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Relationships between stock markets and macroeconomic variables: an empirical analysis of the Istanbul Stock Exchange

Abstract

The purpose of this study is to investigate the relationships between returns in Istanbul Stock Exchange (ISE) and macroeconomic variables of Turkish economy. Employing cointegration tests and vector error correction model (VECM) on a quarterly data set, we find long-term stable relationships between ISE and four macroeconomic variables, GDP, exchange rate, interest rate, and current account balance. As a result of causality tests, we found unidirectional relationships between macro indicators and ISE index. That is, consistent with the existing literature, changes in GDP, foreign exchange rate and current account balance have an effect on ISE index. However, on the contrary to expectations, changes in the stock market index do affect interest rates.

Keywords: emerging markets, Istanbul Stock Exchange, time series models, macroeconomic variables.
JEL Classification: G14, G2, C32.

Introduction

Beginning in the early 1980s, capital flows to emerging stock markets have continuously increased, following the liberalization of these economies and their removal on foreign capital controls. Rapidly growing economies of emerging markets have attracted the accumulated funds of developed economies that are in search of diversification benefits or eagerly look for higher returns, as named ''return chasers'' by Bohn and Tesar (1996). The forms of capital flows are known as foreign direct investment (FDI) and foreign portfolio investment (FPI). As assumed and also empirically proven by several researches (e.g., Calvo, Leiderman, & Reinhart, 1993), FPI appears to be short-term generally and its benefit to developing economies is doubtful.

The response of market returns to changes in macroeconomic variables cannot be determined in advance since it varies across countries. In addition, it is generally claimed that the global variables are consistently more important than the domestic ones in explaining returns across markets. Nevertheless, since the markets are inherently linked to some of the domestic economic variables, weaknesses in the macroeconomic environment, poor policymaking and implementation even in a single emerging market may be transmitted to other markets in today's global market place. For example in the last decade, following weak macroeconomic fundamentals and over leveraged banks, many emerging economies, from Argentina to Russia, experienced severe financial crises that led to increased market volatility and sharp declines in, whether near or far, many other markets' valuations.

Assuming that macroeconomic fluctuations pose influence on stock prices through their effect on future cash flows and the rate at which these cash flows are discounted, the relationship between stock prices and macroeconomic variables has been widely investigated. The arbitrage pricing theory (Ross, 1976) has been the primary motive of earlier studies and may be considered as global asset pricing models. Among macroeconomic factors included in the models are either monetary ones such as inflation, interest rate, exchange rate, etc. or real economic ones such as production, oil prices, etc. The studies aim to explain expected returns over time. Therefore, the motive and methodologies employed are based upon the understanding that expected returns are associated with these variables. And, the direction of the relationship is assumed to be unidirectional, and from macroeconomic variables to stock returns.

As studied and observed empirically, the volatility in emerging stock exchanges is almost a common feature (e.g., Aggarwal, Carla, & Ricardo, 1999; Bekaert & Harvey, 1997). Stock markets are likely to be affected by economic policies. Moreover, due to lower depth and lack of timely and reliable company-specific information, macroeconomic variables are mostly left to be the only available data to rely on for investors' decision making. There are theoretical implications to believe that a connection between stock returns and macroeconomic variables exists. Among these are Fama (1981), Chen et al. (1986), Geske and Roll (1983), Boudoukh and Richardson (1993), Mandelker and Tendon (1985). Existing literature on the subject is mostly focused on developed markets. However, a massive amount of funds currently flows into emerging stock markets for the sake of efficient asset allocation due to liberalizations and increased liquidity in these markets. This makes it interesting to investigate possible connections between emerging stock markets and country-specific macroeconomic variables.

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Therefore, this study aims to contribute filling this gap in the literature by performing a single emerging market examination of the subject. Turkey is chosen to conduct this study on since it has been either long neglected in spite of its impressive economical and stock market performance or included in cross-country studies along with other emerging economies.

Although the Turkish stock market is growing rapidly, the market capitalization of ISE is much smaller compared to developed markets. Thus, it can be almost certainly claimed that ISE is more subject to speculative activities, manipulations, and government interventions than a developed market. Because of different investor perceptions, it is likely that ISE responds to economic variables differently from any developed market. If it appears that no significant relationship exists between stock market index and domestic macroeconomic variables, than we may conclude that the Turkish stock market behaves independently of fundamental economic activities.

In this study, we aim to investigate whether there is a long-term relationship between stock market returns and key macroeconomic indicators – exchange rate, interest rate, GDP, and current account balance. There are differences among economies in terms of the significance of domestic macroeconomic indicators. In addition, these differences are consistent with the underlying economic environment, and may be associated with the stock market at varying degrees. Thus, we were prepared to end up with surprising empirical results compared to those of existing literature. Employing a vector error correction model (VECM) following a unit root test, the study finds that the Turkish market reflects long-term unidirectional relationships between selected macroeconomic variables and ISE index.

This study contributes to the literature on the dynamic relationships between stock markets and macroeconomic indicators within the context of a multivariate framework in an emerging market. Best to our knowledge, we are the first to investigate the relationships between the macroeconomic indicators and the stock market of Turkey on most up-to-date data by conducting the set of analyses, which constitutes another unique aspect of this study. These analyses include unit root tests, Johansen cointegration tests, VECM estimation, and Granger causality tests in this given order. The main result underlines the effect of macroeconomic variables on stock market index performance.

1. Literature review

The relationship between stock market returns and fundamental economic activities in developed economies and especially in the US have been documented in numerous studies (Fama, 1970, 1990). Arbitrage pricing theory (APT) has been extensively used in studies analyzing the relationship between stock market and macroeconomic indicators. An early theory of arbitrage pricing uses a functional form to test the relationship between stock index and macroeconomic variables. All individual stocks are affected by common factors. Market index can be affected by macroeconomic variables, such as changes in interest rate, money supply, economic growth, and inflation. However, the APT model has a drawback as it assumes the constant term to be a risk-free rate of return (Brahmasrene and Jiranyakul, 2007).

Among the macroeconomic indicators, exchange rates have been displayed to influence stock prices through trade effect (Geske and Roll, 1983). The depreciation of domestic currency increases the volume of exports. Provided that the demand for export goods is elastic, this in turn causes higher cash flows for domestic companies, and thus causes stock prices to increase. As one of macroeconomic variables of this study, current account balance is chosen. Current account deficit and/or trade deficit is considered a factor affecting country risk for investors (e.g., Tourani-Rad, Choi, and Wilson, 2006; Sun and Tong, 2000). Although we aware that exchange rate and current account balance are strongly correlated, we still use the both as macroeconomic variables in the model. That is, because the Turkish economy has a history of persisting current account deficit and because we employ vector auto regression (VAR) model, it is not considered to produce any weakness to use both variables simultaneously. The relationship between the stock returns and inflation, however, is highly controversial. Empirical researches have dominantly proven a negative relationship between stock returns and inflation (Fama and Schwert, 1977; Geske and Roll, 1983). An increase in inflation has been predicted to increase the nominal risk-free rate, which in turn would higher the discount rates used in stock valuation. Increased discount rate's effect would be zeroed sum only if firms' cash flows increase at the same rate. On the other hand, in the case that contracts are nominal and cannot adjust accordingly, the effect will be negative. Therefore, in this context, the effect of nominal interest rates on stock prices is also expected to be negative (Chen et al., 1986). The level of the real economic activity is expected to have a positive effect on cash flows ex ante, and thus will affect stock prices in the same direction (Fama, 1990).

Rapach (2001) examines the effects of money supply, aggregate spending, and aggregate supply shocks on real US stock prices in a structural VAR model. One of their main findings is that real stock

returns reflect a negative correlation with inflation. Employing quarterly stock index and macroeconomic data of Canada, Germany, Italy, Japan, and the US, Cheung and Ng (1998) observe evidence of long-run co-movements between five national stock market indices and measures of aggregate real activity including the real oil price, real consumption, real money, and real output. Long-term relationships between the stock market index and various macroeconomic indicators are commonly investigated. Mookerjee and Naka (1995), on the other hand, show that short-run relationships among these variables exist in the Japanese stock market by employing a VECM in a system of seven equations.

By employing a bivariate error-correction model, Ajayi and Mougoue (1996) examine the relationship between stock prices and exchange rates. They study both the short-run and long-run relationships between the two variables in eight major industrial markets. Their results show that an increase in domestic stock prices has a negative short-run effect on the domestic currency value. However, sustained increases in the domestic stock prices in the lon grun cause an increase in the domestic currency, due to the increased demand for the currency. Hashemzadeh and Taylor (1998) investigate the direction of causality between the money supply, stock prices, and interest rates in the US. The relationship between money supply and stock prices is reflected by a feedback system, with money supply explaining some of the observed variation in stock price levels, and vice versa. Causality runs from interest rates to stock prices, but not the other way around.

Emerging stock markets have been identified as being at least partially segmented from global capital markets. As a consequence, it has been argued that local factors rather than global ones are the primary source of equity return variation in these markets. The level of integration affects the selection of global versus local variables. If we accept that markets are not perfectly integrated, especially in relation to emerging markets, then it is likely that national factors may be more relevant than global ones (Bilson, Brailsford, and Hooper, pp. 401, 404).

Bailey and Chung (1995) study the systematic influence of exchange rate fluctuations and political risk on stock returns in Mexico. Their major findings reflect consistency with time-varying equity market premium for exposure to the changes in free market dollar premium. Using Granger causality and monthly data, Abdalla and Murinde (1996) investigate the relationships between exchange rates and stock prices in India, Korea, Pakistan, and the Philippines. They find a unidirectional causality from exchange rates to stock prices in all countries except the Philippines, where stock prices Granger cause stock prices. Mookerjee and Yu (1997) report that not all macroeconomic variables are cointegrated with stock prices in Singapore.

Investigating the effects of changes in the consumer price index on industrial production and stock market returns for China, Soenen and Johnson (2001) report a positive and significant association between stock returns and real output. Inflation seems to have no impact on Chinese real stock returns. Ibrahim (2003) obtained results suggesting cointegration between returns and the money supply in the Malaysian stock market. Patra and Poshakwale (2006) examined the short-run dynamic adjustments and the long-run equilibrium relationships between selected macroeconomic variables, trading volume and stock returns in the Greek stock market during the period of 1990 to 1999. They reach results showing that short run and long run equilibrium relationship exists between inflation, money supply and trading volume and the stock prices in the Athens stock exchange. No short run or long run equilibrium relationship is found between the exchange rates and stock prices.

Brahmasrene and Jiranyakul (2007) examined the relationship between stock market index and selected macroeconomic variables during the post-financial liberalization (pre-financial crisis) and post-financial crisis in Thailand. In the empirical analysis, they perform unit root, cointegration and Granger causality tests. Their results show that money supply has a positive impact on the stock market index, while the industrial production index, the exchange rate and oil prices have a negative impact in the post-financial liberalization period. With respect to the post-financial crisis, money supply is reported to be the only variable positively affecting the stock market. Employing a six-variable VAR model, Abugri (2006) studies whether selected macroeconomic indicators like exchange rates, interest rates, industrial production and money supply in four Latin American countries significantly explain market returns. He reports that the global factors are consistently significant in explaining returns in all the markets. The country variables are found to impact the markets at varying significance and magnitudes.

Kasman (2002) chooses GDP growth, industrial production, inflation and exchange rate as macroeconomic variables relevant to the characterization of the business cycle for the Turkish economy. Using daily returns, she estimates monthly standard deviations of stock returns as a measure of volatility. She reports that the plots of the volatility measures show an upward trend in

volatility of National 100 index, suggesting public's correct impression about the increased stock market volatility in ISE. Moreover, all volatility plots have significant jumps during the times of important political and economic events of Turkey.

Using a multivariate approach, Muradoglu, Taskin and Bigan (2000) study the causal relationship between macroeconomic variables and stock returns in nineteen emerging markets, including Turkey. They conduct Granger causality tests for each country on a set of selected macroeconomic indicators. They conclude that two-way interaction between stock return and macroeconomic variables derives from the size of the stock markets, and their integration with the world markets, through various measures of financial liberalization.

2. A brief on Istanbul Stock Exchange

Prior to January 1980, Turkish economy was government-dominated and characterized by restrictions. It was a highly centralized and state-oriented economy with no capital markets and with prohibitions on foreign exchange operations. Beginning the initiative taken by the government in January 1980, the economy and financial markets have undergone a comprehensive structural transformation. During the 1980s, from the liberalization of interest rates to the introduction of convertible Turkish lira, serious measures have been taken to create a highly liberalized and globally integrated economy. Following the start of these steps toward liberalization, the Istanbul Stock Exchange was founded in 1986 and opened trading with 42 companies listed. As of November 2007, the number of listed companies has reached 327 (www.cnnturk.com) with a market capitalization of $200 billion (siteresources. worldbank.org); and the daily trading volume has exceeded $2 billion (www.trt.net.tr). It carried the titles of the most rapidly growing and also the exchange with the highest return in its recent past. It has also been highly volatile. However, this should not be surprising since it is a common feature for almost all emerging market exchanges. During the 20 years of its history, ISE has witnessed a number of crises, and political and economical turmoils. Considering the lacking in depth and in also timely information flow of companies, the market participants have to count almost only on macroeconomic data for efficient decision-making as pointed out by Muradoglu, Berument and Metin (1999).

Equity instruments are necessary source of funds for businesses. A continuous increase in private investment, especially by issuing new shares of stock, may promote economic growth, a high employment rate, and thus, an enhanced economic stability. By taking the financial liberalization measures in 1980 and 1989, the Turkish government urged capital inflows in FPI as well as in FDI. As a result, the volume of stock trading increased substantially in recent years especially by foreign investors so that the 72% of outstanding shares in the market is owned by foreign capital as of November 2007 (www.mkk.com.tr).

3. Data, methodology and empirical findings

This study uses stock exchange market returns, production levels, interest rates, foreign exchange rates and current account deficits of Turkey in a time-series manner. All data set, obtained from the Central Bank of Turkey's data base, is quarterly and runs from the last quarter of 1991 to the last quarter of 2006.

In the literature of economics, interactions between the national and global macroeconomic indicators and stock market returns are studied by using various econometric models (e.g., Kwon and Shin, 1999; Bilson, Brailsford and Hooper, 2001; Abugri, 2006). This study aims to identify the relationships between macroeconomic variables and stock market returns for Turkey. Most of the studies use macro indicators as the explanatory forces of the changes in stock market returns. However, the endogeneity problems between the returns from stock market and macroeconomic variables, and among macroeconomic variables put some limits on econometric model to select.

$$ISE_t = \beta_0 + \beta_1 GDP_t + \beta_2 NIR_t + \beta_3 USD_t + \beta_4 CAB_t + e_t ,$$

where *ISE* – Istanbul Stock Exchange Index (ISE-100, in 1986 ISE-100 = 1); *GDP* – GDP (in constant USD); *NIR* – nominal interest rates (monthly); *USD* – nominal exchange rates (USD/TL); *CAB* – current account balance.

Basic econometric model giving the structure of relationship between ISE and selected macroeconomic variables is presented above. First, stationarity of each series will be checked since using OLS with variables carrying unit roots will bring spurious results (Gujarati, 2003).

When the unit root test results are examined in Table 1, it is observed that all five series, including Istanbul Stock Exchange Index figures, are not stationary at their own levels. PP and ADF test scores show that GDP, interest rates, foreign exchange rates (TL per USD), current account balance and ISE index figures, all of them are integrated from the first order (I(1)). Since all variables are not stationary at their own levels, OLS model is not appropriate to test the relations of this study. Because of endogeneity problem and unit

roots of the series, VAR model is chosen as the basis to test the relationships between selected macro variables and stock market index figures.

Table 1. Unit root test statistics

Series		ADF (with constant) *Prob.	PP (with constant) *Prob.
ISE	*level*	1.0000	1.0000
	first difference	0.0001	0.0001
GDP	*level*	0.9849	0.9820
	first difference	0.0000	0.0000
NIR	*level*	0.6391	0.0591
	first difference	0.0000	0.0000
FER	*level*	0.3586	0.5530
	first difference	0.0000	0.0000
CAB	*level*	0.8337	0.8117
	first difference	0.0000	0.0000
Test critical values:		1% level	-3.632900
		5% level	-2.948404
		10% level	-2.612874

Notes: * MacKinnon (1996) one-sided p-values. All data set is used at seasonally adjusted levels.

The VAR model is an effective means of characterizing the dynamic interactions among economic variables since it introduces very few restrictions (Lastrapes and Koray, 1990; McMillin, 1991).

The use of the VAR model also allows inclusion of the appropriate lag lengths. This is important because of the time delays in the production of information concerning the macroeconomic variables. In particular, the transmission and incorporation of information into stock returns are not always instantaneous. This may be the case because reporting delays may create a lag between the observation of data concerning a macroeconomic variable and the incorporation of that information into stock returns (Abugri, 2006, p. 5).

In order to decide what type of VAR model will be used in this study, after determination of unit roots and integration at first order, Johansen cointegration tests are applied to control whether cointegration exists among these five variables. Cointegration analysis is important, since if the error term coming from the linear combination of two variables is stationary, then there is cointegration between the two variables. When there is no cointegration between the two variables, then there is no long-term relationship between two variables.

Table 2. Johansen cointegration test results

Series: ISE, GDP, USD, NIR, CAB Unrestricted cointegration rank test (Trace)			
Hypothesized No. of CE(s)	Trace statistic	0.05 Critical value	Prob.**
None *	140.1268	76.97277	0.0000
At most 1 *	75.37449	54.07904	0.0005
At most 2	33.19240	35.19275	0.1607
At most 3	14.79520	20.26184	0.5056
At most 4	6.437426	9.164546	0.1595
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level			
Unrestricted cointegration rank test (Maximum Eigenvalue)			
Hypothesized No. of CE(s)	Max-Eigenvalue statistic	0.05 Critical value	Prob.**
None *	64.75233	34.80587	0.0000
At most 1 *	42.18209	28.58808	0.0005
At most 2	18.39721	22.29962	0.1607
At most 3	8.357771	15.89210	0.5056
At most 4	6.437426	9.164546	0.1595
2 Cointegrating equation(s):	Log likelihood -2841.995		

Normalized cointegrating coefficients (satatistically signifacant results at α = 0.05)					
ISESA	GDPSA	USDSA	NIRSA	CABSA	C
1.000000	0.000000	-0.026336	-1687.390	21.46568	130378.3
0.000000	1.000000	-8.183654	-518686.3	5464.982	17043852

Notes: Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis p-values.

Cointegration analyses have been used to test long-run relationships between macroeconomic variables and stock returns in various studies before (e.g., Mookerjee and Yu 1997; Cheung and Ng, 1998).

This study uses cointegration analysis not only to test whether there is a long-term relationship between macro variables and stock returns, but also to decide specific VAR model to use in adjustment and short-term coefficient estimations. Johansen test is used to test cointegration among ISE index, GDP, interest rate, foreign exchange rate and current account balance by using up to four lags length.

The lag length is decided by using Akaike IC. It is seen from Table 2 that, both Maximum Eigenvalue and Trace tests result in the same decision: there are two cointegration relationships among five variables we study. This means that there are two long-term stable relationships among these five variables, namely returns on stock market and four macroeconomic variables. In other words, looking at the information coming from the past changes in ISE figures and four macroeconomic indicators, it may be concluded that all five variables move together in the lon grun.

Table 3. Statistically significant (at $\alpha = 0.05$) results from VECM estimates

Short-run coefficients	D(ISE)	D(GDP)	D(USD)	D(NIR)	D(CAB)
D(ISE(-2))				-0.003579	
D(ISE(-3))	-0.444374			0.004330	
D(ISE(-4))	-0.877187				
D(GDP(-3))	-0.000904				
D(GDP(-4))	-0.001118				
D(USD(-1))					-0.001261
D(USD(-2))			-0.538149		-0.001068
D(USD(-3))					-0.000704
D(USD(-4))	-0.001489				
D(NIR(-1))		-50275.88			
D(NIR(-2))					-43.78486
D(CAB(-1))					0.394295
D(CAB(-3))	-0.794723				
D(CAB(-4))	-0.570173				
Adjustment coefficients					
Coint. Eq. 1	-0.137679			0.000319	
Coint. Eq. 2	0.000565				-0.000141
R-squared	0.763833	0.430389	0.539722	0.493933	0.615133
Adj. R-square	0.629792	0.107096	0.278483	0.206706	0.396695
F-statistic	5.698504	1.331267	2.066008	1.719659	2.816053

Autocorrelation and heteroskedasticity tests of the estimate results given in appendices provide the healthy signs to make analyses and interpretations on VECM estimates. This study especially looks for the relationship between ISE and other four macro variables. Therefore, we analyze only the relationship between ISE and the others.

In adjustment coefficients part of Table 3, we find significant coefficients to assure common long-term moves of stock returns and four macroeconomic indicators. Four statistically significant coeeficients, of which two belong to stock returns, show the response of ISE, interest rates and current account balance to the deviations from common long-term changes in five variables. The greatest response to any deviation from long-term equilibrium is coming from stock returns. In other words, moves in stock returns keep long-term relationship among ISE and four macroeconomic variables stable.

Looking at the short-run coefficients in Table 3, we may observe the reasons of the changes occurred in five variables in the short run. The focus here is on the reasons of the changes in ISE figures and the impact of ISE's past moves on the current changes of four macroeconomic variables, if any. The changes in stock returns may be explained by the past changes of ISE index itself, GDP, exchange rates, and current account balance but not interest rates. All these changes in the past are creating a negative impact on the moves of stock returns. Of these impacts on the current moves of stock returns, the past moves of stock return and current account balance are the important ones.

We next look at how the past moves of ISE index create impact on current changes in macroeconomic variables. It shows that past moves of ISE index lead changes only in the moves of interest rates but not in other three variables. Looking at the signs of

the coefficients, we clearly observe that one is negative and the other is positive. Consequently, it is not certain to say whether information coming from the past moves of ISE index has a positive or negative impact on the current moves of interest rates.

When we talk about the estimation results from VECM analysis, one more step should be taken for the sake of consistent results on the relationships between stock market returns and macro economic variables. If VECM estimates sign some meaningful relationships between the variables, then causality relations should be checked to back up results from estimation. One of the techniques for controlling causality is Granger causality test. The general model of causality between two variables is given below:

$$X_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i \cdot X_{t-i} + \sum_{j=1}^{m} b_j \cdot Y_{t-j} + u_t ,$$

$$Y_t = b_0 + \sum_{j=1}^{m} b_j \cdot Y_{t-j} + \sum_{i=1}^{m} \alpha_i \cdot X_{t-i} + v_t ,$$

If b_j is statistically significant, then we can say that Y is the Granger cause of X, and if α_i is meaningful then it is accepted that X is the Granger cause of Y.

Table 4. Statistically significant results of Granger causality tests

Dependent variable: D(ISESA)			
Excluded	Chi-sq	df	Prob.
D(GDP)	20.86686	4	0.0003
D(USD)	18.12791	4	0.0012
D(CAB)	8.684216	4	0.0695
All	47.72373	16	0.0001
Dependent variable: D(GDPSA) (statistically there is no significant result)			
Dependent variable: D(USDSA) (statistically there is no significant result)			
Dependent variable: D(NIRSA)			
Excluded	Chi-sq	df	Prob.
D(ISE)	15.87233	4	0.0032
D(GDP)	8.074076	4	0.0889
All	24.94797	16	0.0707
Dependent variable: D(CABSA)			
Excluded	Chi-sq	df	Prob.
D(USD)	8.024539	4	0.0907
Only statistically significant results are shown above (at α = 0.1)			

Examining the results of Granger causality tests in Table 4, we look for two ways of causality, one from stock market to four macroeconomic variables, and the other is from macro variables to stock market. When α is taken as 0.1, the results of VECM estimates are supported by the results of causality tests. GDP, exchange rate and current account balance are Granger cause of ISE. Interest rate is not causing changes in ISE, and these results are consistent with the results of VECM estimates. In other words, while GDP, CAB and exchange rate series do improve the forecasting performance of ISE, interest rates do not help the prediction of ISE figures. Lastly, when the causes of changes in four macroeconomic variables are analyzed, we look for the effect of ISE index especially. It is seen from Table 4 that changes in ISE index are Granger cause of interest rates only. Therefore, it is concluded that ISE figures may help the forecasting of interest rates but not the other way around. Even though the first causation from macro indicators to stock index is in line with expectations, the latter one from ISE to interest rate contradicts with expectations. Nevertheless, similar causalities are also reported by Muradoglu, Taskin and Bigan (2000).

Conclusion

This study examines the relationships between stock market returns and domestic macroeconomic variables in the Turkish economy. Employing cointegration tests, a vector error correction model (VECM) and causality tests on a quarterly data set, we find first long-term stable relationships among ISE and four macroeconomic variables – GDP, exchange rates, interest rates, and CAB, and second unidirectional relationships between macro indicators and ISE index. It should be noted that stock price variability is fundamentally linked to the changes in macroeconomic variables.

The cointegration test and the vector error correction model illustrate that stock price index is cointegrated with a set of macroeconomic variables — that is, production, exchange rate, interest rate and current account balance — which provides a direct long-run equilibrium relationship. There are two ways of causalities. One is from macro indicators to stock returns, which is consistent with the previous findings that the stock market rationally incorporates economic activity changes into the pricing. This causality gives rise to help the improvements in predictions of ISE changes by using the past information on the moves of GDP, CAB, and exchange rates. The other causality, on the contrary to expectations and the existing literature, is from stock market to interest rate, but not the other way around. A possible explanation for this unexpected result is that dominant share of foreign investors in the Turkish stock market may send signals of information trading to domestic participants of the interest rate market.

As observed from the empirical results, the past moves of ISE, GDP, exchange rate and current

account balance have negative impacts on the current changes in ISE index. In addition, there is a clear effect of stock market on the moves of interest rate but the net impact whether positive or negative is uncertain.

These findings may have important implications for decision-making by investors. For example, the finding that domestic macroeconomic variables have varying impacts and significance on returns in a market may prove itself useful for portfolio diversification strategies as well as achieving better risk-return tradeoffs. The results also imply that investors may improve their portfolio performance in individual markets by focusing on the varying significance of the economic risk factors.

Even though it is beyond the scope of this study, the significant and consistent effects of the global variables on market returns also highlight the importance of external shocks to emerging markets. Investors in these markets may have to look beyond the domestic economic environment to determine their full risk exposures. Therefore, possible impacts of external factors on the Turkish stock market remain to be the subject of further research.

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Appendix A. Autocorrelation test results for VECM

H_0: no serial correlation at lag order h		
Lags	*LM-Stat*	*Prob*
1	12.99862	0.9765
2	32.80140	0.1361
3	31.93735	0.1598
4	33.93552	0.1113

Appendix B. Heteroskedasticity test results for VECM

Joint test: Chi-sq		df		Prob.	
691.7593		660		0.1898	
Individual components:					
Dependent	R-squared	F(44,14)	Prob.	Chi-sq(44)	Prob.
es1*res1	0.814586	1.397883	0.2526	48.06059	0.3118
res2*res2	0.760541	1.010571	0.5205	44.87192	0.4351
res3*res3	0.863091	2.005852	0.0786	50.92235	0.2199
res4*res4	0.789508	1.193430	0.3737	46.58098	0.3667
res5*res5	0.860484	1.962428	0.0853	50.76855	0.2243
res2*res1	0.904051	2.012964	0.0737	53.33899	0.1580
res3*res1	0.883809	2.420252	0.0374	52.14472	0.1868
res3*res2	0.908232	2.409076	0.0355	53.58571	0.1525
res4*res1	0.817820	1.428342	0.2380	48.25138	0.3050
res4*res2	0.741906	0.914631	0.6104	43.77245	0.4813
res4*res3	0.838356	1.650228	0.1546	49.46300	0.2642
res5*res1	0.743119	0.920456	0.6048	43.84405	0.4783
res5*res2	0.837564	1.640631	0.1575	49.41627	0.2658
res5*res3	0.797752	1.255042	0.3326	47.06735	0.3481
res5*res4	0.746188	0.935431	0.5903	44.02510	0.4706