Journal of Social Economics Research
2024 Vol. 11, No. 4, pp. 435-445
ISSN(e): 2312-6264
ISSN(p): 2312-6329
DOI: 10.18488/35.v11i4.4014

The impact of interest rate strategies implemented by the central bank of the republic of Türkiye on the liquidity risk within the banking sector: An exploration using a nonlinear boundary test method

Levent Sezal

Vocational School of Social Sciences, Kahramanmaraş Sütçü Imam University, Kahramanmaraş, Türkiye.
Email: leventsezal@ksu.edu.tr

Article History
Received: 19 September 2024
Revised: 14 November 2024
Accepted: 5 December 2024
Published: 24 December 2024

Keywords
Central bank
Lee and Strazicich unit root tests
Liquidity adequacy ratio
Nonlinear border test approach
Policy rate
Turkish banking sector.

JEL Classification:
E43; E52; E58.

ABSTRACT

This study analyses the effects of changes in the CBRT's policy interest rate on the liquidity adequacy ratio of the Turkish banking sector. In order to determine the relationships between variables, Lee and Strazicich unit root tests, which also take into account structural breaks, are applied. Accordingly, the asymmetric effect of the policy interest rates of the Central Bank of the Republic of Türkiye on the Turkish banking sector liquidity adequacy ratio is analysed with the Nonlinear Lag Distributed Autoregressive Model (NARDL). The 'Toda-Yamamoto' method, in the form of binary analysis, tests the direction of causality to determine if there is a causal relationship between the variables. According to the NARDL test results, no cointegration relationship was found between the CBRT policy interest rates and the Turkish banking sector. Conversely, the results of the causality test reveal a unidirectional causal relationship between policy interest rates and the liquidity adequacy ratio. As a result, the management of liquidity-related risks by banks is critical for the continuity of the bank's operations. A change in the policy rate directly affects banks' funding and funding ratios through money market rates, which in turn affects the emergence of liquidity-related risks in the short and long term. Proper management of liquidity-related risks could potentially lead to bank liquidation.

Contribution/Originality: The number of studies on liquidity risk in the Turkish banking sector is quite limited. On the other hand, the lack of consensus on how to measure liquidity risk in the literature makes this study more attractive.

1. INTRODUCTION

The process of monetary policy decisions affecting the economy is called the monetary transmission mechanism. Understanding these mechanisms, which can be thought of as a series of interactions that show how and why decisions about monetary policy affect the economy, is one of the most important things that must be in place for monetary policy to work (Macit & Durgun, 2019). In the economic literature, there are different views on the channels through which monetary transmission works and the relative importance of these channels. These differences of opinion on which channel is the main transmission channel are largely due to the relative importance attributed to money, credit, interest rates, exchange rates, asset prices, or the role of commercial banks and other financial institutions (Taylor, 1995). Central banks are empowered to affect financial markets directly and the real economy indirectly through their decisions. The global crises have intensified the impact of central banks' interest rate decisions on the markets. The

2008 liquidity crisis and the COVID-19 pandemic, which showed their effects in 2019, were two important developments that emphasised the critical importance of central bank policy interest rate decisions at the global level.

Financial markets play an important role in the development of economies. Strong economies are often associated with developed financial markets. In Türkiye, financial markets are mainly composed of the banking sector. Therefore, the development of the banking sector play a crucial role in driving economic growth. Banks, whose main function is to collect excess funds from depositors and transfer them to the real sector, have a very important position in both the restructuring of the economy and the establishment of long-term sustainable macroeconomic stability, both due to their financial intermediation function in transforming savings into profitable investments and their large share in the financial structure (Altan, 2017).

While banks continue their activities with the aim of profitability like other commercial enterprises, they may face risks that affect the economy in general or sectoral risks. Sectoral risks and risks related to the bank's structure may damage the financial structure and reputation of banks in the market. Credit risk, market risk, operational risks, and liquidity risk are important risk factors faced by the banking sector. Liquidity, in simple terms, is a financial concept closely related to a bank's ability to have the resources it needs to fulfil its obligations in a complete manner when the time comes (Çakmak & Sunal, 2023). Given their business models, banks try to sustain their operations by managing the potential risks posed by the maturity mismatch problem.

Compared to other businesses, the banking sector processes a large portion of daily payments, making the ability of banks to make payments without market failures a prerequisite for the efficient functioning of the payment system in general. Therefore, the liquidity adequacy of banks is of paramount importance even in the context of market practices where central banks are committed to providing funds as the liquidity lender of last resort. The ability of free reserves or the market conditions for accessing these resources closely influences banks' ability to make daily payments, particularly in the face of unforeseen deposit outflows. In addition to all these, considering that unmanageable liquidity squeezes also carry the risk of creating bank panics, the liquidity situation of banks, even individually and regardless of their size, may directly concern the entire sector.

Liquidity risk and liquidity risk management have come to the forefront in banking with the global crisis in 2008. To put it another way, the global crisis led to deficiencies in the liquidity risk management of banks. Intensive liquidity risk exposure by banks may have a negative impact on both financial stability and economic stability. Especially in finance, risk management and risk predictability have attracted attention. Liquidity indicators receive attention in the financial sector and during the evaluation of bank stocks (Ahi, 2020).

Changes in the central bank policy rate cause the market interest rate to change. Banks, which constitute the majority of the financial markets in Türkiye, are directly affected by these decisions. Banks are exposed to various risks arising from the market, operations, customers, regulatory decisions, interest rates, unexpected events, and liquidity. Among these risks, the most vital one for the bank is the liquidity-related risk. If the risks arising from liquidity cannot be intervened in time, the liquidation of the bank will be in question, so the management of liquidity risk is of great importance. It is seen that there is a limited number of studies on this subject, and it is thought that this study will contribute to the literature. In this context, the first part of the study reviews comparable domestic and foreign literature on the subject. In the second part of the study, information about the data set and methodology used in the study is given. In the third section, the findings of the study are presented, and the study is finalised with the conclusion.

2. LITERATURE REVIEW

Although liquidity risk is the subject of many studies in the international literature, the number of studies published on liquidity risk in Türkiye remains quite limited. The low number of studies on liquidity risk in Türkiye and the lack of a consensus on how to measure liquidity risk in the literature have made this study more attractive. A review of the international and national literature reveals that many studies use the ratio of liquid assets to total

assets as a basic indicator of liquidity adequacy (Altan, 2017; Ayaydın & Karaaslan, 2014; Bourke, 1989; Ganic, 2014; Gülhan, 2018; Iqbal, 2012; Işık & Belke, 2017; Kakaç, 2019; Mohammad, Asutay, Dixon, & Platonova, 2020; Onat, 2019; Singh & Sharma, 2016; Vodova, 2011). On the other hand, there are also studies that use the ratio of liquid assets to short-term liabilities as an important ratio representing liquidity (Aspachs, Nier, & Tiesset, 2005; Çelik & Tekşen, 2021; Dinger, 2009; Ferrouhi & Lehadiri, 2014; Grant, 2012; Kocaman Ekim, Babuşçu, & Hazar, 2018; Maechler, Mitra, & Worrell, 2007; Roman & Şargu, 2014).

In 2008, the global financial crisis brought to the agenda again the necessity to closely monitor the liquidity status of banks as well as their capital adequacy, and in this framework, the Liquidity Coverage Ratio (LCR), which was introduced within the scope of BASEL III regulations, has been used in a limited number of new studies (Abdul-Rahman, Sulaiman, & Said, 2018; Altahtamouni & Alyousef, 2021; Cucinelli, 2013; Du, 2017; Muriithi & Waweru, 2017; Shahchera & Taheri, 2017; Sitepu & Erlina, 2020; Yaacob, Rahman, & Karim, 2016). In this context, information on some national and international studies on liquidity risk in the banking sector is given below.

Karagiannis, Panagopoulos, and Vlamis (2009) examined the impact of interbank money market interest rates and central bank interest rates on banks' deposit and lending rates for the European Union and the United States. As a result of the study, they found that the monetary transmission mechanism deteriorated in both the US and the European Union during the 2008 financial crisis. They also concluded that interest rate pass-through changed significantly before and after the financial crisis. Accordingly, the divergence between the central bank rate and the interbank money market rate increased in both regions. Similarly, the spread between the central bank rate and retail interest rates (interest rates on loans and deposits) has also widened. However, the Euro area finds money market interest rates to be more determinant than the policy rate, while the US finds the policy rate to be more determinant.

Akhtar, Ali, and Sadaqat (2011) compared participation banks and traditional banks in terms of liquidity risk using regression analysis method by using the data of six participation banks and six traditional banks operating in Pakistan between 2006-2009. The study analysed the effect of asset size, net working capital, return on equity, capital adequacy ratio, and return on assets on liquidity risk. Only the return on equity in participation banks demonstrates statistical and economic significance and a negative correlation with liquidity risk. In traditional banking, only the capital adequacy ratio is found to be statistically and economically significant, and it is argued that there is a positive relationship with liquidity risk.

In the study by Munteanu (2012) the determinants of liquidity risk of commercial banks in Romania were analysed with a panel data regression model since even very profitable banks had difficulties in managing their liquidity during the 2008 global financial crisis. 27 banks operating in Romania in the period 2002-2010 were included in the study, and the period covering 2008-2010 was also analysed. The study's most significant finding is that banks with high non-performing loan ratios faced increased liquidity risk during both the crisis and pre-crisis periods.

Trenca, Petria, and Corovei (2015) used the data of 40 commercial banks in Spain, Greece, Italy, Portugal, Croatia, and Cyprus for the period 2005-2011. As a result of the study, it was found that there is a positive and significant relationship between liquidity risk and current account deficit, inflation, unemployment, prior period liquidity ratio, and output growth rate.

In their study, Singh and Sharma (2016) analysed the factors affecting the liquidity risk of banks by using the data of 59 commercial banks in India between 2000-2013. Using panel data regression analysis method, they concluded that bank capital, inflation rate, ratio of deposits to total assets, and return on assets have significant and positive effects on banks' liquidity. On the other hand, bank size and economic growth have significant and negative effects on banks' liquidity. Furthermore, the study asserts that the cost of funding and unemployment rate, the other independent variables, do not significantly influence liquidity risk.

Borio, Gambacorta, and Hofmann (2017) analysed 109 banks operating in G10 countries (the United Kingdom, Japan, Canada, Italy, Belgium, Switzerland, France, Germany, Netherlands, Sweden, and the United States) and Austria, Australia, and Spain within the scope of interest rate and profitability. The dynamic panel analysis with annual data for the period 1995-2012 revealed a positive relationship was found between short-term interest rates and banks' profitability ratios. In addition, the effect on banks' profitability is stronger when the interest rate is lower and the profitability slope is less steep.

Onat (2019) examined liquidity risk management in participation banking. Issues related to liquidity risk and management in participation banking in Türkiye were evaluated, and the factors affecting liquidity risk in participation banking were analyzed by regression analysis method in order to support these evaluations. The analysis concluded that factors related to bank balance sheets, particularly profitability, significantly influence liquidity adequacy.

In his study, Ahamed (2021) examined the factors affecting the liquidity risk of banks by using the data of 23 commercial banks in Bangladesh between 2005-2008. The study concludes that bank size has a negative relationship with liquidity risk, while return on equity and capital adequacy ratio have a positive and insignificant relationship. On the other hand, while there is a negative relationship between liquidity risk and inflation among macroeconomic variables, there is a positive relationship with gross domestic product GDP.

Karakaş and Acar (2022) examined the relationship between liquidity and profitability in commercial banks in the Turkish banking sector. The study included 20 commercial banks operating in Türkiye during the 2002-2020 period. The study using the panel data analysis method found that the current ratio and the liquid asset ratio have a positive impact on the return on assets ratio, but a negative impact on the return on equity ratio and the net interest margin. The acid-test ratio has a negative impact on the return on assets ratio, but a positive impact on the return on equity ratio and the net interest margin. Finally the loan/deposit ratio has a negative impact on all three profitability ratios. These results show that liquidity is generally negatively related to profitability.

Çakmak and Sunal (2023) investigated the factors determining the liquidity coverage ratio in the Turkish banking sector during the Covid-19 pandemic period using panel data analysis method. In this context, the data set of 4 participants and 19 commercial banks operating in Türkiye between the periods 12/2015-09/2021 was used. In this study, statistically significant relationships were found between the liquidity level of the Turkish banking sector during the Covid-19 pandemic period and macroeconomic factors such as return on equity, loan-deposit ratio, capital adequacy ratio, Non-Performing Loans (NPL) ratio, and equity-asset size, which are among the main indicators of the banking sector, and the control variable.

3. MATERIALS AND METHOD

This study aims to determine whether the policy interest rates of the Central Bank of the Republic of Türkiye have an asymmetric effect on the liquidity adequacy ratio of the Turkish banking sector. In order to determine the relationships between the variables, the stationarity of the variables should be determined first. "Lee and Strazicich (2013)" unit root tests, which take into account structural breaks, are applied to the data. Accordingly, the asymmetric effect of the policy interest rates of the Central Bank of the Republic of Türkiye on the liquidity adequacy ratio of the Turkish banking sector is analyzed with the Nonlinear Lag Distributed Autoregressive Model (NARDL). Economic research widely uses the Autoregressive Distributed Lag (ARDL) approach, and the NARDL technique is an improved version. The ARDL bounds testing approach was introduced by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001). The ARDL bounds testing approach eliminates the need for a priori information on the degree of integration of series unless they reach the second order. Therefore, the ARDL bounds testing approach assumes that the existence of a cointegrated relationship between variables can be tested regardless of their I(0) or I(1) degree of integration (Yamak & Erdem, 2017). Later on, Pesaran and Shin (1999) and Pesaran et al. (2001) extended the ARDL model to include asymmetric effects as the NARDL model by Shin and

Greenwood-Nimmo (2014). These advantages make the NARDL model significantly superior to other methods. On the other hand, "Toda-Yamamoto Causality Test" is used to determine whether there is any causal relationship between the central bank policy interest rates and the Turkish banking sector liquidity adequacy ratios.

The data set used in the study covers the period 2011:05-2024:05 and consists of monthly data. Table 1 presents information on the data set.

Table 1. Descriptions of the data set.

Variables	Explanations of variables	Time interval	Data period	Source
PR	Central bank of the Republic of Turkey policy rate	2011:05- 2024:05	Monthly	Banking regulatory and supervisory authority (BRSA), Central bank electronic data delivery system (EDDS)
LAR	Banking sector liquidity adequacy ratio	2011:05- 2024:05	Monthly	Banking regulatory and supervisory authority (BRSA), Central bank electronic data delivery system (EDDS)

The NARDL method first separates the independent variables as positive and negative. For example, two different variables, $X+$ and $X-$, should be created from the independent variable X. Equation 1 shows the linear ARDL model.

$$\Delta y_t = \alpha + \theta_{t-1} + \delta x_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta y_{t-i} + \sum_{i=0}^{q-1} \mu_i \Delta x_{t-i} + \epsilon_t \quad (1)$$

In this equation, α is the constant term, δ and θ are the long-run coefficients, π_i and μ_i are the relevant parameters, and ϵ_t is the error term. Equation 2 defines the NARDL model asymmetric cointegration regression equation.

$$y_t = \sigma^+ x_t^+ + \sigma^- x_t^- + u_t \quad (2)$$

The terms σ^+ and σ^- in the equation are defined as long-run parameters and x_t is defined as the vector k x 1. The vector x_t is modeled in Equation 3:

$$x_t = x^0 + x_t^+ + x_t^- \quad (3)$$

Equations 3 and 4, respectively calculate the cumulative sums of positive and negative changes in the independent variables.

$$x_t^+ = \sum_{i=1}^{t} \Delta x_i^+ = \sum_{i=1}^{t} \max(\Delta x_i, 0) \quad (4)$$

$$x_t^- = \sum_{i=1}^{t} \Delta x_i^- = \sum_{i=1}^{t} \min(\Delta x_i, 0) \quad (5)$$

Combining the linear ARDL model (Equation 1) with the NARDL model (Equation 2) yields the asymmetric error correction model (AECM) as expressed in Equation 6.

$$\Delta y_t = \alpha + \theta y_{t-1} + \delta^+ x_{t-1}^+ + \delta^- x_{t-1}^- \sum_{i=1}^{p-1} \pi_i \Delta y_{t-i} + \sum_{i=0}^{q-1} (\mu_i \Delta x_{t-i}) + \epsilon_t \quad (6)$$

In this equation, $\delta^+ = -\theta\sigma^+$ and $\delta^- = -\theta\sigma^-$. Therefore, the short-run coefficients of the changes in xt are expressed by the terms μ_i^+ and μ_i^-. Therefore, the asymmetric effects of the short and long run are shown in Equation 6. Before estimating Equation 6, you should follow these steps:

- Stationarity tests should be applied to the series to determine the degree to which the series are stationary. As a result of this analysis, the dependent variable should be stationary at the I(1) level, the independent variables should be stationary at the I(0) and I(1) levels, and they should not be stationary at the I(2) or higher degree.
- Equation 6 is estimated using the Least Squares Method (LSM).
- The Wald test tests the hypotheses $\frac{\delta^+}{\theta} = \frac{\delta^-}{\theta}$ for long-run asymmetry and $\sum_{i=0}^{q-1} \mu^+ = \sum_{i=0}^{q-1} \mu^-$ for short-run asymmetry.

If the null hypotheses for the short and long run are rejected, the NARDL model takes the form shown in Equations 7 and 8.

$$\Delta y_t = \alpha + \theta y_{t-1} + \beta t + \delta \quad x_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta y_{t-1} + \sum_{i=0}^{q-1} (\mu_i^+ \quad \Delta x_{t-i}^+ \quad + (\mu_i^- \quad \Delta x_{t-i}^- \quad) + \in_t \quad (7)$$

$$\Delta \boldsymbol{y_t} = \boldsymbol{\alpha} + \boldsymbol{\theta y_{t-1}} + \boldsymbol{\beta t} + \boldsymbol{\delta^+ x_{t-1}^+} + \boldsymbol{\delta^- x_{t-1}^-} + \sum_{i=1}^{p-1} \boldsymbol{\pi_i} \Delta \boldsymbol{y_{t-i}} + \sum_{i=0}^{q-1} (\boldsymbol{\mu_i} \quad \Delta \boldsymbol{x_{t-1}} \quad +) + \in_t \quad (8)$$

Equations 7 and 8 above show the short-run and the long-run asymmetry, respectively. The term t in these equations denotes the trend. In this study, EViews 10 package program is used to investigate the long-run and short-run asymmetric relationships between the policy interest rates of the Central Bank of the Republic of Türkiye and the liquidity adequacy ratio of the Turkish banking sector with the NARDL approach between 2011:05 and 2024:05.

4. EMPIRICAL RESULTS

As stated in the previous section of the study, in this technique, the relevant series should be I(0) or I(1) and not I(2). Therefore, before applying the NARDL model, the stationarity levels of the relevant series are determined at the first stage. Lee and Strazicich (2013) unit root test is used to determine the stationarity levels of the series. The Lee and Strazicich unit root test is a unit root test that allows for structural breaks and is based on two models: constant (Model A) and trended (Model C).

Within the scope of the research, The research is based on Model C. First, the stationarity of the variables was tested. Differences of non-stationary series were taken. Table 2 presents the findings.

Table 2. Lee Strazicich unit root test results.

(Model C)						
Variable	**Level test statistics**	**Level break date**	**Critical value**	**1. Difference test statistics**	**1. Date of breaking the difference**	**Critical value**
PR	-3.0831	2023/05	-3.41	-4.8091*	2012/04	-3.41
LAR	-1.9592	2023/07	-3.41	-16.4771*	2012/03	-3.41

Note: * is significant at the 5% level.

According to the results of the unit root tests, PR and LAR variables were different since they were not stationary at their level values. The first difference caused the variables to become stationary.

Within the scope of the study, the NARDL estimation results, where the coefficients for the short and long run are determined, are presented in Table 3.

Table 3. NARDL (4,6,0) boundary test results.

The dependent variable	F-test	Significance level				Conclusion
		10%		5%		
(LAR)	2.9294	I(0)	I(1)	I(0)	I(1)	No relationship
NARDL model		3.02	3.51	3.62	4.16	

Table 3 presents the NARDL test results, which indicate the absence of a cointegration relationship between the variables. Therefore, the null hypothesis (H0) stating that there is no cointegration relationship between the variables is accepted. Table 4 presents the long-run coefficient.

Table 4. Estimation results.

Long-term coefficients				
Variable	**Coefficients**	**Standard error**	**t-statistic**	**Prob.**
PR^+	0.7587	0.6906	1.0986	0.2728
PR^-	0.4095	0.8171	0.5011	0.6171
C	143.2054	3.2016	44.7289	0.0000
ECT_{t-1}	-0.0751	0.0285	-2.6375	0.0093
R^2	0.8825			
Adjusted R^2	0.8723			
Cusum test	Stable			
Cusum SQ test	Stable			

According to the results obtained from the NARDL test, PF^+ and PF^- coefficients are statistically significant and positive. Since the probability values are greater than 0.05, a cointegration relationship cannot be established in the long run.

The CUSUM test proposed by Brown, Durbin, and Evans (1975) shows whether the error terms are within the desired bounds at 95% confidence interval, while the CUSUM2 test performs the same test for the squares of the cumulative error terms (Çetin, Kutlutürk, & Akmaz, 2014). Moreover, it is seen that the CUSUM and CUSUM2 graphs presented in Figure 1 are within the desired limits at 95% confidence interval. This result confirms the stability of the model.

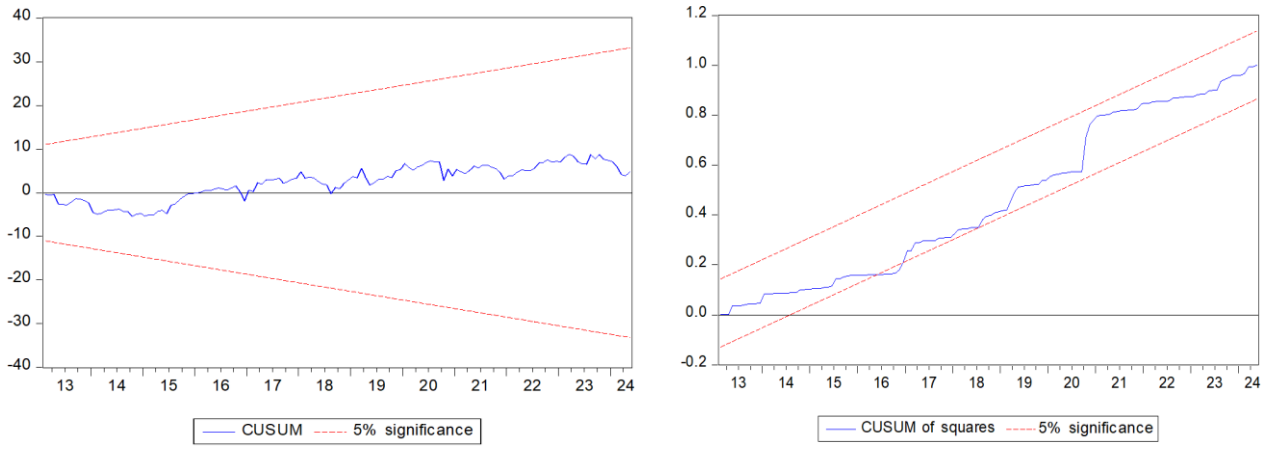

Figure 1. CUSUM and CUSUM² graphs.

"Schwarz (SC) criterion" was used for the lag length (k) to determine the relationship between the variables. "Toda and Yamamoto (1995) causality test" was used to determine the causality relationship between central bank monetary policy interest rates and Turkish banking sector liquidity adequacy ratio. Table 5 presents the results of the Toda-Yamamoto causality test.

Table 5. Causality test results.

Dependent variable	Independent variable	d_{max}	K	Chi-square test statistics	Chi-square P - value	Relationship and direction
LAR	PR	5	5	15.40577	0.0088	PR ⟹ LAR
PR	LAR	5	5	3.390068	0.6401	No relationship

Note: The test statistic is significant at the 5% significance level.

According to the results of the Toda-Yamamoto causality tests, the hypotheses between the dependent variable LAR and the independent variable PR at the 5% significance level show that the H0 hypothesis is rejected and the H1 hypothesis is accepted. In other words, it is determined that there is a causal relationship from policy interest rates to the liquidity adequacy ratio in the analyzed periods. Conversely, the reciprocal model revealed no casual relationship when PR was the dependent variable and LAR was the independent variable. In this case, hypothesis H0 is accepted and hypothesis H1 is rejected.

5. CONCLUSIONS

For central banks, the choice of the most appropriate monetary policy instrument depends on the extent to which existing instruments meet the requirements of the economic conjuncture and the transparency of policymakers' commitments to the future of the economy. The central bank supports the government's economic growth and employment policies, provided that these policies do not conflict with the objective of achieving price stability. It uses monetary policy tools to achieve these objectives. One of the most traditional and most important tools of central banks is policy interest rates. The policy rate decision made by the central bank has an impact on many economic variables. The market can quickly react to immediate changes in interest rates. The first effects of these changes are first seen in money markets. These changes in interest rates directly affect banks, which act as intermediaries between those who supply funds and those who demand funds and constitute the majority of financial markets.

This study analyzes the effects of changes in the CBRT's policy interest rate on the liquidity adequacy ratio of the Turkish banking sector. "Lee and Strazicich (2013)" unit root tests, which also take into account structural breaks, are applied to determine the relationships between variables. Accordingly, the asymmetric effect of the Central Bank of the Republic of Türkiye policy interest rates on the Turkish banking sector liquidity adequacy ratio is analyzed with the Nonlinear Lag Distributed Autoregressive Model (NARDL). In the study, Toda-Yamamoto causality test was used to determine the causality relationship between the dependent and independent variables and its direction. The NARDL test results revealed no cointegration relationship was found between the CBRT policy interest rates and the Turkish banking sector. On the other hand, according to the causality test results, there is a unidirectional causality relationship from policy interest rates to liquidity adequacy ratio.

As a result, managing banks' liquidity-related risks is critical for the continuity of the bank's operations. A change in the policy rate directly affects banks' funding and funding ratios through money market rates, which in turn affects the emergence of liquidity-related risks in the short and long term. Proper management of liquidity-related risks could potentially lead to bank liquidation. The fact that the maturity of deposits in the Turkish banking sector is concentrated between 36-45 days on average puts pressure on banks' liquidity adequacy. Conversely, the sector concentrates the maturity of loans between 1-3 years. Therefore, banks need to formulate sound policies to eliminate liquidity-related risks. Extending the maturity of deposits is important in reducing vulnerabilities related to liquidity risk. In this framework, banks may focus on policies to reduce the ratio of deposits with maturities up to one month to medium- and long-term deposits. Another important factor is the diversification of banks' funding structures. Policies can be formulated to emphasize long-term and cheaper borrowings from abroad compared to deposits. Future studies may investigate the effect of policy rates on liquidity adequacy ratios according to banks' capital ownership status.

Funding: This study received no specific financial support.
Institutional Review Board Statement: Not applicable.
Transparency: The author states that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: Levent Sezal can provide the supporting data of this study upon a reasonable request.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Abdul-Rahman, A., Sulaiman, A. A., & Said, N. L. H. M. (2018). Does financing structure affects bank liquidity risk? *Pacific-Basin Finance Journal, 52*, 26-39. https://doi.org/10.1016/j.pacfin.2017.04.004

Ahamed, F. (2021). Determinants of liquidity risk in the commercial banks in Bangladesh. *European Journal of Business and Management Research, 6*, 164-169. https://doi.org/10.24018/ejbmr.2021.6.1.729

Ahi, E. (2020). *Liquidity and risk management in the banking sector.* Ankara: Yüksek Lisans Tezi, Atılım Üniversitesi Sosyal Bilimler Enstitüsü.

Akhtar, M. F., Ali, K., & Sadaqat, S. (2011). Liquidity risk management: A comparative study between conventional and Islamic banks of Pakistan. *Interdisciplinary Journal of Research in Business, 1*(1), 35-44.

Altahtamouni, F., & Alyousef, S. (2021). The effect of liquidity according to the requirements of the basel III committee on the profitability of banks: Evidence from Saudi banks. *International Journal of Economics and Business Administration, 9*(2), 439-463. https://doi.org/10.35808/ijeba/713

Altan, F. (2017). *Factors determining liquidity risk in the Turkish banking sector: A panel data application.* Master of Thesis, Cumhuriyet University Social Sciences Institute, Sivas, Türkiye.

Aspachs, O., Nier, E. W., & Tiesset, M. (2005). Liquidity, banking regulation and the macroeconomy. *Available at SSRN 673883*, 1-26. http://dx.doi.org/10.2139/ssrn.673883

Ayaydın, H., & Karaaslan, İ. (2014). Liquidity risk management: A study on Turkish banking sector. *Gümüşhane Üniversitesi Sosyal Bilimler Elektronik Dergisi, 5*(11), 237-256.

Borio, C., Gambacorta, L., & Hofmann, B. (2017). The influence of monetary policy on bank profitability. *International Finance, 20*(1), 48-63.

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking & Finance, 13*(1), 65-79. https://doi.org/10.1016/0378-4266(89)90020-4

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society Series B: Statistical Methodology, 37*(2), 149-163. https://doi.org/10.1111/j.2517-6161.1975.tb01532.x

Çakmak, A., & Sunal, O. (2023). Factors determining the liquidity coverage ratio in the Turkish banking sector: A panel data analysis application including the Covid-19 pandemic period. *Doğuş Üniversitesi Dergisi, 24*(1), 399-410. https://doi.org/10.31671/doujournal.1201124

Çelik, M., & Tekşen, Ö. (2021). Does it matter how to fund?: A research on Turkish deposit banks. *Istanbul Business Research, 50*(2), 359-383. https://doi.org/10.26650/ibr.2021.50.861522

Çetin, A. K., Kutlutürk, M. M., & Akmaz, H. K. (2014). GDP impact of employment by education level. *Journal of Management and Economics Research, 12*(22), 249-266. https://doi.org/10.11611/JMER206

Cucinelli, D. (2013). The determinants of bank liquidity risk within the context of Euro area. *Interdisciplinary Journal of Research in Business, 2*(10), 51- 64.

Dinger, V. (2009). Do foreign-owned banks affect banking system liquidity risk? *Journal of Comparative Economics, 37*(4), 647-657. https://doi.org/10.1016/j.jce.2009.04.003

Du, B. (2017). How useful is basel III's liquidity coverage ratio? Evidence from US bank holding companies. *European Financial Management, 23*(5), 902-919. https://doi.org/10.1111/eufm.12116

Ferrouhi, E. M., & Lehadiri, A. (2014). Liquidity determinants of Moroccan banking industry. *International Research Journal of Finance and Economics, 118*, 103-112. https://doi.org/10.3846/btp.2014.443

Ganic, M. (2014). An empirical study on liquidity risk and its determinants in Bosnia and Herzegovina. *The Romania Economic Journal, 52*, 157-184. https://dx.doi.org/10.2139/ssrn.2510743

Grant, J. (2012). Liquidity buffers of Australianowned ADIs. *JASSA: The Journal of the Securities Institute of Australia, 3*(1), 31-36.

Gülhan, O. (2018). *Liquidity risk and liquidity regulations in banking applications on the Turkish banking sector*. Doctoral Thesis. Başkent University Social Sciences Institute, Ankara, Türkiye.

Iqbal, A. (2012). Liquidity risk management: A comparative study between conventional and Islamic banks of Pakistan. *Global Journal of Management and Business Research, 12*(5), 54-64.

Işık, Ö., & Belke, M. (2017). Likidite riskinin belirleyicileri: Borsa İstanbul'A kote mevduat bankalarindan kanitlar. *Ekonomi Politika ve Finans Araştırmaları Dergisi, 2*(2), 113-126. https://doi.org/10.30784/epfad.354458

Kakaç, B. (2019). *Türkiye'de bankacılık türleri açısından kredi risk yönetiminin analizi*. Master of Thesis, Hitit University Social Sciences Institute, Çorum, Türkiye.

Karagiannis, S., Panagopoulos, Y., & Vlamis, P. (2009). Interest rate pass-through in the Eurozone and the USA: Implications for monetary policy in the context of the recent financial crisis. *Centre for Planning & Economic Research, 32*(3), 1-25.

Karakaş, A., & Acar, M. (2022). Liquidity and profitability relationship in commercial banks: An application on Turkish banking sector. *BDDK Bankacılık ve Finansal Piyasalar Dergisi, 16*(2), 139-171. https://doi.org/10.46520/bddkdergisi.1178316

Kocaman Ekim, B., Babuşçu, Ş., & Hazar, A. (2018). *An analysis of the factors affecting liquidity risk – application example*. Paper presented at the The 21th Finance Symposium, Mersin, Türkiye, October 10-13.

Lee, J., & Strazicich, M. C. (2013). Minimum LM unit root test with one structural break. *Economics Bulletin, 33*(4), 2483-2492.

Macit, D., & Durgun, Ö. (2019). The impact of monetary transmission mechanism on real economy: A literature survey on international credit channel. *Balkan Sosyal Bilimler Dergisi, 8*(15), 77-87.

Maechler, A. M., Mitra, S., & Worrell, D. (2007). Decomposing financial risks and vulnerabilities in Eastern Europe. *IMF Working Paper, 248*, 1-33.

Mohammad, S., Asutay, M., Dixon, R., & Platonova, E. (2020). Liquidity risk exposure and its determinants in the banking sector: A comparative analysis between Islamic, conventional and hybrid banks. *Journal of International Financial Markets, Institutions and Money, 66*, 101196. https://doi.org/10.1016/j.intfin.2020.101196

Munteanu, I. (2012). Bank liquidity and its determinants in Romania. *Procedia Economics and Finance, 3*, 993-998. https://doi.org/10.1016/s2212-5671(12)00263-8

Muriithi, J. G., & Waweru, K. M. (2017). Liquidity risk and financial performance of commercial banks in Kenya. *International Journal of Economics and Finance, 9*(3), 256-265.

Onat, C. (2019). *Liquidity risk and management in participation banking*. General Directorate of Economic Modeling and Conjuncture Evaluation, Specialization Thesis, Ankara, Türkiye.

Pesaran, M. H., & Shin, Y. (1999). An Autoregressive distributed lag modelling approach to cointegration analysis. In S. Strom (Ed.), econometrics and economic theory in the 20th Century: The ragnar frisch centennial symposium. In (pp. 371–413). Cambridge: Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326. https://doi.org/10.1002/jae.616

Roman, A., & Şargu, A. C. (2014). Banks liquidity risk analysis in the new European Union member countries: Evidence from Bulgaria and Romania. *Procedia Economics and Finance, 15*, 569-576. https://doi.org/10.1016/s2212-5671(14)00512-7

Shahchera, M., & Taheri, M. (2017). Liquidity coverage ratio, ownership, stability: Evidence from Iran. *Journal of Money and Economy, 12*(2), 175-191. https://doi.org/10.2139/ssrn.3550912

Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in an ARDL framework. In Horrace, W. C. & Sickles, R. C. (Eds.), Festschrift in honor of peter schmidt: Econometric methods and applications. In (pp. 281–314). New York: Springer Science & Business Media.

Singh, A., & Sharma, A. K. (2016). An empirical analysis of macroeconomic and bank-specific factors affecting liquidity of Indian banks. *Future Business Journal*, *2*(1), 40-53. https://doi.org/10.1016/j.fbj.2016.01.001

Sitepu, R. W., & Erlina, R. (2020). Factors affecting liquidity coverage ratio (LCR) as implementation of basel III in the banking sector. *International Journal of Public Budgeting, Accounting and Finance*, *2*(4), 1-15. https://doi.org/10.32702/2307-2105-2020.5.66

Taylor, J. B. (1995). The monetary transmission mechanism: An empirical framework. *Journal of Economic Perspectives*, *9*(4), 11-26. https://doi.org/10.1257/jep.9.4.11

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, *66*(1-2), 225-250.

Trenca, I., Petria, N., & Corovei, E. A. (2015). Impact of macroeconomic variables upon the banking system liquidity. *Procedia Economics and Finance*, *32*, 1170-1177. https://doi.org/10.1016/s2212-5671(15)01583-x

Vodova, P. (2011). Liquidity of Czech commercial banks and its determinants. *International Journal of Mathematical Models and Methods in Applied Sciences*, *5*(6), 1060-1067.

Yaacob, S. F., Rahman, A. A., & Karim, Z. A. (2016). The determinants of liquidity risk: A panel study of Islamic banks in Malaysia. *Journal of Contemporary Issues and Thought*, *6*, 73-82. https://doi.org/10.15408/aiq.v8i2.2871

Yamak, R., & Erdem, H. F. (2017). *Applied time series analysis: Eviews applied.* Trabzon: Celepler Printing Publishing and Distribution.