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Threshold Regression Model for Taylor Rule: The Case of Turkey

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This paper employs the structural threshold approach of Kourtellos et al. (2016) to examine various specifications of the Taylor rule model. Contrary to the previous work on the Taylor rule, this methodology allows for endogeneity of the threshold variable in addition to the right-hand-side variables suggesting a fully comprehensive flexible framework that does not rely on restrictive linearity and/or exogeneity assumptions. In order to examine the model, Turkey is selected as an inflation targeting developing economy, since its central bank (the Central Bank of Turkey) as argued by Dincer and Eichengreen (2014) has been one of the fastest improving central banks in terms of its transparency score. We will use monthly data for the period of 2004-2018 that includes a number of historical episodes such as the global financial crisis as well as various internal political developments that may have had an impact on the fluctuations of the relevant macroeconomic variables as well as on the functional form of the inflation targeting Taylor rule specification. Empirical findings highlight the different reactions of the central bank in determining policy rate under different regimes.

Keywords: Nonlinearities, Taylor rule, Threshold regression models

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1 Introduction

The Turkish economy has had a long history of high inflation, even reaching levels of over a hundred percent, combined with successive periods of economic crises in 1979, 1994, 1997 and 2001. After the decades of high inflation, Central Bank of the Republic Turkey (CBRT) was officially granted its independence following the amendment of the Central Bank Law in 2001 and started to implement implicit inflation targeting (IT) policies. Following a successful disinflation effort which managed to bring down the inflation rate to single digits, IT was explicitly adopted as the main target policy. As a result CBRT gained credibility and found itself among the top central banks in terms of its rapid increase in the transparency index achieved. Within the group of over 120 central banks CBRT's transparency score rose from 3.2 in 1998 to 5.5 in 2010 (Dincer and Eichengreen, 2014). The success of this disinflation effort[1] led researchers to estimate different Taylor rule models for Turkey (Us, 2007; Yazgan and Yilmazkuday, 2007; Çağlayan and Astar, 2010; Aklan and Nargelecekenler, 2008; Civcir and Akçağlayan, 2010; Khakimov et al., 2010; Erdem and Kayhan, 2011; Güney, 2016). These studies provided different results for the estimated parameters as they consider different periods, versions of the rule and different methodologies.

Following the great financial crisis 2009, the monetary policy of CBRT has been gradually redesigned and a macroprudential policy approach has become more and more dominant (Kara, 2012, 2016). This redesign in the monetary policy approach has raised some concerns regarding the loss of the main objective of maintaining price stability. Gürkaynak et al. (2015) stated that while CBRT was a strong inflation targeter early in 2000's, it has began to pay less attention to inflation after 2009. They also provided empirical evidence to their claim by detecting a change in the estimated policy rule coefficient at that date. From the institutional perspective Ozel, 2012 indicated a deterioration in the independence of Turkish regulatory agencies in general, including the CBRT, even though they were regarded as a model for a number of countries at the begining of 2000's. Similarly Demiralp and Demiralp (2019) pointed out that CBRT has currently been experiencing an erosion in its independence. They showed that political intervention, as captured by political commentaries favoring a drop in interest rates, is as influential as traditional variables in the Taylor rule.

These policy changes and concerns of political interventions indicates the importance of introducing non-linearities and regime changes in modeling Taylor rule targeting for Turkey. This topic has been recently analyzed together with some other emerging market countries by Caporale et al. (2018) via a threshold model using the inflation as a threshold variable. In this paper, we also analyze the Taylor rule targeting of Turkey via threshold models allowing however for the threshold variable and the regressors to be endogenous. In the literature of nonlinear regression models, threshold regression offers a convenient and parsimonious way to charac-

[1]See Ersel and Özatay (2008) and Benlialper and Cömert (2015)

terize nonlinearities without running into curse of dimensionality issues that plague alternative nonparametric and semiparametric approaches. These models imply that below and under the estimated threshold parameter, the slope parameters differ and imply regime specific marginal responses. Initial studies based on the work of Hansen (2000) and Caner and Hansen (2004), even allowing for endogenous regressors, assume that the threshold variable itself is exogenous. The structural threshold models by Kourtellos et al. (2016) provides a generalization that allows for the endogeneity for the threshold variable and also regime-specific heteroscedasticity. In this paper we will follow their approach as our estimation strategy, since the threshold variable may be in itself an important determinant that cannot be separated in an ad hoc manner from the other potentially endogenous regressors.

The rest of the study is organized as follows. Section 2 explains the model, data and methodology. Section 3 presents the empirical findings, while the last section concludes the paper. In the appendix we collect a variety of additional Taylor rule specifications that were estimated in addition to the ones reported in the main text[2]. These different specifications confirm the main features of the models presented in the main body of the paper.

2 Model and methodology

The Taylor rule suggests a basic monetary policy rule[3] for central banks such that inflation and real output deviations from their target levels would be determining the short-term interest rate target. Following this basic rule, several different versions are used in the literature taking into account open economy requirements and country specifications. We consider two different specification for the Taylor rule.

2.1 Model I

This first model is a basic Taylor rule augmented by exchange rate. The standard Taylor rule (Taylor, 1993) observes a policy rule for Federal Reserve suggesting that inflation gap and output gap are the determinants of the federal funds rate. Several papers considered the incorporation of exchange rate as an additional variable into the policy rule (see, among others, Taylor (2001) and Mohanty and Klau (2005)). Many studies of Turkish monetary policy high-

[2]In the literature, there are many criticisms against different specifications. Hamilton (2018) criticizes HP filtering technique for calculations of gap. Fernandez et al. (2010) suggests that unemployment rate is more useful than detrended output in the monetary policy models. Orphanides (2003) argues that concepts such as the natural rate of interest and potential output are known to be notoriously unreliable as policy indicators. Yellen (2005) criticizes constant natural (or neutral) real interest rate. Considering these criticisms, we run several Taylor rule estimations using different specifications for relevant variables. We do not document all the results to conserve some space, however, the complete results can be provided upon request.

[3]Taylor (1993) provides a policy rule for Federal Reserve suggesting that inflation (π) above a target of 2 percent and percentage deviation of real GDP from its trend (y) affect federal funds rate (r) by 0.5, i.e., $r = \pi + 0.5y + 0.5(\pi - 2) + 2$.

light the importance of the inclusion of exchange rate in the policy rule considering the fragility of economy to exchange rate shocks (Us, 2007; Civcir and Akçağlayan, 2010; Erdem and Kayhan, 2011). Moreover, Turkey was found as the only country whose reaction function has a significant response to exchange rate changes among the 5 emerging markets considered by Caporale et al. (2018, pp.312). Following this literature, the first estimated Taylor rule in this paper also includes an exchange rate variable in addition to inflation gap and output gap. Froyen and Guender (2018) strongly suggest the use of real exchange rate in a Taylor rule specification and following this suggestion, we will use the real exchange rate rather than the nominal one.

The model employs policy rate (i_t) as a function of inflation gap, which is the difference between realized inflation (π_t) and the inflation target set by the central bank (π_t^T), output gap ($\tilde{y}_t$), which is calculated as HP filtered output, and the real effective exchange rate (rer_t).

$$i_t = \beta_0 + \beta_1(\pi_t - \pi_t^T) + \beta_2\tilde{y}_t + \beta_3 rer_t \tag{1}$$

2.2 Model II

The second model is selected based on CBRT's own approach to be country specific, as outlined in inflation reports of CBRT (CBRT, 2018). This model takes the natural real interest rate into account:

$$r_t = r^*_{t-1} + \rho_r(r_{t-1} - r^*_{t-1}) + (1-\rho_r)(\theta_\pi E_t(\pi_{t+1} - \pi_t^T) + \theta_y\tilde{y}_t) + u_t \tag{2}$$

where $\tilde{y}_t$ is the output gap using HP filter, r_t is the interest rate minus the average inflation rate and r^* is the natural (neutral) real interest rate.

2.3 Methodology

In this study, the two Taylor rule models outlined above are examined using a threshold regression methodology, an approach that relies on a parsimonious modeling of possible nonlinearities that avoids the curse of dimensionality issue that plagues alternative nonparametric methodologies. Threshold regression models have been used extensively in applied work in the last twenty years. In the first generation of threshold models, Hansen (2000) developed a useful asymptotic distribution theory for both the threshold parameter estimate and the regression slope coefficients under the assumption that the threshold effect becomes smaller as the sample increases, while Caner and Hansen (2004) allowed for endogenous regressors, under an exogenous threshold variable framework. In the second generation of threshold models Kourtellos et al. (2016) allow for an endogenous threshold variable. The main strategy here was to exploit the intuition obtained from the limited dependent variable literature, and to relate the problem of having an endogenous threshold variable with the analogous problem of having an endogenous dummy variable or sample selection in the limited dependent variable framework. However, there is one important difference. While in sample selection models, we observe the assignment of observations into regimes but the (threshold) variable that drives this assignment is taken to be latent, here, it is the opposite here as we do not know which observations belong to which regime (we do not know the threshold value), but we can observe the threshold variable. To put it differently, while endogenous dummy models treat the threshold variable as unobserved and the sample split as observed (dummy), here one treats the sample split value as an unknown to be estimated. Just as in the limited dependent variable framework, consistent estimation of slope parameters under normality requires the inclusion of a set of inverse Mills ratio bias correction terms, implying that the slope parameter estimates of the threshold regression by Hansen (2000) and Caner and Hansen (2004) will be inconsistent in the endogenous threshold variable case due to the omission of the inverse Mills ratio bias correction terms.

As there are many potential endogenous threshold variable candidates we select the one that best fits the data using a GMM J-statistic criterion to identify the best threshold model out of the pool of threshold variable candidates. Once the threshold variable is selected then we will adopt both a two stage least squares (2SLS) and GMM estimation approach for the estimation of slope parameters and we will also provide asymptotically valid confidence intervals for the threshold parameter. We will proceed as follows. We first test the null hypothesis of linearity against the alternative of a nonlinear Taylor rule model using the LM-test of Hansen (2000) for all possible threshold variable candidates and select the one with the best fit according to the J-statistic. We then estimate the threshold Taylor rule models, by applying the Kourtellos et al. (2016) structural threshold regression (STR) estimation tests using both two-stages least squares and GMM methodology.

3 Empirical Findings

3.1 Data

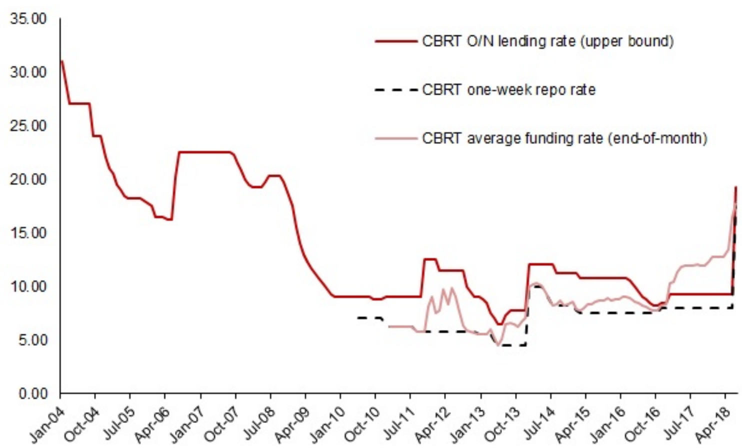
We employ monthly data for the period of 2004-2018 for Turkey. The existence of a ”plethora” of interest rates employed by CBRT (see Figure 1) requires a choice on the appropriate policy rate. We use official policy rates, i.e., overnight rate for the period of January 2004 - 2010 April, one-week repo for the period of May 2010 - December 2013 and average funding rate of CBRT[4] for the period of January 2014 - June 2018.[5]

Inflation is used as the annual (%) change of CPI. Inflation target is the official target of CBRT. Output is seasonally adjusted industrial production index. Output gap is calculated by taking HP filter of logarithmic output. Real effective exchange rate (RER) is CPI 2003 based

[4]This is the weighted average cost of outstanding funding by the CBRT via Interbank Money Market (overnight lending facility) and Open Market Operations (BIST repo, primary dealer repo, one-week repo via quantity auction, one-week repo via traditional auction and one-month repo, see Küçük et al. (2016)

[5]Alp et al. (2012) and Gürkaynak et al. (2015), both use TRlibor arguing that it is a better predictor as a policy rate.

Figure 1: Policy rates (%)



and is in logarithmic form. A rise in RER refers to appreciation.[6] Table 1 presents descriptive statistics.

Table 1: Descriptive statistics

Variables	Mean	Std Dev	Max	Min
Interest rate	0.1299	0.0681	0.3100	0.0500
Inflation rate	0.0874	0.0199	0.1600	0.0400
Inflation gap	0.0235	0.0220	0.0781	-0.0240
Output gap	0.0003	0.0415	0.0900	-0.1500
RER	4.6697	0.1031	4.8514	4.3442

Table 2 provides Phillips and Perron (1988) and Lee and Strazicich (2003) unit root test results. The latter one allows for breaks with unknown dates. Inflation gap, output gap and real exchange rate are observed to be stationary rejecting the null hypothesis of unit root with break. However, the interest rate produces an ambiguous result with either test. There are several studies observing an ambiguity regarding the (non)stationarity property of interest rates but end up using them in levels according to theoretical arguments Clarida et al. (2000); Martin and Milas (2004, 2013); Castro (2011); Caporale et al. (2018).

[6]CBRT defines real effective exchange rate, which is calculated by the weighted averages of foreign currencies according to their trade ratio, using this formula: $P/(P^{*}XR)$, where P and P^{*} are domestic and foreign prices, respectively.

Table 2: Unit Root Tests

	Phillips-Perron Test		Lee-Strazizich Test	
Variables	C	C-T	LM-Stat	Break date
Interest rate	-2.6030*	-0.7824	-2.9339	2014M08
Inflation gap	-1.8450	-0.7889	-4.3916**	2008M09
Output gap	-4.7449***	-4.7317***	-4.3922**	2008M09
RER	-0.5711	-2.0608	-4.2337**	2008M09

Note: The values above are test statistics. The null hypothesis for Phillips-Perron and Lee-Strazizich tests are existence of unit root (with break in the latter one). *,**,*** denote significance at 10%,5% and 1% significance levels. For Lee-Strazizich test, the critical values for RER are -4.7833, -4.2337 and -3.9588; for the other variables are -4.7266, -4.1707 and -3.8877 at 1%, 5% and 10% significance levels, successively. For Phillips-Perron test, the critical values are -2.5757, -2.8781 and -3.4683 for constant case; -3.1421, -3.4360 and -4.0119 for constant and trend case, successively. C and C-T refer to constant and constant&trend cases.

3.2 Structural Threshold Taylor Rule model I

In this first model, nominal interest rate is used in levels form and is regressed on inflation gap, output gap and real effective exchange rate using each variable as a candidate threshold variable. q_t is defined as the threshold variable and γ is the threshold parameter. Threshold variable lower/higher than the estimate for the threshold parameter denotes low regime (L) periods/high regime (H) periods.

$$\begin{aligned} i_t = I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(\pi_t - \pi_t^T) + \beta_2^L \tilde{y}_t + \beta_3^L rer_t \\ + I(q_t > \gamma)(\beta_0^H + \beta_1^H(\pi_t - \pi_t^T) + \beta_2^H \tilde{y}_t + \beta_3^H rer_t) + u_t. \end{aligned} \tag{3}$$

Hansen (2000) LM-test in Table 3 shows that regressions with all candidate threshold variables reject the null hypothesis of linearity for model I. The Structural Threshold Taylor Rule (STR) model using GMM estimation shows that regression with the threshold variable inflation gap best fits as the J statistic is the lowest. However, the threshold estimate is observed to be insignificant which results in ambiguity in terms of selecting the best fitted model. There are two models with significant threshold parameters, RER and interest rate. Among these two candidates, RER has the smallest J-statistics. Hence, in Table 4, test results for the model with the threshold variable RER are provided for Hansen, STR-GMM and STR-2SLS[7].

The test results reflects that in the low regime period, when RER is lower than the estimated threshold level, inflation gap and RER variables are found to be significant with negative coefficients. Keeping in mind that a rise in RER refers to an appreciation, the low regime period refers to the relatively depreciated currency period and the negative coefficient of RER suggests that

[7]Test results for the models with other threshold candidates are available in the appendix

Table 3: Threshold estimates for Model 1

Threshold Candidates	Hansen Test LM-test	Hansen Test Threshold	GMM J-stat	GMM Threshold	2SLS Threshold
Inflation gap	48.2661	0.0039	4.5242	-0.0017	0.0039
	(0.0000)	[-0.0001, 0.0070]		[-0.0151, 0.062]	[-0.0151, 0.062]
Output gap	36.7058	0.0112	22.5194	0.0000	0.0100
	(0.0000)	[0.0056, 0.0249]		[-0.05, 0.05]	[-0.05, 0.05]
RER	32.2128	4.6619	8.5986	4.6687	4.7005
	(0.0000)	[4.6283, 4.7101]		[4.5096, 4.7878]	[4.5096, 4.7878]
Interest rate	115.8041	0.1550	25.9689	0.1400	0.1400
	(0.0000)	[0.1350, 0.1550]		[0.06, 0.23]	[0.06, 0.23]

Note: Apart from LM-test and J statistics, values above are threshold estimates. Values in brackets are confidence intervals in 95%. Values in paranthesis for LM-test are bootstrap p-values.

a depreciation in the currency raises interest rates in this period. As will be discussed below, since depreciations not only induce serious cost inflation in Turkey but also cause inflationary expectations to become more pessimistic, CBRT is expected to have tendency to favor the appreciation. As an emerging market country raising interest rates may help to attract capital flows, hence results in appreciation which is also helpful for controlling prices. On the other hand, the inflation gap is observed to have a negative effect on interest rate contrary to theory. Hence, we may argue that when the depreciation is over the threshold, concerns on currency dominate monetary policy over inflation targeting and we observe an opposite sign on the inflation gap variable. However, in the high regime period, that is when RER is above the estimated threshold level for RER (appreciated currency), the inflation gap becomes the sole significant variable with the expected sign. In this period, there is no need for CBRT to worry about depreciation for its adverse effect on inflation so it can use its interest rate policy to dampen the domestic demand to fight against inflation.

3.3 Structural Threshold Taylor Rule model II

In this model, the natural real interest rate (r_t^*) is estimated using Kalman filter based on Öğünç and Batmaz (2011).[8] In our model, expected inflation is the expected end of year inflation and real exchange rate is also added to the original model in equation 2 considering the importance of exchange rate to a developing open economy.

$$\begin{aligned} r_t - r_{t-1}^* = {} & I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(r_{t-1} - r_{t-1}^*) + \beta_2^L(E_t\pi_{end} - \pi_t^T) + \beta_3^L\tilde{y}_t + \beta_4^L rer_t) \\ & + I(q_t > \gamma)(\beta_0^H + \beta_1^H(r_{t-1} - r_{t-1}^*) + \beta_2^H(E_t\pi_{end} - \pi_t^T) + \beta_3^H\tilde{y}_t + \beta_4^H rer_t) + u_t \end{aligned} \quad (4)$$

[8] They employ two alternative specifications for natural real interest rates for the period of 1989-2005. The first model assumes a simple random walk specification for natural interest rate and the second model related natural rate with a trend growth rate and risk premium. Kara et al. (2007) also make a similar proposition to the first model in their output gap model estimation. For simplicity, we employ the first model of Öğünç and Batmaz (2011)

Table 4: Threshold Test Results for Model 1

Variables	**Hansen test**	**GMM**	**2SLS**
Regime 1	$RER_t < \hat{\gamma}_{rer}$	$RER_t < \hat{\gamma}_{rer}$	$RER_t < \hat{\gamma}_{rer}$
Constant	2.1800***	3.8181**	-0.3148
	(0.5137)	(1.6786)	(0.8098)
Inflation gap	-1.3848***	-2.1986***	-1.1553***
	(0.3128)	(0.3555)	(0.3415)
Output gap	-0.2996	-0.2348	-0.2519*
	(0.2292)	(0.227)	(0.142)
RER	-0.4422***	-0.8306*	0.2189
	(0.1111)	(0.4785)	(0.2276)
Regime 2	$RER_t > \hat{\gamma}_{rer}$	$RER_t > \hat{\gamma}_{rer}$	$RER_t > \hat{\gamma}_{rer}$
Constant	0.225	1.4425	-2.1362
	(0.617)	(3.035)	(1.3057)
Inflation gap	0.7483***	1.0198***	1.1144***
	(0.2334)	(0.2368)	(0.1916)
Output gap	0.2077	0.1495	0.3131**
	(0.1389)	(0.1610)	(0.1260)
RER	-0.0218	-0.2457	0.3558
	(0.1302)	(0.5323)	(0.2278)
Difference			
Constant		2.3756	1.8214**
		(1.5863)	(0.9042)
Inflation gap		-3.2184***	-2.2697***
		(0.4377)	(0.3913)
Output gap		-0.3842	-0.5650***
		(0.277)	(0.1908)
RER		-0.5849***	-0.1369
		(0.1953)	(0.1754)
IMR		-0.2191	0.7251**
		(0.7092)	(0.3607)
JSSE		0.5775	0.5872
No. of high regime		97/174	77/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 10%,5% and 1% significance levels. JSSE refers to joint sum of squares and IMR refers to inverse Mill ratio.

Hansen (2000) LM-test in Table 5 shows that models with all the threshold candidates reject the null of linearity at 10% significance level. The STR model using GMM selects the model with the threshold variable output gap according to J-statistics, however the threshold estimate is observed to insignificant. Again, only the model with RER as the threshold variable has significant threshold effect.

The test results for Model 2, given in Table 6 are in line with the results in Model 1, such that RER has a negative effect in the low regime period (depreciated currency), whereas inflation gap has a positive effect on the real policy rate gap (using natural real policy rate) in the high regime period (appreciated currency). In addition to these findings, Model 2 shows a positive effect of output gap in the appreciated currency period. Hence, the high regime period fits the

Table 5: Threshold estimates for Model 2

Threshold Candidates	Hansen Test LM-test	Hansen Test Threshold	GMM J-stat	GMM Threshold	2SLS Threshold
Inflation gap	14.3985	0.0478	4.0896	0.0106	0.0247
	(0.033)	[0.0170, 0.0574]		[-0.0089, 0.0487]	[-0.0089, 0.0487]
Output gap	13.0258	-0.024	2.812	-0.0044	-0.0250
	(0.065)	[0.034, 0.0200]		[-0.05, 0.0458]	[-0.05, 0.0458]
RER	17.3548	4.5623	5.4897	4.6687	4.5623
	(0.005)	[0.5622, 4.5886]		[4.5096, 4.7878]	[4.5096 , 4.7878]
Interest rate	21.781	0.0662	8.5652	0.0262	0.0262
	(0.001)	[0.0061, 0.0711]		[-0.0713, 0.0962]	[-0.0713 , 0.0962]

Note: As in Table 3

expectations from a standard central bank policy standpoint as both the inflation and output gaps display positive and significant effects.

4 Conclusion

This study examines how policy rate is determined in Turkish economy using two Taylor rule models. As an open developing economy, it seems highly possible that there is not a single rule followed by CBRT as also argued by several empirical work in the literature (Kara et al., 2007; Gürkaynak et al., 2015; Caporale et al., 2018). Dummy variables, structural breaks, sample splitting models are some of the options to handle nonlinearity issues. However, threshold regression models stand out since these techniques estimate the threshold parameters and hence are less restrictive compared to time-dependent regime switching models. Kourtellos et al. (2016), differently from the previous threshold models, allows for endogeneity for the threshold variables. In this paper, we employ GMM and two stages least squares methodology of Kourtellos et al. (2016).

In the empirical work, real exchange rate is added to the standard Taylor rule model and is selected as the preferred threshold variable by the employed test statistics. Our estimates indicate the Taylor rule implies different behaviors according to whether the real exchange is above or below the threshold. In the appreciated currency period, when CBRT has no need to have concerns on currency due its adverse effects on inflation, the Taylor rule exhibits its expected characteristics and indicates that CBRT adjust interest rate according to inflation and output.

However, in the times of currency depreciation, CBRT may appear to lose its main policy objective of inflation targeting and focuses on the depreciation of the currency. We think that this interpretation should be taken with caution. It is widely known that Turkish economy is highly dependent on imported inputs and exchange rate depreciations cause to inflation via pass-through mechanism. Moreover, currency depreciations deteriorate confidence, worsen inflation expectations, and have the potential of leading to depreciation-inflation spiral (Arbalı, 2003;

Table 6: Threshold Test Results for Model 2

Variables	**Hansen test**	**GMM**	**2SLS**
Regime 1	$RER_t < \hat{\gamma}_{rer}$	$RER_t < \hat{\gamma}_{rer}$	$RER_t < \hat{\gamma}_{rer}$
Constant	0.8232***	0.055	0.8698***
	(0.2114)	(0.3633)	(0.2939)
Lagged LHS	0.1946*	1.0459***	0.2266
	(0.1134)	(0.0847)	(0.2584)
Inflation gap	0.5900***	0.2789	0.5967
	(0.2476)	(0.2284)	(0.4185)
Output gap	0.1472	0.0155	0.1517
	(0.1262)	(0.0324)	(0.1731)
RER	-0.1916***	-0.0248	-0.2107***
	(0.0461)	(0.0915)	(0.0684)
Regime 2	$RER_t > \hat{\gamma}_{rer}$	$RER_t > \hat{\gamma}_{rer}$	$RER_t > \hat{\gamma}_{rer}$
Constant	0.0568	0.3589	0.2297
	(0.0346)	(0.4186)	(0.2220)
Lag LHS	0.9820***	0.9451***	0.9828***
	(0.0072)	(0.0365)	(0.0091)
Inflation gap	0.0630***	0.0429	0.0649**
	(0.0254)	(0.0445)	(0.0312)
Output gap	0.0457***	0.0662***	0.0445***
	(0.0125)	(0.0163)	(0.0102)
RER	-0.0127*	-0.0652	-0.0417
	(0.0073)	(0.0732)	(0.0384)
Difference			
Constant		-0.3039	0.6401**
		(0.2606)	(0.3218)
Lag LHS		0.1008	-0.7563***
		(0.0976)	(0.2582)
Inflation gap		0.236	0.5318
		(0.2284)	(0.4194)
Output gap		-0.0507	0.1072
		(0.0359)	(0.1735)
RER		0.0404	-0.169***
		(0.0493)	(0.0647)
IMR		-0.0697	-0.0517
		(0.0958)	(0.0593)
JSSE		0.51518	0.0062
No. of high regime		97	149

Note: As in Table 4. Lagged LHS refers to the lagged value of left hand side (dependent) variable variable.

Kara et al., 2007; Kara and Öğünç, 2008; Karagöz et al., 2016; Civcir and Akçağlayan, 2010; López-Villavicencio and Mignon, 2017). As emphasized by Benlialper and Cömert (2015), because of its impact on inflation, exchange rate appreciation has played an important role as a dis-inflationary tool in Turkey. Hence focusing on the currency depreciation may not necessary mean that CBRT loses its objective of fighting inflation. As indicated in the introduction, after the great financial crisis of 2009, the newly adopted macro-prudential approach has rendered Turkish central bank more cautious about financial stability. As in many emerging markets, in Turkey, financial stability is always considered closely linked to exchange rate stability. By also following the famous fear of floating argument of Calvo and Reinhart (2002) it can be argued that keeping exchange rate stable is crucial since fluctuations can deteriorate the confidence on the economy leading to capital outflows that further destabilize exchange rates which hampers the implementation of inflation targeting. Consequently, when the currency depreciation is above certain threshold it is certainly possible that its priority dominates monetary policy.

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Appendix A: Linear GMM analysis for alternative models

Table A. 1 provides the results of linear GMM estimation for the following seven alternative models.

Model 1

$i_t = \beta_0 + \beta_1(\pi_t - \pi_t^T) + \beta_2\tilde{y}_t + \beta_3 rer_t + u_t,$

where i_t is official policy rates as explained in the data section, $\tilde{y}_t$ is the output gap using HP filter, rer_t is the real effective exchange rate as explained in the data section. In this model, inflation gap is employed as the difference between contemporaneous inflation and inflation target.

Model 2

$r_t - r^*_{t-1} = \beta_0 + \beta_1(r_{t-1} - r^*_{t-1} + \beta_2 E_t(\pi_{end} - \pi_t^T) + \beta_3\tilde{y}_t + \beta_4 rer_t + u_t,$

where r_t is the real interest rate which is calculated as nominal interest rate minus contemporaneous inflation rate, r^* is the natural real interest rate as explained in Section 3.3. $E_t\pi_{end}$ is expected end of year inflation. Expected inflation for the end of year is obtained from the survey of expectations of CBRT.

Model 3
$\Delta i_t = \beta_0 + \beta_1(E_t\pi_{end} - \pi_t^T) + \beta_2\tilde{u}_t + \beta_3 rer_t + u_t,$
where $\tilde{u}_t$ is the unemployment gap. Unemployment gap is the difference between NAIRU and unemployment rate where NAIRU is calculated by regressing the first difference of inflation on unemployment rate using the following model: $\pi_t - \pi_t^e = -a(u - u_t^*) + \nu_t$, where we assume adaptive expectations, so that $\pi_t^e = \pi_{t-1}$ and constant non-accelarating inflation rate of unemployment as defined in Ball and Mankiw (2002). In this model nominal interest rate is assumed to be non-stationary, and its first difference, Δi_t, is used in the estimation.

Model 4
$\Delta i_t = \beta_0 + \beta_1(\pi_t - \pi_t^T) + \beta_2\tilde{y}_t + \beta_3 rer_t + u_t,$

Model 5
$\Delta r_t = \beta_0 + \beta_1(E_t\pi_{end} - \pi_t^T) + \beta_2\tilde{y}_t + \beta_3 rer_t + u_t$

Model 6
$\Delta i_t = \beta_0 + \beta_1(E_t\pi_{end} - \pi_t^T) + \beta_2\tilde{y}_t + \beta_3 xrvol_t + u_t,$
where $xrvol_t$ is the exchange rate volatility using monthly standard deviations of daily data.

Model 7
$\Delta i_t = \beta_0 + \beta_1(E_t\pi_{end} - \pi_t^T) + \beta_2\tilde{y}_t + \beta_3 rer_t + u_t$

Appendix B: Threshold analysis for the 7 alternative models outlined in Appendix A

Model 1:

$$\begin{aligned} i_t = I(q_t \le \gamma)(\beta_0^L + \beta_1^L(\pi_t - \pi_t^T) + \beta_2^L\tilde{y}_t + \beta_3^L rer_t) \\ + I(q_t > \gamma)(\beta_0^H + \beta_1^H(\pi_t - \pi_t^T) + \beta_2^H\tilde{y}_t + \beta_3^H rer_t) + u_t \end{aligned} \quad \text{(B. 1)}$$

Table A. 1: Linear - GMM models

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.0764***	0.0710**	0.0650*	0.1192***	-0.1832	-0.0086***	-0.0395
	(0.0289)	(0.0294)	(0.0378)	(0.0428)	(0.2649)	(0.0032)	(0.04267)
Lagged LHS		0.9885***					
		(0.0088)					
Inflation gap	0.0644**	0.0493*	-0.0262	-0.0605*	-0.0139	-0.1865**	0.1026***
	(0.03071)	(0.0272)	(0.0379)	(0.0365)	(0.3483)	(0.0914)	(0.0357)
Output gap	0.0260	0.0344***		0.0881***	0.3055*	0.1143***	-0.0523**
	(0.0175)	(0.0117)		(0.0274)	(0.1670)	(0.0360)	(0.0267)
Unemployment gap			0.0004				
			(0.0007)				
RER	-0.0168***	-0.0156***	-0.0138*	-0.0252***	0.0669		0.0076
	(0.0061)	(0.0062)	(0.0080)	(0.0091)	(0.0554)		(0.0090)
XRVOL						0.4592***	
						(0.1607)	

Note: Lagged LHS refers to the lagged value of left hand side (dependent) variable variable. RHS (right hand side) variables are instrumented using their lagged values. Values in parentheses are robust standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 1: Hansen (2000) for Model 1

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0039	0.0112	4.6619	0.1550
95% C.I.	[-0.0001, 0.0070]	[0.0056, 0.0249]	[4.6283, 4.7101]	[0.1350, 0.1550]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	5.5603***	0.9694***	2.1800***	0.8710***
	(0.9764)	(0.3117)	(0.5137)	(0.1320)
Inflation gap	1.6458	-0.6782***	-1.3848***	-0.0499
	(1.0419)	(0.2317)	(0.3128)	(0.1230)
Output gap	0.3433**	-0.0399	-0.2996	-0.3401***
	(0.1683)	(0.1701)	(0.2292)	(0.0592)
RER	-1.1429***	-0.1783***	-0.4422***	-0.1698***
	(0.2060)	(0.0666)	(0.1111)	(0.0280)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	-0.8394***	-1.4435***	0.2250	0.5941***
	(0.1999)	(0.3655)	(0.6170)	(0.1609)
Inflation gap	1.6826***	1.2027***	0.7483***	-0.3033***
	(0.2456)	(0.3063)	(0.2334)	(0.0903)
Output gap	0.1789	0.0698	0.2077	0.0979
	(0.1323)	(0.4577)	(0.1389)	(0.0793)
RER	0.1916***	0.3274***	-0.0218	-0.0794**
	(0.0423)	(0.0798)	(0.1302)	(0.0342)
LM-test	48.2661	36.7058	32.2128	115.8041
Bootstrap P-Value	0.0000	0.0000	0.0000	0.0000

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 10%, 5% and 1% significance levels.

Table B. 2: Structural regression model using GMM for Model 1

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	-0.0017	0.0000	4.6687	0.1400
95% C.I.	[-0.0151, 0.062]	[-0.05, 0.05]	[4.5096, 4.7878]	[0.06, 0.23]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	19.5147***	0.8138*	3.8181**	1.3508***
	(3.3289)	(0.4606)	(1.6786)	(0.1220)
Inflation gap	16.0191***	-1.3190***	-2.1986***	-0.1405
	(3.0555)	(0.3620)	(0.3555)	(0.1046)
Output gap	0.7963*	-0.2620	-0.2348	-0.3138***
	(0.4067)	(0.3576)	(0.2270)	(0.0526)
RER	-2.6007***	-0.3096***	-0.8306*	-0.1822***
	(0.3750)	(0.0580)	(0.4785)	(0.0233)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	-8.2207***	-1.1068**	1.4425	0.2488
	(1.8161)	(0.4359)	(3.0350)	(0.3918)
Inflation gap	8.3658***	1.1293***	1.0198***	-0.2695*
	(1.7259)	(0.3095)	(0.2368)	(0.1505)
Output gap	-0.7569**	-1.3775	0.1495	0.3943***
	(0.3834)	(1.0921)	(0.1610)	(0.1371)
RER	0.2918***	0.4326***	-0.2457	-0.0967
	(0.0809)	(0.1094)	(0.5323)	(0.0764)
Difference				
Constant	27.7354***	1.9206***	2.3756	1.1020***
	(5.0319)	(0.7487)	(1.5863)	(0.4374)
Inflation gap	7.6532***	-2.4483***	-3.2184***	0.1290
	(2.2501)	(0.4704)	(0.4377)	(0.1858)
Output gap	1.5532***	1.1156	-0.3842	-0.7081***
	(0.5723)	(0.9317)	(0.2770)	(0.1450)
RER	-2.8925***	-0.7423***	-0.5849***	-0.0855
	(0.3802)	(0.1361)	(0.1953)	(0.0784)
IMR(kappa)	8.6157***	-0.9849	-0.2191	0.5325***
	(2.2435)	(0.6157)	(0.7092)	(0.1399)
JSSE	0.4514	0.6479	0.5775	0.0902
JSTAT	4.5242	22.5194	8.5986	25.9689
Upper regime (%)	147/174	88/174	97/174	63/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate.. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels. JSSE is short for joint sum of squares.

Table B. 3: Structural threshold regression using Least Squares for Model 1

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0039	0.0100	4.7005	0.1400
95% C.I.	[-0.0151, 0.062]	[-0.05, 0.05]	[4.5096, 4.7878]	[0.06, 0.23]
Regime 1	$\pi \leq \gamma_{\pi}$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_{i}$
Constant	5.4716***	0.4143	-0.3148	1.0083***
	(1.1148)	(0.3551)	(0.8098)	(0.1724)
Inflation gap	1.6478*	-0.6501**	-1.1553***	-0.0451
	(0.9006)	(0.3196)	(0.3415)	(0.0734)
Output gap	0.3211*	-0.1612	-0.2519*	-0.2948***
	(0.1775)	(0.2230)	(0.1420)	(0.0528)
RER	-1.1309***	-0.1313**	0.2189	-0.1629***
	(0.1346)	(0.0580)	(0.2276)	(0.0189)
Regime 2	$\pi > \gamma_{\pi}$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_{i}$
Constant	-0.8173	-1.4255***	-2.1362	0.4145
	(0.6376)	(0.5211)	(1.3057)	(0.4162)
Inflation gap	1.6658***	1.0649***	1.1144***	-0.3066***
	(0.3671)	(0.2378)	(0.1916)	(0.1226)
Output gap	0.1819	-0.2781	0.3131**	0.1855**
	(0.1243)	(0.3874)	(0.1260)	(0.0805)
RER	0.1940***	0.3992***	0.3558	-0.0775
	(0.0307)	(0.0710)	(0.2278)	(0.0628)
Difference				
Constant	6.2888***	1.8399***	1.8214**	0.5938
	(1.6843)	(0.7750)	(0.9042)	(0.5510)
Inflation gap	-0.0180	-1.7150***	-2.2697***	0.2614*
	(0.8241)	(0.4003)	(0.3913)	(0.1447)
Output gap	0.1393	0.1169	-0.5650***	-0.4803***
	(0.2177)	(0.4139)	(0.1908)	(0.0937)
RER	-1.3249***	-0.5305***	-0.1369	-0.0854
	(0.1329)	(0.0879)	(0.1754)	(0.0634)
IMR(kappa)	-0.0400	-0.4264	0.7251**	0.2140
	(0.8696)	(0.4031)	(0.3607)	(0.2220)
JSSE	0.4780	0.6231	0.5872	0.0892
Upper regime (%)	140/174	52/174	77/174	63/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Model 2:

$$r_t - r^*_{t-1} = I(q_t \leq \gamma)(\beta^L_0 + \beta^L_1(r_{t-1} - r^*_{t-1}) + \beta^L_2 E_t(\pi_{end} - \pi^T_t) + \beta^L_3 \tilde{y}_t + \beta^L_4 rer_t) + I(q_t > \gamma)(\beta^H_0 + \beta^H_1(r_{t-1} - r^*_{t-1}) + \beta^H_2 E_t(\pi_{end} - \pi^T_t) + \beta^H_3 \tilde{y}_t + \beta^H_4 rer_t) + u_t \quad (B.\,2)$$

Table B. 4: Hansen (2000) for Model 2

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0478	-0.0240	4.5623	0.0662
95% C.I.	[0.0170, 0.0574]	[0.034, 0.0200]	[0.5622, 4.5886]	[0.0061, 0.0711]
Regime 1	$\tilde{\pi}_t \leq \gamma_{\tilde{\pi}}$	$\tilde{y}_t \leq \gamma_{\tilde{y}}$	$rer_t \leq \gamma_{rer}$	$i_t \leq \gamma_i$
Constant	0.0724**	-0.0010	0.8232***	0.1362***
	(0.0314)	(0.0905)	(0.2114)	(0.0323)
Lagged LHS	0.9671***	0.9281***	0.1946*	0.9721***
	(0.0089)	(0.0226)	(0.1134)	(0.0123)
Inflation gap	0.0107	0.0097	0.5900***	-0.0236
	(0.0396)	(0.0458)	(0.2476)	(0.0380)
Output gap	0.0501***	0.0492	0.1472	0.0477***
	(0.0158)	(0.0317)	(0.1262)	(0.0131)
RER	-0.0159***	-0.0003	-0.1916***	-0.0294***
	(0.0067)	(0.0192)	(0.0461)	(0.0068)
Regime 2	$\tilde{\pi}_t > \gamma_{\pi}$	$\tilde{y}_t > \gamma_{\tilde{y}}$	$rer_t > \gamma_{rer}$	$i_t > \gamma_i$
Constant	0.1821***	0.1038***	0.0568	0.5861***
	(0.0751)	(0.0301)	(0.0346)	(0.0982)
Lagged LHS	0.9953***	0.9912***	0.9820***	0.7586***
	(0.0703)	(0.0088)	(0.0072)	(0.0513)
Inflation gap	-0.2379	0.0821***	0.0630***	0.0656
	(0.1725)	(0.0347)	(0.0254)	(0.0632)
Output gap	0.0770**	0.0189	0.0457***	0.1781***
	(0.0372)	(0.0266)	(0.0125)	(0.0517)
RER	-0.0352**	-0.0227***	-0.0127*	-0.1204***
	(0.0176)	(0.0064)	(0.0073)	(0.0209)
LM-test	14.3985	13.0258	17.3548	21.7810
Bootstrap P-Value	0.0330	0.0650	0.0050	0.0010

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 10%,5% and 1% significance levels.

Table B. 5: Structural regression model using GMM for Model 2

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0106	-0.0044	4.6687	0.0262
95% C.I.	[-0.0089, 0.0487]	[-0.05, 0.0458]	[4.5096, 4.7878]	[-0.0713, 0.0962]
Regime 1	$\tilde{\pi}_t \leq \gamma_{\tilde{\pi}}$	$\tilde{y}_t \leq \gamma_{\tilde{y}}$	$rer_t \leq \gamma_{rer}$	$i_t \leq \gamma_i$
Constant	0.5207*	0.1438***	0.055	0.5658***
	(0.2871)	(0.0568)	(0.3633)	(0.1325)
Lagged LHS	0.9238***	0.9328***	1.0459***	0.6539***
	(0.0284)	(0.0277)	(0.0847)	(0.0885)
Inflation gap	0.2982	-0.0577	0.2789	-0.0272
	(0.2892)	(0.0401)	(0.2284)	(0.0535)
Output gap	0.0964***	0.0976***	0.0155	-0.076*
	(0.0291)	(0.0314)	(0.0324)	(0.0396)
RER	-0.0581	-0.0283***	-0.0248	-0.0683***
	(0.0459)	(0.0113)	(0.0915)	(0.0154)
Regime 2	$\tilde{\pi}_t > \gamma_{\pi}$	$\tilde{y}_t > \gamma_{\tilde{y}}$	$rer_t > \gamma_{rer}$	$i_t > \gamma_i$
Constant	-0.1384	0.0263	0.3589	-0.1063
	(0.1343)	(0.0426)	(0.4186)	(0.1235)
Lagged LHS	0.988***	0.9632***	0.9451***	0.9421***
	(0.0469)	(0.0204)	(0.0365)	(0.0437)
Inflation gap	0.2115**	0.0837***	0.0429	0.0473
	(0.1023)	(0.0356)	(0.0445)	(0.0294)
Output gap	0.0345	-0.0002	0.0662***	0.1667***
	(0.0224)	(0.064)	(0.0163)	(0.0439)
RER	-0.024	-0.0083	-0.0652	-0.0357
	(0.0122)	(0.0095)	(0.0732)	(0.0134)
Difference				
Constant	0.6591*	0.1176	-0.3039	0.6722***
	(0.3806)	(0.0762)	(0.2606)	(0.2427)
Lagged LHS	-0.0642	-0.0304	0.1008	-0.2881***
	(0.0489)	(0.0347)	(0.0976)	(0.1096)
Inflation gap	0.0866*	-0.1414***	0.236	-0.0744
	(0.2984)	(0.052)	(0.2284)	(0.0619)
Output gap	0.0619*	0.0978*	-0.0507	-0.2427***
	(0.0353)	(0.0525)	(0.0359)	(0.0727)
RER	-0.0341	-0.02	0.0404	-0.0326
	(0.0453)	(0.0155)	(0.0493)	(0.0226)
IMR(kappa)	0.3098	0.0136	-0.0697	0.3401***
	(0.216)	(0.0439)	(0.0958)	(0.1025)
JSSE	0.21542	0.50198	0.51518	0.061778
JSTAT	4.0896	2.812	5.4897	8.5652
Upper regime (%)	129	106	97	61/173

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 10%,5% and 1% significance levels.

Table B. 6: Structural regression model using Least Squares for Model 2

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0247	-0.025	4.5623	0.0262
95% C.I.	[-0.0089, 0.0487]	[-0.05, 0.0458]	[4.5096 , 4.7878]	[-0.0713 , 0.0962]
Regime 1	$\tilde{\pi}_t \leq \gamma_{\tilde{\pi}}$	$\tilde{y}_t \leq \gamma_{\tilde{y}}$	$rer_t \leq \gamma_{rer}$	$i_t \leq \gamma_i$
Constant	0.5347***	0.0029	0.8698***	0.2812**
	(0.2065)	(0.0433)	(0.2939)	(0.1343)
Lagged LHS	0.9521***	0.9285***	0.2266	0.8506***
	(0.0156)	(0.0239)	(0.2584)	(0.0657)
Inflation gap	0.235*	0.0127	0.5967	-0.0409
	(0.1209)	(0.0337)	(0.4185)	(0.0631)
Output gap	0.0607***	0.0517***	0.1517	0.0042
	(0.0134)	(0.0208)	(0.1731)	(0.0147)
RER	-0.0359	0.0001	-0.2107***	-0.0427**
	(0.0267)	(0.0108)	(0.0684)	(0.0192)
Regime 2	$\tilde{\pi}_t > \gamma_{\pi}$	$\tilde{y}_t > \gamma_{\tilde{y}}$	$rer_t > \gamma_{rer}$	$i_t > \gamma_i$
Constant	-0.2012	0.0977***	0.2297	0.1403
	(0.1281)	(0.0366)	(0.2220)	(0.1041)
Lagged LHS	1.0344***	0.9913***	0.9828***	0.8827***
	(0.014)	(0.0102)	(0.0091)	(0.0297)
Inflation gap	0.2481***	0.0826***	0.0649**	0.0752***
	(0.0955)	(0.0309)	(0.0312)	(0.0294)
Output gap	0.0427***	0.0212	0.0445***	0.0968***
	(0.0128)	(0.0262)	(0.0102)	(0.0175)
RER	-0.0386***	-0.0226***	-0.0417	-0.0483***
	(0.0083)	(0.0071)	(0.0384)	(0.0141)
Difference				
Constant	0.7359**	-0.0948*	0.6401**	0.1409
	(0.3168)	(0.0504)	(0.3218)	(0.2202)
Lagged LHS	-0.0823***	-0.0628***	-0.7563***	-0.0322
	(0.0209)	(0.0261)	(0.2582)	(0.0744)
Inflation gap	-0.0131	-0.07	0.5318	-0.1161*
	(0.0807)	(0.0462)	(0.4194)	(0.0697)
Output gap	0.0181	0.0304	0.1072	-0.0926***
	(0.0186)	(0.033)	(0.1735)	(0.0251)
RER	0.0027	0.0227*	-0.169***	0.0055
	(0.0275)	(0.0129)	(0.0647)	(0.0264)
IMR(kappa)	0.4693***	0.0072	-0.0517	0.1143
	(0.1708)	(0.0237)	(0.0593)	(0.0738)
JSSE	0.0072	0.0079	0.0062	0.0063
Upper regime (%)	86	142	149	61/173

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 10%,5% and 1% significance levels.

Model 3:

$$\varDelta i_t = I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(E_t\pi_{end} - \pi_t^T) + \beta_2^L\tilde{u}_t + \beta_3^L rer_t) \\ + I(q_t > \gamma)(\beta_0^H + \beta_1^H(E_t\pi_{end} - \pi_t^T) + \beta_2^H\tilde{u}_t + \beta_3^H rer_t) + u_t \quad \text{(B. 3)}$$

Table B. 7: Hansen (2000) for Model 3

Threshold variable	inflation gap	unemployment gap	rer	interest rate
Threshold estimate	0.0153	-2.7803	4.7275	-0.01
95% C.I.	[-0.0210 , 0.0781]	[-2.7803 , 2.5196]	[4.7123, 4.7855]	[-0.0100, -0.0100]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	-0.0784	1.0354	0.1593***	0.0055
	(0.2056)	(1.7371)	(0.0627)	(0.0517)
Inflation gap	0.0133	2.4238	-0.0912	0.0206
	(0.1999)	(1.5468)	(0.0657)	(0.0492)
Unemployment gap	0.0018	0.0095	0.0017***	-0.0004
	(0.0013)	(0.0190)	(0.0007)	(0.0006)
RER	0.0171	-0.2128	-0.0341	-0.0040
	(0.0434)	(0.3568)	(0.0133)	(0.0110)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	0.0778*	0.0703*	0.2264	0.0409
	(0.0412)	(0.0388)	(0.1964)	(0.0271)
Inflation gap	0.0123	-0.0442	0.1075	0.0010
	(0.0637)	(0.0475)	(0.0841)	(0.0369)
Unemployment gap	0.0002	0.0005	-0.0032***	0.0002
	(0.0008)	(0.0007)	(0.0014)	(0.0004)
RER	-0.0169*	-0.0148*	-0.0474	-0.0077
	(0.0088)	(0.0082)	(0.0411)	(0.0057)
LM-test	7.1054	3.99788	11.5222	71.8867
Bootstrap P-Value	0.606	0.958	0.092	0.000

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 8: Structural regression model using GMM for Model 3

Threshold variable	inflation gap	unemployment gap	rer	interest rate
Threshold estimate	0.0113	2.12	4.7259	-0.01
95% confidence interval	[0.0068 , 0.0498]	[-1.88 , 2.32]	[4.5051 , 4.7923]	[-0.01 , 0.01]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	-1.2924	0.0375	0.1213	-0.7524**
	(0.8312)	(0.0354)	(0.2287)	(0.3724)
Inflation gap	-0.423	-0.0522	-0.0332	0.0287
	(0.4479)	(0.0500)	(0.0719)	(0.0285)
Unemployment gap	-0.0039	0.0008	0.0011*	-0.0004
	(0.0027)	(0.0012)	(0.0006)	(0.0006)
RER	0.2809**	-0.0076	-0.0248	0.0051
	(0.1433)	(0.0075)	(0.0666)	(0.0078)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	0.0309	0.435**	0.4877	0.7152**
	(0.2201)	(0.2249)	(0.5886)	(0.3336)
Inflation gap	0.0512	0.0612	0.0926	0.0177
	(0.1732)	(0.2109)	(0.0726)	(0.0401)
Unemployment gap	0.0002	0.0001	-0.0021	-0.0002
	(0.0009)	(0.013)	(0.0016)	(0.0005)
RER	-0.017**	-0.0935**	-0.1034	-0.0016
	(0.0084)	(0.0467)	(0.1072)	(0.0067)
Difference				
Constant	-1.3233	-0.3975*	-0.3664	-1.4677**
	(1.0026)	(0.2274)	(0.3966)	(0.705)
Inflation gap	-0.4742	-0.1134	-0.1258	0.011
	(0.3456)	(0.2165)	(0.1065)	(0.0459)
Unemployment gap	-0.0041	0.0007	0.0032*	-0.0002
	(0.0027)	(0.0127)	(0.0017)	(0.0008)
RER	0.2979**	0.0859*	0.0785	0.0067
	(0.1425)	(0.0474)	(0.058)	(0.0091)
IMR(kappa)	0.0596	0.0037	0.0088	-0.889**
	(0.2799)	(0.0053)	(0.1089)	(0.4438)
JSSE	0.013392	0.013476	0.012998	0.0049152
J stat	13.5672	4.81	3.0631	2.5171
Upper regime (%)	125/149	22	45	110

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 9: Structural regression model using Least Squares for Model 3

Threshold variable	inflation gap	unemployment gap	rer	interest rate
Threshold estimate	0.0153	2.12	4.7276	-0.01
95% confidence interval	[0.0068, 0.0498]	[-1.88, 2.32]	[4.5051, 4.7923]	[-0.01, 0.01]
Regime 1	$\pi \leq \gamma_{\pi}$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_{i}$
Constant	0.1519	0.0382	0.2028**	-0.9813**
	(0.2577)	(0.0348)	(0.0921)	(0.4284)
Inflation gap	0.1741	-0.0277	-0.0881*	0.049*
	(0.2584)	(0.0443)	(0.0501)	(0.029)
Unemployment gap	0.0017	0.001	0.0016***	-0.0008
	(0.0017)	(0.0011)	(0.0007)	(0.0007)
RER	0.0068	-0.0079	-0.0473*	0.0043
	(0.037)	(0.0074)	(0.0257)	(0.0085)
Regime 2	$\pi > \gamma_{\pi}$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_{i}$
Constant	-0.1005	0.4325**	0.2983	0.935**
	(0.1659)	(0.212)	(0.1923)	(0.3872)
Inflation gap	0.1191	0.0058	0.1029	0.0367
	(0.1079)	(0.1852)	(0.0682)	(0.0357)
Unemployment gap	0.0003	-0.0024	-0.0032***	-0.0001
	(0.0009)	(0.0119)	(0.0012)	(0.0005)
RER	-0.0182**	-0.0913**	-0.0586	0.0002
	(0.0076)	(0.0459)	(0.0368)	(0.0063)
Difference				
Constant	0.2524	-0.3943*	-0.0956	-1.9163**
	(0.3947)	(0.2149)	(0.1689)	(0.8145)
Inflation gap	0.055	-0.0336	-0.191**	0.0122
	(0.2267)	(0.1900)	(0.0849)	(0.0439)
Output gap	0.0014	0.0034	0.0048***	-0.0006
	(0.0019)	(0.0117)	(0.0014)	(0.0009)
RER	0.025	0.0834*	0.0114	0.004
	(0.0379)	(0.0465)	(0.0354)	(0.0093)
IMR(kappa)	0.2298	0.0044	-0.0237	-1.1781**
	(0.2023)	(0.0047)	(0.0420)	(0.5091)
JSSE	0.0131	0.01338	0.0126	0.0048
Upper regime (%)	117/149	22	43	110

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Model 4:

$$\Delta i_t = I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(\pi_t - \pi_t^T) + \beta_2^L \tilde{y}_t + \beta_3^L rer_t) + I(q_t > \gamma)(\beta_0^H + \beta_1^H(\pi_t - \pi_t^T) + \beta_2^H \tilde{y}_t + \beta_3^H rer_t) + u_t \quad \text{(B. 4)}$$

Table B. 10: Hansen (2000) for Model 4

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0515	-0.0364	4.4526	-0.01
95% C.I.	[-0.0213, 0.0713]	[-0.1150, 0.0137]	[4.4445, 4.7258]	[-0.010 , -0.0100]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	0.0332	-0.1987	-0.7920	0.0248
	(0.0457)	(0.1610)	(1.2276)	(0.0472)
Inflation gap	0.0896***	0.1155	0.3875	-0.0060
	(0.0376)	(0.0847)	(0.2837)	(0.0320)
Output gap	0.0059	0.1439***	-1.5414	0.0055
	(0.0198)	(0.0545)	(0.9925)	(0.0179)
RER	-0.0076	0.0445	0.1764	-0.0080
	(0.0097)	(0.0342)	(0.2772)	(0.0101)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	0.0467	0.0588	0.0545	0.0509**
	(0.0525)	(0.0355)	(0.0392)	(0.0240)
Inflation gap	0.5465***	0.1050***	0.0749***	0.0577***
	(0.1494)	(0.0314)	(0.0288)	(0.0215)
Output gap	0.0554	0.0192	0.0157	-0.0050
	(0.0457)	(0.0309)	(0.0181)	(0.0148)
RER	-0.0174	-0.0134*	-0.0121	-0.0103**
	(0.0110)	(0.0076)	(0.0084)	(0.0051)
LM-test	5.7308	9.4076	8.5442	70.7282
Bootstrap P-Value	0.86	0.272	0.426	0

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 11: Structural regression model using GMM for Model 4

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0065	-0.0331	4.5096	-0.01
95% confidence interval	[-0.0151 0.062]	[-0.05 0.0458]	[4.5096 4.7878]	[-0.01 0.01]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	0.642**	-0.2244	0.3709	-0.739***
	(0.3042)	(0.1618)	(0.6355)	(0.2159)
Inflation gap	0.149	0.1308*	0.5367**	-0.0133
	(0.2676)	(0.0704)	(0.2488)	(0.0249)
Output gap	0.0722***	0.2086***	-0.9634***	-0.019
	(0.0268)	(0.0708)	(0.2859)	(0.0211)
RER	0.0051	0.0558	-0.1829	0.0033
	(0.0244)	(0.0357)	(0.2030)	(0.0088)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	-0.5497**	0.1206*	2.0411	0.7038***
	(0.2238)	(0.0641)	(1.3049)	(0.1762)
Inflation gap	0.4169**	-0.0364	-0.0482	0.0507*
	(0.1922)	(0.0393)	(0.0618)	(0.0265)
Output gap	0.1006***	0.0881	0.0719**	-0.0296
	(0.0386)	(0.0713)	(0.0330)	(0.0212)
RER	-0.0264***	-0.0305***	-0.3546	-0.0001
	(0.0069)	(0.0091)	(0.2259)	(0.0074)
Difference				
Constant	1.1916**	-0.3449**	-1.6701**	-1.4428***
	(0.5199)	(0.1728)	(0.7649)	(0.3891)
Inflation gap	-0.2679**	0.1672**	0.5849**	-0.064*
	(0.1378)	(0.0831)	(0.2429)	(0.0344)
Output gap	-0.0283	0.1205*	-1.0353***	0.0106
	(0.0469)	(0.0743)	(0.2876)	(0.0268)
RER	0.0315	0.0862**	0.1717***	0.0034
	(0.0247)	(0.0367)	(0.065)	(0.0102)
IMR(kappa)	0.8442***	0.0285	-0.5488	-0.8848*
	(0.2841)	(0.0760)	(0.3580)	(0.2448)
JSSE	0.01417	0.0151	0.01525	0.0057176
JSTAT	14.6727	10.2025	7.7662	3.6959
Upper regime (%)	139	149	157	127

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 12: Structural regression model using Least Squares for Model 4

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0187	-0.0364	4.5194	-0.01
95% C.I.	[-0.0151, 0.062]	[-0.05, 0.0458]	[4.5096, 4.7878]	[-0.01, 0.01]
Regime 1	$\pi \leq \gamma_{\pi}$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_{i}$
Constant	1.051***	-0.2312*	-0.0992	-0.8155***
	(0.2243)	(0.1423)	(0.2530)	(0.2313)
Inflation gap	0.6507***	0.0861	0.3298*	0.0068
	(0.1525)	(0.0762)	(0.1832)	(0.0206)
Output gap	0.0794***	0.1234**	-0.5704***	-0.0145
	(0.0191)	(0.0526)	(0.2226)	(0.0137)
RER	-0.0309***	0.0415	0.0132	0.0004
	(0.0125)	(0.0315)	(0.0572)	(0.0081)
Regime 2	$\pi > \gamma_{\pi}$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_{i}$
Constant	-0.8515***	0.1074*	0.1584	0.7915***
	(0.1966)	(0.0554)	(0.1297)	(0.1996)
Inflation gap	0.7117***	0.1007***	0.0743***	0.0793***
	(0.1308)	(0.0295)	(0.0280)	(0.0223)
Output gap	0.0235	0.001	0.0151	-0.0252*
	(0.0285)	(0.0301)	(0.018)	(0.0133)
RER	-0.0172***	-0.0143*	-0.0289	-0.0002
	(0.005)	(0.0077)	(0.0222)	(0.0063)
Difference				
Constant	1.9025***	-0.3386**	-0.2576	-1.607***
	(0.4169)	(0.1514)	(0.2581)	(0.4287)
Inflation gap	-0.0611	-0.0145	0.2554	-0.0725**
	(0.0695)	(0.0801)	(0.1855)	(0.0298)
Output gap	0.0559*	0.1224**	-0.5856***	0.0107
	(0.0323)	(0.0573)	(0.2233)	(0.0186)
RER	-0.0137	0.0558*	0.0421	0.0007
	(0.013)	(0.0322)	(0.0544)	(0.0095)
IMR(kappa)	1.1508***	-0.057	-0.0367	-0.9959***
	(0.2536)	(0.0484)	(0.0394)	(0.2688)
JSSE	0.0076	0.0145	0.0148	0.0053
Upper regime (%)	119/174	151	155	127

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Model 5:

$$\varDelta r_t = I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(E_t\pi_{end} - \pi_t^T) + \beta_2^L\tilde{y}_t + \beta_3^L rer_t) \\ + I(q_t > \gamma)(\beta_0^H + \beta_1^H(E_t\pi_{end} - \pi_t^T) + \beta_2^H\tilde{y}_t + \beta_3^H rer_t) + u_t \quad \text{(B. 5)}$$

Table B. 13: Hansen (2000) for Model 5

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0690	-0.0327	4.5859	0.0023
95% C.I.	[-0.0242, 0.0713]	[-0.1150, 0.0630]	[4.4445, 4.8367]	0.0009, 0.0032]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	0.0681*	0.1149	0.3859*	0.0286
	(0.0395)	(0.1577)	(0.2329)	(0.0297)
Inflation gap	-0.0163	-0.0552	-0.3646***	-0.0292
	(0.0320)	(0.0671)	(0.1525)	(0.0236)
Output gap	0.0398**	-0.0481	0.4433***	0.0379***
	(0.0193)	(0.0502)	(0.1861)	(0.0155)
RER	-0.0146*	-0.0266	-0.0819	-0.0072
	(0.0084)	(0.0336)	(0.0505)	(0.0063)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	0.2212**	0.0526	0.0596	0.1037***
	(0.1010)	(0.0380)	(0.0570)	(0.0412)
Inflation gap	-1.1258***	-0.0522	-0.0130	-0.0095
	(0.3682)	(0.0346)	(0.0325)	(0.0370)
Output gap	0.0863	-0.0019	0.0364*	0.0388
	(0.1619)	(0.0338)	(0.0194)	(0.0235)
RER	-0.0293	-0.0108	-0.0128	-0.0199**
	(0.0203)	(0.0081)	(0.0121)	(0.0088)
LM-test	7.0772	11.3613	5.8068	89.6762
Bootstrap P-Value	0.6660	0.1050	0.8450	0.0000

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 14: Structural regression model using GMM for Model 5

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0328	-0.0331	4.5985	0.0017
95% C.I.	[-0.0151, 0.062]	[-0.05, 0.0458]	[4.5985, 4.5985]	[-0.013, 0.0118]
Regime 1	$\pi \leq \gamma_{\pi}$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_{i}$
Constant	-1.0342***	0.0878	0.8231**	-0.5665*
	(0.3436)	(0.1525)	(0.3628)	(0.3105)
Inflation gap	-0.644**	-0.0732	0.1343	-0.0238
	(0.2965)	(0.0753)	(0.0866)	(0.0271)
Output gap	-0.0227	-0.0759	0.2189*	0.0137
	(0.0339)	(0.0730)	(0.1294)	(0.0196)
RER	0.0083	-0.0165	-0.262***	-0.0047
	(0.0124)	(0.0286)	(0.0937)	(0.0061)
Regime 2	$\pi > \gamma_{\pi}$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_{i}$
Constant	1.0478***	-0.0473	1.8573***	0.6572**
	(0.3328)	(0.0635)	(0.3943)	(0.2990)
Inflation gap	-0.7206**	0.0494	0.1187**	-0.0532
	(0.2999)	(0.0404)	(0.0493)	(0.0433)
Output gap	-0.0383	-0.0574	-0.0138	0.0421**
	(0.0355)	(0.0647)	(0.0354)	(0.0173)
RER	-0.0014	0.0052	-0.3222***	-0.0131
	(0.0098)	(0.0092)	(0.0688)	(0.0087)
Difference				
Constant	-2.0820***	0.1352	-1.0343***	-1.2237**
	(0.6727)	(0.1832)	(0.2578)	(0.6077)
Inflation gap	0.0766	-0.1226	0.0156	0.0294
	(0.1279)	(0.0873)	(0.0991)	(0.0482)
Output gap	0.0156	-0.0185	0.2327*	-0.0284
	(0.0482)	(0.0715)	(0.1350)	(0.0262)
RER	0.0097	-0.0217	0.0602	0.0084
	(0.0154)	(0.0299)	(0.0533)	(0.0108)
IMR(kappa)	-1.2758***	0.0288	-0.4709***	-0.7326*
	(0.4171)	(0.0727)	(0.0984)	(0.3905)
JSSE	0.0166	0.0162	0.0162	0.0077
JSTAT	6.6234	14.8725	14.0112	3.4198
Upper regime (%)	78	149	137	61/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 15: Structural regression model using Least Squares for Model 5

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0167	-0.0331	4.586	0.0015
95% C.I.	[-0.0151, 0.062]	[-0.05, 0.0458]	[4.5096, 4.7878]	[-0.013, 0.0118]
Regime 1	$\pi \leq \gamma_{\pi}$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_{i}$
Constant	-0.7653***	0.1743	0.4722*	-0.7556**
	(0.2353)	(0.1309)	(0.2511)	(0.3749)
Inflation gap	-0.4063**	-0.0132	-0.3409**	-0.0666**
	(0.1737)	(0.0518)	(0.1612)	(0.0276)
Output gap	-0.0088	-0.0138	0.4578*	0.0341***
	(0.0202)	(0.0404)	(0.2498)	(0.0126)
RER	0.0353**	-0.021	-0.1111*	-0.0058
	(0.0153)	(0.0272)	(0.0612)	(0.0056)
Regime 2	$\pi > \gamma_{\pi}$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_{i}$
Constant	0.6796***	-0.0358	0.2566	0.8774***
	(0.2158)	(0.0522)	(0.2579)	(0.3402)
Inflation gap	-0.4832***	-0.0466	-0.0102	-0.0352
	(0.1529)	(0.0309)	(0.0294)	(0.0301)
Output gap	0.0408	0.0368	0.0349**	0.0324**
	(0.027)	(0.0299)	(0.0162)	(0.0153)
RER	-0.0143*	-0.0095	-0.0457	-0.0185*
	(0.0080)	(0.0084)	(0.0443)	(0.0103)
Difference				
Constant	-1.4449***	0.2101	0.2156	-1.6331**
	(0.4442)	(0.1466)	(0.2638)	(0.7137)
Inflation gap	0.0769	0.0334	-0.3306**	-0.0314
	(0.0919)	(0.0593)	(0.1629)	(0.0354)
Output gap	-0.0495*	-0.0507	0.4228*	0.0017
	(0.0302)	(0.0493)	(0.2507)	(0.0203)
RER	0.0497***	-0.0115	-0.0653	0.0126
	(0.0173)	(0.0285)	(0.0495)	(0.0111)
IMR(kappa)	-0.7575***	0.1059**	-0.0583	-0.9777**
	(0.2839)	(0.0440)	(0.0703)	(0.4651)
JSSE	0.0132	0.0161	0.0162	0.0072
Upper regime (%)	123	149	146	63/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Model 6:

$$\Delta i_t = I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(E_t\pi_{end} - \pi_t^T) + \beta_2^L\tilde{y}_t + \beta_3^L xrvol_t) \\ + I(q_t > \gamma)(\beta_0^H + \beta_1^H(E_t\pi_{end} - \pi_t^T) + \beta_2^H\tilde{y}_t + \beta_3^H xrvol_t) + u_t \quad \text{(B. 6)}$$

Table B. 16: Hansen (2000) for Model 6

Threshold variable	inflation gap	output gap	xrvol	interest rate
Threshold estimate	-0.002	-0.115	0.0271	167
95% C.I.	[-0.0169, 0.0685]	[-0.1150, 0.0692]	[0.0137, 0.0722]	[6.0000 , 168.0000]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	-0.0037	-0.1015	-0.0043	-0.0017
	(0.0055)	(0.0723)	(0.0028)	(0.0013)
Inflation gap	-0.6223*	-0.0241	-0.0398	0.0010
	(0.3358)	(0.1561)	(0.0513)	(0.0394)
Output gap	0.0287	-0.4174	-0.0004	0.0285
	(0.0423)	(0.4510)	(0.0296)	(0.0192)
xrvol	-0.2798	0.8925***	0.3469*	0.0561
	(0.2013)	(0.3654)	(0.1850)	(0.0388)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	-0.0017	-0.0018	-0.0081***	0.0108
	(0.0017)	(0.0013)	(0.0025)	(0.0241)
Inflation gap	-0.0092	0.0127	0.0953	0.0769
	(0.0507)	(0.0408)	(0.0614)	(0.3934)
Output gap	0.0144	0.0033	0.0442	-1.5579***
	(0.0232)	(0.0250)	(0.0251)	(0.4988)
xrvol	0.0781***	0.0617*	0.1028***	-0.0552
	(0.0325)	(0.0327)	(0.0426)	(0.0767)
LM-test	6.7515	7.1113	13.1572	7.1983
Bootstrap P-Value	0.686	0.606	0.049	0.589

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 17: Structural regression model using GMM for Model 6

Threshold variable	inflation gap	output gap	xrvol	interest rate
Threshold estimate	0.0119	-0.0491	0.026103	-0.01
95% C.I.	[-0.0089, 0.0487]	[-0.05, 0.0458]	[0.0094089, 0.051331]	[-0.01, 0.01]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	0.1694	-0.0425	-0.4816**	-1.1797***
	(0.7389)	(0.0745)	(0.2109)	(0.3228)
Inflation gap	0.7391	0.0133	-0.1249	0.0217
	(0.5263)	(0.1241)	(0.0819)	(0.0405)
Output gap	-0.1687	0.2761***	0.0522	-0.0363
	(0.1568)	(0.1034)	(0.0447)	(0.0226)
xrvol	-1.4086	0.4775*	-1.1974*	-0.1984
	(1.1642)	(0.2926)	(0.7335)	(0.1788)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	-0.1584	0.0434	0.5044**	1.1568***
	(0.7691)	(0.0691)	(0.2203)	(0.321)
Inflation gap	-0.0112	-0.1546*	-0.0145	0.1047*
	(0.6093)	(0.0912)	(0.1372)	(0.0610)
Output gap	0.1623***	0.0477	0.1209***	-0.0835**
	(0.0553)	(0.0844)	(0.0456)	(0.0366)
xrvol	0.3966*	0.3279**	-0.0928	-0.047
	(0.1520)	(0.1502)	(0.2142)	(0.0792)
Difference				
Constant	0.3279	-0.0858	-0.986**	-2.3365***
	(1.5079)	(0.1434)	(0.4310)	(0.6437)
Inflation gap	0.7503**	0.1678	-0.1104	-0.0829
	(0.3892)	(0.1605)	(0.1396)	(0.0688)
Output gap	-0.33100	0.2283**	-0.0687	0.0473
	(0.1420)	(0.1047)	(0.0597)	(0.0335)
xrvol	-1.8052	0.1496	-1.1046	-0.1514
	(1.1337)	(0.3246)	(0.7466)	(0.1666)
IMR(kappa)	0.1854	-0.0637	-0.6303**	-1.4569***
	(0.9517)	(0.0890)	(0.2725)	(0.4044)
JSSE	0.01408	0.015152	0.014503	0.0053781
JSTAT	5.7658	5.3668	3.1158	5.7118
Upper regime (%)	126/174	156	69	127

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 18: Structural regression model using Least Squares for Model 6

Threshold variable	inflation gap	output gap	xrvol	interest rate
Threshold estimate	-0.002	-0.0364	0.0272	-0.01
95% confidence interval	[-0.0089, 0.0487]	[-0.05, 0.0458]	[0.0094, 0.0513]	[-0.01, 0.01]
Regime 1	$\pi \leq \gamma_\pi$	$\pi \leq \gamma_{\tilde{y}}$	$\pi \leq \gamma_{rer}$	$\pi \leq \gamma_i$
Constant	0.0033	-0.0954***	-0.2552	-0.8884***
	(0.1180)	(0.0373)	(0.1629)	(0.2437)
Inflation gap	-0.6168**	-0.0579	-0.091*	0.0036
	(0.2997)	(0.082)	(0.0524)	(0.0256)
Output gap	0.0291	0.1043*	0.0063	-0.011
	(0.0337)	(0.0558)	(0.0240)	(0.0133)
xrvol	-0.2794	0.1278	0.3038*	-0.0135
	(0.1847)	(0.1182)	(0.1643)	(0.0578)
Regime 2	$\pi > \gamma_\pi$	$\pi > \gamma_{\tilde{y}}$	$\pi > \gamma_{rer}$	$\pi > \gamma_i$
Constant	-0.0086	0.0949***	0.2465	0.8657***
	(0.1166)	(0.0353)	(0.1646)	(0.2404)
Inflation gap	-0.0046	0.0282	-0.0016	0.0342
	(0.0859)	(0.0471)	(0.0803)	(0.0296)
Output gap	0.0144	-0.0255	0.0619**	-0.0251
	(0.0199)	(0.0291)	(0.0276)	(0.0173)
xrvol	0.0781***	0.0696***	0.1048***	0.0135
	(0.0227)	(0.0227)	(0.0356)	(0.0167)
Difference				
Constant	0.0119	-0.1903***	-0.5017	-1.7541***
	(0.2345)	(0.0724)	(0.3275)	(0.4841)
Inflation gap	-0.6122**	-0.0861	-0.0894	-0.0307
	(0.2939)	(0.0916)	(0.0770)	(0.0393)
Output gap	0.0146	0.1299**	-0.0556	0.0141
	(0.0397)	(0.0626)	(0.0357)	(0.0198)
xrvol	-0.3576**	0.0582	0.1989	-0.027
	(0.1861)	(0.1202)	(0.1688)	(0.0591)
IMR(kappa)	0.0087	-0.1263***	-0.3174	-1.0893***
	(0.1472)	(0.0453)	(0.2061)	(0.3036)
JSSE	0.0154	0.0154	0.0148	0.0054
Upper regime (%)	145/174	151	68	127

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Model 7:

$$\Delta i_t = I(q_t \leq \gamma)(\beta_0^L + \beta_1^L(E_t\pi_{end} - \pi_t^T) + \beta_2^L\tilde{y}_t + \beta_3^L rer_t) \\ + I(q_t > \gamma)(\beta_0^H + \beta_1^H(E_t\pi_{end} - \pi_t^T) + \beta_2^H\tilde{y}_t + \beta_3^H rer_t) + u_t \quad \text{(B. 7)}$$

Table B. 19: Hansen (2000) for Model 7

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0685	-0.033	4.4526	-0.010
95% C.I.	[-0.0141 , 0.0685]	[-0.1150 , 0.0630]	[4.4445 , 4.7258]	[-0.0100 , -0.0100]
Regime 1	$\tilde{\pi}_t \leq \gamma_{\tilde{\pi}}$	$\tilde{y}_t \leq \gamma_{\tilde{y}}$	$rer_t \leq \gamma_{rer}$	$i_t \leq \gamma_i$
Constant	0.0491	-0.2672*	-0.2413	0.0210
	(0.0392)	(0.1549)	(1.2310)	(0.0481)
Inflation gap	0.0101	0.0443	0.2123	0.0065
	(0.0446)	(0.0792)	(0.4313)	(0.0385)
Output gap	0.0179	0.1147**	-1.3790	0.0043
	(0.0212)	(0.0502)	(1.0230)	(0.0183)
RER	-0.0106	0.0586*	0.0547	-0.0072
	(0.0083)	(0.0330)	(0.2776)	(0.0102)
Regime 2	$\tilde{\pi}_t > \gamma_{\pi}$	$\tilde{y}_t > \gamma_{\tilde{y}}$	$rer_t > \gamma_{rer}$	$i_t > \gamma_i$
Constant	0.4730***	0.0874**	0.0642	0.0541**
	(0.1688)	(0.0388)	(0.0409)	(0.0258)
Inflation gap	-1.4130	0.0223	0.0038	0.0429
	(1.3080)	(0.0457)	(0.0382)	(0.0300)
Output gap	0.0942	0.0289	0.0282	-0.0022
	(0.0582)	(0.0332)	(0.0190)	(0.0160)
RER	-0.0782***	-0.0189**	-0.0137	-0.0108**
	(0.0255)	(0.0082)	(0.0087)	(0.0054)
LM-test	8.9829	7.1104	8.3406	75.0088***
Bootstrap P-Value	0.3330	0.5870	0.4640	0.0000

Note:Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 20: Structural regression model using GMM for Model 7

Threshold variable	inflation gap	output gap	rer	interest rate
Threshold estimate	0.0119	-0.04	4.5193	-0.01
95% confidence interval	[-0.0089, 0.0487]	[-0.05, 0.05]	[4.5096, 4.7878]	[-0.01, 0.01]
Regime 1	$\tilde{\pi}_t \leq \gamma_{\tilde{\pi}}$	$\tilde{y}_t \leq \gamma_{\tilde{y}}$	$rer_t \leq \gamma_{rer}$	$i_t \leq \gamma_i$
Constant	1.2949**	-0.3766***	1.6432*	-0.7468***
	(0.6547)	(0.1452)	(0.9191)	(0.2457)
Inflation gap	1.4229**	0.1251	1.3813**	-0.0003
	(0.6679)	(0.1198)	(0.7091)	(0.0230)
Output gap	-0.0246	0.1601***	-1.0021*	-0.0166
	(0.0667)	(0.0531)	(0.5491)	(0.0214)
RER	-0.0642	0.0719**	-0.6174**	0.0045
	(0.0599)	(0.0356)	(0.2917)	(0.0082)
Regime 2	$\tilde{\pi}_t > \gamma_{\pi}$	$\tilde{y}_t > \gamma_{\tilde{y}}$	$rer_t > \gamma_{rer}$	$i_t > \gamma_i$
Constant	-0.8267*	0.1632**	5.0779***	0.7056***
	(0.4582)	(0.0710)	(2.0504)	(0.2043)
Inflation gap	0.7449**	0.0201	0.0377	0.0526*
	(0.3785)	(0.0409)	(0.0920)	(0.0312)
Output gap	-0.2258***	0.0208	0.0789*	-0.0315
	(0.0798)	(0.0742)	(0.0456)	(0.0227)
RER	-0.0392**	-0.0245***	-0.8800***	-0.0001
	(0.0099)	(0.0088)	(0.3545)	(0.0078)
Difference				
Constant	2.1215**	-0.5398***	-3.434***	-1.4524***
	(1.0922)	(0.1541)	(1.4470)	(0.4475)
Inflation gap	0.6780	0.1050	1.3437**	-0.0529
	(0.4565)	(0.1283)	(0.6948)	(0.0386)
Output gap	-0.1703*	0.1393*	-1.0810**	0.0149
	(0.0899)	(0.0818)	(0.5519)	(0.0273)
RER	-0.0251	0.0965***	0.2626*	0.0046
	(0.0591)	(0.0373)	(0.1552)	(0.0099)
IMR(kappa)	1.2520**	-0.0643	-1.3721***	-0.8866***
	(0.5765)	(0.0834)	(0.5602)	(0.2824)
JSSE	0.0149	0.0153	0.0154	0.0057
J stat	7.7312	7.7919	5.7484	2.4761
Upper regime (%)	126/174	151/174	156/174	127/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate.. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.

Table B. 21: Structural threshold regression using Least Squares for Model 7

Threshold variable	inflation rate	output gap	rer	interest rate
Threshold estimate	0.0119	-0.04	4.7196	-0.01
95% C.I.	[-0.0089, 0.0487]	[-0.05, 0.05]	[4.5096, 4.7878]	[-0.01, 0.01]
Regime 1	$\tilde{\pi}_t \leq \gamma_{\tilde{\pi}}$	$\tilde{y}_t \leq \gamma_{\tilde{y}}$	$rer_t \leq \gamma_{rer}$	$i_t \leq \gamma_i$
Constant	-0.1103	-0.2808**	0.1853**	-0.6731***
	(0.1526)	(0.1358)	(0.0954)	(0.2531)
Inflation gap	-0.0958	-0.0325	0.0055	0.0065
	(0.1686)	(0.0754)	(0.0463)	(0.0237)
Output gap	-0.0021	0.0748	0.0285	-0.0114
	(0.0277)	(0.0553)	(0.0231)	(0.0141)
RER	0.0434**	0.0400	-0.0426*	-0.0003
	(0.0197)	(0.0313)	(0.0260)	(0.0082)
Regime 2	$\tilde{\pi}_t > \gamma_{\pi}$	$\tilde{y}_t > \gamma_{\tilde{y}}$	$rer_t > \gamma_{rer}$	$i_t > \gamma_i$
Constant	0.0100	0.1870***	0.2382	0.6702***
	(0.1336)	(0.0626)	(0.2010)	(0.2199)
Inflation gap	0.0484	0.0267	0.0252	0.0456*
	(0.0983)	(0.0426)	(0.0439)	(0.0284)
Output gap	0.0556**	-0.0083	-0.0153	-0.0180
	(0.0264)	(0.0308)	(0.0287)	(0.0135)
RER	-0.0231***	-0.0198***	-0.0474	-0.0033
	(0.0084)	(0.0083)	(0.0385)	(0.0067)
Difference				
Constant	-0.1203	-0.4678***	-0.0529	-1.3433***
	(0.2688)	(0.1467)	(0.1770)	(0.4709)
Inflation gap	-0.1442	-0.0592	-0.0197	-0.0390
	(0.1520)	(0.0847)	(0.0640)	(0.0370)
Output gap	-0.0577	0.0831	0.0438	0.0065
	(0.0387)	(0.0600)	(0.0368)	(0.0190)
RER	0.0665***	0.0598*	0.0047	0.0029
	(0.0217)	(0.0319)	(0.0360)	(0.0097)
IMR(kappa)	0.1224	-0.1239**	-0.0152	-0.8230***
	(0.1538)	(0.0542)	(0.0406)	(0.2944)
JSSE	0.0157	0.0153	0.0155	0.0056
Upper regime (%)	126/174	151/174	57/174	127/174

Note: The instrumental variables for the model are first and twelfth lags of inflation gap, output gap and real exchange rate. Values in paranthesis are standard errors. *,**,*** denote significance at 1%,5% and 10% significance levels.