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THE EFFECT OF INTEREST RATES ON PORTFOLIO INVESTMENTS AND FOREIGN DIRECT INVESTMENTS IN TÜRKİYE*

Türkiye'de Faiz Oranlarının Portföy Yatırımları ve Doğrudan Yabancı Yatırımlara Etkisi

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Keywords:
Foreign Direct Investment, Portfolio Investment, Interest Rate Rates, ARDL Border Test, Toda-Yamamoto Causality Test

JEL Codes:
C22, E20, F21

Abstract

This study aims to analyse the relationship between foreign direct investments (FDI) and portfolio investments (PI) and interest rates. Firstly, ADF and PP unit root tests were applied to determine whether the variables were stationary or not. Since the series became stationary at different levels, the ARDL (Autoregressive Distributed Lag Bound Test) test, one of the cointegration tests, was applied. Afterward, Toda-Yamamoto tests were utilized to determine whether there is causality between the variables and if there is a causality relationship, to determine its directions. According to the ARDL bound test results, it is concluded that there is no short-term asymmetric relationship between PI and other independent variables. In other words, there is no statistically significant relationship between PI and EUR, USD and TL interest rates. On the other hand, it is concluded that the FDI dependent variable and other independent variables are long-run cointegrated in the relevant period. According to the results of the Toda-Yamamoto causality test where FDI and TL, EUR, and USD are independent variables, it is concluded that there is a Granger causality relationship between FDI and TL and EUR interest rates.

Anahtar Kelimeler:
Doğrudan Yabancı Yatırımlar, Portföy Yatırımları, Faiz Oranları, ARDL Sınır Testi, Toda-Yamamoto Nedensellik Testi

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C22, E20, F21

Öz

Bu çalışmada, doğrudan yabancı yatırımlar (DDY) ve portföy yatırımları ile faiz oranları arasındaki ilişkiyi analiz etmeyi amaçlamıştır. İlk olarak, değişkenlerin durağan olup olmadıklarının tespiti için ADF ve PP birim kök testleri uygulanmıştır. Eşbütünleşme testlerinden ARDL (Autoregressive Distributed Lag Bound Test) testi uygulanmıştır. Sonrasında, değişkenler arasında nedenselliğin olup olmadığı, nedensellik ilişkisi varsa yönlerinin tespit edilebilmesi için Toda-Yamamoto testlerinden yararlanılmıştır. ARDL sınır testi sonuçlarına göre, portföy yatırımları ile diğer bağımsız değişkenler arasında kısa dönemli asimetrik ilişkinin olmadığı sonucuna varılmıştır. Yani, portföy yatırımları ile EUR, USD ve TL faiz oranları arasında istatistiki anlamda herhangi bir ilişki bulunamamıştır. Diğer taraftan hesaplanan F istatistiği %1 önem seviyesindeki kritik değerlerden büyük olduğu için DDY bağımlı değişkeni ile diğer bağımsız değişkenlerinin ilgili dönemde uzun dönemli eşbütünleşik olduğu sonucuna varılmıştır. Toda-Yamamoto nedensellik testlerinin sonuçlarına göre ise; DYY ile TL, EUR ve USD bağımsız değişken olduğu Toda-Yamamoto nedensellik testi sonuçlarına göre, DYY ile TL ve EUR faiz oranları arasında Granger nedensellik ilişkisinin olduğu sonucuna varılmıştır.

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1. Introduction

With globalization after the 1980s, portfolio investments (PI) and FDI have grown worldwide. PI and FDI used to take place from developed countries to other countries in order to benefit from the production factors and underground resources of developing countries. In the 2000s, these investments started to be demanded intensively by developed countries as well. Today, the phenomenon of liberalization has become widespread along with the liberal policies that have made their impact felt all over the world. As countries adopt such policies more and more, the barriers to capital mobility have started to disappear, and as a result, both foreign direct capital movements and monetary capital movements have started to gain momentum.

While physical investments made by savers in another country in order to achieve higher returns are referred to as FDI, investments in capital market instruments such as public or private sector bonds and stocks are characterized as PI (Mucuk, 2011: 11-12). In other words, it can be defined as a multinational company shifting its production to a country outside its headquarters, establishing another company with partners, acquiring an existing company, or increasing its capital (Kurtaran, 2007: 367).

The shallow supply of financial funds in developing countries leads to high returns on financial instruments. Therefore, there has been a significant flow of financial resources from developed countries, where the supply of funds is abundant and therefore the returns on financial instruments are low, to these countries. In this way, there has been a significant amount of financial capital inflow to the capital and money markets of developing countries in the form of portfolio and other investments. PI are expected to provide financing opportunities for investments and support financial development, while direct investments are expected to positively affect economic growth through technology, capital and knowledge. However, this effect is limited by the fact that PI generally come in the form of short-term profits without turning into investments in the form of production and FDI come in the form of mergers and acquisitions. In addition, both forms of investment may not contribute to economic growth in countries that have not reached a certain technological level, have not achieved financial development, and have a weak institutional and legal framework (De Vita and Kyaw, 2009: 281; Gök and Güvercin, 2020: 59-60; Durham, 2004: 285).

As a developing country, Türkiye has implemented significant reforms in the capital markets with the policies implemented since the early 1990s. As a result, especially in the recent period, there has been a significant inflow of FDI and PI to Türkiye. Therefore, our study aims to analyze the relationship between FDI and PI and interest rates. When the studies in the literature are analyzed, it is observed that the studies mostly consist of studies that consider FDI and PI separately and include different macroeconomic independent variables. Our study differs from the other studies in the literature in this respect as it examines the relationship between interest rates by considering FDI and PI as two dependent variables. Therefore, this study is expected to contribute to the literature. In this framework, ARDL test, one of the cointegration tests, was applied by using quarterly values between 2010 and 2023. Then, the Toda-Yamamoto test is used to examine the causality relationship between the variables. In the second section of the study after the introduction, the literature on FDI and PI is reviewed. The third section provides information on the data set, methodology, and econometric results obtained. In the conclusion section, empirical findings are interpreted and a general evaluation of the study is made.

2. Literature Review

When the studies in the literature on PI and FDI are examined, it is seen that the studies generally focus on the relationship with macroeconomic factors. It is observed that macroeconomic factors such as inflation, exchange rate, economic growth, and CDS premiums are used with PI and FDI.

Clark and Berko (1996) conducted a correlation analysis for the Mexican stock market. They found that a 1 percent increase in the amount of foreign portfolio investment increased Mexican stock prices by 13 percent. A similar study was conducted by Lin and Swanson (2003) for the Taiwanese economy. The behavior of foreign investors investing in 60 large companies listed on the Taiwan Stock Exchange was investigated. Strong evidence was found that foreign investors use a momentum strategy by buying stocks that have won in the past and selling stocks that have lost in the past.

Pal (2006) investigated the impact on the Indian economy. He also stated that FPI affect the stock market, which in turn has a significant impact on the real economy. He concluded that the impact of FPI on the stock market and the real economy is not positive in his analyses.

Duasa and Kassim (2009) examined the relationship between Malaysia's economic performance and PI using Toda and Yamamoto causality test. Quarterly data were used in the study covering the years 1991-2006. As a result of the study, it was found that economic performance is an important factor in attracting foreign investments to the country. It is emphasized that foreign investors will feel secure if the economy has a healthy and sustainable growth policy.

In another study, Acaravcı and Bostan (2011) investigated the effects of macroeconomic variables on FDIs using the ARDL bounds test and Granger causality models for the period 1992Q1- 2007Q1. The results of the study show that there is a significant relationship between FDI and selected macroeconomic variables such as economic growth in the long run. According to the findings, an increase in GDP and domestic investments leads to an increase in FDI in the long run, while an increase in FDI leads to an increase in economic growth in the short run.

In his study, Okafor (2012) focused on the impact of macroeconomic variables on capital flows in Nigeria and conducted an analysis using the Ordinary Least Squares (OLS) method. The findings show that real GDP, interest rate and real exchange rate are the main determinants of FDI in Nigeria. The result shows that macroeconomic variables are critical for FDI inflow. Therefore, policymakers should endeavour to improve the macroeconomic environment to encourage the flow and benefits of FDI in Nigeria.

Wu et al. (2012), on the other hand, investigated the relationship between the governance structure and environment of a country and FDI inflows into the country using correlation analysis. As a result of the study, it was observed that countries based on the principle of rule-based governance have a lower share of foreign direct investment than other countries, but their stock markets are stronger than other countries because they have better public order.

The aim of Asaad (2014) is to analyse the effect of three macroeconomic variables (inflation rate, interest rate and exchange rate) on FDI in Iraq by multiple regression method for the period 2004-2011. The results of the study show that inflation and interest rate do not have a significant effect on FDI in Iraq, while exchange rate has a negative and significant effect. Therefore, the Iraqi government has focused on creating an effective monetary policy by fixing

the exchange rate in order to attract more FDI in the process of economic development and reconstruction.

Albulescu (2014) analyzed the impact of direct physical investment and portfolio investment in the form of equity securities on 13 Eastern European countries using a panel data set for the period 2005-2012. Econometric results show that both types of capital inflows have made a significant contribution to economic growth in these countries. In this study, especially equity investments within PI are analyzed and it is pointed out that PI in the form of debt securities create problems in economies due to the burden they create on external debt stock. Moreover, it is emphasized that equity capital inflows are more important in the relationship between PI and growth.

Pala and Orgun (2015) analyzed the determinants of PI in Türkiye and examined the effect of national income on PI by regression analysis for the period between 1998 and 2012. Empirical results reveal that the level of national income positively affects PI in addition to the level of interest rate and current account deficit. Thus, with the monetary and fiscal policies to be implemented, it will be possible to increase PI in Türkiye with the changes to be created in these variables and especially on growth.

Gülmez (2015) investigated the effects of physical direct investments and PI in Türkiye as external financing sources on economic growth by using the ARDL bounds test and Toda-Yamamoto causality test method using annual data for the period between 1986 and 2014. The empirical results reveal that there is a causality relationship from both FDI and PI to economic growth. More specifically, it is calculated that a 1% increase in PI leads to a 0.34% increase in economic growth. Thus, it is determined that policies aimed at attracting foreign capital investments to Türkiye will yield effective results in terms of economic growth.

Çiftçi and Yıldız (2015), on the other hand, aimed to empirically analyze the factors that may affect foreign direct investment flows to the Turkish economy within the framework of relevant theoretical approaches using data for the period 1974-2012. They conclude that in the long run, GDP, real exchange rate and financial development variables have a positive effect on FDI, while trade deficit and foreign debt have negative effects.

Telatar (2016) analyzed the relationship between PI in Türkiye and economic growth using data from 1998 to 2016. The results of the nonlinear cointegration and error correction model reveal that PI in Türkiye make a positive contribution to economic growth. However, it is pointed out that the economic growth process in Türkiye is vulnerable to internal and external shocks due to the hot money nature of PI.

Zghidi et al. (2016) analyzed the relationship between growth, economic freedom, and FDI for the period 1980-2013, covering the countries of Egypt, Morocco, Tunisia, and Algeria. A positive relationship was found between the variables. In addition, economic freedoms were found to be complementary to FDI.

Kazemi and Saini (2017) analyzed FDI and democracy variables in 87 countries. They used panel data analysis in the study covering the period 1981-2010. As a result of the study, they found that economic freedoms positively affect FDI. The findings of the analysis show that democracy does not have a significant role in attracting FDI.

A study conducted for the Chinese economy by Haider et al. (2017) aimed to determine the impact of FPI on stock market performance and inflation. They found that PI increase stock market performance and have a positive impact on the stock market.

Şahin (2018) analyzed the relationship between FDI and economic growth in his study on BRICS-T countries. In the study covering the period 1995-2014, he used bootstrap panel causality analysis after horizontal cross-section dependence and heterogeneity tests. As a result of the study, it is concluded that the causality from economic freedom to FDI is found only in Türkiye.

In his study, Anetor (2020) examined the relationship between FDI, financial development and economic growth on 28 Sub-Saharan African countries. According to the results of the study covering the years 1995-2017, FDIs have a significant and negative impact on economic growth. On the other hand, he found that FDIs have a statistically insignificant effect on economic growth.

Shamim et al. (2021) used annual time series data for the years 1984-2015 in order to determine the impact of PI on stock market performance in Pakistan. Multiple econometric techniques were used to examine the relationship between variables. In the study, Johansen cointegration analysis was performed to verify the long-run relationship. The results of the study show that PI has a positive impact on stock market capitalization. They also found that PI has a significantly positive impact on stock market capitalization in Pakistan with a bidirectional causal relationship.

Şahin et al. (2021) investigated the effect of macroeconomic variables on FDI in their study covering the period 1980-2020 for the Turkish economy. Using cointegration and Granger causality tests, they found that there is a bidirectional causality relationship between inflation and FDI in the period. However, a unidirectional Granger causality relationship was found from economic growth to FDI.

In their study, Karahan and Bayır (2022) focused on the financial factors affecting foreign direct investment inflows to Türkiye. In their study covering the period 2008-2019, they investigated the effect of exchange rate, interest rate and stock market index on FDI. Using the ARDL bounds test, they did not find a statistically significant relationship between FDI and interest rates. On the other hand, it is concluded that changes in the stock market index are the most important factor affecting FDI inflows to Türkiye.

3. Data and Methodology

As a developing country, Türkiye has realized significant reforms in capital markets with the policies implemented since the early 1990s. As a result, there has been a significant inflow of foreign direct investment and portfolio investment in Türkiye, especially in the recent period. Therefore, our study aims to analyze the relationship between FDI and PI and interest rates.

The data set used in the study covers the period 2010Q4-2023Q4. The data is obtained from the Central Bank of the Republic of Türkiye's Electronic Data Distribution System (EDDS). PI and FDI data are normalized by taking their natural logarithms. Time series analysis is used to examine the relationship between variables. ADF and PP unit root tests were applied to determine the stationarity levels of the variables. Since the series became stationary at different levels, the ARDL test, one of the cointegration tests, was applied. Afterwards, Toda-Yamamoto tests were

utilized to determine whether there is causality between the variables and if there is a causality relationship, to determine its directions.

3.1. ADF and PP Unit Root Tests

The Extended Dickey-Fuller unit root test is frequently used in research to determine whether the series contains unit roots. This unit root test can be characterized as a different version of the 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. To solve this problem, the ADF test utilizes the AR(p) process rather than the AR(1) process and includes "p" lagged difference terms in the equation (Dickey and 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 expressed as follows. 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 a unit root for these models are as follows:

H_0: δ=0 (The series is non-stationary)

H_1: δ<0(ϕ1<1) (The series is stationary)

The ADF test is based on the basic assumptions that error terms are independent and constant variance. Moreover, the DF test does not provide adequate results in series with structural breaks. PP attempts to generalize the DF test by smoothing its assumptions about error terms (Demir, 2015: 28). In this transformation, the nonparametric method was utilized (İnce, 2015: 30).

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

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

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 formulated as "H_0: α = 0 and H_1: α < 0" and the main hypothesis states that the series contains a unit root (Çağlayan and Saçalı, 2006: 125).

H_0: If δ = 0, there is a unit root.

H_1: If δ<0, there is no unit root.

3.2. Cointegration and ARDL Bounds Test

Cointegration means that linear combinations of multiple non-stationary time series are stationary and these series have an equilibrium relationship in the long run (Tarı, 2014: 415). Although there are different cointegration tests developed in the literature such as Engle and 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 analysis in all combinations where the variables are I (0) and I (1) (Pesaran et al., 2001: 289-290). In other words, cointegration relationships between time series with different stationarity levels can be realized with the ARDL bounds test approach. In addition, the dependent variable must be I(1) in the ARDL bounds test approach.

The bounds test, which is based on the estimation of the unrestricted error correction model, is applied in two stages: the first one is to establish the long-run relationship between the variables and the second one 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, Xt is the independent variable, ε_t is the error term, m is the optimum lag length and m is the minimum 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, the long-run relationship coefficients of the variables are examined after the cointegration relationship for the variables is revealed. In addition, the existence of short-run deviations from the long-run relationship can also be examined with the help of the error correction model. 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, Yt is the dependent variable, Xt is the independent variable, β_0; is the constant term, ε_t; is the error term, and n and m are the optimal lag lengths.

3.3. Toda-Yamamoto Causality Analysis

The Toda Yamamoto causality test is based on the VAR (VectorAutoregressive) model. In the analysis, after determining the appropriate lag length of the VAR model (m) and the maximum degree of stationarity of the series used (d_{max}), a VAR model of size ($m+d_{max}$) is estimated. The VAR (m+dmax) model estimated in the Toda-Yamamoto causality approach consists of the following equations (Toda and Yamamoto, 1995).

$$"Y_t = \omega + \sum_{t-1}^{m} a_{1i}\, x_{t-i} + \sum_{i=1}^{m} \beta_{1i} Y_{t-i} + \sum_{j=m+1}^{dmax} \delta_{1i} X_{t-i} + \sum_{j=m+1}^{dmax} \theta_{1i} Y_{t-i} + \varepsilon_{1t} \quad (7)$$

$$"X_t = \varphi + \sum_{i=1}^{m} a_{2i}\, X_{t-i} + \sum_{i=1}^{m} \beta_{2i} Y_{t-i} + \sum_{j=m+1}^{dmax} \delta_{2i} X_{t-i} + \sum_{j=m+1}^{dmax} \theta_{2i} Y_{t-i} + \varepsilon_{2t}" \quad (8)$$

The appropriate lag length (m) can be determined with the help of information criteria and the maximum degree of integration (d_{max}) can be determined by unit root tests (Toda and Yamamoto, 1995).

4. Findings of the Research

In this section of the study, the tests applied in order to reveal the relationship between the variables and the results of the findings obtained are given.

4.1. ADF and PP Unit Root Test Results

Before proceeding to the causality analysis, it is necessary to check whether the series contains unit roots, that is, whether they are stationary. For this purpose, ADF (Augmented Dickey-Fuller) and PP (Phillips-Perron) tests were conducted. The purpose of these tests is to prevent spurious regression. The results of ADF and PP unit root tests are presented in Table 1 and Table 2.

Table 1. ADF Unit Root Test Results

	At Level				
	EUR	**logFDI**	**logPI**	**TL**	**USD**
With Constant	-1.8891	-5.7383	0.6591	1.7207	-2.7953
	0.3348	0.0000***	0.9900	0.9996	0.0660*
With Constant & Trend	-2.4711	-8.4290	-0.5940	-0.7795	-2.7581
	0.3406	0.0000***	0.9751	0.9607	0.2190
Without Constant & Trend	-0.9528	-0.5484	1.8765	1.3675	-0.8749
	0.2998	0.4745	0.9844	0.9553	0.3322
	At First Difference				
	d(EUR)	**d(logFDI)**	**d(logPI)**	**d(TL)**	**d(USD)**
With Constant	-4.7152	-9.0687	-9.1114	-2.2115	-4.5321
	0.0003***	0.0000***	0.0000***	0.2048***	0.0006***
With Constant & Trend	-4.7220	-8.9825	-9.2075	-2.5189	-4.5125
	0.0020***	0.0000***	0.0000***	0.3182	0.0037***
Without Constant & Trend	-4.7358	-9.1410	-8.2957	-2.0111	-4.5799
	0.0000***	0.0000***	0.0000***	0.0434**	0.0000***

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

Table 2. PP Unit Root Test Results

	At Level				
	EUR	**logFDI**	**logPI**	**TL**	**USD**
With Constant	-1.3423	-5.9515	0.8810	0.6322	-2.0894
	0.6031	0.0000***	0.9945	0.9894	0.2497
With Constant & Trend	-1.9597	-8.4584	-1.0484	-0.9624	-2.1204
	0.6090	0.0000***	0.9277	0.9403	0.5226
Without Constant & Trend	-0.9765	-0.3196	1.8765	1.4156	-0.4588
	0.2901	0.5656	0.9844	0.9592	0.5116
	At First Difference				
	d(EUR)	**d(logFDI)**	**d(logPI)**	**d(TL)**	**d(USD)**
With Constant	-4.3905	-33.3085	-9.1202	-4.4109	-4.2882
	0.0009***	0.0001***	0.0000***	0.1438	0.0012***
With Constant & Trend	-4.3669	-43.4938	-9.2075	-4.8018	-4.2456
	0.0055***	0.0001***	0.0000***	0.2034	0.0077***
Without Constant & Trend	-4.4287	-26.8680	-8.1977	-4.2065	-4.3447
	0.0000***	0.0000***	0.0000***	0.0276**	0.0000***

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

According to the results of the unit root test, it was concluded that some of the variables included in the research contain unit root, that is, they are non-stationary. The variables were transformed into stationary by taking the first differences of the non-stationary series.

4.2. ARDL Border Test Results

In time series analysis, whether the variables are related to each other in the long run is investigated by cointegration tests. Normally, for these tests to be applied, the series should be stationary. However, if non-stationary series form a stationary process when they come together, a long-run relationship between variables can be determined.

Since the data used in this study are 3 months old, the maximum lag number is taken as 4. After writing the maximum number of lags and determining the Schwarz Information Criterion as the information criterion, it is determined that the most appropriate ARDL model is the ARDL(1,3,4,1,4,4,3,3) model in the Eviews 9 program. Since this study uses two dependent variables, namely PI and FDI, firstly, the relationship between FDI and other independent variables for the ARDL(1,3,4,1,4,3,3) model is given in Table 3.

Table 3. F Statistic and Critical Values for PI Dependent Variable

Model	**K**	**M**	**F Statistic**	**Significance Level**	**Lower Bound**	**Upper Bound**
ARDL(1,3,4,1,4,3,)	3	4	2.2542	1%	3.65	4.66
				5%	2.79	3.67
				10%	2.37	3.40

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

Since the calculated F statistic is smaller than the critical values at the 5% significance level, it is understood that the PI dependent variable and other independent variables are not long-

run cointegrated 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 (1.3.4.1.4.4.3.3) model with a maximum of 4 lags and Schwarz Information Criterion are presented in Table 4.

Table 4. ARDL Long and Short Run Coefficients of the PI Dependent Variable

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EUR	-5.605722	27.156680	-0.020642	0.9836
TL	-1.652342	80.603390	0.020500	0.9838
USD	2.045897	10.192096	0.020073	0.9841
Short Run Coefficients				
D(LOGPI)	-0.363122	0.138219	-2.627155	0.0123
D(EUR)	-0.059375	0.041299	-1.437663	0.1587
D(TL)	0.003816	0.01964	1.943469	0.0594
D(USD)	0,009266	0.020820	0.445065	0.6588
CointEq(-1)	0,001917	0.000564	3.397394	0.0016
Descriptive Tests				
"R-squared	0.313217	Mean dependent var		0.008227
Adjusted R-squared	0.132484	S.D. dependent var		0.027883
S.E. of regression	0.025971	Akaike info criterion		-4.268952
Sum squared resid	0.025630	Schwarz criterion		-3.844258
Log likelihood	115.5893	Hannan-Quinn criter.		-4.107824
F-statistic	1.733040	Durbin-Watson stat"		2.027234
Prob(F-statistic)	0.108608			

According to the short-term asymmetric relationship results in Table 4, changes in variables do not have an asymmetric effect on the FDI index. The existence of a short-term asymmetric relationship is evaluated according to the Wald test results. According to the results of the Wald test, the F statistic value is (1.733040) and the p probability value is (0.108608). These results prove that there is no short-run asymmetric relationship. As a result, there is no statistically significant relationship between FDI and EUR, USD, and TL interest rates.

The F statistics and critical values obtained for the ARDL (1.1.4.2) model for the relationship between FDI and other independent variables are given in Table 5.

Table 5. F Statistics and Critical Values for FDI Dependent Variable

Model	**K**	**M**	**F Statistic**	**Significance Level**	**Lower Bound**	**Upper Bound**
ARDL(1.1.4.2)	3	4	16.79940	1%	3.65	4.66
				5%	2.79	3.67
				10%	2.37	3.40

Notes: M denotes the maximum number of lags, K denotes the number of explanatory variables and * denotes 1% significance level. The critical values used for 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 the 1% significance level, it is understood that the FDI dependent variable and other independent variables are cointegrated 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(1.1.4.2) model with a maximum lag of 4 and the Schwarz Information Criterion are presented in Table 6.

Table 6. ARDL Long and Short Run Coefficients of FDI Dependent Variable

Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EUR	0.173785	0.051170	3.396225	0.0016
TL	-0.004773	0.007409	-0.644160	0.5234
USD	-0.055626	0.038263	-1.453801	0.1544
Short Run Coefficients				
D(EUR)	0.871455	0.232867	3.742289	0.0006
D(TL)	0.042661	0.012174	3.504136	0.0012
D(USD)	0,363154	0.123199	-2.247705	0.0055
CointEq(-1)	-1.226479	0.127127	-9.647683	0.0000
Descriptive Tests				
"R-squared	0.738388	Mean dependent var		0.006351
Adjusted R-squared	0.660611	S.D. dependent var		0.252360
S.E. of regression	0.147018	Akaike info criterion		-0.787634
Sum squared resid	0.799725	Schwarz criterion		-0.324331
Log likelihood	31.29703	Hannan-Quinn criter.		-0.611858
F-statistic	9.493711	Durbin-Watson stat"		1.942115
Prob(F-statistic)	0.000000			

According to the short-run asymmetric relationship results in Table 6, changes in the variables have an asymmetric effect on the FDI dependent variable. The existence of a short-term asymmetric relationship is evaluated according to the Wald test results. According to the results of the Wald test, the F statistic value is (9.493711) and the p probability value is (0.000). These results prove the existence of a short-run asymmetric relationship. When the short-run coefficients are analyzed, it is determined that a 1% increase in EUR interest rates increases the FDI variable by 0.87%, a 1% increase in TL interest rates by 0.042%, and a 1% increase in USD interest rates by 0.36%.

When the short-term estimation results are analyzed, "Y1", 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 5, the coefficient of the error correction term is -1.226479 with a probability value of 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 and 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: 232).

The CUSUM and CUSUMQ graphs in Figure 1 are used to examine the long-run parameter stability. The graphs reveal that the long-run coefficients obtained from the long-run ARDL model are stable.

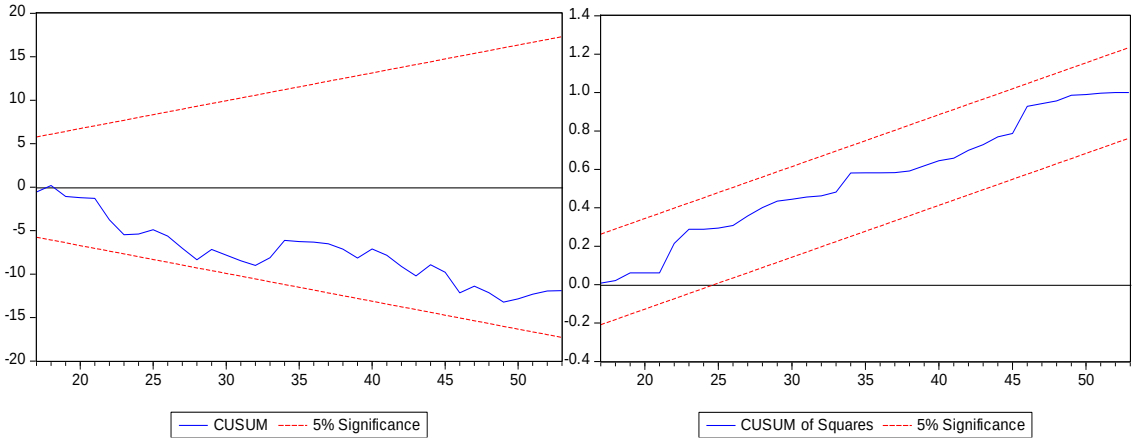

Figure 1. CUSUM and CUSUMQ Graphs

4.3. Todo-Yamamoto Causality Test Results

The traditional Granger (1969) Causality Test, which is used to determine the causality relationship between the data, requires the series to be stationary. However, when non-stationary series are differenced, information loss occurs. The test developed by Toda-Yamamoto (1995), which is based on the VAR (Vector Autoregression) model, does not take into account whether the series is stationary or not. Therefore, this test allows the model to be estimated using the level values of the series (Toda-Yamamoto, 1995: 225- 250).

While determining the causality between the series, the lag length (k) of the series is found according to the "Schwarz (SC) criterion" and the maximum degree of integration (dmax) is found according to the ADF unit root test. Then, the "Wald Statistic" was applied to the (k) lagged values of this model and it was mutually determined whether there was a causality relationship between the two dependent variables and the independent variables. Table 7 and Table 8 show the results of the Toda-Yamamoto Causality test.

Table 7. Toda-Yamamoto Causality Test Results-1

Dependent Variable	Independent Variable	d_{max}	k	Chi-Square Test Statistics	Chi-Square P - Value	Relationship and Direction
PI	TL	2	2	3.102.633	0.2120	No relationship
	EUR	2	2	0.000144	0.9904	No relationship
	USD	2	2	0.083866	0.9580	No relationship

Note: Statistically significant at the 5% level. The optimal lag length is determined according to the Schwarz (SC) criterion.

Table 7 and Table 8 present the results of the Toda-Yamamoto causality tests. Accordingly, it is seen that the H_0 hypothesis is accepted and the H_1 hypothesis is rejected in the hypotheses established between PM and TL, EUR, and USD variables at a 5% significance level. In other words, it is concluded that there is no Granger causality relationship between PM and TL, EUR, and USD interest rates as of the analyzed periods.

Table 8. Toda-Yamamoto Causality Test Results-2

Dependent Variable	Independent Variable	d_{max}	k	Chi-Square Test Statistics	Chi-Square P - Value	Relationship and Direction
TL		2	2	1.738.369	0.4193	No relationship
EUR	**PI**	2	2	0.040972	0.8396	No relationship
USD		2	2	0.872046	0.6466	No relationship

Note: Statistically significant at the 5% level. The optimal lag length is determined according to the Schwarz (SC) criterion.

According to the results of the Toda-Yamamoto causality tests in Table 9 and Table 10, it is seen that the H_0 hypothesis is rejected and the H_1 hypothesis is accepted in the hypotheses established between FDI and TL and EUR interest rates at a 5% significance level. In other words, it is concluded that there is a Granger causality relationship between FDI and TL and EUR interest rates as of the analyzed periods. On the other hand, no causality relationship was found between FDI and USD interest rates.

Table 9. Toda-Yamamoto Causality Test Results-3

Dependent Variable	Independent Variable	d_{max}	k	Chi-Square Test Statistics	Chi-Square P - Value	Relationship and Direction
FDI	TL	7	7	1.425.539	0.0468	TL ➡ FDI
	EUR	2	2	4.979.253	0.0257	EUR ➡ FDI
	USD	2	2	0.538691	0.1704	No relationship

Note: Statistically significant at the 5% level. The optimal lag length is determined according to the Schwarz (SC) criterion.

Table 10. Toda-Yamamoto Causality Test Results-4

Dependent Variable	Independent Variable	d_{max}	k	Chi-Square Test Statistics	Chi-Square P - Value	Relationship and Direction
TL		7	7	1.052.293	0.1608	No relationship
EUR	**FDI**	2	2	0.096481	0.7561	No relationship
USD		2	2	0.063162	0.9689	No relationship

Note: Statistically significant at the 5% level. The optimal lag length is determined according to the Schwarz (SC) criterion.

5. Conclusion and Recommendations

The global increase in portfolio and foreign direct investment flows has created an important opportunity for developing countries, which have problems in capital accumulation, to achieve sustainable high growth rates. In this framework, determining the factors affecting foreign investment inflows to developing countries has gained great importance for policymakers to design effective policies. Research in the literature has identified many factors affecting foreign investment inflows in developing countries. Especially in the recent period, due to the increase in the volume of transactions in financial markets, the relationship between financial indicators and portfolio and FDI in developing countries has gained much more importance. In this context, many studies have been conducted in the literature to investigate the impact of changes in global interest rates, stock prices, and exchange rates on foreign direct investment.

As a developing country, Türkiye has implemented significant reforms in the capital markets with the policies implemented since the early 1990s. As a result, there has been a

significant inflow of foreign direct investment and portfolio investment in Türkiye, especially in the recent period. Therefore, our study aims to analyze the relationship between FDI and PI and interest rates. Time series analyses were used to examine the relationship between the variables. ADF and PP unit root tests were applied to determine the stationarity levels of the variables. Since the series became stationary at different levels, the ARDL test, one of the cointegration tests, was applied. Afterwards, Toda-Yamamoto tests were utilized to determine whether there is causality between the variables and if there is a causality relationship, to determine its directions. According to the ARDL bound test results, it is concluded that there is no short-term asymmetric relationship between PI and other independent variables. In other words, there is no statistically significant relationship between PI and EUR, USD and TL interest rates. On the other hand, since the calculated F statistic is greater than the critical values at a 1% significance level, it is concluded that the FDI dependent variable and other independent variables are cointegrated in the long run in the relevant period.

According to the results of the Toda-Yamamoto causality tests, it is concluded that there is no Granger causality relationship between FDI and TL, EUR, and USD interest rates in the analyzed periods. According to the results of the Toda-Yamamoto causality test where FDI is the dependent variable and TL, EUR, and USD are the independent variables, it is concluded that there is a Granger causality relationship between FDI and TL and EUR interest rates at 5% significance level. On the other hand, no causality relationship was found between FDI and USD interest rates.

As a result of the study, no statistical relationship was found between PI and interest rates. The reason for the lack of a relationship, despite the expected relationship, can be attributed to the fact that one of the main indicators of portfolio investment inflows is affected by political and economic developments in the country. Looking at the last decade of the Turkish economy, it is thought that the Gezi Park events in 2013, the coup attempt in 2016, the Rahip Brunson crisis with the United States in 2018, and the COVID-19 pandemic crisis that affected the whole world in early 2020 negatively affected portfolio investment inflows.

One of the most important obstacles to economic growth is the lack of capital. Therefore, developing countries make arrangements to encourage portfolio investment and FDI movements in order to maximize the welfare of the country by making use of advanced technological investments for growth and development. In this direction, it is necessary to follow policies to create a favorable environment for increasing foreign capital investments, to ensure domestic economic and political stability, to realize incentive regulations, to encourage foreign investments by establishing facilitating structures for foreign investors and to increase the benefits to be obtained. In future studies, this study can be extended by using different macroeconomic factors and comparing different countries.

Declaration of Research and Publication Ethics
This study does not require ethics committee approval and/or legal/private authorization is compatible with research and publication ethics.

Researcher's Contribution Rate Declaration
The authors declare that they have contributed equally to the article.

Researcher's Conflict of Interest Declaration
There are no potential conflicts of interest in this study.

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