabilities or crises occurring in these markets have partial or general effects on the economy. Since the 17th century, the world economy experienced many crises that arose from financial and more specifically, stock exchange markets (Garber 1990, p. 36). Thus, economy administration of countries and policymakers carefully observe the progress of stock markets so as to take precautions in case of unexpected instabilities.

Daily fluctuations of the stock markets might stem from economic and political affairs. However, stock markets are not independent of domestic and global macroeconomic conditions. Investors are directly or indirectly affected by the changes in macroeconomic factors and make their decisions on shares by considering the overall situation of the market. Therefore, examining the determinants of stock market fluctuations matters for economies and investors.

The present study mainly deals with this issue specific to Turkey and investigates the determinants of Istanbul Stock Exchange Market Index (BIST-100). Turkey has been an outstanding emerging economy for many years. Especially since 1980, Turkey has adopted liberalized economic policies and has opened both goods and financial markets to foreign countries. Subsequently, foreign trade volume, portfolio investments and foreign direct investments (FDI) showed a substantial increase. In 1985, the Istanbul Stock Exchange Market was established and led to remarkable capital inflows to Turkey. The Turkish economy has not had a stable history since the 1980s. There have been crucial economic crises in 1994, 1999 and 2001. Since the study's focus is not the economic crises of Turkey and we only deal with the fluctuations starting from 2003, we will not address the details of these crises.

In recent history, the global financial crisis of 2008—which mainly arose from the US economy—affected many countries. However, the 2008 financial crisis only slightly affected the Turkish economy compared to the US and continental Europe. Turkey recovered from the negative impacts of the crisis after about one year. In the post-2008 period, there has been an abundance of liquidity in the world from which Turkey has benefited. The interest rates were at significantly lower levels and this led to a market boom in domestic markets. Although the interest rates in Turkey have decreased during the mentioned period, they have been relatively higher than the interest rates offered by many developed countries. Thus, foreign capital inflows to Turkey have shown a substantial increase. Since Turkey is an emerging economy and provides relatively higher returns in financial markets for many years, portfolio investment inflows have considerably increased in the post-2008 period. FDI inflows, on the other hand, have also increased but the period of the increase has started only after a recovery process, in 2010. The Turkish economy has benefited from the liquidity excess, which valued the domestic currency over a few years. The nominal exchange rates and inflation rates were almost stable and enabled the economy to be strong. However, most of the liquidity was directed to the construction sector rather than the manufacturing or other productive sectors.

Within this perspective, the study investigates the effects of some prominent macroeconomic factors such as interest rate, real effective exchange rate, market activity, portfolio investment inflows, FDI inflows and crude oil prices on the Turkish Stock Exchange market by employing an autoregressive distributed lag (ARDL) model over the 2003Q1–2017Q4 period.

After presenting some brief information on the structure and history of the Turkish economy, the study continues with a literature review in the next section. In the third section, the data and the empirical methodology of the study will be described; and lastly, the findings of the econometric analysis will be presented and discussed.

2. Literature Review

The stock market value and its determinants are broadly discussed in the existing literature. In this section, some empirical evidence from the stock markets of other countries and Turkey will be presented.

Chen (2009) examined the behavior of the Standard and Poor's 500 (SP500) index and tried to find the most significant determinants on the prediction of the recessions in the stock market over the 1957–2007 period. The findings obtained from the monthly data reveal that the yield curve spreads and the inflation rate can significantly predict the recessions.

Mukherjee and Naka (1995) investigated the relationship between the Tokyo Stock Exchange index and some selected macroeconomic factors over the 1971–1990 period. Their findings obtained from the vector error correction model imply that there is a long-term association between the stock market index and the call money, inflation rate, exchange rate, money supply, industrial production, and government bond rate. On the other hand, Humpe and Macmillan (2009) made a comparative applied analysis for US and Japan. They investigated the relationship between macroeconomic variables and stock market movements. The findings of the study suggest that for the US, there is a positive relationship between stock prices and industrial production while interest rate and consumer price index are negatively associated with stock prices. They also found that money supply has no significant impact. For Japan, their findings show that stock prices are negatively related to industrial production and negatively related to money supply. However, their findings also suggest that the industrial production in Japan is negatively associated with consumer price index and interest rate. Thus, any increases in these factors most probably will reduce the stock market prices.

The stock markets in emerging economies are remarkable targets for investors and this makes the prediction of the behavior of these markets a substantial effort. Muradoglu et al. (2000) investigated the causalities between inflation rate, interest rate, industrial production, exchange rate and returns in global markets and the stock returns in selected nineteen emerging countries. They stated that country-specific factors might have a significant role in determining the stock market returns. Thus,

they emphasized that examining each country's stock market separately rather than a panel data analysis will yield more substantial results for policy implication. Their findings suggest that indeed each emerging country has its own characteristics.

Inflation rate is the Granger cause of stock returns only in Argentina and Brazil; interest rate is the Granger cause of stock returns only in Argentina, Brazil, Pakistan and Zimbabwe; exchange rate is the Granger cause of stock returns only in Brazil, Colombia, Greece, Korea, Mexico and Nigeria; the SP500 index is the Granger cause of stock returns only in Colombia, Mexico and Portugal. Industrial production does not affect the stock returns in any of the nineteen countries. Wongbangpo and Sharma (2002) tested the causalities between the stock market price index and selected macroeconomic factors such as gross national product, consumer price index, money supply, interest rate and exchange rate. Their analysis mainly focused on the ASEAN-5 countries (Indonesia, Malaysia, Philippines, Singapore and Thailand) over the 1985–1996 period. They found that all the selected macroeconomic factors are significant determinants of the stock market index in these countries. Hajilee and Al Nasser (2014) examined the linkage between exchange rates and stock market development in twelve emerging economies over the 1980–2010 period. Their results showed that in only six economies, significant long-run relationships are observed. According to the findings, exchange rate volatility negatively affected stock market development in China, Mexico, Pakistan and Venezuela, while positive impacts were observed in the Philippines and South Africa.

Ben Naceur et al. (2007) analyzed the effects of selected macroeconomic factors on stock market development (share of the stock exchange value in GDP) in Middle Eastern and North African (MENA) region countries. Their findings, obtained from panel data analysis, implied that saving rate, share of domestic credit to private sector, stock market liquidity and inflation rate were significant determinants of stock market development while income level and investment did not have any statistically significant impact.

Oil price is an important factor that has the possibility to determine stock market fluctuations. By applying a VAR (vector autoregression) model including stock market index, industrial production, inflation rate, and oil prices, Filis (2010) dealt with the issue for Greece over the 1996–2008 period. In regards to the stock market, the findings of the study showed that industrial production has a positive impact on the stock market index while increases in inflation rate and oil prices reduced it. Bjørnland (2009) investigated the oil prices–stock market relationships for Norway, an oil-exporting country, over the 1993–2005 period. As expected, the results were the exact opposite of countries that do not export oil. The structural VAR model suggests that increases in oil prices lead to an increase in stock market prices. Degiannakis et al. (2014) investigated the impacts of oil price shocks on stock markets in Europe over the 1999–2010 period. The findings obtained from a structural vector autoregressive model suggested that increases in oil prices significantly affect the demand side of economies, which finally cause a negative effect on stock markets. They stressed that oil price is a good indicator on predicting stock market volatility.

Pilinkus and Boguslauskas (2009) analyzed the short-run relationships between macroeconomic variables and the stock market index in Lithuania over the 2000–2009 period. Their findings suggested that increases in GDP and money supply raise the stock market index while increases in unemployment, exchange and interest rates reduced the index value.

Eita (2012) tried to model macroeconomic determinants of stock market prices in Namibia over the 1998–2009 period. The results obtained from the vector error correction model suggested that increases in income level and money supply raise stock prices while inflation rate and interest rate had a negative impact on stock prices.

As for foreign capital inflows, FDI and portfolio investments have different features. Stock markets are one of the main directions of portfolio investments. Since portfolio inflows create an additional foreign demand on shares, this will result in a price increase and will raise the stock market return. Froot et al. (2001), in their extensive study focusing on the behavior and impacts of portfolio flows, analyzed 44 countries for the 1994–1998 period. One of their substantial findings was that portfolio

inflows can significantly predict the equity returns in emerging markets. Singh and Weisse (1998), on the other hand, stated that portfolio investments in the developing world are mostly short-term and speculative. Foreign investors may shift their portfolio investments in developing countries with a whim and fad profit motive. If the inflows are continuous, the portfolio investments indeed might bear fruit for the stock market. In case of a reversal, however, these kinds of capital inflows may lead to serious economic crises as in Latin America in the 1990's. Singh and Weisse (1998) indicated that durable supply of capital inflows (such as FDI inflows) is more substantial for developing countries.

The world economy becomes more globalized day by day and foreign investments make the stock markets, and accordingly, the economies more integrated. Contrary to portfolio investments as discussed above, FDI inflows are more persistent and they strengthen the linkages between countries and their markets. Shi et al. (2010) state that by virtue of FDI inflows, business cycles and stock market fluctuations of countries can show comovements. Their empirical analysis implied that FDI linkages between countries can explain stock market integration. Soumaré and Tchana Tchana (2015) dealt with the issue for 29 emerging economies for the 1994–2006 period. The findings obtained from the panel data analyses suggested that FDI inflows positively affect both the stock market and banking sector development in these countries. They stress that policies on inducing FDI inflows accompany market-friendly regulations, which finally result in better governance and a more developed financial system. Adam and Tweneboah (2009) investigated the effects of FDI on stock market development in Ghana over the 1991–2006 period. The findings of their study suggested that FDI inflows have a substantial impact on stock market development. Agbloyor et al. (2013) in their analysis focusing on FDI and stock market interaction in 16 African countries over the 1990–2007 period found that FDI inflows significantly accelerate the development process of domestic stock markets. Jeffus (2005) examined the impact of FDI inflows on stock market development in four Latin American countries (Argentina, Brazil, Chile, and Mexico) over the 1988–2002 period. The findings showed a significant relationship between FDI inflows and stock market development.

There are also some studies in the existing literature that focus on the interaction between stock market and macroeconomic factors. Acikalin et al. (2008), for example, dealt with the issue for Turkey and examined the relationships between GDP, interest rate, exchange rate, current account balance and the Istanbul Stock Exchange index over the 1991–2006 period. The findings of their study suggested that changes in current account balance, exchange rate, and GDP significantly affect the stock exchange index while the interest rate had no power in explaining the index value. Rjoub et al. (2009) investigated the impacts of some selected macroeconomic factors on the Istanbul Stock Exchange over the 2001–2005 period. According to their findings, unanticipated inflation rate, interest rate, risk premium and money supply had significant effects on stock market returns while exchange rate and unemployment have no significant effects. They conclude their study by stating that even the significant factors have little explanatory power, which is a signal for omitting some other potential factors. Aydemir and Demirhan (2009) examined the causality between the nominal exchange rate and stock prices in Turkey for the 2001–2008 period. They found that the stock prices in Turkey decrease as the nominal exchange rate increases.

Büyüksalvarci and Abdioglu (2010) examined the existence of any causal relationships between macroeconomic variables and stock prices in Turkey. The findings obtained from their analysis covering 2001–2010 period suggested that stock prices affected the Granger-cause exchange rate, gold price, money supply, industrial production and consumer price index while it is determined by none of the mentioned macroeconomic factors. They conclude from these results that fluctuations in the stock market can be used on predicting the analyzed macroeconomic factors. Karacaer and Kapusuzoglu (2010) investigated the association between inflation rate, industrial output, exchange rate and stock price index in Turkey over the 2003–2010 period. Although their results suggested a long-term cointegration between these variables, the causality test showed that inflation rate, stock market index and exchange rate can explain industrial output while none of the variables have an explanatory power on stock market index. Thus, there is a unidirectional causality from the stock

market index to industrial output. Sayilgan and Süslü (2011) investigated the impact of macroeconomic factors on the stock market returns of selected eleven developing countries including Turkey over the 1999–2006 period. Their findings suggest that inflation rate and nominal exchange rate are the significant determinants of the stock market returns while there was no significant evidence favoring interest rate, economic growth, and petrol prices. According to the pooled regression model, they also found that the SP500 index is a significant determinant while the fixed effects model implies that money supply in the domestic market is a significant factor determining the stock market returns.

After presenting a framework from the existing literature and making it possible to hold a view on the issue, let us continue with the data used in the analysis and the empirical strategy of the study.

3. Model, Data and Methodology

By considering the facts of the Turkish economy and the empirical findings from the existing literature, we define the stock market index function as below:

$$BIST = f(INT, PORT, REER, BRENT, FDI, Y) \tag{1}$$

Therefore, the study examines whether these factors determine the stock market fluctuations in Turkey. In this function, BIST represents the Istanbul Stock Market Index, INT is the commercial loan interest rate, PORT is net portfolio investment inflows (liabilities in the balance of payments), REER is real effective exchange rate, BRENT is Brent Crude Oil Price, FDI is net foreign direct investment inflows (liabilities in the balance of payments) and Y is real gross domestic product. As mentioned in the literature review section, the interest rate is a highly possible determinant for stock market fluctuations in many countries. Portfolio investments and foreign direct investments are important sources for the Turkish Economy for many years. These capital inflows feed the economy both through goods and financial markets. Moreover, there exists some evidence from the existing literature on the impacts of capital inflows on stock markets. There is also a good deal of evidence in the literature suggesting the importance of exchange rate and inflation rate on stock markets. Instead of adding both variables into the function, we use the real effective exchange rate, which reflects the "real" value of the domestic currency both in domestic and foreign markets.[1] Since stock market fluctuations are not independent of the relative position of the domestic country in global, following this way might yield better findings to debate over.[2] Turkey is an energy-importing country and its economy certainly depends on energy prices. Therefore, as a main global indicator, we use the Brent Crude Oil price (US Dollar) as a potential determinant. Lastly, to reflect the market activity, we thought to include the industrial production as in the existing literature, but the industrial production index of Turkey has been updated and currently, the data starts from 2005. To keep the data span longer, we use the gross domestic product instead of industrial production, which is another good proxy for market activity. Moreover, the GDP data may also reflect the impact of economic growth on stock market fluctuations.

---

[1] The real effective exchange rate is calculated as the weighted geometric average of the prices in Turkey relative to the prices of its principal trade partners in international markets. The formula is as follows:

$$REER = \prod_{i=1}^{N} \left[\frac{P_{TUR}}{P_i * e_{i,TUR}} \right]^{w_i}$$

where w_i is the weight of the partner country i in the calculation, P_{TUR} is the price index in Turkey, P_i is the price index in country i, $e_{i,TUR}$ is the nominal Exchange rate of the currency of country i in Turkish Lira and N is the number of countries used in this calculation which is 44 countries for Turkey (Kocakale and Toprak 2015).

[2] Price level might be also included as an explanatory variable in the model, but we could not include it into the model since the real effective exchange rate formula already include the price level of home country. Nevertheless, we tried to estimate the base model by including the price level, but the variance inflation factor (VIF) values referred to a colinearity problem caused by the price level.

The implicit function given in Equation (1) might be written in an explicit, econometric form as below:

$$BIST_t = \beta_0 + \beta_1 INT_t + \beta_2 PORT_t + \beta_3 REER_t + \beta_4 BRENT_t + \beta_5 FDI_t + \beta_6 Y_t + \varepsilon_t \quad (2)$$

where β_0 is the constant and the ε_t is the error term of the estimated function. The parameters from β_1 to β_6 are the coefficients of the potential determinants presented in the implicit BIST function.

We use quarterly data between 2003Q1–2017Q4.[3] All the data, except the crude oil prices, are obtained from the Central Bank of the Republic of Turkey and the Brent Crude Oil Price data is obtained from the U.S. Energy Information Administration. Table 1 presents some basic descriptive statistics and the sources of the data. Note that the values in the descriptive statistics table reflect the statistics of the raw data but in the further analyses, all the variables are going to be used by taking their natural logarithm.[4] Over the last fifteen years, it is seen that the BIST-100 index fluctuates between 10,570 and 107,803, which implies a substantial improvement in the stock market. After the national economic crisis in 2001, the Turkish Economy has started to recuperate under the International Monetary Fund's (IMF) watch and the interest rates started to decline from about 44.6%. Moreover, due to the global liquidity excess after 2008, the interest rates in Turkey decreases from about 20% to 10%, which stimulated the economy by lowering the costs for investment. The net portfolio investment inflows which were near to zero in 2003, declined even to negative values during the unstable periods such as 2008 and 2015. However, the portfolio investments considerably have maintained the economic growth process of Turkey over the period of the analysis and reached the peak in 2012. The FDI inflows, which also were near to zero in 2003, started to increase in the post-2004 period and reached their peak in 2007. This was an outcome of the recovering period after the 2001 national economic crisis.

As for the real effective exchange rate, the picture is quite dramatic. Note that the real effective exchange rate variable reflects the real value of the Turkish currency (Lira) against the currencies of the principal trade partners by considering purchasing powers of each country. Increases in this variable imply a real appreciation of the Turkish Lira. After the 2001 crisis, the Turkish Lira gained its value both in domestic and international markets and reached to peak in 2008. Since 2010, the real effective exchange rate is in a periodical decreasing process. The variable is in an index form that considers the value of REER in 2003 is equal to 100; and since 2015, the index value is even lower than 100. In the last quarter of the analysis period, the index value is 85.08. Thus, we may suggest a substantial depreciation of the Turkish Lira and a considerable decrease in relative purchasing power in Turkey. For the general analysis period, except 2008, the GDP data implies that the Turkish economy shows continuous growth. Lastly, the crude oil price, which was about \$30 per barrel in 2003, has reached its maximum over the whole analysis period: \$121 in 2008. With the impact of the 2008 global financial crisis, the crude oil price showed a significant fall and decreased to \$44. Although the crude oil price exceeds the \$100 threshold between 2011–2014 period, its current value in 2017 fluctuates around \$50–\$60.

The study employs an autoregressive distributed lag (ARDL) model to estimate both the short-run and long-run parameters, but our main purpose is to obtain evidence reflecting the long-run relationships between the stock market and its potential determinants. In the econometrics literature, there are several cointegration approaches providing long-run coefficients

---

[3] Since we investigate the "long-run" associations between the variables, the short-run volatilities are not our main concern. Enhancing the frequency of the data such as quarterly to monthly will provide three times more observation but there would be many irrelevant volatilities for each variable from which we try to abstain. There are different methods such as autoregressive conditional heteroskedasticity (ARCH) and generalized autoregressive conditional heteroskedasticity (GARCH) models dealing with the volatilities but note that we mainly focus in this study long-run relationships.

[4] The portfolio investment data includes some negative values and makes it impossible to take their logarithm. To overcome this problem for the further steps of the analysis, the portfolio investment data has been transformed into an index data, which does not include any negative values. Since we use a log-log model, this will not cause any bias in the coefficients.

(i.e., Engle and Granger 1987; Johansen 1988; Johansen and Juselius 1990; Johansen 1995). However, the ARDL Bounds Testing approach developed by Pesaran and Shin (1999) and Pesaran et al. (2001) has some advantages compared to previous ones. First, the older approaches certainly require the chosen variables in the same order of integration. However, the ARDL Bounds Test does not regard whether the variables are stationary at level or first-difference (I(0) or I(1)). Secondly, as Banerjee et al. (1986) state that OLS estimation results are biased in finite samples as they do not take into account short-term dynamics. The ARDL Bounds Test can provide more consistent coefficients in relatively small samples (see Panopoulou and Pittis 2004; Baek and Kim 2013).

Table 1. Descriptive Statistics.

Variable	Notation	Source	Mean	Min.	Max.	St. Dev.
BIST-100, Istanbul Stock Market Index	BIST	Central Bank of the Republic of Turkey (CBRT)	54,584	10,570	107,803	24,940
Interest Rate (%)	INT		17.39	8.53	44.61	7.75
Portfolio Investment Inflows (Net-Million US Dollar)	PORT		3057	−5698	15,805	4403
Real Effective Exchange Rate	REER		107.13	85.08	127.92	9.78
Foreign Direct Investment Inflows (Net-Million US Dollar)	FDI		3219	226	9510	1923
Gross Domestic Products (Chained Linked Volume- million TRY)	Y		296,335	166,572	464,491	73,228
Brent Crude Oil Price (US Dollar)	BRENT	U.S. Energy Information Administration	71.84	26.17	121.39	28.73

Under the null hypothesis, the ARDL Bounds Test suggests no cointegration relationship. To consider whether the variables are I(0) or I(1), the Bounds Test produces two different asymptotic critical values. The estimated model in the ARDL Bounds Testing form is given below;

$$\begin{aligned}\Delta BIST_t &= \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta BIST_{t-1} + \sum_{i=0}^{p} \alpha_2 \Delta INT_{t-1} + \sum_{i=0}^{p} \alpha_3 \Delta PORT_{t-1} + \sum_{i=0}^{p} \alpha_4 \Delta REER_{t-1} \\ &+ \sum_{i=0}^{p} \alpha_5 \Delta BRENT_{t-1} + \sum_{i=0}^{p} \alpha_6 \Delta FDI_{t-1} + \sum_{i=0}^{p} \alpha_7 \Delta Y_{t-1} + \lambda_1 BIST_{t-1} + \lambda_2 INT_{t-1} + \lambda_3 PORT_{t-1} \\ &+ \lambda_4 REER_{t-1} + \lambda_5 BRENT_{t-1} + \lambda_6 FDI_{t-1} + \lambda_7 Y_{t-1} + \varepsilon_t\end{aligned} \tag{3}$$

Here, the α parameters represent the short-run relationships while the λ parameters represent the long-run relationships.

To examine a potential cointegrated relationship between variables, the ARDL Bounds approach tests the null hypothesis of no cointegration ($\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = 0$) against the alternative hypothesis of cointegration ($\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq \lambda_7 \neq 0$) via the F-test. The F-statistic obtained from the Bounds Test is compared with the lower and upper bound values proposed by Pesaran et al. (2001).

The Bounds Test part of the ARDL approach only provides information on whether the variables are cointegrated or not. If the variables are cointegrated, the long-run coefficients of each variable can be estimated through an error correction model as below:

$$\begin{aligned}\Delta BIST_t &= \gamma_0 + \sum_{i=1}^{p} \delta_i \Delta BIST_{t-i} + \sum_{i=0}^{p} \phi_i \Delta INT_{t-i} + \sum_{i=0}^{p} \phi_i \Delta PORT_{t-i} + \sum_{i=0}^{p} \phi_i \Delta REER_{t-i} + \sum_{i=0}^{p} \phi_i \Delta BRENT_{t-i} \\ &+ \sum_{i=0}^{p} \phi_i \Delta FDI_{t-i} + \sum_{i=0}^{p} \phi_i \Delta Y_{t-i} + \mu ECT_{t-1} + u_t\end{aligned} \tag{4}$$

Here, the ECT term denotes the error correction term and the μ parameter is the speed of adjustment. A negatively estimated, significant μ parameter implies a correction mechanism on the deviations from the equilibrium. In other words, a negative μ parameter suggests a converging process to the equilibrium path.

4. Results

The first step of the time series analysis is examining the stationarity of the variables. As suggested by Granger and Newbold (1974), nonstationary series might lead to spurious regression problem. Thus, to test the stationarity of the variables, the Augmented Dickey–Fuller (ADF), the Phillips–Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root tests, which were developed by Dickey and Fuller (1979), Phillips and Perron (1988), and Kwiatkowski et al. (1992), respectively, are used in this study. The unit root test results in Table 2 present the test results for level and first-difference of the variables estimated through intercept and intercept with trend. Note that the null hypothesis for the ADF and the PP tests is that the variable has unit root (nonstationary) while the alternative hypothesis suggests stationarity. However, the null hypothesis for the KPSS test is that the variable is stationary. Thus, the KPSS test should be inversely interpreted as against the ADF and PP unit root tests. Combining three different unit root tests enable us to examine both the null hypotheses of stationarity and nonstationarity. According to the test results, some of the variables are stationary at level while some others are not. But according to the test results for the first difference of the variables, we may suggest that all the variables become stationary. As mentioned in the previous section, compared to other cointegration methods, the ARDL Bounds Test has an advantage with respect to the stationarity of the variables. The ARDL Bounds test can powerfully analyze the long-run association between these variables regardless of their order of integration.

Table 2. Unit Root Test Results.

Panel A: Augmented Dickey–Fuller (ADF) Unit Root Test				
	Intercept		**Trend and Intercept**	
Variable	**Level**	**First Difference**	**Level**	**First Difference**
LBIST	−2.480	−5.436 ***	−3.728 **	−5.529 ***
LINT	−3.112 **	−4.957 ***	−2.538	−5.313 ***
LPORT	−5.648 ***	−8.092 ***	−5.614 ***	−8.013 ***
LREER	−2.219	−8.561 ***	−3.394 *	−5.684 ***
LBRENT	−2.74 *	−6.036 ***	−1.723	−6.169 ***
LFDI	−3.430 **	−7.179 ***	−3.445 *	−7.417 ***
LY	−0.265	−2.716 *	−2.818	−2.668
Panel B: Phillips–Perron Unit Root Test				
	Intercept		**Trend and Intercept**	
Variable	**Level**	**First Difference**	**Level**	**First Difference**
LBIST	−2.336	−5.326 ***	−2.945	−5.346 ***
LINT	−2.817 *	−4.950 ***	−1.891	−5.335 ***
LPORT	−5.599 ***	−23.049 ***	−5.563 ***	−22.751 ***
LREER	−2.240	−9.383 ***	−3.398 *	−13.614 ***
LBRENT	−2.084	−5.913 ***	−1.772	−6.090 ***
LFDI	−3.286 **	−11.901 ***	−3.223 *	−12.508 ***
LY	−1.642	−14.272 ***	−6.295 ***	−14.073 ***
Panel C: Kwiatowski–Phillips–Schmidt–Shin Unit Root Test				
	Intercept		**Trend and Intercept**	
Variable	**Level**	**First Difference**	**Level**	**First Difference**
LBIST	0.885 ***	0.249	0.146 **	0.062
LINT	0.573 **	0.354 *	0.234 ***	0.053
LPORT	0.114	0.138	0.082	0.133 *
LREER	0.543 **	0.291	0.256 ***	0.082
LBRENT	0.335	0.190	0.220 **	0.060
LFDI	0.430 *	0.158	0.161 **	0.025
LY	0.958 ***	0.131	0.136 *	0.125 *

Note: All the variables are tested in their natural logarithmic form. ***, ** and * denote statistical significance at 10%, 5% and 1% respectively. The lag lengths for the ADF and PP tests are automatically chosen by Schwarz Information Criteria. The bandwidth for the KPSS test is automatically selected through the bandwidth selection procedure proposed by Newey and West (1994). The null hypothesis of the ADF and the PP tests is that the series are not stationary while the null hypothesis of the KPSS test is that the series are stationary.

The result for the ARDL Bounds Test is presented in Table 3. The table shows that the optimal model determined by the Schwarz Information Criteria is ARDL (7, 3, 4, 3, 1, 2, 3). Here, the lag length of the dependent variable might be supposed as high but remember that the frequency of the data is quarterly, and seven quarters correspond to less than two years. The estimated F-statistic value is greater than the upper critical values, which are based on Pesaran et al. (2001). Therefore, one may suggest that the null hypothesis of no cointegration is rejected regardless of the regressors are I(1) or I(0). Since we empirically observed that the variables are cointegrated, we can now continue with the estimation of the cointegration form of the model and the long-run coefficients.

Table 3. The Results for Autoregressive Distributed Lag (ARDL) Bounds Test.

Model: F(LBIST | LINT, LPORT, LREER, LBRENT, LFDI, LY)					
Optimal Lag Length:	ARDL (7, 3, 4, 3, 1, 2, 3)				
F-statistic:	9.402				
Critical Values					
10%		5%		1%	
I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
1.99	2.94	2.27	3.28	2.88	3.99

Note: The critical values of I(0) and I(1) bounds are based on Pesaran et al. (2001). The lag lengths are chosen by Schwarz Information Criteria.

Table 4 shows the long-run and short-run coefficients of the model. First, the diagnostic test results imply that the model has no serial correlation, heteroskedasticity and misspecification problem, and the residuals are normally distributed. Additionally, the plots of the cumulative sum of recursive residuals and the cumulative sum of squares of recursive residuals imply that the estimated parameters are between the critical bounds and stable. The short-run estimation results imply that the error correction term ($ECT(-1)$) is statistically significant with a negative coefficient as it should be. Narayan and Smyth (2006) suggest that if the negative coefficient of the error correction term is between -1 and -2, which is -1.07 here; the system converges to the equilibrium path by fluctuating around the long-run value instead of a monotonic process.

The long-run estimation results, which constitute our main concern, are presented in the top of Table 4. The findings imply that the stock market index, the BIST-100 decreases by -0.35% as the interest rate increases by 1%. Since higher interest rates canalize investors to term deposit, the demand for stock shares decreases and their prices go down. Moreover, higher interest rates raise investment costs and obstruct the expanding behavior of firms that release their shares to the stock market.

International capital flows, on the other hand, are another substantial determinant of the stock market. For Turkey, the findings suggest that both portfolio investment inflows and FDI inflows significantly raise the BIST-100 index. According to the coefficients, the stock market index increases by 0.17% and by 0.13% as portfolio investment inflows and FDI inflows increase by 1% respectively. Although the coefficients are quite close to each other, the findings show that the portfolio investment inflows are a bit more influential on stock market prices. Since Turkey is an emerging country and promises higher relative returns in financial markets, the portfolio investments have been flowing into the Turkish Economy for many years. The descriptive statistics on the portfolio investment inflows in Turkey implies a volatile trend and the fluctuations significantly affect the stock market behavior. The FDI inflows, which are more persistent than portfolio investment inflows show a more stable flow in the Turkish Economy. Since FDI leads to a direct increase in the capital accumulation of Turkey, the stock market absolutely takes advantage of these flows. However, the results imply that portfolio investments are more influential in Turkey as expected from an emerging country.

Table 4. The Long-Run and Short-Run Estimation Results.

Dependent Variable: BIST-100 Index	
Long-Run Estimations	
Regressors	**Coefficients**
LINT	−0.356 (0.048) ***
LPORT	0.175 (0.050) ***
LREER	0.881 (0.301) ***
LBRENT	−0.146 (0.063) **
LFDI	0.137 (0.024) ***
LY	1.804 (0.112) ***
Constant	−29.528 (3.286) ***
Short-Run Estimations (Cointegrating Form)	
Regressors	**Coefficients**
LBIST(−1)	0.634 (0.095) ***
LBIST(−2)	0.599 (0.107) ***
LBIST(−3)	0.091 (0.093)
LBIST(−4)	−0.027 (0.080)
LBIST(−5)	0.087 (0.068)
LBIST(−6)	−0.215 (0.061) ***
LINT	−0.441 (0.088) ***
LINT(−1)	0.286 (0.099) ***
LINT(−2)	0.245 (0.097) **
LPORT	0.022 (0.012) *
LPORT(−1)	−0.111 (0.018) ***
LPORT(−2)	−0.071 (0.014) ***
LPORT(−3)	−0.051 (0.012) ***
LREER	1.176 (0.165) ***
LREER(−1)	−0.626 (0.184) ***
LREER(−2)	−0.474 (0.189) **
LBRENT	0.087 (0.048) *
LFDI	0.032 (0.018) *
LFDI(−1)	−0.078 (0.020) ***
LY	0.580 (0.101) ***
LY(−1)	−0.744 (0.120) ***
LY(−2)	−0.412 (0.100) ***
ECT(−1)	−1.072 (0.108) ***
Diagnostic Tests	
Serial Correlation (p-value)	0.196 (0.82)
Heteroskedasticity (p-value)	0.893 (0.61)
Normality (p-value)	0.976 (0.61)
Functional Form (p-value)	0.766 (0.39)
CUSUM	Stable
CUSUMSQ	Stable

Note: Standards errors are given in parentheses. ***, ** and * denote statistical significance at 10%, 5% and 1% respectively.

The relative value of Turkish currency is positively related to the stock market value. The results suggest that the stock market index increases by 0.88% as the real effective exchange rate increases by 1%. Note that higher values of the real effective exchange rate imply an appreciation of Turkish Lira as against other currencies of the trade partners. Since the REER variable reflects both the fluctuations of the nominal exchange rate and the ratio of consumer price indices of the home country and partner countries. The result obviously reveals that the Turkish stock market is positively influenced by the appreciation of the Turkish currency. So indeed, most of the economic crises and recessions in Turkey are caused by the instability of the currency. The previous studies mentioned in the literature review section dealt with the issue only through nominal exchange rate and found a negative relationship

between stock market and nominal exchange rate. Thus, our findings on real effective exchange rate here confirm the previous findings.

The crude oil price, which is a substantial determinant of stock market fluctuations, is significantly estimated for the Turkish Stock Exchange Market. The findings imply that the stock market index decreases by 0.14% as the Brent Crude Oil price increases by 1%. The negative impact here confirms the previous findings mentioned in the literature review section. Since Turkey is an energy and oil importing country, any increase in the energy sources directly affect the Turkish Economy and the responses are seen in the stock market fluctuations.

Lastly, to control the variations in market activity, the impact of gross domestic product variable has been estimated. The effect of GDP might be interpreted either as the impact of market activity or the impact of economic growth. The results show that the stock market index increases by 1.8% as GDP increases by 1%. As mentioned in the literature review section, some previous studies employed industrial production index while some others employed GDP to proxy market activity. The findings of the present study confirm the empirical findings in the existing literature as expected. Stock markets benefit from active and growing domestic economies regardless of their development path. If the economy is in a growth path, this will bear fruit for the stock market.[5]

What kind of policy implications can be made according to the evidence obtained here? Briefly, all the presumed factors are significantly estimated; and we may suggest that interest rate, portfolio investment inflows, FDI inflows, real effective exchange rate, crude oil prices, and market activity are substantial determinants of the BIST-100, Istanbul Stock Exchange Market. The findings firstly suggest that the Istanbul Stock Exchange Market is negatively affected by any increase in the costs. Increases in interest rate (cost of investment) and crude oil price (cost of operation) significantly reduce the stock market index. Thus, to keep the market value stable or sustain its growth trend, policymakers should focus to reduce the interest rate. Since crude oil price is a global indicator, the policymakers of the domestic country have no chance to keep it stable. However, since the crude oil prices are in foreign currency (US Dollar), the domestic country may try to reduce nominal exchange rate, which will finally lead to reduce the crude oil price in Turkish Lira. Secondly, the real value of the domestic currency against foreign currencies is another substantial determinant of stock market index. To sustain the stock market's increase, policymakers should appreciate the currency. Since real effective exchange rate variable consists of the price index of the home country, the price indices of the foreign partner countries and the nominal exchange rate, policymakers may try to reduce nominal exchange rate and consumer price index (inflation rate) in their home country. Any efforts on these two indicators will serve the purpose and benefit the stock market. Thirdly, international capital inflows raise the stock market value. Both portfolio and FDI inflows lead to an increase in the stock market index. Therefore, to feed the stock exchange market, policymakers should sustain these inflows to the country. Portfolio investments, however, are more liquid compared to FDI. Thus, to benefit from these inflows effectively, the economy administration should use this advantage in respect to the balance of payments and try to find canalize these positive additions into productive sectors such as the manufacturing industry. Following such a strategy will create a multiplier effect and sustain the country's economic growth process. Fourthly, market activity is also a significant determinant of stock market fluctuations in Turkey. To keep the pot boiling in the stock markets, policymakers should sustain the market activity and economic growth. Any recession in the economy directly affects stock

[5] Our argument on choosing GDP instead of industrial production index was that GDP data is available for a longer period. We collected these data from the Central Bank of the Republic of Turkey (CBRT), which made a transformation on industrial production data in 2005. Therefore, the industrial production index data is available by the CBRT only from 2005.However, OECD released an industrial production data for a longer period. Even though we are not sure whether the methodology of the OECD on calculation of industrial production is same with the CBRT, we replicated our quarterly analysis by using industrial production data of OECD to make a robustness check. There are some minor differences in the coefficients, but all the directions of the impacts are same. Thus, we can clearly suggest that the GDP variable reflects the developments in the industrial production as well as reflecting the market activity. These results are available upon request.

markets and cause decreasing returns in the markets, which will lead to a decrease in international capital inflows. In the sequel of such a cycle, both the stock market and the whole economy will be harmed.

5. Conclusions

This study investigated the impact of some outstanding macroeconomic factors on the Turkish Stock Exchange Market, BIST-100. Since stock markets provide substantial information on the home country economies, economists and policymakers attentively watch the fluctuations in these markets and try to predict the forthcoming fluctuations through the factors determining the stock market conditions. Within this perspective, the study examined the impacts of interest rate, real effective exchange rate, portfolio investment inflows, FDI inflows, crude oil price and market activity on BIST-100 index over the 2003Q1–2017Q4 period.

The findings obtained from ARDL Bounds Test suggest that there is a cointegrated long-run relationship between the factors and the stock market index. Therefore, an error correction model is employed to observe the long-run effects of each factor. The results of the long-run analysis imply that increases in market activity, portfolio investment inflows, FDI inflows, and real effective exchange rate raise the stock market index while increases in interest rate and crude oil prices reduce it. These evidences briefly suggest that increasing costs of investment and costs of operation significantly lower the market value (interest rate and crude oil prices respectively). Since Turkey is still in a developing country, which needs growing physical investment, lower interest rates are required to sustain the growth process. On the other hand, Turkey is an energy importer country and an increase in energy prices negatively influence the economy. The estimated impact of the crude oil price indicates the energy-dependent position of the Turkish Economy. International capital inflows have great importance in Turkey for many years. The findings of the present study show that both portfolio investment and FDI inflows positively affect the stock market value. The findings also imply that portfolio investment inflows, which are more liquid have a bit more influential on the stock market. Market activity has a positive impact on the stock market as observed for almost all economies in the existing literature. Lastly, the real effective exchange rate which reflects the "real" value of the domestic currency in global has a significant positive impact on the stock market value. Turkey is an exchange rate-sensitive country for decades and has had important recessions and crises caused by unexpected exchange rate volatilities. Since the real effective exchange rate includes price indices and reflects relative values (higher values imply a valuation of Turkish currency), this coefficient can be interpreted as the need of lower inflation and lower nominal exchange rate.

Policymakers and economists concerned with predictions of the Turkish Stock Exchange Market should necessarily consider the estimated factors in the present study. Moreover, to raise the stock market value, Turkey should induce international capital inflows, raise the real effective value of the domestic currency, raise market activity and implement a lower interest rate. There might be also some endogenous relationships for some variables. Further research should also analyze this point and observe the interactions from an endogenous perspective.

Funding: This research received no external funding.

Conflicts of Interest: The author declares no conflict of interest.

References

Acikalin, Sezgin, Rafet Aktas, and Seyfettin Unal. 2008. Relationships between stock markets and macroeconomic variables: An empirical analysis of the Istanbul Stock Exchange. *Investment Management and Financial Innovations* 5: 8–16.

Adam, Anokye M., and George Tweneboah. 2009. Foreign direct investment and stock market development: Ghana's evidence. *International Research Journal of Finance and Economics* 1: 178–85.

Agbloyor, Elikplimi Komla, Joshua Abor, Charles Komla Delali Adjasi, and Alfred Yawson. 2013. Exploring the causality links between financial markets and foreign direct investment in Africa. *Research in International Business and Finance* 28: 118–34. [CrossRef]

Aydemir, Oguzhan, and Erdal Demirhan. 2009. The relationship between stock prices and exchange rates: Evidence from Turkey. *International Research Journal of Finance and Economics* 23: 207–15.

Baek, Jungho, and Hyun Seok Kim. 2013. Is Economic Growth Good or Bad for the Environment? Empirical Evidence from Korea. *Energy Economics* 36: 744–49. [CrossRef]

Banerjee, Anindya, Juan J. Dolado, David F. Hendry, and Gregor W. Smith. 1986. Exploring equilibrium relationships in econometrics through static models: some Monte Carlo evidence. *Oxford Bulletin of Economics and Statistics* 48: 253–77. [CrossRef]

Ben Naceur, Samy, Samir Ghazouani, and Mohamed Omran. 2007. The determinants of stock market development in the Middle-Eastern and North African region. *Managerial Finance* 33: 477–89. [CrossRef]

Bjørnland, Hilde C. 2009. Oil price shocks and stock market booms in an oil exporting country. *Scottish Journal of Political Economy* 56: 232–54. [CrossRef]

Büyüksalvarci, Ahmet, and Hasan Abdioglu. 2010. The causal relationship between stock prices and macroeconomic variables: A case study for Turkey. *International Journal of Economic Perspectives* 4: 601–10.

Chen, Shiu-Sheng. 2009. Predicting the bear stock market: Macroeconomic variables as leading indicators. *Journal of Banking & Finance* 33: 211–23.

Degiannakis, Stavros, George Filis, and Renatas Kizys. 2014. The effects of oil price shocks on stock market volatility: Evidence from European data. *The Energy Journal* 35: 35–56. [CrossRef]

Dickey, David A., and Wayne A. Fuller. 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association* 74: 427–31.

Eita, Joel Hinaunye. 2012. Modelling macroeconomic determinants of stock market prices: Evidence from Namibia. *The Journal of Applied Business Research* 28: 871–84. [CrossRef]

Engle, Robert F., and Clive WJ Granger. 1987. Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society* 55: 251–76. [CrossRef]

Filis, George. 2010. Macro economy, stock market and oil prices: Do meaningful relationships exist among their cyclical fluctuations? *Energy Economics* 32: 877–86. [CrossRef]

Froot, Kenneth A., Paul GJ O'connell, and Mark Seasholes. 2001. The portfolio flows of international investors. *Journal of financial Economics* 59: 151–93. [CrossRef]

Garber, Peter M. 1990. Famous first bubbles. *Journal of Economic Perspectives* 4: 35–54. [CrossRef]

Granger, Clive WJ, and Paul Newbold. 1974. Spurious regressions in econometrics. *Journal of Econometrics* 2: 111–20. [CrossRef]

Hajilee, Massomeh, and Omar M. Al Nasser. 2014. Exchange rate volatility and stock market development in emerging economies. *Journal of Post Keynesian Economics* 37: 163–80. [CrossRef]

Humpe, Andreas, and Peter Macmillan. 2009. Can macroeconomic variables explain long-term stock market movements? A comparison of the US and Japan. *Applied Financial Economics* 19: 111–19. [CrossRef]

Jeffus, Wendy M. 2005. FDI and stock market development in selected Latin American countries. In *Latin American financial markets: Developments in Financial Innovations*. Bingley: Emerald Group Publishing Limited, pp. 35–44.

Johansen, Søren. 1988. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control* 12: 231–54. [CrossRef]

Johansen, Søren. 1995. *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. Oxford: Oxford University Press.

Johansen, Søren, and Katarina Juselius. 1990. Maximum likelihood estimation and inference on cointegration—With applications to the demand for money. *Oxford Bulletin of Economics and Statistics* 52: 169–210. [CrossRef]

Karacaer, Semra, and Ayhan Kapusuzoglu. 2010. Investigating causal relations among stock market and macroeconomic variables: Evidence from Turkey. *International Journal of Economic Perspectives* 4: 501–7.

Kocakale, Yahya, and Hakan Husnu Toprak. 2015. *Türkiye'nin Reel Efektif Döviz Kuru Endekslerinin Güncellenmesi (Updating Real Effective Exchange Rate Indices of Turkey)*. CBT Working Paper No. 15/06. Ankara: Research and Monetary Policy Department, Central Bank of the Republic of Turkey.

Kwiatkowski, Denis, Peter CB Phillips, Peter Schmidt, and Yongcheol Shin. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root? *Journal of Econometrics* 54: 159–78. [CrossRef]

Mukherjee, Tarun K., and Atsuyuki Naka. 1995. Dynamic relations between macroeconomic variables and the Japanese stock market: An application of a vector error correction model. *Journal of Financial Research* 18: 223–37. [CrossRef]

Muradoglu, Gulnur, Fatma Taskin, and Ilke Bigan. 2000. Causality between stock returns and macroeconomic variables in emerging markets. *Russian & East European Finance and Trade* 36: 33–53.

Narayan, Paresh Kumar, and Russell Smyth. 2006. What Determines Migration Flows from Low-Income to High-Income Countries? An Empirical Investigation of Fiji–Us Migration 1972–2001. *Contemporary Economic Policy* 24: 332–42. [CrossRef]

Newey, Whitney K., and Kenneth D. West. 1994. Automatic lag selection in covariance matrix estimation. *The Review of Economic Studies* 61: 631–53. [CrossRef]

Panopoulou, Ekaterini, and Nikitas Pittis. 2004. A comparison of autoregressive distributed lag and dynamic OLS cointegration estimators in the case of a serially correlated cointegration error. *The Econometrics Journal* 7: 585–617. [CrossRef]

Pesaran, M. Hashem, and Yongcheol Shin. 1999. An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. In *Econometrics and Economic Theory in the 20th Century The Ragnar Frisch Centennial Symposium*. Edited by Steinar Strøm. Cambridge: Cambridge University Press, pp. 371–413.

Pesaran, M. Hashem, Yongcheol Shin, and Richard J. Smith. 2001. Bounds Testing Approaches to the Analysis of Level Relationships. *Journal of Applied Econometrics* 16: 289–326. [CrossRef]

Phillips, Peter CB, and Pierre Perron. 1988. Testing for a unit root in time series regression. *Biometrika* 75: 335–46. [CrossRef]

Pilinkus, Donatas, and Vytautas Boguslauskas. 2009. The short-run relationship between stock market prices and macroeconomic variables in Lithuania: an application of the impulse response function. *Engineering Economics* 65: 26–34.

Rjoub, Husam, Turgut Türsoy, and Nil Günsel. 2009. The effects of macroeconomic factors on stock returns: Istanbul Stock Market. *Studies in Economics and Finance* 26: 36–45. [CrossRef]

Sayilgan, Güven, and Cemil Süslü. 2011. Makroekonomik Faktörlerin Hisse Senedi Getirilerine Etkisi: Türkiye ve Gelişmekte Olan Piyasalar Üzerine Bir İnceleme. *Journal of BRSA Banking & Financial Markets* 5: 73–96.

Shi, Jing, Chris Bilson, John G. Powell, and Julie Wigg. 2010. Foreign direct investment and international stock market integration. *Australian Journal of Management* 35: 265–90.

Singh, Ajit, and Bruce A. Weisse. 1998. Emerging stock markets, portfolio capital flows and long-term economie growth: Micro and macroeconomic perspectives. *World Development* 26: 607–22. [CrossRef]

Soumaré, Issouf, and Fulbert Tchana Tchana. 2015. Causality between FDI and financial market development: Evidence from emerging markets. *The World Bank Economic Review* 29: 205–16. [CrossRef]

Wongbangpo, Praphan, and Subhash C. Sharma. 2002. Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries. *Journal of Asian Economics* 13: 27–51. [CrossRef]