6. MEASURING THE MONETARY POLICY STANCE IN TURKEY: EFFECTS OF TRADITIONAL AND NON-TRADITIONAL MONETARY POLICY INSTRUMENTS[1]

Metin TETİK[2]
Görkem KARA[3]

Abstract

In this study, we aimed to predict the monetary policy stance by creating a new monetary policy stance index for Turkey between 2006 and 2019. We analyzed the connection between the monetary policy stance index we created and the economic situation separately for the entire period (2006m01-2019m10) and for the periods when the CBRT used traditional and non-traditional policy instruments (2006m01-2010m09 and 2010m10-2019m10). The findings show that the CBRT preferred a more cautious but expansionary policy stance in the traditional period as compared to the non-traditional period. In addition, we found that the CBRT continued to exhibit an expansionary stance in the unconventional period. The monetary policy reaction function estimated using the index shows us that while you determine the CBRT's policy stance according to the inflation gap and exchange rate gap in the traditional period, you only determine it according to the exchange rate gap in the non-traditional period. This finding shows us that the CBRT's policy stance strategy has changed as regards achieving price stability, which is its main objective. At the same time, it offers us some clues about the loss of credibility of the CBRT in the non-traditional period.

Keywords: central bank, monetary policy stance, monetary policy instruments, monetary reaction function, ordered Probit model

JEL Classification: E52, E61, C35

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[1] *Görkem Kara's master's thesis called "Measurement of the CBRT's Policy Stance: Ordered Probit Approach", which was defended in the Uşak University Graduate Education Institute econometrics department, is based on this article.*

[2] *School of Applied Science, Uşak University, Turkey. E-mail: metin.tetik@usak.edu.tr.*

[3] *Department of Econometrics, Uşak University, Turkey. E-mail: grk_kr_86@hotmail.com.*

1. Introduction

The Central Bank of the Republic of Turkey (CBRT) implemented a macro-prudential measures program during the period after the 2008 financial crisis. Within the scope of these measures, apart from traditional policy instruments, it also started to actively use new monetary policy instruments such as reserve requirement ratio, asymmetric interest rate corridor, and reserve option mechanism. The fact that multiple policy instruments are used at the same time made it difficult to understand the monetary policy of the CBRT and measure the impact of each of these instruments on the monetary policy.

Measuring monetary policy correctly is important for both policymakers and researchers (Bernanke & Mihov, 1998). The fact that the monetary policy stance can be a good criterion is provided by giving us qualitative or quantitative information about whether the monetary policy is expansionary or contractionary. Most of the studies show that represent monetary policy stance are often considered as changes in a single policy instrument in the literature. As a result, a link is established between this instrument and other macroeconomic variables (Xiong, 2012). For example, many studies show that in Turkey the Libor interest rate is used as an indicator to represent the CBRT's monetary policy stance (Alp *et al*., 2010; Gürkaynak *et al*., 2015).

This study aimed to obtain a new monetary policy stance index for the CBRT between 2006 and 2019, especially with the inflation targeting regime. The motivation to do this study is that the CBRT started to use non-traditional policy instruments especially during 2010-2019, which made it difficult to measure the CBRT's policy stance. This index application is a first in terms of economic literature in Turkey and we think that it is an element of novelty. After creating such an index, the link between this index and the economic condition is examined separately for the entire period (2006m01-2019m10) and for periods when the CBRT used traditional and non-traditional policy instruments (2006m01-2010m09 and 2010m10-2019m10). Although the literature is extensively vast so far, to the best of our knowledge, no studies have examined the effectiveness of traditional and non-traditional policy instruments of central banks periodically with index approach. We think that this is an element of novelty in terms of economic literature.

To apply this investigation, we used a monetary policy reaction function. When the backward-looking and forward-looking models for the Turkish economy evaluate together, it does not show a significant difference in the forward and backward rule distinction of the central bank behavior (Albayrak and Abdioğlu, 2015). Therefore, we used a backward-looking model for simplicity. Then, we tested only a backward-looking model and only for output, inflation, and exchange rate gaps. Because of the qualitative index data structure of the dependent variable, this model was analyzed by the Probit approach. The layout of the study is as follows. Section 2 reviews the literature on the monetary policy stance. Section 3 explains how the change in the CBRT's monetary policy stance for periods between 2006M01 and 2019M10 is measured by an index. Section 4 presents some empirical results on the relation between the policy index and the macroeconomic variables. Section 5 offers some concluding remarks.

2. Literature Review

It is revealed that traditional monetary policies were inadequate during the 2008 global financial crisis and that led central banks to non-traditional monetary policy practices (Vural, 2013). However, the fact that many policy instruments are used at the same time made it difficult to understand the monetary policy stance of central banks and to measure the impact of each of these instruments on the monetary policy. Therefore, it is necessary to consider a wide range of these monetary policy instruments to accurately measure the policy stance.

Structural vector autoregressions (SVARs) are one of the commonly used methods to follow the impact of the monetary policy stance on the economy. The study that stands out in the literature as predicting monetary policy rules and evaluating monetary policy effects is that of Bernanke and Mihov (1998). In this study, a linear combination of policy shocks from the SVAR model is used as the monetary policy stance. To measure the Fed's monetary policy stance, Bernanke and Mihov used total reserves, non-borrowed reserves (NBR), and federal fund rates as monetary policy variables. Similar to this study, Bernanke *et al*. (2005) used the factor augmented VAR (FAVAR) methodology to provide a more comprehensive and consistent picture of the impact of the monetary policy stance on the economy. Varlik and Berument (2017) used a similar model like Bernanke *et al*. (2005) for the CBRT's policy stance. In this study, CBRT's policy stance is represented as four different interest rates (average funding cost, overnight repo and reverse repo, overnight borrowing, overnight lending), and the effects of these variables on the economic situation variables are examined. In this direction, the impact of each policy instrument on the economic variables becomes different. As a result, this study shows that more policy instruments can provide various results as compared to a single policy instrument.

In the literature, some studies use an index-based approach to determine the monetary policy stance (Gerlach and Svensson, 2002; Gerlach, 2004; He and Pauwels, 2008; Xioang, 2012). The policy stance index created in these studies has some similarities in terms of the techniques used. For instance, when determining the direction of the policy stance, all policy instruments share the same weight. It is revealed that various monetary policy instruments taken into account differ from country to country when creating the index. Gerlach and Svensson (2002) and Gerlach (2004) measured the stance of the European Central Bank's (ECB) monetary policy, using changes in the repo rate. He and Pauwels (2008) measured the Central Bank of China (PBC) monetary policy stance by combining reserve requirement ratio, lending rate, deposit rates, and changes in the size of open market transactions. Xioang, (2012) tried to measure the PBC’s monetary policy stance as in He and Pauwels (2008). In addition, using the quarterly executive reports published by PBC, a series of subjective indicators have been developed based on PBC's views on output, money growth, and its inflation outlook.

The literature on estimating the monetary policy stance in Turkey mostly concentrates on structural models involving the policy rate and the validity of the Taylor rule. The monetary policy reaction function is treated as the original and augmented Taylor rules. In addition, there are also studies on the validity of Taylor-type rules, which have developed retrospective and forward-looking variations. The underlying models are evaluated within the framework of the estimation of linear and nonlinear models. If we consider some of these studies, Aklan and Nargeleçekenler (2008) estimated the backward reaction function of the CBRT using data from the 2002-2006 period. According to the results of the reaction function estimated within the framework of the original and generalized Taylor rule, short-term interest rates in Turkey change according to the rule to ensure price stability. In the study, it is emphasized that the CBRT reacts significantly to the output gap and the exchange rate, as well as the inflation rate in the interest rate determination process. Lebe and Bayat (2011) tested the validity of the augmented Taylor rule for Turkey by using three different interest rates (interbank interest rate, deposit interest rate, and rediscount interest rate). Vector Autoregressive Model (VAR) was applied in the study, in which data from the 1986-2010 period was used. The results of the analysis showed that, according to the model in which the rediscount interest rate is used, the interest rates in Turkey act according to the Taylor rule. Yapraklı (2011) found that the central bank interest rate responded significantly to inflation, output gap, and exchange rate by using the boundary test approach for the period 2001-2009. He determined that the monetary policy rule is valid during the inflation-targeting period. Demirbaş and Kaya (2012) also analyzed the validity of the augmented Taylor rule for Turkey by using different interest rates such as overnight quotation buying/selling interest rates. As a result of the analysis made for the Turkish economy using the data for the 2001-2012 period, it shows that the model created for both interest rates comply with the Taylor rule, but the model using the overnight quotation sales interest rate gives more consistent results. Albayrak and Abdioğlu (2015) examine the retrospective Taylor rule for Turkey, and estimate the retrospective and forward-looking monetary policy reaction functions of the Central Bank of the Republic of Turkey for the 2002-2014 and lower periods. According to the findings, the central bank responds to the movements in inflation rather than the output gap. The central bank monitors the forward-looking and retrospective monetary policy reaction functions, especially as of the 2008-2014 period. Özcan (2016), in his study examining the asymmetric effects of the Taylor rule, covers the period 2001-2013. According to the estimation results of the threshold regression model, he determined that the output gap affects the short-term interest rates the most in the high inflation period. In Yalçınkaya and Yazgan (2020), the validity of Taylor's rules for the CBRT in the 2002-2019 period is analyzed econometrically within the scope of linear and non-linear time series analysis. As a result of the study, it has been determined that the original and augmented Taylor rules in linear and non-linear forms are valid for the CBRT in terms of inflation, output, and exchange rate gaps during the assessment period. These results show that in the 2002-2019 period when the inflation targeting regime was adopted in the Turkish economy, monetary policy strategies were designed by the CBRT within the scope of the original and expanded Taylor rules, and the policy rates were determined by taking into account the changes in inflation, output, and exchange rate gaps. Finally, Akdeniz (2021) analyzed the validity of the nonlinear augmented Taylor rule for the Turkish economy. According to the findings obtained from the model estimated for the period 1986-2019, after the inflation gap and output gap shocks it has been observed that the magnitude of the response of the interest rate changes over time. In addition, in the case of exchange rate shocks, he concluded that both the direction and the quantitative magnitude of the response of the interest rate change.

In this context, the studies carried out on Turkey are based on the policy rate; that it is sensitive to varying degrees to changes in inflation, output and/or exchange rate gap, and the validity of Taylor-type rules. They show that it tends to change according to the econometric methodology used in the studies, the estimators, the variation of the Taylor rule, the sample period, the data set, etc. (Yalçınkaya and Yazgan, 2020). In this study, unlike the relevant literature, we take the stance of monetary policy in Turkey with an index we created. With the help of this index, we estimate a Taylor-type reaction function in parallel with the literature. Thus, we have the opportunity to compare the obtained findings with the relevant literature. In addition, the alternative policy tools (on the interest rate) used in creating the index offer us a comparison opportunity according to the periods when the CBRT used traditional and non-traditional policy tools. Also, we determine which macroeconomic factors are sensitive to traditional and non-traditional policy instrument choices.

With the creation of the monetary policy stance index, the effectiveness of non-traditional policy tools becomes debatable. In this context, we may find some studies in the literature. Vural (2013) stated that developed countries use the non-traditional monetary policy instruments that they implemented in the post-global crisis period to stimulate the economy. He stated that the developing countries use non-traditional monetary policy instruments to both stimulate the economy and reduce the negative effects of the capital flows into the country. Besides, the fact that the crises in these countries are more frequent and their effects are more devastating, have led these countries to take more radical decisions about using non-traditional monetary policy instruments. Kara ve Afsal (2018) concluded that non-traditional monetary policy instruments are used for Turkey to provide financial stability and this contributes to financial stability. However, there are also some studies showing the emphasized uncertainties created by the non-traditional monetary policy instruments in the monetary policy stance and the economic problems caused by them (Baker *et al*., 2016, Berke *et al*., 2018, Mueller *et al*., 2017). For instance, Mueller *et al.* (2017) found that monetary policy uncertainty caused significant changes in the exchange rates. In this case, they stated that the use of different instruments of central banks may cause the monetary transmission channel not to work well and may harm inflation targeting.

3. CBRT's Policy Stance: The Policy Change Index

The global crisis that occurred between 2007 and 2009 had a great impact on the economy and the financial system. Within this period, central banks started to use new monetary policy tools in order to overcome the effects of the global crisis and to prevent future economic risks (Yüksel, 2017). Similarly, in this period, the CBRT started to use new monetary policy tools to reduce financial risks in Turkey. In particular, after May 2010, it started to actively use instruments such as asymmetric interest rate corridor, reserve option mechanism (ROM), and required reserve ratio. However, this situation made it difficult to measure the CBRT's policy stance. The reason for this is that many monetary policy instruments come together and are used in different directions (asymmetric) at the same time. The CBRT's simultaneous implementation of both a contractionary and an expansionary policy stance in these periods stems from its efforts to both fight inflation and maintain economic stability. Table 1 summarizes the general framework of the monetary policies implemented by the CBRT between 2001 and 2019.

Table 1

CBRT's Policy Framework during 2001-2019

Traditional Monetary Policy Instruments Period: 2001 – 2010	**Non-Traditional Monetary Policy Instruments Period: 2010 – 2019**
• Policy Rate • Liquidity Management (Late Liquidity Window, Borrowing-Lending, Overnight Borrowing-Lending)	• Policy Rate • Liquidity Management (Overnight Borrowing-Lending and Repo Interest), Late Liquidity Window Borrowing-Lending • Interest Rate Corridor (Overnight Borrowing-Lending) • Required Reserves (TL-FX) • Reserve Option Mechanism (ROM) (Currency-Gold)
OBJECTIVE: Price Stability	**OBJECTIVE:** Price Stability and Financial Stability

During the period between 2001 and 2010, the CBRT used the policy interest rate, one of the classical monetary policy instruments, to ensure price stability and to assist the government's growth and employment policies. To overcome the effects of the 2008 global economic crisis and to try to prevent possible economic risks in the future, it started to use new monetary policy tools after May 2010. Regarding the CBRT policy rates after 2010, due to the excessive growth and increasing domestic loan demand, the CBRT started funding the banks. In other words, this period differs from the pre-2010 period, in which there is excess liquidity in the economic system and, therefore, the policy rate is considered the lower limit of the interest rate corridor. In this new period, the CBRT funds banks with two main interest rate instruments. The first of them is the repo rate, and the second is the overnight lending rate, which constitutes the upper limit of the interest rate corridor. In the post-2017 period, the CBRT started to provide market funding from the late liquidity window instead of the upper limit of the interest rate corridor. The repo rate, on the other hand, it is called the CBRT's policy rate in the post-2010 period. It is important to understand the policy stance of the CBRT, namely that the CBRT can change the market interest rates by reducing the funding it makes from this policy rate without changing the policy rate by forcing the banks to borrow from the upper limit of the interest rate corridor.

Another non-traditional monetary policy tool in the post-2010 period is the required reserve ratios. This concept refers to the ratio that banks accepting deposits have to keep at the Central Bank for the volume of deposits they accept. Since an increase in this ratio will reduce the liquidity available to banks, it will directly reduce the amount of loans they can provide to the private sector. For this reason, the CBRT planned to reduce the credit expansion by increasing the required reserves, with the thought that an interest rate hike could increase the short-term capital inflows (CBRT, 2018). In summary, the CBRT used the reserve requirements as an active monetary policy tool. Another new monetary policy tool is the asymmetric interest rate corridor. This tool became a monetary policy tool that was actively used by the CBRT for the first time. In its application, it is shown to other market elements that the average returns of short-term interest rates to be realized within this interest rate corridor may decrease by reducing the lower limit of the interest rate corridor, that is, by widening the corridor downwards (Kara, 2012). The main task of this instrument is to prevent the entry and exit of speculative money flows. In 2011, this practice was used to direct capital flows. Another new monetary policy tool is the ROM, or the reserve option mechanism. This is an instrument that allows banks to meet a certain percentage of the TL required reserves they have to keep at the CBRT in foreign currency such as euros or dollars, and in gold. With this mechanism, banks can willingly accumulate foreign exchange reserves at the CBRT. The reserve option mechanism, which is expected to act as an automatic stabilizer, is designed to reduce the exchange rate volatility created by capital flows in the domestic markets and to facilitate banks in liquidity management. The coefficients that determine the foreign currency or gold equivalent that can be established for each unit of Turkish lira required reserves are defined as the Reserve Option Coefficient (ROC). Using the mechanism increases the CBRT's gross reserves, but does not change its net reserves. Like the asymmetric interest rate corridor, ROM is a tool used for the first time by the CBRT. With this practice, it was aimed to limit the negative effects of excessive volatility in capital movements on macroeconomic and financial stability, to strengthen the CBRT's gross foreign exchange reserves by increasing and to provide more flexibility to banks in their liquidity management.

3.1 The Policy Stance Index

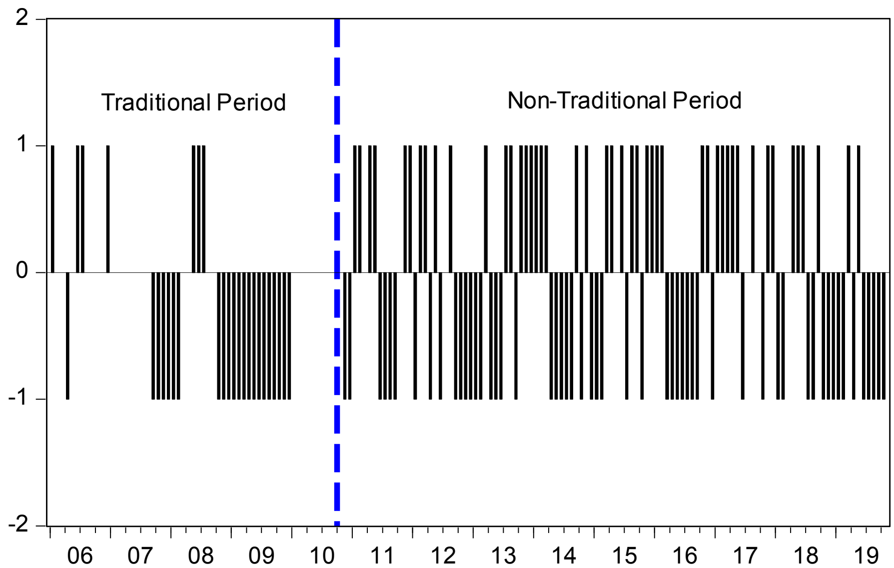
In this study, the policy instruments used by the CBRT are limited to interest rates therefore, the policy stance index that we create can be considered as an interest rate change index similar to that of Xiong (2012). However, such an index design is a first in the Turkish specialized literature. We think that the method in this study will be stimulating in terms of deriving similar indices (*e.g.*, communication index, etc.) in future studies on Turkey. First of all, to create the CBRT's policy change index, it is necessary to define the change in each policy instrument that is going to be used in this index. There are studies in the literature that use the index approach to measure the monetary policy stance (Bernanke & Blinder, 1992; Christiano and Eichenbaum, 1992; Gerlach & Svensson, 2002; Gerlach, 2004; He & Pauwels, 2008; Xiong, 2012). In these studies, the monetary policy instrument is evaluated in terms of the three-choice set. This cluster shows us -1, if the monetary policymaker takes an expansionary stance, shows us 0 if there is no change in stance, and 1 if it adopts a contractionary stance.

$$MSI_t = \left\{ \begin{array}{l} -1, \text{if there is an expansionary change} \\ 0, \text{if there is no change} \\ 1, \text{if there is a contractionary change} \end{array} \right\}$$

While creating the CBRT policy change index, the change in each policy instrument used in the index is evaluated separately between 2006m01-2010m09 (traditional period) and 2010m10-2019m10 (non-traditional period). All the policy instruments considered in these periods are presented in Appendix Table A1 and Table A2. During the period 2006M01-2010M09, the CBRT changed all the policy instruments it used symmetrically. Thus, there was no uncertainty in determining the policy stance during this period. For instance, in 2007M10, the CBRT decreases the overnight borrowing rate by 0.5 points. However, it also decreased the overnight lending rate and late liquidity lending and borrowing rates. In this case the index representing the CBRT's policy stance, the expansionary monetary policy defined as $MSI_{2007m10} = -1$. However, it became a bit difficult to evaluate the overall policy stance index when considering the diversity of the policy instruments used by the CBRT and the asymmetric nature of the change in the policy instruments, especially after 2010M05, because the CBRT implemented some of its policy tools as expansionary and some as contractionary. In this case, the way we make a basic indicative assessment of the policy stance is as follows: If there is the same direction change in the policy instruments, monetary policy stance is defined in the same direction. However, since more policy instruments are included in the policy change index during this period, sometimes it may be seen that the policy instruments move in opposite directions. It is determined that such a stance is 51 times in the 2010M10-2019M10 period. It is assumed that each policy instrument within the index shares the same weight to overcome this confusion caused by conflicting signs. Therefore, if two different signs appear simultaneously, they will balance each other without making a change in the overall monetary policy stance. For example, in 2011M10, CBRT decreased the overnight lending rate and late liquidity lending rate while increasing the TL weighted average reserve ratio and FX weighted average reserve ratio. While the first implementation reflects the expansionary policy stance, the second one is a contractionary policy stance. By assumption, there is no change in the overall monetary policy stance ($MSI_{2011m10} = 0$). The fact that central banks do not make any changes in their monetary policies is an indication that they have adopted a prudent policy in the literature (Xiong, 2012). If the number of conflicting signs does not balance each other, then the policy stance will be in the direction of the policy instrument which has more weight than the others. For instance, in 2012M08, the CBRT decreased the weighted funding cost while increasing the TL weighted average reserve ratio and FX weighted average reserve ratio. Again, the first implementation reflects expansionary policy stance and the second one reflects a contractionary policy stance. By assumption, the overall monetary policy stance is defined as a contractionary, as the second one has more weight ($MSI_{2012m08} = 1$). By consolidating all policy instrument indices, the overall policy change index is shown separately in Figure 1 for the traditional period (2006M01-2010M09) and the non-traditional period (2010M10-2019M10). Besides, information on how the monetary policy stance index is formed for certain periods may be found in Appendix Table A1 and Table A2.

Figure 1

Monetary Policy Stance Index (Interest Rate Change Index)



Along with Figure 1, some interesting patterns of policy changes can be inferred from Table 2, which presents the frequency of three policy changes.

Looking at Table 2, the CBRT did not change its monetary policy stance in 20.73% of the entire period (in 34 out of 165 months). When analyzed periodically, the CBRT did not change its monetary policy stance in 46.15% of the traditional period and 8.11% of the non-traditional period. Therefore, we see that the CBRT preferred a more cautious policy stance in the traditional period than in the non-traditional period, despite the 2008 financial crisis and the economic stagnation it created.

Table 2

Frequencies of the Monetary Policy Change Index by Period

Monetary Policy Stance	Count	Percent
	Entire Period	
-1	78	47.56
0	34	20.73
1	53	31.71
	Traditional Period	
-1	22	42.31
0	24	46.15
1	6	11.54
	Non-traditional Period	
-1	56	50.45
0	9	8.11
1	46	41.44

Again, while the CBRT's monetary policy was expansionary in 47.56% of the entire period, its policy stance was contractionary in 31.71% of the period. When we look at it periodically, one may notice that the CBRT exhibited an expansionary stance in 42.31% of the traditional period and a contractionary stance in 11.54% of the traditional period. The three-quarter contraction in the Turkish economy during the 2008 financial crisis may explain this expansionary stance of the CBRT. When we look at the non-traditional period, the findings are a little more interesting. In the non-traditional period, the CBRT's use of a large number of policy instruments and their asymmetrical changes make it difficult to determine the stance of the CBRT. We think that this uncertainty has been partially reduced with the policy index approach. When we look at Table 2, the CBRT exhibits an expansionary attitude in 50.45% of the non-traditional period, while it exhibits a contractionary attitude in 41.44% of it. In other words, the CBRT continued to display an expansionary stance during the non-traditional period. Despite the absence of an economic recession in the non-traditional period and the increasing rate of deviation from the inflation target (the increase in the inflation gap), the fact that the CBRT was more expansionary is open to discussion. This finding can also be evaluated with the findings of Demiralp and Demiralp (2019) and Çakmaklı and Demiralp (2020). In these studies, it was stated that especially since 2013 (in other words, in the non-traditional period), the political commitment towards a more expansionary policy stance of the CBRT has increased significantly. It has been mentioned that the CBRT's relatively expansionary attitude in the non-traditional period caused the CBRT's credibility to decrease, inflation not being able to be brought under control despite the implementation of inflation targeting, and to increased exchange rate uncertainty. Therefore, our finding that the CBRT exhibited a relatively expansionary stance in the non-traditional period supports the interpretations of both studies.

As a result, the created policy change index in this section adequately captures the important changes in the monetary policy. An empirical analysis of our policy change index is done within the framework of the ordered probit method in the next section.

4. The CBRT Reaction Function: Ordered Probit Method

With the help of the policy change index in Section 3, the policy stance of the CBRT was obtained. This index can help us to discover the link between changes in the CBRT's policy stance and changes in the economy. In other words, it helps us to discover the link between changes in the CBRT's policy stance and the CBRT's policy reaction function. Thus, we might answer the following questions:

- Is the CBRT sensitive to output, inflation, or exchange rates when making policy decisions?
- How sensitive is the CBRT to output, inflation, or exchange rates when making policy decisions?
- Does the CBRT's sensitivity to output, inflation, or exchange rate differs between traditional period and non-traditional period?

In the ordered probit model, the dependent variable has a certain order and limited values. These models in which stochastic term has a normal distribution are known as ordered probit models. There are some applications of the ordered probit approach to the monetary policy reaction function estimation (Eichengreen ***et al***., 1985; Gerlach, 2004; He and Pauwels, 2008, Xiong 2012). In these studies, the monetary policy stance variable is determined based on the pre-determined macroeconomic variables vector. In this section, the features, data, and methods of this model which is used in the econometric analysis of the CBRT policies in the period of 2006M01-2019M10 are explained.

4.1 The Model

Our analysis is similar to the studies made by Gerlach (2004), He and Pauwels (2008), and Xiong (2012). Let us assume that the preferred monetary policy of the CBRT is determined by the following function;

$$MSI_t = \beta' x_t + \alpha ACCMSI_{t-1} + \varepsilon_t \quad (1)$$[4]

where: MSI_t is the variable representing the CBRT's policy stance; x_t is the set of observed macroeconomic variables; vector β is the parameter vector; and ε_t is the error term that is considered to be normally distributed. This function shows that the policy stance preferred by the CBRT is a linear function of certain macroeconomic variables. The role of this preferred policy stance is similar to the Taylor-type monetary policy reaction function. Variables entering x_t upon which MSI_t depends are output gap (ygap), inflation gap (pigap) and real effective exchange rate gap (reergap). The real effective exchange rate gap (reergap) variable is added to the model due to its important role in the framework of the new monetary policy of CBRT, which also targets financial stability. It should be noted that all of the independent variables in the reaction function are expressed in terms of differences from their target/potential values. Theoretically, our expectation is that a positive change in

[4] *We believe that all variables in x_t's set of macroeconomic variables to Equation 1 can explain the CBRT's observed policy decision. Under the normality assumption, the possibilities of the observed policy changes are added to x_t, β, α and ε_t.*

ygap and pigap variables affects the MSI_t variable positively (contractionary monetary policy). For the central banks targeting price stability and financial stability, we expect the increases in reergap variable will affect MSI_t variable negatively (expansionary monetary policy). In other words, under circumstances when the national currency is appreciated, inflationary pressures will decrease and the central banks are expected to implement expansionary monetary policies. When the national currency is depreciating, central banks are expected to take a contractionary stance due to the increase in inflationary pressures (Aklan and Nargeleçekenler, 2008). The cumulative value of MSI_t (namely, $ACCMSI_t$) is also included in the model as a separate variable. This type of cumulative policy change, indicated as $ACCMSI_t$, provides a general measure of the level of monetary policy. The intuition behind $ACCMSI_t$ is simple. In this case, since all other macroeconomic variables have been already greatly influenced (*e.g.*, tightened[5]), it is expected that the possibility of applying the same policy stance in the coming term will decrease (Xiaong, 2012). As it may be understood from here, when $ACCMSI_{t-1}$ increases (tightening), MSI_t is expected to decrease, *i.e.*, the expected sign of α is negative.

4.2. Data

In this study, the monetary policy reaction function is analyzed in determining the sensitivity of the CBRT's policy stance to macroeconomic variables, and 2006M01-2019: M10 period's monthly data are used. The analysis is applied separately for the periods when the CBRT used the traditional and non-traditional policy instruments and for the entire period. Table 3 contains detailed information about the content of the variables used in the study.

Table 3

Variables Used in the Analysis

Variables	Conversion	Data Source
Inflation Gap (PIGAP)	Calculated as the difference between inflation rate and the inflation rate target	CBRT
Output Gap (YGAP)	Calculated by subtracting the long-term equilibrium value obtained from the seasonally adjusted industrial production index by Hodrick Prescott (HP) filtering method	CBRT
Real Exchange Rate Gap (REERGAP)	Calculated by applying HP to the seasonally adjusted real effective exchange rate	CBRT
Cumulative Monetary Policy Stance (ACCMSI)	Calculated by cumulative sum of the policy stance index	Author's Calculation

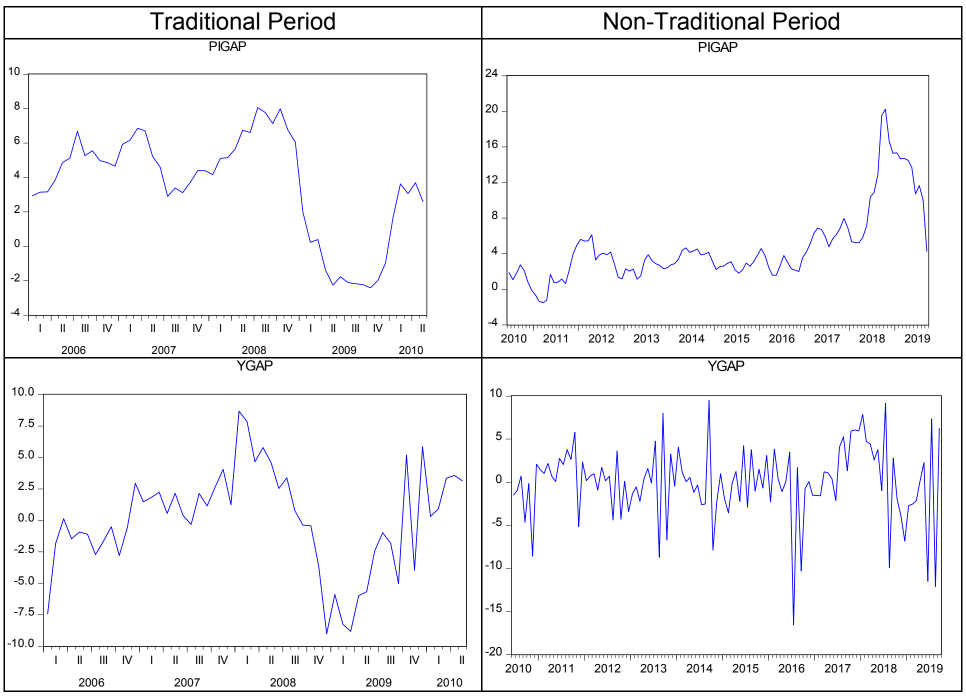
The reason the analysis started from 2006M01 is that the CBRT started to apply the open inflation targeting strategy at that date. In the model, the inflation gap variable is calculated

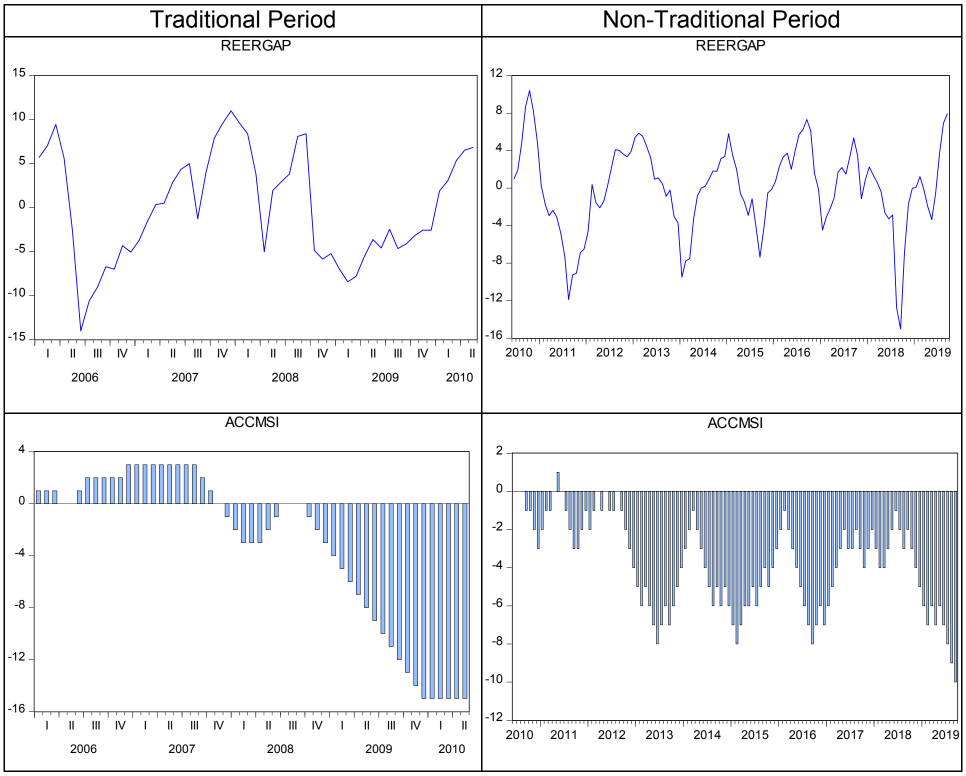
[5] *If the central bank tightens its monetary policy repeatedly, this means a high level of ACCMSI. On the contrary, this means a low-level ACCMSI.*

by taking the difference of the targeted inflation rate from the annual percentage change in the consumer price index. The industrial production index is used to obtain the output gap variable. Thus, the output gap is calculated as the proportional deviation of the seasonally adjusted industrial production index from its Hodrick and Prescott (1997) trend, as is the case with Aklan and Nargeleçekenler (2008), Görgül and Songur (2016), and Caporale *et al*. (2018). The exchange rate gap variable was obtained by taking the difference of the seasonally adjusted real effective exchange rate from the long-term equilibrium value calculated with the HP filter. All series used in the model are shown in Figure 2 for individual periods.

Figure 2

The Evolution of All Series Individual Periods.





5. Empirical Findings

The results of the estimation using the maximum likelihood procedure are shown in Table 4.

Table 4

Ordered Probit Estimation Results

Variables	Entire Period	Traditional Period	Non-Traditional Period
PIGAP	0.061**	0.584***	0.001
	(0.032)	(0.201)	(0.039)
YGAP	0.043*	-0.075	0.004
	(0.025)	(0.089)	(0.030)
REERGAP	-0.052***	-0.088**	-0.078***
	(0.018)	(0.043)	(0.028)
ACCMSI(-1)	-0.015	-0.106**	-0.171***
	(0.011)	(0.047)	(0.056)
Dummy	-1.693***	-3.842***	-1.283**
	(0.398)	-1.077	(0.629)
Pseudo R-squared	0.125	0.502	0.117

Variables	Entire Period	Traditional Period	Non-Traditional Period
LR statistic	42.979	50.694	23.928
Prob(LR statistic)	0.000	0.000	0.000
Log likelihood	-149.703	-25.090	-89.481

*Note: Values in parentheses are standard errors; ***, ** and * indicate 1%, 5% and 10% values, respectively. We also made some attempts to correct the non-constant variance. However, this does not lead to a significant change in the reported standard errors as in Xiong, (2012).*

The ordered probit estimation results are reported in Table 4 and estimations for three periods are different, as we expected. In the first column, the monetary policy reaction function is estimated for the entire period and MSI's reactions to other macroeconomic variables are shown. Over the entire period, the reactions of the MSI variable are towards the economically expected direction and all are statistically significant, except for the ACCMSI (-1) variable only. In the traditional period, the reaction of the MSI variable to all variables except YGAP is statistically significant and is towards the expected direction. Finally, in the non-traditional period, the reaction of the MSI variable to all variables is statistically significant and is towards the expected direction, except for PIGAP and YGAP. As it is shown, the output gap is insignificant in both subperiods, but is significant for the entire period. The finding that the reaction function did not react significantly to the output gap in the two subperiods is in line with the findings of Albayrak and Abdioğlu (2015), Caporale *et al*. (2018), and Akdeniz and Catik (2019). This result shows that the CBRT does not take into account the fluctuations in the output gap in determining the policy stance in the examined subperiods. However, the reaction to the output gap is significant at the 10% level for the entire period. We think that this meaningful reaction may be related to sample size rather than to an economic explanation. A similar result is also found in Albayrak and Abdioğlu's (2015) estimations of the reaction function for alternative sampling periods. In this study, the reaction of the policy rate to the output gap differs as the sample periods change.

The reaction of the MSI variable to the ACCMSI (-1) variable in the traditional and non-traditional period is towards the economically expected direction. In other words, this shows us that the possibility of the central bank applying the same policy stance is gradually decreasing in the coming period. However, this is not true for the entire period. Therefore, it shows us that the policy stance that the CBRT will implement in the next period is unrelated to the previous policy stance for the entire period. However, this is not an expected situation. We think that this result supports our rationale for dividing the sample into sub-periods when estimating the CBRT's stance. Similarly, the differentiation of MSI's periodic reactions to other macroeconomic variables is the main subject of this study. As it was stated, the primary objective of the CBRT in the traditional period was price stability. As Table 4 shows, the fact that the CBRT has a significant contractionary stance in the case that inflation deviates from the target in the traditional period supports this situation. This finding also coincides with the findings of Aklan and Nargeleçekenler (2008), Lebe and Bayat (2011), and Yapraklı (2011). According to these results, in particular, the 2008 financial crisis in the traditional period explains why MSI does not respond to the YGAP variable towards an expected direction. In addition, the crisis' dummy variable negative sign indicates that the CBRT strongly reflected its expansion stance during this period. At the same time, MSI's significant reaction to the variable of REERGAP gives us a clue about the stance of the CBRT in terms of financial stability. In the non-traditional period, it is shown that the MSI variable did not respond significantly to PIGAP and YGAP variables, but had a significant reaction to the REERGAP variable. Therefore, we may say that the policy stance of the CBRT has changed over time, as Coparale *et al*. (2018) and Akdeniz (2021) stated. In addition, this finding shows us that the CBRT, which has adopted the explicit inflation targeting regime since 2006, does not coincide with the main objective of ensuring and maintaining price stability. Therefore, in the non-traditional period, the CBRT's policy stance is more sensitive to the exchange rate gap than to the inflation gap. As Yalçınkaya and Yazgan (2020) stated, this situation may happen because inflation is highly sensitive to changes in exchange rates in the developing open economies such as Turkey, and that price stability depends on the stability of exchange rates. On the other hand, as Demiralp and Demiralp (2019) pointed out, it may also indicate that the expansionary policy pressure on the CBRT, especially in the untraditional period, could not be exerted during exchange rate increases. As a result, the CBRT was only able to show the expected response to exchange rate increases in this period. We may say that this situation harmed the credibility of the CBRT, which did not particularly react to inflation gaps. This comment also supports the comments expressed by Çakmaklı and Demiralp (2020). Along with these comments, there are also studies in the literature that central banks' use of different policy tools and lending with different interest rates may hinder the good functioning of the monetary transmission channel and create policy uncertainty (Baker *et al*., 2016 and Mueller *et al*., 2017). Therefore, this finding can also be interpreted as the non-monetary policy instruments used by the CBRT negatively affecting the credibility of the monetary policy and creating policy uncertainty. Table 5 shows the partial effects of the ordered probit model. Since the obtained findings are compatible with Table 4, the interpretations were made only from a technical point of view.

Table 5

Partial Effects in the Entire Period, Traditional and Non-Traditional Period

Entire Period	Expansionary (-1)	Neutral (0)	Contractionary (1)
PIGAP	-0.017*	0.001	0.016*
	(0.010)	(0.001)	(0.009)
YGAP	-0.017**	0.001	0.016**
	(0.008)	(0.001)	(0.007)
REERGAP	0.015**	-0.001	-0.014**
	(0.006)	(0.000)	(0.005)
ACCMSI(-1)	0.003	-0.000	-0.003
	(0.003)	(0.000)	(0.003)
DUMMY	0.426***	-0.033*	-0.392***
	(0.099)	(0.019)	(0.099)
Traditional period	Expansionary (-1)	Neutral (0)	Contractionary (1)
PIGAP	-0.091***	-0.025	0.066***
	(0.0195)	(0.018)	(0.023)
YGAP	-0.003	0.001	0.002
	(0.014)	(0.004)	(0.010)
REERGAP	0.012*	-0.003	-0.008
	(0.007)	(0.003)	(0.005)
ACCMSI(-1)	0.018**	-0.004	-0.013**
	(0.007)	(0.004)	(0.006)
DUMMY	0.324***	-0.088	-0.235**
	(0.097)	(0.067)	(0.094)

Entire Period	Expansionary (-1)	Neutral (0)	Contractionary (1)
Non-traditional period	Expansionary (-1)	Neutral (0)	Contractionary (1)
PIGAP	-0.011	0.000	0.011
	(0.014)	(0.000)	(0.014)
YGAP	-0.012	0.000	0.012
	(0.010)	(0.000)	(0.010)
REERGAP	0.022***	-0.000	-0.022***
	(0.008)	(0.000)	(0.008)
ACCMSI(-1)	0.060***	-0.000	-0.059***
	(0.016)	(0.001)	(0.015)
DUMMY	0.593***	-0.006	-0.587***
	(0.188)	(0.013)	(0.190)

*Note: Values in parentheses are standard errors; ***, ** and * denote 1%, 5% and 10% values, respectively*.

Considering the partial effects of the ordered probit model for the entire period, the following results come into view. When we interpret the PIGAP variable: if inflation exceeds the target by one percentage point, the CBRT's probability of adopting an expansionary monetary policy stance will decrease by 1.7%. At the same time, the probability of adopting a contractionary monetary policy stance will increase by 1.6%. Moreover, if the inflation exceeds its target by one percent, CBRT’s probability of not changing its policy stance is 0.01%; however, this value is not statistically significant. Our comment for the YGAP variable is as follows: if the potential value of the output exceeds one percent, the probability of the CBRT to adopt an expansionary monetary policy stance will decrease by 1.7%, while the probability of adopting a contractionary monetary policy stance will increase by 1.6%. In such a case, the probability of not changing the policy stance is 0.01% and this value is not statistically significant. The interpretation for REERGAP is as follows. If the real exchange rate exceeds the potential value by one percent, the probability of the CBRT to adopt an expansionary monetary policy stance will increase by 1.5%. At the same time, the probability of adopting a contractionary monetary policy stance will decrease by 1.4%. In such a case, the probability of the CBRT not changing its policy stance is -0.01% and this value is not statistically significant. There was no statistically significant effect of the ACCMSI (-1) variable on the CBRT monetary policy stance. An important finding for this period is that the crisis period affects the CBRT monetary policy stance. In crisis periods, the probability of the CBRT to adopt an expansionary monetary policy stance increases by 42.6%, while the probability of adopting a contractionary monetary policy stance decreases by 39.2%. The probability of not changing the policy stance during the crisis is also reduced by 3.3%.

In the traditional period, if the inflation exceeds its target value by one percent, the probability of the CBRT to adopt an expansionary monetary policy stance decreases by 9.1% while the probability of adopting a contractionary monetary policy stance increases by 6.6%. In this case, the probability of the CBRT not changing its policy stance is - 2.5%. However, this value is not statistically significant. In the non-traditional period, in case of inflation exceeded the target value by one percent, no statistically significant effect is found on the CBRT's monetary policy stance. In the traditional and non-traditional periods, no statistically significant effect of the YGAP variable on the CBRT monetary policy stance is found. If the real exchange rate exceeds the potential value by one percent, the probability of the CBRT to adopt an expansionary monetary policy stance increased by 1.2% in the traditional period, while it increased by 2.2% in the non-traditional period. In other words, the probability of the

CBRT reacting to the changes in exchange rates increased in the non-traditional period as compared to the traditional period. Finally, in Table 5, it is revealed that the probability of the CBRT to adopt a contractionary and expansionary monetary policy stance in the traditional and non-traditional periods differs during crisis periods. When the results are evaluated, it is revealed that CBRT is sensitive to output, inflation, or exchange rate while making its policy decisions. However, one may see that CBRT's reaction changed to these variables in the traditional and non-traditional periods.

6. Conclusion

In this study, we tried to measure the stance of monetary policy in Turkey with an index we created. We estimated a monetary policy reaction function with this index. In addition, the alternative policy tools (on interest) used while creating the index have provided us with a comparison opportunity according to the periods when the CBRT used traditional and non-traditional policy tools. Thus, we have also determined which macroeconomic factors are sensitive to traditional and non-traditional policy instrument choices.

When we analyze the created index, we see that the CBRT preferred a more cautious but expansionary policy stance in the traditional period (2006-2010) as compared to the non-traditional period (2010-2019). The three-quarter contraction in the Turkish economy along with the 2008 financial crisis in the traditional period may be an explanation for the CBRT's more expansionary stance in this period. Due to the CBRT's use of many policy instruments and asymmetric changes in the non-traditional period, the problem of measuring the stance of the CBRT has been partially alleviated with the monetary policy index approach we have created. Thanks to the index, we determined that the CBRT continued to exhibit an expansionary stance during the non-traditional period. Despite the absence of an economic recession in the non-traditional period and the increasing deviation from the inflation target, it is worth discussing that the CBRT is more expansionary. This finding supports the comments that the political commitments towards a more expansionary policy stance of the CBRT have increased significantly since 2013. We think that the CBRT's relatively expansionary stance in the non-traditional period and its failure to control inflation despite its inflation targeting has damaged the credibility of the CBRT.

In addition, the monetary policy reaction function estimated using the created index shows us striking results in terms of the CBRT's policy stance. First of all, the CBRT's policy stance changes over time. In the traditional period, the CBRT determined its policy stance according to the inflation gap and exchange rate gap, while in the non-traditional period it was determined only according to the exchange rate gap. This finding, especially in the non-traditional period, does not coincide with the CBRT's main objective of ensuring and maintaining price stability. However, this happens because inflation is highly sensitive to changes in exchange rates in open economies such as Turkey. Therefore, the CBRT may have given importance to exchange rate stability in order to maintain price stability. From a different perspective, this finding may also indicate that the expansionary policy pressure on the CBRT, especially in the non-traditional period, could not be applied during exchange rate increases. If this is the case, this may be one reason for the CBRT's loss of credibility during the non-traditional period. We think that because CBRT, whose main purpose is to ensure price stability, does not react to inflation gaps explains this situation.

7. Limitations

As stated earlier, many studies on Turkey show that different indicators are used to represent the Central Bank's monetary policy stance. For instance, Alp *et al*., 2010, Gürkaynak *et al*., 2015 used Libor weekly interest to represent the monetary policy stance. A robustness analysis can be made by analyzing the interaction of the policy stance index that we obtained in this study with the Libor weekly interest.

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APPENDIX

Table A1

Traditional Period Monetary Policy Stance Index

Date	Discount Rate Applied in Rediscount Transactions (%)	Interest Rate Applied on Advance Transactions (%)	Late Liquidity Window Borrowing Ratio	Late Liquidity Window Lending Ratio	Overnight Borrowing Rate (Interest Corridor)	Overnight Lending Rate (Interest Corridor)	Monetary Policy Stance Index
2006-01	23.00	25.00	9.50	19.50	13.50	16.50	1
2006-02	23.00	25.00	9.50	19.50	13.50	16.50	0
2006-03	23.00	25.00	9.50	19.50	13.50	16.50	0
2006-04	23.00	25.00	9.25	19.25	13.25	16.25	-1
2006-05	23.00	25.00	9.25	19.25	13.25	16.25	0
2006-06	23.00	25.00	13.25	25.25	17.25	22.25	1
2006-07	23.00	25.00	13.50	25.50	17.50	22.50	1
2006-08	23.00	25.00	13.50	25.50	17.50	22.50	0
2006-09	23.00	25.00	13.50	25.50	17.50	22.50	0
2006-10	23.00	25.00	13.50	25.50	17.50	22.50	0
2006-11	23.00	25.00	13.50	25.50	17.50	22.50	0
2006-12	27.00	29.00	13.50	25.50	17.50	22.50	1
2007-01	27.00	29.00	13.50	25.50	17.50	22.50	0
2007-02	27.00	29.00	13.50	25.50	17.50	22.50	0
2007-03	27.00	29.00	13.50	25.50	17.50	22.50	0
...	...	...	...	...	...	...	...

Table A2

Non-Traditional Period Monetary Policy Stance Index

Date	Discount Rate Applied in Rediscount Transactions (%)	Interest Rate Applied on Advance Transactions (%)	Weighted Average Cost of Funding	Late Liquidity Window Borrowing Ratio	Late Liquidity Window Lending Ratio	Overnight Borrowing Rate	Overnight Lending Rate	One Week Repo Lending Rate	TL Weighted Average Required Reserve Ratio	FX Weighted Average Required Reserve Ratio	Reserve Option Mechanism Currency Max	Reserve Option Mechanism Gold	Monetary Policy Stance Index
2010-10	15.00	16.00		1.75	11.75	5.75	8.75	7.00					0
2010-11	15.00	16.00		0.00	11.75	1.75	8.75	7.00					-1
2010-12	14.00	15.00		0.00	12.00	1.50	9.00	6.50					-1
2011-01	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	7.4	11.0			1
2011-02	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	9.4	11.0			1
2011-03	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	9.4	11.0			0
2011-04	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	13.2	11.0			1
2011-05	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	13.3	11.8			1
2011-06	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	13.3	11.8			-1
2011-07	14.00	15.00	6.25	0.00	12.00	1.50	9.00	6.25	13.2	11.8			-1
2011-08	14.00	15.00	5.75	0.00	12.00	5.00	9.00	5.75	13.2	11.5			-1
2011-09	14.00	15.00	5.75	0.00	12.00	5.00	9.00	5.75	13.1	11.0			-1
2011-10	14.00	15.00	5.75	0.00	15.50	5.00	12.50	5.75	12.6	10.2	20		0
2011-11	14.00	15.00	8.07	0.00	15.50	5.00	12.50	5.75	10.5	10.3	40	10	1
2011-12	17.00	17.75	9.04	0.00	15.50	5.00	12.50	5.75	10.5	10.3	40	10	1
2012-01	17.00	17.75	7.56	0.00	15.50	5.00	12.50	5.75	10.5	10.3	40	10	-1
2012-02	17.00	17.75	7.77	0.00	14.50	5.00	11.50	5.75	10.5	10.3	40	10	1
2012-03	17.00	17.75	9.75	0.00	14.50	5.00	11.50	5.75	10.5	10.3	40	10	1
2012-04	17.00	17.75	8.34	0.00	14.50	5.00	11.50	5.75	10.5	10.3	40	20	-1
2012-05	17.00	17.75	9.81	0.00	14.50	5.00	11.50	5.75	10.5	10.3	40	20	1
2012-06	16.00	16.50	9.02	0.00	14.50	5.00	11.50	5.75	10.5	10.3	40	20	-1
2012-07	16.00	16.50	7.63	0.00	14.50	5.00	11.50	5.75	10.5	10.3	50	20	0
2012-08	16.00	16.50	6.33	0.00	14.50	5.00	11.50	5.75	10.6	10.3	55	25	1
2012-09	16.00	16.50	5.84	0.00	13.00	5.00	10.00	5.75	10.6	10.3	60	30	-1

Date	Discount Rate Applied in Rediscount Transactions (%)	Interest Rate Applied on Advance Transactions (%)	Weighted Average Cost of Funding	Late Liquidity Window Borrowing Ratio	Late Liquidity Window Lending Ratio	Overnight Borrowing Rate	Overnight Lending Rate	One Week Repo Lending Rate	TL Weighted Average Required Reserve Ratio	FX Weighted Average Required Reserve Ratio	Reserve Option Mechanism Currency Max	Reserve Option Mechanism Gold	Monetary Policy Stance Index
2012-10	16.00	16.50	5.78	0.00	12.50	5.00	9.50	5.75	10.6	10.2	60	30	-1
2012-11	16.00	16.50	5.61	0.00	12.00	5.00	9.00	5.75	10.6	10.2	60	30	-1
2012-12	13.50	13.75	5.55	0.00	12.00	5.00	9.00	5.50	10.6	10.2	60	30	-1
2013-01	13.50	13.75	5.60	0.00	11.75	4.75	8.75	5.50	10.6	10.6	60	30	-1
2013-02	13.50	13.75	5.53	0.00	11.50	4.50	8.50	5.50	10.8	11.1	60	30	-1
2013-03	13.50	13.75	5.96	0.00	10.50	4.50	7.50	5.50	11.0	11.5	60	30	1
2013-04	13.50	13.75	5.17	0.00	10.00	4.00	7.00	5.00	10.9	11.5	60	30	-1
2013-05	13.50	13.75	4.52	0.00	9.50	3.50	6.50	4.50	10.9	11.5	60	30	-1
2013-06	9.50	11.00	5.11	0.00	9.50	3.50	6.50	4.50	10.9	11.9	60	30	-1
2013-07	9.50	11.00	6.44	0.00	10.25	3.50	7.25	4.50	10.9	11.9	60	30	1