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UNCONVENTIONAL MONETARY POLICIES AND FINANCIAL MARKETS: A CAUSALITY ANALYSIS FOR TURKIYE

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ABSTRACT

This study investigates the influence of the Central Bank of the Republic of Türkiye's unconventional monetary policy tools on the BIST100 index, utilizing monthly data from January 2013 to December 2023. The analysis focuses on the Reserve Requirement Ratios (for both Turkish Lira and Foreign Currency) and the Late Liquidity Window Rate as measures of unconventional policy, while the BIST100 index represents financial market performance. The results indicate a unidirectional causality from the Late Liquidity Window Rate to the BIST100 index, suggesting that policy impacts the market through a significant but narrow channel. Conversely, no causal relationship is observed between the reserve requirement ratios and the BIST100 index. These findings highlight the limited efficacy of the Central Bank's unconventional policy tools in stabilizing financial markets.

Keywords: *Unconventional Monetary Policy, Central Bank, Stock Market, Causality Tests*

JEL Codes*: E52, E31, E44, C10*

1. INTRODUCTION

Before 2008, central banks mostly used policy interest rates as the primary tool for monetary policy. Amid the global financial crisis of 2007–2009, several central banks reduced interest rates to near-zero levels in an effort to mitigate the severe recession affecting multiple regions worldwide. Despite these measures, sluggish economic growth persisted, prompting central banks to adopt unconventional monetary policies to stimulate their economies further. Conventional monetary policy involves central banks adjusting their short-term interest rate targets—referred to as the policy rate—to achieve economic goals. The policy rate influences other interest rates in the economy, such as those on mortgages, commercial loans, and deposits. These changes affect the cost of borrowing, the return on

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savings, exchange rates, and asset prices, ultimately shaping investment and consumption decisions. Consequently, conventional monetary policy plays a crucial role in a central bank's ability to manage aggregate demand, employment, and inflation. For instance, raising interest rates tends to reduce aggregate demand and slow down employment growth, which in turn exerts downward pressure on inflation. Conversely, lowering interest rates stimulates aggregate demand and employment growth, thereby increasing inflationary pressures.

The pandemic caused by COVID-19, much like the 2008 global financial crisis, evolved into a widespread economic challenge, prompting numerous central banks to reintroduce unconventional monetary policy measures. CBRT also adopted an unconventional stance by lowering policy rates as of August 2021, in contrast to the rate hikes seen globally. However, it is generally not advisable to pursue such a policy—referred to as the Unconventional Monetary Policy Path—in countries where basic preconditions do not exist, such as a lack of central bank independence or credibility (Federal Reserve Bank, 2020).

This study primarily seeks to investigate how the CBRT's unconventional monetary policy practices affect the BIST 100 index. To analyze these effects, we employ cointegration and causality tests. The following sections of the study provide an overview of how monetary policies have evolved since the global financial crisis and examine the alternative policy instruments adopted by the CBRT to ensure financial stability in the post-pandemic period. The literature review section evaluates the impact of these policies on economic indicators, and the final sections discuss the findings on the causal relationship between CBRT instruments and financial markets, presenting the study's conclusions.

1.1. Unconventional Monetary Policy Tools

Credible monetary policy frameworks and good governance are essential prerequisites for the effective implementation of unconventional monetary policies (UMP). Failure to meet these conditions can expose UMPs to significant risks, leading to financial dominance. Misusing the UMP may result in depreciation pressures and elevated risk premiums.

Unconventional monetary policies exhibit distinct characteristics, and their success depends on several factors:

- **Emerging markets with developed capital markets** and efficient monetary transmission mechanisms through interest rates are more likely to benefit from the UMP.
- For most emerging market economies (EMEs), **quantity-based quantitative easing programs** are more appropriate than price-based programs.
- The scope for UMP to reduce long-term interest rates in countries with **high-risk premia** is likely to be limited.

- Implementing UMP in a manner consistent with other policies enhances its credibility and effectiveness, increasing its chances of success.
- Central banks must also ensure **clear communication** regarding the use of UMP to strengthen its impact (Federal Reserve Bank, 2020).

During periods of deep recession or economic crisis, traditional monetary policy tools offer limited solutions. Lowering nominal interest rates to near-zero levels may push the economy into a liquidity trap, where individuals lose the incentive to invest and prefer to hoard cash, thereby stalling economic recovery. In such scenarios, central banks resort to expanding the money supply through open market operations. However, in times of crisis, government bonds tend to increase in value due to their perceived safety, which reduces their effectiveness as a policy instrument.

To counter this, central banks can purchase securities other than government bonds in the open market, a strategy known as quantitative easing. Typically, non-government securities markets operate independently of central bank intervention and are only targeted when necessary. The types of securities acquired during quantitative easing often include bonds or debt instruments of financial institutions, such as mortgage-backed securities (Investopedia, 2024).

1.2. Interest Rate Corridor

The interest rate corridor functions as a mechanism to align short-term market interest rates with the central bank's target or policy rate. This system includes the rate at which the central bank provides loans to banks (usually the overnight lending rate) and the rate at which it accepts deposits. The interest rate corridor mechanism establishes that the lending rate is set above the central bank's target or policy rate, creating an upper bound for short-term market rates, while the deposit rate is positioned below the target rate, thereby forming a lower bound (1).

The interest rate corridor system is designed to help maintain money market interest rates within a reasonably close range of the central bank's policy rate. This close alignment between the policy rate and market interest rates serves as a key pillar for the transmission of monetary policy. By utilizing the interest rate corridor, central banks can generate more accurate policy forecasts, as market rates tend to closely follow the policy target rate (BSP, 2022).

$$i_{ba} < i_p < i_{bv} \qquad (1)$$

i_{ba}: Central Bank Borrowing Rate,

i_p: Policy Interest Rates,

i_{bv}: Central Bank Lending Rate refers to.

1.3. Forward Guidance

Clear communication regarding monetary policy intentions enables banks, financial market participants, businesses, and consumers to better anticipate future borrowing costs and make informed financial decisions. This transparency helps foster confidence and provides the economy with the momentum it needs to stimulate growth. To achieve this, central banks often employ forward guidance—a communication strategy in which they share information about future monetary policy plans based on their assessment of economic conditions and the outlook for price stability (European Central Bank, 2022).

1.4. Reserve Option Mechanism (ROM)

The ROM is basically a mechanism that allows banks to hold a percentage of their Turkish lira (TL) required reserves in gold and/or foreign currency (FX). The reserve option coefficient (ROC) refers to the amount of FX or gold that banks can hold per unit of Turkish lira. For example, if the ROC is 2, banks must hold TL 2 worth of foreign currency or gold per TL 1 required reserve if they want to benefit from the ROM facility (Alper, Kara and Yörükoğlu, 2013: 2).

1.5. Overnight Late Liquidity Window Rate

The CBRT, acting as the lender of last resort, provides the Late Liquidity Window, a TL borrowing facility, to meet the temporary liquidity needs of banks at the end of the day, thereby preventing potential problems in their payment systems. Banks can also lend their excess liquidity at the end of the day via the Late Liquidity Window (TCMB, 2024).

1.6. Exceptional Liquidity Provision

Exceptional Liquidity Provision, also known as additional monetary tightening, is an unconventional monetary policy tool used by the Central Bank to prevent the pressure of exchange rate volatility on the national currency. On the days it deems necessary, the Central Bank does not lend money to the market through weekly repo and sells foreign exchange to increase foreign exchange liquidity and decrease the liquidity of the national currency (Vural, 2013: 77).

2. LITERATURE REVIEW

This section provides an overview of the key studies addressing the effects of unconventional monetary policy tools, focusing on their implications for financial stability, exchange rates, and financial markets, with a specific emphasis on Turkey. Several studies investigate the impact of the Central Bank of the Republic of Turkey's (CBRT) unconventional monetary policy tools on financial markets. For example, Kazak (2023) analyzed the effects of interest rate policy changes on the BIST100 index and foreign exchange rates using ARCH-LM and EGARCH models, finding significant impacts of rate adjustments at the 1% and 5% levels. Similarly, Gümüş and Topoğlu (2023) applied Event Study

Methodology (ESM) to evaluate the CBRT's policy rate cuts, concluding that these decisions did not significantly influence foreign exchange rates.

In a broader perspective, Felek and Ceylan (2021) examined the effects of key unconventional policy tools such as the interest rate corridor and exceptional day practices on financial stability using a Structural Vector Error Correction Model (SVAR). Their findings suggest that these tools effectively support financial stability when measured through a composite financial stability index. However, Akça and Kaya (2023) highlighted the insufficiency of unconventional policies in maintaining stability, observing that Turkey's financial stability index remained at low levels during the post-crisis period.

The mechanisms through which unconventional monetary policies affect financial markets and macroeconomic stability have also been a focus of research. Yalınpala Çokgezen and Keskin Gündoğdu (2022) demonstrated a cointegration relationship between the exchange rate and tools like the Reserve Options Mechanism (ROM) and Late Liquidity Interest Rate (LLR), suggesting that an increase in the ROM reduces exchange rate volatility. Likewise, Gündoğdu (2022) provided a comprehensive review of the effectiveness of unconventional policies, applying Johansen Cointegration and VECM models to measure their impact on exchange rates, inflation, and credit growth.

Earlier works, such as Başçı and Kara (2011), highlighted the initial outcomes of the CBRT's post-crisis monetary policy mix, emphasizing its effectiveness in achieving macroeconomic stability. Eroğlu, Söylemez, and Alıç (2016) and Tufaner, Uslu, and Sözen (2016) focused on the reserve requirement policy and interest rate corridor, respectively, both identifying limited yet targeted impacts on financial indicators such as credit volume and monetary transmission.

In the context of developed economies, Altavilla et al. (2019) examined the European Central Bank's (ECB) Quantitative Easing (QE) and negative interest rate policies. Their findings demonstrate that QE effectively reduced yields across the yield curve, though its impact on inflation and output growth remained limited. Similarly, Belke (2018) analyzed the U.S. Federal Reserve's QE programs, concluding that these measures struggled to significantly lower long-term interest rates. The study attributes this outcome to the restrictive effects of Europe's debt crisis during the post-crisis period.

In emerging markets, the effectiveness of unconventional monetary policies varies significantly. Kırcı (2018) employed a panel VAR analysis covering Turkey, Romania, Poland, and Hungary from 2008 to 2017. The results indicate that while these policies had no significant impact on inflation, they elicited a pronounced response in the real effective exchange rate, highlighting the sensitivity of exchange rates to unconventional monetary tools in emerging economies.

Focusing on the Eurozone, Elbourne, Ji, and Duijndam (2018) utilized VAR models to evaluate the effects of QE on interest rates, inflation, and economic growth. Their findings suggest that a unit of QE reduced interest rates by 0.20 percentage points; however, its overall expansionary effects on inflation and output growth were relatively limited.

Sümer (2020) explores the relationship between CBRT interest rates and key macroeconomic variables such as inflation, exchange rates, domestic credit volume, and net portfolio investments. The study uses data from May 2010 to September 2019 and highlights a reciprocal interaction between CBRT interest rates and these variables. Serel and Özkurt (2014) focus on understanding the background and implementation process of the monetary policies and through observational analyses using the Central Bank's resources, they demonstrate that the implemented policies produce positive outcomes. Vural (2013) explains how the crisis led policymakers to adopt unconventional monetary policy tools. It evaluates the unconventional monetary policies implemented by selected countries, including the USA, UK, and Japan, that followed inflation targeting between 2009 and 2012. The final section assesses the implementation and results of the unconventional monetary policies adopted by the CBRT during the post-crisis period.

4. METHODOLOGY

This section of the study examines how the tools used by the CBRT as part of its unconventional monetary policy framework influence the BIST 100 index, which represents the state of the financial markets between January 2013 and December 2023. The analysis includes the unconventional monetary policy instruments—Reserve Requirement TL, Reserve Requirement FX, and Late Liquidity Window (LLW)—as independent variables, while the BIST 100 index serves as the dependent variable. Table 1 provides the definitions and data sources for all variables included in the study. The analysis begins with a visual analysis of the variables to identify potential trends, seasonality, and structural breaks. Figure 1 illustrates these characteristics, offering insights into the variables' behavior over the study period. Table 2 summarizes the descriptive statistics of the variables. The results show that the standard deviation of the LLW is higher compared to the other variables, indicating frequent policy changes and a broad range of interest rate fluctuations during the analyzed period.

Table 1. Variables

Variable Name	Abbreviation	Source
BİST 100 Index	BIST100	**CBRT Electronic Data Delivery System (EVDS)**
Late Liqiudity Window	LLW	
Turkish Lira Reserve Requirement Ratio	RRTL	
Foreign Currency Reserve Requirement Ratio	RRFX	

Figure 1. Time Series Graphs

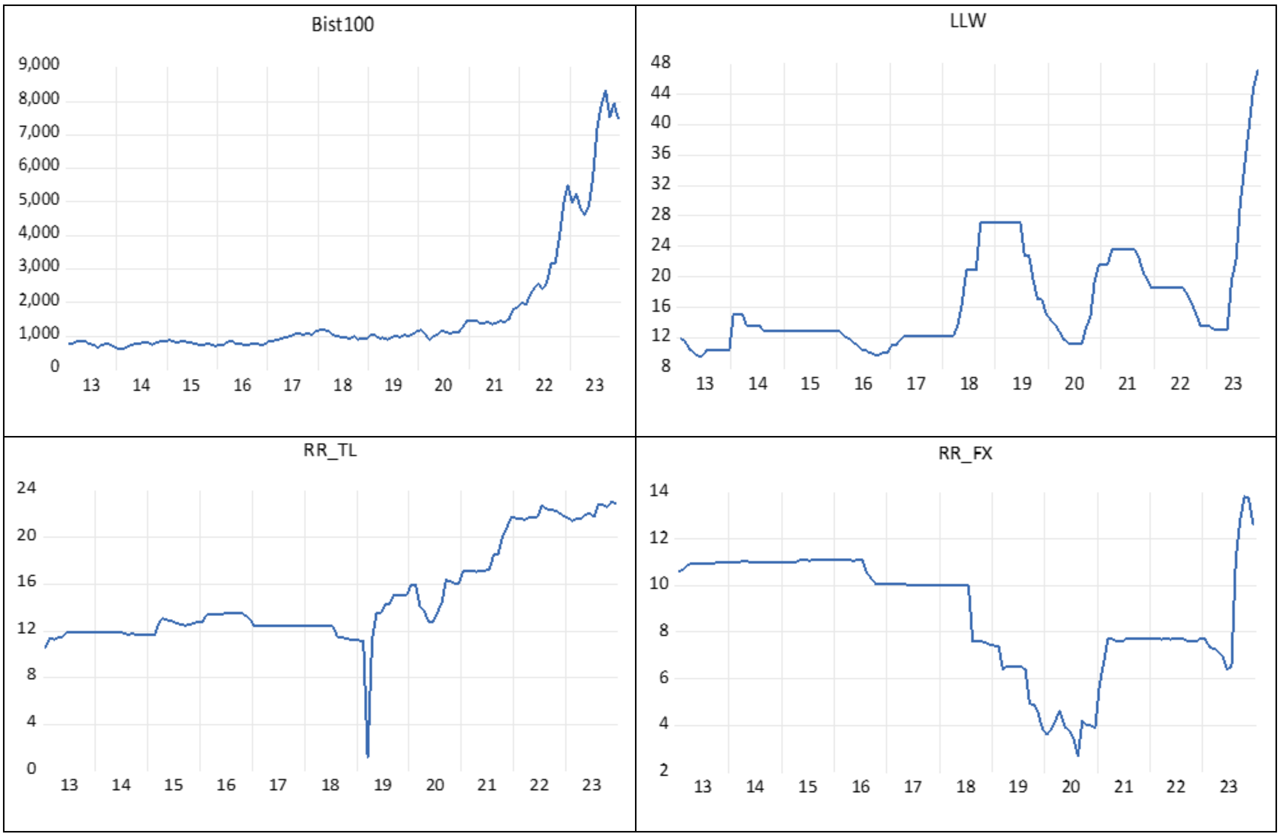

Table 2. Descriptive Statistics

	LOGBIST100	LLW	RR_TL	RR_FX
Mean	7.127971	16.40720	8.816136	14.89470
Median	6.908671	13.12500	10.00000	12.97500
Max	9.009515	47.00000	13.80000	23.10000
Min	6.447638	9.500000	2.650000	1.200000
Standard Dev.	0.646398	6.876043	2.491874	4.102123
Skewness	1.602508	1.858167	-0.592954	0.644726
Kurtosis	4.486542	7.277381	2.486758	3.054002
Jarque-Bera	68.65062	176.5892	9.183878	9.160810
Prob.	0.000000	0.000000	0.010133	0.010251
Nu. of Obs.	132	132	132	132

4.1. Stationarity Test of Variables

The study begins by testing the stationarity of the independent and dependent variables using conventional methods, such as the Augmented Dickey-Fuller (ADF), Kwiatkowski-Phillips-Schmidt-Shin (KPSS), and Phillips-Perron (PP) unit root tests (results shown in Table 3). Additionally, unit root tests that account for structural breaks are also applied to enhance robustness. Since the BIST 100 index data exhibit seasonality, we use seasonally adjusted logarithmic data in the analysis.

Table 3. Unit Root Test Result

	Level ADF		First Difference ADF	
	τ(tau)	**p**	**τ(tau)**	**p**
LOG BİST 100				
Constant	2,5453	1,0000	-9.7528***	0,0000
With Constant and Trend	-0,1159	0,9941	-10,409***	0,0000
LLW				
Constant	-2,2965	0.1747	-3,6732***	0,0056
With Constant and Trend	**-3,626475	0,0314	-3,8253**	0,0182
RR_TL				
Constant	-1,6620	0,4481	-8,4689***	0,0000
With Constant and Trend	-1,3023	0,8829	-8,5263***	0,0000
RR_FX				
Constant	-0,7785	0,8215	-15,6960***	0,0000
With Constant and Trend	-2,7811	0,2070	-11,1178***	0,0000

	Level PP		First Difference PP	
	τ(tau)	**p**	**τ(tau)**	**p**
LOG BİST 100				
Constant	2,4016	1,0000	-9,8201***	0,0000
With Constant and Trend	-0,1960	0,9926	-10,3927***	0,0000
LLW				
Constant	-0,6946	0,8434	-6,86715***	0,0000
With Constant and Trend	-1,7252	0,7346	-7,08153***	0,0000
RR TL				
Constant	-1,3609	0,5995	-8,2450***	0,0000
With Constant and Trend	-0,7209	0,9689	-8,2290***	0,0000
RR FX				
Constant	-0,8345	0,8056	-19,2516***	0,0000
With Constant and Trend	-2,7322	0,2256	-20,5552***	0,0000

Significance Level	**Constant t-statistic**	**Constant and Trend t-statistic**
1%	-3,482035	-4,031309
5%	-2,884109	-3,445308
10%	-2,578884	-3,147545

	Level KPSS	First Difference KPSS
	LM -Stat.	**LM - Stat.**
LOG BİST 100		
Constant	0,8128	0,6972**
With Constant and Trend	0,2543	0,1627**
LLW		
Constant	0,7143	0,1850***

With Constant and Trend	0,0488	0,0820***
RR TL		
Constant	0,7214	0,2423***
With Constant and Trend	0,1927	0,1294***
RR FX		
Constant	1,0701	0,1769***
With Constant and Trend	0,2960	0,0831***
Significance Level	**Constant LM-statistic**	**Constant and Trend LM-statistic**
1%	0,739	0,216
5%	0,463	0,146
10%	0,347	0,119

Not: Statistical significance levels are denoted by ** and ***, corresponding to 10%, 5% and 1% levels.

Table 4. Structural Break Unit Root Test Results

	Level		**First Difference**	
	τ(tau)	**p**	**τ(tau)**	**p**
LOG BİST 100				
Constant	-1,5472	> 0,99	-7,3221***	<0,01
With Constant and Trend	-1,6572	> 0,99	-7,7070***	<0,01
LLW				
Constant	-3,9755	0,1642	-7,8935***	<0,01
With Constant and Trend	-4,2222	0,2462	-7,8650***	<0,01
RR_TL				
Constant	-2,3508	0,9371	-9,8061***	<0,01
With Constant and Trend	-3,7201	0,5520	-9,7667***	<0,01
RR_FX				
Constant	-6,7470***	<0,01	-18,242***	<0,01
With Constant and Trend	-5,8256***	<0,01	-18,540***	<0,01
Significance Level	**Constant t-statistic**		**Constant and Trend t-statistic**	
1%	-4,949133		-5,347598	
5%	-4,443649		-4,859812	
10%	-4,193627		-4,607324	

Not: Statistical significance levels are denoted by ** and ***, corresponding to 10%, 5% and 1% levels.

The results of both conventional and structural break unit root tests indicate that all variables become stationary at their first differences. We test for a long-run equilibrium relationship between the variables if all variables remain stationary in their first differences. We used the Johansen cointegration test to determine the presence of cointegration. VAR estimation result, based on the initial values of the variables, indicates a suitable number of lags at 2. The inverse roots of the AR characteristic polynomial lie within the unit circle, indicating that the model has also a stable structure. Diagnostic tests show that the model has no autocorrelation (prob 0.168) and no heteroscedasticity (prob 0.772).

4.4. Toda – Yamamoto ve Fourier Toda - Yamamoto Causality

Granger (1969) proposed a methodology that primarily investigates causal relationships between variables. The Vector Auto Regression (VAR) model forms the basis of this methodology, which analyzes the first differences of non-stationary time series. However, the divergence of the series can lead to a significant loss of long-term information content. The Toda-Yamamoto (1995) Granger causality approach mitigates this negative effect. Enders and Jones (2016) improved the Granger causality framework by incorporating Fourier functions; Nazlıoğlu et al. (2016) similarly added Fourier functions to the Toda-Yamamoto causality framework to design a methodology that takes structural changes into account. As a result, the formulation of the VAR (p+d) model is expressed as follows:

$$yt = \alpha(t) + \beta 1yt{-}1 + \cdots + \beta p{+}dyt{-}(p{+}d) + \varepsilon t \qquad yt = \alpha(t) + \beta 1yt{-}1 + \cdots + \beta p{+}dyt{-}(p{+}d) + \varepsilon t \tag{2}$$

In equation (1), the variable represented by $\alpha(t)$ is a time-dependent function that captures the structural changes in yt. If the dates or the number of structural breaks cannot be determined, we can estimate the Fourier equation in equation (2) to identify structural changes:

$$\alpha(t) = \alpha_0 + \sum_{k=1}^{n} \alpha_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \alpha_{2k} \cos\left(\frac{2\pi kt}{T}\right) \tag{3}$$

In Equation (2), the symbol n denotes the number of frequencies ranging from 1 to 5, while the symbol T represents the total number of observations and the variable k represents the frequency value. A high value of n can cause changes in the stochastic parameters, leading to the potential emergence of overfitting problems. So, the single Fourier function tries to fill in the empty spaces with deterministic parts, without taking into account their time data, quantization, or shape (Nazlioglu et al., 2016). Equation (3) expresses the formulated model.

$$\alpha(t) = \alpha_0 + \alpha_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \alpha_{2k} \cos\left(\frac{2\pi kt}{T}\right) \tag{4}$$

We formulate equation (4) by integrating equation (3) into equation (1).

$$y_t = \alpha_0 + \alpha_{1k} \sin\left(\frac{2\pi kt}{T}\right) + \alpha_{2k} \cos\left(\frac{2\pi kt}{T}\right) + \beta_1 y_{t-1} + \cdots + \beta_{p+d} y_{t-(p+d)} + \varepsilon_t \tag{5}$$

In addition to the Toda-Yamamoto analysis, recognizing the potential for structural breaks and non-linear relationships during the study period (2013–2023), we employed the Fourier Toda-Yamamoto causality test. This method incorporates Fourier series to account for structural changes, enhancing the test's power and capturing policy impacts that may vary across different sub-periods, such as economic crises or policy shifts. By addressing these structural breaks, the Fourier Toda-Yamamoto test provides a more nuanced understanding of causality.

The results of the Toda-Yamamoto and Fourier Toda-Yamamoto causality tests reveal a unidirectional relationship between the Late Liquidity Window (LLW) rate and the BIST100 index. However, no causal relationship was detected between the BIST100 index and the reserve requirement ratios (for both Turkish lira and foreign currency). Furthermore, neither the Fourier nor the traditional Toda-Yamamoto causality tests identified any causal relationships between the BIST100 index, the LLW rate, and the reserve requirement ratios.

While the Fourier method captures more complex structures by incorporating frequency components and the dynamic characteristics of the series, its findings align with those of the traditional Toda-Yamamoto test. This consistency suggests that the "no causality" result obtained from the traditional method remains robust, even when structural breaks and non-linear dynamics are accounted for using Fourier terms. Thus, both methods collectively reinforce the reliability of the causality findings.

Table 5. Toda – Yamamoto ve Fourier Toda – Yamamoto Causality Tests Results

Dependent Variable	Independent Variable	Toda - Yamamoto		Single Fourier Toda - Yamamoto		Causality
		Test St.	Prob.	Test St.	Prob.	
LLW	BIST100	3.008	0.071*	3.741	0.053**	LLW→LOGBİST100
	RRTL	0.063	0.731	0.111	0.675	No causality
	RRFX	0.309	0.490	0.254	0.554	No causality
BIST100	LLW	0.579	0.461	0.042	0.833	No causality
	RRTL	0.023	0.889	0.154	0.705	No causality
	RRFX	0.898	0.329	1.177	0.304	No causality
RRTL	LLW	0.565	0.323	0.649	0.333	No causality
	BIST100	0.658	0.421	0.572	0.432	No causality
	RRFX	0.006	0.919	0.010	0.896	No causality
RRFX	LLW	0.180	0.611	0.024	0.841	No causality
	RRTL	1.011	0.334	0.435	0.496	No causality
	BIST100	0.004	0.920	0.018	0.867	No causality

4.5. Granger ve Fourier Granger Causality Analysis

Granger (1969) defines the VAR(p) model for testing causality as follows.

$$y_t = \gamma + \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + u_t \quad (6)$$

Where yt denotes the m endogenous variables, γ represents the vector consisting of constant terms, ϕ = (ϕ1,...,ϕp) signifies the coefficient matrix, and ut is identified as the error term. Granger causality analysis necessitates the examination of the variables' unit root and cointegration characteristics. This is necessary because the Wald test has a non-standard distribution and can depend on wrong parameters if the variable(s) in the VAR model have unit roots or are cointegrated (Dolado and Lütkepohl 1996; Toda and Yamamoto 1995). To address this issue, Toda and Yamamoto (1995) advocate for the estimation of the VAR(p+d) model, which incorporates an additional lag corresponding to the highest unit root degree of the variables (d) into the VAR model using the level values of the variables, henceforth referred to as the VAR. The TY causality methodology articulates:

$$y_t = \gamma + \phi_1 y_{t-1} + \cdots + \phi_{p+d} y_{t-(p+d)} + u_t \quad (7)$$

The VAR models defined in both Equations (5) and (6) do not take into account a possible structural break in the variables.

Table 6: Granger and Fourier Granger Causality Test Results

Depend. Variab.	Independ. Variab.	Granger		Single Fourier Granger		Causality
		Test Sta.	Prob.	Test St.	Prob.	
	BIST100	3.984	0.051*	4.663	0.043**	LLW→LOGBİST100
LLW	RRTL	0.025	0.826	0.007	0.925	No Causality
	RRFX	1.488	0.166	0.861	0.310	No Causality
	LLW	0.674	0.826	0.097	0.745	No Causality
BIST100	RRTL	0.010	0.166	0.462	0.488	No Causality
	RRFX	0.675	0.454	2.150	0.162	No Causality
	LLW	0.999	0.201	1.258	0.181	No Causality
RRTL	BIST100	1.141	0.300	1.118	0.295	No Causality
	RRFX	1.287	0.207	0.697	0.372	No Causality
	LLW	0.435	0.399	0.193	0.587	No Causality
RRFX	RRTL	1.092	0.306	0.661	0.395	No Causality
	BİST100	0.408	0.425S	0.052	0.776	No Causality

To complement the above methods, we also applied traditional Granger and Fourier Granger causality tests. The Granger causality test provided baseline insights into linear relationships, while the Fourier Granger test extended this analysis by capturing non-linear dynamics and structural breaks. Together, these methods ensured a comprehensive examination of both linear and non-linear causality.

The results indicate that the reserve requirement ratios (TL and FX) do not exhibit a causal relationship with the BIST100 index, as their probability values exceed the 10% significance threshold. Similarly, the BIST100 index does not show causality toward the reserve requirement ratios or the late liquidity rate (LLR). However, a significant unidirectional causal relationship was identified between the Late Liquidity Window (LLW) rate and the BIST100 index. These findings are consistent with the results of the Fourier Toda-Yamamoto and conventional Toda-Yamamoto causality tests.

Despite the observed causality from the LLW to the BIST100 index, other monetary policy instruments, such as reserve requirement ratios, appear insufficient in driving short-term impacts on financial markets. This suggests that broader and more comprehensive monetary policy measures are needed, as short-term instruments like the LLR have limited capacity to shape market expectations.

These findings diverge from those of Felek and Ceylan (2021), who concluded that the CBRT's interest rate corridor strategy and exceptional day practices were effective in maintaining financial stability. While this study employs the BIST100 index as a proxy for financial stability, Felek and Ceylan (2014) utilized a composite financial stability index constructed from the 1-week repo rate, nominal exchange rate, and domestic credit volume.

Conversely, the study by Akça and Kaya (2023) aligns more closely with our findings. They argue that unconventional monetary policies during the analyzed period were insufficient to support financial stability, as the financial stability index remained at low levels and declined further in the post-crisis period. Similarly, our results highlight the limited impact of unconventional monetary policies on financial stability, underscoring the need for more comprehensive policy frameworks.

5. CONCLUSION

The 2008 Global Financial Crisis highlighted the limitations of traditional monetary policy instruments in maintaining both price stability and financial stability. In response, many central banks introduced unconventional monetary policy tools to support financial stability and respond swiftly to market volatility. Economic uncertainties and global shocks, such as the COVID-19 pandemic over the past decade, have further emphasized the necessity of these tools.

During this period, CBRT has actively employed various unconventional monetary policy tools—including the interest rate corridor, the reserve option mechanism, the Late Liquidity Window (LLW), —to maintain financial stability. This study analyzes the effects of these CBRT policies on the BIST 100 index using the Toda-Yamamoto and Granger causality tests, as well as the Fourier Granger and Toda-Yamamoto causality tests.

The findings reveal that the LLW variable has a significant causal relationship with the BIST 100 index and plays an effective role in determining short-term liquidity conditions in the market. However, this effect does not persist in the long term and does not evolve into a structure capable of ensuring permanent market stability. Conversely, the reserve requirement variables (in both TL and FX) do not exhibit a significant causal relationship with the BIST 100 index, suggesting that the influence of reserve requirement ratios on financial market dynamics is limited and their impact on the market is indirect and weak.

The results of the study indicate that the CBRT's unconventional monetary policy tools, while effective in influencing short-term market movements, are insufficient to provide sustained long-term stability. This suggests that policymakers should focus not only on enhancing the effectiveness of short-term tools but also on supporting these tools with a broader, long-term perspective. Implementing structural reforms and adopting a more comprehensive policy framework to influence the behavior of financial market participants over the long run would not only improve the efficacy of policy instruments but also contribute to more predictable and consistent market expectations.

In conclusion, Turkey needs to rethink its monetary policy framework with a long-term perspective and broaden its policy mix to maintain financial stability and respond more effectively to economic fluctuations. This approach is crucial for ensuring market stability and for managing market expectations more effectively in the face of future economic challenges.

REFERENCES

Akça, M., and Kaya, V. (2023). Effectiveness of Unconventional Monetary Policy Tools on Financial Stability: A NARDL Approach for Turkey. Bingöl Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 7(1), 63-80.

Altavilla, C., Brugnolini, L., Gürkaynak, R., Motto, R. and Ragusa, G. (2019) "Measuring Euro Area Monetary Policy", Journal of Monetary Economics, 108: 162-179.

Alper, K., Kara, H. and Yörükoğlu M. (2013) "Reserve Options Mechanism", Central Bank Review, 13: 1-14.

Başcı, E. and Kara, H. (2011) "Finansal İstikrar ve Para Politikası", Iktisat Isletme ve Finans, 26(302): 9-25.

Belke, A. (2018) "The Effectiveness of the FED's Quantitative Easing Policy- A Survey of the Econometrics", Estudios De Economia Aplicada, 36(1): 291-308.

BSP (2022) "Revised framework for monetary operations under the BSP interest rate corridor (IRC) system", Annual Report:1-8.

European Central Bank (2022) "What is forward guidance?", https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/what-is-forward_guidance.en.html (08.09.2024)

Elbourne, A., Ji, K. Duijndam, S. (2018) "The Effects of Unconventional Monetary Policy in the Euro Area", CBP Netherlands Bureau for Economic Policy Analysis, CBP Discussion Paper, 37(1): 1-36.

Enders, W. and Jones. L. (2012) "The Flexible Fourier form and Dickey– Fuller Type Unit Root Tests", Economics Letters, 117(1): 196-199.

Eroğlu, N. Söylemez, A.O. and Alıç, C. (2016) "Türkiye'de Zorunlu Karşılıklar ve Tüketici Kredileri: Ekonometrik Bir Model Denemesi", Marmara Üniversitesi İktisadi ve İdari Bilimler Dergisi, 38 (2): 2149-1844

Federal Reserve Bank, (2020). https://www.federalreserve.gov (25.08.2024).

Granger, C. W. (1969) "Investigating Causal Relations by Econometric Models and Cross-spectral Methods", Econometrica, 37(3): 424-438.

Gümüş, T. and Topoğlu, E. (2023) "Türkiye Cumhuriyet Merkez Bankası Politika Faiz Kararının TL/ABD Doları Kuruna Etkisinin İncelenmesi", Journal of Bankingand Financial Research, 10(1): 1-13.

Felek S. and Ceylan R. (2021)" Geleneksel Olmayan Para Politikası Araçlarının Finansal İstikrar Üzerindeki Etkisi: Türkiye Uygulaması", Business and Economics Research Journal, 12(3): 537-555.

Kazak, H. (2023) "Merkez Bankası Politika Faizi Kararlarının Hisse Senetleri ve Döviz Kuru Üzerindeki Etkisinin Ampirik Bir Analizi: Türkiye'den Kanıtlar", Uluslararası İktisadi Ve İdari İncelemeler Dergisi, 41:50-63.

Keskin Gündoğdu, S. (2022) "Geleneksel Olmayan Para Politikası Araçlarının Etkileri: TCMB Örneği", Yüksek Lisans Tezi, Marmara Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.

Kırcı, B. (2018) "Geleneksel ve Geleneksel Olmayan Para Politikası Stratejilerinin Etkinliğinin Karşılaştırılması", Yüksek Lisans Tezi, Namık Kemal Üniversitesi, Sosyal Bilimler Enstitüsü, Tekirdağ.

Nazlıoğlu, S., Görmüş, N., and Soytaş, U. (2016) "Oil prices and real estate investment trusts (REITs): Gradual-shift causality and volatility transmission analysis", Energy Economics, 60: 168-175.

TCMB (2024) "Standing Facilities". https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Core+Functions/Markets/Standing+Facilities/ (12.04.2024).

Serel, A. and Özkurt, İ. C. (2014) "Geleneksel Olmayan Para Politikası Araçları ve Türkiye Cumhuriyet Merkez Bankası", Yönetim ve Ekonomi Araştırmaları Dergisi. 22, 56-71.

Sümer, A. L. (2020) "Geleneksel Olmayan Para Politikası Kapsamında Neo-Fisher Etkisi: 2008 Sonrası Türkiye Deneyimi. Uluslararası Ticaret ve Ekonomi Araştırmaları Dergisi, 4(1): 1-21.

Toda, H. Y. and Yamamoto, T. (1995) "Statistical Inference in Vector Autoregressions with Possibly Integrated Processes", Journal of Econometrics, 66(1-2): 225-250.

Tufaner, M.B., Uslu, K. and Sözen, İ. (2016) "Faiz Koridoru Uygulamasının Merkez Bankası Politikalarına Etkisi", International Conference On Eurasian Economies: 658-666.

Vural U. (2013) "Geleneksel Olmayan Para Politikalarının Yükselişi", TCMB Uzmanlık Yeterlik Tezi. Ankara.

Yalınpala Çokgezen, J., and Keskin Gündoğdu, S. (2022) "Geleneksel Olmayan Para Politikası Araçlarının Fiyat İstikrarı ve Finansal İstikrara Etkileri: TCMB Örneği. Artuklu Kaime Uluslararası İktisadi ve İdari Araştırmalar Dergisi, 169-201.

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