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RESEARCH ARTICLE

What Determined Stock Returns in Turkey from 1990 to 2022: Evidence from Structural Break Regression

Türkiye'de Hisse Senedi Getirilerini Ne Belirler: 1990 - 2022 Dönemi Yapısal Kırılmalı Regresyondan Kanıtlar

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ABSTRACT

This study reassesses the impact of key macroeconomic variables (industrial production, interest rate, inflation, money supply, trading volume, US dollar, oil, and gold prices) on Turkish stock from 1990:01 to 2022:01. The article uses a breakpoint regression model considering the possibility of a structural break in the relationship between stocks and economic variables over time. According to the model, the structural break date was determined to be May 2004. Before the structural break, only the interest rate, money supply, and trading volume statistically affected the stock market return. After May 2004, oil prices and the US dollar rate also started to have an impact on the Borsa Istanbul-100 index. The empirical results underline that the effect of economic factors on the stock market is not constant, and investors' decisions are shaped around reforms that only affect economic policies in Turkiye.

Keywords: Stock return, Macroeconomic variables, Structural break regression, Turkiye
JEL Classification: G1, G12, G15

ÖZ

Bu çalışma, temel makroekonomik değişkenlerin (sanayi üretimi, faiz oranı, enflasyon, para arzı, ticaret hacmi, ABD doları, petrol ve altın fiyatları) 1990:01'den 2022:01'e kadar Türkiye borsası üzerindeki etkisini yeniden analiz etmektedir. Çalışma, hisse senedi getirileri ve ekonomik değişkenler arasındaki ilişkide, zaman içinde herhangi bir kırılma olasılığını göz önünde bulundurarak, yapısal kırılmalı regresyon modelini kullanmaktadır. Modele göre yapısal kırılma tarihi Mayıs 2004 olarak belirlenmiştir. Söz konusu tarihten önce sadece faiz oranı, para arzı ve işlem hacmi istatistiksel olarak borsa getirisini etkilerken, Mayıs 2004'ten sonra petrol fiyatları ve ABD doları kuru da Borsa İstanbul-100 endeksini etkilemeye başlamıştır. Ampirik sonuçlar, ekonomik faktörlerin hisse senedi piyasası üzerindeki etkisinin sabit olmadığını ve yatırımcıların kararlarının Türkiye'de sadece ekonomi politikalarını etkileyen reformlar etrafında şekillendiğini açıkça ortaya koymaktadır.

Anahtar kelimeler: Hisse senedi getirisi, Makroekonomik değişkenler, Yapısal kırılma regresyonu, Türkiye
JEL Sınıflaması: G1, G12, G15

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1. Introduction

Undoubtedly, macroeconomic factors that affect the cash flow of companies also direct the stock markets (Chen, Roll & Ross, 1986). Since the development of the Arbitrage Pricing Model by Ross (1976), many studies have provided evidence of why there may be a relationship between stock prices and macroeconomic variables. For instance, industrial production is the leading economic factor that is thought to have a positive effect on stock returns. Since industrial production, which is an indicator of future economic growth, will increase the profitability of companies, stock prices are expected to go up. (Camilleri, Scicluna & Bai, 2019). The long-run interrelation between market interest rates and stock prices can be interpreted using the discounted cash flow model. According to the model, the increase in interest rates decreases the present value of the dividends to be paid by the companies. Secondly, since the increase in interest rates will reduce investments and contract the economy, the cash flows of companies will be adversely affected. Therefore, there is an inverse relationship between interest rates and share prices. (Mok, 1993; Lobo, 2000). It is possible that the effect of inflation on stock returns can be both positive and negative. As consumer prices strongly impact interest rate, investors' demand for bonds increases and they start removing stocks from their portfolios. On the other hand, firms try to find funds by issuing stocks instead of bonds, as market interest rates are high in the inflation environment. For this reason, selling pressure in the stock market causes prices to fall (Quayes & Jamal, 2008). Stocks ultimately represent physical assets. As the general level of prices rises during inflationary periods, the price of physical assets increases. Thus, stock returns are expected to increase depending on the fixed assets owned by the companies (Anari & Kolari, 2001). However, if inflation rates are perceived by investors as a signal of future economic decline, stock prices will fall (Roley & Schall, 1988). The nexus between the money supply and stock return is ambiguous because the money supply has the power to directly affect inflation rates, interest rates, and aggregate demand. In fact, since the expansion in the money supply means excess liquidity for investors, this surplus is used for stock purchases. However, if unexpected increases in monetary expansion trigger inflation and raise interest rates, stock

markets begin to move downwards. (Palmer, 1970; Alatiqi & Fazel, 2008). The correlation between foreign exchange and stock returns varies according to the situation. For instance, devaluation increases the demand for stocks of some companies because the weak exchange rate allows foreign investors to buy domestic stocks at lower prices. But on the other hand, a high exchange rate policy can increase the revenues of exporting companies (Hughen & Beyer, 2015). The effect of oil prices on stock prices varies depending on whether the country is a net oil exporter or importer. Since the jumps in world oil prices will cause a current account surplus in net oil-exporter countries, the profitability of firms increases and stock markets rise (Adaramola, 2012). When we look at the price movements between gold and stocks, if economic uncertainty increases or inflation rates rise, investors prefer gold (Melvin & Sultan, 1990). Therefore, it is emphasized in the literature that the gold price rises as the stock prices decrease (Smith, 2002). However, the fact that investors prefer both gold and stocks at the same time due to economic optimism causes a positive correlation between the two variables (Chua, Sick & Woodward, 1990). The trading volume is important in terms of showing how the information reaching the market is spread by the investors. The trading volume of stocks gives an idea about where prices may go. In general, a linear relationship is observed between volume and price (Karpoff, 1987). This study tries to reveal the effects of the macroeconomic factors briefly mentioned above on the returns of Borsa Istanbul in the period between 1990:01 and 2022:01. Considering that the data covers a long period, it seems unlikely that the factors affecting stock prices will remain constant for several decades. In this study, taking into account the fact that there may be structural breaks (resulting from business cycles, economic policies, or technological developments) in the affiliation between share prices and economic fundamentals, Bai and Perron's (1998, 2003) regression model was used. For this reason, our study will shed light on the literature at several points. To the best of our knowledge, this is the first study to evaluate the effect of economic variables on stock returns since the establishment of the stock market in Turkey. Secondly, the changing structural association between the stock market and fundamental economic variables is determined. Lastly, given the length of the period (1990-2022), the Turkish economy experienced many financial crises, entered various periods of political

instability, and had to struggle with high inflation. However, sometimes by agreeing with the IMF or adhering to European Union criteria, Turkey manages to maintain its economic growth. Therefore, investigating the response of the Turkish stock market to economic variables is important to both policymakers and investors, in terms of implementing financial policies and investment strategies in developing countries. This article presents a literature review, followed by the data and econometric methodology, and finally the empirical findings and conclusion.

2. Literature review

The literature on how economic factors affect stock returns is quite extensive for both emerging and developed capital markets. On the point of emerging markets, Patra & Poshakwale (2006) found that the trading volume, inflation, and money supply are in an equilibrium relationship with the Athens stock exchange. Hoque, Soo Wah & Zaidi (2019) showed that oil prices are a systematic risk factor for the Malaysian financial markets by using the FAVAR approach. Chang, Bhutto, Turi, Hashmi & Gohar (2021) employed the QARDL model and their findings show that the response of exchange rate, interest rate, and inflation on the Pakistan stock exchange depends on market conditions such as whether the market is bullish or bearish. Sahu & Pandey (2020) documented the positive relationships between the money supply and Indian stock markets. Fedorova & Pankratov (2010) emphasized the role of oil price, Euro/US dollar ratio, and net capital movement on the return changes of the Russian MICEX stock exchange. Lee & Rui (2000) determined that the volumes of the Shanghai A and Shenzhen B indices in the Chinese financial market can be used to predict returns. Hsing & Hsieh (2012) posited that developments in industrial production have improved the Polish capital market, while expected inflation has a negative effect. Santos, Neto, Araujo, De Oliveira & Abrita (2013) indicated that the Brazilian stock market index reacts adversely to the shocks of exchange and interest rates. Iyke & Ho (2021) accentuated that the exchange rate risk of the South African stock market increases even more after the onset of the Covid-19 disease. Ajmi, El-Montasser, Hammoudeh & Nguyen (2014) stated that oil price fluctuations affect most MENA stock markets to varying degrees.

When the literature is examined for Turkey, which is the subject of the study, Rjoub, Türsoy & Günsel (2009) concluded that unanticipated inflation, interest rate, and money supply have a certain impact on Borsa Istanbul stock return. Tursoy & Faisal (2018) reported the negative interaction between stock and gold prices by using the ARDL model. Polat (2020) and Mandacı & Kırkpınar (2021) studied the effect of oil shocks on the stock indices with time-varying parameter-based econometric models and presented various portfolio strategies. Tiryaki, Ceylan & Erdoğan (2019) found that increases in industrial production in Turkey increase the BIST-100 returns. Nalın & Güler (2013) and Kıran (2010) focused on the performance of trading volume in explaining the return and volatility of Borsa Istanbul. He, Gokmenoglu, Kirikkaleli, & Rizvi (2021) and Kassouri & Altıntaş (2020) confirmed the negative correlation and asymmetric threshold relationships between the BIST-100 index and foreign exchange rates.

3. Data and Method

3.1. Data

To uncover the link between macroeconomic factors and the Turkish capital market, industrial production[1](IND), market interest rate (INT), inflation (INF), money supply (M2), foreign exchange rate (USD), world oil prices (OIL), world gold prices (GOLD), and trading volume of BIST-100 (VOL) were used. The index used for modeling the stock returns is Borsa Istanbul (BIST-100), which is Turkey's main stock exchange. The source of data for BIST-100, gold prices, and trading volume is the Electronic Data Delivery System of The Central Bank of the Republic of Turkey. Interest rates, oil prices, and US dollar variables were accessed from the Federal Reserve Bank of St. Louis. Industrial production and inflation data were retrieved from the OECD database. All data are monthly frequency, and the study covers the period between January 1990 and January 2022. The reason we started the analysis in 1990 is that foreign investors were allowed to buy and sell stocks from that date on (BIST, 2022).

[1] To be seasonally adjusted by the Census-13 method.

3.2. Model

Although Borsa Istanbul started its operations in Istanbul in 1985, it took 5 years to integrate into the international financial system. Capital markets evolve over time. Therefore, in the course of time, policy changes, periods of economic recovery or recession, and political or financial shocks can cause structural changes in the market. Considering the length of the analysis period, the ADF unit root with breakpoint test and the regression model proposed by Bai and Perron, which takes into account the structural breaks, were employed. This regression model has the power to detect dates that cause multiple structural breaks in the interaction between variables (Uddin, Hoque & Ali, 2020). Therefore, the following model is used in the study:

$$R_t = c_t + \beta_1 IND_t + \beta_2 \mathrm{INT}_t + \beta_3 \mathrm{INF}_t + \beta_4 \mathrm{M2}_t + \beta_5 \mathrm{USD}_t + \beta_6 \mathrm{OIL}_t + \beta_7 \mathrm{GOLD}_t + \beta_8 \mathrm{VOL}_t + \varepsilon_t \quad (1)$$

Where demonstrates the Borsa Istanbul return at time t, IND_t, INT_t, INF_t, $\mathrm{M2}_t$, USD_t, OIL_t, GOLD_t and VOL_t represent the first logarithm differences of industrial production, market interest, CPI, M2, US dollar rate, oil price, gold price, and trading volume at time *t*, respectively. While ε_t refers to residual distributed to $\mathrm{N}(0,\sigma^2)$, $\beta_{1\ldots9}$ coefficients, respectively, show the impact of the variables on share prices. Since the main goal of the paper is to investigate the structural breaks in the relationship between stock returns and economic variables, the above regression model is solved by Bai and Perron's (1998, 2003) approach with *m* structural breaks (*m* + 1) regimes. According to studies (Zhu, Guo, & You,, 2015 ; Akyurek, Kutan & Yilmazkuday, 2011; Hong, Bian & Lee, 2021) using similar models in the literature, structural break regression can be explained as follows. First, by adding the j segment index to equation 1, equation 2 is obtained.

$$R_t = c_{tj} + \beta_{1j} IND_t + \beta_{2j} \mathrm{INT}_t + \beta_{3j} \mathrm{INF}_t + \beta_{4j} \mathrm{M2}_t + \beta_{5j} \mathrm{USD}_t + \beta_{6j} \mathrm{OIL}_t + \beta_{7j} \mathrm{GOLD}_t + \beta_{8j} \mathrm{VOL}_t + \varepsilon_t \quad (2)$$

In equation 2, where t= can be considered as a segment index and () indicates previously unknown structural break dates. Since *T* also means the total number of observations, In order to determine the unknown break dates, Andrews and

Ploberger (1994) developed an econometric test based on the F-statistic. However, this test only allows one structural breakpoint to be detected. Then, in the test developed by Bai and Perron (1998, 2003), it was shown that more structural breaks can be identified. This method tested whether there is a structural break from one break to five. The test is based on the global minimization of the sum of squared residuals obtained from Eq. (2), to determine the number of breaks in the regression. According to Bai and Perron (1998, 2003), one can benefit from two strategies: the sup-F type test and a double-maximum (Dmax) test. While the null hypothesis of the first strategy is 0 structural break versus the fixed number of breaks, Dmax consists of an unknown number of breaks given some upper bound (Weideman, Inglesi-Lotz & Van Heerden, 2017). The summary of the analysis regarding the structural break dates examination is given in Table 4.

4. Findings

Before starting the regression analysis, the ADF unit root with breakpoint test is performed to determine the stationary condition of the series under the presence of a structural break. Table 1 clearly confirms that these series in logarithmic forms are not stationary, but the first differences are stationary with a break.

Table 1: ADF unit root with breakpoint test results

Variables	t-statistic	Break date
Log level		
BIST-100	-4.02	1992:12
IND	-1.65	2009:04
INT	-4.03	2003:03
INF	-3.08	2002:01
M2	-2.64	1993:03
USD	-3.14	2008:07
OIL	-1.83	2014:06
GOLD	-3.56	2007:08
VOL	-3.12	1999:12
Log first difference	t-statistic	Break date
BIST-100	-20.51***	1999:12
IND	-24.01***	1994:05
INT	-16.17***	2003:03

INF	-7.47***	2021:11
M2	-20.68***	2001:03
USD	14.20***	1994:05
OIL	-14.84***	2020:06
GOLD	-18.13***	1999:10
VOL	-17.24***	1999:12

Source: Author's calculation
Note: Critical values at 1%, 5%, and %10 significance levels are –4.94, –4.44, and -4.19, respectively. *** denotes that test statistics are significant at the 1% level of significance. The Engle-Granger cointegration results can be seen in appendix Table 1.

With regard to the break dates in the variables, it is thought that some economic developments took place on these dates. For example, based on BIST-100, Borsa Istanbul[2] was accepted as a full member of the World Federation of Stock Exchanges (WFE) in October 1992 (Bigpara, 2022). The delayed effect of the 17 August 1999 Marmara earthquake may have been seen in both stock and gold returns and trading volume in December 1999 (Mutan & Topcu, 2009). The 1990s was a period in which budget deficits continued to increase for Turkey. To finance deficits, the government tried to borrow below the market interest rate. However, in the borrowing market, banks did not prefer to lend to the government at the current interest rate. Therefore, the funds that remained idle in the market were directed to the USD. The USD rate jumped from 18,400 TL (Turkish Lira) on January 9, 1994, to the level of 38,000 TL on April 5 (Özatay, 1995). Therefore, the breaks in the logarithmic form of the money supply series, the dollar return, and the stationary industrial production series are related to the 1994 financial crisis in Turkey. The low-interest policy implemented by the central bank in 2019 is the main reason for the break in inflation in 2021. The breaks in the logarithmic form of industrial production, gold, and dollar variables may be widely interpreted by the 2008 global crisis. Turkey experienced an economic crisis in November 2000 and February 2001. After these crises, a new reform process started with the Transition to a Strong Economy Program announced on April 15, 2001. According to this program, a set of policies covering central bank independence, inflation targeting, and other fiscal policies would be employed to combat high inflation and ensure economic stability (Züngün, 2008). The reforms

[2] Borsa Istanbul's first official name was the Istanbul Stock Exchange (ISE). This was changed to Borsa Istanbul on April 5, 2013.

made in the related fields were successful and inflation was restrained in a short time. Structural breaks in interest rates and money supply are related to the transition period to a strong economy. The break date in oil prices was the date when the price of oil began to fall from $112 in June 2014 to a low of $31 in January 2016 (Prest, 2018). The break in the oil return observed in June 2020 may have been due to Covid-19. Zhang, Farnoosh & Lantz (2022) found structural breaks on similar dates using the Zivot and Andrews test and the Gregory and Hansen cointegration tests. Descriptives of the variables are given in Table 2.

Table 2: Descriptive statistics of stock market return and economic factors

	Mean	Standard Deviation	Skewness	Kurtosis	JB
BIST-100	0.022	0.122	0.319	5.886	0.000
IND	0.003	0.035	1.850	29.559	0.000
INT	-0.002	0.117	1.068	17.591	0.000
INF	-0.000	0.098	0.581	8.840	0.000
M2	0.030	0.042	4.011	37.585	0.000
USD	0.022	0.049	2.953	24.542	0.000
OIL	0.003	0.102	-0.665	9.106	0.000
GOLD	0.003	0.035	0.440	4.892	0.000
VOL	0.034	0.540	0.194	3.236	0.190

Source: Author's calculation; the table provides the basic descriptive statistics of log first difference of series.

It is clearly illustrated from the standard deviation coefficients that the highest volatility belongs to the trading volume. Also, we observe that the BIST-100 return is more volatile than the macroeconomic variable, indicating the instability of the Turkish capital market from its inception up to 2021. Except for the trading volume, all series are non-normal distributions; there have sharp peaks and fat tails according to skewness and kurtosis. This situation is not surprising, because, between 1990 and 2021, financial crises, wars, and technological developments were experienced both in the world and in Turkey, which caused an extraordinary decrease or increase in both stock markets and economic variables.

Table 3: Correlation among stock market and macroeconomic factors

Correlation	BIST-100	IND	INT	INF	M2	USD	OIL	GOLD	VOL
BIST-100	1								
IND	-0.04	1							
INT	-0.32	-0.05	1						
INF	-0.02	-0.03	0.14	1					
M2	0.05	-0.08	0.05	0.00	1				
USD	0.07	-0.12	0.24	0.25	0.15	1			
OIL	-0.00	0.32	-0.04	0.04	-0.04	-0.01	1		
GOLD	-0.01	-0.03	-0.09	-0.06	-0.00	-0.08	0.12	1	
VOL	0.46	-0.10	-0.09	-0.02	-0.04	0.09	-0.07	-0.00	1

Source: Author's calculation

Table 3 implies that the correlation changes from 0.46 to -0.32 among those variables. The two variables with the highest correlation are trading volume and stock market index. On the other hand, interest rates and the stock market index have the lowest correlation coefficient. From the point of view of economic policies, the positive relationship between the dollar rate and inflation shows that both variables move in the same direction in Turkey.

Table 4: Structural break dates in the relationship between BIST-100 returns and variables

	statistics	Critical value	Break Date
F	31.44810*	25.65	2004:05
UDMax	31.44810*	25.81**	2004:05
WDMax	31.44810*	27.53**	2004:05

Source: Author's calculation
Notes: Estimated number of breaks: 1. Method: Bai-Perron tests of 1 to M globally determined breaks. Maximum number of breaks: 5. Break date: 2004:05. Break test options: Trimming 0.15, Max. Breaks 5, Sig. level 0.05. Test statistics employ HAC covariances (Prewhitening with lags = 1, Quadratic-Spectral kernel, Andrews bandwidth). Allow heterogeneous error distributions across breaks. * Significant at the 0.05 level. ** Bai-Perron (Econometric Journal, 2003) critical values.

Table 5. Results of regression with structural breaks and without breaks

	Panel A		Panel B
	Subsample	Subsample	Whole sample
	(1990:02-2004:04)	(2004:05-2022:01)	(1990:02-2022:01)
IND	-0.112	-0.196	-0.016
INT	-0.304***	-0.382***	-0.328***
INF	0.026	0.006	0.006

M2	0.396*	0.011	0.212*
USD	0.210	0.194*	0.251**
OIL	-0.114	0.158**	0.031
GOLD	0.147	-0.191	-0.103
VOL	0.137***	0.037***	0.096***
Intercept	0.002	0.009**	0.006
Diagnostics			
Adj. R^2	0.348		0.297
LM-test [4]	0.089		
ARCH [4]	0.061		
F-statistic [Prob]	13.07 [0.00]		
	0.059		
	0.145		
	24.29[0.00]		

Source: Author's calculation
Notes: The table shows the OLS regression results of Equation (2). Breaks in ***, **, and * denote the statistical significance at 1%, 5%, and 10% levels, respectively.

In Table 5, Panel B shows the result for classic regression without any break. In this context, whereas the M2, the USD, and the VOL variables are significantly included in the model with positive signs, INT has a negative mark. According to the regression results covering the whole period, if the money supply, US dollar rate, and trading volume increase by 1 percent, the BIST-100 is forecasted to increase by 0.21 percent, 0.25 percent, and 0.09 percent, respectively. On the other hand, a 1 percent increase in interest rates leads to a 0.32 percent decrease in BIST-100 returns. Based on the results of the regression without considering any structural break, it can be seen that industrial production, inflation, and oil and gold prices do not have any powerful effect on share prices. As stated in the structural break regression estimates presented in Panel B, the coefficients of industrial production, inflation, and gold are not statistically significant. If we start in order, the reason industrial production does not have any effect on the stock market is that the source of economic growth is start-up companies, because it takes time for newly established companies to be listed on the stock exchange and to distribute profits (MSCI Barra 2010). Our results are similar to those of Bhuiyan & Chowdhury (2020), who found a negative but statistically insignificant relationship between the S&P 500 sub-sectors and industrial production. According to Marshall (1992), if the changes in inflation are due to fluctuations in the money supply rather than economic activity, the impact of consumer prices

on market returns disappears. In addition, in countries with low inflation rates, inflation does not affect stock returns (Barnes, 1999). The fact that annual inflation rates in Turkey were in the single digits between 2004 and 2017 may have contributed to these results. An insignificant relationship between inflation rates and stock returns has also been found in the study by Davis & Kutan (2003). In Turkey, most households invest in gold, and gold is generally stored in houses rather than banks, because it has become a tradition to give gold as a gift at Turkish weddings. Therefore, since gold is not sufficiently utilized in the financial system, both the productivity of savings decreases and gold is less involved in portfolio diversification (Gülseven & Ekici, 2016; Coşkun & Ümit, 2016). In this case, gold prices do not affect the stock market return, because the stock and gold are bought with different intentions. Looking at Panel B, in which structural break regression estimates are presented, it is understood that the adjusted R^2 value increased from 0.29 to 0.35, indicating a better fit. Although the return of BIST-100 does not seem to be affected by inflation and gold prices in both periods, it remains sensitive to interest rates and trading volume. On the other hand, while the BIST-100 return was affected by changes in the money supply in the first period, the aforementioned effect has become insignificant in the second period. While the effect of the dollar exchange rate and oil prices on the stock market are statistically insignificant during the first subsample, they started to have both significant and positive effects on the stock market in the second subsample. It should not be seen as a coincidence that the model detected a break in May 2004. According to the Turkish Industrialists and Businessmen's Association (TÜSIAD, 2004) report, the positive developments in the Turkish economy were most clearly noticed in 2004. Undoubtedly, the government's successful implementation of the Transition to a Strong Economy Program starting in 2001 played an important role. Indeed, the most important development among economic indicators has been in the field of public finance. The consolidated budget had a primary surplus and outperformed its targets. The positive course of relations with the IMF and the steps taken towards the European Union entry process led to an improvement in the expectations of investors. Because it is a well-known fact that EU member countries attract more foreign capital, Turkey tried to attract more foreign capital by accelerating its membership

negotiations with the European Union (TÜSIAD, 2004: 5-14). If we discuss the reasons for the break in May 2004 in terms of international financial developments, the most important factor is the interest rate decisions of the Fed. Because of the surge in the US national income in 2004 and inflationary pressures, the Fed started to increase interest rates gradually. For instance, the Fed funding rate, which was reduced to 1 percent in June 2003, had risen to 2.25 percent in December 2004. The Fed's rate hike caused a fund outflow from emerging markets such as Turkey. Finally, the political development that will explain the break was the referendum held on April 24, 2004 for Cyprus to become a single state (CBRT, 2005:1,6,16).

5. Conclusion

Macroeconomic variables concentrate on the movements of the stock market. In order to appreciate investors' expectations based on economic aggregates, it is necessary to identify which variables have the power to change firms' cash flows. This article investigates the factors that affect stock returns, which are always on the agenda of finance professionals and academicians. Based on the fact that many studies focus on developed markets, we expanded the literature by adding Turkey as an emerging country. Using monthly data for the period from 1990:01 to 2022:01 and a model of structural break regression, the effects of industrial production, market interest rate, inflation, money supply, USD rate, oil prices, gold prices, and trading volume on Borsa Istanbul were examined. The result of the structural break regression indicates that the response of BIST-100 returns to the macroeconomic factors changed after 2004:05. The reasons for choosing this date are the program of transition to a strong economy, the beginning of the Fed's interest rate hike, and some political developments concerning Turkey. Before this date, while local variables (the value or amount of which can be determined by Turkey) such as interest rate, money supply, and trading volume were effective on the stock market, after this date, oil price and USD (variables whose prices are determined mostly in international markets) started to have an impact on the Borsa Istanbul. In addition, compared to the first subsample period, the returns of Borsa Istanbul have become more sensitive to changes in interest rates and the impact of trading volume on returns has weakened considerably. Inflation rates

and industrial production variables did not have a statistically significant effect on the stock market in both periods. Therefore, the consequences of the research show that it is possible to make a profit in Borsa Istanbul by monitoring some economic variables. For instance, when oil prices, USD rate, and trading volume increase or interest rates decrease, investors can buy the stocks included in the Borsa Istanbul-100 index. It should also be emphasized that the interaction between Borsa Istanbul and macroeconomic factors was not affected by the Covid-19 pandemic. Finally, Borsa Istanbul seems to be inefficient in terms of a strong form of an efficient market hypothesis, as more economic factors affect stock market returns, and also information about these factors is publicly available.

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Appendix

Tablo 1: The Engle-Granger test results

Cointegrating equation deterministics: Constant	tau-statistic	Prob.*	z-statistic	Prob.*
BIST-100-IND	-1.789	0.635	-4.270	0.788
BIST-100-INT	-2.468	0.294	-7.158	0.557
BIST-100-INF	-1.343	0.818	-5.205	0.714
BIST-100-M2	-2.880	0.143	-16.710	0.104
BIST-100-USD	-2.585	0.245	-13.036	0.210
BIST-100-OIL	-2.784	0.172	-12.694	0.224
BIST-100-GOLD	-2.505	0.278	-4.155	0.797
BIST-100-VOL	-4.478	0.001	-40.643	0.000
Cointegrating equation deterministics: Trend	tau-statistic	Prob.*	z-statistic	Prob.*
BIST-100-IND	-2.496	0.524	-11.990	0.525
BIST-100-INT	-1.650	0.889	-3.578	0.968
BIST-100-INF	-1.844	0.832	-4.763	0.936
BIST-100-M2	-4.536	0.005	-38.776	0.004
BIST-100-USD	-2.508	0.518	-13.405	0.441
BIST-100-OIL	-1.604	0.900	-4.126	0.955
BIST-100-GOLD	-1.321	0.949	-4.050	0.957
BIST-100-VOL	-4.187	0.017	-35.756	0.008

Notes: Null hypothesis: Series are not cointegrated. Automatic lags specification based on Schwarz criterion (maxlag=16). *MacKinnon (1996) p-values.