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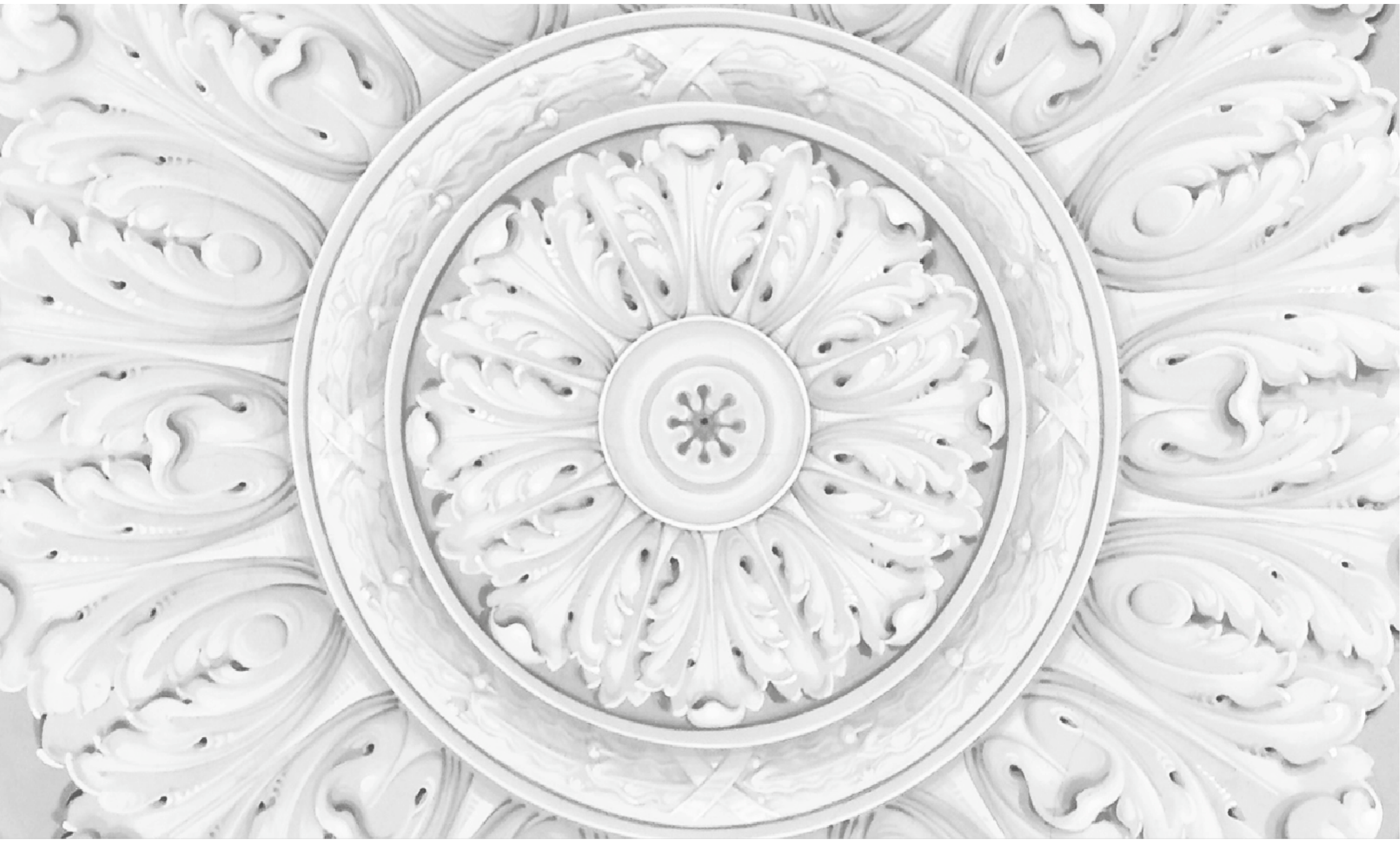

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Transmission of foreign monetary shocks to a small open economy under structural instability: the case of Russia

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This paper was written as the Bank of Russia's team contribution to the International Banking Research Network (IBRN) initiative “The International Transmission of Monetary Policy"

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Abstract

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

JEL classification: E52, F34, G21.

Transmission of Foreign Monetary Shocks to a Small Open Economy under Structural Instability: The Case of Russia*

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December 10, 2018

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This paper studies 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 has been statistically and economically significant. Surprisingly, the magnitude of the effect remained roughly the same even after the monetary policy in Russia transited from exchange rate to inflation targeting. This finding suggests that a free floating regime does not attenuate the effect of foreign monetary policy shocks on domestic lending.

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1 Introduction

This paper studies inward transmission of foreign monetary policy shocks to a small open economy using an unbalanced panel of bank-level data augmented with macroeconomic time series. Specifically, we study how monetary policy shocks in a systemic economy such as the U.S. affect lending of domestic banks to private non-financial borrowers in Russia. We adopt a standard definition of a monetary policy shocks, which is a change in the monetary policy stance that was unanticipated by economic agents (Galí (2015); Christiano et al. (1999)). U.S. monetary policy shocks are estimated in a structural vector autoregression (SVAR) framework using a high-frequency identification (HFI) procedure with monetary surprises as external instruments (Gertler and Karadi (2015)). Monetary surprises are defined as changes in the price of a futures contract on an interest rate within 30-minute window surrounding a U.S. monetary policy announcement.

Literature on monetary policy transmission generally distinguish between two main channels through which banks respond to change in the monetary policy stance: bank lending (Bernanke and Blinder (1988); Disyatat (2011)) and portfolio channels (Bernanke and Gertler (1995)). A special issue of the *Journal of International Money and Finance* (Buch et al. (2017)) provides an overview of literature on channels of monetary transmission and states that transmission channels are much richer as there is no single balance sheet item or bank characteristics that determines how banks respond to shocks. In reality adjustment to shocks depends on the frictions that banks are facing. We focus on two specific channels of transmission that reflect a friction in bank's ability to access alternative source of funding: one related to cross-border liabilities of domestic banks and the other to liquid asset holdings. We exploit heterogeneity across banks to identify and estimate the dynamic effect of foreign monetary policy shocks on domestic lending. The heterogeneity implies that the effect of a shock of certain size is likely to be different for different institutions depending on their exposure to cross-border funding and liquid asset holdings. Credit growth of banks with a greater share of foreign funding in liabilities should be be more sensitive to foreign monetary shocks compared with institutions that rely mainly on domestic sources of funds. Similarly, banks with a greater share of liquid assets in total assets should be better insulated from foreign monetary policy shocks causing the response of their credit growth to be more muted.

The time period covered by our data, 2000Q1 through 2018Q1, features the transition from one domestic monetary policy regime to another, namely, from exchange rate targeting (or exchange rate band) to inflation targeting, and this transition was finalized in November 2014. Monetary policy trilemma hypothesis outlined by Mundell (1963) implies that, assuming free movement of capital across borders, the domestic economy should be more insulated from foreign monetary policy shocks when its currency free-floats than when it is fixed. Specifically, the intensity of transmission of external monetary shocks should be attenuated. Empirical studies have found support for insulation of foreign shocks under flexible exchange rate. Hausman and Wangswan (2011) find that equity indexes and interest rates in countries with a less flexible exchange rate regime respond more to U.S. monetary policy surprises. Obstfeld et al. (2018) provide evidence on a sample of 43 emerging countries that the spillovers of global financial shocks are amplified for economies with fixed exchange rates as compared to those who have relatively flexible exchange rates. In contrast, Rey (2015, p. 18) suggests that "cross-border flows and leverage of global institutions transmit monetary conditions globally, even under floating exchange-rate regimes." In other words "Large gross cross-border flows are moving in tandem across countries regardless of the exchange rate regime..." (Passari and Rey (2015), p. 693). Thus global financial cycle transforms the trilemma into an "irreconcilable duo," making exchange rate regime superfluous. So when capital is freely mobile the role of exchange rate regime in insulating monetary autonomy is quite limited. As for empirical support, Rey (2015) emphasises that "U.S. monetary policy shocks transmit internationally and affect financial conditions even in inflation-targeting economies with large financial markets. Hence, flexible exchange rates are not enough to guarantee monetary autonomy in a world of large capital flows." The above-mentioned feature of our data allows us to track how (if any) the effect of U.S. shocks on domestic credit growth in Russia has changed as long as the domestic monetary policy regime has gradually switched from one to another.

Our empirical findings suggest that the inward transmission of foreign monetary policy shocks is seen in the data. The lending of Russian bank that rely on foreign funding is more responsive to U.S. monetary shocks with contractionary shocks having a negative effect on the growth of credit. This effect, which is both statistically and economically significant, is born entirely by dollar-denominated loans to domestic borrowers with lending in rubles remaining unaffected. Surprisingly, this effect is found to be remarkably stable over time. As our rolling regressions show, the effect of foreign monetary shocks on domestic lending do not become more muted as long as the domestic monetary policy transits from exchange rate targeting toward inflation targeting.

Our paper is related to the literature on the international bank lending channel of monetary policy transmission and international spillovers of monetary policy from systemic economies. Using aggregate data, Bruno and Shin (2015) document that a loosening of U.S. monetary policy gives rise to higher leverage of global financial institutions, flow of capital from center economies to the periphery, lower risk aversion and more risk taking. Morais et al. (2015) use credit registry data from Mexico matched with information banks and borrowers. They find that following a monetary policy in a foreign country affiliates of banks headquartered in that country expand the volume of credit to Mexican firms and tend to make riskier loans. This study also implies that, due to certain market frictions, domestic and foreign funding sources are only imperfectly substitutable in the short run. For this reason and following the literature (surveyed, e.g., in Buch et al. (2017)), we view the currency composition of funding as predetermined, at least, at a four-quarter horizon. Using bank-level data, Correa and Murry (2009) report that a monetary tightening in the U.S. by 100 p.p. leads to a reduction in cross-border claims of U.S. banks by 4 percent, which is consistent with the existence of the international bank lending channel. Cetorelli and Goldberg (2012a) show that a monetary tightening in the U.S. triggers reallocations of funds from foreign affiliates of U.S. banks towards headquarters through internal capital markets, thus propagating the U.S. monetary shock internationally. Temesvary et al. (2015) find strong cross-border effects of changes in the U.S. monetary policy on lending by affiliates of U.S. banks, both before and after the most recent financial crisis. Correa et al. (2015) employ a BIS multi-country bilateral panel dataset and show that, in response a monetary tightening at home, U.S. banks re-allocate their cross-border claims towards safer destinations.

Our paper studies the international from a host country perspective. It was written as the Bank of Russia's research team contribution to the International Banking Research Network (IBRN) initiative on the international transmission of monetary policy (Buch et al. (2017)). It contributes in the existing literature on international monetary policy spillovers in two ways. First, most of empirical studies exploiting bank-level data we are aware of measure monetary policy shocks as first-differences of the U.S. short-term policy rate or a shadow policy rate. Unlike them, we use a novel high-frequency identification approach (Gertler and Karadi (2015)). Second, we are not aware of a study addressing how international monetary transmission transforms when domestic monetary policy in a given country changes from one regime (exchange rate targeting) to another (inflation targeting). All empirical papers that we are familiar with and that address international transmission typically emphasize a distinct reaction to external monetary shocks between two subsets of countries, peggers and floaters. In our paper, instead, we look at how (if any) a specific channel of international transmission was reshaped with a change of the domestic monetary policy regime within borders of the same country.

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 5 offers a discussion of our results, and Section 6 concludes.

2 Methodology

In order to estimate the dynamic effect of shocks in the U.S. monetary policy on credit growth in Russia, 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. We consider two such variables, the ratio of all foreign liabilities to total assets and the ratio of liquid assets to total assets. In what follows we refer to these variables as channel variables and label them, respectively, as *nonres* and *liquid*. 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). The VAR model contains 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 quarterly data. The order of the SVAR is set equal to 4, which is a conventional choice in the literature when data is quarterly.

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 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 an interest 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 monetary surprise on the space of VAR innovations, which spans the space of structural shocks, should isolate the structural monetary shock from noise. 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.

On 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 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 17.3 and 15.8, respectively. 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) loans denominated in all currencies, (ii) ruble-denominated loans, and (iii) 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 a channel variable. We consider two alternative channel variables separately. These are (i) the ratio of foreign liabilities of a bank to its total assets and (ii) the ratio of liquid assets to total assets.

Some specifications also include 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 channel variables capture the idea that the dynamic effect of U.S. monetary policy can be heterogeneous across banks. 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.

The fixed-effects panel regression specification is thus given by

$$\begin{aligned} loans_{it} = & \sum_{k=0}^{3} \alpha_k channel_{i,t-4} us_{t-k} + \beta\, channel_{i,t-4} + \gamma_1 ta_{i,t-1} \\ & + \gamma_2 tier1_{i,t-1} + \gamma_3 core_{i,t-1} + u_i + v_t + e_{it} \end{aligned} \tag{1}$$

where *loans* is either *all*, *ruble*, or *dollar*, and *channel* is either *nonres* or *liquid*. As specification (1) implies, channel variables enter 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 flows or its buffer of liquid assets just before the arrival of the shock. In general, both channel variables are endogenous and will therefore respond to a monetary shock in the U.S. Taking predetermined, namely, date $t-4$, values of this variables should make OLS estimates of the coefficients of interest – those on the distributed lag of the U.S. monetary policy shock interacted with a lagged channel variable – free of a simultaneity bias.

We estimated four versions of specification (1). Two of them included bank-level controls, two others did not. We also experimented with dropping bank-level fixed effects to see if the point estimates of the effects of interest change substantially. The specification with no bank-level fixed effects is motivated by a well-known fact that entity (group) fixed effects tend to exacerbate the bias caused by a measurement error in regressors (Wooldridge (2010), p. 365). The regressors of interest in our study are interactions of the distributed lag of the estimated U.S. monetary policy shock and predetermined channel variables, *nonres* and *liquid*. Potentially, both terms in the interactions are subject to a measurement error.

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}.

In our study we also address three important structural changes in macroeconomic environment that occurred after 2014. First, in November 2014 the Bank of Russia announced that the transition from one monetary policy regime to another, namely, from exchange rate targeting to inflation targeting, which had taken several years, was finally completed. As a result, the target band for the exchange rate was removed so that the ruble was allowed to free-float, with CB committed to intervene on the FX market only occasionally in times of extreme volatility. As a medium-term policy target, the Bank of Russia declared the rate of inflation 4% by the end of 2017. Figure 6 shows that there was a clear tendency for the target zone of the ruble exchange rate to widen over time. At the same time the upper and lower bounds of policy rates, which are, respectively, REPO (repurchase agreement) lending and borrowing (deposit) rates offered by the Bank of Russia to commercial banks, tended to converge, as Figure 7 illustrates.

Second, in the fall 2014, the price of oil, a major Russian exports commodity, on the world market dropped dramatically from about USD 100 per barrel to below USD 40 per barrel. This abrupt decline was accompanied by growing uncertainty with regard to the future prospects for the price of oil.

Third, due to geopolitical factors, governments of the U.S. and European countries introduced financial sanctions against Russia. These sanctions were supposed to limit the access of Russian financial institutions to long-term funding from their U.S. and European counterparts.

In terms of potential effects on cross-border financial flows to Russia, all three events worked in the same direction. The financial sanctions directly affect availability of funding. To the extent that the price of oil is a main determinant of the ruble exchange rate, a rise in uncertainty surrounding the oil price increases foreign exchange risks and therefore makes external funding more costly, all other things being equal. Finally, letting the ruble to free-float elevated implicit hedge against currency risks and passed on the entire responsibility for handling them on borrowers themselves.

Being specific to Russia, these three developments are likely to affect the international transmission mechanism of foreign monetary policy shocks to Russia. To capture potential changes in the mechanism, we estimated rolling-window versions of the baseline specification (1) setting the width of the rolling window equal to 43 quarters. The purpose was to see if the above-mentioned changes in the macro environment affected the point estimates of the effects of interest. All three developments should presumably discourage domestic banks in Russia to borrow from abroad. Free-floating ruble raised foreign exchange risks associated with borrowing in foreign currency and lending in rubles domestically. If hedging opportunities are limited, then a likely consequence of that would be to reduce a currency mismatch between liabilities and loans by financial institutions, with dollar-denominated liabilities being mainly the source of funding for dollar-denominated loans to exporters whose sales revenues are denominated in dollars. The effect of changes in the U.S. monetary policy on lending by Russian banks with cross-border liabilities could become muted under the new policy regime, as a result.

The effect of uncertainty with regard to the future price of oil translates immediately into the uncertainty regarding the future exchange rate of the ruble. It should therefore reinforce the effect of the first development in the macro environment, namely, the finalized switch to inflation targeting resulting in potentially higher ruble exchange rate volatility. It is worth mentioning, though, that the empirical link between the price of oil and volatility of the ruble exchange rate became much weaker after adoption of a fiscal rule in 2017.

The effect of sanctions, in principle, works in the same direction as the effects of the two other factors. The financial sanctions involved restrictions for U.S. and European financial institutions to do business with certain industries in Russia and also sat an upper limit of 90 days on the term to maturity for new loans.

2.3 Hypotheses of interest

In this study, we investigate if

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

(ii) if present, this transmission works through the foreign borrowing and/or liquid asset channels;

(iii) the transmission mechanism has changed or remains stable over time;

(iv) the structural change in the macroeconomic environment that occurred around 2014 attenuated the effect of U.S. monetary policy shocks on lending in Russia.

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

To approach (i) and (ii), we look at the statistical significance of the four-quarter cumulative effect of the U.S. monetary shock interacted with the fourth lag of a transmission channel variable. 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).

To approach (iii) and (iv), we estimate rolling regressions (1) mentioned above with the time width equal to 32 quarters, or 8 years of observations. We then compare the estimated cumulative effect across all subintervals to see if this effect is stable over time or not and, if not, if there is a tendency for the effect to become less pronounced in subsamples that contain time observations for 2014 to 2017.

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 significant quantitatively.

3 Data

The dataset that we employ in this study consists of two parts: (a) a panel of supervisory bank-level data and (b) U.S. macroeconomic time series for SVAR that serves to estimate a time series of the U.S. monetary policy shock. The data are quarterly and cover the time period from the first quarter of 2000 through the first quarter of 2018.

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 ($nonres$), the ratio of liquid assets to total assets ($liquid$), 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 channels of transmission 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.

Figure 1 shows the time paths of sample averages for the growth rates of all loans, ruble-denominates loans, and dollar-denominated loans. Figure 2 shows time paths of sample averages for the two transmission channel variables that we employ in our study, *nonres* and *liquid*.

[FIGURES 1 AND 2 ABOUT HERE]

Four U.S. macroeconomic time series employed in the SVAR are index of industrial

[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

production (seasonally adjusted), the rate of CPI inflation (seasonally adjusted), the interest rate on one-year government bonds, and Gilchrist – Zakrajšek's excess bond premium (EBP). The first three series 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 2012 are taken from Peter Karadi's webpage. We updated these time series through the first quarter of 2018 using data from Bloomberg and dates of FOMC meetings from the website of the Federal Reserve Board.

4 Findings

4.1 The dynamic effect of U.S. monetary policy shocks on domestic lending estimated on the full sample

In this section we report our estimation results obtained on the full sample of observations, 2000Q1 through 2018Q1. Tables 3, 4, and 5 show estimated regressions for the foreign borrowing transmission channel whereas Tables 6, 7, and 8 estimated regressions for the liquid asset channel.

All specifications contain a set of regressors of interest – contemporaneous and first three lags of the identified U.S. monetary policy shock, each interacted with the fourth lag of the channel variable. The channel variable enters all specifications as a control variables. Specifications (1) and (2) do not include any bank-level control variables in addition to the lagged channel variable whereas specifications (3) and (4) do include them. These additional controls are (i) the logarithm of a bank's total real assets, (ii) the inverse of leverage ratio defined as the tier one capital divided by total assets, and (iii) core deposit ratio defined as the volume of core deposits divided by total assets. Regressions (1) and (3) contain both time and bank fixed effects whereas regressions (2) and (4) only time fixed effects. Time fixed effects absorb the effect of all factors that change over time and affect all banks uniformly. Examples are the state of economic activity in Russia and the stance of domestic monetary policy. Bank fixed effects absorb the effect of bank-specific factors that vary across banks but remain constant over time.

Technically, bank fixed effects can be interpreted as bank-specific intercepts in the regression. The dependent variable is the growth rate of loan portfolios. It is not obvious if there are any time-invariant bank-specific factors that force loan portfolios of some banks to grow systematically faster than those of the others over eighteen years covered by our sample. Being agnostic, though, we report regressions with and without bank fixed effects.

Numbers in parentheses are standard errors clustered by the bank level. Each table contains three sections. The upper section shows estimation results for the U.S. monetary shock identified using MP1 monetary surprises as an external instrument, the middle section the same for FF4 monetary surprises, and the bottom section the same for both MP1 and FF4 monetary surprises serving as external instruments in SVAR. Regressions shown in Tables 3 and 6 have the quarterly growth of credit denominated in all currencies as the dependent variable, Tables 4 and 7 the growth of ruble-denominated credit, and Tables 5 and 8 the growth of dollar-denominated credit.

[TABLES 3, 4, AND 5 ABOUT HERE]

Regressions in Table 3 provide some evidence in support of the operativeness of the foreign borrowing channel of transmission. For quite a few specifications, the sign of estimated coefficients on the regressors of interest is consistent with theoretical predictions. The estimates suggest that the effect of monetary policy tightening in the U.S. is more negative for those banks that rely more heavily on cross-border financing as proxied by a higher fraction of liabilities to non-residents in total assets. In specifications (1) and (3) featuring bank fixed effects with U.S. monetary policy shocks identified using either FF4 only or MP1 and FF4 monetary surprises, the three-quarter cumulative effect of the U.S. monetary shock has the expected negative sign and is statistically significant. For a bank with foreign liabilities equal to 6% of its total assets, which is the sample mean, a 0.5 p.p. contractionary monetary shock in the U.S. will decelerate the growth of its overall loan portfolio by about $0.5 \times 0.35 \times 6 \approx 1$ p.p. per quarter, or by 4 p.p. per year. The effect is quite significant in economic terms.

Regressions reported in Tables 4 and 5 suggest that the effect on the reduction of overall lending is entirely driven by a decline in the growth of dollar-denominated loans. Neither specification in Table 4 where the dependent variable is the quarterly growth in ruble-denominated loans produces a statistically significant effect. On the contrary, regressions in Table 5 where the dependent variable is the growth rate of dollar-denominated loans yields highly statistically significant four-quarter cumulative effect of the U.S. monetary policy shock in specifications where the shock is identified using MP1 or MP1 cum FF4 monetary surprises. The effect is quantitatively large: the point estimate, depending on specification, lies in the range between -0.65 and -0.95, which is more than twice as large as the size of the cumulative effect on lending in all currencies. The midpoint of this interval suggests that a 0.5 p.p. contractionary monetary shock in the U.S. will cumulatively reduce the growth rate of dollar loans of a bank with the sample-mean value of foreign liabilities as percentage of total assets by $0.5 \times 0.8 \times 6 \approx 2.5$ p.p. per quarter, or by 10 p.p. per year, which is huge compared with the sample-mean quarterly growth of dollar-denominated loans of merely 0.5% per quarter, or 2% per year.

[TABLES 6, 7, AND 8 ABOUT HERE]

Regressions in Tables 6, 7, and 8 look into the working of the liquid asset channel. Neither specification in these tables features a statistically significant (at conventional significance levels) point estimate of the cumulative effect of the U.S. monetary policy shock interacted with predetermined liquid-to-total asset ratio. This implies that the strength of the effect of exogenous monetary disturbance in the U.S. on lending by a bank does not depend on its liquid asset holdings.

4.2 Alternative proxies for the U.S. monetary policy shock

Along with U.S. monetary policy shocks identified in a SVAR framework with monetary surprises as external instruments, we also consider a set of alternative proxies for the U.S. monetary policy shock. First, we employ monetary surprises themselves as direct measurements of monetary policy shocks. A similar approach was taken in Gürkaynak et al. (2005). Second, we try quarterly changes of the shadow policy rate derived in Wu and Xia (2013) as a proxy for the U.S. monetary policy shock. The shadow policy rate is backed out from the data on the term structure of interest rates using a conventional theoretical affine model of term structure. Third, we consider quarterly changes in one-, five-, and ten-year U.S. Treasury bonds as proxies for the U.S. monetary policy shock. Our choice of first-differenced interest rates is due to the observation that, from the practical point of view, Russia is a small open economy, which takes international prices, including interest rates in systemic economies, as given. We re-do the analysis for each alternative proxy separately using specification (3) in Table 3 to 8 that features bank controls and bank and time fixed effects. Tables 9 and 10 report four-quarter cumulative effects of U.S. monetary shocks interacted with a transmission channel variable for the foreign borrowing and liquid asset channels, respectively.

[TABLES 9 AND 10 ABOUT HERE]

Regressions shown in Table 9 reveal two patterns in the data. First, first-differenced interest rates do not yield any statistically significant effects. Second, monetary surprises as shock proxies produce statistically significant estimated cumulative effects of a negative sign, which is consistent with theoretical predictions. What is less clear is why the size of the estimated effect increases with the maturity term of a related futures contract. It is also remarkable that the futures contracts on the Eurodollar deposits that proved to be weak instruments in our SVAR framework produce statistically significant effects for the growth in loans denominated in all currencies and, especially, in dollar-denominated loans. Overall, we take the evidence reported in Table 9 as an important robustness check for our main findings reported in the previous subsection.

Table 10 shows similar regressions for the liquid asset transmission channel. Only Wu – Xia shadow policy rate is significant at the conventional level in the specification with all denomination loans as dependent variable. Its sign is counterinutitive, however: the more liquid assets has a bank on its balance sheet, the more it cuts on lending in all currencies in response to a contractionary monetary shock in the U.S. Furthermore, the cumulative effect looses its statistical significance and becomes less sizable if we turn the the specification with either ruble-denominated or dollar-denominated credit growth as dependent variable. We explain this pattern by peculiarity of data.

4.3 The change in the transmission mechanism over time

We have established so far that the inward transmission of U.S. monetary shocks to bank lending in Russia works through the foreign liabilities channel: institutions with greater foreign-liabilities-to-assets ratios tend to cut more on their lending to private non-financial borrowers in response to a contractionary shock. This effect is produced exclusively by a reduction in dollar-denominated credit growth with no reaction from from the ruble-denominated credit growth. The liquid asset channel though is not operative: the effect of a monetary shock on lending does not depend on liquid asset holding of a bank on the eve of the arrival of the shock. We now investigate if the estimated cumulative through the foreign liabilities channel is stable over time.

To check time stability of the effect of interest, we estimate a series of rolling window regressions. We employ specification with dollar-denominated credit growth as dependent variable and foreign-liabilities-to-assets ratio as transmission channel variable featuring our set of bank controls as well as bank and time fixed effects, i.e. specification (3) in Table 5. The rolling regressions are reported in Table 11. The width of the rolling window is set to 41 quarter, with the earliest estimation subsample being 2000Q1:2010Q1 and the latest estimation subsample 2008Q1-2018Q1. We repeat computations separately for different versions of the U.S. monetary policy shock identified with a different set of external instruments, namely, MP1, FF4, and MP1 cum FF4. The inspection of Table 10 suggests that, up to 2017Q1, the cumulative effect of the U.S. shock interacted with the foreign-liabilities-to-assets ratio on dollar-denominated credit growth remains remarkably stable over time and across alternative identifications. It is always significant at 1% level in the case of MP1 and MP1-cum-FF4 identifications whereas occasionally significant in the case of FF4 identification (recall that the this identification does not yield a statistically significant effect – see the middle section of Table 5). Numerically, the point estimates of the cumulative effect lie, roughly speaking, between 1 and 1.5. To the extent that confidence intervals of substantially overlap across different estimation subsamples and identifications, the estimated effects are statistically indistinguishable among each other.

One reason why the estimated effect ceases to be stable once the estimation window is moved beyond 2007Q1-2017Q1 is related to two specific deficiencies of our macro data. As mentioned in Section 3, the time series for the excess bond premium (EBP) is available only through 2016Q3. In order to be able to estimate our reduced-form VAR on the full sample, we had to extend this series through 2018Q1 by forecasting EBP iteratively with the help of the same VAR. Given that our VAR contains only four variables, this exercise is likely to produce unwanted noise in the generated data and distort estimates of U.S. monetary policy shocks for dates that are close to the end of the sample. Another peculiarity of our data is due to data availability for monetary surprises. Up to 2015Q1, monetary surprises are computed based on a symmetric 30-minute window around a U.S. monetary policy announcement. For the rest of the sample, only daily data on the five interest rate futures contracts are available for us. We therefore had to extend the times series of quarterly aggregates of 30-minute surprises by quarterly aggregates of daily surprises for the period 2015Q4-2018Q1, which are presumably much noisier than daily surprises. To the extend that this subperiod has a substantial weight in estimation-window subsample close to the right end of the sample, the apparent loss of stability on subsamples ending in 2017Q1 to 2018Q1 might be a product of either or both of the two above-mentioned circumstances.

5 Discussion

We have documented several patterns in the data. First, monetary policy shocks in the U.S. transmit across borders to Russia affecting domestic lending by Russian banks to private non-financial borrowers. The effect is negative with contractionary shocks suppressing credit growth and quantitatively important. Second, it is dollar-denominated but not ruble-denominated loans that respond to U.S. monetary shocks. Third, the effect works through the foreign liability channel but not through the liquid asset channels. Loan portfolios of banks with a greater exposure to foreign borrowing are more sensitive to U.S. monetary shocks whereas the strength of the effect does not depend on the buffer of liquid assets held by a bank. Fourth, the effect proved to be remarkably stable over time despite the fact that the time period covered by our sample features a transition from one monetary policy regime, exchange rate targeting, to another, inflation targeting, turbulence on the world oil market, an important source of export revenue for the economy of Russia, and seismic geopolitical events. As we already mentioned, first two factors, in theory, should raise the degree of uncertainty and foreign exchange risk associated with borrowing in foreign currency and hence potentially attenuate the foreign liabilities transmission channel. This is not what we observe: the strength of this channel as measured by the four-quarter cumulative effect of the U.S. monetary shock interacted with lagged foreign-liabilities-to-assets ratio remains unchanged. The geopolitical factor brought about financial sanctions on Russian banks and therefore should have worked in the same direction, which is not something readily seen in the data. It is worth mentioning that, during 2015-2017, the Bank of Russia introduced a few macroprudential policies aiming to limit borrowing and lending in foreign currency. It raised substantially risk weights on foreign-currency-denominated loans to individuals and firms without sufficient exports revenues and also increased reserve requirements on foreign liabilities of Russian banks. These interventions should have reinforced the process of de-dollarization of bank assets and liabilities.

The documented empirical patterns have an important implication for economic policy: merely a more flexible exchange rate does not seem capable to insulate the economy from the Global Financial Cycle *given* the exposure of its financial sector to foreign capital market. One tendency that emerged in the data and accompanied the unfolding of the three above-mentioned factors along with macropru policy intervention has been a gradual decline in foreign borrowing as shown on the upper section of Figure 2. It is accompanied by a downward trend in dollar-denominated loans, both in absolute and relative terms, as shown on Figures 9, 10, and 11. Unfortunately, our data do not allow us to answer the question which of the three factors contributed the most to this downward trend on the aggregate scale, the effect of the macropru policy also remaining unclear.

Another remarkable finding is unresponsiveness of ruble-denominated credit growth to monetary policy shocks in the U.S. A rise in the cost of funding in U.S. dollars as a consequence of a contractionary shock in the U.S. should encourage domestic borrowers in Russia switch from dollar-denominated loans, since they become more expensive, to ruble-denominated loans. We do not observe this to happen in the data as ruble-denominated credit growth remains unaffected, even for earlier estimation subsamples that correspond to a narrower target band for the exchange rate as Figure 3 illustrates. The lack of substitutability between dollar-denominated and ruble-denominated loans from the borrower's perspective seems puzzling. One possible interpretation is that borrowers are extremely averse with respect to foreign exchange risks whereas the opportunities for hedging them are limited. In this situation, exporters whose revenues are dollar-denominated would have a strong preference to borrow in U.S. dollars, while firms catering domestic market would prefer to borrow in rubles. It follows that a rise in the cost of U.S. dollar funding will make dollar-denominated loans more expensive discouraging exporters from borrowing in U.S. dollars, with or without financial sanctions being imposed. It is also conceivable that, being very risk averse, banks are willing to make dollar-denominated loans only to exporters while ruble-denominated loans only to non-exporters. It is not obvious though how appealing either interpretation is from the practical point of view.

6 Conclusion

We study the inward transmission of foreign monetary policy shocks on lending by Russian banks to private non-financial borrowers. We find that, on the full sample, the transmission does occur through the cross-border liability channel: institutions with higher fraction of cross-border liabilities in total assets are more sensitive to U.S. monetary policy shocks than those that tap mainly domestic sources of funding. The effect is entirely due to the reaction of dollar-denominated loans with ruble-denominated loans being unresponsive. The cumulative dynamic effect tends to be remarkably stable over time as our rolling-window regressions demonstrate. This is surprising given the dramatic developments in macroeconomic environment that occurred after 2014, namely, finalized transition to from exchange rate to inflation targeting in Russia, turbulence in the oil market, and financial sanctions. One policy implication from our findings is that a free-floating currency regime might not be capable to insulate a small open economy from the influence of monetary policy shocks in systemic economies through the international lending channel. It follows that, to the extent that these shocks are a major driving force of the Global Financial Cycle, as documented, e.g., in Bruno and Shin (2015), domestic monetary policy has to bear a burden of curbing unwanted capital inflows, perhaps, in a combination with macroprudential policy. We leave for future research the question to what extent macroprudential policies are able to reshape the dynamic effect of foreign monetary shocks on domestic outcomes and thus insulate a small open market economy from the influence of the Global Financial Cycle.

References

Bernanke, B. and A. Blinder (1988): "Credit, Money, and Aggregate Demand," *American Economic Review Papers and Proceedings*, 78, 435–439.

Bernanke, B. and M. Gertler (1995): "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," *Journal of Economic Perspectives*, 9, 27–48.

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

Buch, C. M., M. Bussiere, L. Goldberg, and R. Hills (2017): "The International Transmission of Monetary Policy," working paper, International Banking Research Network.

Cetorelli, N. and L. Goldberg (2012a): "Banking Globalization and Monetary Transmission," *Journal of Finance*, LXZII, 1811–1843.

Christiano, L. J., M. Eichenbaum, and C. L. Evans (1999): "Monetary Policy Shocks: What Have We Learned and to What End?" in *Handbook of Macroeconomics*, ed. by J. B. Taylor and M. Woodford, North-Holland: Elsevier.

Correa, R. and C. Murry (2009): "Is there cross-border bank lending channel? Evidence from US banks international exposure," Manuscript, Federal Reserve Board of Governors.

Correa, R., T. Paligorova, H. Sapriza, and A. Zlate (2015): "Cross-Border Bank Flows and Monetary Policy," Tech. rep., Federal Reserve Board of Governors.

Disyatat, P. (2011): "The Bank Lending Channel Revisited," *Journal of Moneya, Credit, and Banking*, 43, 711–734.

Galí, J. (2015): *Monetary Policy, Inflation, and the Business Cycle*, Princeton and Oxford: Princeton University Press, 2nd ed.

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.

Gürkaynak, R. S., B. Sack, and E. T. Swanson (2005): "Do Actions Speak Louder than Words? The Response of Asset Prices to Monetary Policy Actions and Statements," *International Journal of Central Banking 1*, 55–93.

Hausman, J. and J. Wangswan (2011): "Global Asset Prices and FOMC Announcements," *International Journal of Money and Finance*, 547–571.

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.

Morais, B., J. Peydro, and C. Ruiz (2015): "The International Bank Lending Channel of Monetary Policy Rates and QE: Credit Supply, Reach for Yield, and Real Effects," Federal Reserve International Finance Discussion Papers 1137.

Mundell, R. A. (1963): "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates," *Canadian Journal of Economics and Political Science 29*, 475–485.

Obstfeld, M., D. Ostry, S. Mavash, and M. Read (2018): "A Tie That Binds: Revisiting the Trilemma in Emerging Market Economies Metrics," *Review of Economics and Statistics*.

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

Rey, H. (2015): "Dilemma Not Trilemma: The Global Financial Cycle and Monetary Policy Independence," NBER Working Paper 21162.

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.

Temesvary, J., S. Ongena, and A. Owen (2015): "Global Lending Channel Unplugged? Does US Monetary Policy Affect Cross-Border and Affiliate Lending by Global US Banks?" mimeo.

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

Wu, J. C. and F. D. Xia (2013): "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound," Working Paper 13-77, Chicago Booth.

Tables

Table 1: Description of variables

name	description
	dependent variables
all loans	growth rate of all loans to nonfinancial borrowers, % per quarter
ruble loans	growth rate of ruble loans to nonfinancial borrowers, % per quarter
dollar loans	growth rate of dollar loans to nonfinancial borrowers, % per quarter
	channel variables
nonres	the ratio of liabilities to nonresidents to total assets, %
liquid	the ratio of liquid assets to total assets, %
	foreign monetary policy variable
us	US MP shock, percentage points
	bank control variables
leverage	the ratio of capital to assets, %
core	the ratio of core deposits to total liabilities, %
ta	log real total assets, constant RUB

Table 2: Descriptive statistics

variable	mean	std. dev.	min	max
Number of observations: 25,059				
all loans	6.2	15.7	-129.9	139.5
ruble loans	6.4	17.0	-140.5	142.6
dollar loans	0.5	23.1	-163.6	152.8
nonres	6.0	12.0	0.0	92.6
liquid	28.7	14.7	0.0	96.9
leverage	15.5	16.2	-484.3	260.2
core	38.0	19.1	0.0	88.9
ta	15.1	2.3	6.1	23.9

Table 3: Cumulative dynamic effect of foreign monetary policy shocks on domestic lending in *all currencies* through the $foreignliabilities$ channel

regressor	(1)	(2)	(3)	(4)
		external instrument: MP1		
us×nonres(-4)	-0.055 (0.097)	-0.039 (0.100)	-0.052 (0.097)	-0.020 (0.100)
(us+us(-1)) ×nonres(-4)	-0.108 (0.121)	-0.068 (0.125)	-0.105 (0.121)	-0.030 (0.124)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.238 (0.156)	-0.161 (0.160)	-0.238 (0.155)	-0.110 (0.158)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.219 (0.165)	-0.118 (0.172)	-0.220 (0.163)	-0.054 (0.171)
nonres(-4)	-0.056 (0.020)***	-0.009 (0.012)	-0.041 (0.020)**	-0.021 (0.013)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instrument: FF4		
us×nonres(-4)	-0.156 (0.120)	-0.124 (0.122)	-0.153 (0.120)	-0.107 (0.121)
(us+us(-1)) ×nonres(-4)	-0.246 (0.185)	-0.164 (0.183)	-0.248 (0.184)	-0.129 (0.181)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.391 (0.218)*	-0.248 (0.214)	-0.402 (0.216)*	-0.202 (0.214)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.344 (0.232)	-0.164 (0.233)	-0.356 (0.228)	-0.111 (0.234)
nonres(-4)	-0.054 (0.020)***	-0.007 (0.013)	-0.039 (0.021)*	-0.019 (0.014)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instruments: MP1 and FF4		
us×nonres(-4)	-0.092 (0.101)	-0.070 (0.104)	-0.089 (0.101)	- 0.051 (0.103)
(us+us(-1)) ×nonres(-4)	-0.156 (0.139)	-0.100 (0.141)	-0.155 (0.138)	-0.064 (0.139)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.296 (0.1732)*	-0.194 (0.174)	-0.300 (0.172)*	-0.146 (0.173)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.266 (0.184)	-0.135 (0.189)	-0.271 (0.181)	-0.076 (0.188)
nonres(-4)	-0.055 (0.020)***	-0.008 (0.012)	-0.040 (0.020)**	-0.020 (0.014)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes

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 foreign monetary policy shocks on domestic lending in *rubles* through the *foreignliabilities* channel

regressor	(1)	(2)	(3)	(4)
		external instrument: MP1		
us×nonres(-4)	-0.084 (0.136)	-0.067 (0.138)	-0.080 (0.136)	-0.051 (0.137)
(us+us(-1)) ×nonres(-4)	-0.015 (0.188)	0.018 (0.189)	-0.012 (0.189)	0.051 (0.188)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.132 (0.217)	-0.059 (0.221)	-0.132 (0.218)	-0.015 (0.221)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	0.011 (0.225)	0.107 (0.229)	0.011 (0.224)	0.161 (0.229)
nonres(-4)	-0.021 (0.025)	0.027 (0.014)*	-0.004 (0.025)	0.018 (0.016)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instrument: FF4		
us×nonres(-4)	-0.110 (0.219)	-0.093 (0.216)	-0.106 (0.220)	-0.079 (0.216)
(us+us(-1)) ×nonres(-4)	-0.074 (0.297)	-0.019 (0.290)	-0.076 (0.299)	0.010 (0.289)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.207 (0.286)	-0.087 (0.2821)	-0.219 (0.286)	-0.048 (0.282)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.041 (0.315)	0.108 (0.310)	-0.053 (0.312)	0.153 (0.312)
nonres(-4)	-0.021 (0.025)	0.027 (0.015)*	-0.004 (0.026)	0.017 (0.017)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instruments: MP1 and FF4		
us×nonres(-4)	-0.093 (0.160)	-0.076 (0.159)	-0.089 (0.160)	-0.060 (0.159)
(us+us(-1)) ×nonres(-4)	-0.035 (0.220)	0.006 (0.218)	-0.033 (0.222)	0.037 (0.217)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.160 (0.237)	-0.069 (0.237)	-0.163 (0.237)	-0.028 (0.238)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.008 (0.252)	0.107 (0.252)	-0.013 (0.250)	0.157 (0.253)
nonres(-4)	-0.021 (0.024)	0.027 (0.014)*	-0.004 (0.025)	0.017 (0.016)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes

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 foreign monetary policy shocks on domestic lending in *dollars* through the *foreignliabilities* channel

regressor	(1)	(2)	(3)	(4)
		external instrument: MP1		
us×nonres(-4)	-0.434 (0.225)*	-0.403 (0.225)*	-0.430 (0.225)*	-0.356 (0.221)
(us+us(-1)) ×nonres(-4)	-0.573 (0.272)**	-0.506 (0.268)*	-0.556 (0.273)**	-0.413 (0.265)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.614 (0.300)**	-0.494 (0.284)*	-0.587 (0.301)*	-0.374 (0.280)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.978 (0.322)***	-0.780 (0.304)***	-0.945 (0.323)***	-0.633 (0.299)**
nonres(-4)	-0.110 (0.039)***	0.085 (0.021)***	-0.115 (0.041)***	0.028 (0.023)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instrument: FF4		
us×nonres(-4)	-0.529 (0.233)**	-0.453 (0.233)*	-0.518 (0.233)**	-0.413 (0.230)*
(us+us(-1)) ×nonres(-4)	-0.468 (0.333)	-0.326 (0.329)	-0.438 (0.334)	-0.244 (0.324)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.497 (0.356)	-0.264 (0.327)	-0.450 (0.359)	-0.163 (0.325)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.649 (0.401)	-0.303 (0.376)	-0.594 (0.403)	-0.191 (0.371)
nonres(-4)	-0.104 (0.039)***	0.085 (0.021)***	-0.108 (0.040)***	0.027 (0.023)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instruments: MP1 and FF4		
us×nonres(-4)	-0.484 (0.218)**	-0.434 (0.218)**	-0.478 (0.219)**	-0.390 (0.215)*
(us+us(-1)) ×nonres(-4)	-0.531 (0.286)*	-0.433 (0.283)	-0.509 (0.287)*	-0.345 (0.279)
(us+us(-1)+us(-2)) ×nonres(-4)	-0.570 (0.309)*	-0.403 (0.288)	-0.535 (0.311)*	-0.292 (0.285)
(us+us(-1)+us(-2) +us(-3))×nonres(-4)	-0.850 (0.342)***	-0.590 (0.320)*	-0.809 (0.344)**	-0.457 (0.316)
nonres(-4)	-0.107 (0.039)***	0.087 (0.021)***	-0.111 (0.040)***	0.029 (0.023)
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes

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 foreign monetary policy shocks on domestic lending in *allcurrencies*through the *liquidassets* channel

regressor	(1)	(2)	(3)	(4)
		external instrument: MP1		
us×liquid(-4)	-0.037 (0.082)	-0.030 (0.083)	-0.046 (0.083)	-0.038 (0.083)
(us+us(-1)) ×liquid(-4)	-0.005 (0.105)	0.009 (0.102)	-0.031 (0.105)	-0.004 (0.102)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.095 (0.121)	-0.046 (0.122)	-0.135 (0.121)	-0.062 (0.121)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.122 (0.129)	-0.071 (0.127)	-0.164 (0.129)	-0.092 (0.126)
liquid(-4)	0.111 (0.014)***	0.046 (0.010)***	0.121 (0.014)***	0.067 (0.010)***
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instrument: FF4		
us×liquid(-4)	-0.117 (0.101)	-0.135 (0.101)	-0.130 (0.101)	-0.136 (0.101)
(us+us(-1)) ×liquid(-4)	-0.121 (0.143)	-0.144 (0.140)	-0.158 (0.142)	-0.144 (0.139)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.173 (0.153)	-0.182 (0.155)	-0.223 (0.152)	-0.176 (0.154)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.194 (0.156)	-0.229 (0.157)	-0.242 (0.156)*	-0.218 (0.156)
liquid(-4)	0.112 (0.014)***	0.048 (0.010)***	0.122 (0.015)***	0.069 (0.011)***
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instruments: MP1 and FF4		
us×liquid(-4)	-0.067 (0.086)	-0.072 (0.086)	-0.077 (0.086)	-0.077 (0.086)
(us+us(-1)) ×liquid(-4)	-0.047 (0.116)	-0.050 (0.113)	-0.077 (0.115)	-0.057 (0.112)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.124 (0.129)	-0.101 (0.131)	-0.166 (0.129)	-0.107 (0.130)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.150 (0.135)	-0.136 (0.135)	-0.194 (0.135)	-0.143 (0.134)
liquid(-4)	0.112 (0.014)***	0.047 (0.010)***	0.122 (0.014)***	0.068 (0.010)***
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes

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 foreign monetary policy shocks on domestic lending in *rubles* through the *liquidassets* channel

regressor	(1)	(2)	(3)	(4)
		external instrument: *MP1*		
us×liquid(-4)	-0.051 (0.103)	-0.038 (0.102)	-0.061 (0.104)	-0.046 (0.102)
(us+us(-1)) ×liquid(-4)	-0.023 (0.131)	-0.011 (0.127)	-0.050 (0.132)	-0.022 (0.127)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.072 (0.150)	-0.028 (0.147)	-0.114 (0.149)	-0.041 (0.147)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.069 (0.157)	-0.011 (0.150)	-0.113 (0.158)	-0.029 (0.149)
liquid(-4)	0.096 (0.016)	0.043 (0.011)***	0.106 (0.016)***	0.061 (0.011)***
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instrument: *FF4*		
us×liquid(-4)	-0.105 (0.130)	-0.115 (0.129)	-0.119 (0.130)	-0.116 (0.129)
(us+us(-1)) ×liquid(-4)	-0.088 (0.182)	-0.113 (0.178)	-0.127 (0.182)	-0.113 (0.178)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.064 (0.186)	-0.072 (0.183)	-0.117 (0.186)	-0.066 (0.183)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.039 (0.189)	-0.050 (0.184)	-0.090 (0.189)	-0.042 (0.184)
liquid(-4)	0.096 (0.016)***	0.043 (0.011)***	0.106 (0.016)***	0.062 (0.012)***
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instruments: MP1 and FF4		
us×liquid(-4)	-0.070 (0.109)	-0.068 (0.108)	-0.081 (0.110)	-0.072 (0.108)
(us+us(-1)) ×liquid(-4)	-0.045 (0.146)	-0.049 (0.142)	-0.076 (0.146)	-0.055 (0.142)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.066 (0.159)	-0.045 (0.156)	-0.111 (0.159)	-0.050 (0.156)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.056 (0.165)	-0.028 (0.158)	-0.101 (0.165)	-0.034 (0.158)
liquid(-4)	0.096 (0.016)***	0.043 (0.011)***	0.106 (0.016)***	0.061 (0.011)***
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes

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 foreign monetary policy shocks on domestic lending in *dollars* through the *liquid* channel

regressor	(1)	(2)	(3)	(4)
		external instrument: MP1		
us×liquid(-4)	0.169 (0.208)	0.212 (0.213)	0.161 (0.209)	0.209 (0.213)
(us+us(-1)) ×liquid(-4)	0.181 (0.232)	0.316 (0.229)	0.164 (0.232)	0.320 (0.229)
(us+us(-1)+us(-2)) ×liquid(-4)	0.103 (0.268)	0.287 (0.260)	0.078 (0.269)	0.299 (0.258)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.004 (0.294)	0.195 (0.283)	-0.031 (0.295)	0.197 (0.281)
liquid(-4)	0.099 (0.029)***	0.015 (0.020)	0.106 (0.029)***	0.037 (0.020)*
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instrument: FF4		
us×liquid(-4)	-0.043 (0.208)	-0.019 (0.211)	-0.049 (0.209)	-0.006 (0.212)
(us+us(-1)) ×liquid(-4)	0.030 (0.266)	0.069 (0.260)	-0.047 (0.267)	0.108 (0.260)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.179 (0.303)	-0.065 (0.293)	-0.197 (0.304)	-0.003 (0.291)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.273 (0.320)	-0.179 (0.306)	-0.286 (0.319)	-0.115 (0.305)
liquid(-4)	0.102 (0.029)***	0.019 (0.020)	0.109 (0.029)***	0.041 (0.021)**
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes
		external instruments: MP1 and FF4		
us×liquid(-4)	0.080 (0.202)	0.112 (0.206)	0.073 (0.202)	0.115 (0.206)
(us+us(-1)) ×liquid(-4)	0.098 (0.238)	0.215 (0.234)	0.082 (0.238)	0.233 (0.234)
(us+us(-1)+us(-2)) ×liquid(-4)	-0.019 (0.272)	0.132 (0.263)	-0.040 (0.273)	0.165 (0.262)
(us+us(-1)+us(-2) +us(-3))×liquid(-4)	-0.116 (0.293)	0.034 (0.281)	-0.137 (0.293)	0.062 (0.280)
liquid(-4)	0.100 (0.029)***	0.016 (0.020)	0.107 (0.029)***	0.038 (0.020)*
bank controls	no	no	yes	yes
bank fixed effects	yes	no	yes	no
time fixed effects	yes	yes	yes	yes

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 9: Four-quarter cumulative dynamic effect of a U.S. monetary policy shock on credit growth in Russia through the *foreign liabilities* transmission channel

proxy for shock	all loans	ruble loans	dollar loans
SVAR + MP1	-0.220 (0.163)	0.011 (0.224)	-0.945 (0.323)***
SVAR + FF4	-0.356 (0.228)	-0.053 (0.312)	-0.594 (0.403)
SVAR + MP1 + FF4	-0.271 (0.181)	-0.013 (0.250)	-0.809 (0.343)**
MP1	0.013 (0.395)	0.079 (0.667)	-1.431 (0.788)*
FF4	-0.228 (0.545)	0.373 (1.072)	-1.935 (0.889)**
ED2	-0.750 (0.543)	0.371 (1.001)	-3.848 (0.928)***
ED3	-0.832 (0.445)*	-0.122 (0.807)	-3.551 (0.785)***
ED4	-0.869 (0.403)**	-0.098 (0.724)	-3.760 (0.756)***
Wu – Xia	-0.019 (0.029)	0.010 (0.039)	0.016 (0.056)
GS1	-0.036 (0.039)	0.021 (0.050)	-0.079 (0.074)
GS5	-0.023 (0.052)	0.045 (0.068)	-0.091 (0.105)
GS10	-0.002 (0.058)	0.033 (0.078)	-0.115 (0.128)

The entries are estimated four-quarter cumulative effects of a U.S. monetary policy shock by 1 p.p. interacted with lagged *foreign liabilities* transmission channel variable. HAC standard errors clustered at the bank level are shown in the parentheses. ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively. The dependent variable is quarterly credit growth in respective currency. The regressors are the four-quarter distributed lag of a respective proxy of the U.S. monetary policy shock interacted with the fourth lag of *nonres* and first lags of *core*, $tier1$, and *ta*. Bank and state fixed effects are added.

Table 10: Four-quarter cumulative dynamic effect of a U.S. monetary policy shock on credit growth in Russia through the *liquid assets* transmission channel

proxy for shock	all loans	ruble loans	dollar loans
SVAR + MP1	-0.164 (0.129)	-0.113 (0.158)	-0.031 (0.295)
SVAR + FF4	-0.242 (0.156)	-0.090 (0.189)	-0.286 (0.319)
SVAR + MP1 + FF4	-0.194 (0.135)	-0.101 (0.165)	-0.137 (0.293)
MP1	-0.121 (0.348)	-0.179 (0.428)	-0.338 (0.737)
FF4	-0.145 (0.446)	-0.162 (0.571)	-0.889 (0.877)
ED2	0.030 (0.459)	-0.084 (0.587)	-0.182 (0.921)
ED3	0.022 (0.385)	-0.097 (0.494)	-0.114 (0.794)
ED4	0.076 (0.375)	-0.096 (0.480)	-0.041 (0.793)
Wu – Xia	-0.053 (0.025)**	-0.034 (0.029)	-0.035 (0.057)
GS1	-0.052 (0.031)*	-0.024 (0.037)	-0.039 (0.068)
GS5	-0.072 (0.046)	-0.036 (0.056)	-0.127 (0.103)
GS10	-0.073 (0.059)	-0.032 (0.074)	-0.150 (0.125)

The entries are estimated four-quarter cumulative effects of a U.S. monetary policy shock by 1 p.p. interacted with lagged *liquid assets* transmission channel variable. HAC standard errors clustered at the bank level are shown in the parentheses. ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively. The dependent variable is quarterly credit growth in respective currency. The regressors are the four-quarter distributed lag of a respective proxy of the U.S. monetary policy shock interacted with the fourth lag of *liquid* and first lags of *core*, *tier*1, and *ta*. Bank and state fixed effects are added.

Table 11: Rolling-sample cumulative four-quarter effect of a U.S. monetary policy shock on *dollar*-denominated credit growth in Russia through the *foreign liabilities* channel

sample	MP1	FF4	MP1 + FF4
2000Q1-2018Q1	-0.945 (0.323)***	-0.594 (0.233)	-0.809 (0.344)**
2000Q1-2010Q1	-0.999 (0.360)***	-0.589 (0.453)	-0.843 (0.385)**
2001Q1-2011Q1	-1.130 (0.397)***	-0.634 (0.637)	-0.999 (0.468)**
2002Q1-2012Q1	-1.306 (0.382)***	-1.034 (0.682)	-1.292 (0.456)***
2003Q1-2013Q1	-1.482 (0.396)***	-1.482 (0.666)**	-1.521 (0.459)***
2004Q1-2014Q1	-1.406 (0.408)***	-1.395 (0.681)**	-1.437 (0.473)***
2005Q1-2015Q1	-1.109 (0.417)***	-0.866 (0.714)	-1.081 (0.488)**
2006Q1-2016Q1	-1.243 (0.444)***	-1.595 (0.796)**	-1.371 (0.527)***
2007Q1-2017Q1	-1.280 (0.446)***	-1.227 (0.779)	-1.318 (0.528)**
2007Q2-2017Q2	-1.645 (1.172)	-0.949 (0.894)	-1.302 (0.946)
2007Q3-2017Q3	-1.006 (1.195)	1.914 (1.200)	0.387 (1.126)
2007Q4-2017Q4	1.706 (1.463)	3.856 (1.263)***	2.771 (1.282)**
2008Q1-2018Q1	6.453 (1.889)***	5.655 (1.362)***	5.238 (1.431) ***

Notes: Reported HAC standard errors are clustered at the bank level. See Table 1 for detailed description of variables. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

Table 12: Rolling-sample cumulative four-quarter effect of a U.S. monetary policy shock on *ruble*-denominated credit growth in Russia through the *foreign liabilities* channel

sample	MP1	FF4	MP1 + FF4
2000Q1-2018Q1	0.011 (0.224)	-0.053 (0.312)	-0.013 (0.250)
2000Q1-2010Q1	0.169 (0.259)	0.152 (0.352)	0.164 (0.287)
2001Q1-2011Q1	0.172 (0.256)	0.079 (0.458)	0.166 (0.311)
2002Q1-2012Q1	0.092 (0.228)	0.390 (0.403)	0.167 (0.272)
2003Q1-2013Q1	0.002 (0.215)	0.066 (0.376)	0.015 (0.254)
2004Q1-2014Q1	-0.196 (0.212)	-0.280 (0.369)	-0.222 (0.250)
2005Q1-2015Q1	-0.259 (0.221)	-0.449 (0.391)	0.312 (0.263)
2006Q1-2016Q1	-0.223 (0.211)	-0.471 (0.390)	0.286 (0.253)
2007Q1-2017Q1	-0.168 (0.215)	-0.273 (0.398)	-0.199 (0.258)
2007Q2-2017Q2	-0.355 (0.667)	-0.027 (0.453)	-0.040 (0.526)
2007Q3-2017Q3	-0.407 (0.678)	-0.216 (0.700)	-0.227 (0.618)
2007Q4-2017Q4	0.042 (0.652)	0.211 (0.769)	0.283 (0.627)
2008Q1-2018Q1	1.440 (1.258)	0.633 (0.881)	0.970 (0.878)

Notes: Reported HAC standard errors are clustered at the bank level. See Table 1 for detailed description of variables. ., *, **, and *** denote significance at 10%, 5%, 1%, and 0.1% level, respectively.

Figures

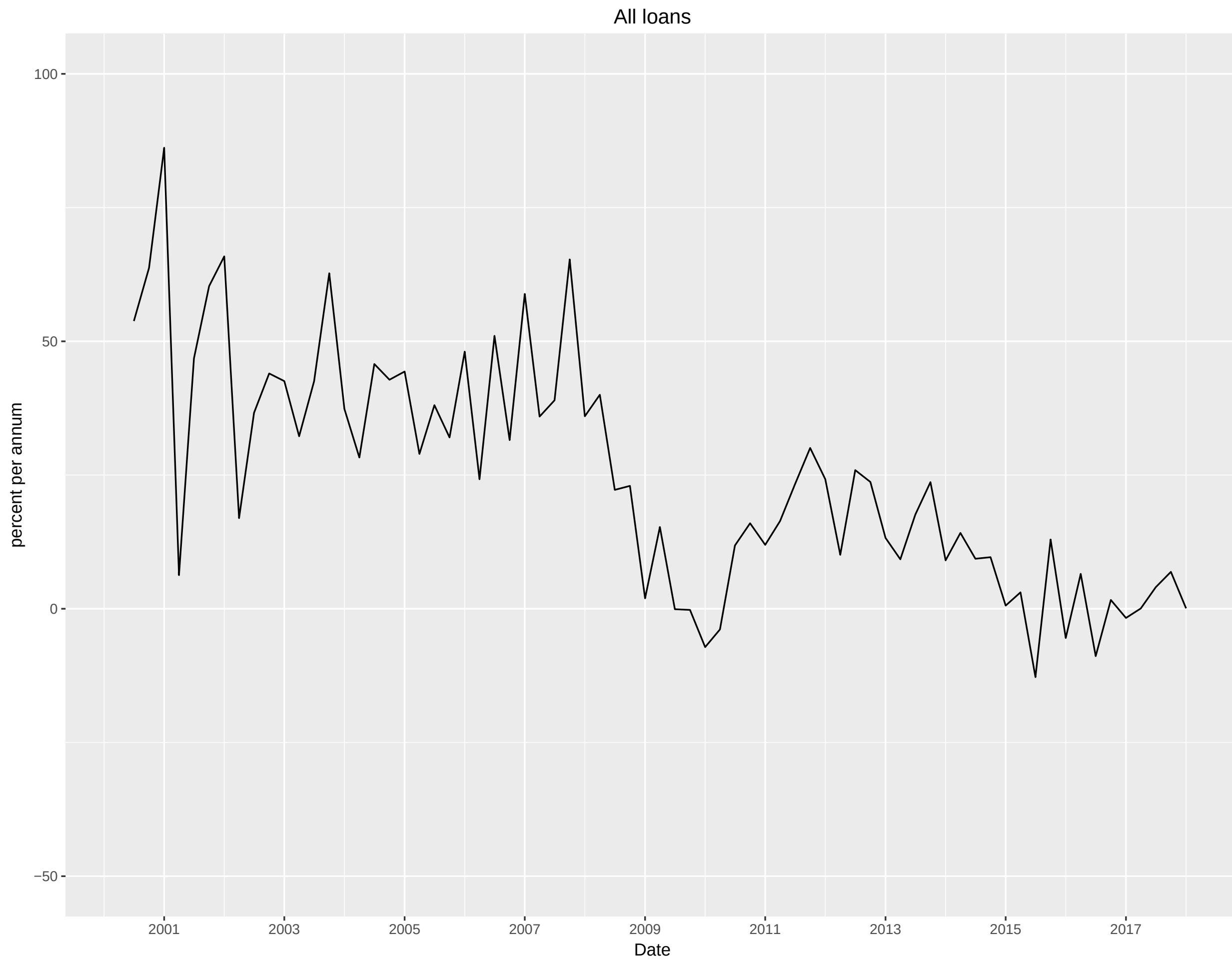

Figure 1: Aggregate quarterly growth of credit in Russia

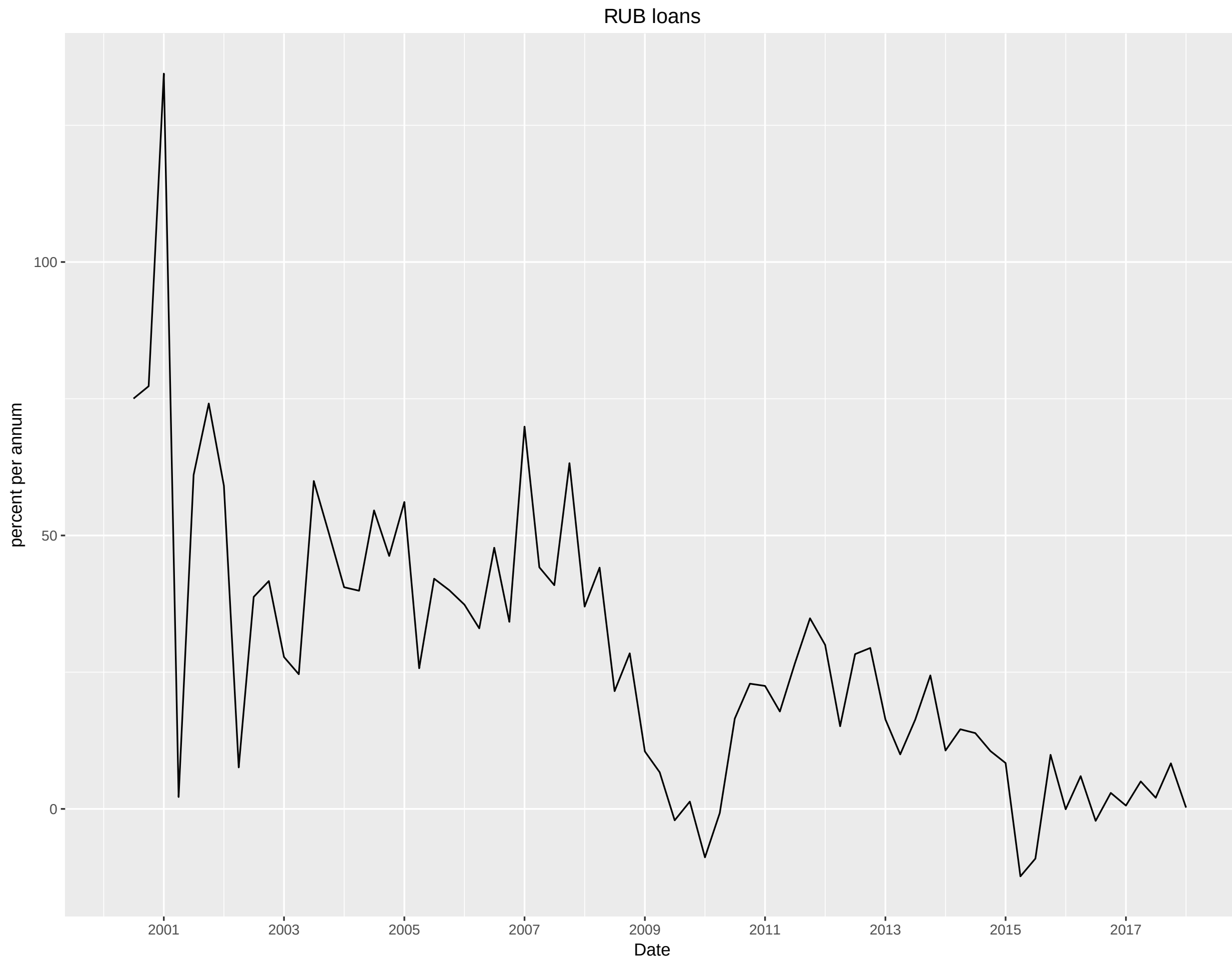

Figure 2: Aggregate quarterly growth of ruble-denominated credit in Russia

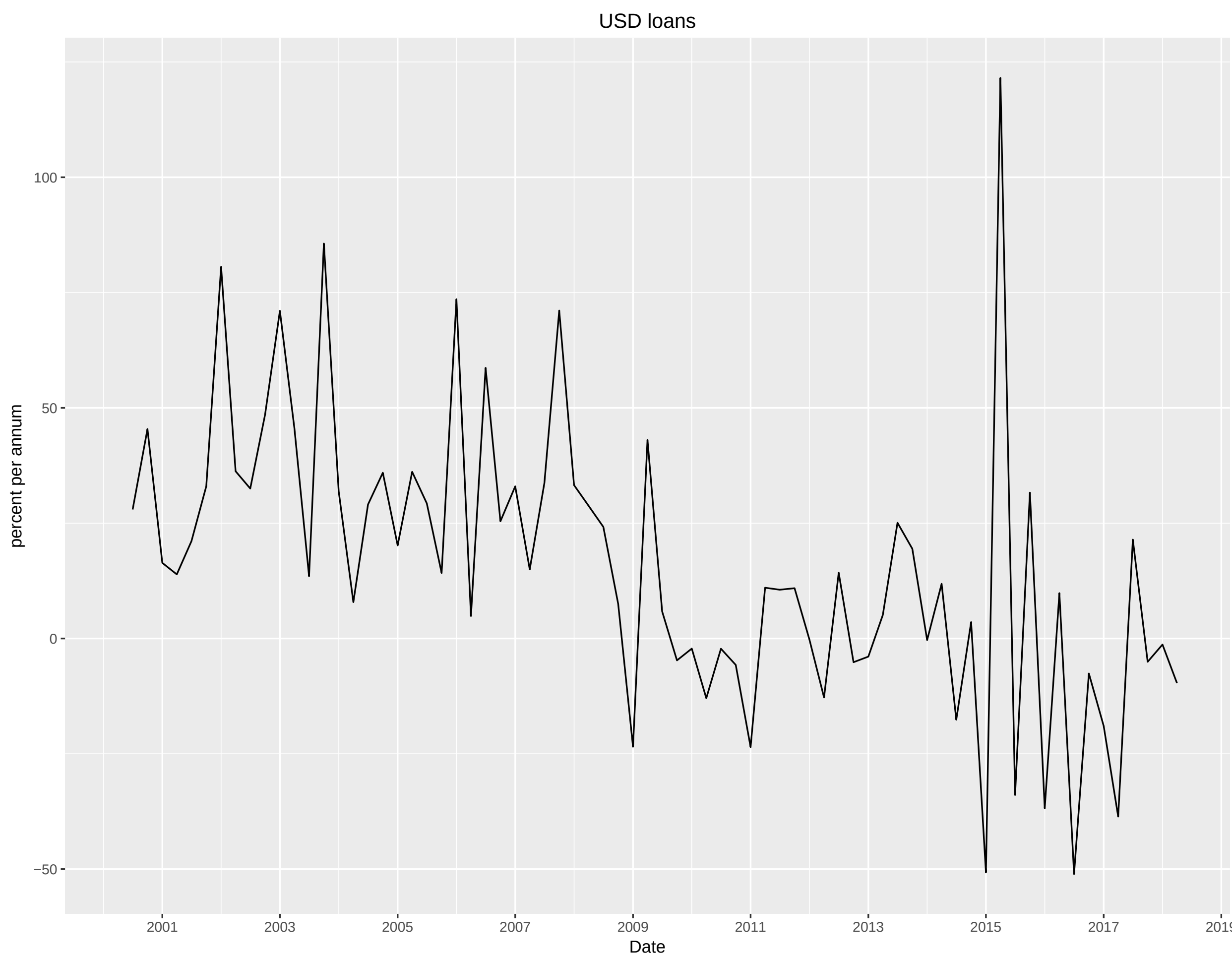

Figure 3: Aggregate quarterly growth of dollar-denominated credit in Russia

Figure 4: Aggregate foreign-liabilities-to-assets ratio

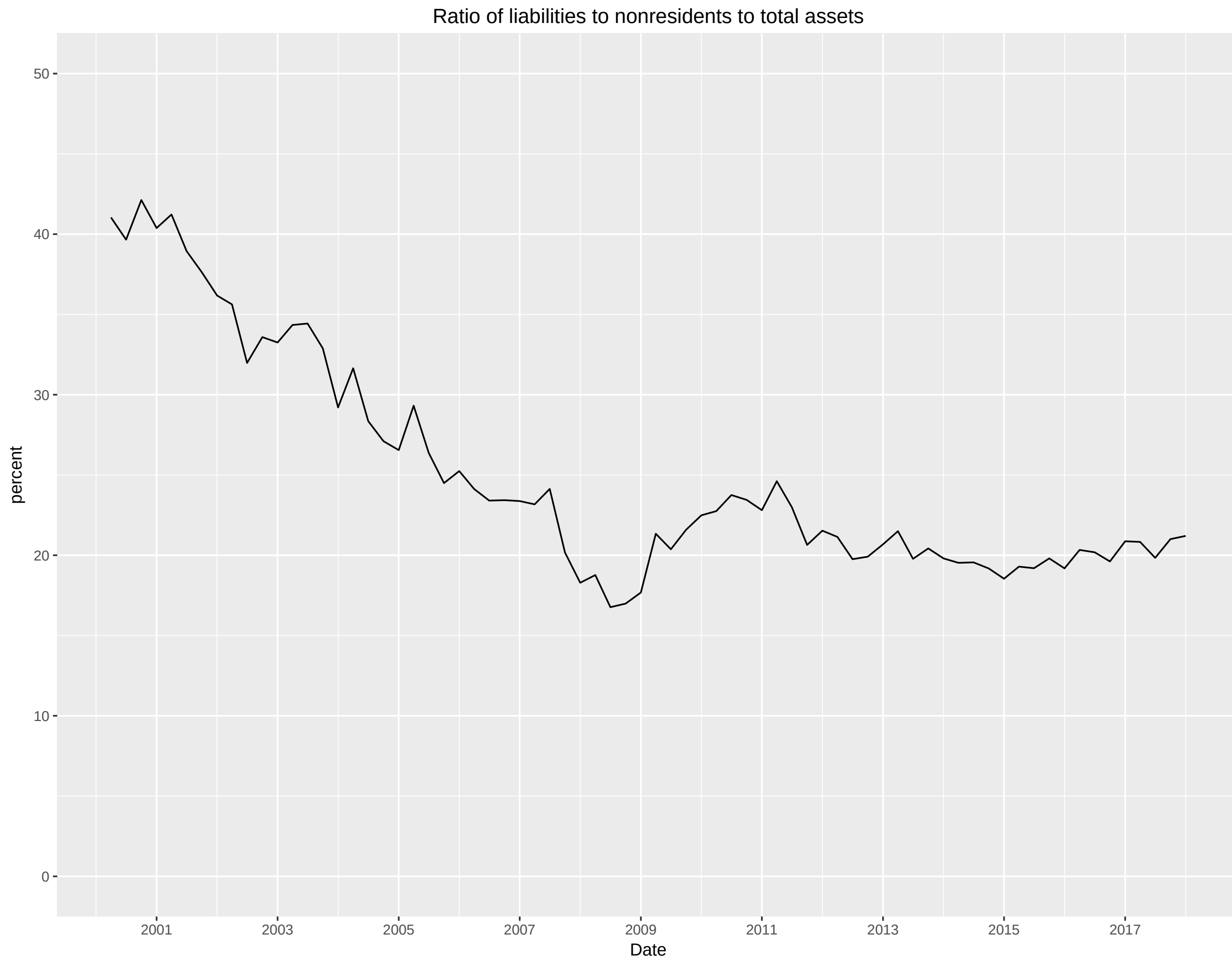

Figure 5: Aggregate liquid-to-total-assets ratio

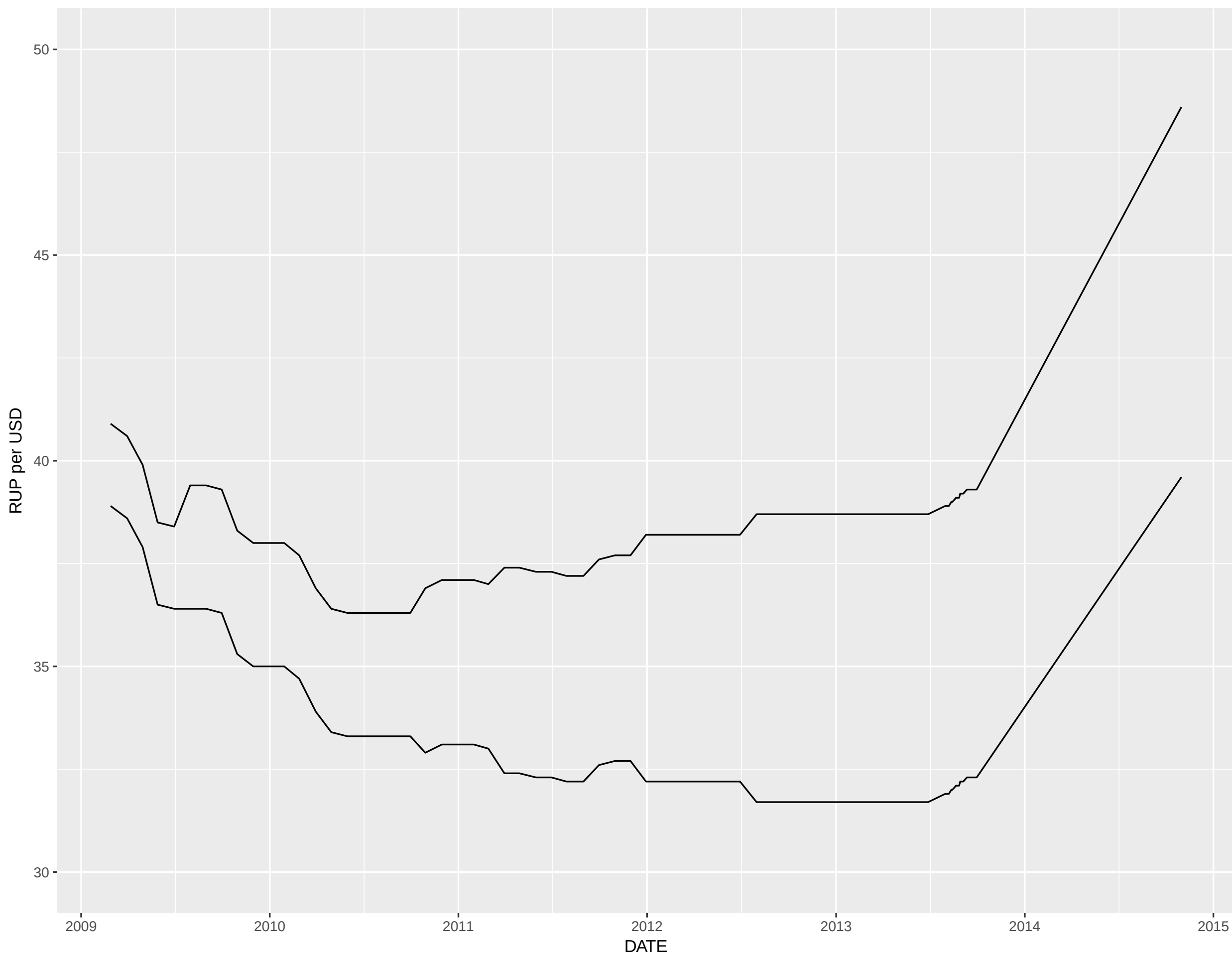

Figure 6: Target zone for ruble (rubles per US dollar). Source: Bank of Russia

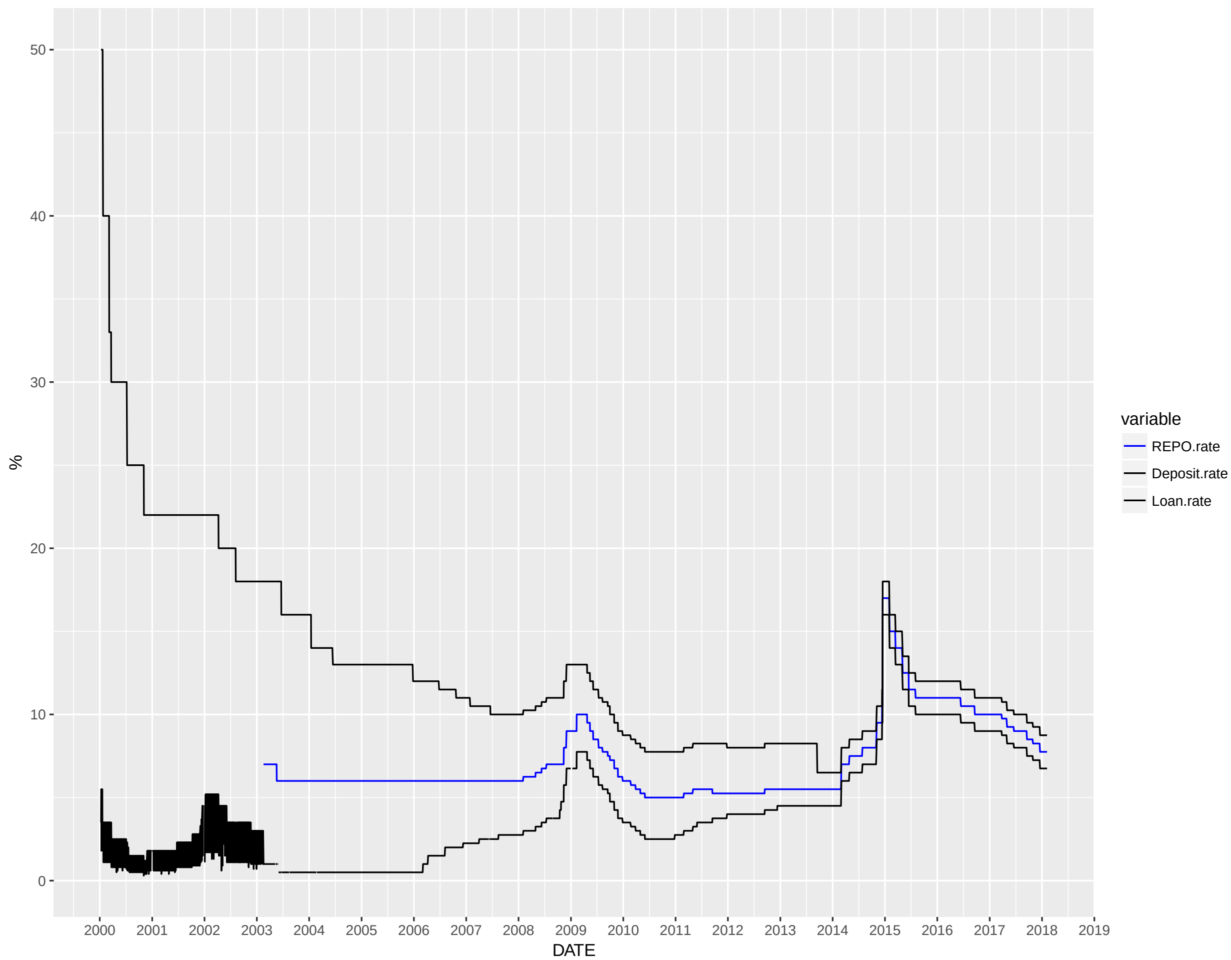

Figure 7: Bank of Russia's policy rates. Source: Bank of Russia

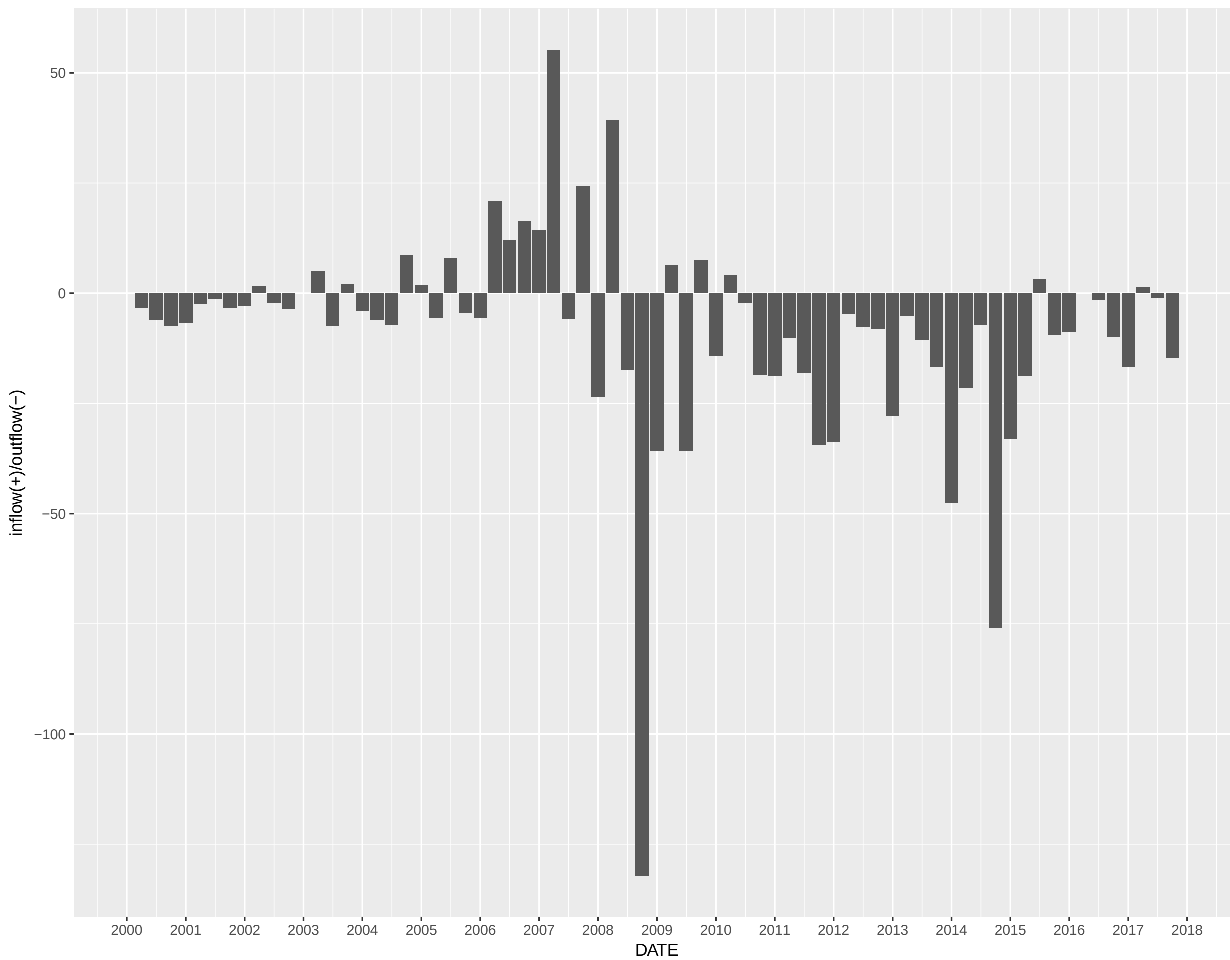

Figure 8: Cross-border private capital flows. Source: Bank of Russia

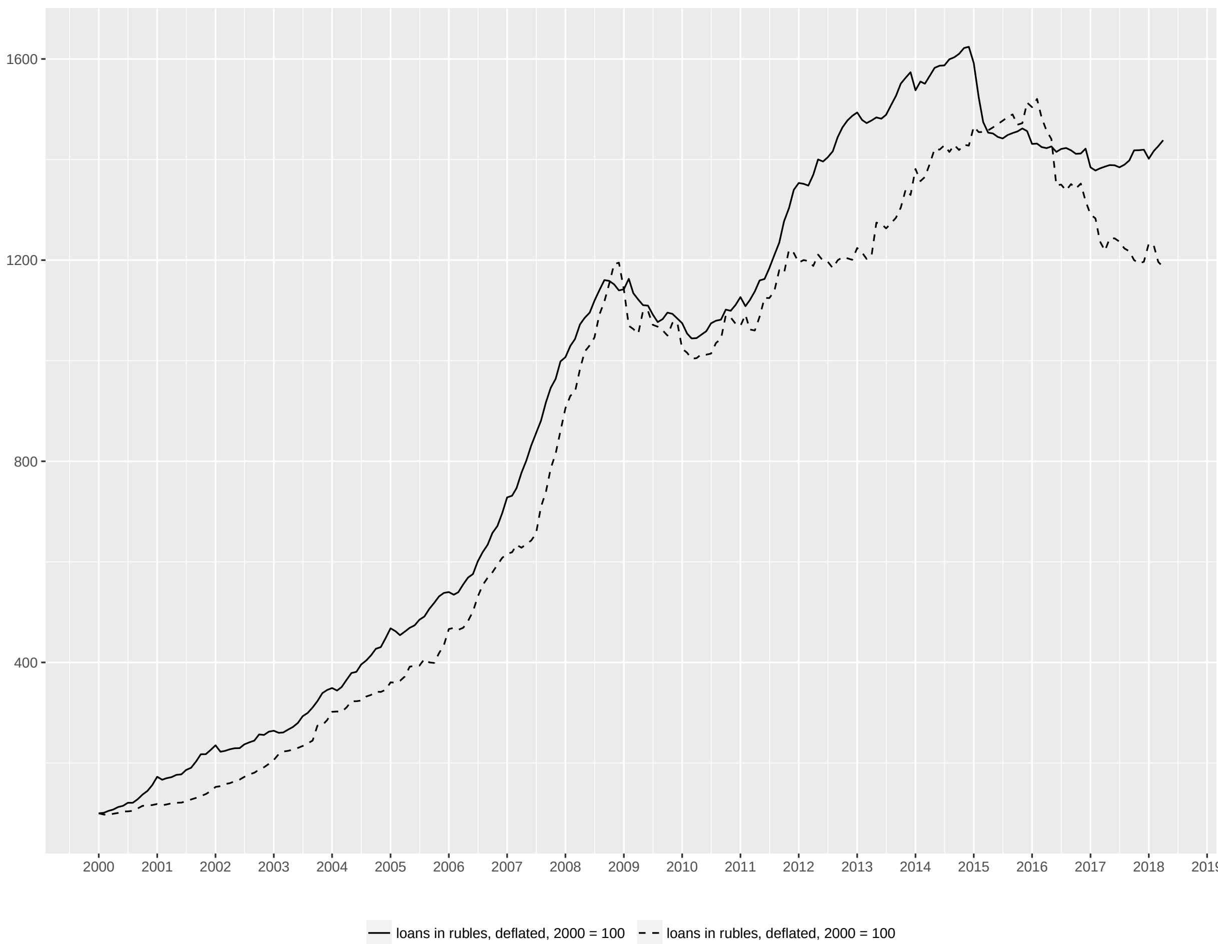

Figure 9: Loans denominated in rubles and in U.S. dollars. Source: Bank of Russia

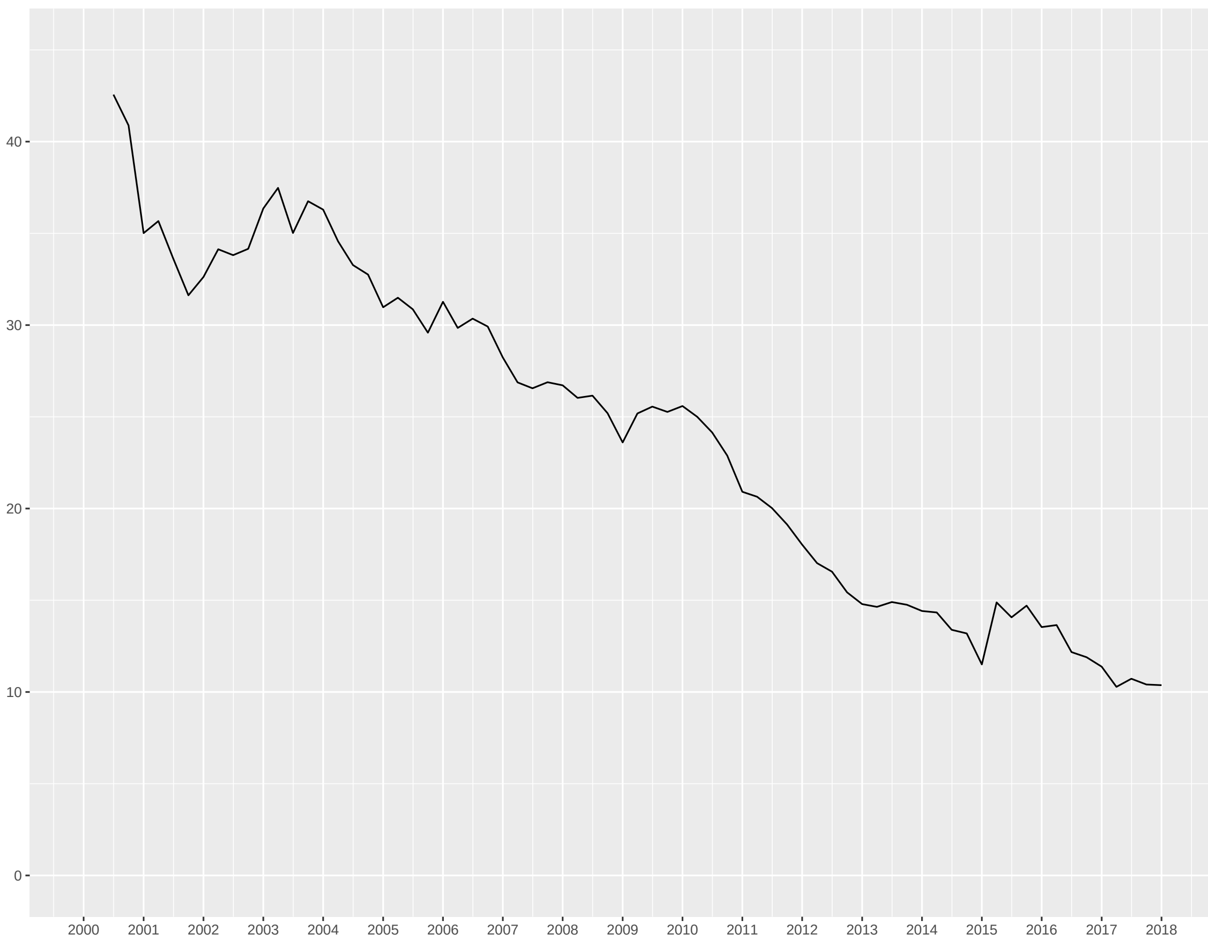

Figure 10: Share of loans denominated in U.S. dollars in total loans. Source: Bank of Russia, authors' calculations

Figure 11: Loans denominated in U.S. dollars and foreign liabilities as a fraction of total assets. Source: Bank of Russia, authors' calculations