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Unconventional Interest Rate Corridor and the Monetary Transmission: Evidence from Turkey[1]

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Abstract

Central banks typically implement the monetary policy via a *single* policy rate within a *narrow* and *symmetric* interest rate corridor. On the other hand, the Central Bank of the Republic of Turkey (CBRT) has adopted an unconventional approach by using a *multiple* policy rate framework within an *asymmetric* and *wide* corridor since end-2010. During this period, the interbank rates were frequently allowed to deviate from the officially announced policy rates in order to respond to excessive global financial volatility. This approach complicated the transmission of monetary policy as the effective rates occasionally differed from the official rates, making it challenging to assess the stance of monetary policy. This study aims to shed light on the monetary policy stance and the monetary transmission mechanism during this period. To this end, we first present a simplified version of the CBRT's monetary policy operational framework, highlighting the role of each parameter of the interest rate corridor for the transmission mechanism. We then examine the relationship between bank loan/deposit rates and multiple policy rates by using panel estimation methods and bank-level flow data. Our findings show that, from the traditional interest rate channel perspective, effective rates are more relevant than official rates for the transmission of monetary policy. Overnight interbank rates particularly play a key role in the pricing of loans and deposits. Our results also have implications for other central banks such as ECB or Fed, where the interbank money market rates occasionally deviated from the official policy rate due exceptional liquidity conditions following the global financial crisis. We argue that, in an environment of divergence between effective and official rates, interbank rate is a reasonable metric to assess the actual stance of monetary policy.

Key words: Monetary policy transmission mechanism; interest rate corridor; credit channel; interest rate pass-through; Turkey.

JEL Classification: E44; E51; E52

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1. Introduction

The relationship between central bank policy rates and bank interest rates is a major channel of monetary transmission mechanism, which is known as the "interest rate channel" in the economic literature. Central banks typically operate under a conventional corridor system, where monetary policy is conducted using a single policy rate within a narrow interest rate corridor. The degree to which changes in the policy rate pass through loan and deposit rates is one of the main channels monetary policy affects aggregate demand. This relationship is especially significant for the monetary transmission mechanism in economies where financial intermediation is predominantly carried out by banks.[2]

This paper studies the interest rate channel in an unconventional setup where the central bank policy rate diverges from the interbank rates. The Central Bank of the Republic of Turkey (CBRT) has adopted an unconventional policy approach within an asymmetric corridor since end-2010. During this period, the interbank rates were frequently allowed to deviate from the officially announced policy rates in order to respond to global financial volatility. Contrary to the conventional corridor mechanism, CBRT allowed the announced *official* policy rates and the *effective* rates to diverge from each other as a deliberate policy choice. Under such an unconventional policy framework, the interest rate channel of the monetary policy transmission mechanism becomes even more interesting and complex, because it is not straightforward which interest rate would the banks take as the benchmark rate for loan and deposit rate setting.

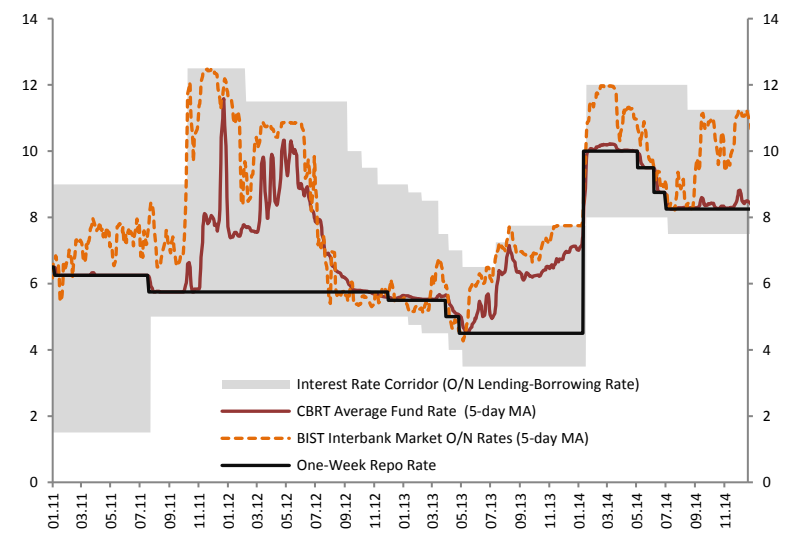
In order to explore the implication of the unconventional framework for the interest rate channel of monetary policy, we proceed in several steps. First, we present a simplified version of the operational framework for the CBRT's monetary policy, explain the relevant short term interest rates controlled by the central bank, and provide some intuition for the significance of each rate for the banks. We then analyze the relationship between loan/deposit rates and policy rates by using panel data models and bank-level flow data. Our findings yield valuable information on the channels through which the monetary transmission mechanism functions. Based on these findings, we discuss how the monetary policy stance could be assessed under a multiple policy rate framework.

To provide some motivation, Figure 1 shows both the policy rates announced by the CBRT within the wide interest rate corridor and the interbank overnight rates. Here, it is quite evident that the system adopted by the CBRT has many discrepancies from a conventional corridor system. First, unlike the conventional corridor systems where money market rate is close to the policy rate, the CBRT's system exhibits systematically large divergences between interbank rates and policy rates.

[2] In Turkey, household financial assets mostly include bank deposits, while bank loans account for the largest share of financial liabilities. Bank loan is the largest financial liability for non-financial firms as well.

Second, the CBRT's policy allows the upper and lower bound of the corridor to change at different rates and directions, using the width of the corridor effectively as an additional policy tool, which is at odds with a conventional policy framework where the monetary authority adjusts the corridor parameters in the same direction and by a similar magnitude with the main policy rate. These observations raise questions such as: which interest rates matter for the monetary transmission mechanism? How should monetary stance be assessed in such a complex framework? Is it the official rate or the effective rate that banks take into account in pricing their loans and deposits? In this study, we aim to offer some insight into the monetary transmission mechanism by addressing some of these questions. The systematic divergence between official rates and effective rates particularly helps us to identify certain features of the transmission mechanism that have not been addressed in the previous literature.

Figure 1: CBRT Rates and BIST Interbank Market Rate (%)



Source: BIST, CBRT

The link between policy rates and bank rates in the context of the monetary transmission mechanism has long been discussed in the economic literature.[3] Studies published before the global financial crisis typically assume that the policy rate is a reasonable proxy for the cost of short-term funding throughout the financial system. Although this is a plausible assumption in general, it may not be valid at certain times even under a conventional corridor framework. For instance, in times of heightened market distress such as a global financial crisis, the short-term market rates may diverge notably from the policy rate. In fact, a number of studies conducted after the global financial crisis mention the changing relationship between policy rates and loan/deposit rates.[4] Some of these

[3] For some key studies, see Bernanke and Blinder (1988), Bernanke (1993), Cottarelli and Kourelis (1994), De Bondt (2002), ECB (2009), and Banerjee et al. (2013).
[4] Illes et al (2015); Gambacorta et al (2014); Karagiannis et al (2010); Darracq Paries et al (2014).

studies address the significance of the funding composition of banks and short-term effective market rates for the transmission mechanism, as we do in our study. For example, Illes et al (2014) discuss that the pricing of loan and deposit rates depends primarily on the average cost of short-term market funding for banks rather than on the central bank's policy rate. However, these authors do not take up the issue of divergence between the policy rate and the money market rates in many advanced economies due to the unprecedented expansion of central bank balance sheets. Nor do they mention the implications of this divergence for the monetary policy transmission mechanism and the stance of monetary policy.

Similar to our study, Cottarelli and Kourelis (1994) simultaneously use both market rates and policy rates when modelling the short-term dynamics of loan rates. They focus on the structural factors driving the divergence in monetary transmission across countries; yet they do not relate this divergence to the operational framework of monetary policy. Our paper differs with Cottarelli and Kourielis (1994) in many dimensions. We associate the monetary policy transmission mechanism directly with the operational framework. Moreover, we use bank-level data and utilize various loan types and deposit rates to provide further insights into the transmission mechanism.

In another closely related study, Karagiannis et al (2010) compare the interactions between money market, policy, and bank rates. They find that, in the euro area, short-term market rates appear to have a more pervasive impact on loan/deposit rates whereas the policy rate is more influential in the US. However, the study contains no reference to the operational framework of monetary policy and the divergence between short term rates. Moreover, the authors use the policy rate and the market rate separately in the empirical modeling, possibly due to collinearity problem. On the other hand, our study links the empirical modeling and its outcomes with certain aspects of the operational framework. In addition, due to the variation in certain components of monetary policy during our sample period, we are able to use policy rates and market rates contemporaneously since the gap between these rates has changed notably and frequently. Thus, the relative role of the policy rates and market rates in the transmission mechanism can be properly identified.

An interesting feature of our paper, which is different from the recent studies analyzing the interest rate channel, is that in our case the divergence between policy rates and market rates is an intentional outcome of the unconventional corridor policy adopted by the CBRT, rather than a widening of market spreads during crisis conditions. The peculiar funding strategy pursued by the CBRT that frequently creates a wedge between the official interest rates and effective rates, enables us to investigate issues regarding the transmission mechanism that previously has not been explored in the economic literature. For example, in our framework it is possible to assess the marginal

information content of the official policy rates *vis a vis* effective rates, or investigate the relative significance of policy rates vs. market rates in driving bank lending rates.

Using bank level flow data, our empirical results indicate that it is the effective interest rates, rather than the official interest rates, that matters for bank loan and deposit pricing. The official interest rates are central bank lending rates announced at the monthly policy statements. The effective rates are: (i) the weighted average interest rate of the short-term funds extended by the CBRT to financial institutions, and (ii) the interbank overnight interest rate materialized at the money market. Effective interest rates are determined indirectly by the CBRT, although they are not officially announced as policy rates. The empirical analysis reveals that the official interest rates announced by the CBRT yield no additional information regarding the monetary policy stance, once the effective rates are controlled. In other words, what banks consider as a benchmark for pricing of loan and deposit rates are the effective rates rather than the official rates announced by the CBRT. Our findings also indicate that during post-2011 period, the stance of monetary policy cannot be represented by a single interest rate. The policy stance can be best expressed as a combination of effective rates, namely, interbank rates and the central bank average funding rate.

We provide further evidence regarding the transmission mechanism by examining the transmission to consumer loans, commercial loans and deposits. We find that overnight market rates are more important than the CBRT's average funding rates in driving loan rates. In other words, the overnight interbank rate, which constitutes a benchmark for banks' short term funds from the market, stands out as an important variable in pricing loan rates. Meanwhile, the CBRT funding rate, another short-term source of funding for financial institutions, plays a less important role in loan pricing than market rates. These findings suggest that the interbank rate is a key variable for the standard interest rate channel. Our results also show that the role of CBRT's average funding rate is relatively less important, but still significant, for the transmission mechanism. Average funding rate seems to be particularly important for the pricing of deposit rates.

The study also analyzes various dimensions of the monetary transmission mechanism such as the asymmetric response of banks to interest rates and the interaction of short term funding position with the interest rate pass-through. Our results indicate that the relationship between monetary policy and loan rates exhibits asymmetric features. The impact of monetary policy on loan rates is faster and stronger during tightening periods than easing periods. On the other hand, our findings suggest that the asymmetry observed in loan rates pricing is not valid for deposit rates. When banks set deposit rates, they react almost the same way to the CBRT policies in both directions. In other words, when the CBRT hikes interest rates, banks swiftly adjust their deposit and loan rates; however in case of monetary easing, the banks rapidly cut deposit rates while they keep loan rates intact, which effectively leads to a widening in net interest margins in the short term. This pattern of

behavior suggests that Turkish banking system is not perfectly competitive. In fact, Banks Association of Turkey (2012), Aktan and Masood (2010), Yüksel and Özcan (2013) and Aysan et al (2013) conclude that the Turkish banking industry operates in monopolistic competition. This structure is not peculiar to the Turkish banking system. Some other country case studies also document the asymmetry in loan and deposit pricing.[5]

As an extension, we also examine the interaction of banks' short-term funding position with the monetary transmission mechanism. Banks, as maturity transforming agents, are exposed to interest rate risk arising from short term interest rate volatility. Therefore, banks that are more dependent on short term financing are expected to be more exposed to interest rate risk, and hence more sensitive to unexpected movements in interbank rates, which could have implications for the monetary transmission mechanism.[6] To this end, we try to test whether banks with larger short term financing needs compared to their balance sheets are more responsive to the policy rates in setting their deposit and loan rates. The highly volatile nature of short term money market rates due to unconventional policy implemented by the CBRT during our sample period may have exacerbated this effect. Indeed, our results indicate that consumer loan rates of banks with a relatively larger short-term borrowing are more responsive to the interbank rates. Moreover, the sensitivity is even larger for mortgage loans, which have longer maturity than other segments of consumer loans.

Although the main focus of this paper is Turkey's unconventional interest rate corridor policy, our results have also implications for the monetary transmission mechanism in many other economies facing divergences between monetary policy rates and short-term market rates. For example, the ample liquidity created by quantitative easing policies drove short-term market rates below official policy rates in many advanced economies.[7] The prolonged period of divergences in short term rates will have major implications for the monetary transmission mechanism. Our approach for identifying the relative role of various short-term interest rates in loan and deposit pricing helps to assess the effective monetary policy stance and to gain further insight into the monetary transmission mechanism.

The remaining of the study is organized as follows: Section two lays out the mechanics of the interest rate corridor system adopted by the CBRT, discusses how monetary policy and short-term interest rates are determined in practice, and identifies main policy variables that might be relevant for the empirical analysis. The next two sections present the data, methodology and the empirical analysis. The last section concludes with an overall evaluation.

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[5] The asymmetry of banks' pricing behavior and its interaction with the market structure are broadly discussed in Hannan and Berger (1991) and Neuwark and Sharpe (1992). Karagiannis et al (2010) found that deposit rates are sensitive to falling market rates, whereas loan rates are sensitive to rising market rates across the euro zone.

[6] Herrera et al (2010) also argue that a larger reliance on central bank funding adds to interest rate risk.

[7] For example, in that period, the euro area market rate (the EONIA, reflecting the weighted average of the overnight market rate) consistently remained below the ECB policy rate (the Main Refinancing Operations Rate).

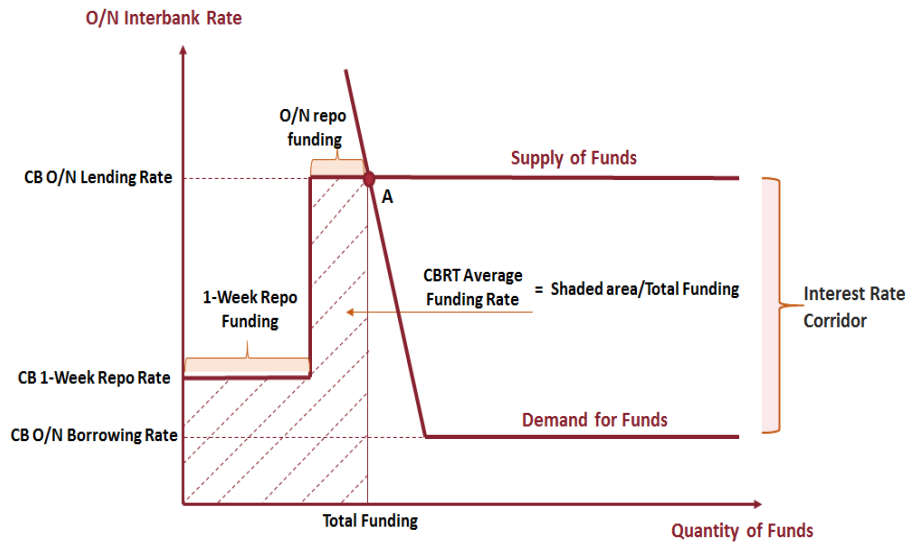
2. Interest Rate Corridor and the Determination of Short-term Interest Rates

This study is about the interest rate channel of monetary policy. In the related empirical literature, monetary policy is represented by the central bank's policy rate. However, in our case there may be more than one variable representing the monetary policy over the period of analysis. Turkish experience sets an interesting case in point in the sense that (i) multiple interest rates were used as a monetary policy instrument, and (ii) the officially announced interest rates deviated frequently from the interbank rates, during the 2011-2014 period. Under such a policy strategy, selecting the relevant variables representing the monetary policy stance becomes less trivial. Therefore, to conduct the analysis properly, it is necessary to understand the operational details of the monetary policy. To this end, before moving onto the econometric analysis, we will briefly describe how the CBRT's unique interest rate corridor functions and discuss the implications of the funding policy for the monetary transmission mechanism. This will lay the foundations for selecting the policy variables to be used in the empirical analysis.

In the period of study, the CBRT's monetary policy stance is determined by the interaction between the officially announced interest rates and the funding composition. To better understand the possible implications of this interaction for the transmission of monetary policy, Figure 2 provides a simplified illustration of how interest rates are determined in the interbank market. Here, supply and demand curves represent the system's net supply and demand for short-term funds. As the system has had a shortage of net liquidity (liquidity deficit) in Turkey since 2010, the CBRT is a net lender to the financial institutions. In other words, the CBRT is a net supplier of funds. The net demand for funds is basically generated by the short term funding needs of the banking system.

In Figure 2, the vertical axis represents interest rates, while the horizontal axis depicts the quantity of short term funds. "Official" policy rates set by the CBRT are shown on the left side of the vertical axis. The weekly repo rate and the overnight lending rate (marginal funding) represent the lending rates of the CBRT. In other words, the central bank may provide liquidity through two distinct channels to the market. The overnight borrowing rate, on the other hand, shows the interest paid to daily deposits at the CBRT. The distance between the overnight borrowing rate and the overnight lending rate is called the "interest rate corridor". By definition, short-term market rates would not exceed the CBRT's lending rate, nor would they fall below the CBRT's borrowing rate. Therefore, the interest rate corridor represents the band within which market rates are allowed to fluctuate.

Figure 2: CBRT Operational Framework: Determination of Short-Term Interest Rates



In order to assess how the CBRT's policy actions affect the monetary transmission during the period of study, it would be useful to first look at Figure 2 to see how the supply and demand is determined in the short-term funds market. The demand curve shows the quantity of short term funds demanded by banks at various market rates. The demand for funds declines as market rates rise, thus the demand curve has a negative slope. Yet, since there will be an infinite demand for funds at an interest rate that is below the central bank's borrowing rate, the demand curve becomes flat at the level of the CBRT borrowing rate.

The supply curve, on the other hand, reflects the CBRT's multiple funding channels. During the period of analysis, central bank supplies funds essentially through one-week repo (quantity) auctions and overnight lending facilities.[8] As the CBRT provides funding via two distinct channels at different costs, the supply curve takes a stepwise shape. The equilibrium interest rate at the intersection of the supply and demand curves (point A) can be considered as the short-term interest rate materialized at the money market. This interest rate represents the overnight rate used for interbank transactions and, thus, might play a significant role for the transmission mechanism and the stance of monetary policy.

The central bank conducts monetary policy basically by shifting the supply curve. The central bank is able to shift the supply curve horizontally or vertically by controlling the price (interest rate) and quantity, respectively. Interest rates are set and announced by the Monetary Policy Committee

[8] In addition to the weekly repo and marginal funding, the CBRT provided primary dealers with a third facility, overnight lending at an interest rate slightly below the marginal funding rate. Adding this facility to the illustration in Figure 2 leads to a two-step supply curve without changing the main transmission mechanism. Moreover, as the spread between marginal funding and interest rates for primary dealers changed only once during the period of analysis, the funding rate for primary dealers will yield no additional information in the empirical analysis. Therefore, our graphical illustration and empirical analysis do not include the CBRT's overnight funding facility for primary dealers.

each month. On the other hand, the amount of funds provided via weekly repo facility is determined through quantity auctions at a daily frequency.[9] At the beginning of the day, the CBRT announces the amount of funds allocated for weekly repo and distributes them among bidding banks in proportion to their size. The CBRT has the disposal to meet either all or part of the funding needs of the system through weekly repo on any given day. On days when only part of the liquidity is provided through weekly repo, banks have to resort to the more expensive marginal funding facility for their remaining liquidity needs. On such days, the CBRT effectively provides liquidity through two different interest rates.

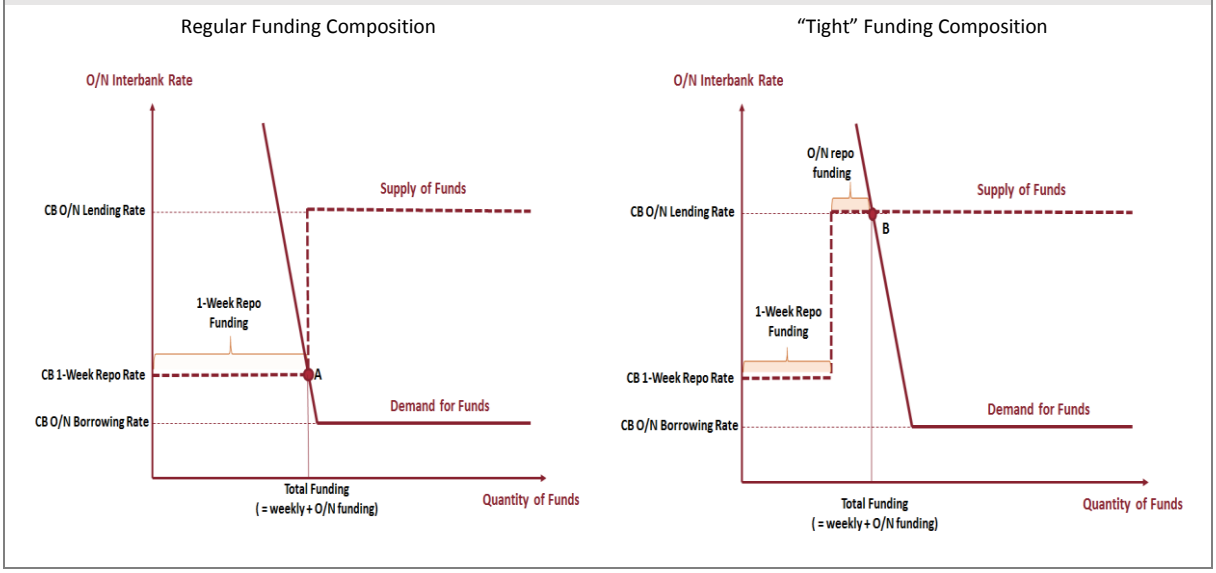
Thus, the CBRT's funding composition (the share of weekly vs. overnight funding) has a direct impact on the location of the supply curve and thus may shift the level of the equilibrium market rate. For instance, when the CBRT does not meet all the liquidity need of the banking system through weekly repo funds, the equilibrium market rate materializes at the upper bound of the interest rate corridor, as shown in Figure 2. In this setup, not only the interbank rates, but also the average central bank funding rate may matter for banks' loan and deposit pricing decisions, as it represents the weighted average cost of the funds provided by the CBRT to the banking system. The central bank can alter the average cost of total funding available to the banks by adjusting the funding composition. For example, the lower (higher) is the share of the weekly funding, the more expensive (cheaper) becomes the CBRT funding. Furthermore, the average funding rate may be closely monitored by banks as an indicator of policy stance. Therefore, although the average funding rate of the central bank is not an officially published policy variable in the monthly policy statements, it is a potential candidate to represent the monetary policy stance.

Figure 3 illustrates more explicitly how changes in the CBRT's funding composition can affect the monetary policy stance. We depict two different cases depending on whether the central bank meets the liquidity needs of the system partly or fully through one week repo auctions: The left panel shows a more conventional funding composition whereas the right panel corresponds to a "tight" funding policy, similar to Figure 2. In the former, the CBRT provides all the liquidity through weekly repo, and thus supply and demand curves intersect at the weekly repo rate level. Thus, both the CBRT funding rate and the market rate (equilibrium rate) materialize at the weekly repo rate. If this were the case at all times, the monetary policy stance would have been represented by a single interest rate—the weekly repo rate. However, in our sample, the funding composition changes frequently as a deliberate policy decision. For example, as shown in the right panel, when the central bank does not provide all the funding through the weekly repo facility, the vertical part of the supply

[9] In addition to quantity auctions, the CBRT occasionally offered liquidity through conventional price auctions from end 2011 to mid-2012. Since movements in the overnight market rate and average funding rate remain main determinants of the transmission mechanism, we do not provide additional analysis for this case. Readers may refer to Küçük et al (2014) for more information on the CBRT's liquidity transactions and relevant markets.

curve shifts to the left. In this case, banks have to resort to the more costly marginal funding facility for their remaining liquidity needs, leading to an upward shift in effective rates. Thus, moving from left to right panel, while the announced policy rates (CBRT overnight borrowing and lending rates, and the weekly repo rate) remain constant, the monetary policy tightens through two channels: (i) the equilibrium market rate jumps to the marginal funding rate level (the upper limit of the interest rate corridor), and (ii) the average cost of CBRT funds increases. In other words, both CBRT funds and market funds are more expensive for the banking system in the right panel compared to the left panel. At the left panel, the monetary policy stance can be expressed by a unique interest rate, whereas in the right panel, no single interest rate can represent the monetary policy stance, as the CBRT's official interest rates, the average funding rate and the market rate differ from each other.

Figure 3: CBRT Funding Composition and Monetary Policy Stance

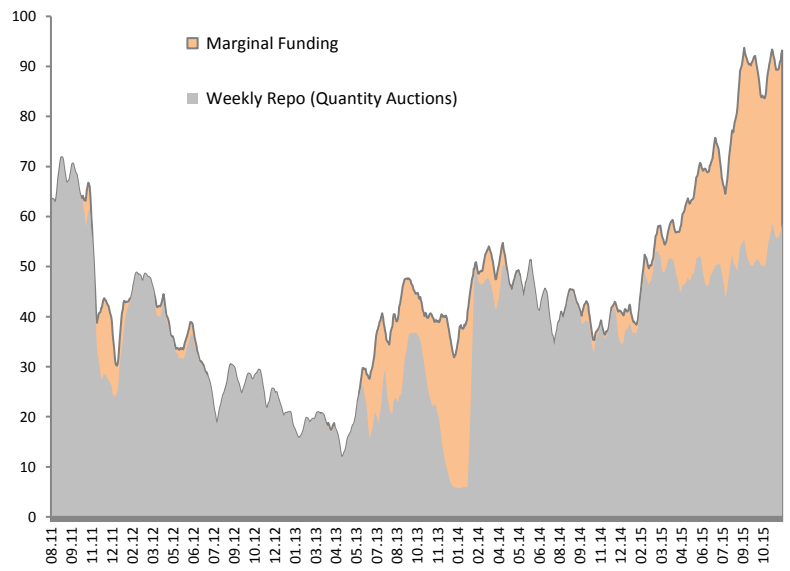


Hence, the central bank is able to achieve different monetary policy stances with the same corridor parameters. That is to say, the *effective* degree of tightness in the monetary policy stance may change even when the *official* interest rates are kept on hold. Therefore, when modeling loan and deposit rates, it is necessary to take into account not only the CBRT's official corridor parameters but also the effective interest rates implied by the funding composition.

Figure 4 shows how the CBRT's funding composition has changed in time. In the period of analysis, the CBRT made frequent and substantial alterations to the share of funds from the weekly repo facility, leading to a volatile pattern in the average funding rate and the overnight market rate. More precisely, during the period of study, these interest rates exhibited occasional high-frequency fluctuations (Figure 1). Thus, we assess that the effective interest rates determined by the CBRT's funding strategy in this period played a key role for the monetary policy stance. Frequent and substantial alterations to the funding composition also mean that there is enough variation in the

effective and official rates as well as their spread over the sample period, which partly eases the econometric identification problem.

Figure 4: CBRT Funding Composition



Source: CBRT

Overall, the operational framework we presented for the interest rate determination process provides us some suggestions regarding the variables that may be used in the empirical analysis to assess the monetary policy stance and the transmission mechanism. In this context, below we briefly describe the possible role of the various interest rates for the monetary transmission and why they were (not) included in the empirical analysis. As our main focus is the interest rate channel, we discuss the transmission mechanism in terms of bank deposit and loan rates. Accordingly, the short-term interest rates that may potentially represent the CBRT's monetary policy may be listed under two groups:

i. **Official Interest Rates**: These are the main interest rates (shown on the vertical axis of Figure 2) announced by the CBRT through monthly policy statements published on its official website.
   a. *CBRT funding rates*: As mentioned in the above analysis, the CBRT injects liquidity into the market basically via weekly repo and overnight lending facilities during the sampling period. Since these interest rates are adjusted and announced monthly by the Monetary Policy Committee, they might affect loan and deposit rates via the expectations and signaling channel. Therefore, we include the official funding rates—weekly and overnight repo rates—as right hand side variables in our empirical analysis.
   b. *CBRT borrowing rate*: During our sample period, the banking system has a sizeable net liquidity deficit, causing the CBRT's borrowing rate to remain relatively passive for the

transmission mechanism. In fact, market rates did not significantly fall below the weekly repo rate during the period of interest (Figure 1). Thus, the role of the CBRT borrowing rate in monetary transmission is likely to be negligible. Therefore, we did not use the CBRT borrowing rate as an additional explanatory variable in our empirical analysis.

ii. **Effective interest rates:** These are the interest rates set by the interaction between corridor parameters and the funding strategy (composition).

a. *CBRT average funding rate* (i^{afr}): this variable denotes the weighted average interest rate of the funds provided by the central bank to the banking system. As mentioned above, this rate can vary depending on the CBRT's funding composition. Assuming that total funding has two components—weekly funding and overnight funding, the CBRT weighted average funding rate can be expressed as follows:

i^{afr} = *(weekly repo*weekly repo rate + O/N funding *O/N funding rate)/total funding*

Because the Turkish banking system is net borrower from the central bank, the CBRT funding rate is a component of the cost of total funding of the banks, it is likely to be taken into consideration when pricing deposits, loans and other financial instruments. Furthermore, the CBRT's policy documents and public announcements make frequent references to this interest rate, which might have enhanced its role as a policy variable. Therefore, we added the CBRT average funding rate into our empirical analysis as another variable that may be significant for monetary transmission mechanism.

b. *Interbank overnight market rate* (i^{BIST}): This is the overnight interest rate at which banks and financial institutions lend and borrow from each other[10] and represents the equilibrium rates shown in Figures 2 and 3. The equivalent of this interest rate for the Turkish case is the overnight rate set at the Borsa Istanbul (BIST) Interbank Repo/Reverse Repo market. The level of the overnight market rate is determined at the market and thus it is not set directly by the central bank. Yet, the CBRT can effectively control the interbank rates by adjusting the volume and composition of the open market operations. The interbank overnight rate serves as a benchmark for banks' cost of funds from other short term money market sources such as cross-currency swaps, and therefore has the potential to play a key

[10] In Turkey, there are two different repo/reverse repo markets at Borsa Istanbul. The first is the Interbank Repo/Reverse Repo Market where banks transact with one another and are not liable for holding required reserves, and the second is the BIST Repo/Reverse Repo Market where banks mostly borrow from intermediaries and are liable for holding required reserves. At both markets, interest rates materialize effectively at the same level and only reflect a certain difference of level due to factors such as required reserves and transaction costs. In our analysis, the overnight market rate is represented by the Repo/Reverse Repo Market rate (daily weighted average) at the BIST Debt Securities Market as their data are backdated. Meanwhile, Figure 1 uses the Interbank Repo/Reverse Repo Market rate exempt from required reserves to make it comparable with the CBRT rates.

role for the pricing of loan and deposit rates. Accordingly, we use the BIST rate as an additional explanatory variable in our empirical analysis.

In sum, our analysis regarding the operational framework of monetary policy suggests that changes in the CBRT average funding rate and the overnight market rate might be key indicators to gauge the stance of monetary policy. Therefore, it is essential to incorporate these variables into the empirical analysis. Yet, the officially announced interest rates also have the potential to influence loan and deposit rates via a separate channel through expectations. Accordingly, in our empirical analysis, we use both official and effective rates as explanatory variables representing the monetary policy stance. The question of which interest rate(s) would be the most relevant one(s) for the transmission mechanism is an empirical one.

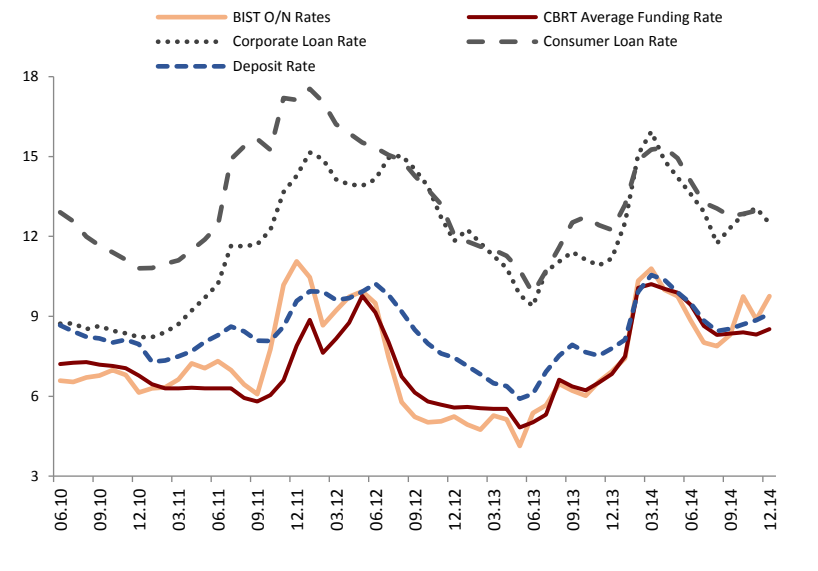
3. Data and Methodology

We use bank-level data to investigate the relationship between monetary policy components and loan/deposit rates. In order to identify the role of different components of the monetary policy for the transmission mechanism, we focus on the period when the CBRT used multiple interest rates, and the interbank rates fluctuated frequently within a wide interest rate corridor. Therefore, our sample starts in June 2010 and ends in December 2014. For this period, we used balanced panel data of 19 deposit banks dominating the industry. As of end-2014, these banks account for 88 percent of the loan market and 91 percent of the deposit market. Thus, the sampling in our study is largely representative of the banking industry and the monetary policy transmission mechanism.

We used the flow values of loan and deposit rates, which makes it easier to identify the short-term effects of monetary policy changes. Flow rates represent the interest rates on newly originated consumer loans, commercial loans and deposit accounts. Using flow data for loan and deposit rates allows for a real-time and high-frequency evaluation of the effects of changes in the monetary policy on loan and deposit rates. We focus on Turkish lira denominated loans and deposit rates. In order to identify certain characteristics of the transmission of monetary policy to bank lending rates, we conduct our analysis separately for commercial loans and consumer loans.

The study uses monthly data. Data on bank rates are reported at weekly intervals; yet, as many of the macro variables are announced monthly, we converted all data into monthly frequency by estimating the mean values of loan and deposit rates as well as other daily market data. Figure 5 illustrates average deposit and loan rates of the banking industry and the CBRT's effective interest rates (CBRT average funding rate and interbank overnight market rates). Although the CBRT interest rates and loan/deposit rates move closely, there are also some divergences driven by other factors.

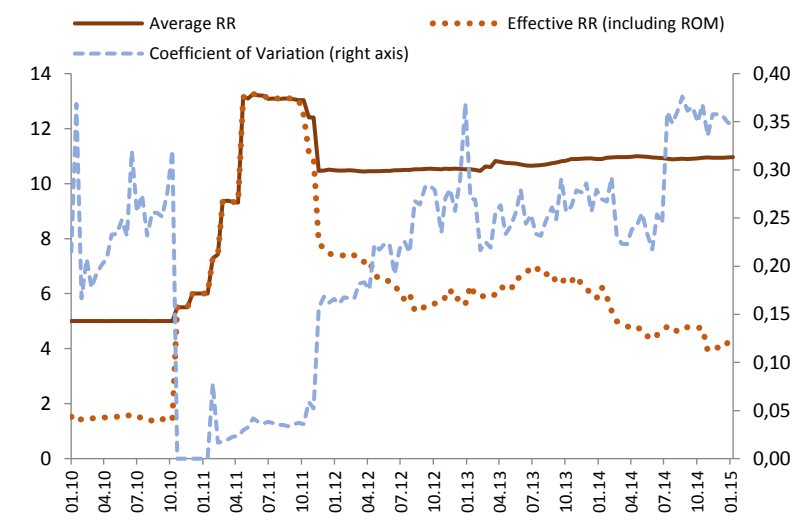
Figure 5: Loan and Deposit Rates (Sector Average, %)



Source: CBRT

Required reserves were occasionally used as an instrument by the CBRT during the period of our study. Therefore, we added reserve requirements into our analysis as an additional variable that may affect bank behavior. The CBRT has made changes to the reserve requirements ratios, coverage of liabilities, and remuneration rates. Moreover, banks were allowed to hold part of their TL required reserves in foreign currency through the reserve option mechanism (ROM)—a new tool devised by the CBRT.[11] Taking into account all these factors, we constructed effective required reserve ratios based on the methodology of Alper et al (2014). Due to the ROM and bank-specific maturity structure, required reserve ratios exhibit substantial cross sectional variation as shown in Figure 6.

Figure 6: Reserve Requirement Ratio (%)



Source: CBRT and authors' calculation

[11] For more information on the mechanics of reserve option mechanism, see Alper et al (2013).

In addition to policy variables such as short-term interest rates and required reserves, we also control for macroeconomic variables, such as inflation, that may have an indirect impact on bank rates. Moreover, we add some variables to capture the demand and supply side for loans. For example, when modeling commercial loan rates, we used a variable from the Business Tendency Survey applied on manufacturing companies, which reflects their overall sentiment about the economy. Following a similar approach, we used the consumer confidence index and the nonfarm unemployment rate when modeling consumer loan rates. From a demand side perspective, these variables are expected to be positively correlated with loan rates as they can be regarded as a proxy for the economic activity and thus for the credit demand. From the supply side, the same variables are expected to be negatively correlated with loan rates because they represent the cyclical fluctuations and thus the perceived credit risk. Therefore, the sign of coefficient estimates may provide some information on whether banks' loan pricing is mainly driven by supply or demand factors. Lastly, we added exchange rate and risk premium (EMBI-spread) variables into the analysis since they might affect loan and deposit rates through external finance conditions and the expectation channel. Table 1 gives a summary of the statistics related to bank-specific and macroeconomic variables.

Table 1: Descriptive Statistics (2010:06-2014:12)

	Original Frequency	Conversion	Num. of Obs.	Mean	Standard Dev.
Bank level variables					
Corporate loan rate	Weekly	Average, Level	1045	12.448	3.033
Consumer loan rate	Weekly	Average, Level	1045	13.806	2.697
Deposit rate	Weekly	Average, Level	1045	8.686	1.411
Reserve requirement rate	Bi-weekly	Average, Level	1045	6.552	3.099
Short term interest rates					
Weekly repo rate	Daily	Average, Level	55	6.433	1.509
Average funding rate	Daily	Average, Level	55	7.168	1.435
Marginal funding rate	Daily	Average, Level	55	9.825	1.745
BIST O/N rate	Daily	Average, Level	55	7.352	1.826
BIST O/N rate-CBRT funding rate	Daily	Average, Level	55	0.183	0.917
Macro indicators					
Economic sentiment	Monthly	Monthly change	55	-0.440	5.620
US dollar	Daily	Monthly % change	55	2.143	4.711
EMBI Turkey	Daily	Monthly change	55	-0.606	26.26
Inflation	Monthly	Level	55	7.628	1.504
Non-farm unemployment rate	Monthly	Monthly change	55	-0.024	0.255
Consumer confidence index	Monthly	Monthly change	55	-0.396	6.381

We estimated a dynamic panel model to analyze the sensitivity of loan and deposit rates to monetary policy indicators:

$$i_{it} = \beta_0 + \mu_i + \beta_1 i_{i,t-1} + \beta_2 PR_t + \beta_3 RR_{it} + \beta_4 Y_t + \varepsilon_{it}$$

Here, i_{it} denotes the loan or deposit rate, while the PR_t vector stands for policy rates, i.e. the official and effective short-term interest rates reflecting the CBRT's interest rate corridor policies, which include the CBRT's weekly repo funding rate, the marginal funding rate, the CBRT's weighted average funding rate and the overnight market rate materialized in the BIST interbank repo market. The PR_t

variable in our regression model includes different combinations of these four interest rates. RR_{it} represents effective required reserve ratios, while Y_t denotes the vector of macroeconomic variables.

Empirical models estimating the impact of macro and policy variables on bank rates may typically suffer from an endogeneity problem as dependent variables (bank rates) potentially affect explanatory variables. In this study, we used the dynamic panel method of generalized moments (GMM) to alleviate the endogeneity problem and obtained consistent parameter estimates. GMM was first used by Holtz-Eakin et al (1988) and Arellano and Bond (1991), and later developed by Blundell and Bond (1998) to involve system estimations. The models in our study are estimated using the system GMM. The use of this methodology reduces any endogeneity bias that may affect the estimation of the regression parameters. It also takes into account the heterogeneity in the data caused by unobservable factors affecting individual banks.[12]

The related literature typically addresses the long-term relationships when estimating the relationship between central bank policy rates and bank rates, therefore often resorting to co-integration and error correction models (ECM) (e.g., Cottarelli et al (1995), Weth (2002), Gambacorta (2008), Mishra et al (2014) and Das (2015)). On the other hand, some studies such as Cottarelli and Kourelis (1994) estimate short-term parameters to capture the dynamics of the monetary transmission mechanism. Our study also focuses on short-term interactions, as the impact of the high frequency monetary policy implemented by the CBRT is better identified though short-term movements in bank rates. Thus, also given the short sampling period, we believe that the standard dynamic panel method serves better for our purpose.

The extent to which monetary policy affects bank rates might vary depending on bank-specific factors and the structural characteristics of the banking system. Therefore, studies explaining the long-term relations between monetary policy and bank rates usually incorporate bank- and industry-level variables into empirical models. For example, Cottarelli and Kourelis (1994), Borio and Fritz (1995) and Gambacorta (2008) indicate that structural characteristics of the banking industry, such as competitiveness, influence the level of the pass-through from monetary policy to bank rates. However, as structural characteristics of the financial system change quite slowly, incorporating such factors would be less important for studies with a short sampling period, such as ours. Moreover, it should be emphasized that our main focus is the relative impact of various monetary policy variables on bank rates at a specific period rather than the change in the monetary transmission over time.

[12] In addition, we kept the number of lagged dependent variables at the minimum to address the many instruments problem, because the time dimension is larger than the number of banks in the sampling. For related discussions, see Roodman (2009).

Given all these factors, and also considering the degree of freedom issues, we decided to exclude the variables representing bank capital and industry structure in our baseline regression analysis.[13]

4. Empirical Results

The main variables we are trying to explain are loan and deposit rates set by the commercial banks. Regression analysis is designed mainly to address the following question: Which interest rates have a more significant role in the pricing of bank rates: *Official rates* or *effective rates?* As explained in Section 2, the former is directly set by the CBRT as parameters of the interest rate corridor, while the latter is an indirect outcome of the interaction of the official rates with the central bank funding policy. The monetary policy stance is determined by a combination of these interest rates. However, in practice it may not be clear which interest rate is relatively more important. Therefore, by empirically assessing the relationship between the various policy variables and the banks rates, we are also trying to answer which short-term interest rate offers a better representation of monetary policy stance.

We perform the regression analysis in several steps to answer a series of questions. In the first stage, we include the official and effective interest rates, one at a time, as an explanatory variable in our regressions along with other control variables. We interpret the significance and relative magnitude of the coefficient of each policy variable. In the second stage, we basically seek to answer the following question: after controlling for effective rates, do official rates still contain any additional information for the monetary policy stance? In this stage, the interest rate variables that are found statistically significant in the first stage are entered into the same specification jointly. Next, at the third and last stages, variables with no statistical significance in the second stage are omitted from the model and more parsimonious specifications are estimated. Specifications at these finals stages (baseline models) are estimated separately for commercial loans, consumer loans, and deposit rates. The relative size and significance of the coefficients obtained through all these stages shed light on the question of which monetary policy variable is relatively more important for loan and deposit pricing.

4.1 Commercial Loan Rates

The results of the regression analysis for commercial loan rates are presented in Table 2. Estimates for the first stage where each policy rate is added into the regression individually are given in columns 1 to 4. According to the estimation results, coefficients of all interest rates are statistically significant. Given the main question of this article, we are interested in the relative magnitude and

[13] For robustness purposes, we repeated the regressions adding variables such as bank assets, NPL ratios, liquidity, equity; but our main results regarding the relative impact of policy rates remained intact. Hence, these regressions are not reported. Readers may refer to the authors for detailed results about these regressions.

marginal significance of the coefficients on the policy variables. From this perspective, it should be highlighted that the coefficients of the effective rates—CBRT funding rate and the BIST overnight interbank rate—are larger than the coefficients of the official interest rates. More importantly, when all the short-term interest rates are jointly estimated at the second stage (column 5), official interest rates become statistically insignificant, while effective interest rates still remain significant. These observations suggest that the pricing of TL-denominated commercial loan rates is presumably determined by effective rates.

The last column of Table 2 goes one step further and addresses the question of which of these to effective interest rates is more influential in the pricing of commercial loan rates. Because there is a strong correlation between the CBRT funding rate and the BIST overnight rate (87 percent), we do not use both variables in the same regression in level form. Instead, we transform the regression to use one of the variables as level and the other as the spread. Accordingly, in the last column, the effective rates are added into the regression as: (i) the level of the CBRT funding rate, and (ii) the spread between the overnight interbank rate and the CBRT funding rate. Entering one variable as level and the other as a spread might raise questions of how to interpret the coefficients of each policy rate in absolute terms.[14] However, since the variation in the spread is mainly driven by the BIST overnight rate over the study period, the coefficient of the spread can be interpreted as the effect of the BIST rate.[15] Moreover, due to the very low and insignificant correlation of the spread and the CBRT funding rate, the coefficient of the CBRT funding rate will broadly reflect the effect of this variable itself. Therefore, in column 6 of Table 2, the coefficients of the policy variables of the estimated model show the relative significance of the BIST interbank rate and the CBRT funding rate to a great extent.

Estimation results indicate that there is a strong and significant positive association between commercial loan rates and the BIST overnight market rate over the period of study. The CBRT average funding rate also seems to play some role in the pricing of commercial rates, albeit at a lesser extent. The interbank money market rate represents the effective marginal funding cost for financial institutions. Because TL-denominated commercial loans in Turkey are mostly short-term in nature, it is not surprising to see that their pricing is highly sensitive to the effective rates faced by the banks for their short term borrowing. Yet, it is still interesting to observe that official policy rates cease to be significant once the effective rates are controlled.

[14] We thank the referee and the editor for bringing this issue to our attention.
[15] Cross-correlations are given in Table A of Annex 2.

Table 2: Corporate Loan Rate

	(1)	(2)	(3)	(4)	(5)	(6)
Corporate Loan Rate$_{i,t-1}$	0.888***	0.869***	0.859***	0.822***	0.827***	0.842***
	(0.036)	(0.039)	(0.037)	(0.035)	(0.031)	(0.028)
Weekly Repo Rate $_t$	0.122***				0.012	
	(0.027)				(0.044)	
Marginal Funding Rate $_t$		0.180***			0.069	
		(0.040)			(0.059)	
CBRT Average Funding Rate $_t$			0.214***		0.128**	0.183***
			(0.036)		(0.057)	(0.031)
BIST O/N Market Rate $_t$				0.233***		
				(0.035)		
BIST O/N Rate-CBRT Avr. Fund. Rate $_t$					0.278***	0.304***
					(0.082)	(0.066)
Reserve Req. Rate $_{i,t}$	0.065***	0.041***	0.064***	0.037***	0.022*	0.023*
	(0.014)	(0.013)	(0.014)	(0.014)	(0.013)	(0.012)
Inflation $_{t-1}$	0.091**	0.003	0.023	0.004	-0.004	0.001
	(0.046)	(0.045)	(0.044)	(0.046)	(0.048)	(0.044)
Δ EMBI_Turkey $_{t-1}$	0.004*	0.005**	0.004*	0.004**	0.005**	0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ USD/TL $_{t-1}$	0.040***	0.031**	0.036***	0.024*	0.019	0.019
	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)	(0.014)
Δ Economic Sentiment $_{t-1}$	-0.036***	-0.033***	-0.035***	-0.035***	-0.034***	-0.036***
	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)
Constant	-0.569*	-0.464*	-0.412	0.214	0.309	0.435
	(0.329)	(0.279)	(0.306)	(0.305)	(0.334)	(0.329)
Number of obs.	1,045	1,045	1,045	1,045	1,045	1,045
Robustness Tests						
AR (2) statistic	-0.147	-0.185	-0.209	0.0182	0.0524	0.0594
AR (2) p-value	0.883	0.854	0.834	0.985	0.958	0.953
Hansen J statistic	10.86	13.38	10.85	13.42	12.07	15.32
Hansen J p-value	0.145	0.146	0.145	0.0625	0.280	0.121

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Although our study essentially focuses on the relative coefficients of short term interest rates, interpreting the coefficients of other variables also involve useful information. For example, reserve requirement ratio is a significant explanatory variable in the commercial loan rate regressions. Another notable result is that commercial loan rates are negatively related to the economic (business) sentiment. A negative coefficient means that commercial loans fall during heightened optimism over the economic activity. This result indicates that supply-side pricing is more influential for commercial loans rather than demand factors, highlighting the significant role of credit risk from the banks' perspective.

Changes in risk premiums (measured by EMBI spread) are also found to be significantly correlated with the commercial loan rates. On the other hand, inflation and exchange rates seem to play no significant role in the pricing of TL-denominated commercial loans. These observations do not necessarily indicate that inflation and exchange rates have no effect on loan rates. Assuming that monetary policy systematically reacts to inflation and exchange rates, these variables will still affect commercial loan rates *indirectly* through monetary policy.

In sum, our findings suggest that effective policy rates and risk indicators are the main variables driving commercial loan rates in the short-term.

4.2 Consumer Loan Rates

Results for consumer loan rates are presented in Table 3. In the first stage where policy rates are added into the regression one at a time, the CBRT's officially announced funding rates, which are the weekly repo rate and the overnight lending rate, appear to be statistically insignificant (first two columns). Similar to the regressions for commercial loans, coefficients of effective interest rates, i.e. the CBRT average funding rate and the interbank overnight rate, are found to be significant (columns 3 and 4). When effective interest rates are simultaneously estimated (column 5), both rates become statistically significant, with the coefficient of the overnight market rate being much larger. These findings reveal that, similar to commercial loan rates, the pricing of consumer loan rates is based largely on the interbank rates and partly on the CBRT average funding rates. Thus, our results once again suggest that loan rates respond to the effective rates rather than the official rates of the central bank.

Looking at the relationship between consumer loan rates and other variables, the coefficient of required reserves appears to be more significant and larger than the regression results of commercial loans. The higher sensitivity of consumer loan rates to reserve requirements can be attributed to the interest rate risk and/or liquidity risk posed by changes in reserve requirements. Because consumer loans have longer maturities than commercial loans, their pricing might be more sensitive to policies that directly affect the interest rate risk and liquidity position of banks.[16]

Table 3: Consumer Loan Rates

	(1)	(2)	(3)	(4)	(5)
Consumer Loan Rates $_{i,t-1}$	0.935***	0.961***	0.900***	0.843***	0.850***
	(0.040)	(0.058)	(0.045)	(0.044)	(0.046)
Weekly Repo Rate $_{t-1}$	-0.016				
	(0.031)				
Marginal Funding Rate $_{t-1}$		-0.052			
		(0.061)			
CBRT Average Funding Rate $_{t-1}$			0.074***		0.084**
			(0.041)		(0.041)
BIST O/N Market Rate $_{t-1}$				0.131***	
				(0.030)	
BIST O/N Rate-CBRT Avr. Fund. Rate $_{t-1}$					0.218***
					(0.043)
Reserve Req. Rate$_{i,t-1}$	0.078***	0.078***	0.091***	0.0.85***	0.066***
	(0.016)	(0.013)	(0.017)	(0.016)	(0.017)
Inflation$_{t-1}$	0.029	0.045**	0.036	0.029	0.019
	(0.036)	(0.023)	(0.028)	(0.027)	(0.028)
Δ EMBI Turkey $_{t-1}$	-0.000	-0.001	-0.001	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Δ USD/TL $_{t-1}$	0.036***	0.034***	0.037***	0.039***	0.0.38***
	(0.010)	(0.010)	(0.010)	(0.009)	(0.010)
Δ Non-farm Unemployment Rate$_{t-1}$	0.341***	0.285***	0.252***	0.240***	0.250***
	(0.087)	(0.099)	(0.088)	(0.088)	(0.087)
Δ Consumer Confidence$_{t-1}$	-0.022***	-0.022***	-0.022***	-0.022***	-0.022***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Constant	0.199	0.134	-0.082	0.363	0.795***
	(0.200)	(0.199)	(0.215)	(0.315)	(0.211)
Number of obs.	1,045	1,045	1,045	1,045	1,045

[16] See Alper et al (2014) for a comprehensive assessment of the various channels of transmission from required reserves to bank rates.

Robustness Tests					
AR (2) statistic	-0.664	-0.688	-0.813	-0.900	-0.910
AR (2) p-value	0.507	0.492	0.416	0.368	0.363
Hansen J statistic	13.04	14.95	16.33	16.84	15.64
Hansen J p-value	0.291	0.185	0.129	0.113	0.155

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Turning to the coefficients of macro variables, consumer confidence and nonfarm unemployment seem to be highly significant in all specifications. Higher consumer confidence or lower unemployment rates are associated with falling consumer loan rates. These findings indicate that the consumer loans rates are driven by supply rather than demand factors as in the case of commercial loans.

There is a positive and significant relationship between consumer loan rates and exchange rates, while the coefficient of inflation appears insignificant. Since consumer loan rates have generally been long-term and fixed-rate assets, their pricing might be more sensitive to variables conveying information regarding the future path of inflation such as exchange rates, rather than realized inflation. Finally, our results do not reveal a statistically significant relationship between risk premium (EMBI spread) and consumer loan rates.

4.3 Deposit Rates

Table 4 reports the results of the regression analysis on deposit rates. Our results suggest that, similar to loan rates, deposit rates are driven by effective interest rates rather than official interest rates. Columns 1 to 4 indicate that all short-term interest rates are statistically significant when they are included one at a time in the regressions. As in the case of loan rates, the size of the coefficients of effective interest rates (the CBRT funding rate and the BIST overnight market rate) are larger than those of official interest rates. However, when all four interest rates are included in the regression, official rates (CBRT weekly repo and overnight rates) become insignificant (column 5). In the last stage, when we drop the official interest rates from the regression, we find that the coefficient of the funding rate is relatively higher (column 6) than the interbank rate. Unlike the case of loan rates, the CBRT average funding rate seems to play a stronger role in deposit pricing than overnight market rates.

Looking at the coefficients of other variables, the significance of the required reserve ratio in explaining the deposit rate appears to be robust across all models. In other words, banks seem to pass the additional cost arising from required reserves into deposit rates. On the other hand, the coefficients of the variables for exchange rates and risk premiums are, unlike our findings on loan rates, highly significant across all models. This outcome indicates that, exchange rate and risk premium developments directly affect TL-denominated deposit rates. While there may be many alternative explanations, we believe that the household portfolio behavior may be important for

driving these results. For example, if the Turkish lira depreciation or a worsening risk appetite leads to a decline in the household demand for local currency assets, banks might have to offer higher returns to protect the TL deposit base. Another important variable for explaining the movements in deposit rates is the inflation rate. The coefficient of inflation is positive and highly significant across all specifications. Higher inflation is associated with higher deposit rates, suggesting that real returns might play an important role for the supply of deposits.

Table 4: Deposit Rates

	(1)	(2)	(3)	(4)	(5)	(6)
Deposit Rates $_{i,t-1}$	0.800***	0.765***	0.587***	0.666***	0.595***	0.597***
	(0.010)	(0.011)	(0.021)	(0.015)	(0.022)	(0.021)
Weekly Repo Rate $_t$	0.141***				-0.025	
	(0.010)				(0.018)	
Marginal Funding Rate $_t$		0.149***			0.015	
		(0.011)			(0.014)	
CBRT Average Funding Rate $_t$			0.376***		0.357***	0.347***
			(0.023)		(0.026)	(0.022)
BIST O/N Market Rate $_t$				0.263***		
				(0.013)		
BIST O/N Rate-CBRT Avr. Fund. Rate $_t$					0.163***	0.172***
					(0.022)	(0.019)
Reserve Req. Rate$_{i,t}$	0.047***	0.025***	0.062***	0.014**	0.034***	0.036***
	(0.005)	(0.005)	(0.009)	(0.006)	(0.009)	(0.009)
Inflation$_{t-1}$	0.138***	0.081***	0.079***	0.051***	0.051***	0.061***
	(0.010)	(0.009)	(0.013)	(0.011)	(0.010)	(0.013)
Δ EMBI_Turkey $_{t-1}$	0.035***	0.028***	0.028***	0.015***	0.018***	0.019***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Δ USD/TL $_{t-1}$	0.003***	0.004***	0.002***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.599***	-0.248***	-0.164	0.465***	0.297*	0.255
	(0.098)	(0.088)	(0.149)	(0.121)	(0.154)	(0.164)
Number of obs.	1,045	1,045	1,045	1,045	1,045	1,045
Robustness Tests						
AR (2) statistic	-1.873	-1.834	0.110	0.0517	0.465	0.476
AR (2) p-value	0.0610	0.0666	0.912	0.959	0.642	0.634
Hansen J statistic	18.48	18.11	17.38	18.44	16.53	17.54
Hansen J p-value	0.102	0.112	0.136	0.103	0.168	0.130

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively. *First lag of short term interest rates and reserve requirement rates are considered in the last specification (6*).

In sum, our results suggest that effective policy rates—overnight interbank rate and central funding rate—are the main drivers of bank rates. Once the effective interest rates are controlled in the regressions, the official corridor parameters (weekly and overnight funding rates) cease to be significant. These results reveal that effective rates are more relevant indicators to gauge the monetary policy stance during our sample period. Moreover, interbank overnight market rate plays a particularly significant role in loan pricing than other policy variables. All these findings point to the central role of the interbank rates for the transmission of monetary policy.

4.4 The Asymmetric Effect of Monetary Policy

In this section, we analyze the asymmetric response of loan and deposit rates to the short term interest rates. Specifically, we seek to answer the following question: do changes in the CBRT interest rates have a stronger impact on loan and deposit rates in times of monetary tightening than

monetary easing? In the previous section, we have shown that monetary policy stance of the CBRT is determined by the level of effective interest rates. Therefore, monetary tightening can be represented by a hike in the effective interest rates, i.e. the CBRT average funding rate and/or the overnight market rate. To investigate the asymmetric effects, we use the baseline specification from the previous chapter (column 6 in Tables 2, 3 and 4). Regressions are re-estimated separately for monetary tightening and easing periods, and the magnitude of the coefficients on policy variables are compared to assess the extent of the asymmetry. Our findings on commercial, consumer and deposit rates are presented in Tables 5A, 5B and 5C, respectively, in Annex 1.

The results point to important differences in the response of loan and deposit rates to monetary policy in terms of asymmetry. There is an asymmetric relationship between loan rates and central bank interest rates. The response of loan rates to monetary policy is stronger during tightening periods than easing periods (Table 5A and 5B). The pass-through of monetary tightening to loan rates is larger than the case of monetary easing. On the other hand, deposit rates respond to central bank rate changes in a largely symmetrical way (Table 5C).

The asymmetric relationship between loan rates and policy rates suggests that banks in Turkey might have some pricing power. In other words, market structure of the banking sector does not exhibit perfect competition. When monetary policy is tightened, banks rapidly adjust their deposit and loan rates upwards. During periods of monetary easing, however, banks slash deposit rates rapidly but reduce loan rates at a more sluggish pace.[17] Therefore, the net interest margins of banks are likely to widen in times of monetary easing. These results might be interpreted as an indication that banks follow a monopolistically competitive pricing behavior in the loan market.

The symmetric response of deposit rates to monetary policy does not necessarily mean a high degree of price competition in the deposit market.[18] It should be noted that the deposit rates are determined not only by the price competition among banks but also by the competition among the returns on alternative financial instruments. Thus, it should be noted that the differing degree of symmetry in the response of loan and deposits to monetary policy might be explained by the different constraints faced by banks on their assets and liabilities, rather than the relative degree of competition across markets.

4.5 Short-term Funding Needs of Banks and the Monetary Policy Transmission

In this section, we aim to assess the interaction between short-term funding needs of banks and the monetary transmission mechanism. The CBRT is a net lender to the banking system during our

[17] Mojon (2001) indicates that in a strongly competitive loan market, banks lower loan rates at a more rapid pace during monetary easing than during tightening periods.

[18] Based on the finding that Turkish deposits exhibit low sensitivity to interest rate changes, Akın et al (2013) argue that banks have more pricing power in the deposit market. The same study concludes that loan customers are relatively more sensitive to interest rates and the competition in the loan market is particularly fierce.

sample period. Moreover, the cost of funding for banks' short term borrowing is frequently altered by the CBRT using tools daily funding operations and required reserves. In such an environment, the degree of banks' short term borrowing—represented by the ratio of short-term funds to banks' total deposits—might play a role in the transmission of monetary policy.

In order to test the above hypothesis, the banks are categorized into two groups depending on their short-term borrowing from the interbank market. We use the ratio of bank's borrowings from the BIST interbank repo market to total deposits to represent banks' short term funding needs. Eight banks with this ratio over 4 percent are identified as banks with high short term funding needs, whereas five banks with a ratio of either zero or negative are classified as banks with low short term funding needs. Then we estimate separate regressions (final rows in Table 2, 3 and 4) for each group.

The level of short-term bank borrowings can matter for the transmission mechanism via channels such as interest rate risk. In the flexible system implemented by the CBRT, overnight market rates followed a highly volatile path over the period of our study (see Figure 1). Under such an unconventional policy framework, banks in need for large amount of short-term funds (borrowing extensively from the overnight market) might be exposed to more interest rate risk compared to conventional policies, thus causing bank loan rates to be more sensitive to monetary policy. However, our findings on commercial loan rates fail to confirm this prediction: the results presented in Table 6A show that commercial loan rates respond in a quite similar way to monetary policy rates across banks irrespective of the degree of their short-term borrowing. This might be due to the fact that commercial loans are less prone to interest rate risk as they have mostly short-term maturities and are often indexed to interbank rates regardless of banks' level of short-term borrowing. In fact, regressions on consumer loan rates, which have longer-term maturity and fixed-rates, indicate that banks with greater need for short term funding react more strongly to the interbank rates (Table 6B).

In order to provide further evidence on this issue, we repeat the same regressions by breaking down consumer loans into longer term and shorter term components, represented by mortgages (8 years maturity on average) and personal loans (3.5 years maturity on average). If the interest rate risk is important for the monetary transmission, then the sensitivity of mortgage loans to changes in monetary policy should be higher than that of the personal loans. Interestingly, the results reveal that, for the case of mortgages, banks with higher short term borrowing react more strongly to the interbank rates, whereas this effect is less significant for personal loans. These findings suggest that banks' short term borrowing position might play some role in the transmission of monetary policy, possibly due to interest rate risk. However, it should be noted that, in the case of Turkey, the role of interest rate risk might have been amplified because of the high frequency monetary policy implemented by the CBRT.

The short-term borrowing needs of the banks may also interact with the transmission of reserve requirement policy to bank loan rates. In fact, estimated coefficients for required reserve ratio show that the short-term borrowing position of the banks may affect the reaction of loan rates to changes in required reserve ratios (Table 6 A, B). The relationship between loan rates and required reserve ratios is found to be statistically significant for banks with higher borrowings from the interbank market but is insignificant for banks with low funding needs. In other words, banks with greater short-term market debt respond more strongly to changes in required reserves. This result may be reflecting the balance sheet constraints faced by the banks. For example, consider a bank that has already borrowed extensively from the overnight market. In such a case, a sudden rise in required reserves would further push up the borrowing needs of the bank. If the bank is reluctant to raise its short term borrowing above a certain level due to prudential reasons, its loan pricing would be more responsive to an increase in reserve requirements.

The results in Table 6C indicate that the relationship between deposit rates and policy rates hardly differs in regard to the short-term funding level of banks. On the contrary, the relation between monetary policy and deposit rates seems to be much stronger for banks with a low level of short-term debt. This finding may be attributed to the fact that deposit rates hovered mostly above the overnight borrowing rate in the sample period, prompting some banks to tap heavily on the interbank market. If the level of borrowing from money markets reflects the bank's choice to reduce dependency on deposits, the correlation between deposit rates and monetary policy would appear much weaker for banks with higher short-term debt.

All these results suggest that banks' balance sheet constraints may play some role in the strength of the monetary transmission mechanism.

5. Conclusion and Final Remarks

This study investigates the interest rate transmission channel when banks are exposed to multiple short-term interest rates due to diverging policy rates and market rates as a result of unconventional monetary policy. In this regard, experience of Turkey with a wide and flexible interest rate corridor during 2011-2014 period provides some sort of a natural experiment to identify certain relationships regarding the transmission of monetary policy. In the conventional corridor setting, central banks adjust open market transactions to keep market rates close to the policy rate; and therefore, the quantity or composition of central bank funds becomes irrelevant for monetary policy. On the contrary, by adjusting the funding composition on a high frequency basis, Turkish central bank deliberately allowed a systematic wedge between the central bank funding rate and interbank rate. In other words, the *effective* rates and *official* rates have diverged occasionally, leading to a rich variation in the data. We take advantage of this variation to shed light on the transmission of

monetary policy. To this end, we run panel regressions using bank level data to evaluate the relationship between various short term interest rates and bank rates. Our findings indicate that bank loans and deposit rates are more sensitive to effective interest rates (interbank market rate and the central bank average funding rate), rather than official interest rates. Especially, interbank rates seem to be the main driver of loan rates and thus the monetary transmission. Central bank average funding rate—weighted average cost of the funding provided by the central bank to the banking system—has also been partly influential for the pricing of bank rates. In sum, our findings suggest that financial intermediaries pay attention to what the central bank implements rather than what it announces officially.

It is not surprising to see that interbank money market rate is important for the pricing of loan and deposit rates, because it serves as a reference for the marginal cost of funding for banks. However, it is interesting to see that the central bank average funding rate also has some significant role in driving the bank deposit and loan rates. The question of why banks take into account the central bank average funding rate is vital to understanding the micro foundations of the monetary transmission mechanism. Our interpretation is that, in the case of Turkey, the CBRT average funding rate is not only a component of the banks' funding cost, but also serves as a partial benchmark for the future monetary policy stance. One reason for this perception may be the fact that the CBRT average funding rate was relatively more stable, whereas interbank rates followed a highly volatile path during most of our sample period.

Although the analysis in this study is based on the specific corridor system implemented in Turkey, our findings may also provide useful insights for other countries facing divergence between policy rates and market rates. Undoubtedly, this question is not much relevant under conventional frameworks where the announced policy rate and the interbank rate are at the same level, as in such a case monetary policy would be largely represented by a single interest rate. However, effective rates persistently deviated from policy rates across major central banks in recent years. For example, after hitting the zero lower bound in 2009, the Fed announced a target range for the federal funds rate instead of a single policy rate, and short-term market interest rates hovered within this range, showing small but persistent upside and downside movements. Similarly, the ECB's main refinancing rate and the interbank market rate in Europe have also persistently diverged after the adoption of quantitative easing policies. Although the gap between effective rates and the official policy rates are quite small in the case of the Fed and the ECB, it may still be important for the monetary transmission, given the exceptionally low level of interest rates across the globe. Therefore, our findings may be useful for advanced economies to address the question of which interest rates are more relevant for the stance of monetary policy.

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Appendix 1:

Table 5A: Corporate Loan Rate – Asymmetric Effect of Monetary Policy

	ΔBIST O/N Rate>0		ΔBIST O/N Rate <0		ΔAverage Funding Rate>0		ΔAverage Funding Rate <0	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Corporate Loan Rate $_{i,t-1}$	0.685***	0.691***	0.831***	0.859***	0.570***	0.612***	0.527***	0.580***
	(0.077)	(0.084)	(0.078)	(0.078)	(0.076)	(0.077)	(0.113)	(0.114)
CBRT Average Funding Rate $_t$		0.359***		0.084	0.475***	0.463***	0.256***	0.180*
		(0.062)		(0.051)	(0.086)	(0.089)	(0.093)	(0.092)
BIST O/N Market Rate $_t$	0.385***		0.168***					
	(0.031)		(0.042)					
BIST O/N Rate-CBRT Avr. Fund. Rate $_t$		0.415***		0.336***		0.453***		0.272***
		(0.065)		(0.077)		(0.074)		(0.095)
Reserve Req. Rate $_{i,t}$	0.041*	0.033*	0.035*	0.011	0.135***	0.042	0.094**	0.061*
	(0.021)	(0.019)	(0.019)	(0.023)	(0.028)	(0.030)	(0.037)	(0.037)
Inflation $_{t-1}$	0.029	0.031	-0.052	-0.052	0.121**	-0.030	0.259***	0.233**
	(0.069)	(0.069)	(0.048)	(0.045)	(0.057)	(0.058)	(0.096)	(0.092)
Δ EMBI_Turkey $_{t-1}$	0.006*	0.006*	0.003	0.002	0.002	0.008***	-0.003	-0.003
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Δ USD/TL $_{t-1}$	0.024*	0.024*	0.022	0.016	0.090***	0.030***	0.076***	0.065***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.016)	(0.012)	(0.017)	(0.017)
Δ Economic Sentiment $_{t-1}$	-0.037***	-0.038***	-0.009	-0.011	-0.030**	-0.039***	0.007	0.005
	(0.013)	(0.014)	(0.009)	(0.009)	(0.013)	(0.014)	(0.008)	(0.008)
Constant	0.464	0.599	1.080	1.495*	-0.068	1.203***	1.274**	1.612***
	(0.512)	(0.445)	(0.813)	(0.811)	(0.462)	(0.404)	(0.605)	(0.528)
Number of obs.	551	551	494	494	418	418	551	551
Robustness Tests								
AR (2) statistic	1.326	1.307	0.295	0.295	0.601	0.750	-0.680	-0.627
AR (2) p-value	0.185	0.191	0.768	0.768	0.548	0.453	0.496	0.530
Hansen J statistic	7.537	8.305	8.805	8.362	9.860	6.316	13.87	13.84
Hansen J p-value	0.375	0.307	0.267	0.302	0.197	0.503	0.0536	0.0541

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 5B: Consumer Loan Rates – Asymmetric Effect of Monetary Policy

	ΔBIST O/N Rate>0		ΔBIST O/N Rate <0		ΔAverage Funding Rate>0		ΔAverage Funding Rate <0	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Consumer Loan Rate $_{i,,t-1}$	0.624***	0.637***	0.764***	0.784***	0.616***	0.501***	0.561***	0.633***
	(0.108)	(0.116)	(0.102)	(0.141)	(0.082)	(0.088)	(0.151)	(0.147)
CBRT Average Funding Rate $_{t-1}$		0.198**		0.109	0.262***	0.342***	0.248***	0.177**
		(0.081)		(0.078)	(0.082)	(0.090)	(0.085)	(0.089)
BIST O/N Market Rate $_{t-1}$	0.245***		0.154***					
	(0.064)		(0.043)					
BIST O/N Rate-CBRT Avr. Fund. Rate $_{t-1}$		0.307***		0.234***		0.412***		0.187**
		(0.069)		(0.057)		(0.074)		(0.075)
Reserve Req. Rate$_{i,t-1}$	0.080***	0.064**	0.133***	0.114**	0.150***	0.114***	0.184***	0.139*
	(0.029)	(0.031)	(0.039)	(0.056)	(0.036)	(0.038)	(0.070)	(0.074)
Inflation$_{t-1}$	0.161***	0.152**	0.028	0.007	0.267***	0.159***	0.276**	0.200
	(0.061)	(0.062)	(0.092)	(0.128)	(0.043)	(0.042)	(0.133)	(0.133)
Δ EMBI_Turkey $_{t-1}$	-0.007***	-0.007***	-0.002	-0.002	-0.009***	-0.010***	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δ USD/TL $_{t-1}$	0.070***	0.071***	0.041***	0.036**	0.070***	0.080***	0.065***	0.055***
	(0.017)	(0.017)	(0.008)	(0.015)	(0.019)	(0.019)	(0.010)	(0.011)
Δ Non-farm Unemployment Rate$_{t-1}$	0.051	0.056	0.388**	0.416***	-0.118	-0.130	0.388**	0.444***
	(0.122)	(0.123)	(0.153)	(0.135)	(0.205)	(0.192)	(0.184)	(0.159)
Δ Consumer Confidence$_{t-1}$	-0.036***	-0.036***	0.004	0.003	-0.051***	-0.042***	-0.002	-0.004
	(0.011)	(0.011)	(0.006)	(0.005)	(0.015)	(0.015)	(0.008)	(0.007)
Constant	1.457**	1.768***	0.999**	1.341***	0.288	2.237***	0.849**	1.247***
	(0.608)	(0.537)	(0.450)	(0.321)	(0.462)	(0.514)	(0.362)	(0.360)
Number of obs.	551	551	494	494	418	418	551	551
Robustness Tests								
AR (2) statistic	-1.724	-1.724	-1.411	-1.497	-0.705	-1.578	-0.805	-0.886
AR (2) p-value	0.0848	0.0847	0.158	0.134	0.481	0.115	0.421	0.375
Hansen J statistic	6.584	6.157	8.857	9.003	16.63	12.68	17.05	16.19
Hansen J p-value	0.473	0.522	0.263	0.252	0.119	0.315	0.106	0.134

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 5C: Deposit Rates – Asymmetric Effect of Monetary Policy

	ΔBIST O/N Rate>0		ΔBIST O/N Rate <0		ΔAverage Funding Rate>0		ΔAverage Funding Rate <0	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deposit Rate $_{i,t-1}$	0.700***	0.621***	0.589***	0.586***	0.533***	0.658***	0.427***	0.504***
	(0.033)	(0.030)	(0.024)	(0.033)	(0.043)	(0.032)	(0.024)	(0.027)
CBRT Average Funding Rate $_t$		0.375***		0.319***	0.403***	0.348***	0.443***	0.360***
		(0.017)		(0.031)	(0.025)	(0.019)	(0.022)	(0.026)
BIST O/N Market Rate $_t$	0.279***		0.296***					
	(0.012)		(0.014)					
BIST O/N Rate-CBRT Avr. Fund. Rate $_t$		0.186***		0.244***		0.220***		0.189***
		(0.020)		(0.033)		(0.023)		(0.034)
Reserve Req. Rate$_{i,t}$	-0.010	0.018**	0.031***	0.037***	0.051***	-0.003	0.072***	0.047***
	(0.007)	(0.009)	(0.008)	(0.012)	(0.010)	(0.010)	(0.011)	(0.011)
Inflation$_{t-1}$	0.044***	0.057***	0.032*	0.026	0.127***	0.044**	0.102***	0.084***
	(0.013)	(0.013)	(0.018)	(0.020)	(0.019)	(0.020)	(0.015)	(0.015)
Δ EMBI_Turkey $_{t-1}$	0.005***	0.004***	0.001*	0.001**	0.003***	0.006***	-0.000	-0.001
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Δ USD/TL $_{t-1}$	0.019***	0.020***	0.020***	0.021***	0.046***	0.028***	0.034***	0.027***
	(0.004)	(0.004)	(0.003)	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)
Constant	0.228	-0.024	0.991***	0.852***	-0.218	0.030	0.482**	0.725***
	(0.178)	(0.189)	(0.205)	(0.245)	(0.280)	(0.265)	(0.224)	(0.204)
Number of obs.	551	551	494	494	418	418	551	551
Robustness Tests								
AR (2) statistic	-0.654	-0.188	1.509	1.427	0.622	0.470	0.466	0.229
AR (2) p-value	0.513	0.851	0.131	0.154	0.534	0.639	0.641	0.819
Hansen J statistic	17.80	17.67	18.68	15.53	18.43	16.84	17.34	16.98
Hansen J p-value	0.122	0.126	0.0964	0.214	0.103	0.156	0.137	0.150

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 6A: Corporate Loan Rate – Effect of Short-Term Borrowing Need

	BIST Borrowing/Deposit (High)	BIST Borrowing/Deposit (Low)
	(1)	(2)
Corporate Loan Rate $_{i,t-1}$	0.787***	0.822***
	(0.033)	(0.059)
CBRT Average Funding Rate $_{t}$	0.183***	0.219***
	(0.058)	(0.052)
BIST O/N Rate-CBRT Avr. Fund. Rate $_{t}$	0.298***	0.297***
	(0.103)	(0.083)
Reserve Req. Rate $_{i,t}$	0.037***	-0.002
	(0.010)	(0.029)
Inflation $_{t-1}$	0.126**	-0.066
	(0.056)	(0.090)
Δ EMBI_Turkey $_{t-1}$	0.007**	0.004
	(0.003)	(0.003)
Δ USD/TL $_{t-1}$	0.025	0.018
	(0.019)	(0.032)
Δ Economic Sentiment $_{t-1}$	-0.047***	-0.011*
	(0.015)	(0.006)
Constant	0.035	1.047
	(0.520)	(0.706)
Number of obs.	440	275
Number of banks	8	5
Robustness Tests		
AR (2) statistic	-0.879	0.661
AR (2) p-value	0.379	0.508
Hansen J statistic	0.000	0.000
Hansen J p-value	1.000	1.000

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 6B: Consumer Loans – Effect of Short-Term Borrowing Need

	Total Consumer Loans		Housing Loans		Personal Loans	
	BIST Borrowing/Deposit (High)	BIST Borrowing/Deposit (Low)	BIST Borrowing/Deposit (High)	BIST Borrowing/Deposit (Low)	BIST Borrowing/Deposit (High)	BIST Borrowing/Deposit (Low)
Consumer Loan Rate $_{i,t-1}$	0.898***	0.959***	0.710***	0.880***	0.840***	0.718***
	(0.077)	(0.063)	(0.067)	(0.109)	(0.076)	(0.082)
CBRT Average Funding Rate $_{t-1}$	0.067	0.005	0.151***	0.046	0.100*	0.019
	(0.078)	(0.051)	(0.052)	(0.053)	(0.056)	(0.118)
BIST O/N Rate-CBRT Avr. Fund. Rate $_{t-1}$	0.190**	0.126*	0.289***	0.143	0.201***	0.212*
	(0.076)	(0.069)	(0.060)	(0.088)	(0.055)	(0.112)
Reserve Req. Rate$_{i,t-1}$	0.055***	0.039	0.056***	0.035	0.065**	0.060
	(0.013)	(0.028)	(0.013)	(0.032)	(0.026)	(0.063)
Inflation$_{t-1}$	0.004	-0.014	0.230	0.200	0.230**	0.085
	(0.030)	(0.052)	(0.155)	(0.159)	(0.113)	(0.123)
Δ EMBI_Turkey $_{t-1}$	-0.002	-0.001	0.056***	0.050***	0.049***	0.074***
	(0.001)	(0.003)	(0.008)	(0.018)	(0.008)	(0.016)
Δ USD/TL $_{t-1}$	0.047***	0.036**	-0.029***	-0.027***	-0.013	-0.024***
	(0.014)	(0.018)	(0.005)	(0.010)	(0.010)	(0.007)
Δ Non-farm Unemployment Rate $_{t-1}$	0.169	0.444***	0.058	-0.010	0.029	0.193**
	(0.137)	(0.137)	(0.038)	(0.075)	(0.062)	(0.090)
Δ Consumer Confidence$_{t-1}$	-0.018	-0.024***	-0.003***	-0.002	-0.003***	-0.009***
	(0.011)	(0.008)	(0.001)	(0.002)	(0.001)	(0.003)
Constant	0.373	0.292	1.383***	0.691	0.827**	1.865***
	(0.327)	(0.376)	(0.359)	(0.468)	(0.391)	(0.718)
Number of obs.	440	275	414	238	432	270
Number of banks	8	5	8	5	8	5
Robustness Tests						
AR (2) statistic	-0.354	-0.388	-0.296	-1.342	-1.613	0.100
AR (2) p-value	0.723	0.698	0.767	0.180	0.107	0.920
Hansen J statistic	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J p-value	1.000	1.000	1.000	1.000	1.000	1.000

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 6C: Deposit Rates -- Effect of Short-Term Borrowing Need

	BIST Borrowing/Deposit (High)	BIST Borrowing/Deposit (Low)
Deposit Rate $_{i,t-1}$	0.585***	0.555***
	(0.022)	(0.054)
CBRT Average Funding Rate $_{t}$	0.360***	0.365***
	(0.027)	(0.050)
BIST O/N Rate-CBRT Avr. Fund. Rate $_{t}$	0.165***	0.200***
	(0.026)	(0.036)
Reserve Req. Rate$_{i,t}$	0.032***	0.028*
	(0.009)	(0.016)
Inflation$_{t-1}$	0.064***	0.066***
	(0.021)	(0.013)
Δ EMBI_Turkey $_{t-1}$	0.003***	0.003**
	(0.001)	(0.001)
Δ USD/TL $_{t-1}$	0.018***	0.017***
	(0.005)	(0.006)
Constant	0.215	0.519***
	(0.289)	(0.121)
Number of obs.	440	275
Number of banks	8	5
Robustness Tests		
AR (2) statistic	-0.260	0.978
AR (2) p-value	0.795	0.328
Hansen J statistic	0.000	0.000
Hansen J p-value	1.000	1.000

Notes: Robust standard errors (clustered at the bank level) are reported. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Appendix 2:

Table A1: Cross-Correlation

	CBRT Average Funding Rate	BIST O/N Market Rate
BIST O/N Market Rate	0.869	
(P-value)	(0.000)	
BIST O/N Rate-CBRT Avr. Fund. Rate	0.166	0.632
(P-value)	(0.227)	(0.000)

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