Domestic Macroprudential Policy and Inward Transmission of Foreign Monetary Shocks: The Case of Russia*

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February 18, 2019

Abstract

This paper studies how the stance of domestic macroprudential policy affects the transmission of monetary policy shocks in the U.S. to a small open economy by estimating their effect on lending based on bank-level balance sheet data of Russian banks for 2000-2018. To identify the causal effect at the bank level we exploit heterogeneity across banks in terms of their reliance on cross-border funding. We find evidence that the effect of U.S. monetary policy shocks on domestic lending U.S. dollars has been statistically and economically significant, whereas the effect on lending in rubles being insignificant. Furthermore, a more restrictive stance of domestic macroprudential policy tends to attenuate the effect of foreign monetary shocks.

Keywords: monetary policy, macroprudential policy, international spillovers, cross-border transmission

JEL Codes: E52, F34, G21

*This paper was written as the Bank of Russia's team contribution to the International Banking Research Network (IBRN) initiative "Macroprudential and Monetary Policy Interaction." The views expressed in the paper are solely those of the authors and do not necessarily represent the official position of the Bank of Russia. The Bank of Russia is not responsible for the contents of the paper. Any reproduction of this paper shall be subject to the consent of the authors.

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1 Introduction

This paper studies empirically whether domestic macropudential policy can insulate a small open economy from the influence of the Global Financial Cycle. To the extent that capital flows from systemic economies to emerging markets are triggered by monetary policy shifts in the former, as documented by Bruno and Shin (2015) and Passari and Rey (2015), for example, this is related to the question whether or not and by how much the macroprudential policy at home is able to reshape the inward transmission of foreign monetary shocks.

We do our empirical exercise using Russian bank-level data. Russia is a small open emerging market economy, and, like other emerging market economies, it is influenced by the Global Financial Cycle. Recently, Russia experienced two major capital inflow episodes, one around 2007 and the other after 2012. In both cases, capital flows from abroad inspired excessive credit growth. This motivated the Bank of Russia, BoR thereafter, which is in charge of both price and financial stability in Russia, to test various macroprudential policies. In 2007 it experimented with raising reserve requirements on foreign borrowings. In 2013, BoR increased capital charges (i.e. introduced a higher risk weight) on high-interest, and therefore perceived as high-risk, uncollateralized consumer loans.

In this study, we investigate how the stance of domestic macropru policy transforms the dynamic effect of US monetary shocks on the growth of credit to private non-financial borrowers by Russian banks that works through the channel of banks' external funding.

We employ a panel data set that covers about 600 banks and 19 years of quarterly observations, 2000 through 2018. The dependent variable is quarterly credit growth by bank i in quarter t. There are two effects of interest. The first one is a four-quarter cumulative effect of monetary policy shocks in the US interacted with lagged transmission channel variable, which is the ratio of external liabilities to total assets (the foreign funding ratio). We limit our analysis only to US monetary shocks since up to 80-90 percent of external borrowing by Russian banks tends to be denominated in US dollars. The expected sign of the cumulative effect is negative: other things equal, the lending by institutions that rely more heavily on external funding is expected to be more sensitive to monetary tightening in the US, and these institutions will cut on their lending more aggressively.

The second effect of interest is a four-quarter cumulative dynamic effect of US monetary shocks interacted with the lagged transmission channel variable and a lagged indicator of macroprudential policy stance. If domestic macroprudential policy dampens the transmission of monetary shocks from abroad, the sign of this effect should be the opposite to the sign of the first effect of interest.

Monetary policy shocks in the US are obtained through the so-called High-Frequency Identification procedure as suggested in Gertler and Karadi (2015). According to this approach, monetary policy surprises, which are increases in the price of a futures contract on the US federal funds rate within a tight window surrounding a time of US monetary policy announcements, serve as external instruments in a Structural Vector Autoregression (SVAR) framework.

The proxy for domestic macroprudential policy stance in Russia is based on a recently compiled IMF database (Cerutti et al. (2016)). As a baseline specification, it is a 2-year cumulative sum of +1, 0, and -1s, indicating, respectively, tightening, no change, and loosening of macroprudential policy in a given period. We use a 3-year cumulative as a robustness check.

As is standard, our regressions include a number of bank-level controls as well as bank and time fixed effects.

We find that U.S. monetary policy shocks affects domestic lending by Russian in U.S. dollars with no effect on lending in rubles. An unanticipated monetary loosening in the U.S. is shown to stimulate growth in dollar-denominated loans extended by Russian banks to domestic private non-financial borrowers. The effect is statistically and economically significant. We also find that the stance of domestic macroprudential policy in Russia considerably attenuates the inward transmission of U.S. shocks. Taken at the face value, these findings suggest that domestic macroprudential policy is capable to limit international monetary spillovers.

Our paper is related to several strands of the literature...

The remainder of the paper is organized as follows. Section 2 explains how we identify U.S. monetary shocks and set up our regressions. Section 3 describes the data we use. Section 4 reports empirical findings. Section **??** offers a discussion of our results, and Section 5 concludes.

2 Methodology

In order to estimate the dynamic effect of shocks in the U.S. monetary policy on credit growth in Russia and its dependence on the domestic macroprudential policy stance, we employ a panel data regression with bank and time fixed effects, and bank controls. Regressors of interest are a distributed lag of the U.S. monetary policy shock interacted with a bank-level variable that is related to a specific channel of transmission of U.S. monetary shocks to Russian economy and a measure of the macroprudential policy stance. As the transmission channel variable, we consider the foreign funding ratio defined as the ratio of all foreign liabilities to total assets. The contemporaneous stance of domestic macroprudential policy is measured as a 2-year cumulative sum of quarterly indicators coded as +1, 0, or -1, where +1 indicates tightening, -1 loosening, and 0 no change. As a robustness check we also consider a 3-year cumulative sum. The raw data are taken from the cross-country macroprudential policy database developed recently in Cerutti et al. (2016). The time path of aggregate foreign funding ratio and the stance of domestic macroprudential policy are shown on Figures 1 and 2, respectively.

[FIGURES 1 AND 2 ABOUT HERE]

The U.S. monetary shock is identified in a structural vector autoregression framework (SVAR) using a high-frequency identification (HFI) procedure of Gertler and Karadi (2015).

Subsection 2.1 lays out details of this identification method. Subsection 2.2 describes our fixed-effect panel data regression specification.

2.1 Identification of U.S. monetary policy shocks

U.S. monetary shocks are identified in a SVAR framework, which is similar to Gertler and Karadi (2015). Following Gertler and Karadi (2015), we consider two separate identifications, one using a 4-variable SVAR and the other 6-variable SVAR. The former model contains the following four variables for the U.S.: consumer price index, industrial production, one-year interest rate on government bonds, and the excess bond premium (EBP) developed by Gilchrist and Zakrajšek (2012). The EBP is a credit spread, the difference in the yield of corporate bonds and government bonds with the same term to maturity net of the probability of default on the corporate bond. As Gilchrist and Zakrajšek (2012) document, this variable features a well-pronounced cyclical behavior and predicts well future economic activity. Together with one-year rate on government bonds, the EBP characterizes the cost of debt finance for private firms. The reduced-form four-variable VAR estimated on monthly data. The order of the SVAR is set equal to 12, which is a conventional choice in the literature when data is monthly. Monthly times series of identified monetary shocks are then aggregated to the quarterly frequency to be used in regressions. The 6-variable SVAR additionally includes credit spreads for 3-month U.S. commercial paper and 10-year mortgage loans.

The high-frequency identification (HFI) method of Gertler and Karadi (2015) employs data on so-called monetary surprises as external instruments for the identification of monetary policy shocks. This is a special case of a more general external instrument approach developed by Mertens and Ravn (2013) and Stock and Watson (2012). The idea behind the external instrument method is simple and quite appealing. Suppose that there is some imperfect proxy for a structural shock of interest. Gertler and Karadi (2015) use various series of monetary surprises as such a proxy. A monetary surprise is measured as a change in the price of a futures contract on a policy rate within a narrow (30-minute) window surrounding a time of interest rate decision announcement by the U.S. Federal Open Market Committee or any other watched-out monetary policy event. The identifying assumption is that during this narrow window a monetary policy announcement is the only development that occurs in the macroeconomic environment, with everything else remaining unchanged. It follows that a systematic component of the monetary surprise, i.e. one that is related to the exogenous change in monetary policy and is free of any noise due to market over- or underreaction, can be interpreted as a monetary policy shock. For each variable, its VAR innovation, which is a residual from an OLS regression of this variable on its own lags and lags of all other variables, is a surprise change that cannot be forecast by past information. Macroeconomic theory considers all unforeseeable developments in the environment as driven by structural shocks of different nature, i.e. exogenous shifts in preferences, technology, or economic policy, one of them being a monetary policy shock. It follows that a reduced-form VAR innovation should be a mixture of structural structural shocks. If a VAR contains a sufficient number of variables, then the space of VAR innovations should span the space of structural shocks. To the extent that the monetary shocks is the only structural shock that gives rise to a monetary surprise, an OLS projection of the VAR innovation of a monetary policy variable, which is one-year rate on governments securities, on the monetary surprise should isolate the structural monetary shock from noise. The monetary surprise works exactly in the same way as an instrumental variable with respect to the VAR innovation of the monetary policy variable. In practice, the monetary policy shock is identified as the predicted value from an OLS regression of a VAR innovation for a monetary policy indicator (one- or two-year interest rate on government bonds in Gertler and Karadi (2015)) on a monetary surprise.

Following Gertler and Karadi (2015), we use monetary surprises on five different interest rate derivatives: a current-month futures on the federal funds rate (labeled as MP1), a three-month-ahead futures on the federal funds rate (FF4), and six month, nine month, and a year ahead futures on three month Eurodollar deposits (ED2, ED3, and ED4, respectively). For each derivative contract, all individual monetary surprises are aggregated to the quarterly frequency.

In the language of instrumental variable estimation, the OLS regression of the interest rate innovation on a monetary surprise is called a first-stage regression of an endogenous regressor, the interest rate, on an instrumental variable, a monetary surprise. It is now well understood that standard methods of statistical inference cannot be applied when instruments are weakly correlated with the instrumented endogenous regressor. As a screening device, Stock et al. (2002) suggest using a threshold of 10 for the F-statistic that tests the null hypothesis that in population all instrumental variables in the first-stage regression are jointly insignificant. We applied this method to the five candidate instrumental variables and found that only two of them were strong instruments, MP1 and FF4, with first-stage F-statistics being 18.75 and 23.11, respectively, for 4-variable SVAR and 18.04 and 20.01, respectively, for 6-variable SVAR. Our baseline regressions therefore employ U.S. monetary policy shocks identified with three different sets of external instruments: (i) MP1, (ii) FF4, and (iii) MP1 and FF4.

2.2 Econometric specification

Our econometric specification is a fixed effects panel data regression. The dependent variables is the quarterly growth rate of loans granted by a bank to private non-financial borrowers. We run separate regressions for (i) ruble-denominated loans and (ii) dollar-denominated loans. The regressors of interest are a contemporaneous value of the identified U.S. monetary policy shock along with its three lags, all interacted with the fourth lag of the foreign funding ratio and the fourth lag of the macroprudential policy stance.

The specification also includes bank-level control variables: log of total real assets, the ratio of core deposits to total assets, and (the reciprocal of) the leverage ratio defined as the ratio of banks tier 1 capital to total assets.

The effect of time-invariant factors at the bank level is captured by bank fixed effects u_i. The effect of time-varying factors that affect all banks uniformly is captured by time fixed effects v_t. These factors potentially include domestic and foreign levels of economic activity, risk appetite of international investors, etc. The interactions of contemporaneous and lagged foreign monetary policy shocks with lagged foreign funding ratio and lagged macroprudential policy stance capture the idea that the dynamic effect of U.S. monetary policy can be heterogeneous across banks and can depend on the stance of domestic macroprudential policy. For example, institutions that rely on external funding to a greater extent than their peers are likely to cut their lending more intensively in response to monetary tightening in the U.S., while higher reserve requirements on external borrowing is likely to discourage banks to borrow abroad and thus reduce the effect of foreign monetary shocks on domestic lending.

The fixed-effects panel regression specification is thus given by

$$\begin{aligned} loans_{it} = & \sum_{k=0}^{3} \alpha_k foreign_{i,t-4} us_{t-k} + \sum_{k=0}^{3} \beta_k foreign_{i,t-4} mpp_{t-4} us_{t-k} \\ & + \delta\, foreign_{i,t-4} + \gamma_1 ta_{i,t-1} + \gamma_2 tier1_{i,t-1} + \gamma_3 core_{i,t-1} + u_i + v_t + e_{it} \end{aligned} \quad (1)$$

where *loans* is either *ruble* or *dollar* loans, and *foreign* is the foreign funding ratio. As specification (1) implies, the foreign funding ratio enters the regression with lag 4. This is motivated by the intention to estimate the dynamic effect of foreign monetary policy shocks given the exposure of a bank to cross-border financial liabilities just before the arrival of a shock. In general, this variable is endogenous, and it will therefore respond to a monetary shock in the U.S. Taking predetermined, namely, date $t-4$, values of this variable should make OLS estimates of the coefficients of interest – those on the distributed lag of the U.S. monetary policy shock interacted with the lagged foreign funding variable – free of a simultaneity bias. A similar argument applies to the macroprudential policy stance variable, which appears in the equation at its fourth lag.

When estimating regressions (1), the standard errors are clustered at the bank level in order to account for serial correlation in the idiosyncratic error term e_{it}.

2.3 Hypotheses of interest

In this study, we investigate if

(i) U.S. monetary policy shocks transmit to the economy of Russia through the foreign borrowing channel;

(ii) A tighter stance of domestic macroprudential policy attenuates the transmission of foreign monetary shocks to domestic lending.

In the Section 4 we formally test statistical hypotheses related to research questions (i)-(ii).

To approach (i), we look at the statistical significance of the four-quarter cumulative effect of the U.S. monetary shock interacted with the fourth lag of foreign funding ratio. This cumulative effect equals the sum of the coefficients of the distributed lag of the U.S. monetary policy shock interacted with a channel variable: $\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3$ in the notation of equation (1). The expected sign of the effect is negative: an unanticipated tightening in the U.S. raises the cost of dollar funding and forces a bank dependent on it to cut on its loans.

To approach (ii), we test the statistical significance of the cumulative effect of the triple interactions, the distributed lag of the U.S. monetary shock interacted with lagged foreign funding ratio and the stance of domestic macroprudential policy. The expected sign of the effect is positive: a more restrictive macroprudential policy at home is likely to make the effect of foreign monetary shocks on domestic lending less pronounced.

In all cases, when point estimates prove statistically significant, we pay attention to the sign of the estimated coefficient and check if it is consistent with theoretical predictions. We also make some simple calculations to figure out if the estimated effect is quantitatively substantial.

3 Data

The dataset that we employ in this study consists of three parts: (i) a panel of supervisory bank-level data; (ii) U.S. macroeconomic time series for SVAR that serves to estimate a time series of the U.S. monetary policy shock; and (iii) a quarterly time series of the 2- or 3-year cumulative sum of increments in the macroprudential policy indicator that take values +1, 0, and -1, respectively, for tightening, no change, and loosening. The raw data are taken from the cross-country macroprudential policy database developed in Cerutti et al. (2016). The bank-level and macroprudential policy data are quarterly and cover the time period from the first quarter of 2000 through the first quarter of 2018. The SVARs are estimated on monthly data. Monthly time series of identified U.S. monetary shocks are then aggregated to quarterly.

The bank-level panel data come from obligatory reports that all commercial banks with operations in Russia are required to submit to the Bank of Russia every month. There are more than 700 banks in our dataset. During the period of our analysis a number of banks were reorganised via mergers and acquisitions. To deal with this issue we follow the traditional approach: if two banks merged at some point, we created a synthetic bank, as if both institutions had been a single entity for the entire sample period. More than that during the period under study the number of banks has decreased substantially not least because of enhancement of supervision policy in 2013. We dropped the last four quarters of observations that a bank had reported before its exit (due to a licence withdrawal) to clean the dataset from idiosyncratic business decisions that might distort our dataset.

The bank-level data include such variables as the growth rate of loans to resident private nonfinancial borrowers in rubles and in foreign currencies, the liabilities to nonresidents as a fraction of total assets, which we label as the foreign funding ratio, total assets (ta), the inverse of the leverage ratio ($leverage$) defined as the ratio of tier-one capital to total assets and core deposits as a fraction of total assets ($core$). Balance sheet characteristics and the foreign funding ratio are adjusted for outliers to ensure that large observations are not driving the results [1]. We eliminate valuation effects caused by exchange rate fluctuations from our bank-level variables. We do this in attempt to avoid substantial movements in our bank-level regressors that are uninformative from the perspective of our empirical exercise. For example, a sharp depreciation of the ruble such as one that occurred in December 2014 will reduce the dollar value of ruble-denominated balance sheet items producing a spurious spike in the ratio of cross-border liabilities to assets, a key bank-level variable in our study, even if the dollar value of cross-border liabilities remains unchanged. This spike obviously does not anything to do with a change in the composition of banks' funding sources. From the estimation perspective, noise in a regressor of interest (interacted with a distributed lag of foreign monetary policy shock) will be equivalent to measurement error in the regressor and, hence, bias estimated effect toward zero. In fixed-effect panel regressions, this bias is magnified (Wooldridge (2010), p. 365). To solve this issue, we convert all ruble denominated asset and liability items involved into construction of bank-level variables to U.S. dollars using the average exchange rate of the ruble against the U.S. dollar for the period under estimation. Foreign currency denominated items are expressed in rubles in banks' financial statements. We converted them to U.S. dollars using the contemporaneous exchange rate of the ruble against U.S. dollar.

Figures 3 and 4 show the time path of the cross-section average growth rates of, respectively, dollar-denominates and ruble-denominated loans. Figure 1 shows the time path of the cross-section average foreign funding ratio.

[FIGURES 3 AND 4 ABOUT HERE]

Six U.S. macroeconomic time series employed in the SVAR are index of industrial production (seasonally adjusted), the rate of CPI inflation (seasonally adjusted), the interest rate on one-year government bonds, Gilchrist – Zakrajšek's excess bond premium (EBP), and the credit spread on 3-month commercial paper and 10-year mortgage securities. All series

[1] We exclude observations where the value of the respective variable lies in the top 100 percentile or in the bottom 1 percentile of the sample distribution

except EBP are taken from the online Federal Reserve Database (FRED – `www.fred.org`). The EBP data up to August 2016 is available from Simon Gilchrist's webpage. We extend the EBP series beyond August 2016 by recursively forecasting it one quarter ahead using the reduced-form VAR estimated on a subsample ending the third quarter of 2016.

Data on external instruments MP1, FF4, ED2, ED3, and ED4 up to October 2015 are kindly shared by the Bank of England's IBRN team.

4 Findings

Estimation results for regression (1) are reported in Tables 1 to 8. Each table shows estimated coefficients on the double and triple interactions of identified U.S. monetary policy shocks with lagged foreign funding ratio and the stance of domestic macroprudential policy along with heteroscedasticity and autocorrelation consistent (HAC) standard errors clustered at the bank level. Different columns in correspond to different choices of external instruments used to identify U.S. monetary shocks in a SVAR. The upper section of each table shows estimation results with U.S. shocks identified within a 4-variable SVAR whereas the lower section results for 6-variable SVAR. Note that all tables report *cumulative* rather than individual effects of interacted U.S. monetary shocks at horizons up to one year. For example, the fourth and the eighth rows of each table present estimates of $\sum_{k=0}^{3} \alpha_k$ and $\sum_{k=0}^{3} \beta_k$, respectively, in notation of equation (1).

Tables 1 to 4 report estimated regressions (1) where the dependent variable is the annualized quarterly growth in dollar-denominated loans. Regressions in Table 1 employ the 2-year cumulative measure of the macroprudential policy stance that excludes reserve requirements while Table 2 shows regressions with the same 2-year proxy that involves reserve requirements. The estimated effects of interest are highly significant, both statistically and quantitatively. The estimated effect of a one-year cumulative multiplier under the neutral macroprudential policy stance is about 6. This implies that, in response to an unanticipated rise in the U.S. monetary policy indicator by 25 b.p. the growth rate of the dollar loan portfolio of a typical bank with the foreign funding ratio about 10% will decelerate by 15 percent, perhaps, a bit too much to be true, given quite a moderate magnitude of the shock. It is remarkable though that, according to Table 2, this effect would be totally missing if the macroprudential policy stance on the eve of the arrival of this shock were moderately restrictive, with the macroprudential policy indicator equal to +1.

The somewhat implausible estimates reported in Table 1 might be a product of the omission of the reserve requirements from the proxy for the domestic macroprudential policy stance. It is worth mentioning though that, in Russia, policy interventions of this sort addressed mostly not regular reserve requirements against home currency deposits but rather foreign borrowing. This was the case both in 2006-2007 when Russia experienced massive inflows of private capital and in 2011-2012 when the Bank of Russia. In both episodes the Bank of Russia applied this policy in order to discourage financial institutions from tolerating currency mismatch of assets and liabilities. As one can see from Figure 2, the two proxies for the domestic macroprudential policy stance, with and without reserve requirements, are correlated but the time variation of the policy indicator that omits reserve requirements is much less pronounced. If one uses this indicator, then there is a risk that too much power is assigned to macroprudential policy interventions unrelated to reserve requirements, which results in an omitted variable bias problem. For this reason, we believe that estimates reported in Table 2 are more informative with regard to the potency of macroprudential policies. In Table 2 the estimated cumulative effects interacted with the foreign funding ratio are quantitatively smaller, by the factor of 1.5 to 2, than in Table 1 for two out of three identifications, FF4 and MP1+FF4. What is interesting, the effect of the macroprudential policy stance on the magnitude of the dynamic effect is much more modest: a moderate tightening of the macroprudential policy stance at home offsets about a quarter of the effect of the shock on lending.

Tables 3 and 4 show robustness-check regressions. These are counterparts of Tables 1 and 2, the difference being that 3-year rather than 2-year cumulative macroprudential policy indicators serve as proxies for domestic macroprudential policy stance. The estimates in Tables 3 and 4 are quantitatively close to those in Tables 1 and 6.

The first effect of interest, the 1-year cumulative effect of US monetary shocks interacted with lagged transmission channel variable, the ratio of foreign liabilities to total assets, is negative and significant, statistically and economically for all/most specifications. The sign of the effect is the opposite to what was expected: positive rather than negative. Taken literally, this implies that a monetary tightening in the US will have a more pronounced positive effect or less pronounced negative effect on credit growth of Russian banks with higher dependence on foreign borrowing.

Tables 5 to 8 show estimation results for regression (1) with the annualized quarterly growth of ruble-denominated loans as dependent variable. The estimates suggest that there is no effect of U.S. monetary shocks on lending in rubles at any lags no matter how the U.S. monetary shocks are identified or how exactly the proxy for domestic macroprudential policy stance is constructed.

5 Conclusion

In this paper, we document that U.S. monetary shocks affect domestic lending in Russia but this effect is limited only to dollar-denominated loans extended by Russian banks whereas lending in rubles remains unaffected. We also find that a restrictive domestic macroprudential policy tends to attenuate the transmission of U.S. monetary shocks into domestic lending.

References

Bruno, V. and H. S. Shin (2015): "Capital flows and the risk-taking channel of monetary policy," *Journal of Monetary Economics*, 71, 119–132.

Cerutti, E., R. Correa, E. Fiorentino, and E. Segalla (2016): "Changes in Prudential Policy Instruments: A New Cross-Country Database," working paper 16/110, International Monetary Fund.

Gertler, M. and P. Karadi (2015): "Monetary Policy Surprises, Credit Costs, and Economic Activity," *American Economic Journal: Macroeconomics 7*, 44–76.

Gilchrist, S. and E. Zakrajšek (2012): "Credit Spreads and Business Cycle Fluctuations," *American Economic Review 102*, 1692–1720.

Mertens, K. and M. O. Ravn (2013): "The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States," *American Economic Review 103*, 1212–1247.

Passari, E. and H. Rey (2015): "Financial Flows and the International Monetary System," *Economic Journal 125*, 675–698.

Stock, J. H. and M. W. Watson (2012): "Disentangling the Channels of the 2007-2009 Recession," *Brookings Papers on Economic Activity 42*, 81–135.

Stock, J. H., J. H. Wright, and M. Yogo (2002): "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments," *Journal of Business and Economic Statistics 20*, 518–529.

Wooldridge, J. M. (2010): *Econometric Analysis of Cross Section and Panel Data, 2nd edition*, Cambridge, Massachusetts: MIT Press.

Tables

Table 1: Cumulative dynamic effect of US monetary policy shocks on domestic lending in US dollars with the stance of domestic macroprudential policy measured as a two-year cumulative with reserve requirements excluded

	external instruments		
regressor	MP1	FF4	MP1+FF4
	US MP shocks are identified in 4-variable SVAR		
us×foreign(-4)	-1.864 (0.623)***	-1.979 (0.633)***	-1.927 (0.587)***
us(-1)×foreign(-4)	-2.001 (0.905)**	-1.993 (1.117)*	-1.773 (0.952)*
us(-2)×foreign(-4)	-4.636 (1.514)***	-3.319 (2.147)	-3.895 (1.802)**
us(-3)×foreign(-4)	-6.617 (1.648)***	-5.756 (1.711)***	-5.932 (1.590)***
us×mpp(-4)×foreign(-4)	0.730 (0.749)	2.089 (0.892)**	1.615 (0.784)**
us(-1)×mpp(-4)×foreign(-4)	1.669 (1.131)	3.194 (1.595)**	2.198 (1.351)
us(-2)×mpp(-4)×foreign(-4)	2.957 (1.553)*	4.180 (2.246)*	3.681 (1.882)*
us(-3)×mpp(-4)×foreign(-4)	5.843 (1.648)***	6.986 (1.823)***	6.180 (1.635)***
	US MP shocks are identified in 6-variable SVAR		
us×foreign(-4)	-1.758 (0.591)***	-1.886 (0.618)***	-1.822 (0.565)***
us(-1)×foreign(-4)	-1.789 (0.827)**	-1.852 (1.078)*	-1.589 (0.876)*
us(-2)×foreign(-4)	-4.159 (1.380)***	-2.989 (2.072)	-3.590 (1.636)**
us(-3)×foreign(-4)	-5.882 (1.419)***	-5.189 (1.506)***	-5.318 (1.376)***
us×mpp(-4)×foreign(-4)	0.679 (0.713)	2.007 (0.871)**	1.430 (0.742)*
us(-1)×mpp(-4)×foreign(-4)	1.466 (1.046)	3.047 (1.547)**	1.857 (1.242)
us(-2)×mpp(-4)×foreign(-4)	2.534 (1.417)*	3.837 (2.165)*	3.160 (1.706)*
us(-3)×mpp(-4)×foreign(-4)	5.099 (1.415)***	6.382 (1.628)***	5.360 (1.413)***

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 2: Cumulative dynamic effect of US monetary policy shocks on domestic lending in US dollars with the stance of domestic macroprudential policy measured as a two-year cumulative with reserve requirements included

	external instruments		
regressor	MP1	FF4	MP1+FF4
	US MP shocks are identified in 4-variable VAR		
us×foreign(-4)	-3.156 (0.661)***	-2.197 (0.643)***	-2.401 (0.598)***
us(-1)×foreign(-4)	-2.553 (0.975)***	-1.640 (1.143)	-1.781 (1.016)*
us(-2)×foreign(-4)	-5.372 (1.493)***	-2.966 (1.316)**	-3.682 (1.320)***
us(-3)×foreign(-4)	-6.345 (1.527)***	-3.526 (1.278)***	-4.351 (1.267)***
us×mpp(-4)×foreign(-4)	0.944 (0.271)***	0.927 (0.260)***	0.892 (0.247)***
us(-1)×mpp(-4)×foreign(-4)	0.868 (0.386)**	0.951 (0.375)**	0.822 (0.360)**
us(-2)×mpp(-4)×foreign(-4)	1.071 (0.491)**	1.105 (0.403)***	1.034 (0.419)**
us(-3)×mpp(-4)×foreign(-4)	1.548 (0.469)***	1.253 (0.389)***	1.248 (0.378)***
	US MP shocks are identified in 6-variable VAR		
us×foreign(-4)	-2.914 (0.622)***	-2.131 (0.634)***	-2.347 (0.575)***
us(-1)×foreign(-4)	-2.226 (0.901)**	-1.528 (1.123)	-1.649 (0.956)*
us(-2)×foreign(-4)	-4.763 (1.370)***	-2.777 (1.279)**	-3.521 (1.266)***
us(-3)×foreign(-4)	-5.560 (1.349)***	-3.253 (1.158)***	-4.091 (1.143)***
us×mpp(-4)×foreign(-4)	0.846 (0.254)***	0.901 (0.256)***	0.837 (0.238)***
us(-1)×mpp(-4)×foreign(-4)	0.737 (0.355)**	0.912 (0.369)**	0.732 (0.347)**
us(-2)×mpp(-4)×foreign(-4)	0.900 (0.453)**	1.047 (0.395)***	0.924 (0.408)**
us(-3)×mpp(-4)×foreign(-4)	1.312 (0.414)***	1.164 (0.360)***	1.119 (0.344)***

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 3: Cumulative dynamic effect of US monetary policy shocks on domestic lending in US dollars with the stance of domestic macroprudential policy measured as a three-year cumulative with reserve requirements excluded

	external instruments		
regressor	MP1	FF4	MP1+FF4
US MP shocks are identified in 4-variable VAR			
us×foreign(-4)	-4.167 (1.065)***	-5.819 (1.446)***	-4.832 (1.196)***
us(-1)×foreign(-4)	-3.796 (1.112)***	-1.033 (1.735)	-2.307 (1.217)*
us(-2)×foreign(-4)	-6.914 (1.804)***	-6.756 (2.577)***	-6.349 (2.069)***
us(-3)×foreign(-4)	-7.839 (1.886)***	-6.250 (1.925)***	-6.609 (1.773)***
us×mpp(-4)×foreign(-4)	2.611 (1.075)**	5.088 (1.393)***	3.869 (1.158)***
us(-1)×mpp(-4)×foreign(-4)	3.115 (1.172)***	0.705 (1.850)	1.668 (1.304)
us(-2)×mpp(-4)×foreign(-4)	5.028 (1.776)***	6.053 (2.476)**	5.148 (1.991)***
us(-3)×mpp(-4)×foreign(-4)	6.789 (1.804)***	6.134 (1.821)***	6.036 (1.670)***
US MP shocks are identified in 6-variable VAR			
us×foreign(-4)	-3.682 (0.996)***	-5.548 (1.403)***	-4.283 (1.105)***
us(-1)×foreign(-4)	-3.177 (0.982)***	-0.702 (1.632)	-2.098 (1.066)**
us(-2)×foreign(-4)	-5.928 (1.591)***	-6.270 (2.491)**	-5.604 (1.844)***
us(-3)×foreign(-4)	-6.692 (1.588)***	-5.623 (1.660)***	-5.850 (1.511)***
us×mpp(-4)×foreign(-4)	2.201 (1.009)**	4.847 (1.354)***	3.307 (1.076)***
us(-1)×mpp(-4)×foreign(-4)	2.510 (1.050)**	0.396 (1.766)	1.443 (1.161)
us(-2)×mpp(-4)×foreign(-4)	4.092 (1.568)***	5.575 (2.402)**	4.337 (1.784)**
us(-3)×mpp(-4)×foreign(-4)	5.633 (1.510)***	5.482 (1.588)***	5.189 (1.425)***

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 4: Cumulative dynamic effect of US monetary policy shocks on domestic lending in US dollars with the stance of domestic macroprudential policy measured as a three-year cumulative with reserve requirements included

	external instruments		
regressor	MP1	FF4	MP1+FF4
US MP shocks are identified in 4-variable VAR			
us×foreign(-4)	-4.411 (0.851)***	-3.477 (0.857)***	-3.717 (0.807)***
us(-1)×foreign(-4)	-1.198 (1.042)	-0.821 (1.078)	-0.950 (1.027)
us(-2)×foreign(-4)	-2.492 (1.543)	-1.159 (1.265)	-1.445 (1.303)
us(-3)×foreign(-4)	-2.605 (1.617)	-1.606 (1.288)	-2.067 (1.284)
us×mpp(-4)×channel(-4)	1.237 (0.325)***	1.108 (0.324)***	1.166 (0.301)***
us(-1)×mpp(-4)×foreign(-4)	0.261 (0.342)	0.234 (0.432)	0.201 (0.380)
us(-2)×mpp(-4)×foreign(-4)	0.151 (0.486)	0.171 (0.499)	0.111 (0.471)
us(-3)×mpp(-4)×foreign(-4)	0.619 (0.429)	0.412 (0.373)	0.485 (0.348)
US MP shocks are identified in 6-variable VAR			
us×channel(-4)	-4.245 (0.804)***	-3.452 (0.841)***	-3.705 (0.773)***
us(-1)×foreign(-4)	-1.218 (0.958)	-0.873 (1.053)	-0.985 (0.975)
us(-2)×foreign(-4)	-2.502 (1.411)*	-1.241 (1.209)	-1.543 (1.244)
us(-3)×foreign(-4)	-2.646 (1.420)*	-1.719 (1.164)	-2.183 (1.160)*
us×mpp(-4)×foreign(-4)	1.192 (0.304)***	1.095 (0.318)***	1.159 (0.288)***
us(-1)×mpp(-4)×foreign(-4)	0.264 (0.315)	0.237 (0.424)	0.199 (0.355)
us(-2)×mpp(-4)×foreign(-4)	0.168 (0.448)	0.176 (0.486)	0.109 (0.446)
us(-3)×mpp(-4)×foreign(-4)	0.619 (0.377)	0.418 (0.346)	0.504 (0.316)

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 5: Cumulative dynamic effect of US monetary policy shocks on domestic lending in rubles with the stance of domestic macroprudential policy measured as a two-year cumulative with reserve requirements excluded

	external instruments		
regressor	MP1	FF4	MP1+FF4
US MP shocks are identified in 4-variable VAR			
us×foreign(-4)	0.311 (0.440)	-0.172 (0.433)	-0.065 (0.406)
us(-1)×foreign(-4)	-0.245 (0.598)	-0.251 (0.816)	-0.273 (0.687)
us(-2)×foreign(-4)	0.055 (0.873)	-0.588 (1.133)	-0.312 (0.963)
us(-3)×foreign(-4)	0.282 (0.944)	0.273 (0.985)	0.310 (0.916)
us×mpp(-4)×foreign(-4)	-0.689 (0.510)	-0.085 (0.542)	-0.237 (0.493)
us(-1)×mpp(-4)×foreign(-4)	0.063 (0.687)	0.293 (0.901)	0.203 (0.780)
us(-2)×mpp(-4)×foreign(-4)	-0.120 (0.931)	0.835 (1.239)	0.404 (1.041)
us(-3)×mpp(-4)×foreign(-4)	-0.213 (0.882)	0.231 (0.998)	0.010 (0.888)
US MP shocks are identified in 6-variable VAR			
us×foreign(-4)	0.278 (0.421)	-0.195 (0.425)	-0.045 (0.394)
us(-1)×foreign(-4)	-0.281 (0.565)	-0.295 (0.801)	-0.307 (0.643)
us(-2)×foreign(-4)	-0.036 (0.806)	-0.676 (1.102)	-0.332 (0.886)
us(-3)×foreign(-4)	0.143 (0.823)	0.119 (0.882)	0.171 (0.808)
us×mpp(-4)×foreign(-4)	-0.640 (0.487)	-0.059 (0.532)	-0.258 (0.474)
us(-1)×mpp(-4)×foreign(-4)	0.104 (0.650)	0.333 (0.886)	0.215 (0.734)
us(-2)×mpp(-4)×foreign(-4)	-0.031 (0.862)	0.912 (1.209)	0.385 (0.960)
us(-3)×mpp(-4)×foreign(-4)	-0.084 (0.777)	0.365 (0.905)	0.092 (0.780)

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 6: Cumulative dynamic effect of US monetary policy shocks on domestic lending in rubles with the stance of domestic macroprudential policy measured as a two-year cumulative with reserve requirements included

	external instruments		
regressor	MP1	FF4	MP1+FF4
US MP shocks are identified in 4-variable VAR			
us×foreign(-4)	-0.024 (0.383)	-0.265 (0.342)	-0.226 (0.332)
us(-1)×foreign(-4)	-0.430 (0.632)	-0.233 (0.632)	-0.389 (0.598)
us(-2)×foreign(-4)	-0.060 (0.818)	-0.286 (0.677)	-0.285 (0.670)
us(-3)×foreign(-4)	0.258 (0.855)	0.034 (0.681)	0.073 (0.683)
us×mpp(-4)×foreign(-4)	-0.052 (0.145)	0.022 (0.127)	0.004 (0.123)
us(-1)×mpp(-4)×foreign(-4)	0.061 (0.214)	0.032 (0.164)	0.058 (0.170)
us(-2)×mpp(-4)×foreign(-4)	-0.041 (0.265)	0.039 (0.198)	0.018 (0.207)
us(-3)×mpp(-4)×foreign(-4)	-0.132 (0.249)	-0.006 (0.203)	-0.054 (0.198)
US MP shocks are identified in 6-variable VAR			
us×foreign(-4)	-0.047 (0.363)	-0.267 (0.335)	-0.213 (0.322)
us(-1)×foreign(-4)	-0.458 (0.591)	-0.244 (0.619)	-0.423 (0.573)
us(-2)×foreign(-4)	-0.135 (0.748)	-0.306 (0.651)	-0.299 (0.638)
us(-3)×foreign(-4)	0.144 (0.758)	-0.000 (0.628)	0.038 (0.626)
us×mpp(-4)×foreign(-4)	-0.039 (0.136)	0.024 (0.125)	0.003 (0.118)
us(-1)×mpp(-4)×foreign(-4)	0.076 (0.199)	0.035 (0.161)	0.067 (0.167)
us(-2)×mpp(-4)×foreign(-4)	-0.016 (0.245)	0.043 (0.192)	0.021 (0.201)
us(-3)×mpp(-4)×foreign(-4)	-0.097 (0.220)	0.002 (0.190)	-0.051 (0.182)

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 7: Cumulative dynamic effect of US monetary policy shocks on domestic lending in rubles with the stance of domestic macroprudential policy measured as a three-year cumulative with reserve requirements excluded

	external instruments		
regressor	MP1	FF4	MP1+FF4
US MP shocks are identified in 4-variable VAR			
us×foreign(-4)	-0.210 (0.802)	0.379 (0.871)	0.092 (0.790)
us(-1)×foreign(-4)	-0.517 (1.012)	-0.435 (1.399)	-0.527 (1.103)
us(-2)×foreign(-4)	-0.218 (1.302)	-0.712 (1.516)	-0.361 (1.328)
us(-3)×foreign(-4)	0.420 (1.210)	0.780 (1.202)	0.614 (1.112)
us×mpp(-4)×foreign(-4)	-0.311 (0.796)	-0.782 (0.839)	-0.524 (0.766)
us(-1)×mpp(-4)×foreign(-4)	0.305 (1.001)	0.237 (1.393)	0.298 (1.093)
us(-2)×mpp(-4)×foreign(-4)	0.157 (1.298)	0.749 (1.483)	0.339 (1.309)
us(-3)×mpp(-4)×foreign(-4)	-0.378 (1.147)	-0.436 (1.143)	-0.380 (1.046)
US MP shocks are identified in 6-variable VAR			
us×foreign(-4)	-0.232 (0.743)	0.318 (0.841)	0.002 (0.742)
us(-1)×foreign(-4)	-0.545 (0.909)	-0.521 (1.332)	-0.569 (0.992)
us(-2)×foreign(-4)	-0.287 (1.146)	-0.821 (1.434)	-0.398 (1.194)
us(-3)×foreign(-4)	0.306 (1.017)	0.599 (1.040)	0.450 (0.950)
us×mpp(-4)×foreign(-4)	-0.267 (0.739)	-0.719 (0.813)	-0.432 (0.723)
us(-1)×mpp(-4)×foreign(-4)	0.341 (0.900)	0.317 (1.332)	0.340 (0.986)
us(-2)×mpp(-4)×foreign(-4)	0.227 (1.141)	0.845 (1.406)	0.360 (0.986)
us(-3)×mpp(-4)×foreign(-4)	-0.268 (0.956)	-0.274 (0.993)	-0.253 (0.891)

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 8: Cumulative dynamic effect of US monetary policy shocks on domestic lending in rubles with the stance of domestic macroprudential policy measured as a three-year cumulative with reserve requirements included

	external instruments		
regressor	MP1	FF4	MP1+FF4
	US MP shocks are identified in 4-variable VAR		
us×foreign(-4)	-0.179 (0.446)	-0.421 (0.419)	-0.385 (0.408)
us(-1)×foreign(-4)	-0.414 (0.688)	-0.352 (0.566)	-0.411 (0.584)
us(-2)×foreign(-4)	0.282 (0.863)	0.068 (0.695)	0.082 (0.708)
us(-3)×foreign(-4)	0.851 (0.922)	0.218 (0.726)	0.353 (0.733)
us×mpp(-4)×foreign(-4)	-0.158 (0.167)	-0.007 (0.146)	-0.035 (0.141)
us(-1)×mpp(-4)×foreign(-4)	-0.001 (0.195)	-0.039 (0.204)	-0.019 (0.188)
us(-2)×mpp(-4)×foreign(-4)	-0.200 (0.234)	-0.213 (0.216)	-0.200 (0.210)
us(-3)×mpp(-4)×foreign(-4)	-0.308 (0.247)	-0.160 (0.203)	-0.174 (0.195)
	US MP shocks are identified in 6-variable VAR		
us×foreign(-4)	-0.201 (0.416)	-0.421 (0.409)	-0.372 (0.392)
us(-1)×foreign(-4)	-0.450 (0.639)	-0.358 (0.552)	-0.432 (0.567)
us(-2)×foreign(-4)	0.186 (0.785)	0.049 (0.665)	0.054 (0.674)
us(-3)×foreign(-4)	0.701 (0.817)	0.190 (0.666)	0.338 (0.672)
us×mpp(-4)×foreign(-4)	-0.137 (0.153)	-0.005 (0.142)	-0.038 (0.134)
us(-1)×mpp(-4)×foreign(-4)	0.014 (0.180)	-0.035 (0.198)	-0.007 (0.178)
us(-2)×mpp(-4)×foreign(-4)	-0.170 (0.214)	-0.204 (0.207)	-0.183 (0.198)
us(-3)×mpp(-4)×foreign(-4)	-0.265 (0.217)	-0.151 (0.188)	-0.165 (0.177)

Notes: Reported HAC standard errors are clustered at the bank level. US monetary policy shocks *us* was identified in a structural VAR similar to Gertler and Karadi (2015) with monetary surprises on, alternatively, $MP1$, $FF4$, or $MP1$ and $FF4$, as external instruments. Bank controls are *leverage*, *core*, and *ta*. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Figures

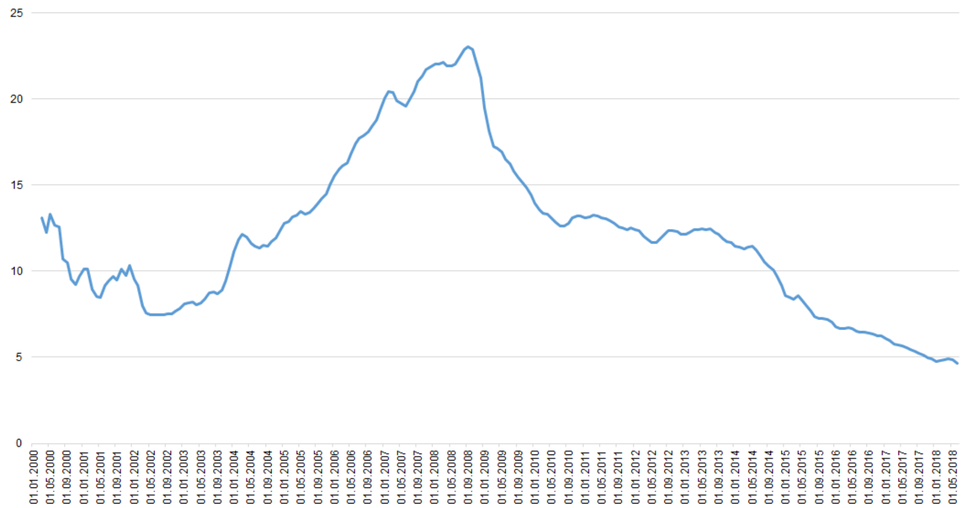

Figure 1: Foreign funding ratio

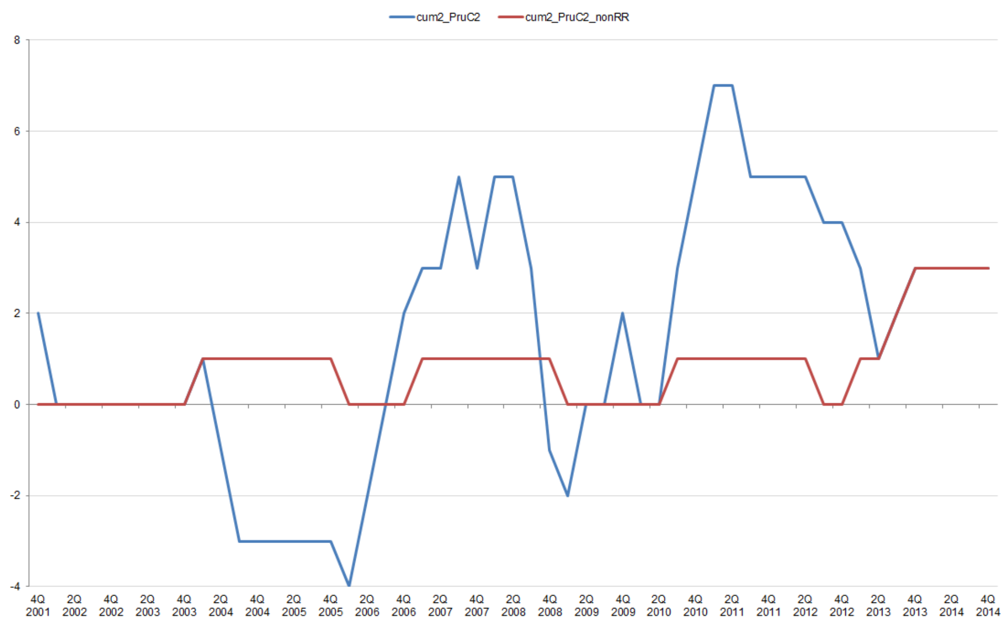

Figure 2: Macroprudential policy stance in Russia

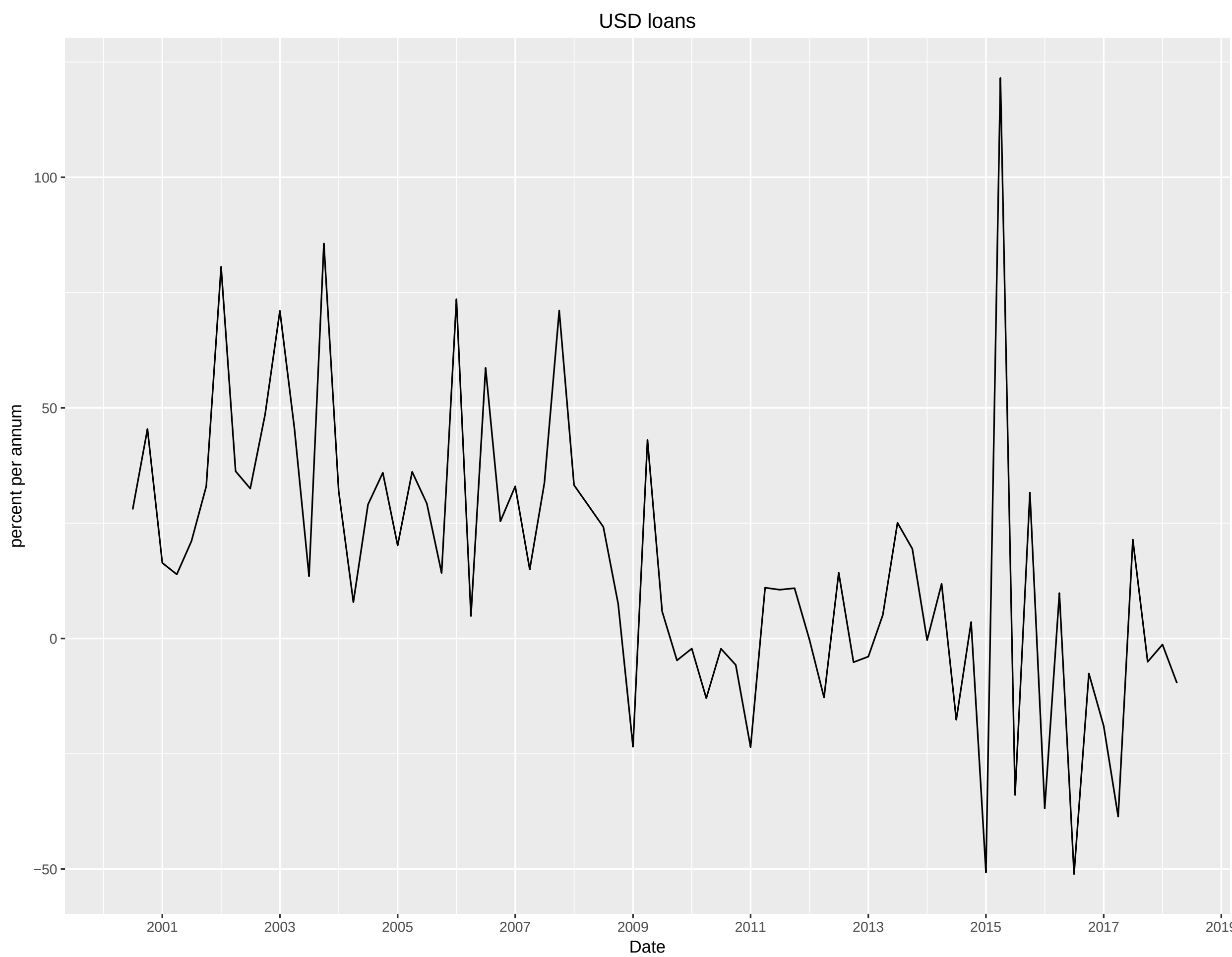

Figure 3: Dollar-denominated loans

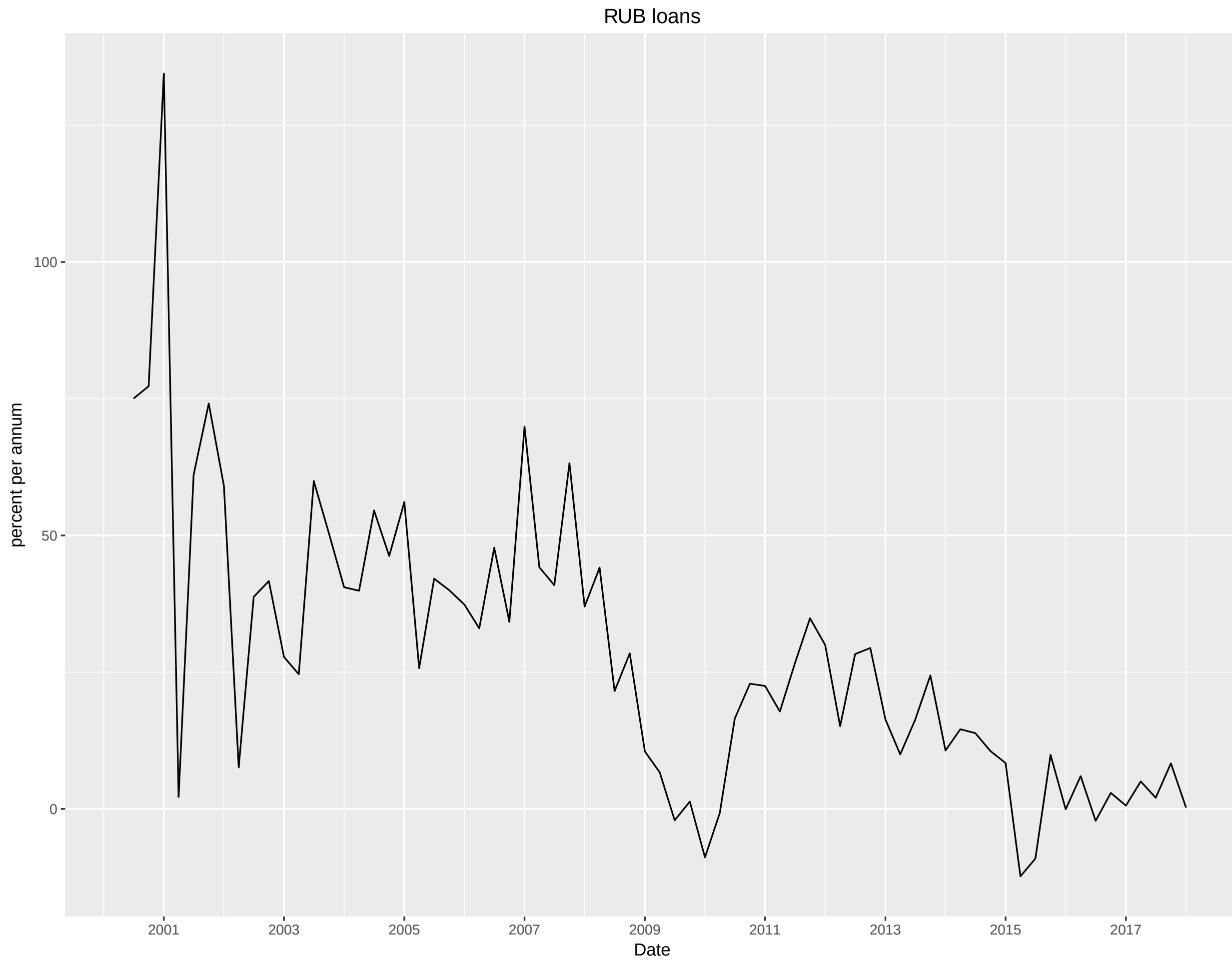

Figure 4: Ruble-denominated loans