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THE RELATIONSHIP BETWEEN BIST BANK INDEX AND INFLATION, EXCHANGE RATE, INTEREST RATE, GOLD AND OIL PRICES: EVIDENCE FROM THE ARDL BOUND TEST

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Abstract

The aim of this study is to investigate the effects of inflation, exchange rate, interest rates, gold and oil prices on the BIST bank index between January 2005 - October 2023. For this purpose, firstly, the stationarity levels of the data were tested by the Augmented Dickey-Fuller (ADF) and Phillips- Perron (PP) tests. Then, since the series became stationary at different levels, ARDL bounds test, one of the cointegration tests, was applied. In the study, it is concluded that the BIST bank index and its independent variables are cointegrated in the long-run in the relevant period. According to the short-term asymmetric relationship results, a 1% increase in gold prices by 0.036%, a 1% increase in interest rates by 0.33%, and a 1% increase in the dollar exchange rate by 1.03% decreased the BIST Bank index. On the other hand, a 1% increase in CPI has a positive effect on the BIST Bank Index. No statistical relationship was found between oil prices and BIST Bank Index.

Keywords: BIST Bank Index, XBANK, Macroeconomic Factors, ARDL Border Test.

Jel Codes: G21, C32.

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BİST BANKA ENDEKSİNİN ENFLASYON, DÖVİZ KURU, FAİZ ORANI, ALTIN VE PETROL FİYATLARI İLE OLAN İLİŞKİSİ: ARDL SINIR TESTİNDEN KANITLAR

Öz

Bu çalışmanın amacı Ocak 2005 – Ekim 2023 dönemlerindeki enflasyon, döviz kuru, faiz oranları, altın ve petrol fiyatlarının Bist banka endeksi üzerindeki etkilerini araştırmaktır. Bu amaçla çalışmada öncelikle verilerin durağanlık seviyeleri Genişletilmiş Dickey-Fuller (ADF) ve Phillips- Perron (PP) testleri sınanmıştır. Sonrasında seriler farklı düzeylerde durağan hale geldikleri için eşbütünleşme testlerinden ARDL (Autoregressive Distributed Lag Bound Test) testi uygulanmıştır. Çalışmada, Bist banka endeksi ile bağımsız değişkenlerinin ilgili dönemde uzun dönemli eşbütünleşik olduğu sonucuna varılmıştır. Kısa dönem asimetrik ilişki sonuçlarına göre, altın fiyatlarındaki %1'lik artış %0,036, faiz oranlarındaki %1 artış %0,33, dolar kurundaki %1'lik artış %1,03 Bist Banka endeksini azalttığı tespit edilmiştir. Diğer taraftan TÜFE'de %1'lik artış Bist banka endeksini pozitif yönde etkilediği görülmüştür. Petrol fiyatları ile Bist banka endeksi arasında istatistiki anlamda herhangi bir ilişki bulunamamıştır.

Anahtar kelimeler: BİST Banka Endeksi, XBANK, Makroekonomik Faktörler, ARDL Sınır Testi.

Jel Kodları: G21, C32.

1. INTRODUCTION

The financial sector is one of the important sector in the terms of transforming the savings into investments and meeting that the fund demands of the units in to need of financing. Good management of existing risks in the financial sector ensures the fulfilment of functions such as reliability, transparency and fairness for investors and units demanding funds. Banks, which are among the important institutions in the financial sector, fulfil functions such as providing fund transfer, custody services, financing, and performing transactions in capital markets.

Businesses and individuals who are or will be investors want to utilise their savings by investing in financial assets. One of the most widely used investment assets is the stock market. With the development of the banking sector, the functions of the sector in financial markets have also developed. This development in banks increases the importance of bank returns. Returns in the banking sector are important for investors who will purchase the shares of banks traded on the stock exchange.

Bank index is one of the most important indicators affecting investors' investment in the stock market. Basic macroeconomic factors as well as firm-based factors can affect the bank index positively or negatively. Among these factors, macroeconomic variables are one of the important factors affecting stock prices. In this respect, it is of great importance to examine the macroeconomic factor variables known to affect the stock price (Dalkılıç & et al, 2021, p.898).

Financial liberalisation, accompanied by increasing technological developments, has led to the easy realisation of international capital flows, accelerated the circulation of information and thus enabled the integration of financial markets in different countries. This situation causes other markets to be affected by positive or negative developments in one market. Financial liberalisation may offer new investment opportunities for investors (Sakarya & Akkuş, 2018, p.352). However, a crisis or price fluctuation in financial markets can affect other markets or countries in a short time. Such a high level of interconnections between markets both encourages and obliges financial practitioners and decision-makers to investigate these relationships.

In an environment of increasing uncertainty, market traders attach great importance to asset price volatility as an important source of information affecting decisions such as capital allocation, hedging and portfolio diversification (Emna & Myriam, 2017, p.52). On the other hand, volatility in one of the financial markets, which are integrated with each other with the increasing globalisation phenomenon, is followed by many investors and can be decisive in investment decisions since it simultaneously affects other financial markets (Iskenderoğlu & Akdağ, 2018, p.490).

The effects of macroeconomic variables on stock returns may be useful in guiding investors and reducing risks. Knowing the direction of the effects of these factors on stock prices can reduce the risks in investments. Investors will be able to minimise the probability of error in their investments by taking these factors into account. In the literature, studies have been conducted on macroeconomic variables affecting stock returns. This study aims to be useful in guiding investors by evaluating the effects of macroeconomic factors on the bank index.

The objective of the study is to investigate the effects of inflation, exchange rate, interest rates, gold and oil prices on the BIST bank index for the period between January 2005 and October 2023. In the study, methodology and data set are explained in the following chapters after the literature review.

In the study, inflation, exchange rate, interest rates, gold and oil prices are macroeconomic variables. The variables are normally distributed. In the results of the analyses, the stationarity of the series is investigated first. The results of unit root stationarity analysis and ARDL bounds test analysis of the series were evaluated. Conclusions and evaluations were made as a result of the findings.

2. LITERATURE REVIEW

There are many national and international studies on macroeconomic factors and their impact on the BIST Bank Index. However, it would not be wrong to say that all these indicators have an impact on the BIST Bank Index from different angles due to the different country classes, different time periods and analysis methods preferred in the studies.

Pan, et al (2007), analysed the securities markets and exchange rates of seven East Asian countries, namely Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand. In the study, the relationship between the stock markets of these countries and exchange rates was tried to be tested by causality analysis. Data covering the period between 1988 January-1998 October were used in the study. As a result of the causality analysis, it was found that there is a significant causality relationship from exchange rates to stock prices in Hong Kong, Japan, Malaysia and Thailand.

Narayan & Sharma (2011) examined the relationship between oil price and firm returns for 560 US firms traded on NYSE. It is concluded that oil price affects firms' returns differently depending on their sectoral location. Strong evidence is found for the lagged effect of oil price on firm returns.

Ayaydın & Dağlı (2012) analysed the effects of macroeconomic variables such as inflation rate, interest rate, industrial production index, money supply and exchange rate on stock returns in 22 emerging markets using panel data analysis method. According to the findings, S&P 500 index is positively affected by inflation, negatively affected by exchange rate and crises, but not affected by deposit interest rate.

Khan (2014) investigated the effect of various macroeconomic factors (GDP, Money Supply, inflation, exchange rate and firm size) on stock market prices in Karachi stock exchange for the period 1971-2012. In the study, autoregressive distributed lag model (ARDL) technique was used. It is concluded that in the long run, each factor has a significant contribution to the stock price, while in the short run, some factors are important while others are not, but the error correction term shows significant convergence towards equilibrium.

Özkul & Akgüneş (2015) analysed the effects of macroeconomic factors affecting bank returns. In the study, BIST 10 bank return index was analysed with monthly data between

January 2010 and July 2014. Macroeconomic variables that have an impact on BIST 10 bank return index were analysed by multiple linear regression method. As a result of the analysis, it is determined that BIST 10 bank return index and BIST 100 return index have a positive effect, while industrial production index, money supply and export unit value index variables have a negative effect.

Kendirli & Çankaya (2016) econometrically investigated the effect of foreign exchange and inflation variables with BIST banking index data for the period 2009-2015. Johansen cointegration test and Granger causality test methods were used in the study. In the study, it was determined that foreign exchange and inflation rate variables do not have a significant effect on Borsa Istanbul Banking Index (XBANK) at 5% significance level. According to the results at 10% significance level, it is concluded that there is a unidirectional relationship from the banking index to the exchange rate variable.

Çıtak & Kendirli (2019) tested the effect of oil prices on exchange rate and stock returns with ARDL cointegration analysis. As a result of the findings obtained from the study, they concluded that both positive and negative changes in oil prices do not statistically affect stock prices and exchange rate in the long run. With this result, no asymmetric transmission from oil prices to stock prices and exchange rate was found, which indicates that both stock prices and exchange rate are insensitive to oil price shocks in Turkey.

Cingöz and Kendirli (2019) examined the relationship between gold prices, exchange rate and stock exchange Istanbul with the Johansen Cointegration Test. As a result of the research, it was concluded that changes in BIST 100 share index and dollar exchange rate may have a significant effect on gold prices in the long run, but these variables do not have a significant effect on gold prices in the short run.

Tsuji (2020) analysed the return and volatility dispersion between the US, Canada, UK, Germany, France, Italy, Belgium, Switzerland and Sweden banking sector indices with the VAR-DCC-MEGARCH-M model, using daily closing prices between 4 January 2000 and 7 August 2018. In the study, he found that there is a unidirectional return spillover from the US banking index to other banking indices, and that there is a bidirectional volatility spillover between the US and the banking indices of the other eight countries and that US bank stocks can be hedged with bank stocks of other countries.

Dalkılıç et al. (2021) used correlation and regression analysis to analyse the effect of macroeconomic factors on the BIST Banks Index. According to the results of the study covering the period January 2003-December 2020, it was found that there is a statistically significant relationship between the BIST Banks Index and the deposit interest rate, exchange rate, gold-ounce, industrial production index. There is a negative relationship between BIST Banks Index and exchange rate and gold-ounce, and a positive relationship between oil price (Brent).

Yıldırım (2021) examined the relationship between the BIST Bank index and macroeconomic variables using bootstrap and asymmetric causality analyses. According to the results of the study, it is observed that a negative shock in the dollar exchange rate is the cause of a positive shock in BIST Bank and a positive shock in BIST Bank is the cause of a positive shock in GDP. In addition, when the causality between BIST Bank and gold prices is analysed, it is determined that a positive shock in gold prices is the cause of both positive and negative shocks in BIST Bank.

In their study, Apostolakis et al. (2022) examined the volatility spillovers and dynamic interconnectedness between the banking sector indices of the USA, the UK, Canada, France, Japan, Germany and Italy with the DCC-GARCH and TVP-VAR model using weekly data from January 2000 to January 2022. As a result of the analysis, it is found that there is a strong link between the banking indices of EU member countries, and the most important transmitters of volatility spillovers are the banking indices of France and Germany, with the UK being the most important. Moreover, the US banking index is found to be more vulnerable to volatility shocks originating from Europe.

In their study, Doğru and Medetoğlu (2023) analysed the volatility interaction between the BIST Bank Index (XBANK) and developed country banking indices with the DCC-GARCH model. Within the scope of the study, daily closing prices of five indices for the period 01.01.2015-20.07.2022 were used. As a result of the analysis, it was found that there is a time-varying, positive correlation between the examined bank indices and XBANK.

Khan et al. (2023) investigated the dynamic relationships between US Islamic equities, oil prices, gold prices and global policy uncertainty by applying a wavelet-based Granger causality test using monthly data for the period 1996-2018. The findings of the study conclude that there is a strong bidirectional Granger causality between the variables for both the original and the decomposed series.

Karyağdı et al. (2023) aimed to investigate the effects of BIST100 index, US dollar and gold returns on inflation using monthly data for the period 2005-2023 in Turkey. The analysis was conducted using the Distributed Autoregressive bounds test with Lags and Toda-Yamamoto causality test. As a result of the Lag Distributed Autoregressive bounds test, it is found that BIST 100 index and US dollar returns are effective on inflation in the short and long run, while gold prices are not effective on inflation.

3. METHOD

Since this study will examine the relationship between the dependent variable of BIST bank index and the independent variables of gram gold prices, oil prices, interest rates, inflation and US dollar, this section explains the unit root and cointegration tests that need to be performed in order to achieve this objective.

3.1. ADF and PP Unit Root Tests

The Augmented Dickey-Fuller unit root test is frequently used by researchers to determine whether the series used in the analyses contain unit roots. This unit root test can be characterised as a different version of the Augmented Dickey-Fuller (ADF) unit root test based on the AR(1) process. However, in time series, εt (error/residual terms) loses its clean series property if there is a higher order correlation in the series. In the ADF test, in order to solve this problem, the "p" lagged difference terms are included in the equation by utilising the AR(p) process rather than the AR(1) process (Dickey & Fuller, 1979). Thus, ADF equations without constant term and trend (none), with constant term (intercept) and with constant term and trend (intercept&trend) respectively:

$$\Delta y_t = \delta y_{t-1} + \sum_{i-1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_i \quad (1)$$

$$\Delta y_t = \mu + \delta y_{t-1} + \sum_{i-1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_i \quad (2)$$

$$\Delta y_t = \mu + \beta t + \delta y_{t-1} + \sum_{i-1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_i \quad (3)$$

is in the form. In equations 1, 2 and 3, μ corresponds to the constant term, t to the trend, p to the number of lags and εt to the error term series. For all three ADF equations, the null hypothesis is formulated in the same way and states that the series contains a unit root. Therefore, the null hypothesis states the existence of a non-stationary series (Gujarati, 2015: 328). The hypotheses for the existence of unit root for these models are as follows:

H_0: $\delta = 0$ (Series is non-stationary.)

H_1: $\delta < 0(\phi 1 < 1)$ (Series is stationary.)

Dickey-Fuller test is based on the basic assumptions that error terms are independent and constant variance. In addition, the DF test does not give adequate results in series with structural breaks. Phillips- Perron tried to generalise the DF test by smoothing its assumptions about error terms (Demirel, 2015, p.28). In this transformation, the nonparametric method was used (İnce, 2015, p.30).

As in the ADF test, the PP test is also applied in three different ways: without constant, with constant, with constant and trend (Samut, 2016, p.40).

$$\Delta y_t = a y_{t-1} + x_t^l \delta + \varepsilon_t \quad (4)$$

is of the form. In equation 4, a= ρ -1, " xt " is the set of deterministic components (constant term or constant term and trend) and "εt " is the set of error (residual) terms. In the PP test, the main and alternative hypotheses are formed as "H_0: α = 0 and H_1: α < 0" and the main hypothesis states that the series contains a unit root (Çağlayan & Saçalı, 2006, p.20).

H_0: $\delta = 0$ (There is a unit root.)

H_1: $\delta < 0$ (There is no unit root.)

3.2. Cointegration and ARDL Border Test

Cointegration means that linear combinations of multiple non-stationary time series are stationary and these series have an equilibrium value in the long run (Tarı, 2014, p.415). This concept, introduced to the literature by Engle and Granger (1987), is important for portfolio diversification in financial terms. Although there are different cointegration tests developed in the literature such as Engle-Granger (1987), Johansen (1988) and Phillips-Ouliaris (1990), in order to apply these cointegration tests, the series of all variables must be stationary in their first differences, i.e. I(1). However, the ARDL bounds test approach eliminates this constraint and allows cointegration analyses to be performed in all combinations where the variables are I(0) and I(1) (Pesaran, et al, 2001, pp.289-290). In other words, cointegration relations between time series with different stationarity levels can be performed with the ARDL bounds test approach. Moreover, an important limitation of the ARDL bounds test approach is that the dependent variable must be I(1).

The bounds test, which is primarily based on the estimation of the unrestricted error correction model, is applied in two stages, the first of which is to establish the long-run relationship between the variables and the second is to determine the cointegration relationship between the variables. The ARDL Border Test equation with two variables to be performed in order to reveal the cointegration relationship is as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} Y_{t-i} + \sum_{i=1}^{m} \beta_{2i} X_{t-i} + \beta_{3i} Y_{t-1} + \beta_4 X_{t-1} + \varepsilon_t \quad (5)$$

In the equation; ΔY_t is the dependent variable, X_t is the independent variable, ε_t is the error term, m is the optimum lag length and m is the smallest value of the information criteria. The hypotheses regarding the existence of cointegration in the ARDL bounds test model are as follows:

H_0: $\beta_3 = \beta_4 = 0$ (There is no cointegration.)

H_1: $\exists\delta_i < 0, i = 3,4$ (There is cointegration.)

In the ARDL bounds test approach, after the cointegration relationship for the variables is revealed, the long-run relationship coefficients of the variables are examined. In addition, the presence of short-term deviations from the long-run relationship can also be examined with the help of the error correction model. However, the error correction model is not included in the scope of the study since the study aims to reveal the long-run relationship. The equation for the long-run relationship is as follows:

$$Y_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} Y_{t-i} + \sum_{i=0}^{n} \beta_{2i} X_{t-i} + \varepsilon_t \quad (6)$$

In the equation, Y_t is the dependent variable, X_t is the independent variable, β_0, is the constant term, ε_t, is the error term, m and n are the optimum lag lengths and the value where the information criteria is the smallest.

3.3. Data and Preliminary Statistics

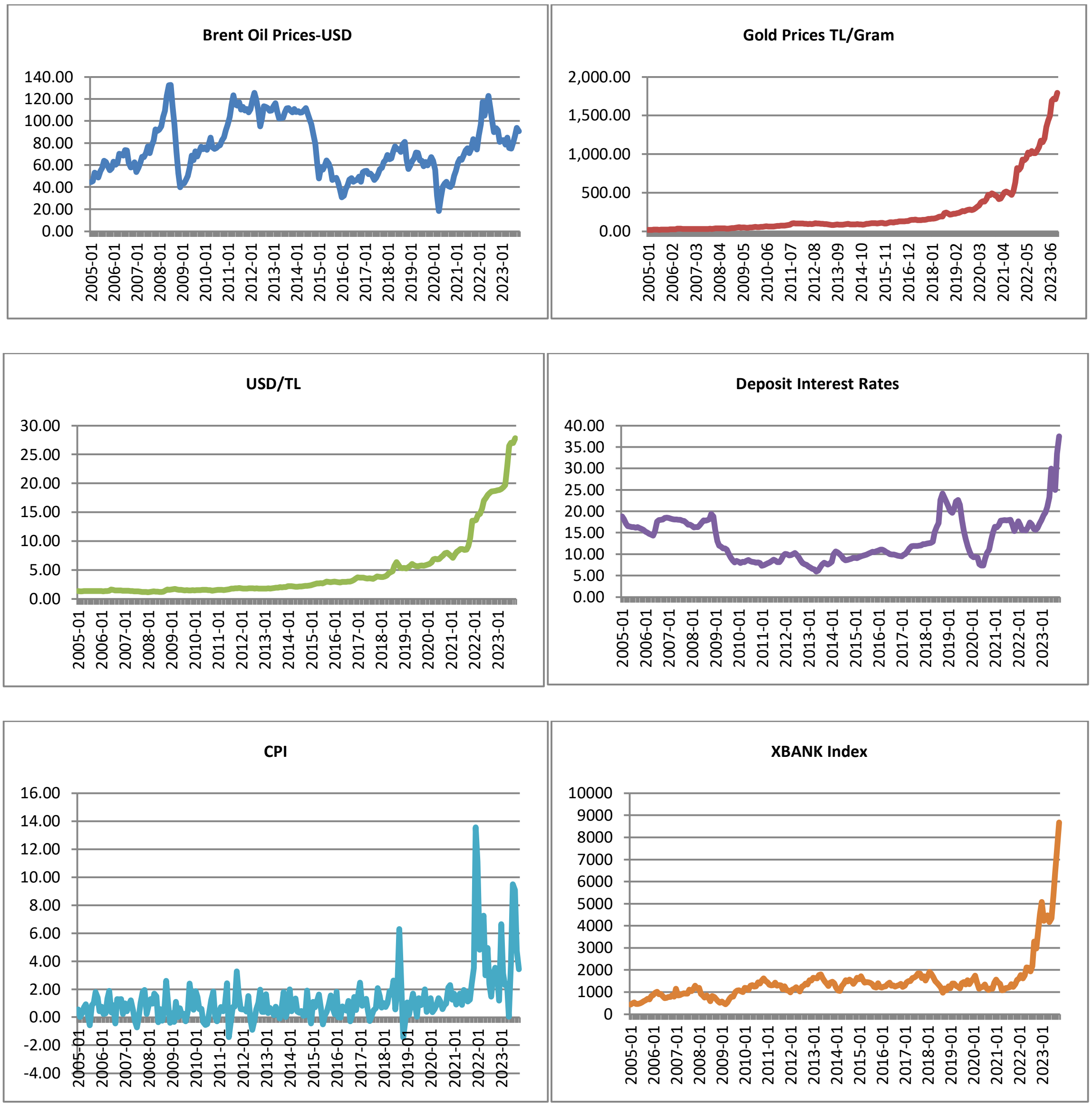
In this study, the relationship between the dependent variable BIST Bank Index (XBANK) and the independent variables gram gold prices, oil prices, interest rates, inflation and US dollar will be analysed. The study covers the period 01/2005-10/2023 and monthly average data are used in the study in accordance with the literature. Gold, oil prices, interest rates, inflation and US dollar data are obtained from the Electronic Data Distribution System (EDDS) of the Central Bank of the Republic of Türkiye, while the XBANK is obtained from the investing.com web address. In addition, these data are included in the study by taking their natural logarithms. Empirical findings are obtained with the help of Eviews 9 econometrics package programme.

Table 1. Descriptions of the Data Set

Variables	Explanations of Variables	Time Interval	Data Period	Source
X	Bist Bank Index	01/2005 - 10/2023	Monthly	EDDS investing.com
P	Brent Oil Prices			
T	Consumer Price Index			
A	Gram Gold TL Prices			
F	TL Deposit Interest Rates			
U	US Dollar/TL			

Figure 1 shows the time series graphs of the variables used in the analysis.

Figure 1. Time Series of Variables



Descriptive statistics of the data used in the study are given in Table 2 below.

Table 2. Descriptive Statistics of Dependent and Independent Variables

	LOGX	LOGA	LOGF	LOGP	LOGT	LOGU
Mean	7.152.796	4.756.079	2.526.106	4.272.187	6.908.984	1.102.355
Median	7.158.584	4.585.323	2.476.748	4.276.247	6.908.605	0.781498
Maximum	9.068.337	7.492.788	3.624.541	4.888.228	6.921.244	3.326.693
Minimum	6.084.955	2.890.372	1.782.719	2.911.182	6.906.314	0.162192
Std. Dev.	0.470894	1.146.964	0.368293	0.344694	0.001801	0.843120
Skewness	0.923418	0.533910	0.201381	-0.413737	3.395.592	0.971188
Kurtosis	6.107.690	2.610.251	2.193.891	3.099.265	1.881.937	2.903.349
Jarque-Bera	1.230.621	1.216.769	7.646.606	6.540.498	2.790.842	3.561.543
Probability	0.000000	0.002279	0.021855	0.037997	0.000000	0.000000
Observations	226	226	226	226	226	226

Table 3. Correlation Matrix Between Variables

CORRELATION	LOGX	LOGA	LOGF	LOGP	LOGT	LOGU
LOGX	1.000.000					
LOGA	0.770396	1.000.000				
LOGF	0.050397	0.216107	1.000.000			
LOGP	0.227956	0.022186	-0.105447	1.000.000		
LOGT	0.419149	0.532597	0.325719	0.145276	1.000.000	
LOGU	0.715640	0.967058	0.398415	-0.087669	0.573371	1.000.000

According to these results, it is clear that there is no multicollinearity problem among the independent variables. Because all correlation coefficients are below 0.80. The high and positive correlation between the dependent variable XBANK and the independent variables gold and dollar is remarkable. On the other hand, there is a low and positive correlation between XBANK and interest rates. It is also observed that there is a moderate positive correlation between the other variables, namely the TFP and oil prices. Therefore, the expected sign values of all independent variables within the framework of the model are positive.

4. EMPIRICAL FINDINGS

After explaining the data and preliminary statistical information about the data, as explained in the methods section, unit root tests for the series will be performed first. The determination of the stationarity degrees of the series as a result of unit root tests is also decisive for the other test methods to be applied.

4.1. Unit Root Analysis with ADF and PP Tests

In our study, the most widely used Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root test methods are preferred. Table 4 below presents the ADF and PP unit root test results.

Table 4. ADF Unit Root Test Results

		UNIT ROOT TEST (ADF)					
	At Level						
		LOGX	LOGA	LOGF	LOGP	LOGT	LOGU
With Constant	t-Statistic	-0.1794	18.051	-16.211	-34.361	-42.494	33.415
	Prob.	0.9377	0.9998	0.4701	0.0107	0.0007	10.000
		-	-	-	**	***	-
With Constant & Trend	t-Statistic	-12.003	-0.3206	-17.754	-34.660	-52.709	0.2192
	Prob.	0.9074	0.9897	0.7135	0.0456	0.0001	0.9981
		-	-	-	**	***	-
Without Constant & Trend	t-Statistic	17.593	47.124	0.2817	0.0369	0.6057	51.699
	Prob.	0.9812	10.000	0.7667	0.6936	0.8465	10.000
		-	-	-	-	-	-
	At First Difference						
		d(LOGX)	d(LOGA)	d(LOGF)	d(LOGP)	d(LOGT)	d(LOGU)
With Constant	t-Statistic	-154.798	-119.412	-58.298	-104.437	-110.080	-105.445
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		***	***	***	***	***	***
With Constant & Trend	t-Statistic	-155.128	-120.794	-59.877	-104.190	-110.136	-113.779
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		***	***	***	***	***	***
Without Constant & Trend	t-Statistic	-153.075	-106.243	-58.226	-104.633	-110.077	-66.561
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		***	***	***	***	***	***

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant

In order to construct a time series model, stationarity must first be ensured in the series. The most basic way to achieve this is the differencing method. According to Table 4 and Table 5, when the results of ADF and PP unit root tests are evaluated, only Brent oil prices and CPI series are stationary at 5% and 10% significance, respectively, i.e. I(0). The series of other variables are stationary, i.e. I(1), when their first differences are taken at 1% significance.

Table 5. PP Unit Root Test Results

		UNIT ROOT TEST (PP)					
	At Level						
		LOGX	LOGA	LOGF	LOGP	LOGT	LOGU
With Constant	t-Statistic	-0.1388	18.315	-12.526	-29.090	-70.214	37.125
	Prob.	0.9425	0.9998	0.6516	0.0459	0.0000	10.000
		-	-	-	**	***	-
With Constant & Trend	t-Statistic	-12.996	-0.0054	-13.959	-29.351	-81.077	0.1447
	Prob.	0.8854	0.9960	0.8599	0.1535	0.0000	0.9975
		-	-	-	-	***	-
Without Constant & Trend	t-Statistic	17.946	57.402	0.2570	0.1749	0.8140	60.475
	Prob.	0.9826	10.000	0.7598	0.7361	0.8870	10.000
		-	-	-	-	-	-
	At First Difference						
		d(LOGX)	d(LOGA)	d(LOGF)	d(LOGP)	d(LOGT)	d(LOGU)
With Constant	t-Statistic	-154.738	-118.440	-84.171	-104.400	-610.125	-95.821
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
		***	***	***	***	***	***
With Constant & Trend	t-Statistic	-155.069	-119.463	-87.323	-104.103	-655.446	-97.715
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
		***	***	***	***	***	***
Without Constant & Trend	t-Statistic	-153.066	-107.529	-84.178	-104.660	-523.930	-92.096
	Prob.	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
		***	***	***	***	***	***

Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant

4.2. ARDL Boundary Test Analysis

After the unit root tests of the variables are performed and the stationarity levels of the variables are determined, cointegration test is applied. Since the series are stationary at different levels, ARDL bounds test, one of the cointegration tests, will be applied at this stage. Since cointegration analyses are sensitive to the number of lags, a systematic process should be followed in determining the number of lags (Uluyol et al., 2014, p.79). Since the data used in this study are monthly, the maximum number of lags is taken as 12. After writing the maximum number of lags and determining the Schwarz Information Criterion as the information criterion, it was determined that the most appropriate ARDL model is ARDL (2,2,0,0,1,7) model in Eviews 9 programme. The F statistic and critical values obtained for the ARDL (2,2,0,0,1,7) model are given in Table 6.

Table 6. F Statistic and Critical Values

Model	K	M	F Statistic	Significance Level	Lower Limit	Upper Limit
				1%	3,41	4,68
ARDL (2,2,0,0,1,7)	5	12	10,2137	5%	2,62	3,79
				10%	2,26	3,35

Note: M denotes the maximum number of lags, K denotes the number of explanatory variables and * denotes 1% significance level. The critical values used for the lower and upper bounds are taken from Table CI(ii) in (Pesaran et al., 2001, p.300).

Since the calculated F statistic is greater than the critical values at 1% significance level, it is understood that XBANK and other independent variables are cointegrated in the long-run in the relevant period. After determining the long-run cointegration relationship, the long-run and short-run coefficients of the variables can be calculated. The long-run and short-run coefficient estimates for the ARDL(2,2,0,0,1,7) model with maximum 12 lags and Schwarz Information Criterion are presented in Table 7.

From the definitional tests of the ARDL short and long-run relationships shown in this table, it is determined that there is no autocorrelation, model fitting error and changing variance in the model. It is also observed that the model is normally distributed. Therefore, the results obtained from the model are reliable.

When the long-run coefficients are analysed, it is found that the dependent variable XBANK is positively cointegrated with the other independent variables in the long run, but the relationship between the independent variables gram gold prices, TL deposit interest rates, Brent oil prices, CPI and USD exchange rate is not statistically significant.

Table 7. ARDL Long and Short Run Coefficients

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LOGA	-2.274.231	1.633.440	-1.392.295	0.1654
LOGF	-1.644.394	1.035.106	-1.588.624	0.1137
LOGP	0.875686	0.625511	1.399.953	0.1631
LOGT	6.802.103	4.165.358	1.633.018	0.1040
LOGU	4.059.253	2.519.497	1.611.136	0.1087
Short Run Coefficients				
D(LOGX)	-0,219805	0.062125	-3.538.124	0.0005
D(LOGU)	-1,035274	0.235803	-4.390.416	0.0000
D(LOGT)	32,281167	5.192.926	6.216.374	0.0000
D(LOGP)	0,047395	0.059208	0.00495	0.4244
D(LOGF)	-0,331757	0.100569	-3.298.798	0.0011
D(LOGA)	-0,368781	0.162262	-2.272.753	0.0241
CointEq(-1)	-0,043486	0.006011	-7.234.549	0.0000
Descriptive Tests				
R-squared	0.959962	Mean dependent var		7.183.768
Adjusted R-squared	0.956576	S.D. dependent var		0.444529
S.E. of regression	0.092633	Akaike info criterion		-1.841.723
Sum squared resid	1.724.761	Schwarz criterion		-1.563.169
Log likelihood	219.6686	Hannan-Quinn criter.		-1.729.223
F-statistic	10.38999	Durbin-Watson stat		1.950.933
Prob(F-statistic)	0.000000			

According to the short-term asymmetric relationship results in Table 7, changes in variables have an asymmetric effect on XBANK index. The existence of short-term asymmetric relationship is evaluated according to the Wald test results. According to the results of the Wald test, the F statistic value was (10.38999) and the p probability value was (0.000). These results prove the existence of a short-term asymmetric relationship. When the short-term coefficients are analysed, it is determined that a 1% increase in gold prices decreases the XBANK index by 0.036%, a 1% increase in interest rates by 0.33%, and a 1.03% increase in the dollar. On the other hand, a 1% increase in CPI had a positive effect on XBANK index. No statistical relationship was found between oil prices and XBANK index.

When the short-term estimation results are analysed, "Y_1", which expresses the coefficient of the error correction term, corresponds to "CointEq(-1)" in this table. This coefficient is expected to be negative (-) and the probability value is expected to be less than 0.05. As can be seen in Table 6, the coefficient of the error correction term is -0.044780 and the probability value is 0.0000. The fact that the coefficient of the error correction term is negative and statistically significant provides additional evidence that the model is cointegrated (Akçay & Karasoy, 2017). A probability value less than 0.05 indicates that this coefficient is significant, while a negative (-) coefficient means that an imbalance in the model will be corrected (Göksu, 2023, p.232).

5. CONCLUSION

Although there are many studies investigating the relationship between macroeconomic variables and stocks, both academicians and practitioners do not have a consensus on the direction of the relationship between these variables. As it is known, even if the variables used in econometric models are the same, completely different results can be found when the period analysed changes. In this study, the effects of macroeconomic variables on the BIST bank index for the period 2005:1-2023:10 in the Turkish economy are analysed with the help of ARDL bounds test analysis. The macroeconomic variables in the study are Brent oil price, foreign exchange price movement, ounce gold price, deposit interest rates and consumer price index (CPI); the dependent variable is the BIST bank index.

In the application part of the study, the theoretical foundations of the methods used are given. In the results of the analyses, the serial stationarity of the time series is investigated. According to the results of unit root analysis, it is seen that the series are not stationary at level. In order to ensure the stationarity of the non-stationary series, their differences were taken and unit root tests were applied to these series again. It is observed that the differenced series are stationary.

In the study, it is concluded that the BIST bank index and other independent variables are long-run cointegrated in the relevant period. According to the short-term asymmetric relationship results, changes in variables have an asymmetric effect on the BIST bank index. When the short-term coefficients are analysed, it is determined that a 1% increase in gold prices, interest rates and dollar exchange rate decreases the BIST bank index by 0.036%, 0.33% and 0.05%, respectively. On the other hand, a 1% increase in CPI has a positive effect on XBANK index. No statistical relationship was found between oil prices and XBANK index. The fact that the coefficient of the error correction term is negative and statistically significant provides additional evidence that the model is cointegrated. A probability value less than 0.05 indicates that this coefficient is significant, while a negative (-) coefficient means that an imbalance in the model will be corrected. When the results of the study are compared with similar studies in the literature, it is concluded that it overlaps with the results of Kendirli and Çankaya (2016), Dalkılıç et al. (2021), and is partially similar to Yıldırım (2021).

Banks whose shares are traded in the Borsa Istanbul Bank Index should take into account the changes in exchange rates, interest rates and money supply in order to increase their stock returns. Investors, on the other hand, should take into account changes in exchange rates, interest rates and money supply in periods when the value of domestic currency decreases against foreign currency, interest rates increase and money supply increases. should be more cautious when making investment decisions in the share certificates of banks.

In future studies, researchers may add depth to the studies in the field by analysing data sets from different periods and the relationships between different variables. For example, in future studies, when analysing the exchange rate, the TL/Euro value instead of TL/Dollar or the ounce price of gold instead of the gram price can be used.

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