# Examining the Effect of Macroeconomic Variables on BIST100 Index Returns Using ARDL Approach

Mehmet İslamoğlu[1] Mustafa Şeker[2]

Received: 11/06/2024 Online Published: 20/10/2024
Accepted: 06/10/2024

**Abstract**

This study focuses on macroeconomic variables believed to be related to stock market indices, drawing on both domestic and international sources. In this context, the effects of the Bond Index (BONO), Consumer Price Index (CPI), Deposit Index (MEV), and the US Dollar to Turkish Lira Exchange Rate (USDTR) on the BIST100 Index (BIST) were analyzed for the period from 2005 to 2023 on a monthly basis. Using this data, we applied the autoregressive distributed lag (ARDL) method to derive empirical results. The research findings indicate that over the long term, the BONO, CPI, and MEV variables have a statistically significant impact on the BIST index. However, the influence of USDTR on the BIST is statistically insignificant. While the BONO and CPI variables positively affect the BIST, the MEV variable has a negative impact.

**Keywords:** BIST100, consumer price index, ARDL

**JEL Classification:** J01, C20, C23, C40

## 1. Introduction

Understanding the direction and magnitude of the basic factors influencing the stock market index is crucial for investors to develop a successful investment strategy. Accordingly, the examination of various economic, political, and psychological factors on stock market indices has garnered significant attention from researchers (Canöz and Yiğit, 2022: 1).

It is anticipated that new policies and financial instruments will evolve that consider the increasing globalization of financial actors in the world economy. The Keynesian approach, which originally embraced non-intervention by the state in markets, was supplanted by the Neo-Classical approach advocating for economic freedom in markets, particularly in response to the oil crises between 1970 and 1980. This shift underscored the importance of developing Money and Capital markets, and the necessity to consider both financial liberalization and the influx of foreign capital (Ünal and Heybeli, 2022: 2).

In such an economic and financial framework, investors who do not adopt a risk and return-oriented approach should meticulously analyze not only financial indicators but also macroeconomic indicators specific to that country, as well as psychological decision-making expectations or confidence indicators, when making investment decisions (Direkçi and Kaygusuz, 2013: 5).

In this study, variables that may impact the BIST100 index were selected and analyzed. In recent years, there has been an increasing number of studies on this topic. Independent variables that could affect the BIST 100 index were chosen based on existing literature. Uniquely, additional variables were also included in the model, which is believed to enrich the literature. Among the

[1]Prof. Dr, Karabük University, Faculty of Business Administration, Karabük, Turkey, mehmetislamoglu@karabuk.edu.tr
[2]Phd student, Uludag University, Faculty of Economics, Bursa, Turkey, mustafaseker@uludag.edu.tr

ISSN 2548-0448

selected variables, the Borsa İstanbul BIST100 Index was designated as the dependent variable, representing stock market and economic activity, while the MEV TL-Deposit-Index (proxy for interest markets), USDTR Parity (proxy for FX markets), Consumer Price Index (CPI), and BONO (All-Bond-Index) were chosen as independent variables. The aim of this study is to identify the existence of a significant relationship between the BIST100 Index and the selected independent variables. To this end, ARDL analysis was conducted on the variables, and it was concluded that there is a significant relationship between the variables in the long term.

## 2. Summary of Literature

When examining the papers in the relevant literature, it is observed that ARDL, VECM, Cointegration, VAR, and ANOVA analyses were employed as research methods. The analysis results in the literature are similar to those of this study, with a few exceptions.

**Table 1.** Summary of literature

| **Author/ Year** | **Purpose and Scope** | **Method** | **Findings** |
|---|---|---|---|
| Al-Sharkas Adel/ (2004) | In this study, similar to others, the relationship between stock prices and macroeconomic variables was investigated. | VECM | According to the research results, there is a long-term relationship between the variables. |
| Kyereboah-Coleman and Agyire-Tettey/ (2008). | The study investigated the relationship between stock prices, deposit interest rates, and inflation in Ghana. | Cointegration and Error correction model | The study revealed that macroeconomic indicators negatively affect stocks in Ghana. |
| Hazar Altınbaş, Nilgün Kutay veN.Cenk Akkaya/ (2015) | Additionally, the impacts of inflation, interest rates, exchange rates, the industrial production index, and oil prices on the BIST-100 index were examined using a multifactor regression model. | Johansen cointegration test, vector error correction, Granger causality test. | Additionally, the exchange rate variable was identified as the only factor with explanatory power on the BIST-100 index. |
| Thi Bich Ngoc Tran (2016) | The aim of the study is to test for the existence of periodic stock price bubbles in Asian and Latin American emerging stock markets during the period from 1990 to 2009. | Non-cointegration, Residual-Augmented Least Squares (RALS) | The study shows that the assumptions of price bubbles cannot be dismissed for any of the developing stock markets examined. This evidence suggests that the cointegration relationship between price and dividends is not always supported, indicating that stock prices may not consistently reflect the fundamental characteristics of developing stock markets. |

| Author/ Year | Purpose and Scope | Method | Findings |
|---|---|---|---|
| Utku Şendururve Semra Karacaer/ (2017) | In this study, three dimensions were examined within the framework of triple bottom line reporting. The activities and sustainability reports (if available) of companies listed on the Borsa Istanbul (BIST) 100 index were analyzed. This was followed by an examination of the relationship between the triple bottom line reporting scores and various identified variables using multiple regression analysis. | ANOVA | According to the regression analysis in the study, no significant relationship was found between the dependent variables, triple bottom line reporting scores, sector ownership structure, and business type. However, company size demonstrated a moderately positive relationship, country of origin exhibited a low level of positive relationship, auditor type showed a moderately positive relationship, age had a low level of negative relationship, leverage ratio displayed a moderately positive relationship, and profitability also indicated a moderately positive relationship. |
| Slah Bahlul, Murad Mroua, Naded Naifar/ (2017) | The aim of the paper is to examine the impact of conventional stock market returns, volatility, and various macroeconomic variables, including inflation rates, short-term interest rates, the slope of the yield curve, and emerging markets, using Markov transition regression models. | VS-VAR model | According to the analysis results, both developing and developed Islamic stock indices are influenced by conventional stock index returns and money supply across both low and high volatility regimes. However, other macroeconomic variables do not adequately explain the dynamics of Islamic stock indices, particularly in high volatility regimes. |
| Tuğba Koyuncu/ (2018) | The purpose of the study is to explore the relationship between the BIST100 index and macroeconomic variables, including inflation rates, interest rates, the industrial production index, and real economic growth. | FMOLS-DOLS | As a result of the study, a general correlation was observed between macroeconomic indicators and the BIST100 index. |
| Turgay Münyas/ (2019) | The objective of the study is to investigate the existence of a relationship between selected macroeconomic variables and stock market indices. | Panel regression analysis | The study found that all independent variables are statistically significant. |
| Devia SS.Vietha/ (2019) | The goal of the study is to determine whether there is a bidirectional relationship between inflation and exchange rates, and to assess their effects on the stock market. | VAR | The results indicate that inflation does not affect the exchange rate, but the exchange rate significantly impacts the inflation rate. Similar to the stock market, when inflation increases, there is a continuous decline or negative movement. Subsequently, as the rupee exchange rate continues to exhibit a depreciation trend, the activity in the stock market appears to |

ISSN 2548-0448

| Author/ Year | Purpose and Scope | Method | Findings |
|---|---|---|---|
| | | | diminish. |
| Gamze Göçmen Yağcılar/ (2021) | The aim of the study is to investigate the asymmetric effects of implied volatility, realized volatility, exchange rates, and liquidity on the returns of the Borsa Istanbul 100 (BIST100) index. | Markov regime change method | The analysis results reveal the existence of two distinct return regimes during the period considered. |
| Seyfettin Ünal ve Göksel Karaş/ (2021) | The aim of the study is to examine the relationship between the stock market and macroeconomic variables in Turkey. | Cointegration test | As a result of the study, a long-term cointegrated relationship was established between the BIST100 and macroeconomic factors according to the trend break model. |
| Süleyman Serdar Karaca, Tuğba Koyuncu ve Mustafa Çevik/ (2021) | In this study, the relationships between the BIST Financial Index (XUMAL) and the dollar exchange rate, interest rate, inflation rate, gold price, capacity utilization rate, and industrial production index were investigated. | ARDL | As a result of the study, it was found that increases in interest rates and the industrial production index positively impact the financial index in the short term but negatively impact it in the long term. |

## 3. Data and Methodology

The study focused on macroeconomic variables that are thought to be related to domestic stock market indices. In this context, variables representing the foreign exchange market, inflation, and bond market were used to assess their impact on the stock market index. The data covers the years 2005-2023 and was evaluated on a monthly basis. The BIST100 index considered as the dependent variable, and the others were selected as independent variables.

**Table 2.** Description of variables

| Variables | Description | Data Source | Period |
|---|---|---|---|
| *BIST* | *Istanbul Stock Exchange-BIST 100 Index (Proxy for Stock Market and Economic Activity)* | *Borsa-Istanbul* | *Jan 2005-Sep 2023* |
| *MEV* | *TL-Deposit-Index (Proxy of Interest Markets)* | *Borsa-Istanbul* | *Jan 2005-Sep 2023* |
| *USDTR* | *Parity (Proxy for FX Markets)* | *CBRT (Central Bank of TR)* | *Jan 2005-Sep 2023* |
| *CPI* | *Consumer Price Index (Proxy for Inflation)* | *CBRT (Central Bank of TR)* | *Jan 2005-Sep 2023* |
| *BONO* | *All-Bond-Index (Return) (Proxy for Bond Market)* | *Borsa-Istanbul* | *Jan 2005-Sep 2023* |

Considering the purpose of the research, analyzing the data with appropriate methods; Autoregressive Distributed Lag (ARDL), and diagnostic tests were performed.

Considering the objectives of the research, data analysis was performed using suitable methods, including the Autoregressive Distributed Lag (ARDL) and various diagnostic tests. Engle and Granger (1987) along with Johansen (1988, 1995) developed methodologies for analyzing cointegration relationships, which are particularly vital when the variables' degree of integration is I(1). In this context, the Fully Modified Least Squares (FMOLS) and Dynamic Least Squares

(DOLS) methods are essential when the variables are at I(0) and I(1) levels. Additionally, the Autoregressive Distributed Lag Model (ARDL), commonly used in cointegration studies, was developed by Pesaran and Shin (1999) and further by Pesaran, Shin, and Smith (2001). The ARDL model is suitable for cases where regressor variables are at I(0) and I(1) levels, or both. This model is a regression framework that incorporates lags of both dependent and independent variables, specifying the number of lags for the explained variable as $p$, for the first independent variable as $q1$, and for the last independent variable as $q_k$.

$$y_t = \alpha + \sum_{i=1}^{p} \gamma_i y_{t-i} + \sum_{j=1}^{k} \sum_{i=0}^{q_j} X_{j,t-i'} \beta_{j,i} + \varepsilon_t \quad (1)$$

An ARDL model features a structure that can be represented through mathematical equations. In this framework, even without lag terms ($qj$ = 0), explanatory variables $Xj$ are considered. Fixed regressors can be employed for static scenarios, while variable regressors are utilized for dynamic cases. Commonly used methods exist for adjusting the parameters of the model and determining the appropriate lag lengths. The ARDL approach enables the specification of unique lag lengths for each explanatory variable, which do not necessarily need to be symmetric; this aspect was emphasized in the study by Pesaran and Shin (1999). The estimation process of the model is conducted using the least squares method, and during this process, information criteria such as the Akaike Information Criterion (AIC) or the Bayesian Information Criterion (BIC) may be employed to determine the optimal model configuration. In a cointegration ARDL model, the long-term coefficients are calculated by transforming differences in Equation (1). By using these transformations instead of direct long-term coefficients, the following equation is derived::

$$\Delta y_t = -\sum_{i=1}^{p-1} \gamma_i^* \Delta y_{t-1} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \Delta X_{j,t-i'} \beta_{j,i^*} - \widehat{\emptyset} EC_{t-1} + \varepsilon_t \quad (2)$$

The error correction (EC) term in Equation (2) is:

$$EC_t = y_t - \alpha - \sum_{j=1}^{k} X_{j,t'} \hat{\theta}_j \quad (3)$$

The OLS residual series is extracted from the long-term cointegration regression, as expressed in the equation. This methodology, developed by Pesaran et al. (2001), outlines a method for testing the long-term relationship between the dependent and independent variables in the ARDL model, using Equation (2). In this approach, the presence of a stationary or long-term relationship among the variables in the model is explored through the cointegration formulation. The bounds testing procedure, as applied to Equation (2), converts it into the following representation:

$$\Delta y_t = -\sum_{i=1}^{p-1} \gamma_i^* \Delta y_{t-1} + \sum_{j=1}^{k} \sum_{i=0}^{q_j-1} \Delta X_{j,t-1'} \beta_{j,i}^* - \rho y_{t-1} - \alpha - \sum_{j=1}^{k} X'_{j,t-1} \delta_j + \varepsilon_t \quad (4)$$

In this context, testing the existence of relationships becomes a simple form with the expressions: ρ=0 and $\delta 1$= $\delta 2$= ..... = $\delta k$= 0. The test statistic obtained from Equation (4) shows a distribution different from a standard distribution under the null hypothesis (absence of relationship) if all regressors are completely at the I(0) or I(1) level. With the method developed by Pesaran et al. (2001), the critical values determined for the cases I(0) and I(1) can serve as a limit for the complex cases of the regressors - both I(0) and I(1).

The ARDL F-statistic is an approach used to assess the presence of a cointegration relationship, utilizing two key critical values: the upper and lower bounds. If the F-statistic surpasses the upper limit of the determined level of statistical significance, the hypothesis asserting the absence of a long-term relationship is rejected, and the presence of cointegration is affirmed. Conversely, if the F-statistic remains below the lower bound, the hypothesis of no long-term relationship is accepted, indicating an absence of cointegration. When the F-statistic falls between these two critical values, the results are inconclusive, and uncertainty persists. Upon detecting cointegration, the cointegration equation is formulated, and the resultant long-term error term is incorporated into the error correction model (ECM). This term, widely known as the Error Correction Term (ECT), indicates the speed at which imbalances are corrected, thus reflecting the strength of the relationship. If the F-statistic lies within these critical bounds, indicating uncertainty, the error correction term becomes a pivotal tool in establishing cointegration relationships and analyzing interactions between variables (Banerjee, Dolado, and Mestre, 1998).

The ARDL method served as the principal predictive model in this study. It offers econometric advantages over traditional cointegration techniques. ARDL modeling is effective when time series data are at I(0) or I(1) levels of integration, allowing for application irrespective of the series' stationarity, unlike other cointegration methods. This methodology can be employed as long as none of the series reaches I(2) or a higher level of integration, thus maintaining efficacy even amid uncertainties regarding the order of integration of the variables (Singhal, Choudhary, and Biswal, 2019). The ARDL model facilitates the simultaneous estimation of both short- and long-run coefficients, which helps minimize the issue of spurious regression when dealing with non-stationary series. It has been observed that there is no endogeneity issue in estimating both short- and long-term coefficients along with lagged dependent and explanatory variables simultaneously (Vasudeva et al, 2016). Through error correction modeling, the ARDL approach enables the identification of causal relationships in both the short and long term, enhancing statistical robustness and reducing measurement errors, especially beneficial when analyzing small samples. The estimation of the research model can be conducted using the Ordinary Least Squares (OLS) method, as described in Equation (5) below (ARDL Frontier approach).

$$\Delta \mathrm{LBIST}_t = \alpha_0 + \alpha_1 L\mathrm{BIST}_{t-1} + \alpha_2 \mathrm{LBONO}_{t-1} + \alpha_3 \mathrm{LCPI}_{t-1} + \alpha_4 \mathrm{LMEV}_{t-1} + \alpha_5 LUSDTR_{t-1} + \sum_{i=1}^{p} \beta_{1i} \Delta \mathrm{LBIST}_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta \mathrm{LBONO}_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta \mathrm{LCPI}_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta \mathrm{LMEV}_{t-i} + \sum_{i=0}^{q_4} \beta_{5i} \Delta \mathrm{LUSDTR}_{t-i} + u_t \quad (5)$$

Equation (5) pertains to various parameters and operators utilized in the econometric modeling process. Here, the symbol Δ (Delta) denotes the first-order difference of the variable under study, representing the change between consecutive observations in the time series data. α0 indicates the deterministic bias or drift parameter of the model. The term ut refers to the Gaussian white noise, defining the error term of the model, and it represents random fluctuations within the model.

Terms such as $\alpha_1$, $\alpha_2$,……. $\alpha_5$ indicate long-term dynamics, while $\beta_{1i}$, $\beta_{2i,}$, …………$\beta_{5i}$ represents short-term dynamics. These parameters are used to model both short- and long-term effects of dependencies and interactions between variables.

In order to determine whether there is a cointegration relationship in the context of the research model, the null hypothesis is: $H_o$:$\alpha_1$=$\alpha_2$=$\alpha_3$=$\alpha_4$=$\alpha_5$=0 ; The alternative hypothesis can be tested with $H_a$:$\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq 0$.In this context, the calculated F-statistic value was compared to Pesaran et al. (2001) at certain significance levels. If the calculated F value is higher than the upper critical value, the null hypothesis that there is no cointegration is rejected.

In determining the appropriate model, statistical criteria such as $R^2$, the Hannan-Quinn Criterion (HQ), the Akaike Information Criterion (AIC), and the Schwarz Criterion (SBC) play a crucial role. If the null hypothesis is rejected, estimations are conducted using the unrestricted error correction model (Unrestricted Error Correction Model - ECM) through Equation (6), as proposed by Pesaran et al. (2001). This model explores how short-term imbalances should be corrected over the long term, considering the contribution of the error correction term..

$$\Delta \mathrm{LBIST}_t = \gamma_0 + \sum_{i=1}^{p} \delta_{1i} \Delta \mathrm{LBIST}_{t-i} + \sum_{i=0}^{q_1} \delta_{2i} \Delta \mathrm{LBONO}_{t-i} + \sum_{i=0}^{q_2} \delta_{3i} \Delta \mathrm{LCPI}_{t-i} + \sum_{i=0}^{q_3} \delta_{4i} \Delta \mathrm{MEV}_{t-i} + \sum_{i=0}^{q_4} \delta_{5i} \Delta \mathrm{USDTR}_{t-i} + \lambda \, \mathrm{ECT}_{t-1} + u_t \quad (6)$$

The Error Correction Term (ECT), defined in Equation (6), encompasses the residuals of the model, and the λ term represents the parameter that describes the duration of the correction process (Murthy and Okunade, 2016). Analyses conducted through the error correction model illustrate the speed at which the system returns to long-term equilibrium following the impact of short-term shocks. Various diagnostic tests are carried out to verify the accuracy of the model employed. These tests identify potential issues such as serial correlation, errors in functional form, and heteroskedasticity within the model. Additionally, the Cumulative Sum (CUSUM) test is applied to assess the stability of the model parameters over time. The statistics derived from these tests are utilized to examine structural breaks throughout the period. If the CUSUM plots remain within the critical boundaries established at the 5% significance level, this indicates that the regression coefficients are stable over time (Jalil, Mahmood, and Idrees, 2013). In this research, the Akaike Information Criterion (AIC) was employed to determine the lag length for the ARDL model, with the maximum lag length set at four.

## 4. Results and Discussions

In this part of the research, the findings derived from the linear ARDL approach are presented. The results concerning the series analyzed were obtained using the linear ARDL framework and are expressed and interpreted through tables and figures. The ARDL bounds test results related to the cointegration of the series are displayed in Table 3 below. Additionally, the "k" in this table denotes the number of primary explanatory variables in the model.

**Table 3.** ARDL bound test results

| F-Bounds Test | | | Null Hypothesis: No levels relationship | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| F-statistic | 6.864265 | 10% | 2.45 | 3.52 |
| K | 4 | 5% | 2.86 | 4.01 |
| | | 2.5% | 3.25 | 4.49 |
| | | 1% | 3.74 | 5.06 |

According to Table 1, the null hypothesis of no cointegration is rejected at the 0.01 significance level as a result of the ARDL Bounds Test conducted within the scope of the study. This indicates that there is cointegration among the variables within the context of the established working model. It can also be noted that there is a long-term relationship between the LBIST and the variables LBONO, LCPI, LMEV, and LUSDTR.

The selection of lag length for the ARDL method was based on the Akaike Information Criterion, and the lag length information for the 20 most suitable models selected according to this criterion is presented in Figure 1.

Upon examining Figure 1, it is observed that the ARDL (1,1,0,0,1) model is the most appropriate according to the Akaike Information Criterion. In this context, this model was used as the basis for the analyses conducted. The estimation results of the ARDL (1,1,0,0,1) model, with optimal lag lengths according to the information criterion, are displayed in Table 2 below.

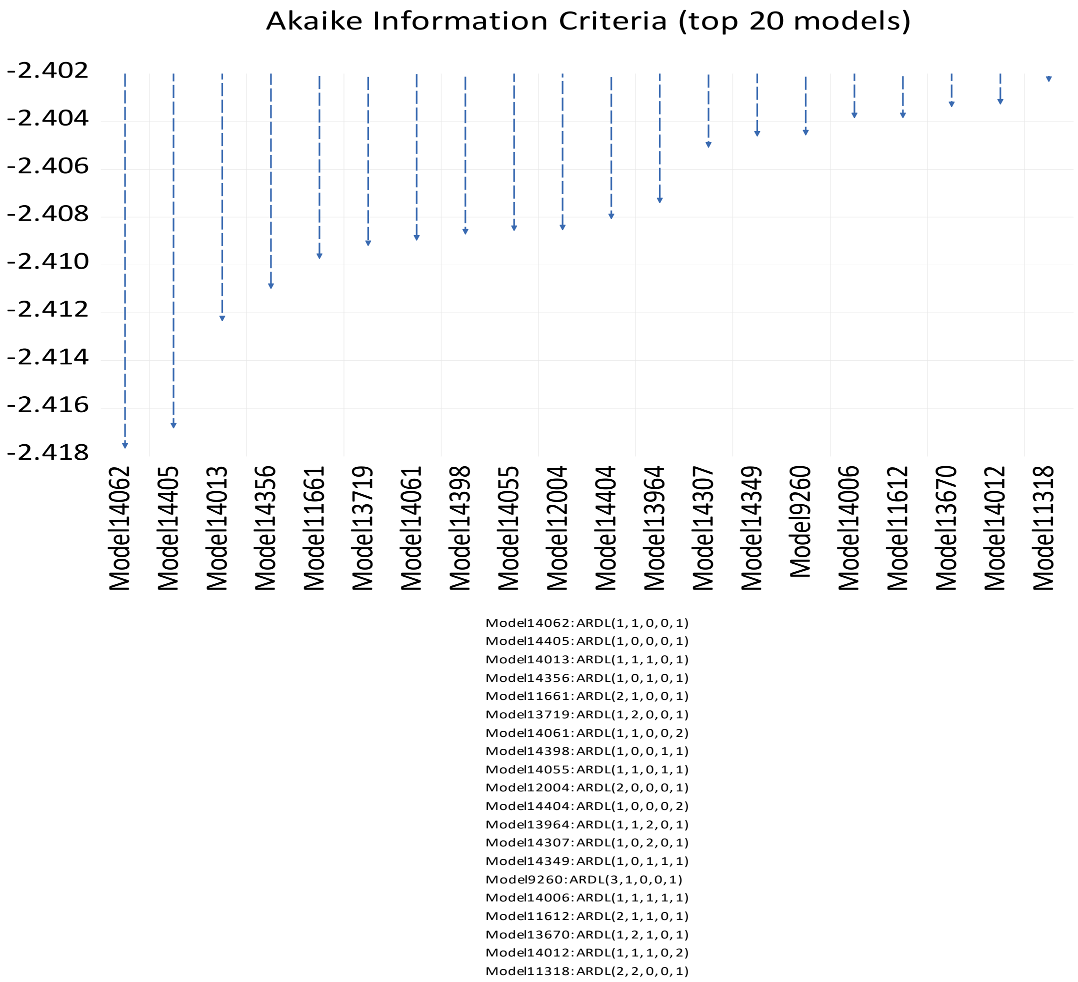


**Figure 1.** Graphical representation of optimal model selection

Upon examining Table 4, the Ramsey Reset test was conducted to check for functional form errors; heteroscedasticity was assessed using the Breusch-Pagan-Godfrey test, and serial correlation was examined using the Breusch-Godfrey Serial Correlation LM test. In this context, the model is confirmed to be free of functional form errors and serial correlation issues. However, it appears that there is a heteroscedasticity problem in the model, and the White correction was applied to achieve more consistent results.

**Table 4.** ARDL (1,1,0,0,1) model estimation results

| | | | | |
|---|---|---|---|---|
| Dependent Variable: LBIST | | | | |
| Method: ARDL | | | | |
| Sample (adjusted): 2005M02 2023M09 | | | | |
| Included observations: 224 after adjustments | | | | |
| Maximum dependent lags: 6 (Automatic selection) | | | | |
| Model selection method: Akaike info criterion (AIC) | | | | |
| Dynamic regressors (6 lags, automatic): LBONO LCPI LMEV LUSDTR | | | | |
| Fixed regressors: C | | | | |
| Number of models evaluated: 14406 | | | | |
| Selected Model: ARDL(1, 1, 0, 0, 1) | | | | |
| Note: final equation sample is larger than selections ample | | | | |
| Huber-White-Hinkley (HC1) heteroskedasticity consistent Standard errors and covariance | | | | |
| | | | | |
| | | | | |

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|---|---|---|---|---|
| LBIST(-1) | 0.915035 | 0.038430 | 23.81075 | 0.0000 |
| LBONO | 0.495326 | 0.207502 | 2.387096 | 0.0178 |
| LBONO(-1) | -0.295903 | 0.228155 | -1.296941 | 0.1960 |
| LCPI | 0.163969 | 0.123039 | 1.332663 | 0.1840 |
| LMEV | -0.381096 | 0.143366 | -2.658198 | 0.0084 |
| LUSDTR | -0.364715 | 0.220041 | -1.657482 | 0.0989 |
| LUSDTR(-1) | 0.424444 | 0.214110 | 1.982363 | 0.0487 |
| C | 1.131288 | 0.494450 | 2.287972 | 0.0231 |
| R-squared | 0.989502 | Meandependent var | | 6.677059 |
| Adjusted R-squared | 0.989162 | S.D. dependent var | | 0.685018 |
| S.E. of regression | 0.071315 | Akaike info criterion | | -2.408350 |
| Sum squared resid | 1.098550 | Schwarz criterion | | -2.286505 |
| Log likelihood | 277.7351 | Hannan-Quinn criter. | | -2.359167 |
| F-statistic | 2908.452 | Durbin-Watson stat | | 1.885378 |
| Prob(F-statistic) | 0.000000 | | | |

*Note: p-values and any subsequent tests do not account for model selection

The CUSUM Test Graph, which is used to assess the stability of the coefficients in the ARDL (1,1,0,0,1) model's analysis results and to check for any structural breaks, is depicted in Figure 2.

According to Figure 2, there are no breaks at the 0.05 significance level in the CUSUM test chart. Therefore, it is concluded that the coefficients of the ARDL cointegration test are stable and that there are no structural breaks in the model.

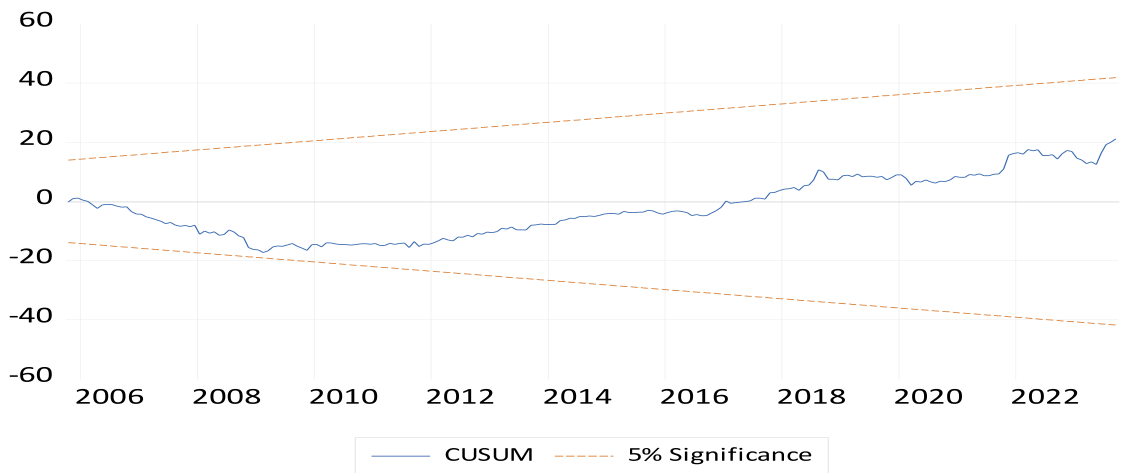


**Figure 2.** CUSUM test results of ARDL (1,1,0,0,1) model

Considering these outcomes, it is concluded that the estimation results of the ARDL model are consistent. In this context, the results for the long-term coefficients are presented in Table 5 below.

Upon examining Table 5, it is observed that the LBONO, LCPI, and LMEV variables have statistically significant impacts on the LBIST variable. However, the impact of another variable, LUSDTR, on LBIST is not statistically significant. While the LBONO and LCPI variables positively affect LBIST, the LMEV variable has a negative impact.

The short-term impacts of the variables included in the model were determined using the error correction model estimated via the ARDL method. In this context, the estimation results concerning the error correction form of the ARDL model, and thus the short-term coefficients, are displayed in Table 5 below.

**Table 5.** Estimation results of ARDL error correction model

ARDL Error Correction Regression
Dependent Variable: D(LBIST)
Selected Model: ARDL(1, 1, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 05/17/24 Time: 14:34
Sample: 2005M01 2023M09
Included observations: 224

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.131288 | 0.188991 | 5.985941 | 0.0000 |
| D(LBONO) | 0.495326 | 0.168306 | 2.943003 | 0.0036 |
| D(LUSDTR) | -0.364715 | 0.105858 | -3.445323 | 0.0007 |
| CointEq(-1)* | -0.084965 | 0.014370 | -5.912436 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.239393 | Meandependent var | 0.015257 |
| Adjusted R-squared | 0.229021 | S.D. dependent var | 0.080478 |
| S.E. of regression | 0.070664 | Akaike info criterion | -2.444064 |
| Sumsquared resid | 1.098550 | Schwarz criterion | -2.383142 |
| Log likelihood | 277.7351 | Hannan-Quinn criter. | -2.419473 |
| F-statistic | 23.08090 | Durbin-Watson stat | 1.885378 |
| Prob(F-statistic) | 0.000000 | | |

| Diagnostic Statistics on Estimation Results | | |
|---|---|---|
| Tests | Test Statistics | p |
| Ramsey Reset Test | 0.693201 | 0.4889 |
| Breusch-Pagan-Godfrey Test | 44.80486 | 0.0000 |
| Breusch-Godfrey Serial Correlation LM Test | 5.967956 | 0.4268 |

In Table 5, the functional form error was tested using the Ramsey Reset test; heteroscedasticity was investigated using the Breusch-Pagan-Godfrey test, and serial correlation was assessed with the Breusch-Godfrey Serial Correlation LM test. In this context, the model shows no signs of functional form errors or serial correlation issues. However, a heteroscedasticity problem is evident, and White correction has been applied to the model to achieve more consistent results.

It is observed that the error correction term (ECT) in the research model is negative and statistically significant (ECT(-1) = -0.084965). Within the context of the study, this rate translates to approximately 8.5%, concluding that 8.5% of the shocks occurring in the system designed for the model are corrected within a month. In other words, the deviations from equilibrium are expected to return to balance in approximately 11.7 months.

## 5. Conclusion

This study focuses on macroeconomic variables believed to influence stock market indices, drawing on both domestic and international sources. A review of the literature reveals numerous studies examining the relationship between macroeconomic indicators and stock market indices. Based on this information, the aim is to explore additional indices thought to impact the stock market. Understanding and monitoring the direction and intensity of these effects is crucial, especially for stock market investors. According to the study results, an anticipated increase in the dollar exchange rate heightens investor demand for dollars to preserve their investments.

Increasing input costs affect firm profitability and influence production decisions and growth policies. Specifically, rising input costs adversely impact a company's profitability or increase its exchange rate risk, leading to a deterioration in its balance sheet. This scenario negatively affects the value of the company's stocks. Many studies in the literature support the finding that positive shocks in the dollar exchange rate exacerbate negative shocks in the BIST100.

The findings from the series analyzed were derived using the linear ARDL approach and were presented and interpreted through tables and figures. The ARDL Bounds Test conducted as part of the study rejects the null hypothesis of no cointegration at a 0.01 significance level, indicating a long-term association among the variables in the model. The selection of lag length for the ARDL method is based on the Akaike Information Criterion. The short-term impacts of the variables in the model were determined using the ARDL method's error correction model. It is observed that the error correction term (ECT) in the research model is negative and statistically significant, indicating that 8.5% of the shocks in the model's system were corrected within a month.

In this study, variables rarely included in existing literature were selected and analyzed. This approach aims to enlighten the analyses conducted by other researchers.

**References**

Al-Sharkas, A. (2004). The Dynamic Relationship Between Macroeconomic Factors and the Jordanian stock market‟. International Journal of Applied Econometrics and Quantitative Studies, 1(1). 97-114.

Altınbaş, H., Kutay, N., & Akkaya, C. (2015). Makroekonomik faktörlerin hisse senedi piyasaları üzerindeki etkisi:Borsa Istanbul üzerine bir uygulama. Ekonomi ve Yönetim Araştırmaları Dergisi, 4(2), 30-49.

Bahloul, S., Mroua, M., &Naifar, N. (2017). The impact of macroeconomic and conventional stock market variables on Islamic index returns under regime switching. Borsa Istanbul Review, 17(1), 62-74.

Banerjee, A.,Dolado, J. J., &Mestre R. (1998).Error-Correction Mechanism Tests for Co-Integration in Single Equation Framework. Journal of Time Series Analysis, 19(3), 267-283.

Canöz, İ., & Yiğit, F. (2022).Seçilmiş Makroekonomik Değişkenlerin BIST100 Endeksi Üzerindeki Asimetrik Etkileri. Yaşar Üniversitesi E-Dergisi, 17(65), 39-56.

Direkçi, T. B., & Kaygusuz, S. (2013). Kısa Vadeli Sermaye Hareketlerinin Makroekonomik Değişkenler ile Olan Etkileşimi: Türkiye Örneği. Akademik Araştırmalar ve Çalışmalar Dergisi (AKAD), 5(9), 28-42.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. Econometrica: journal of the Econometric Society, 251-276.

Jalil, A., Mahmood, T., & Idrees, M. (2013). Tourism–growth nexus in Pakistan: Evidence from ARDL bounds tests. Economic Modelling, 35, 185-191.

Johansen, S. (1988). Statistical Analysis of Cointegrating Vectors. Journal ofEconomic Dynamics and Control, 12, 231-254.

Johansen, S. (1995). Likelihood-Based Inference in Cointegrated Vector Autorregressive Models. New York: Oxford University Press Incorporated.

Karaca, S. S., Koyuncu, T., & Çevik, M. (2021). Borsa İstanbul Mali Endeksi ile Makroekonomik Değişkenlerin Ardl Sınır Testi ileAnalizi. Finansal Araştırmalar ve Çalışmalar Dergisi, 13(25), 572-585.

Koyuncu, T. (2018). BİST-100 endeksinin makroekonomik değişkenler ile ilişkisi: Ampirik bir çalışma. Finans Ekonomi ve Sosyal Araştırmalar Dergisi, 3(3), 615-624.

Kyereboah-Coleman, A., &Agyire-Tettey, K. F. (2008). Impact of macroeconomic indicators on stock market performance: The case of the Ghana Stock Exchange. The Journal of Risk Finance, 9(4), 365-378.

Murthy, V. N., &Okunade, A. A. (2016). Determinants of US health expenditure: Evidence from autoregressive distributed lag (ARDL) approach to cointegration. Economic Modelling, 59, 67-73.

Münyas, T. (2019). Borsa Endeksleriile Makro Ekonomik Değişkenler Arasındaki İlişkinin Gelişmiş ve Gelişmekte Olan Ülkeler Açısından Değerlendirilmesi. Euroasıa Journal of Socıal Scıences & Humanıtıes, 6(7), 111-123.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.

Pesaran, M. H., & Shin, Y. (1999). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis (Chapter 11). In S. Strom (Ed.), Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, Cambridge University Press, 371-413.

Singhal, S., Choudhary, S., & Biswal, P. C. (2019). Return and Volatility Linkages among International Crude Oil Price, Gold Price, Exchange Rate and Stock Markets: Evidence from Mexico. Resources Policy, 60, 255-261.

Şendurur, U., &Karacaer, S. (2017). Üçlü sorumluluk raporlaması: BIST 100 endeksi üzerinde bir araştırma. Ulakbilge Sosyal Bilimler Dergisi, 5(12), 897-930.

Tran, T. B. N. (2017). Speculative bubbles in emerging stock markets and macroeconomic factors: New empirical evidence for Asia and Latin America. Research in International Business and Finance, 42, 454-467.

Ünal, A. E., Nas, S., &Heybeli, M. (2022). Seçilmiş Makroekonomik Değişkenler ve Beklenti Endekslerinin BİST 100 Endeksi Üzerine Etkisi. Sosyoekonomi, 30(54), 443-466.

Ünal, S., & Karaş, G. (2021). Borsa ve Makroekonomik Faktörler Arasındaki Etkileşim: BIST100 Örneği. Yönetim ve Ekonomi Dergisi, 28(1), 169-185.

Vasudeva N. R., Murthy, V. N. R., Albert A., & Okunade, A. A. (2016). Determinants of U.S. Health Expenditure: Evidence from Autoregressive Distributed Lag (ARDL) Approach to Cointegration. Economic Modelling, 59, 67-73.

Vietha, D. S. (2019). The correlation of exchange rate and inflation and its effect on stock markets. Case Study on Consumer Good Index Indonesia: 2004–2017. Academic Journal of Economic Studies, 5(2), 32-44.

Yağcılar, G. G. (2024). Likidite, Kur ve Volatilitenin Bist-100 Endeksine Etkisi: Markov Rejim Değişimi Yaklaşımı. Uluslararası İşletme, Ekonomi ve Yönetim Perspektifleri Dergisi, (1), 59-79.