THE RUSSIAN LENDING RATE, CENTRAL BANK'S POLICY RELATED RATE AND INTERMEDIATION PREMIUM

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ABSTRACT

This paper illustrates asymmetries in the Russian intermediation premium as measured by the spread between the commercial lending rate and the Central Bank's policy related rate. Empirical results have shown that the Russian intermediation premium adjusts to the threshold faster when the Central Bank's policy related rates increase relative to lending rates as opposed to when the Central Bank's policy related rates move in the opposite direction. The findings of this paper suggest that during the period when the Russian Federation faced formidable challenges from a sharp decline in oil prices and reduced access to international capital markets due to Western sanctions, the Central Bank of Russia was not effective in utilizing countercyclical monetary policy to achieve macroeconomic objectives and commercial banks exhibited predatory pricing behavior.

Keywords: Asymmetry, Lending rate, Policy related, Lending-policy related rate spread, Russia, Predatory pricing behaviour, Granger causality, Countercyclical monetary policy.

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INTRODUCTION

Financial intermediation is a critical facilitator of investment and economic growth (Schumpeter, 1912; Patrick, 1966; McKinnon, 1973). Commercial banks serve a most crucial role in determining the spread between the lending rate and the cost of funds. This spread not only creates interest income to financial intermediaries, it also affects the economy's savings and investment level and the effectiveness of central bank's monetary policies as well as economic development and social progress. A portion of the spread is due to risk related to the instrument; that is, the intermediation premium above the "cost of funds". This "risk" element provides useful insights into commercial banks' behaviours, which this paper uses to study Russian commercial banks—with an emphasis on those factors that affect the dynamics of the spread between Russian lending rates and Central Bank policy related rates (or henceforth the "intermediation premium").

Theoretically, banks operating in a free market economy are expected to consider all sources of risk in setting the spread that differentiates the cost of funds from the lending rate. If banks set an intermediation premium either too high or too low, market forces in theory will force an adjustment back to some equilibrium spread. Three main hypotheses explain this rate-setting behaviour: the bank concentration hypothesis, the consumer characteristic hypothesis, and the consumer reaction hypothesis.

The bank concentration hypothesis theorizes that oligopolistic banks are quick to raise lending rates when the Central Bank's policy related rates rise, narrowing the spread; but will only slowly reduce the rates charged to borrowers when Central Bank's policy related rates decline, widening the spread (Neumark and Sharpe, 1992, Hannan and Berger, 1991).

The consumer characteristic hypothesis posits that banks can adjust rates to widen the spread and increase their profitability to the extent that consumers are unsophisticated and/or are saddled with higher costs of searching and switching (Calem and Mester, 1995, Hutchison, 1995, Rosen, 2002).

The consumer reaction hypothesis proposes that asymmetric adjustments in lending rates may actually benefit consumers, because the presence of asymmetric information can foster an adverse selection problem in lending markets such that higher interest rates will tend to attract riskier borrowers (Stiglitz and Weiss, 1981). Therefore, even if Central Bank's policy related rates rise, banks will be reluctant to raise lending rates because the expected cost to the banks of not raising the lending rates (when their marginal cost of funds increases) is offset by the risk reduction benefits of not encouraging higher-risk borrowers.

With regard to the Russian economy and the banking sector, IMF (2016-a) reported that the sharp decline in oil prices and the reduced access to international capital markets due to Western sanctions contributed to a 3.7 percent contraction in real gross domestic product (GDP) in 2015. The ruble came under severe pressure at end-2014 amid concerns about external debt redemptions. To curb foreign exchange (FX) reserve losses, the Central Bank of the Russian Federation/ Bank of Russia (CBR) floated the exchange rate and hiked its policy rate by 650 basis points to 17 percent. Following the ruble depreciation and Russia's imposition of a food import ban as a response to sanctions, inflation accelerated sharply, peaking at 17 percent in March 2015 before declining to 7½ percent by April 2016. Accordingly, the policy rate was cut in stages, most recently to 10.5 percent in June 2016.

Moreover, IMF (2016-a) connected lending and loan concentration continue to be of concern, with possible implications for asset quality. Large exposures stood at 261 percent of capital in February 2016. The reported figures may, however, understate the extent of related party lending, as detailed in the section on bank supervision. Connected lending and loan concentration are especially pronounced among the smaller banks, but some large banks are also affected. Gustavo et al. (2016) reported that since 2014, the Russian banking industry showed a weak performance with profit indicators narrowing and non-performing loans (NPLs) increasing.

The Russian Federation circumstance provides an interesting case to study the rate setting behavior of the Russian commercial banks. Likewise, it is also of interest to compare the rate setting behavior of Russian banks to those of their counterparts in advanced market economies. To these ends, this paper explores whether asymmetries exist in the Russian lending-Central Bank's policy related rate spread and, if such asymmetries are present, how lending and Central Bank's policy related rates respond to these asymmetries. Furthermore, this paper explores whether responses to such asymmetries are independent and static or are dynamically interdependent. Also, this analysis seeks to determine whether Russian lending institutions exhibit competitive or predatory pricing behaviours and if so, to what extent.

The remainder of this study is organized as follows: The next section summarizes the literature on asymmetric rate adjustments by international lending institutions and the Russian banking sector. The section that follows describes the data and the descriptive statistics used in the analysis. The next section describes the methodology used in the investigation. The following section reports the empirical results. The final section provides a summary of the study and offers concluding remarks and policy implications.

ASYMMETRIC RATE ADJUSTMENTS AND THE RUSSIAN BANKING SECTOR

Asymmetric Rate Adjustments

The documented asymmetric rate-setting behavior of commercial banks in the context of rates of return on financial market instruments serves as the rationale for theoretically hypothesizing asymmetric responses to the national countercyclical monetary policy. Dueker (2000) and Tkacz (2001) have reported asymmetries in the U.S. prime lending rate in the past. Thompson (2006) found asymmetries in the U.S. prime lending-Central Bank's policy related rate spread. Sarno and Thornton (2003) found asymmetries in U.S. Treasury securities in their studies. Frost and Bowden (1999) and Scholnick (1999) reported asymmetries in mortgage rates in New Zealand and Canada. Hofmann and Mizen (2004) indicated asymmetric behavior of retail rates in the United Kingdom. Hannan and Berger (1991), and Neumark and Sharpe (1992) examined various asymmetric Central Bank's policy related rates. Several studies have found asymmetric cointegration between bank lending and the Central Bank's policy related rates. For instance, Nguyen et al. (2008) documented similar asymmetries in Mexican lending rates and the Central Bank's policy related rates. Nguyen and Islam (2010) reported asymmetries in Thai bank lending and the Central Bank's policy related rates. Nguyen and Henney (2013) found asymmetries in the US housing mortgage market. Chang and Su (2010) reported nonlinear cointegration between the lending and the Central Bank's policy related rates in ten Eastern European countries. Also, Haug and Basher (2011) found nonlinear cointegration in the purchasing power parity relationships for Canada, Japan, Switzerland, the U.K., Belgium, France, Germany, Italy and the Netherlands.

The Russian Banking Sector

As to the Russian Federation, IMF (2016-a) indicated that the Russian banking sector is heavily concentrated, and state ownership continues to be important. The largest 20 banks account for three quarters of system assets, while the top 10 banks extend about 70 percent of total lending. State-owned commercial banks, dominated by Sberbank and VTB Group, accounted for 60 percent of system assets at end-2015. The top 10 private banks hold 16 percent of system assets, foreign banks hold 13 percent, and 11 percent are held by specialized and small banks. Many smaller banks operate in monoindustrial cities and are often important in their respective regions, complicating efforts to further consolidate the banking sector. The 1990s saw a decrease in state ownership, but the failure of systemically important private commercial banks in 1998 triggered a partial reversal. The 2008 Global Financial Crisis (GFC) further strengthened the dominance of state-owned commercial banks, including most notably Sberbank, which provided a safe harbor and served as bailout vehicles during the turbulent period.

Gustavo et al. (2016) reported that currently, the Russian banking system is comprised of more than 600 banks with the three largest banks (Sberbank, VTB and Gazprombank) accounting for 60% of total assets and 71% of total loans as of 2015. This concentration has become stronger over time, as these three banks accounted for 53% of assets and 64% of loans in 2012. Gustavo et al. (2016) argued that even though the high number of small and regionally-important banks remains significant, the CBR has been implementing measures which contributed to further consolidation of the banking sector.

Gustavo et al. (2016) further argued that a lack of banking supervision, ease in obtaining bank licenses and low-cost financing opportunities in the market after the collapse of the USSR contributed to a sharp increase in the number of commercial banks in the early 1990's, with nearly 2,700 banks in existence in 1995. However, in 2013 a new chapter in the Russian banking system began after Elvira Nabiullina was appointed head of the CBR. Under her administration banking regulation became stricter as a large number of bank licenses were withdrawn and resolution processes took place in many commercial banks.

IMF (2016-a) posited that the CBR has made far-reaching changes to the legal and supervisory landscape in recent years. Legislative impediments to cooperation and collaboration based on domestic and cross border supervisory information exchange have been eliminated. The scope and application of consolidated supervision has been enhanced. CBR now has the power to impose standards for the risk management of banks and banking groups.

Additionally, IMF (2016-a) argued that CBR is developing and enhancing its risk-based approach to supervision. CBR has sharpened its risk focus by differentiating its approach to supervision, including the establishment of a dedicated division to supervise SIBs. CBR has recently issued regulations that focus on the quality of risk management and governance within firms. These regulations will introduce, for example, scrutiny of firms' risk appetite (Gustavo et al, 2016). Even though the CBR announced a number of new regulatory changes which range from stringent controls on off-shore holdings to stronger stress tests, the banking sector remains exposed to a number of risks which could damage the industry if they materialize.

However, IMF (2016-b) pointed out that the regulatory approach in the Russian Federation is highly rules based and presents specific challenges to an effective risk based supervisory regime. The first challenge is moving the supervisory mindset and process from one that primarily focuses on finding and eliminating violations and deficiencies to one that also incorporates a forward looking, early intervention approach that seeks to prevent violations from emerging. Although recent legislative changes support the CBR's risk focus, it may be the case that in some instances the CBR will only be able to recommend that firms change their course of action in order to avoid future deficiencies. A second challenge in a rules based system is ensuring that the rules remain relevant and appropriate to the prevailing risk environment.

As to the banking structure, IMF (2016-a) reported that the money market reflects a three-tiered banking system based on ownership structure and credit ratings. Tier I is made up of several large and highly rated banks with low Central Bank policy related funding costs, which rely mainly on the FX swap market for any wholesale ruble liquidity. These banks also have access to both secured and unsecured interbank markets. Tier II is a larger number of mid-sized banks which do not have access to the unsecured interbank market, and instead raise both FX and ruble in the FX swap and repo markets. These banks have limited lines with Tier I banks and avail themselves of CBR facilities. Tier III is dominated by small banks (with low ratings and larger holdings of higher yielding less liquid assets) with little or no access to the interbank market, often owing to non-transparent ownership structures and lending practices. These banks instead often conserve large cash buffers and can only access CBR operations with high quality collateral.

Also, IMF (2016-a) reported that loan portfolio quality and profitability have deteriorated. NPLs have increased, with household overdue loans reaching 8.4 percent of total loans by February 2016, compared to 6.5 percent for the corporate sector. Overall NPLs were stable in May–December 2015, reflecting loan rescheduling and regulatory forbearance. Bank profitability has dropped markedly— with the return on assets reaching 0.3 percent at end-2015—to levels similar to those observed during the GFC. Several factors explain these developments. On the revenue side, net interest margins have contracted, reflecting slower asset growth and higher policy rates. In addition, net fees and commissions fell in line with net interest income. On the expenditure side, non-interest expenses declined at a lower rate than NII, while provisions have risen sharply owing to the deterioration in loan portfolios.

THE DATA AND DESCRIPTIVE STATISITCS

This study used the monthly lending rates and the Central Bank's policy related rates from the Russian commercial banks from 2011:02 to 2016:11 (where data is available), reported by the International Monetary Fund. Consequently, the results describe how Russian commercial banks behaved during the period of sharp declining oil prices and reduced access to international capital markets due to Western sanctions. The ruble came under severe pressure amid concerns about external debt redemptions which precipitated the CBR to float the exchange rate and hike the CBR policy. The monthly Russian lending rates, Central Bank's policy related rates, and their spread or intermediation premium, are denoted by LR_t, DR_t, and IP_t, respectively. Figure 1 describes the movements of LR_t, DR_t, and IP_t over the sample period.

The mean lending rate during this period is 11.11 percent and ranges from 7.90 to 19.90, with a standard deviation of 2.85. The mean Central Bank's policy related rate over the same period is 7.93 percent and ranges from 5.25 to 17.00, with a standard deviation of 3.19. The mean intermediation premium during this period is 3.18 percent, and ranges from 1.30 to 4.70, with a standard deviation of 0.75. Their correlation is 97.56 percent. Figure 1 suggests the Russian lending-Central Bank's policy related rate spread experienced a structural change over the sample period.

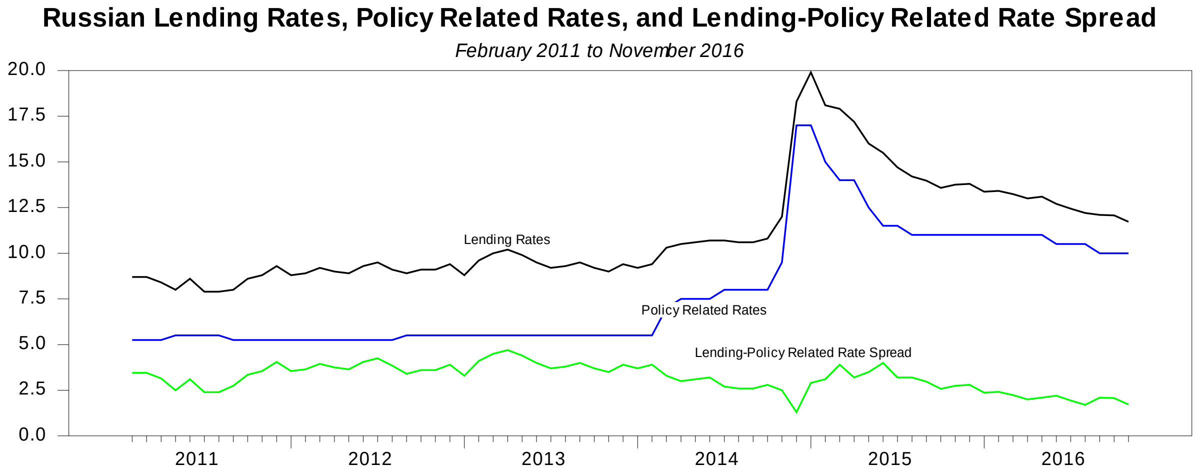

Figure 1. Russian Lending Rate, Policy Related Rate, and their Spread since 2011

METHODOLOGICAL ISSUES AND ANALYTICAL FRAMEWORK

Structural Break

This study specifies and estimates Perron's (1997) endogenous unit root test function with the intercept, slope, and the trend dummy to test the hypothesis that the Russian lending-Central Bank's policy related rate spread has a unit root;

$$IP_t = \mu + \theta DU + \alpha t + \gamma DT + \delta D(T_b) + \beta IP_{t-1} + \sum_{i=1}^{k} \psi_i \Delta IP_{t-i} + \upsilon_t \qquad (1)$$

where $DU = 1(t > T_b)$ is a post-break constant dummy variable; t is a time trend; $DT = 1(t > T_b)$ is a post-break slope dummy variable; $D(T_b) = 1(t = T_b + 1)$ is the break dummy variable; and υ_t are white-noise error terms. The null hypothesis of a unit root is stated as $\beta = 1$. The break date, T_b, is selected based on the minimum *t*-statistic for testing $\beta = 1$ (Perron, 1997).

Nonlinear Cointegration

Breitung (2001) articulated that there is often a nonlinear relationship between economic and financial time series, implying that LR_t and DR_t may be nonlinearly cointegrated. To discern this possibility, this investigation utilizes Breitung's nonparametric procedure to test for their nonlinear cointegration.

Breitung's nonparametric testing procedure consists of the cointegration test, known as the rank test for cointegration, and the nonlinearity test, referred to as the score statistic for a rank test of neglected nonlinear cointegration. To calculate the rank test for cointegration, this study first defines a ranked series as $R_T(LR_t)$ [of LR_t among $LR_1, \ldots, LR_T$] and $R_T(DR_t)$. Breitung's two-sided rank test statistic, testing for no cointegration, denoted by Ξ_T^*, is then calculated as follows:

$$\Xi_T^* = T^{-3} \sum_{i=1}^{T} (r_i^R)^2 / (\sigma_{\Delta r}^2) \qquad (2)$$

where T is the sample size, r_i^R is the least squares residual from a regression of $R_T(LR_t)$ on $R_T(DR_t)$. According to Haug and Basher (2011), $\sigma_{\Delta r}^2$ is the variance of changes in r_i^R, denoted by Δr_i^R, which is included to adjust for the potential correlation between the two time series LR_t and DR_t. The critical values for this rank test are found in Table 2 of Breitung (2001).

Given a positive result of the rank test, the first step in calculating Breitung's score statistic for a rank test of neglected nonlinear cointegration (testing for the null hypothesis of nonlinearity) is to regress the Russian lending rate, LR_t, on a constant, the Central Bank's policy related rate, DR_t, the ranked series of the Central Bank's policy related rate, $R_T(DR_t)$, and the disturbance ζ_t.

$$LP_t = \delta_0 + \delta_1 DR_t + \delta_2 R_t^*(DR_i) + \zeta_t \qquad (3)$$

where $\delta_0 + \delta_1 DR_t$ is the linear part.

Under the null hypothesis, $R_t^*(DR_i) = 0$, implying that LR_t and DR_t are linearly cointegrated. Under the alternate hypothesis, $R_t^*(DR_i) \neq 0$, implying that LR_t and DR_t are nonlinearly cointegrated. The score test statistic is given by $T.\bar{R}^2$, where $\bar{R}^2$ is the coefficient of determination of the least squares regression of ζ_t, under the null hypothesis, on a constant, the ranked series of the Central Bank's policy related, $R_T(DR_t)$, and a disturbance term. T is the sample size. As explained by Breitung (2001), under the null hypothesis of linear cointegration, the score statistic for a rank test of neglected nonlinear cointegration is asymptotically Chi-Square distributed with one degree of freedom.

Threshold Autoregressive (TAR) Model

If the results of Breitung's nonparametric tests are positive, this study follows Thompson (2006) to regress the intermediation premium , IP_t, on a constant, a linear trend and an intercept dummy (with values of zero prior to the structural break date and values of one for the structural break date and thereafter) to formally examine the Russian LR_t, DR_t, and IP_t. The estimation results are reported in Table 1.

Table 1. Estimation Results, Russian Monthly Data, 2011:02 - 2016:11

$$IP_t = 3.4859 - 0.8921 Dummy_t + \varepsilon_t$$
$$(37.9751^*) \quad (-5.6907^*)$$

ln L = -65.1386 R^2 = 0.3126   DW statistic[(a)] = 0.4473 $F_{(1,68)}$ = 32.3844*

Notes: "*" indicates significance at 1 percent level.
(a) As articulated by Enders and Siklos (2001, p. 166), in this type of model specification, ε_t may be contemporaneously correlated.

The saved residuals from the above estimated model, denoted by $\hat{\varepsilon}_t$, are then used to estimate the following TAR model:

$$\Delta\hat{\varepsilon}_t = I_t \rho_1 \hat{\varepsilon}_{t-1} + (1 - I_t)\rho_2 \hat{\varepsilon}_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta\hat{\varepsilon}_{t-i} + \hat{u}_t \qquad (4)$$

where $\hat{u}_t \sim i.i.d.(0, \sigma^2)$, and the lagged values of $\Delta\hat{\varepsilon}_t$ are meant to yield uncorrelated residuals. As defined by Enders and Granger (1998), the Heaviside indicator function for the TAR specification is given as:

$$I_t = \begin{cases} 1 & if\ \hat{\varepsilon}_{t-1} \geq \tau \\ 0 & if\ \hat{\varepsilon}_{t-1} < \tau \end{cases} \qquad (5)$$

The threshold value, τ, is endogenously determined using Chan's (1993) procedure, which obtains τ by minimizing the sum of squared residuals after sorting the estimated residuals in ascending order, and eliminating the largest and smallest 15 percent of values. The elimination of the largest and the smallest values assures that the $\hat{\varepsilon}_t$ series crosses through the threshold in the sample period.

The threshold autoregressive (TAR) model allows the degree of autoregressive decay to depend on the state of the intermediation premium, i.e. the "deepness" of cycles. The estimated TAR model reveals whether the intermediation premium reverts back to the long-run position faster when the premium is above or below the threshold. Therefore, the TAR model indicates whether troughs or peaks persist more when countercyclical monetary policy actions or economic shocks push the premium out of its long-run equilibrium path. The null hypothesis (that the intermediation premium contains a unit root) is expressed as $\rho_1 = \rho_2 = 0$, while the hypothesis that the premium is stationary with symmetric adjustments is expressed as $\rho_1 = \rho_2$.

The Asymmetric Error-Correction Model

If the results of the above asymmetric co-integration tests are positive, a Threshold Autoregressive Vector Error-Correction (TAR-VEC) model is specified and estimated to continue an investigation into any asymmetric short-run dynamic behaviours that occur between lending rates and the Central Bank's policy related rates. Results of this model can be used to study the Granger causality between lending rates and the Central Bank's policy related rates. The Granger causality will help to evaluate empirically (through statistics) how the Russian lending rates and Central Bank's policy related rates respond to widening and narrowing of the intermediation premium due to external economic shocks or countercyclical policy measures. Again, conventional error-correction models do not suffice for this purpose, because they do not allow the asymmetric adjustments toward the long-run equilibrium that the TAR-VEC model does.

$$\Delta LR_t = \alpha_0 + \rho_1 I_t \hat{\varepsilon}_{t-1} + \rho_2 (1 - I_t)\hat{\varepsilon}_{t-1} + A_{11}(L)\Delta LR_{t-i} + A_{12}(L)\Delta DR_{t-i} + u_{1t} \tag{6}$$

$$\Delta DR_t = \widetilde{\alpha}_0 + \widetilde{\rho}_1 I_t \hat{\varepsilon}_{t-1} + \widetilde{\rho}_2 (1 - I_t)\hat{\varepsilon}_{t-1} + A_{21}(L)\Delta LR_{t-i} + A_{22}(L)\Delta DR_{t-i} + u_{2t} \tag{7}$$

where $u_{1,2t} \sim i.i.d.(0,\sigma^2)$ and the Heaviside indicator function is set in accordance with (5). This assumes that the Russian lending rates may respond differently depending on whether the intermediation premium is widening or narrowing as a result of expansionary, contractionary monetary policy or external shocks.

EMPIRICAL RESULTS

Structural Break

Table 2 summarizes the results of Perron's endogenous unit root tests.

Exhibit 2: Perron's Endogenous Unit Root Test, Russian Data – 2011:02- 2016:11

$$SP_t = 1.27162 + 2.41788\,DU - 0.00268\,t - 0.04392\,DT - 1.41788\,D(T_b) + 0.64979\,SP_{t-1} + \upsilon_t$$

(4.24687*) (3.35192*) (-0.64056) (-3.34903*) (-4.53301*) (8.16621*)

Number of augmented lags: $k = 0$	Break Date: November 2011	$t(\alpha = 1) = -4.40117^{***}$

Notes: *Critical values for t-statistics in parentheses. Critical values based on n = 100 sample for the break date (Perron, 1997). "*" indicates significance at 1 percent level.*

The estimation results reveal that the post-break intercept dummy variable, DU, is positive and the post-break slope dummy variable, DT, is negative and they are both significant at 1 percent; while the break dummy, $D(T_b)$ is negative and is significant at any conventional level. The time trend, t, is negative and is insignificant at the 10 percent level. These results suggest that the spread follows a stationary trendless process. Moreover, strength of the test statistic, $t(\alpha = 1) = -4.40117$, confirms the structural break in November 2014 which may be attributable to the impact of the sharp decline in oil prices, combined with Western sanctions and Russian counter-sanctions following the Russian-Ukraine conflict which had negative impact on the Russian economy and banking sector (Gustavo et al., 2016).

Results of Breitung's Nonparametric Tests

Breitung's nonparametric rank tests calculates to be 0.000051, a result which rejects the null hypothesis of no cointegration, while the score test calculates to be 6.73092, which also rejects the null hypothesis of nonlinearity. These results strongly indicate that the Russian lending rates and Central Bank's policy related rates are linearly cointegrated.

Results of the Cointegration Test with Asymmetric Adjustment

Also, the overall estimation results of the TAR model (summarized in Table 3) indicate that the estimation results are without serial correlation and have good predicting power, as shown by the Ljung-Box statistics and the overall *F*-statistics, respectively. The model confirms that the Russian lending-Central Bank's policy related rate spread is stationary, as statistic Φ_{μ} = 9.8169 indicates that the null hypothesis of no cointegration, $\rho_1 = \rho_2 = 0$, should be rejected at the 1 percent significant level.

The results also show that ρ_1 and ρ_2 are statistically significant at the 5 percent level and the 1 percent level, respectively. In fact, the estimation results reveal that the intermediation premium tends to decay at the rate of $|\rho_1| = 0.3237$ for $\hat{\varepsilon}_{t-1}$ above the threshold, τ = -0.2859 , and at the rate of $|\rho_2| = 1.1814$ for $\hat{\varepsilon}_{t-1}$ below the threshold. On the strength of the partial *F = 7.1203,* the null hypothesis of symmetry, $\rho_1 = \rho_2$, should be rejected at 1 percent significant level, indicating statistically asymmetric adjustments around the threshold value of the Russian intermediation premium.

Table 3. Unit Root and Tests of Asymmetry, Russian Data, 2011:02- 2016:11

ρ_1	ρ_2	τ	$H_0 : \rho_1 = \rho_2 = 0$	$H_0 : \rho_1 = \rho_2$	aic	sic
-0.3237**	-1.1814*	-0.2859	Φ_{μ}= 9.8169*	F =7.1203*	-1.9050	-1.7418
$Q_{LB(12)}$ = 16,8250[0.1563]			ln L = -26.7165	$F_{(4,63)}$=5.4888*	D.W. = 2.1073	

Notes: The null hypothesis of a unit root, $H_0 : \rho_1 = \rho_2 = 0$, uses the critical values from Enders and Siklos (2001). "*" and"**" indicate 1 percent and 5 percent levels of significance. The null hypothesis of symmetry, $H_0 : \rho_1 = \rho_2$, uses the standard F distribution. τ is the threshold value determined via the Chan (1993) method. $Q_{LB(12)}$ denotes the Ljung-Box Q-statistic with twelve lags.

Specifically, the adjustment of the intermediation premium toward the long-run equilibrium tends to persist more when the premium is widening than when it is shrinking, evidenced by the finding of $|\rho_2| > |\rho_1|$. This suggests that Russian commercial banks react differently to rising Central Bank's policy related rates than they do to declining policy related rates. These findings may also be interpreted as that these institutions react differently to expansionary monetary policy than to contractionary monetary policy. The empirical results indicate the predatory pricing behaviour of the Russian lending institutions. These results also parallel those reported in advanced and emerging economies. Furthermore, these empirical findings support the aforementioned consumer characteristic and consumer reaction hypotheses.

Results of the Asymmetric Error-Correction Model

The estimation results of the TAR-VEC model, specified by Equations (5), (6), and (7), using the Russian lending rates and the Central Bank's policy related rates are summarized in Table 3. Therein, $A_{ij}(L)$ is the first-order polynomials in the lag operator *L*. F_{ij} is the calculated *F*-statistic (with the p-value in brackets), which tests the null hypothesis that all coefficients of A_{ij} are equal to zero. $Q_{(12)}$ is the Ljung-Box statistic (with its significance in brackets), which tests whether the first twelves of the residual autocorrelations are both equal to zero. *ln L* is the log likelihood.

The empirical results suggest that the estimated equations (6) and (7) are without serial correlation and have good predicting power, as shown by the Ljung-Box statistics and the overall *F-statistic*, respectively. The estimation results of equation (6) of the TAR-VEC model indicate that both ρ_1 and ρ_2 are insignificant at 5 percent level. This finding indicates that, in the long run, the Russian lending rates do not respond to fluctuations in the intermediation premium, and suggests that Russian lending institutions do not respond to either expansionary or contractionary monetary policy in the long run when short-run dynamic factors are incorporated in to the model. Regarding the long-term adjustment of the Central Bank's policy related rates, the estimation results of Equation (7) show that $\tilde{\rho}_1$ is not significant at any conventional level, while $\tilde{\rho}_2$ is statistically significant at the 1 percent level.

In addition to estimating the long-run equilibrium relationship and asymmetric adjustment, the estimated TAR-VEC model also allows for determinations of the short-run dynamic Granger causality between the Russian lending rates and the Central Bank's policy related rates. Equation (6) reveals in the partial *F*-statistic that the lending rate responds only to its own lagged changes, but does not respond to the lagged changes in the Central Bank's policy related rate, suggesting the exogeneity from Russian commercial banks' lending rate to the Central Bank's policy related rate in the short run. However, the estimation results, equation (7), show that the Central Bank's policy related rate responds to both its own lagged changes and lagged changes of the lending rates. These findings suggests a unidirectional Granger-causality from the Russian commercial banks' lending rate and the Central Bank's policy related rate in the short run, and reveal that the the Central Bank of the Russian Federation looked at its past policy related rates and past commercial banks' lending rates to formulate and implement its current policy related rates in the short run.

Table 4. Russian Lending and Policy Related Rates, Monthly Data, 2011:02- 2016:11

$$\Delta LR_t = -0.0826 - 0.2756\, I_t \hat{\varepsilon}_{t-1} - 0.9563\,(1-I_t)\hat{\varepsilon}_{t-1} + A_{11}(L)\Delta LR_{t-i} + A_{12}(L)\Delta PR_{t-i} + u_{1t}$$

(-0.3638) (-0.7249) (-1.9422) F_{11}= 4.2640[0.0455] F_{12}=2.3464[0.1088]

$Q_{(12)}$ = 7.6130[0.8146] *ln L* = -59.4934 $F_{(5,40)}$*-statistic* =3.9196*

$$\Delta PR_t = -0.0778 - 0.1117\, I_t \hat{\varepsilon}_{t-1} - 1.4001\,(1-I_t)\hat{\varepsilon}_{t-1} + A_{21}(L)\Delta LR_{t-i} + A_{22}(L)\Delta PR_{t-i} + u_{2t}$$

(0.230) (0.5394) (2.0021* F_{21}=4.1976[0.0115] F_{22}=6.0122[0.0180]

$Q_{(12)}$ =7.6470 [0.8121 *ln L* = -65.5854 $F_{(6,39)}$*-statistic* =3.2306**

Note: *" and" **" indicate 1 percent and 5 percent levels of significance, respectively.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

This study investigates the behaviour of Russian lending rates, and the Central Bank's policy related rates and corresponding spread during a period that the Russian Federation faced a sharp decline in oil prices and reduced access to international capital markets due to the Western sanctions, by estimating the threshold autoregressive (TAR) model developed by Enders and Siklos (2001).

First, the study tested the hypothesis that the spread between Russian commercial banks' lending rate and the Central Bank's policy related rate has a unit root by specifying and estimating Perron's (1997) endogenous unit root test function with the intercept, slope, and trend. This test suggested that the spread followed a stationary trendless process with a structural break in November 2014. This structural break may be attributable to the impact of the sharp decline in oil prices, combined with Western sanctions and Russian counter-sanctions that had negative impact on the Russian economy and banking sector.

Second, the study tested whether the Russian lending rates and the Central Bank's policy related rates are linearly and/or nonlinearly cointegrated. Breitung's nonparametric rank tests revealed significant linear cointegration.

Third, the estimation results of the TAR model reveal that Russian commercial banks react differently to rising versus declining Central Bank policy related rates. These findings suggest that these institutions react differently to expansionary monetary policy than to contractionary. Furthermore, these results on asymmetric responses reveal the predatory interest rate setting behaviour of the Russian institutions.

Fourth, the study introduced the short-run dynamic components to the model's specification and tested for Granger causality between the lending rate and the Central Bank's policy related rate in the short run by the empirical estimation of the TAR-VEC model. The estimation results revealed the exogeneity from the commercial banks' lending rate to the Central Bank's policy related rate and a unidirectional Granger causality from Central Bank's policy related rate to commercial banks' lending rate.

Finally, the empirical findings of this investigation indicate that during the period from February 2011 to November 2016, when the Russian Federation faced formidable challenges from the sharp decline in oil prices and reduced access to international capital markets due to Western sanctions, the Central Bank of Russia was not effective in utilizing its countercyclical monetary policy to achieve macroeconomic objectives and the commercial banks exhibited predatory pricing behavior.

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