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THE CAUSALITY RELATIONSHIP BETWEEN EXCHANGE RATE PROTECTED DEPOSITS AND INVESTMENT INSTRUMENTS: EVIDENCE FROM TÜRKİYE

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ABSTRACT

This paper examines the causality relationship and the sign and magnitude of the relationship between the Exchange Rate Protected Deposit (ERPD) application, which was introduced to prevent the negative trend in exchange rates in Türkiye, and the stock market, exchange rate, and interest rate, which are considered as alternative investment instruments. ISE100 index closing prices, USD and EUR prices, weighted average deposit interest rate, and weekly data for the period 18.02.2022-17.11.2023 were used as the data set. Toda-Yamamoto causality, impulse-response, and variance decomposition analysis were applied. It is determined that the application of the ERPD affects alternative investment instruments and it is affected by them. In addition, it has been determined that the order of magnitude affecting the ERPD is as follows: euro prices, deposit interest rate, stock market index, money supply, and dollar prices. It was determined that the ERPD negatively affected the stock market and deposit interest rates. However, it was concluded that the ERPD application could not achieve the target of decreasing the euro and dollar prices. This paper will contribute to the literature, and it is thought that the results will be useful for policymakers, investors, and similar financial actors who wish to learn about ERPD.

JEL Classification: G21, G23, G38

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1. INTRODUCTION

Many countries adopt inflation targeting as a national policy. Under inflation targeting, the central bank announces quantitative targets for inflation and states that controlling inflation is a long-term objective of monetary policy. In cases where the monetary policy target cannot be achieved, policies are put forward to bring inflation back to the target. In addition, inflation-targeting central banks often adopt a more transparent policy that requires detailed communication with the public (Dotsey, 2006). Individual and institutional investors include foreign currencies to hedge-against inflation. Determining the demand for foreign currencies is important in determining economic and financial policies. In countries such as Türkiye, where the inflation rate and the demand for foreign currency are high, confidence in the domestic currency should be ensured to reduce inflation to the desired levels. In parallel with the global and national problems, however, Türkiye has experienced unpredictable fluctuations and increases in exchange rates. As stated in Kholdy and Sohrabian (1990), Leigh and Rossi (2002), Işık et al. (2004), McCarthy (2007), Peker and Görmüş (2008), Akgül and Özdemir (2018), Agustina and Permadi (2023), Gür (2022), Bilgin (2023), Çabaş (2023), Çitçi and Kaya (2023), Sözen, Şeyranlıoğlu, and İspiroğlu (2024), there has been an increase in inflation rates due to the rise in exchange rates.

The 1990s are remembered as a period when fixed exchange rate regimes largely lost the importance of maintaining monetary policy. As one of the consequences of the financial crisis, many developing countries were forced to abandon fixed exchange rate regimes and replace them with more flexible exchange rate arrangements. Moreover, some countries did not have to abandon fixed exchange rates as a result of financial crises or market pressures on their currencies but started to adopt more flexible exchange rate regimes regularly (Jonas and Mishkin, 2003).

After the 2001 crisis, Türkiye completely switched to a flexible exchange rate regime. Over time, a stable period in exchange rates occurred as financial market participants adapted to the flexible exchange rate regime. However, Türkiye experienced a currency crisis in 2018 due to the Gezi Park events in May 2013, the treacherous coup

attempts on July 15, 2016, and the arrest of Pastor Brunson in December 2016. In 2018, the Turkish Lira lost 29% of its value against the dollar as the United States of America and the European Union made sanctions rhetoric against Türkiye. In July 2018, inflationary pressures and exchange rate increases continued to rise as inflation rates did not fall from double digits following the currency shock. The New Economic Program was announced in Türkiye, which lost economic momentum due to the impact of exchange rate attacks in 2019, when the growth rate in the global economy slowed down. In 2019, the Turkish Lira lost its value by 12% against the dollar, and its effects were also felt with the increase in the inflation rate. In 2019, in parallel with the policy rate cuts by the US and European Central Banks, Türkiye started to cut interest rates in the second half of the year, and the policy rate fell to 12% in December 2019. The year 2019 ended with the COVID-19 pandemic, which emerged in China and affected the world.

In 2020, when the global economy went through a difficult time due to the COVID-19 pandemic, the Turkish economy was also negatively affected. Until June 2020, when the foreign exchange market experienced a historic rise, the policy rate was continuously reduced. In November, there was a change in the economic administration with the appointment of Lütfi ELVAN as the Minister of Treasury, and in 2020, the Turkish lira lost its value by 23% against the dollar, and annual inflation was at 14.6%. The COVID-19 pandemic and the preventive measures taken to keep the economy afloat continued in 2021. The policy rate, which was 17% in January 2021, was raised to 19% before the dismissal of CBRT Governor Naci AĞBAL in March and then gradually reduced to 14% until December. On December 2, 2021, Nurettin NEBATİ became the Minister of Treasury and Finance. On December 20, 2021, the US dollar hit a record high of TRY 18.36 and fell sharply to TRY 12 on December 21. On the same day, the new economic administration introduced the exchange rate protected deposit (ERPD) system to prevent the exchange rate increase. The US dollar ended 2021 trading at 13.3 TRY.

According to data from the Ministry of Treasury and Finance, the ERPD, which was launched to reduce the share of foreign currency deposits in total deposits, cost the budget 92.5 billion TL in 2022, when Türkiye's primary agenda was the economy. Despite the ERPD, the Turkish lira depreciated by more than 30% against the dollar in 2022, and annual inflation rose to 64%. The new economic administration started to raise interest rates to control inflation after

the post-election appointment of Mehmet ŞİMŞEK as the Minister of Treasury and Finance and Hafize Gaye ERKAN as the first female Governor of the CBRT on June 4, 2023. In June 2021, the policy rate, which had not been raised since March 2021, was raised to 15% for the first time and then gradually increased to 42.5% until the end of 2023. The ISE 100 Index surpassed 8500 points in October, reaching a historic high, as the new appointments to the economic administration were welcomed by the markets. Despite the positive views of international financial institutions on the Turkish economy, the Turkish lira depreciated by 30% against the dollar in 2023, and annual inflation rose to 64%, similar to 2022. As of the end of 2021, when the ERPD started, the amount of residents' foreign currency deposits continued to increase, although the annual rate of increase in the amount of foreign currency deposits decreased every year.

As of December 21, 2021, a new instrument was included in the financial markets to protect investors and ensure that they can earn returns against fluctuations and increases in exchange rates. This instrument, called ERPD, was applied for individual or institutional investors who have their savings in foreign currency deposit accounts and participation fund accounts denominated in foreign currency to voluntarily convert their savings into Turkish Lira. The bank where the investors make the transaction transmits the foreign currency to the CBRT at the conversion rate. The CBRT, in turn, transfers the equivalent amount to the bank in Turkish Lira. The bank in question opens a Turkish Lira or participation account with a maturity of 3 months, 6 months, or 1 year. The interest rate that the bank applies to the deposit account must not be below the one-week repo auction interest rate. In addition, if the return to be transferred to participation accounts is lower than the cost of one-week repo transactions that participation banks perform with the CBRT under open market transactions, the difference must be covered by the bank. At maturity, the principal and interest or dividends to be transferred to the Turkish Lira or participation account are paid by the bank. There is a possibility that the exchange rate at maturity may be higher than the conversion rate, or the interest or dividend to be transferred by the bank may be less than the amount calculated on the exchange rate difference. If these possibilities occur, the CBRT transfers the amount calculated on the exchange rate difference, less interest or dividends, to the bank to be paid to the investor holding a deposit or participation account (CBRT, 2021).

The main problem of the current study is to determine the sign and magnitude of the causal relationships between the KKM

application, which individual and institutional investors benefit from as of 2022, and alternative investment instruments. In this context, it is aimed to find a solution to which alternative investment instruments ERPD, which is a new application for Turkish financial markets, may be affected, and which investment instruments it may affect. The fact that no similar study is found in the literature specifically for Türkiye and the increasing demand for ERPD, in which investors earn returns from both interest and exchange rate differences, constitutes the motivation for the paper. Studies on ERPD, a new application, have been published recently. It is thought that the results obtained will contribute to future studies aimed at filling the gap in the literature in the field of alternative investment instruments.

2. LITERATURE REVIEW

This section provides a detailed review of prior literature on ERPD.

Ceylan (2024) aimed to reveal the nature of the long-run equilibrium relationships between exchange rates and price indices. The deterioration of the long-run equilibrium relationship between producer prices and the dollar exchange rate was attributed to the ERPD implementation. Akkaya (2023) analyzed the macroeconomic and financial variables affecting the dollarization process in the Turkish economy by excluding the year 2022, the year in which the Exchange Rate Protected Deposit system was introduced. Similar to the current paper, he concluded that the real exchange rate and the US Dollar/Turkish Lira exchange rate variables also affect the dollarization process in the Turkish economy. Arslan (2023) aimed to investigate the effects of ERPD on the Turkish economy. The findings indicated that the level of savings in the national currency increased with ERPD implementation. Karagöl (2023) examined the drivers of cash substitution in Türkiye after the Global Financial Crisis by using a dummy variable for the ERPD period in addition to exchange rate expectations, inflation rate, and domestic foreign interest rate differential variables. The findings suggested that exchange rate expectations are a determinant of cash substitution. Reductions in the interest rate spread lead to an increase in cash substitution. It was determined that ERPD implementation leads to a high rate of decrease in cash substitution. Sarıgül (2023) examined the relationship between dollarization and profitability in publicly owned deposit banks in Türkiye. In this study, which uses the data of Halkbank, Vakıfbank, and Ziraat Bank for the period 2005-2021, three dollarization-related variables, namely deposit dollarization, on-balance sheet currency

mismatch, and foreign currency derivatives, were used together for the first time in the literature. The findings showed that these variables have an impact on profitability in publicly-owned deposit banks. Yıldırım et al. (2023) analyzed the effects of credit volume, stock market trading volume, and ERPD system on the financial deepening of the Turkish economy for the period considered in their study. The financial deepening ratio was at its lowest level at the end of the analysis period when the ERPD system was announced. It was stated that the financial deepening ratio improved and increased with ERPD implementation. Despite the success of the ERPD system, it was concluded that rational policies are needed to strengthen financial deepening. Yurttadur and Taşçı (2023) aimed to measure the effect of ERPD implementation on the financial performance of participation banks. The financial performance evaluation of participation banks was made with Total Dividend Income, Return on Assets, Return on Equity, Operating Expenses/Total Assets, and Foreign Resources/Total Equity indicators. Findings revealed that the indicator with the highest weight in determining the financial performance of participation banks is Operating Expenses/Total Assets. It was indicated that the financial performance of participation banks increased with the ERPD implementation, and the performance increased continuously in 2022, with the best performance in September. Zuhal and Göcen (2023) analyzed the effectiveness of ERPD accounts on exchange rates in their study. The implementation of the ERPD account was found to have led to a significant break in the euro and the US dollar as of the date of implementation. In addition, it was indicated that this implementation was effective in reducing exchange rate volatility. In his study, Alpdoğan (2022) mentioned that ERPD accounts issued to stabilize the exchange rate had a negative impact on the economy during the period when the effects of the exchange rate crisis continued. Yılmaz (2022) analyzed the short-term (3 months) effects of ERPD on the Turkish economy. For the period under consideration, it was indicated that the cost of ERPD decreased as the depreciation of the exchange rate decreased. It was also concluded that the ERPD policy reduced exchange rates, increased the Central Bank's foreign exchange reserves, reduced dollarization, and supported the liberalization process.

After the literature review on ERPD, the literature review on exchange rates, interest rates, and ISE 100, which are the other variables used in the study, is presented.

Demiralp and Belliler (2023) found a long-run relationship between the interest rate and the ISE 100 index. Kazak (2023) stated

that the ISE 100 index affects the policy rate. Canöz and Yiğit (2022) revealed a causal relationship from the dollar exchange rate to the ISE100 index. Petek, Doğaner, and Altun (2022) found unidirectional causality from real effective exchange rate decreases to ISE 100 increases and from policy rate increases to ISE 100 decreases. Tekin and Görmüş (2022) showed that interest rates and exchange rates have a negative effect on the ISE100 index. Bezgin and Karaçayır (2021) found that the exchange rate has a negative effect on the Istanbul Stock Exchange index, while the interest rate has a positive effect. Makhdom (2021) found a positive relationship between exchange rates and interest rates in the long run. Şanlı, Konak, and Özmen (2021) stated that there is a bidirectional causality relationship between the ISE 100 index, exchange rate, and interest rate. Alıcı (2020) found that there is a causality relationship between the dollar exchange rate and the ISE 100 index. Fattah and Kocabıyık (2020) found bidirectional causality between the exchange rate and the ISE 100 index for Türkiye. He et al. (2020) found a causality from the Turkish stock market to exchange rates. Saka Ilgın and Sarı (2020) stated that an increase in interest rates in the short and long run leads to a decline in the ISE All index. Güney and Saka Ilgın (2019) found bidirectional causality between interest rates and ISE 100 and unidirectional causality between foreign exchange and ISE 100. Uzunel and Güven (2019) found a negative long-run relationship between the ISE 100 index and the real effective exchange rate. Zarei, Ariff, and Bhatti (2019) stated in their paper that the exchange rate affects stock index returns in selected countries. Khan and Khan (2018) showed that the stock market is affected by exchange rates and interest rates in the long run. Koyuncu (2018) concluded that interest rates have a negative effect on ISE100. Budak, Cangi, and Tuna (2017) found that there is a relationship between the ISE 100 index and foreign exchange and interest rate, and PPI in the long run. Khalid (2017) found a unidirectional causality from the exchange rate to the interest rate. Altınbaş, Kutay, and Akkaya (2015) concluded that the exchange rate has explanatory power on ISE 100. Şentürk and Dücan (2014) found a unidirectional causality relationship from exchange rate to stock market return and from interest rate to exchange rate. Vejzagic and Zarafat (2013) concluded that the stock market index affects the interest rate and exchange rate. Beer (2008) showed that there are positive and significant price spillovers from the foreign exchange market to the stock market.

The next section of the paper is the data and methodology section, which describes the data set, explains the empirical

procedures, and presents the findings. The conclusion and discussion section provides conclusions and suggestions based on the empirical findings.

3. DATA AND METHODOLOGY

The paper aims to examine the reciprocal causality relationship between the amount of currency rate protected deposits and the stock market, interest rate, dollar, euro selling price, and money supply in line with the currency rate protected deposit practice implemented in the Turkish banking sector in recent years. The paper uses weekly data including 92 observations for the period 18.02.2022-17.11.2023. An attempt was made to obtain a sufficient number of datasets using weekly data instead of monthly or quarterly data since the currency rate protected deposit application is a new practice in recent years and this data has been published weekly since 2022. The weekly amount of currency rate protected Turkish Lira deposits in the banking sector, the weekly closing prices of the ISE100 index, the weighted average interest rate applied to deposits opened by banks (current up to 3 months), the dollar selling price, and the euro selling price. The M2 money supply is the control variable of the model. All variables are logarithmically transformed. Table 1 presents the variables and data sources used in the paper. EViews 10.0 package program was used for the analysis.

TABLE 1
Variables and Data Sources

Variable Abbreviation	Description	Data Source
LERPD	Amount of Currency Rate Protected Turkish Lira Deposits	CBRT –EDDS
LISE100	Istanbul Stock Exchange 100 Index Closing Prices	BRSA
LDINTR	Weighted Average Deposit Interest Rate	CBRT –EDDS
LUSDTL	Dollar Price (USD/TRY)	CBRT –EDDS
LEURTL	Euro Price (EUR/TRY)	CBRT –EDDS
LM2	Money Supply	CBRT –EDDS

Note: CBRT, Central Bank of the Republic of Türkiye; EDDS, Electronic Data Distribution System; BRSA, Banking Regulation and Supervision Agency

Figures 1-6 show the time-dependent oscillation graphs of the variables.

FIGURE 1
Time-Dependent Oscillation Graph of LERPD

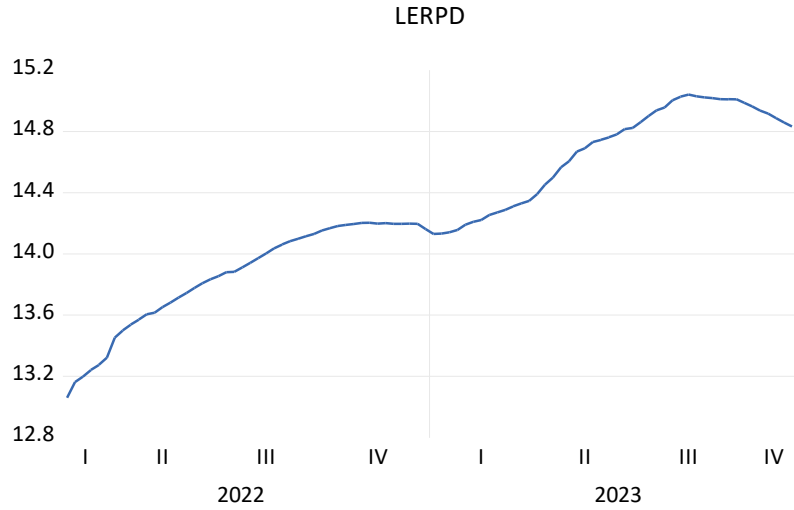


FIGURE 2
Time-Dependent Oscillation Graph of LISE100

FIGURE 3
Time-Dependent Oscillation Graph of LDINTR

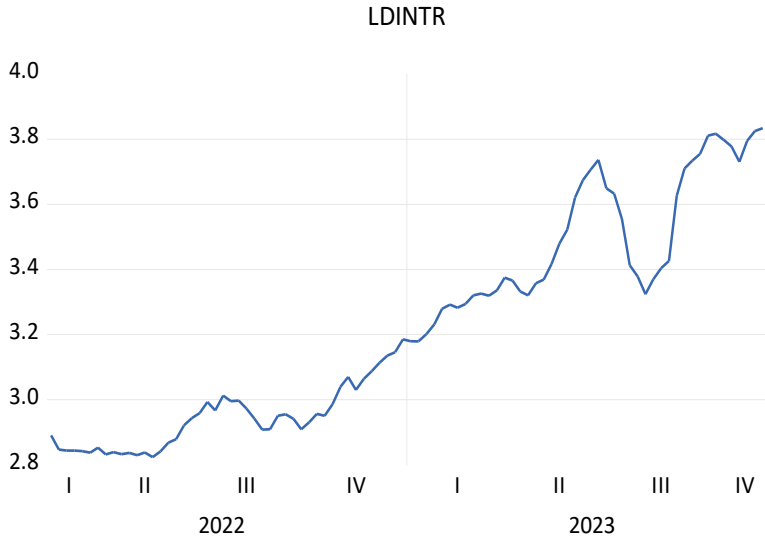


FIGURE 4
Time-Dependent Oscillation Graph of LUSDTL

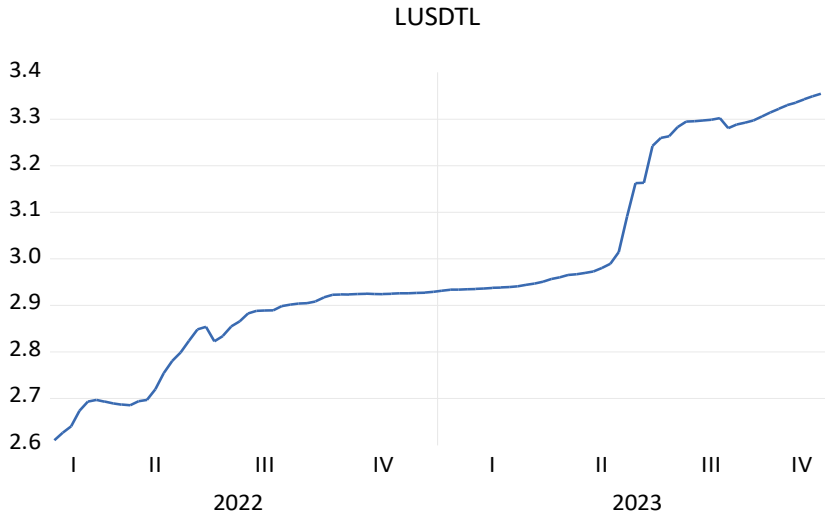


FIGURE 5
Time-Dependent Oscillation Graph of LEURTL

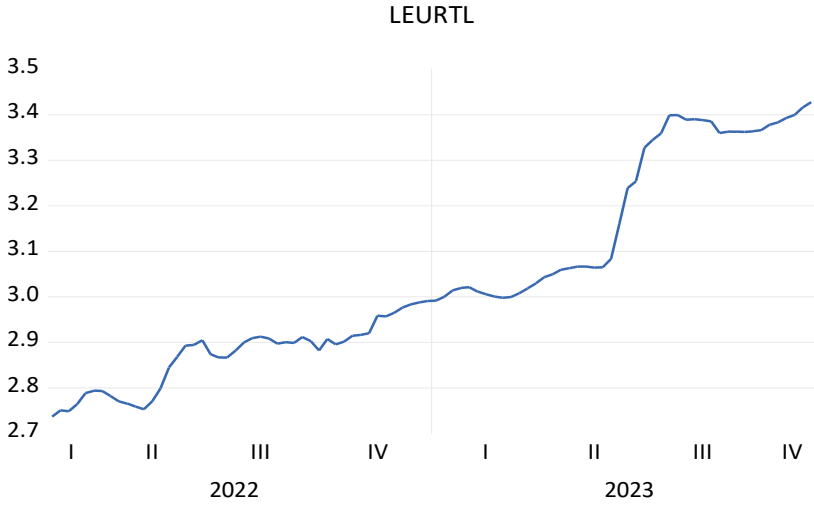
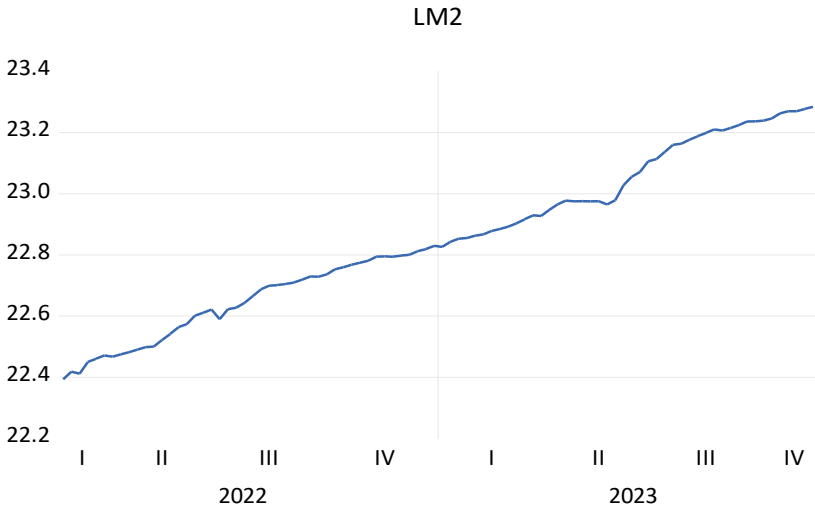


FIGURE 6
Time-Dependent Oscillation Graph of LM2



According to Figures 1-6, it can be stated that the series contains a trend, and although they fluctuate from time to time during the period under review, they are generally on an upward trend.

Equation (1) is the model established in line with the purpose of the paper is given below:

$$(1) \qquad LERPD = a_0 + a_1 LISE + a_2 LDINTR + a_3 LUSDTL + a_4 LEURTL + a_5 LM2 + \varepsilon_t$$

The stationarity of the variables in the model established in the paper was examined first. Since variables with different degrees of stationarity are considered, and one of the variables in the model is stationary in the second difference, it was decided that the methodology of the paper should be VAR (Vector Autoregressive) analysis, the Toda-Yamamoto causality test, impulse-response, and variance decomposition analysis.

Various methods such as the Granger and Toda-Yamamoto causality test are used to determine the causality relationship. One of these methods is the VAR model developed by Granger (1969). However, to eliminate spurious regression in the Granger causality test, the variables to be analyzed must be stationary. By taking the difference of the variables. Stationarity reveals the lack of information in explaining causality. Again, if the variables reach the same level of stationarity in the Granger causality test, the cointegration relationship between the variables should also be investigated. If there is a cointegration relationship, the Vector Error Correction Model can be used. If there is no cointegration between the variables, the Vector Error Correction Model becomes invalid. In the causality test developed by Toda and Yamamoto (1995), causality analysis can be performed without these conditions.

Classical Granger causality analysis is applied in most of the academic studies examining the causality relationships between time series. While investigating the causality relationship between time series with the classical Granger causality test, the prerequisite is that the series is stationary and there is a cointegration relationship. The Toda Yamamoto test does not take into account whether the series is stationary or not, and whether there is a cointegration relationship between them or not. In the Toda-Yamamoto causality test, the fact that the time series is stationary at the same level or that there is a cointegration relationship does not invalidate the test. In the Granger causality test, if the series is stationary by taking the difference of the series, data loss occurs, but the fact that this test prevents data loss is

an important advantage of the Toda-Yamamoto test (Toda and Yamamoto, 1995).

The VAR (Vector Auto Regression) model must first be established and the appropriate lag length (k) of the model must be determined to apply the Toda-Yamamoto test. Then, the maximum degree of integration (d_{max}) of the model is found and added to the lag length. Although stationarity is not a prerequisite for the Toda-Yamamoto test, unit root tests are applied to determine the maximum cointegration degree of the model. Here, the necessary condition of the analysis is that d_{max} is not greater than k. In the next step of the analysis, the VAR ($k + d_{max}$) model is estimated. The Wald test is applied to the VAR(k) model to determine causality.

Toda and Yamamoto (1995) developed the Granger causality test by estimating a system of two equations using the Seemingly Unrelated Regression (SUR) technique. The model is expressed as follows:

$$(2) \quad Y_t = \alpha_1 + \sum_{i=0}^{k+d} \gamma_{1i} Y_{t-i} + \sum_{t-i}^{k+d} \gamma_{2i} X_{t-i} + \varepsilon_{yt}$$

$$(3) \quad X_t = \alpha_2 + \sum_{i=0}^{k+d} \delta_{1i} Y_{t-i} + \sum_{t-i}^{k+d} \delta_{2i} X_{t-i} + \varepsilon_{xt}$$

Where k is the optimal lag length, d is the maximum degree of integration, and ε_{xt} are the error terms. The hypotheses of the Wald test applied to determine the direction of causality are defined as follows.

If $\gamma_{2i} \neq 0$ in (2), X_t is the Granger cause of Y_t.
If $\delta_{2i} \neq 0$ in (3), Y_t is the Granger cause of X_t.

In this model, the test statistic value is tested with the Wald test with chi-square distribution (Alimi and Ofonyelu, 2013).

There is no restriction on structural models in the VAR analysis. All variables are examined as a system. Each variable is assumed to be endogenous in the model, and the values up to the lag length of both dependent and independent variables are included in the analysis (Kirchgässner, Wolters, and Hassler, 2012). In the VAR model, the responses of variables to sudden shocks are tested through the impulse response function. Impulse response functions indicate how one of the variables will react to this shock in the face of a 1% deviation in the error term. The variance decomposition obtained from the moving average section of the VAR model expresses the sources of shocks occurring in the variables and other variables as percentages.

It shows what percentage of the change will happen in the variables used is due to itself and what percentage is due to different variables. If the majority of the changes occurring in a variable are due to shocks by itself, it shows that this variable acts exogenously. Variance decomposition also provides information about the degree of causality between variables (Enders, 2008).

4. FINDINGS

The first step of the Toda-Yamamoto test for the examined models is the unit root test was first applied to the variables, and the stationarity degrees of the variables were examined to determine the maximum cointegration degrees of the variables. Table 2 presents the results of the ADF unit root test.

TABLE 2
Unit Root Test Results

Variables	ADF Unit Root Test (Trend and Constant)					
	$t_{ist-level}$	p-value	$t_{ist-1st.difference}$	p-value	$t_{ist-2nd difference}$	p-value
LERPD	-1.8	0.69	-2.9	0.15	-14.7	0.00
LISE100	-1.7	0.70	-9.0	0.00		
LDINTR	-2.4	0.33	-6.6	0.00		
LUSDTL	-2.4	0.36	-5.9	0.00		
LEURTL	-1.9	0.60	-5.9	0.00		
LM2	-1.9	0.62	-3.0	0.00		

Table 2 shows that the LERPD variable becomes stationary when the second difference of the series is taken, while the LISE100, LDINTR, LUSDTL, LEURTL, and LM2 variables, which are considered as dependent variables in the models, become stationary when the first differences of the series are taken. Therefore, the LERPD series is I(2), while the LISE100, LDINTR, LUSDTL, LEURTL, and LM2 series are I(1). In this case, it is determined that the maximum degree of cointegration (d_{max}) to be used when applying the Toda-Yamamoto test is 2 for the model ((d_{max}) = 2).

The second step in the Toda-Yamamoto test is to determine the optimal lag length (k) for the VAR (Vector Autoregression) model. Table 3 shows the optimal lag length for the VAR model according to various information criteria. While determining the lag length, the diagnostic tests of the model at the relevant lag were also taken into

account. These tests are the graphs shown in Figure 7, which represent the Inverse Roots of the AR Characteristic Polynomials of the model, and the Autocorrelation LM Test and White Heteroscedasticity tests shown in Table 4.

TABLE 3
Optimal Lag Length of the VAR Model

Lag	LogL	LR	FPE	AIC	SC	HQ
2	1099.47	65.83*	1.10e-1*	-24.86*	-23.27	-24.22*

Notes: LR: Sequential Modified LR Test, FPE: Final Estimation Error, AIC: Akaike Information Criterion, SIC: Schwarz Information Criterion, and HQ: Hannan-Quinn Information Criteria. *It indicates that the lag specified according to the relevant information criterion is the optimal lag length.

FIGURE 7
Inverse Roots of the AR Characteristic Polynomial of the VAR(2) Model

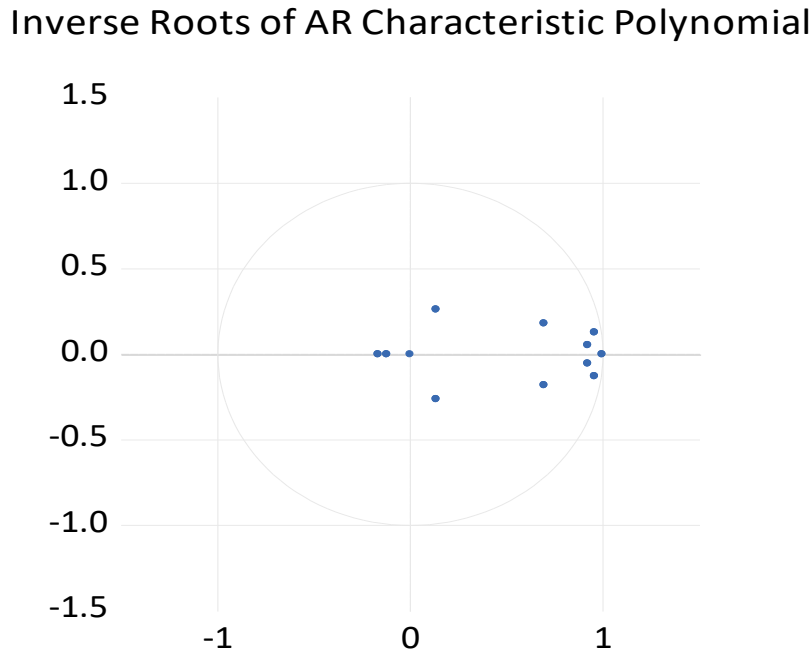


Table 3 shows that the optimal lag lengths obtained according to various information criteria are 2 for the model (k=2). The lag

length of the model is supported by various diagnostic tests in Figure 7 and Table 4. Figure 7 shows the inverse roots of the AR characteristic polynomial for the model constructed according to the specified lag lengths, while Table 4 reports the autocorrelation and Table 5 reports the heteroscedasticity test results.

TABLE 4
LM Autocorrelation Test Results

Lag (k)	LM Test Statistic	p-value
2	30.90153	0.7110

TABLE 5
White Heteroscedasticity Test Results

Lag (k)	White Test Statistic	p-value
2	560.8465	0.0602

The result obtained in Figure 7 shows that the inverse roots of the AR polynomial of the variables are within the unit circle for the model when the specified lag lengths are taken into account. The results in Tables 4 and 5 indicate that the p-values of the LM and White Test Statistic, which have the opposite hypothesis, are greater than 0.05, therefore, the model constructed according to the appropriate lag lengths does not have autocorrelation and heteroscedasticity problems.

In the third stage of the analysis, the optimal lag lengths (k) obtained from the classical VAR analysis were added to the maximum degree of integration (d_{max}) obtained from the unit root tests to construct ($k+ d_{max}$) lagged improved VAR model. In the last stage, the causality relationship between the variables was analyzed by applying the Wald test statistic to the k-lagged values in the VAR ($k+ d_{max}$) model. The results of the Toda-Yamamoto Causality Analysis, showing the Wald test statistic results, are presented in Table 6.

According to the Toda-Yamamato causality analysis results in Table 6, for the VAR(4) model, there is a unidirectional causality from ISE100 to ERPD; there are bidirectional causalities between ERPD and all of the other variables in the model. The findings indicate that the ERPD implementation in Türkiye is affected by all of the variables in the model as the Istanbul Stock Exchange 100 index, deposit interest rate, dollar, euro selling prices, and the money supply. At the same time, it is concluded that the amount of currency rate protected

deposits also affects all of the variables in the model except the Istanbul Stock Exchange 100 index.

TABLE 6
Toda-Yamamoto Causality Analysis Results

Model VAR(k+ d_{max})=VAR(4)	Wald Test Chi-square Statistic [p-value]
ISE100-ERPD	12.92389 [0.001561]
ERPD-ISE100	3.321374 [0.190013]
DINTR-ERPD	13.75856 [0.001028]
ERPD-DINTR	10.43453 [0.005422]
USDTL-ERPD	18.21454 [0.000110]
ERPD-USDTL	26.07334 [0.000000]
EURTL-ERPD	11.86095 [0.002657]
ERPD- EURTL	11.59261 [0.003038]
M2-ERPD	23.79262 [0.000000]
ERPD-M2	7.071890 [0.029131]

Note: [p-value] indicates the probability values of the Wald statistic calculated by the author according to k.

The impulse response and variance decomposition analyses were applied to obtain information about the direction and magnitude of the reactions of the variables to each other after creating the VAR model, performing causality analysis, and determining causality relationships. Figures 8 and 9 show the results of the impulse response analysis, and Table 7 shows the results of the variance decomposition. ERPD responses to a one standard deviation shock occurring in ISE100, DINTR, USDTL, EURTL, and M2 are shown in Figures 8 and 9. According to Figures 8 and 9, the response of ISE100 to ERPD is positive for 10 weeks, and the increase rate of this response is higher in the first 3 weeks. While the response of DINTR to ERPD was negative until 10 weeks, the effect started to turn positive in the 10th week. The rapid increase in the negative effect in the first 3 weeks is striking. The reactions of USDTL and EURTL to ERPD are similar but negative, and the effect turned positive towards the 10th week. M2 positively affects ERPD, and this effect decreases until the 6th week and then increases. The response of the ERPD to ISE100 and DINTR is negative, while the responses of the ERPD to M2 and EURTL are positive. However, the response of the ERPD to USDTL was positive in the first 6 weeks, and then the effect turned negative.

FIGURE 8
Impulse Response Analysis Results

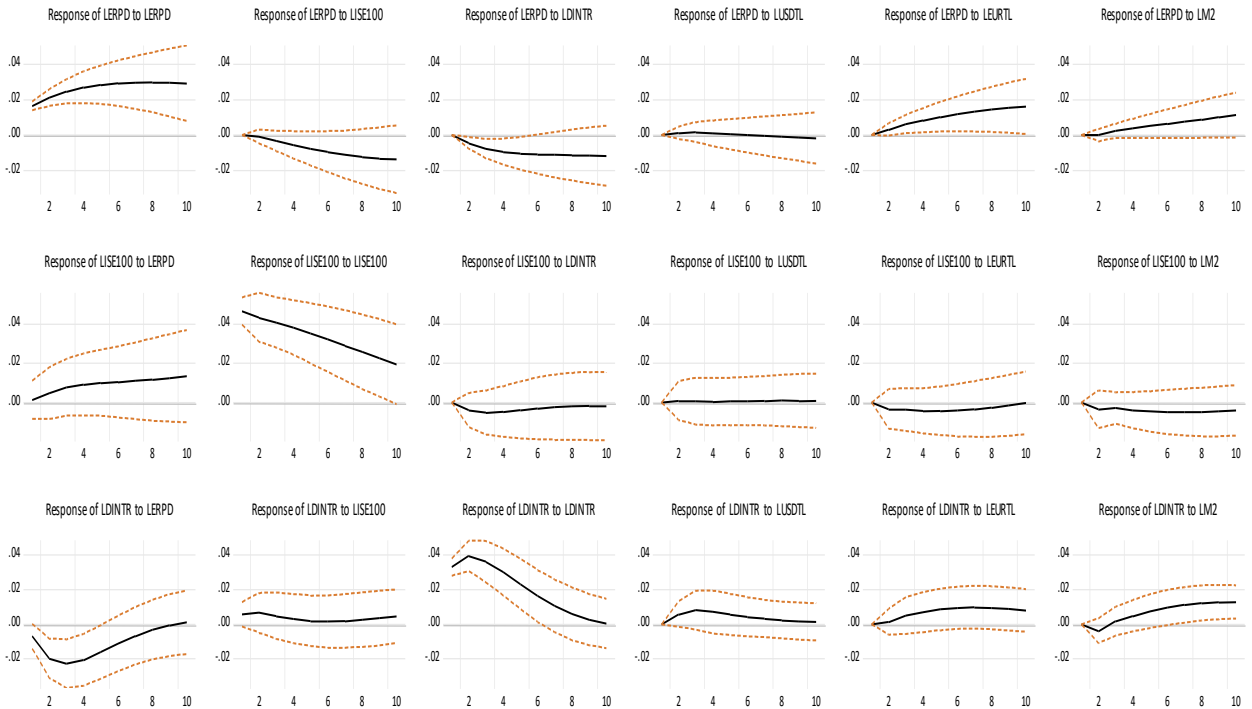


FIGURE 9
Impulse Response Analysis Results *(continued)*

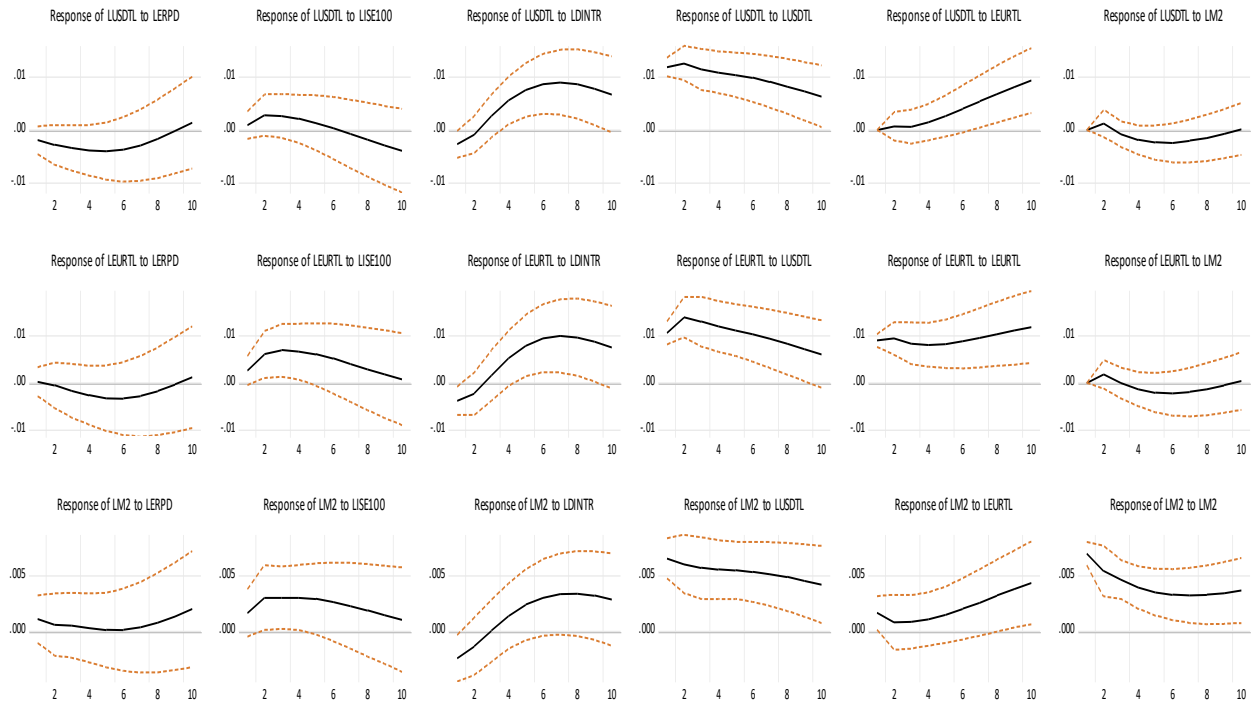


TABLE 7
Variance Decomposition Results

Period	Standart Error	LERPD	LISE100	LDINTR	LUSDTL	LEURTL	LM2
1	0.016464	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.027418	95.78360	0.079293	2.491255	0.260400	1.385396	5.37E-05
3	0.038453	89.86758	0.707931	5.249503	0.325950	3.395562	0.453475
4	0.049154	85.24739	1.668219	6.857950	0.246110	5.052681	0.927651
5	0.059413	81.43310	2.769767	7.697060	0.175070	6.513527	1.411472
6	0.069165	78.12868	3.881542	8.112861	0.129182	7.830345	1.917388
7	0.078419	75.16220	4.944466	8.308322	0.103602	9.020395	2.461021
8	0.087203	72.45399	5.923759	8.395560	0.093597	10.08553	3.047570
9	0.095539	69.96830	6.795992	8.437534	0.095892	11.02461	3.677671
10	0.103435	67.68954	7.546445	8.469242	0.108004	11.83749	4.349272

Cholesky Ordering: LERPD LISE100 LDINTR LUSDTL LEURTL LM2

According to Table 7, approximately 67% of the changes in exchange rate protected deposits are caused by their own lagged values, 11% by Euro prices, 8% by deposit interest rates, 7.5% by ISE100 index prices, 4% by money supply, and approximately 0.1% by dollar prices. While ERPD was completely determined by its shocks at the beginning of the period, this rate decreased to 67% at the end of the 10th week, but it can still be said that it was affected by its shocks the most.

5. CONCLUSION

Emerging countries such as Türkiye need to remove the obstacles to financial stability to achieve their targeted economic growth and social welfare. Fluctuations and increases in exchange rates adversely affect this stability and many macroeconomic variables. It is accepted that one of the decisive steps to be taken in ensuring financial stability and macroeconomic performance is exchange rate policies consistent with inflation targets. The ERPD was put into effect as of December 21, 2021, to mitigate exchange rate pressure on inflation. Since the level of the exchange rate is one of the variables contributing to disinflation in Türkiye, there is a close relationship between the exchange rate and inflation. This relationship becomes more important when the Turkish lira depreciates. Therefore, it may be inevitable for the CBRT to implement ERPD and similar practices to maintain the exchange rate at an optimal level.

This paper aims to examine the effect of ERPD implementation on dollar selling price, euro selling price, deposit interest rate, and the ISE 100 index. For this purpose, the reciprocal causality relationship between the amount of currency rate protected Turkish Lira deposits and other alternative investment instruments is investigated using the Toda-Yamamoto causality test. In line with the findings of the analysis, it can be stated that this new but uncertain practice has an impact on other investment instruments.

In the empirical part of the study, causality analysis was conducted and concluded that there is a bidirectional causality relationship between ERPD and other variables. The only exception is the absence of causality from the ERPD to the ISE100 index. Changes in ERPD cause changes in interest rates, euro, dollar sales prices, and money supply. In addition, changes in the ISE100 index, interest rates, euro and dollar sales prices, and M2 also cause changes in ERPD. The results obtained in the study align with those in Tunalı and Kalkay

(2023) for Türkiye. Impulse-response and variance decomposition analyses were applied to gain an idea about the direction and intensity of these relationships after determining the causality relationship between the variables of the paper. According to these findings, it was determined that a positive shock in the ISE100 index positively affects the amount of ERPD. This result shows that if there is an increase in the ISE100 index, this increase causes an increase in the amount of the ERPD. Here, it is seen that the ISE100 index plays an important role in the ERPD application, and the increase in demand for the stock exchange increases the ISE100 index and the amount of ERPD. The reaction of the ERPD to ISE100 is negative. Investors' belief that they can obtain more returns in the ERPD application may hurt stock markets. According to another finding, a positive shock in the interest rate negatively affects the ERPD amount. This result shows that if there is an increase in the interest rate, this change causes a decrease in the ERPD amount. Similarly, it has been found that the increase in ERPD negatively affects the interest rate. Here, it is seen that the interest rate plays an important role in the ERPD application and that the reflection of monetary policy transactions on the interest rate affects the ERPD amount. It can be stated that the ERPD amount decreases because the increase in interest rates directs investors to invest in interest. Another finding is that a positive shock in the dollar and euro sales price negatively affects the ERPD amount, and this effect turns positive at the end of the period. This result shows that if there is an increase in the dollar and euro sales price, this increase first causes a decrease in the ERPD amount and then an increase in the period observed. This finding can be interpreted as investors initially investing in foreign exchange with the expectation of high returns upon seeing the increasing foreign exchange prices, but the excessive increase in foreign exchange prices directed investors to ERPD over time. Here, it is seen that the dollar and euro sales prices play an important role in the ERPD application and that dollarization affects the ERPD amount. While the ERPD response to euro prices is positive, its response to the dollar is first positive and then negative. This finding also shows that the ERPD application in Türkiye cannot prevent dollarization in the country very much.

Finally, we found that a positive shock in M2 positively affects the ERPD amount, and the ERPD increases M2. Here, it is seen that M2 plays an important role in the ERPD application, and the increase in money in circulation increases the ERPD amount. The variance decomposition analysis findings also show that when the

ERPD amount changes, approximately 11% of this change originates from the euro sales price, 8.5% from interest, 7.5% from the BIST 100 index, 4% from M2, and finally 0.1% from the dollar sales price. These findings show that when there is a change in the amount of ERPD, the investment instruments that affect this change the most are the Euro, deposit interest rate, ISE100 index, and the dollar, respectively, and that the money supply also significantly affects this change.

Based on the findings, the ERPD application can be used as a new indicator for individual and institutional investors when making predictions in stock markets. The ERPD application can guide domestic and foreign stock investors in different financial instruments. In addition, the fact that these investors think that they can obtain more returns with the ERPD application can hurt stock markets. Our analysis suggests that the ERPD application in Türkiye affects the deposit interest rate; likewise, the deposit interest rate is affected by the ERPD application. Based on the findings, it can be interpreted that the ERPD investors are interested in financial instruments that provide interest income in the Turkish Lira. Hence, it can be stated that the application's success is debatable since the ERPD application cannot prevent the significant increase in the foreign exchange prices it targets in Türkiye.

In line with the analyses conducted in this paper, it is seen that the ERPD implementation can be effective on alternative investment instruments. It is thought that the results obtained will be beneficial for policymakers, investors, and similar financial actors who want information about ERPD. The relationship between ERPD and macroeconomic indicators can be compared by including different variable groups and methods in future studies. This paper is thought to contribute to literature, especially as a guide to applied studies.

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