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Examining the effect of credit on monetary policy with Markov regime switching: Evidence from Turkey[1]

Ali İlhan[2]

Abstract: This paper analyses the effect of credit on monetary policy responses for different regimes in Turkey. To do so, the Taylor rule augmented with the credit gap is estimated by using a Markov regime switching model from January 2006 to December 2019. The empirical findings identify two regimes: the low- and high-interest rate regimes. The prevalence of the former indicates policy authorities' growth priorities. Furthermore, differing responses across the regimes reflect that the Central Bank of the Republic of Turkey has an asymmetric policy stance. In the low-interest rate regime, the monetary policy only significantly responds to inflation. In the high-interest rate regime, both inflation and credit have significant positive impacts on interest rate setting. This indicates that credit conditions affected the tightening of the monetary policy stance in Turkey despite the use of macroprudential tools after the global financial crisis.

Keywords: credit, financial stability, monetary policy, macroprudential policy, Markov regime switching, Turkey.

JEL codes: C24, E44, E52, E58.

Introduction

Since the global financial crisis (GFC) showed that price stability is not sufficient to ensure financial stability, the search for alternative policy tools and frameworks has accelerated.[3] While there were debates on the role of monetary policy in financial stability, international financial institutions focused on establishing a macroprudential policy framework that directly targets systemic risk in the financial system (FSB, IMF & BIS, 2011a, 2011b).

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[3] Before the GFC, many economists were already pointed out that price stability might not guarantee financial stability and monetary policy should consider financial stability (Borio & Lowe, 2002; Borio, English & Filardo, 2003; White, 2006).

Despite the consensus reached for a proactive response to financial instabilities, views differ regarding which policy or policy mix best does this. Suggestions for the best policy framework for achieving price and financial stability mainly fall into two groups.[4] The first group proposes a policy framework in which monetary policy focuses on price stability while macroprudential policy pursues financial stability. Effective macroprudential policies, which should be the first line of defence against financial instabilities, allow monetary policy to focus on price stability (Svensson, 2012, 2017; Ekholm, 2013; Ozkan & Unsal, 2014; Laeven, 2016). In contrast, the second group claims that macroprudential policies are usually inadequate, so monetary policy should lean against macro-financial imbalances. Central banks should consider financial stability in their interest rate setting, while monetary policy and macroprudential policy should complement each other to achieve their goals (Woodford, 2012; Angeloni & Faia, 2013; Borio, 2014; Rungcharoenkitkul, Borio, & Disyatat, 2019; Adrian, 2020).

Reasonable credit growth is vital for macro-financial stability, especially in emerging market economies (EMEs). Jordà, Schularick, and Taylor (2011) showed that the best indicator of financial instability is credit growth. Excessive credit growth increases the risk of a price bubble when it flows into asset markets. As the share of credit in financing consumption and investment increases, it leads to an unsustainable debt burden and damages economic activity (Gross & Zahner, 2021). Furthermore, the rapid credit growth increases depreciation pressure in the foreign exchange market, whose stability is crucial for EMEs (Aizenman & Binici, 2016; İlhan, Akdeniz, & Özdemir, 2022). Agénor and Pereira da Silva (2019) proposed a framework leaning against the credit cycles for EMEs called integrated inflation targeting (IIT). IIT suggests that the credit growth gap should be included in central banks' reaction function while monetary policy and macroprudential instruments should be calibrated together.

One of the EMEs that adopted the lean against the wind strategy after the GFC is Turkey. The domestic and external demand differentiation associated with accelerating capital inflows created dilemmas for the country's existing policy framework. Accordingly, in late 2010, a new policy framework, namely the new policy mix, was implemented under the Central Bank of the Republic of Turkey (CBRT) leadership to simultaneously ensure price and financial stability. In this new policy mix, financial stability was adopted as a supplementary goal of monetary policy while many macroprudential tools were introduced. Monetary and macroprudential policies were implemented in coordination to complement each other. The intermediate targets were controlling credit growth and slowing short-term capital inflows while the intermediate variables were credit and the exchange rates (Başçı & Kara, 2011; Kara, 2013).

This paper analyses the effect of credit on monetary policy responses with a Markov regime switching (MS) model in Turkey. More specifically, the cred-

[4] See Smets (2014) for a detailed review of policy frameworks for financial stability.

it-gap augmented Taylor rule is estimated using the Markov regime switching intercept autoregressive heteroscedasticity (MSIAH) model between January 2006 and December 2019. Unlike previous studies, the effect of credit on monetary policy is examined for different regimes in Turkey. For example, TVP-VAR models allow quantifying the gradual evolution of the interaction between series throughout the sample period, and parameters can change without the subsamples (Çatik & Akdeniz, 2019). However, the MSIAH model defines different regimes and captures the effects of policy stance by providing regime dependent coefficients (Baharumshah, Soon & Wohar, 2017). Thus, the MSIAH model can estimate the impact of credit on monetary policy depending on the CBRT's policy stance.

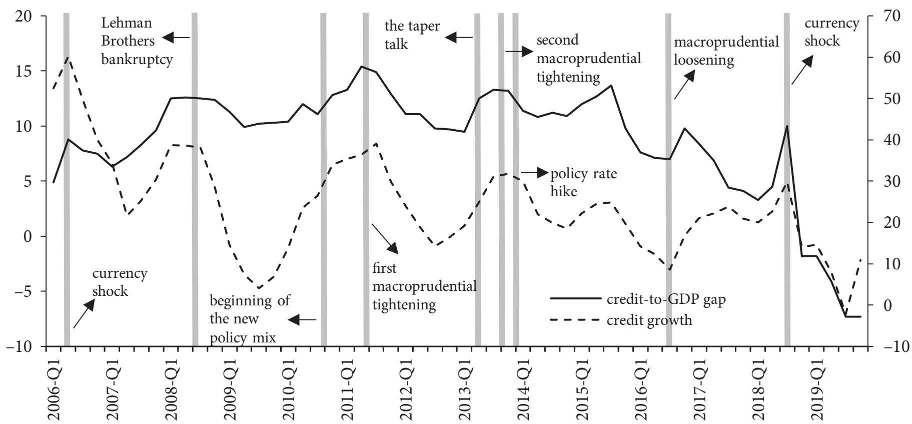
This paper contributes to the literature as follows. First, it analyses two different interest rate regimes with differing coefficients and provides asymmetric monetary policy behaviour in Turkey. Second, the prevalence of the low-interest rate regime throughout the sample period reflects the growth priorities of the policy authorities. Finally, in the low interest rate environment, monetary policy focused only on inflation whereas also the credit gap affected monetary policy decisions in the high-interest rate regime. The significance of the effect in the high-interest rate regime indicates that credit conditions contributed to a tightening of monetary policy stance in Turkey.

The paper proceeds as follows. Section 1 explains Turkey's monetary and macroprudential policy responses to credit developments in full-fledged inflation targeting. Section 2 reviews the empirical literature. Section 3 describes the data and methodology. The following section provides the empirical results and discussion. The final section concludes the paper.

1. Policy responses to credit developments in Turkey

The Turkish banking sector, which operated as a public debt financier in the 1990s due to high bond yields, returned to its traditional intermediary function after the 2001 crisis and credit volume grew. The improvement in credit quality due to a decline in the ratio of non-performing loans encouraged the perception that rapid credit growth indicated the normalisation of the banking sector (Kenc, Turhan, & Yildirim, 2011). In May 2006, however, a currency shock interrupted credit growth when the policy rate was increased by 425 basis points in two months (CBRT, 2022a) due to a sharp depreciation of the Turkish Lira (TL) and increased inflation expectations (CBRT, 2008). The monetary policy responses to restore price and exchange rate stability slowed credit growth (see Figure 1). Despite the modest recovery after the first months of 2007, credit growth suffered from the GFC. The policy rate was reduced by 650 basis points between December 2008 and April 2009 to limit the GFC's harmful effects on economic activity and financial stability (CBRT, 2009).

The quantitative easing and unconventional monetary policies of advanced economies to alleviate the adverse effects of the GFC accelerated capital inflows to EMEs, thereby creating new macro-financial risks. Exposed to these risks, as are many EMEs, Turkey was forced to switch its policy framework. In the new policy mix, the CBRT announced that monetary policy considers financial stability while emphasising the use of non-rate instruments under various scenarios (CBRT, 2010). Accordingly, the CBRT employed reserve requirements and unique tools for financial stability, such as the asymmetric interest rate corridor and the reserve option mechanism. Moreover, in the second half of 2011, the Banking Regulation and Supervision Agency (BRSA) introduced various macroprudential instruments to control credit growth (CBRT, 2014b). Due to these measures and the impact on capital flows of the sovereign debt crisis in the euro area, credit growth declined from the third quarter of 2011 (see Figure 1).



Note: The left axis stands for the credit-to-GDP gap, while the right denotes credit growth. All values are in percent for both axes. The credit-to-GDP is the ratio of credit from all sectors to private non-financial sectors to GDP. The credit-to-GDP gap is the difference between the actual value of the credit-to-GDP and its trend. Credit growth is the annual growth of total credit volume in the banking sector's balance sheets.

Figure 1. Credit-to-GDP gap and credit growth in the Turkish economy: 2006Q1–2019Q4

Source: Author's construction based on CBRT (2022b) and BRSA (2022).

From the second half of 2012, an increasing global risk appetite accelerated capital inflows to Turkey while falling interest rates to ease appreciation pressure in TL encouraged credit growth (CBRT, 2013). However, once this exceeded a reasonable level (Kara, Küçük, Tiryaki, & Yüksel, 2013), the authorities under the leadership of the BRSA further tightened the macroprudential policy stance by introducing new tools and strengthening existing tools (CBRT, 2014b).

Besides these macroprudential instruments, a tightening monetary policy stance associated with global financial conditions also helped restrain credit growth. Following the taper talk in May 2013 (Bernanke, 2013), its implementation in December 2013 accelerated capital outflows from EMEs. The CBRT hiked interest rates sharply in January 2014 due to worsening TL depreciation (CBRT, 2015).

After a series of shocks in the second half of 2016 deepened the slowdown in credit growth, Turkey's macroprudential policy stance was eased in September 2016 (CBRT, 2016; İlhan, Özdemir, & Eryigit, 2021). While monetary policy tightened in 2017 to limit the depreciation in TL associated with global shocks (CBRT, 2018), credit growth was supported by increased credit guarantee fund incentives (IMF, 2018). Although the monetary policy stance was not loosened in the first half of 2018, the pace of credit growth increased. However, the currency shock in August 2018 and the subsequent rise in inflation resulted in a sharp interest rate hike and falling credit growth (CBRT, 2019). The policy rate, which had remained constant in the first half of 2019, declined by 1200 basis points until the end of the year, resulting in a recovery in credit growth (CBRT, 2020).

2. Literature review

Many studies have estimated the exchange rate-augmented Taylor rule in analysing the CBRT's actions to achieve financial stability (Hasanov & Omay, 2008; Civcir & Akçağlayan, 2010; Caporale, Helmi, Çatık, Ali & Akdeniz, 2018; Yağcıbaşı & Yıldırım, 2019; Soybilgen & Eroğlu, 2019; Özdemir, 2020; Tetik & Yıldırım, 2021). However, few have examined the role of credit in Turkey's monetary policy.

Çamlıca (2016) investigated the CBRT's responses to financial stress using a composite index of systemic stress, which is an indicator of financial risk in the credit, money, equity, forex and bond markets, for 2005:01 – 2015:10. Compared to the pre-GFC period, the CBRT responded more to financial stress, and adopted a lean against the wind strategy after mid-2010. Erdem, Bulut, and Kocak (2017) analysed the exchange rate gap- and credit gap-augmented Taylor rule in a time-varying manner using a cointegration test and the Kalman filter for 2006:01 – 2016:02. Although the nominal domestic credit gap and exchange rate gap affected the interest rate settings, they did not change the priorities of the CBRT in the new policy mix.

Chadwick (2018) explored the impact of monetary and macroprudential policies on consumer credit growth with panel VAR for the period from 2005:12 to 2017:12. A contractionary monetary policy has a restrictive impact on credit growth. Moreover, this impact is greater when combined with macroprudential policy. Kurowski, Rogowicz, and Smaga (2020) examined the Taylor rule extended with the credit-to-GDP gap using the TVP-VAR model from 2002Q1 to 2018Q3. The interest rate settings were adjusted following the Taylor rule and credit conditions were considered in monetary policy decisions after 2010 in Turkey. The effect of interest rate settings on credit and inflation increased with the strengthening of monetary transmission mechanisms after the GFC.

3. Data and methodology

This study used an MS model to investigate the effect of credit on Turkey's monetary policy between January 2006 and December 2019. The starting date corresponds to the adoption of full-fledged inflation targeting while the ending date excludes the impact of COVID-19.

Taylor (1993) suggested a simple interest rate rule, known as the Taylor rule, for policy authorities focusing on price and output stability. However, increasing financial stability concerns have led others to expand this rule by including financial variables (Käfer, 2014). Following this literature, an augmented Taylor rule is employed to analyse the impact of credit on monetary policy in Turkey. The credit-augmented Taylor rule to be estimated is as follows:

$$i_t = \alpha + \beta i_{t-1} + \delta(\pi_t - \pi_t^*) + \theta(y_t - y_t^*) + \omega(cr_t - cr_t^*) \quad (1)$$

Here, i_t stands for the policy rate. The CBRT used different short-term interest rates as policy rates throughout the sample period. Moreover, from late 2010, the multi-policy rate framework was employed in line with an unconventional approach (Binici, Kara & Özlü, 2016). Alp, Kara, Keleş, Gürkaynak and Orak (2010) showed that the strongest predictor of Turkey's monetary policy stance is the one-week Turkish Lira Libor (TRLIBOR) rate. Similarly, Gürkaynak, Kantur, Taş and Yıldırım-Karaman (2015) used the one-week TRLIBOR to measure the effective policy rate. Therefore, the one-week TRLIBOR rate is used in this study to represent the CBRT's policy rate.

π_t is actual inflation, obtained from the annual percentage change of the consumer price index, while π_t^* is the inflation target. The inflation gap $(\pi_t - \pi_t^*)$ is calculated as the difference between actual inflation and its target. y_t is the industrial production index, which proxies for output while cr_t represents the total credit volume in the banking sector. For both variables, the actual values (y_t, cr_t) are transformed into the logarithmic form before applying the Hodrick--Prescott[5] filter for the trend values (y_t^*, cr_t^*). The trend values are then subtracted from their actual values to obtain gaps. The series representing season-

[5] The Hodrick-Prescott smoothing parameter was set as $\lambda = 14400$, while suggest power for λ was set as 2.

al effects are adjusted with the Census X-13. To eliminate level differences, all series are standardised.

The series are taken from various databases. The one-week TRLIBOR rate is retrieved from the Banks Association of Turkey. The consumer price index and production index of total industry are obtained from the Federal Reserve Economic Data. The banking sector's total credit volume is retrieved from the CBRT. Table 1 shows the time series properties and descriptive statistics of the variables.

Table 1. Descriptive statistics and unit root test results

Descriptive statistics					
Variables	**Observations**	**Mean**	**Maximum**	**Minimum**	**Standard deviation**
i_t	168	12.534	26.318	5.089	5.199
π_t	168	9.547	25.240	3.986	3.593
π_t^*	168	5.178	7.500	4.000	0.860
y_t	168	87.524	119.990	56.995	18.714
cr_t	168	1,010,904	2,587,738	136,063	755,481

Unit root test results			
Variables	**LM**	DT_{1t}	DT_{2t}
i_t	−6.2557***	2009:08	2018:03
$(\pi_t - \pi_t^*)$	−7.2967***	2008:11	2018:06
$(y_t - y_t^*)$	−5.9626**	2008:08	2011:01
$(cr_t - cr_t^*)$	−5.3337*	2009:01	2010:10

Note: Descriptive statistics are the level forms of the series. ***, **, and * show stationary at 1%, 5%, and 10% significance level, respectively.

Source: Author's estimation.

Inflation and the interest rate reached their maximum levels in September 2018, right after the currency shock in August. While the minimum value of the interest rate corresponded to the beginning of the taper tantrum, inflation fell to its lowest value in the first months of 2011, when global liquidity was abundant. Actual inflation remained well above the target levels due to recent jumps in inflation. Output was lowest around the GFC whereas it peaked in the last month of 2017.

The time-series properties of the variables were analysed using Lee and Strazicich's (2003) unit root test, allowing for two structural breaks. The trend break model indicates that all series are stationary in their levels. Furthermore, the first break dates of all variables correspond to the GFC while the second break dates for the inflation gap and the interest rate fall in the first and second quarters of 2018, respectively, before TL's sharp depreciation. The second break of the credit gap corresponds to the beginning of the new policy mix.

This study used an MS model to estimate the augmented Taylor rule. MS models identify different regimes and allow the dynamic behaviour of the variables to be examined depending on each regime. In these models, past regimes can reoccur throughout the sample while the number of regimes generally varies from two to at most four (Baharumshah et al., 2017, pp. 249–250).

In MS models, the switch in regime is not defined as the outcome of a deterministic event but by an unobserved random variable (s_t), called the regime or state. Since s_t takes only discrete values in determining the regime, a Markov chain is used for the regime switching process (Hamilton, 1994, pp. 677–678). The *N*-state Markov chain with transition probabilities is defined as follows:

$$P\{s_t = j | s_{t-1} = i, s_{t-2} = k, \ldots\} = P\{s_t = j | s_{t-1} = i\} = p_{ij} \quad (2)$$

Here, p_{ij} is the transition probability, which is the probability that state j is preceded by state i, and the sum of the transition probabilities is equal to 1. The transition probabilities can be collected in the following $N \cdot N$ transition matrix (Hamilton, 1994, pp. 678–679):

$$P = \begin{bmatrix} p_{11} & p_{21} & \cdots & p_{N1} \\ p_{12} & p_{22} & \cdots & p_{N2} \\ \vdots & \vdots & \cdots & \vdots \\ p_{1N} & p_{2N} & \cdots & p_{NN} \end{bmatrix} \quad (3)$$

The maximum likelihood (ML), which is the expectation-maximisation (EM) algorithm-based method, is used for the estimation of the MS model.[6] The value of the ML function increases with each iteration of the EM algorithm (Hamilton, 1994, p. 689). These processes continue until the parameters converge (Çatık & Önder, 2011, p. 128).

Many MS models allow for switches in the intercept, mean, and variance of the residuals throughout the regimes governed by an unobserved state variable. This study used the MSIAH model as it takes into account the entire parameter shift and changes in the variance of the residuals throughout the state (Çatık & Önder, 2011, p. 127). The model is shown in linear form in equation (1), but it can be re-written for the two-regime MSIAH model:

[6] The EM algorithm, which was developed by Dempster, Laird and Rubin (1977), was employed by Hamilton (1990) for the ML estimation (Krolzig, 1997).

$$i_t = \beta(s_t)(i_{t-1}) + \delta(s_t)(\pi_t - \pi_t^*) + \theta(s_t)(y_t - y_t^*) + \omega(s_t)(cr_t - cr_t^*) + \varepsilon_t \quad (4)$$

The estimated coefficients are strongly dependent on the state variable (s_t). The integer variable s_t can take the values 1 or 2 to indicate, respectively, that the low-interest or high-interest rate regime prevails.

4. Empirical results and discussion

The empirical findings indicate the existence of both the low- and high-interest rate regimes, called Regime 1 and Regime 2, respectively. That is, the CBRT adopted two different monetary policy stances. Regime 1 reflects a loose stance whereas Regime 2 reflects a tight stance. Table 2 shows the transition matrix and the properties of the two regimes.

Table 2. Transition matrix and regime properties

Transition matrix			
	Regime 1	Regime 2	
Regime 1	0.881	0.118	
Regime 2	0.156	0.843	
Regime properties			
	Observation	Probability	Duration
Regime 1	97.7	0.568	8.43
Regime 2	70.3	0.431	6.40

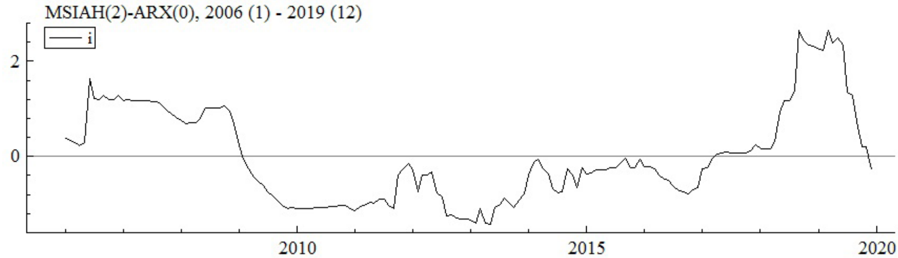
Source: Author's estimation.

As the transition matrix in Table 2 shows, the switching probability from the high- to the low-interest rate regime is higher (15.6%) than that of switching from the low- to the high-interest rate regime (11.8%). Furthermore, the regime properties indicate that the low regime was more likely to be implemented and to last for longer. These findings reflect the policy authorities' monetary policy preferences, which favoured growth. Figure 2 shows changes in regime probabilities over the study period.[7]

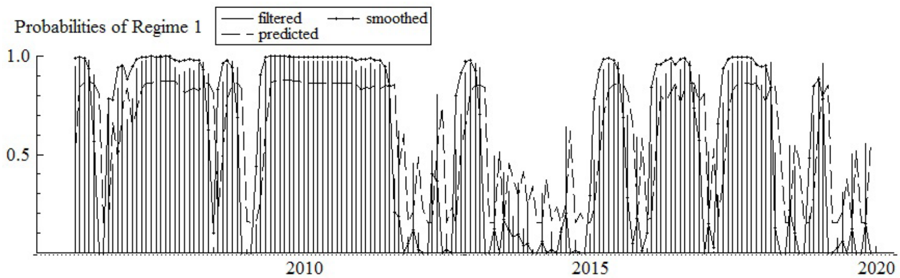
The regime probabilities in Figures 2(b) and 2(c) clearly show that the low-interest rate regime dominated before a surge in capital flows threatened financial stability. The first switch from a low- to high-interest rate regime after the GFC took place when the banking sector's annual credit growth was close to

[7] The regime classifications are reported in Table A1 in the Appendix.

a) Interest rate



b) Low-interest rate regime



c) High-interest rate regime

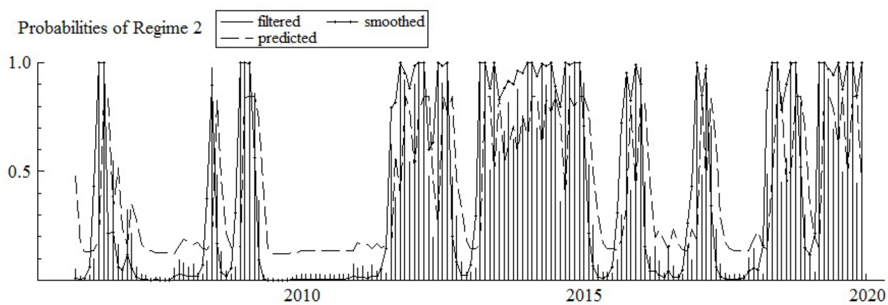


Figure 2. Regime probabilities
Source: Author's estimation.

40% nominal. During this period, macroprudential policy practices started to restrain credit growth (Kara, 2016). In the next high-interest rate regime, the taper tantrum began (Bernanke, 2013), and the CBRT hiked the policy rate, citing TL depreciation (CBRT, 2014a). In addition, macroprudential policies were further tightened in response to accelerating credit growth (CBRT, 2014b). Excluding short-lived switches, the subsequent prevalence of the high-interest rate regime corresponds to the jumps in the nominal exchange rate in the spring of 2018. While interest rate declined from the second half of 2019, the sample ends with a high-interest rate regime.

Prior to estimating the model, its nonlinearity was evaluated with diagnostic tests. As seen in Table 3, the likelihood (LR) linearity test rejects the null hypothesis of linearity and supports the nonlinear model. The log-likelihood and Akaike information criterion (AIC) values of the linear and nonlinear models also verify the two-regime model (Çatık & Önder, 2011; Kumah, 2011). Table 3 presents the empirical results for the estimation.

Table 3. Estimation results

Regime 1 (Standard error: 0.051)			
Variables	**Coefficient**	**Standard error**	***t*-value**
α	–0.006	0.007	–0.927
i_{t-1}	0.965***	0.009	99.072
$(\pi_t - \pi_t^*)$	0.031***	0.010	2.981
$(y_t - y_t^*)$	0.013	0.009	1.504
$(cr_t - cr_t^*)$	0.012	0.008	1.461
Regime 2 (Standard error: 0.297)			
Variables	**Coefficient**	**Standard error**	***t*-value**
α	–0.067	0.043	–1.551
i_{t-1}	0.759***	0.068	11.096
$(\pi_t - \pi_t^*)$	0.209***	0.093	3.188
$(y_t - y_t^*)$	–0.003	0.044	–0.077
$(cr_t - cr_t^*)$	0.156***	0.050	3.098
LR Linearity Test: 160.059 Chi (6) = (0.000)* Chi (8) = (0.000)*** **			

	Log-likelihood	AIC
Nonlinear model	98.540	–1.006
Linear model	18.510	–0.148

Note: ***, **, and * show significance at 1%, 5%, and 10%, respectively.

Source: Author's estimation.

As Table 3 shows, the coefficients differ in sign, size, and significance between the regimes, which supports the nonlinear interest rate setting and the two-regime model. Furthermore, the differentiation of responses is consistent with previous studies reporting an asymmetric monetary policy behaviour for Turkey (Hasanov & Omay, 2008; Caporale et al., 2018; Öge Güney, 2018; Bulut, 2019; Özdemir, 2020).

In the low-interest rate regime, inflation positively and significantly impacts the policy rate, whereas the output and credit gap effects are insignificant. That is, monetary policy focused on the traditional goal, namely price stability, in a low interest rate environment. The coefficients of the high-interest rate regime indicate that the monetary policy took an additional responsibility. The effect of the inflation gap is significant and positive while the coefficient is larger. However, as in the low-interest rate regime, the output gap is insignificant.[8] On the contrary, the credit gap significantly and positively impacts interest rate setting. This indicates that the rising credit gap had an impact on the tightening of monetary policy in Turkey.

These empirical findings confirm those of Erdem and others (2017), Chadwick (2018) and Kurowski and others (2020), who found that credit conditions affected monetary policy decisions in Turkey. Furthermore, the findings consistent with those of Çamlıca (2016), who reported that the CBRT adopted a lean against the wind strategy after mid-2010, to some extent.

A robustness check is performed by augmenting the Taylor rule with another credit variable. Since many macroprudential tools, especially those implemented by the BRSA, mainly aim to control consumer credit growth (CBRT, 2014b), it is worth examining whether consumer credit affected monetary policy. To this end, the Taylor rule augmented with the consumer credit gap ($ccr_t - ccr_t^*$) is estimated.[9]

The empirical findings indicate that the regime probabilities and properties are largely similar to those of the credit-augmented Taylor rule estimation (see Table A3 in the Appendix). In the low-interest rate regime, monetary policy aligns with the standard Taylor rule. Both inflation and the output gap positively and significantly impact the policy rate, whereas the consumer credit gap is insignificant. In contrast, in the high-interest rate regime, inflation and the consumer credit gap significantly and positively affect the policy rate, whereas the output gap has no significant effect. Thus, consumer credits affected the policy rate despite the availability of many macroprudential tools. In conclusion, the robustness check findings verify that credit developments impacted the tightening of the monetary policy stance in Turkey between January 2006 and December 2019.

Conclusions

This study investigates the effect of the credit gap on monetary policy responses in Turkey employing the MSIAH model between January 2006 and December 2019. The empirical findings show that in the low interest rate environment,

[8] When the credit variable is removed from the equation and the standard Taylor rule is estimated, results are similar to credit-augmented Taylor rule findings. In the high-interest rate regime, only inflation has a significant and positive impact on interest rate setting, while the output gap is insignificant (see Table A2 in the Appendix).

[9] Consumer credit is retrieved from the BRSA and similar processes are performed for the consumer credit gap (see Section 3).

monetary policy focuses only on inflation, whereas the credit gap also influences monetary policy decisions in the high-interest rate regime. This indicates that credit conditions contributed to a tightening of the monetary policy stance in Turkey.

The role of monetary policy on financial stability substantially depends on the performance of macroprudential policy. When macroprudential policy falls short of ensuring financial stability, monetary policy might support macroprudential policy (Gerlach, 2012). Many studies have reported that macroprudential policies have a limiting effect on credit growth in Turkey (Binici, Erol, Kara, Özlü & Ünalmış, 2013; Bulut, 2015; Bumin & Taşkın, 2016; Yüceyılmaz, Altın & Tunay, 2017; Alper, Binici, Demiralp, Kara & Özlü, 2018; Chadwick, 2018; İlhan et al., 2021). However, empirical findings show that macroprudential policy was not the only way to control credit growth. Similar to what Kurowski and others (2020) pointed out, the determinants of the monetary policy stance in the high-interest rate regime indicate that the policy framework was partially consistent with the IIT strategy.

The effect of credit developments on interest rate settings also indicates that monetary policy was complementary to macroprudential policy in Turkey. However, this led to adverse side effects on price stability. In the new policy mix, monetary policy, which was also concerned with financial stability, deviated from its primary goal (Gürkaynak et al., 2015). On the other hand, macroprudential policy stance loosened prematurely with the increasing impact of growth priorities. Furthermore, macroprudential policy has not been comprehensive enough, and measures have not directly covered controlling commercial credit growth (Kara, 2016; IMF, 2018). Therefore, implementing a more effective macroprudential policy would ease the burden on monetary policy and increase its room for manoeuvre. Price stability-focused and clearer monetary policy framework would reduce uncertainty and help achieve the ultimate goal of the CBRT.

Appendix

Table A1. Regime classification

Regime 1	Regime 2
2006:01 – 2006:05	2006:06 – 2006:07
2006:08 – 2008:05	2008:06 – 2008:06
2008:07 – 2008:11	2008:12 – 2009:03
2009:04 – 2011:07	2011:08 – 2012:08
2012:09 – 2013:02	2013:03 – 2015:01
2015:02 – 2015:08	2015:09 – 2016:01
2016:02 – 2016:12	2017:01 – 2017:03
2017:04 – 2018:03	2018:04 – 2018:11
2018:12 – 2019:02	2019:03 – 2019:12

Source: Author's estimation.

Table A2. Estimation results of the standard Taylor rule

Regime 1 (*n*: 99.2, Prob.: 0.577, Duration: 8.61, Standard error: 0.052)			
Variables	Coefficient	Standard error	*t*-value
α	–0.011	0.007	–1.573
i_{t-1}	0.965***	0.010	95.682
$(\pi_t - \pi_t^*)$	0.033***	0.010	3.258
$(y_t - y_t^*)$	0.023***	0.006	3.620
Regime 2 (*n*: 68.8, Prob.: 0.422, Duration: 6.29, Standard error: 0.323)			
Variables	Coefficient	Standard error	*t*-value
α	–0.032	0.046	–0.696
i_{t-1}	0.738***	0.077	9.564
$(\pi_t - \pi_t^*)$	0.252***	0.072	3.477
$(y_t - y_t^*)$	0.038	0.050	0.766
LR Linearity Test: 156.871 Chi (5) = (0.000)* Chi (7) = (0.000)*** **			

	Log-likelihood	AIC
Nonlinear model	92.380	–0.956
Linear model	13.944	–0.106

Note: ***, **, and * show significance at 1%, 5%, and 10%, respectively.

Source: Author's estimation.

Table A3. Estimation results of the consumer credit-augmented Taylor rule

Regime 1 (n: 98.8, Prob.: 0.574, Duration: 8.67, Standard error: 0.052)			
Variables	Coefficient	Standard error	t-value
α	–0.008	0.007	–1.229
i_{t-1}	0.965***	0.009	98.427
$(\pi_t - \pi_t^*)$	0.032***	0.010	3.135
$(y_t - y_t^*)$	0.017*	0.009	1.926
$(ccr_t - ccr_t^*)$	0.007	0.008	0.970
Regime 2 (n: 69.2, Prob.: 0.425, Duration: 6.41 Standard error: 0.307)			
Variables	Coefficient	Standard error	t-value
α	–0.074	0.046	–1.596
i_{t-1}	0.741***	0.070	10.513
$(\pi_t - \pi_t^*)$	0.265***	0.068	3.708
$(y_t - y_t^*)$	–0.022	0.051	–0.436
$(ccr_t - ccr_t^*)$	0.153**	0.068	2.557
LR Linearity Test: 161.223 Chi (6) = (0.000)* Chi (8) = (0.000)*** **			
	Log–likelihood	AIC	
Nonlinear model	96.199	–0.978	
Linear model	15.587	–0.114	

Note: ***, **, and * show significance at 1%, 5%, and 10%, respectively.

Source: Author's estimation.

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