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BANKS' FOREIGN CURRENCY REVALUATIONS AND LIQUIDITY CREATION

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We examine the relationship between net revaluations of foreign currency-denominated assets and liabilities and banks' liquidity creation. Our findings reveal a significant effect on FX-USD liquidity creation: revaluations enhance liquidity creation on the asset side but diminish it on the liability side, leading to a total neutral effect. Subsample analysis reveals that banks with positive FX mismatches face liquidity destruction in FX-USD liabilities during exchange rate shocks, whereas negatively FX-mismatched banks use these shocks to extend long-term FX loans, balancing total liquidity creation. For accounts denominated in the domestic currency, no significant effects of net revaluations are observed for liquidity creation on the full sample. For positively FX-mismatched banks net revaluations enhance total liquidity creation, while for negatively FX-mismatched banks reduce it, resulting in an overall neutral outcome for domestic currency liquidity creation. Furthermore, regulatory capital moderates the impact of revaluations on liquidity creation through the financial fragility mechanism. These results underscore the complex interplay of currency risks, balance sheet FX mismatches, and regulatory dynamics in influencing liquidity creation in emerging markets.

Key words: liquidity creation, currency revaluation, bank's capital, foreign currency mismatch

JEL codes: G21; G28

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1. Introduction

Banks in emerging market economies (EM) expose themselves to foreign exchange risk by accepting deposits and providing loans denominated in foreign currency, such as the US dollar (FX-USD). This exposure can affect banks' lending and maturity transformation and transmit exchange rate volatility into the real economy. In extreme cases, exchange rate movements may lead to solvency problems for banks if FX assets and liabilities are mismatched.

Recent literature has uncovered several important ways in which foreign exchange rate shocks are transmitted to the real economy through banking channels. For example, Abbassi and Bräuning (2023) show that foreign currency mismatches of banking sector balance sheets can propagate exchange rate shocks to the real economy via credit contraction. Beck *et al.* (2021) reveal that domestic currency depreciation shifts bank credit toward export-oriented firms. Furthermore, Christiano *et al.* (2021) find that FX-USD deposits serve as a hedge against business cycle income risks, as EM currencies tend to depreciate during recessions. Building on this literature, our study examines the relationship between banks' FX-USD exposure and their ability to perform a key economic function: liquidity creation.

Despite the critical importance of FX exposures and the experience of emerging market banks with FX-USD risk, identifying the impacts of FX-USD balance sheet shocks empirically is challenging. This paper utilizes the unique feature of the Russian banking data that reports the revaluations (*Revals*) values for FX-denominated assets and liabilities in domestic currency. Furthermore, using the methodology of Berger and Bouwman (2009), we construct a liquidity creation measure that considers the liquidity categories and maturities of both domestic and foreign currency balance sheet items. This approach allows us to study the relationship between *Revals* and liquidity creation by banks or more specifically how FX-USD shocks transmit into banks' capacity to extend long-term credit and manage deposits of varying maturities.

Mamonov *et al.* (2024) find that *Revals* are closely linked to currency exchange rate fluctuations, which means that cross-bank variation of *Revals* is due to prior FX balance sheet mismatches. Thus, *Revals* captures the joint effect of individual banks' pre-determined exposure to FX risk and realized macroeconomic foreign exchange rate shock making it an ideal independent variable for our identification strategy.

Our key dependent variable, the bank liquidity creation index (*LC_Tot*), is calculated following Berger and Bouwman's (2009) methodology, described in detail in the data section. The *LC_Tot* index is the weighted sum of all asset-side, and liability-side balance sheet activities. According to the formula liquidity is created (*LC_Tot* increases) when banks transform liquid liabilities (e.g., short-term deposits) into illiquid assets (e.g., long-term loans), thus positive weights are given to both liquid liabilities and illiquid assets. Similarly, since banks destroy liquidity (*LC_Tot* decreases) when they transform illiquid liabilities (e.g., long-term deposits) into liquid assets (e.g., government bonds), the negative weights are given to illiquid liabilities and liquid assets. We analyze total liquidity creation (*LC_Tot*) for each bank, and its components on the asset side (*LC_Asst*) and the liability side (*LC_Liab*). Furthermore, using the fact that Russian banks report separate values of all balance sheet items that originated in the domestic or foreign currency we can calculate separate liquidity creation indices for all banking activities that originated in rubles and for those that originated in FX-USD.

The development of the liquidity creation index has spurred two vibrant strands of empirical literature. The first examines the relationship between liquidity creation and macroeconomic factors, revealing its procyclical nature and predictive power for financial crises (e.g., Berger and Bouwman, 2017; Chatterjee, 2018). The second focuses on capital adequacy requirements and their influence on liquidity creation at the bank level, demonstrating a negative relationship between capital ratios and liquidity creation due to the "financial fragility-crowding out effect" (e.g., Distinguin et al., 2013; Horváth et al., 2014).

Our study contributes to both strands. On a macroeconomic level, we show that liquidity creation indices for ruble- and FX-USD-denominated items are procyclical, with real GDP and monetary aggregate (M2) growth preceding increases in liquidity creation. This aligns with Davydov *et al.* (2018), who highlight the procyclicality of liquidity creation in Russia. Moreover, Davydov *et al.* (2024) find that banks exhibit liquidity hoarding (an inverse measure of bank liquidity creation) in times of higher economic policy uncertainty (which precedes recessions), further underpinning the procyclicality of liquidity creation by banks in Russia.

The estimated coefficients on consumer inflation and exchange rate volatility exhibit contrasting relationships with liquidity creation indices for accounts denominated in rubles and FX-USD. High inflation precedes increased liquidity creation by banks in rubles but leads to liquidity destruction in FX-USD. This phenomenon can be attributed to overheating during high

inflation episodes, prompting central banks to raise policy rates as part of countercyclical monetary measures. The resulting higher short-term domestic currency deposit rates incentivize depositors to shift ruble savings into shorter maturities, increasing the liquidity creation index for rubles. Conversely, expectations of an impending recession and domestic currency depreciation in such environments prompt depositors to shift FX-USD deposits to longer maturities, which reduces the liquidity creation index for foreign currency-denominated accounts[3].

Previous studies have documented a strong relationship between exchange rate volatility and the "dollarization" of deposits (e.g., Honohan, 2007; Fang and Liu, 2021). Our findings suggest that increased exchange rate volatility has a short-term impact on depositors' expectations of domestic currency depreciation, leading them to reallocate savings to short-term FX-USD deposits. This behavior drives up the liquidity creation index for foreign currency-denominated items.

Our bank-level analysis reveals that net revaluations of balance sheet items denominated in foreign currency are significantly associated with liquidity creation in FX-USD on the asset side *(LC_Asst_FX)* and with liquidity destruction in FX-USD on the liability side *(LC_Liab_FX).* Since these effects offset each other, the total effect on liquidity creation in FX-USD *(LC_Tot_FX)* is neutral. Conversely, our full-sample estimation results show no significant association between net revaluations and any components of liquidity creation in rubles, including *LC_Asst_RUB, LC_Liab_RUB, and LC_Tot_RUB*.

Furthermore, we split banks into two subsamples by their average FX-USD balance sheet mismatch. We assign banks with average FX-USD-denominated liabilities exceeding FX-USD-denominated assets into a *positive* FX-mismatch subsample, while banks with average FX-denominated assets exceeding FX-denominated liabilities are assigned to a *negative* FX-mismatch subsample.

Our analysis shows that net revaluations are significantly associated with liquidity destruction in FX-USD on the liability side *(LC_Liab_FX)* for both subsamples. However, the magnitude of the effect is greater for banks with a *positive* FX mismatch. This is likely because,

[3] In a multi-country study Dalgic (2024) shows that the emerging market exchange rates such as ruble usually depreciate in recessions and households are incentivized to hold banking deposits in FX-USD.

during substantial exchange rate movements that result in large revaluations on banks' balance sheets, depositors tend to shift toward long-term "dollar" deposits. This behavior is more pronounced in banks that heavily depend on foreign currency funding.

Significant liquidity creation in FX-USD on the asset side (*LC_Asst_FX*) is observed only in the *negative* FX mismatch subsample, where banks' business model is geared towards making foreign currency-denominated loans. During periods of significant revaluations, these banks experience an influx of long-term "dollar" deposits, which they utilize to extend long-term "dollar" loans. This dynamic results in a neutral overall effect on liquidity creation in FX-USD.

For ruble-denominated liquidity creation, the subsample analysis reveals that net revaluations are linked to total liquidity creation in rubles (*LC_Tot_RUB*) for *positively* FX-mismatched banks but are associated with liquidity destruction in rubles for *negatively* FX-mismatched banks. These findings suggest that during high revaluation periods - often associated with ruble devaluations and increases in domestic policy interest rates - *positively* mismatched banks not only attract "dollar" deposits but also relatively more short-term ruble deposits. Consequently, net revaluations drive up ruble liquidity creation on the liability side for this group. Conversely, *negatively* FX-mismatched banks, which specialize in foreign currency loans, reduce ruble liquidity during these periods. This is likely due to the expansion of "dollar" lending, which crowds out ruble-denominated lending on the asset side.

Our next set of results contributes to the liquidity creation literature that tests the "financial fragility" mechanism on the asset side and the "crowding-out of deposits" mechanism on the liability side of banks' balance sheets. The "financial fragility" mechanism suggests that banks gain depositors' trust by maintaining a fragile financial structure, which incentivizes them to collect more deposits and lend more funds. In this framework, higher capital increases banks' bargaining power, reducing their motivation to monitor loans and exert necessary efforts to attract depositors. Consequently, higher capital diminishes liquidity creation.

The "crowding-out of deposits" mechanism, proposed by Gorton and Winton (2017), posits that an increase in required bank capital forces investors to shift funds away from deposits toward bank capital. Since deposits are liquid and bank capital is illiquid, higher capital requirements result in reduced liquidity creation.

We find robust empirical support for the "financial fragility" hypothesis in the context of ruble-denominated liquidity creation. The coefficient estimates for the lagged regulatory capital ratio (*TCR*) are negative and highly significant across all subsamples for total liquidity creation (*LC_Tot_RUB*) and liquidity creation on the asset side (*LC_Asst_RUB*). However, our results do not support the "crowding-out of deposits" hypothesis, as the estimated coefficients for *TCR* are statistically insignificant in specifications examining liquidity creation on the liability side (*LC_Liab_RUB*).

In the specification for total liquidity creation in rubles (*LC_Tot_RUB*), the coefficient estimates for the interaction term between the regulatory capital ratio (*TCR*) and components of net revaluations (*Net Revals*) are highly significant and exhibit opposite signs relative to the coefficients for *Net Revals* components. This indicates that an increase in regulatory capital (*TCR*) offsets the effects of net revaluations on liquidity creation. This result demonstrates that net revaluations and regulatory capital interact through the "financial fragility" mechanism outlined by Diamond and Rajan (2000, 2001).

The findings for liquidity creation in FX-USD are mixed, as banks in our sample do not assign FX-USD-denominated accounts to regulatory capital. The coefficient estimates for specifications with the interaction term in models of FX-USD liquidity creation (*LC_Tot_FX*) are statistically insignificant.

The rest of the paper is organized as follows. Section 2 contains a detailed description of the data sets used in the study and the constructed variables. Section 3 outlines the hypotheses formulation and the empirical specifications. The results obtained and their robustness are reported in Sections 4 and 5. Section 6 concludes.

2. Data and variables construction

Our sample consists of the quarterly panel data of Russian banks over the 2010-2021 period. The highly detailed data on secondary accounts of balance sheets (Form 101), primary data on profit

and loss (P&L) statements (Form 102), and the data on mandatory ratios were obtained from the Bank of Russia website.

The initial sample encompassed 1,217 financial institutions. Subsequently, we excluded non-bank credit organizations and banks that did not disclose secondary accounts' data. Additionally, banks with one bank-quarter observation were removed due to their hindrance in facilitating panel data models. Consequently, the ultimate sample was refined to include 909 banks, amounting to 26,160 bank-quarter observations.

2.1 Revaluation of balance sheet items denominated in foreign currency

Net revaluation of the bank's assets and liabilities. All banks in Russia are required to report the revaluation value of assets and liabilities that are denominated in foreign currency. Specifically, Form 102 records positive and negative revaluations of all balance sheet items denominated in foreign currency that arise due to exchange rate fluctuations.

When a domestic currency depreciates ($\Delta S > 0$) against foreign currencies[4], a bank gets positive revaluation from all its FX-USD-denominated assets and negative revaluation from its FX-USD-denominated liabilities. When a domestic currency appreciates ($\Delta S < 0$) against foreign currencies, a bank gets negative revaluation from FX-USD-denominated assets and positive revaluation from FX-USD-denominated liabilities.

$$Pos.Reval^{RUB}{}_{i,t} = \begin{cases} FX\_Assets^{\$}{}_{i,t-1} * \Delta S, \ if\ \Delta S > 0 \\ -FX\_Liab^{\$}{}_{i,t-1} * \Delta S, \ if\ \Delta S < 0 \end{cases} \quad (1a)$$

$$Neg.Reval^{RUB}{}_{i,t} = \begin{cases} FX\_Assets^{\$}{}_{i,t-1} * \Delta S, \ if\ \Delta S < 0 \\ -FX\_Liab^{\$}{}_{i,t-1} * \Delta S, \ if\ \Delta S > 0 \end{cases}, \quad (1b)$$

where $FX\_Assets^{\$}{}_{i,t}$ and $FX\_Laib^{\$}{}_{i,t}$ represent the bank's *i* assets and liabilities denominated in foreign currencies, ΔS stands for the change of exchange rate of domestic currency against foreign currencies between *t-1* and *t* periods.

[4] We denote price of one foreign currency unit (USD) in terms of domestic currency units (Rubles) as an exchange rate *S*.

The formulas (1a)-(1b) indicate that banks obtain positive and negative ruble-denominated revaluations from both sides of their balance sheet and the net revaluation effect in a given period depends on the direction of exchange rate movements which are exogenous, and on the bank's choice of the mismatch between assets and liabilities denominated in foreign currencies. Mamonov *et al.* (2022) find that revaluations are largely correlated with currency exchange rate fluctuations which reduces possible endogeneity concerns.

Bank's foreign currency mismatch (FCM). The cross-sectional variation in revaluations is due to the foreign currency mismatch (FCM) component which we define following the literature (e.g., Hardy (2023), Ranciere *et al.* (2010)):

$$FCM_{i,t} = \frac{FX\_Liab^{\$}{}_{i,t} - FX\_Assets^{\$}{}_{i,t}}{Total\ Assets^{\$}{}_{i,t}} \quad (2)$$

If a bank's FX-USD denominated liabilities exceed FX-USD denominated assets, a bank experiences a *positive* FX-mismatch (FCM>0); if in a given period FX-USD denominated liabilities are below than FX-USD denominated assets, a bank experiences a *negative* FX-mismatch (FCM<0). Brown *et al*. (2018) report that Russian banks have moderate to high holdings of accounts denominated in foreign currencies on both sides of the balance sheet.

Let us take the net effect of the bank's revaluation of assets and liabilities denominated in foreign currency in a given period and scale it by the bank's total assets:

$$Net\ Reval\text{-}to\text{-}Assets_{i,t} = \frac{Pos.Reval^{RUB}{}_{i,t} + Neg.Reval^{RUB}{}_{i,t}}{Total\ Assets^{\$}_{i,t}} \quad (3)$$

Combining the formulas (1a,b) and (3) we can separate two cases of net revaluations depending on the direction of the exchange rate movement:

$$NetReval\text{-}to\text{-}Assets_{i,t} = \begin{cases} \left(FX\_Assets^{\$}{}_{i,t-1} - FX_{Liab}{}^{\$}{}_{i,t-1}\right) * \Delta S \,/\, Total\ Assets^{\$}_{i,t}, & if\ \Delta S > 0 \\ \left(-FX_{Liab}{}^{\$}{}_{i,t-1} + FX_{Assets}{}^{\$}{}_{i,t-1}\right) * \Delta S \,/\, Total\ Assets^{\$}_{i,t}, & if \Delta S < 0 \end{cases} \quad (4)$$

Formula (4) reveals that $Net\ Reval\text{-}to\text{-}Assets_{it}$ can be either positive or negative depending on the signs of the change of a domestic currency against foreign currencies over time and the foreign currency mismatch (FCM) of the bank's balance sheet since they enter formula (4) in a multiplicative way: $-FCM_{i,t} * \Delta S$. For example, if in period *t* a domestic currency depreciates ($\Delta S > 0$) against foreign currencies, $Net\ Reval\text{-}to\text{-}Assets_{it}$ should be *positive* when the foreign currency mismatch is negative, and *negative* when the foreign currency mismatch is positive. If a domestic

currency appreciates ($\Delta S < 0$) in period t, $Net\ Reval\text{-}to\text{-}Assets_{it}$ should be *positive* when the foreign currency mismatch is positive, and *negative* when the foreign currency mismatch is negative.

As visible from (4), if a bank has *non-zero FCM*, it makes itself more exposed to exchange rate fluctuations. We follow the intuition of Mamonov *et al.* (2024) and define two new variables depending on the sign of $Net\ Reval\text{-}to\text{-}Assets_{it}$. Variable $Net\ Reval^{+}_{i,t}$ assumes positive values of $Net\ Reval\text{-}to\text{-}Assets_{it}>=0$ and zero otherwise, while variable $Net\ Reval^{-}_{i,t}$ assumes negative values of $Net\ Reval\text{-}to\text{-}Assets_{it}<0$ and zero otherwise.

2.2 Liquidity creation measure

Berger and Bouwman's (2009) research extensively delineates the primary liquidity creation theories and presents an algorithm aimed at formulating liquidity creation measures. In our further baseline regression analysis, we employ a refined liquidity creation metric which was used by Berger *et al.* (2016) for the detailed German data. This measure incorporates the loan category and maturity alongside other secondary account details, leveraging comprehensive insights extracted from the balance sheet data of Russian banks. The granularity of this data source encompasses essential elements such as opening balances, turnovers, closing balances, and maturities of secondary accounts across all banks, obtainable from the Bank of Russia (CBR) official website. Previous studies that employed Russian data for studying different aspects of liquidity creation are Davydov *et al.* (2018) and Fungáčová and Weill (2012).

Following Berger and Bouwman's (2009) notation, we have denoted the enhanced liquidity creation metric as ***catmat nonfat***, emphasizing its reliance on both category and maturity classifications. The algorithm to derive this metric is outlined in six steps below.

1) We categorize a total of 1,734 secondary accounts from Form 101 into 34 balance sheet classes (for example, loans, securities, deposits) using the CBR instructions 2332-U (2009) for the 2010-2016 period, 4212-U (2016) for the 2017-2018 period, and 4927-U (2018) for the 2019-2021 period. Despite the evolution of the CBR instructions during the 2010-2021 period, their overall influence on the balance sheet construction process was negligible;

2) We treat closing balances of active secondary accounts as positive and closing balances of passive secondary accounts as negative within the assets section of the balance sheet, and otherwise for secondary accounts within the liabilities and equity sections of the balance sheet.

This is crucial for step 5 of the algorithm to ensure an accurate assessment within each balance sheet class;

3) We categorize a total of 1,734 secondary accounts from Form 101 into liquidity classes (liquid, semi-liquid, illiquid) relying on the ease, cost, and time for banks to obtain liquid funds. This assessment simultaneously considers the category and maturity available in the description of each secondary account;

4) We assign liquidity weights to all secondary accounts[5] based on liquidity creation theory;

5) We summarize the product of liquidity weight and closing balance for each *k* secondary account within *n* balance sheet's classes of each bank *i* in period *t*.

$$Balance\ sheet's\ class_{i,n,t} = \sum_{k=1}^{S} Liq.weight_k \cdot Bank\ accounts_{k,t} \quad (5)$$

6) We apply formula 5 below to calculate the amount of liquidity created on the asset side (*LC_Asst*), the amount of liquidity created on the liability side (*LC_Liab*), and the amount of liquidity created on the equity side (*LC_Equity*) for each bank.

$$X_{i,t} = \sum_i Balance\ sheet's\ class_{i,n,t} \quad (6)$$

where $X_{i,t} - LC\_Assets_{i.t}$ for balance sheet's classes $i = 1 \ldots 13$ on the asset side, $LC\_Liab_{i,t}$ for balance sheet's classes $i = 15 \ldots 22$ on the liability side, $LC\_Equity_{i,t}$ for $i = 24 \ldots 35$ classes on the equity side of each bank bank *i* in period *t*. All 35 balance sheet classes are listed in Appendix A.

Finally, we obtain the total amount of liquidity created (*LC_Tot*) without off-balance sheet liquidity:

$$catmat\ nonfat = LC\_Tot_{i,t} = LC\_Asst_{i,t} + LC\_Liab_{i,t} + LC\_Equity_{i,t} \quad (7)$$

To demonstrate the construction process of the new liquidity creation metric, consider the simplified bank balance sheet shown in Table 1.

[5] Refer to Annex 1 for liquidity weights.

Table 1. An example of a hypothetical bank balance sheet

Bank balance sheet			
Loans	900	Equity	200
		Total equity	**200**
- 1 month consumer loans	*300*	Deposits	800
- 5 years car loans	*600*	*- 4 months*	*500*
Cash	100	*- 2 years*	*300*
Total assets	**1 000**	**Total liabilities**	**800**

The original Berger and Bouwman (2009) liquidity creation measure *cat nonfat* considers only the category of loans. This would yield the following value of their preferred liquidity creation measure:

$$cat\ nonfat = Cash \cdot \left(-\frac{1}{2}\right) + Loans \cdot \frac{1}{2} + 4\ months\ Deposits \cdot \frac{1}{2} + 2\ years\ Deposits \cdot \left(-\frac{1}{2}\right) + Equity \cdot$$
$$\cdot \left(-\tfrac{1}{2}\right) = 100 \cdot \left(-\tfrac{1}{2}\right) + 900 \cdot \tfrac{1}{2} + 500 \cdot \tfrac{1}{2} + 300 \cdot \left(-\tfrac{1}{2}\right) + 200 \cdot \left(-\tfrac{1}{2}\right) = 400 \quad (8)$$

The ***catmat nonfat*** measure of Berger *et al.* (2016) considers the maturity and category of loans simultaneously and yields a more conservative value for the liquidity creation by this hypothetical bank.

$$catmat\ nonfat = LC\_tot = Cash \cdot \left(-\frac{1}{2}\right) + 1\ month\ Loans \cdot \left(-\frac{1}{2}\right) + 5\ years\ Loans \cdot \frac{1}{2} -$$
$$- Provisions \cdot \frac{1}{2} + Capital \cdot \left(-\frac{1}{2}\right) - Treasury\ shares \cdot \left(-\frac{1}{2}\right) + 4\ months\ Deposits \cdot \frac{1}{2} +$$
$$+ 2\ years\ Deposits \cdot \left(-\tfrac{1}{2}\right) = 100 \cdot \left(-\tfrac{1}{2}\right) + 350 \cdot \left(-\tfrac{1}{2}\right) + 650 \cdot \tfrac{1}{2} - 100 \cdot \tfrac{1}{2} + 220 \cdot \left(-\tfrac{1}{2}\right) - 20 \cdot \left(-\tfrac{1}{2}\right) +$$
$$+ 500 \cdot \tfrac{1}{2} + 300 \cdot \left(-\tfrac{1}{2}\right) = 50 \quad (9)$$

2.3 Bank-level and macro variables

The variables outlined below constitute a set of control variables that have a significant influence on liquidity creation dynamics. They have been widely used in prior Russian banking studies, such as Davydov (2018); Chernykh and Kotomin (2022); and Mamonov *et al.* (2024).

The Total Capital Ratio (*TCR*) quantifies a bank's ability to absorb potential losses. In Russia, the Central Bank (CBR) provides detailed guidelines for calculating this metric. Before January 1, 2014, this measure was referred to as H1. Following the adoption of Basel III provisions, it was redefined as H1.0. It is calculated as the total regulatory capital scaled by the risk-weighted assets.

The natural logarithm of total assets (Total Assets (ln)) accounts for bank size over time, capturing advantages like the enhanced access to the Russian interbank market often enjoyed by "too-big-to-fail" institutions. Return on Assets (ROA) measures profitability, reflecting the net income generated relative to the average of total assets over a specific period. Loan-to-assets ratio distinguishes traditional lending institutions from investment-focused banks by gauging their engagement in the lending business. The Non-Performing Loans (NPL) to gross loans ratio serves as a risk proxy, with higher values indicating elevated credit risk exposure and potential instability.

Our period of analysis is characterized by a high rate of banking license withdrawals by the CBR and geopolitical tensions which we control by including defaulted and sanctioned bank dummies (Goncharenko *et al.* (2022)). We employ dummy variables for banks with 100 percent foreign ownership in each period to account for a different cost of foreign currency funding of these banks.

Macroeconomic controls include Real GDP growth, CPI inflation, exchange rate volatility, and growth of seasonally adjusted monetary aggregate M2.

All variable definitions, along with their summary statistics and data sources, are also listed in Table 2. Additionally, Figure 1 illustrates the sample-average dynamics of our main dependent variables.

Table 2. Variable definitions, summary statistics, and data sources

Notation	Definition	Mean	Std.dev.	Min	Med	Max	Source
Main variables							
LC_Tot_RUB	Liquidity creation measure from Russian ruble-denominated assets, liabilities, and equity divided by total Russian ruble-denominated assets ("*catmat nonfat"*)	-0.074	0.215	-0.782	-0.054	0.406	Author's calc.
LC_Asst_RUB	Liquidity creation measure from Russian ruble-denominated assets divided by total Russian ruble-denominated assets ("*catmat nonfat"*)	0.055	0.200	-0.445	0.080	0.429	Author's calc.
LC_Liab_RUB	Liquidity creation measure from Russian ruble-denominated liabilities divided by total Russian ruble-denominated assets ("*catmat nonfat"*)	0.005	0.181	-0.388	0.000	0.440	Author's calc.
LC_Tot_FX	Liquidity creation measure from FX-denominated assets, liabilities and equity divided by total FX-denominated assets ("*catmat nonfat"*)	-0.233	0.315	-0.910	-0.228	0.455	Author's calc.
LC_Asst_FX	Liquidity creation measure from FX-denominated assets divided by total FX-denominated assets ("*catmat nonfat"*)	-0.214	0.278	-0.500	-0.284	0.433	Author's calc.
LC_Liab_FX	Liquidity creation measure from FX-denominated liabilities divided by total FX-denominated assets ("*catmat nonfat"*)	-0.018	0.270	-0.569	0.000	0.497	Author's calc.
LC_Tot_RUB_BB	Liquidity creation measure in Russian rubles using the "cat nonfat" measure of Berger and Bouwman (2009)	0.137	0.212	-0.395	0.151	0.544	Author's calc.
LC_Tot_FX_BB	Liquidity creation measure in FX-USD using the "cat nonfat" measure of Berger and Bouwman (2009)	-0142	0.368	-1.101	-0.132	0.810	Author's calc.
TCR	Total capital ratio (similar to Tier 1 ratio)	0.287	0.245	0.084	0.199	2.598	The CBR
Net_Reval^{-}	Net revaluation is measured as the difference between positive and negative revaluations and divided by total assets (only negative values taken)	-0.001	0.005	-0.347	0.001	0.000	Author's calc.
Net_Reval^{+}	Net revaluation is measured as the difference between positive and negative revaluations and divided by total assets (only non-negative values taken)	0.002	0.007	0.000	0.001	0.370	Author's calc.
FCM	Foreign currency mismatch: the difference between FX-denominated liabilities and FX-denominated assets divided by total assets	-0.018	0.079	-0.867	-0.002	0.678	Author's calc.

Notation	Definition	Mean	Std.dev.	Min	Med	Max	Source
Bank-specific variables							
Total assets (ln)	Natural logarithm of total assets	15.625	1.841	12.50	15.307	21.06	Author's calc.
ROA	Return on assets	0.011	0.048	-0.181	0.009	0.224	Author's calc.
NPL	Non-performing loans divided by gross loans	0.051	0.070	0.000	0.029	0.438	Author's calc.
Loan-to-assets	Gross loans divided by total assets	0.648	0.177	0.110	0.679	0.959	Author's calc.
M&A	Dummy that is equal to 1 if a bank was involved in M&A in a quarter, 0 otherwise	0.007	0.081	0.000	0.000	1.000	Bloomberg, banki.ru
Sanctions	Dummy that is equal to 1 if a bank is in the sanctions list of the Office of Foreign Assets Control, 0 otherwise	0.023	0.150	0.000	0.000	1.000	The OFAC
Foreign	A dummy that is equal to 1 if a bank is on the list of operating credit institutions with a 100% share of non-residents in the paid capital, 0 otherwise	0.083	0.276	0.000	0.000	1.000	The CBR
Default	A dummy that is equal to 1 if a bank loses its bank license next quarter, 0 otherwise	0.024	0.153	0.000	0.000	1.000	The CBR, banki.ru
Macroeconomic variables							
GDP growth	The growth rate of real gross domestic product (GDP) of the Russian Federation	0.004	0.014	-0.075	0.005	0.073	Rosstat
CPI	Consumer price index, quarter to quarter	0.017	0.014	0.001	0.015	0.081	Rosstat
Vol.RUB-USD	The standard deviation of daily RUB-USD exchange rates within a quarter	1.475	1.473	0.275	0.950	6.853	The CBR
M2 growth	The growth rate of monetary aggregate M2	0.029	0.016	-0.017	0.027	0.073	The CBR

2.4 Dynamics of the variables and binned scatter plots

Figure 1 illustrates the dynamics of the average liquidity creation indices, *LC_Tot_RUB* and *LC_Tot_FX*, over the sample period. Both indices are below zero, indicating that the average Russian bank was a net destroyer of liquidity in both rubles and foreign currencies. From 2010 to early 2015, both indices exhibited a downward trend. Following the abrupt and significant increase in the key rate by the CBR in December 2014, the decline in ruble-denominated liquidity creation accelerated. This was followed by a stabilization period during 2017–2018, after which the index began to rise, ultimately recovering by the end of 2021 to levels comparable to those observed in 2011–2012.

Conversely, FX-denominated liquidity creation exhibited an opposite trajectory, steadily increasing after December 2014. In summary, by the end of 2021, the average Russian bank was destroying considerably less liquidity compared to 2011–2012, primarily due to improvements in FX-denominated liquidity.

Figure 2 presents the proportions of banks with positive net revaluations (Net_Reval^{+}), negative net revaluations (Net_Reval^{-}), and non-zero net revaluations over the sample period. The data indicate that nearly all banks experienced either positive or negative net revaluations. Notably, the share of banks with negative net revaluations peaked during 2016–2017, likely driven by the appreciation of the ruble against foreign currencies and the corresponding decline in the value of FX-denominated assets accumulated during 2014–2015.

During the COVID-19 pandemic, regulatory measures were introduced to support Russian banks. One of the measures allowed banks to calculate mandatory ratios using the exchange rates as of March 1, 2020, for the period from March 1 to September 30, 2020. Crucially, this measure did not affect the financial reporting of revaluations in Form 102. An analysis of Figure 2 during the validity of these measures indicates that the proportions of banks with positive, negative, and non-zero net revaluations remained stable, exhibiting no abnormal fluctuations during this period.

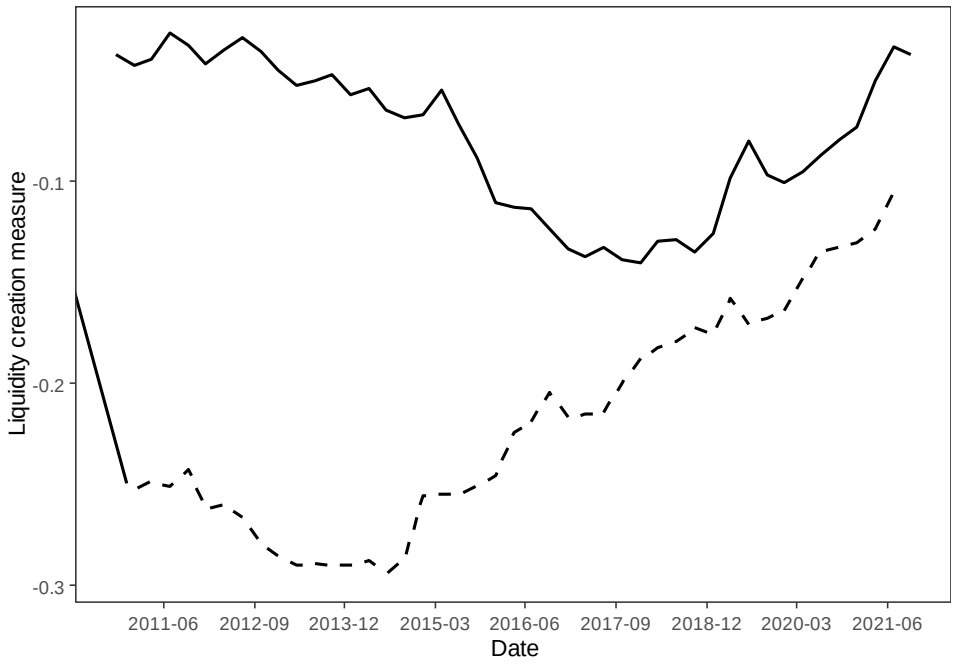


Figure 1. Dynamics of total liquidity creation indices: The solid line represents *LC_Tot_RUB*, and the dashed line represents *LC_Tot_FX.*

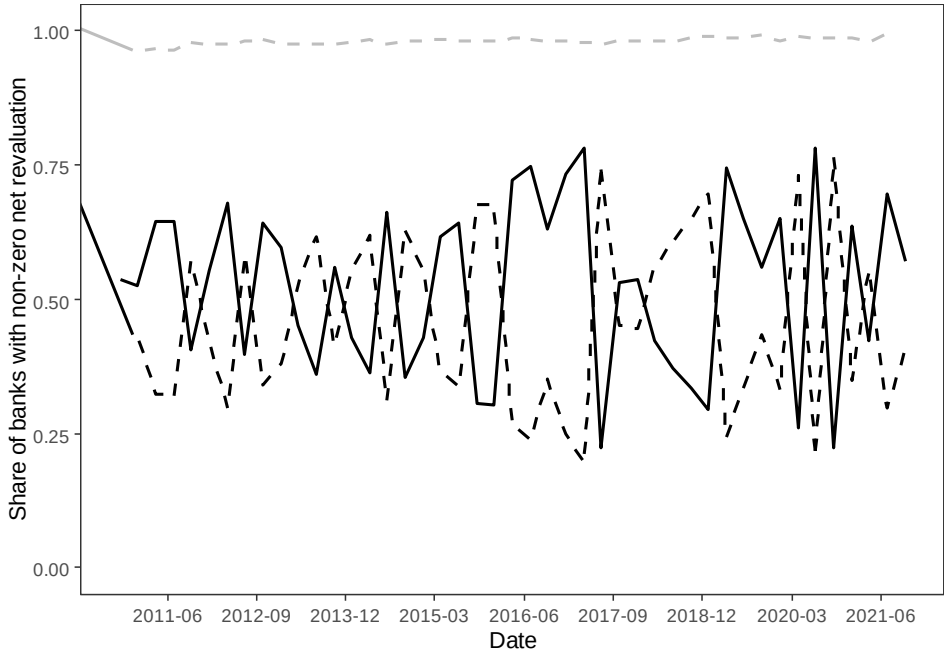
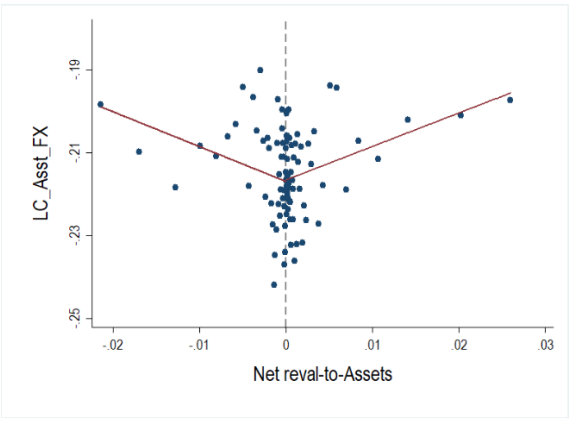
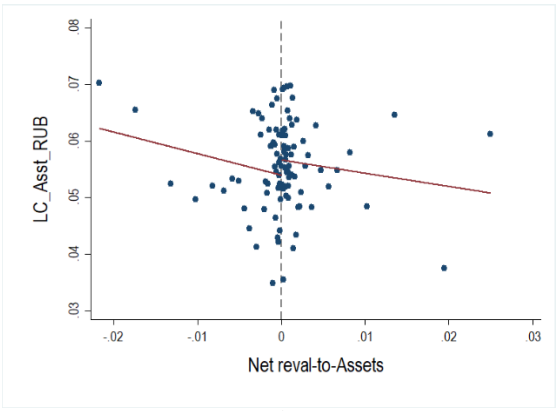


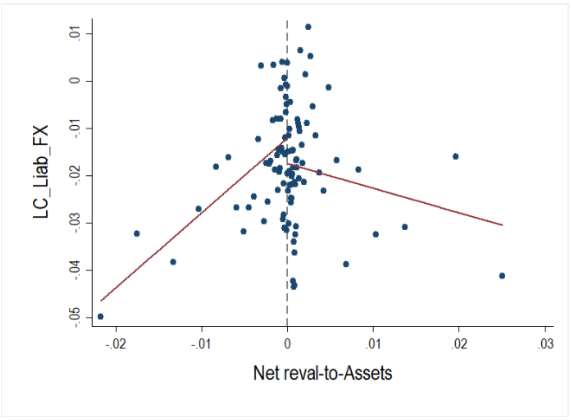
Figure 2. Dynamics of banks with non-zero revaluations: Share of banks with positive (dashed black), negative (solid black), and non-zero (dashed grey) net revaluation over the sample period.



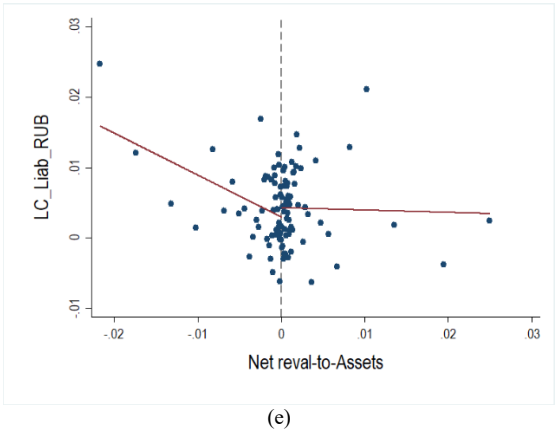
(a)



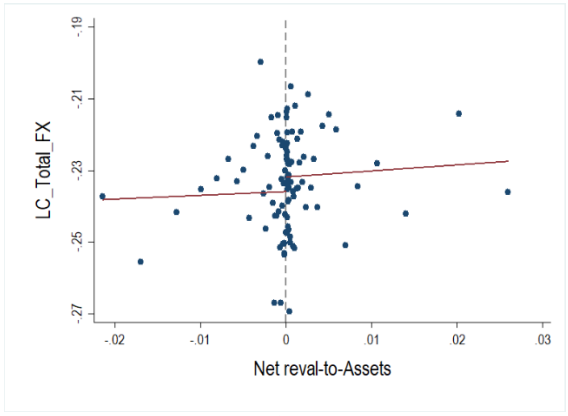
(d)



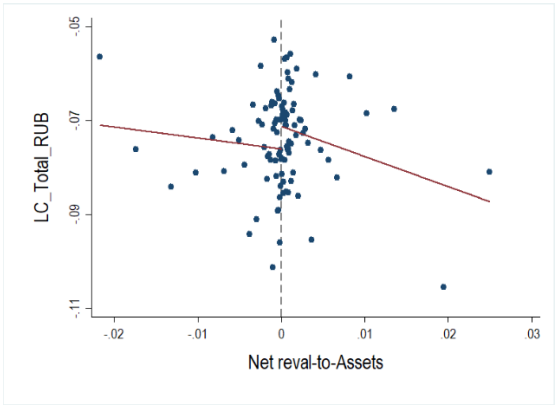
(b)



(e)



(c)



(f)

Figure 3. Binned scatter plots of liquidity creation (LC) components and Net Reval-to-Assets

Note: Figures (a), (b) and (c) plot binscatter (100 bins) of LC in assets, liability, and total LC denominated in FX-USD versus Net Reval-to-Assets. Figures (d), (e), and (f) plot binscatter (100 bins) of LC in assets, liability and total denominated in rubles versus Net Reval-to-Assets. Sources: CBR

Figure 3 plots binned bivariate averages ("binscatters") of liquidity creation components against the *Net reval-to-Assets* (100 bins). Solid circles represent the average of bank-quarter observations for each bin. The regression lines with bank fixed effects fitted for these bins exhibit significant discontinuity at *Net reval-to-Assets=0*, meaning that during periods of negative/positive revaluations, the relationship between liquidity creation components and net revaluations significantly changes. This unconditional analysis motivates us to split the net revaluations into two variables: positive (Net_Reval^{+}) and negative (Net_Reval^{-}) revaluations and provides preliminary evidence on our main empirical findings which we present in the following section.

3. Empirical strategy

3.1 Net revaluations and liquidity creation in foreign and domestic currencies

Under stable conditions, banks ideally experience minimal net revaluations. However, during significant currency fluctuations - particularly involving the US Dollar, which constituted a substantial portion of Russian banks' assets and liabilities prior to 2022 - banks often recalibrate their strategies. This recalibration typically includes adjusting the interest rates on financial products to make them more or less attractive for borrowers and depositors. These adjustments, in turn, alter the composition of assets and liabilities, influencing liquidity creation on both sides of the balance sheet. Such shifts in the distribution of assets and liabilities lead to changes in the banks' overall liquidity positions.

Large revaluations of banks' balance sheets usually occur during pronounced exchange rate movements. In the Russian context, these movements often correspond to the depreciation of the ruble against major foreign currencies, which prompts savers to increase the "dollarization" of deposits. In such circumstances, depositors are expected to shift toward long-term "dollar" deposits, decreasing the liquidity creation index for liabilities (*LC_Liab_FX*) denominated in foreign currencies.

Simultaneously, exchange rate depreciation and the influx of long-term "dollar" deposits provide banks with the ability to extend long-term "dollar" loans. This, in turn, increases the liquidity creation index for assets (*LC_Asst_FX*) denominated in foreign currencies. These

opposing dynamics in the liquidity creation indices for assets and liabilities are likely to result in a neutral overall effect on total liquidity creation in FX-USD (*LC_Tot_FX*).

Taken together, the above economic arguments lead us to our first hypothesis:

Hypothesis 1: Net revaluations are positively (negatively) associated with liquidity creation in "dollar" denominated assets (liabilities). The overall effect of net revaluations on total liquidity creation in "dollar" denominated assets and liabilities is neutral.

Regulations aimed at reducing FX risk encourage banks to maintain a balanced match between foreign currency assets and liabilities, ensuring natural hedging against currency exchange shocks. This is evident in Figure 4, which plots the average share of foreign currency assets and liabilities against banks' foreign currency mismatch (FCM). A significant portion of bank-quarter observations aligns near the naturally hedged region (FCM = 0). However, it is also evident that banks frequently experience FX-mismatched balance sheets, with the magnitude of these mismatches directly related to the overall FX exposure, measured as the FX-USD share of total assets and liabilities.

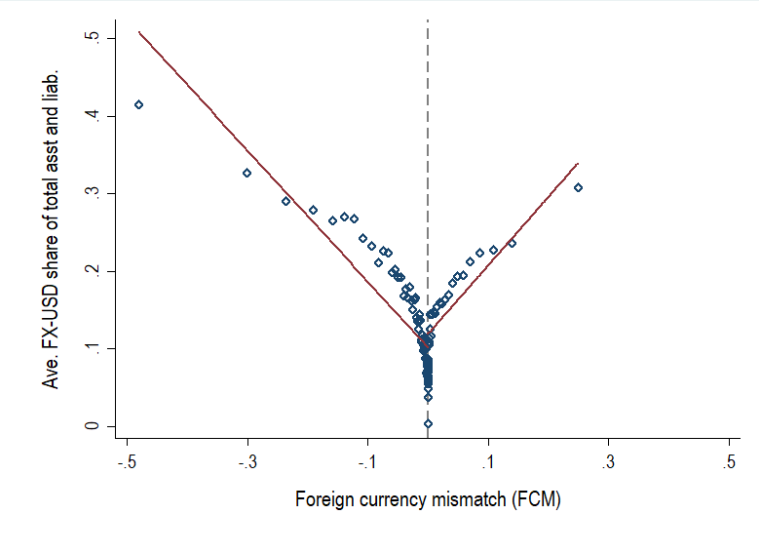


Figure 4. Binned scatter plots (100 bins) of Average FX-USD share of banks' total assets and liabilities versus Foreign Currency Mismatch (FCM).

We focus on two dimensions along which banks may have differing incentives to create liquidity in FX-USD on both the asset and liability sides. When a bank experiences a *negative* FX mismatch (FCM < 0), its FX-USD-denominated assets exceed its FX-USD-denominated liabilities. In this scenario, we expect positive liquidity creation in FX-USD on the asset side (*LC_Asst_FX*) to be stronger for the *negatively* FX-mismatched subsample of banks. These banks have a higher proportion of FX assets on their balance sheets and are more inclined to engage in foreign currency-denominated lending compared to *positively* FX-mismatched banks.

On the liability side, we anticipate that liquidity destruction (*LC_Liab_FX*) will be more pronounced for *positively* FX-mismatched banks, which rely more heavily on foreign currency funding and are better positioned to attract long-term "dollar" deposits.

These considerations lead to a refinement of our first hypothesis:

Hypothesis 1a: The positive association between net revaluations and liquidity creation in "dollar" denominated assets is stronger for banks that are negatively FX-mismatched (FX-denominated assets exceed FX-denominated liabilities).

Hypothesis 1b: The negative association between net revaluations and liquidity creation in "dollar" denominated liabilities is stronger for banks that are positively FX-mismatched (FX-denominated liabilities exceed FX-denominated assets).

For ruble-denominated liquidity creation, the net revaluation of foreign currency-denominated accounts is likely influenced by the central bank's countercyclical monetary policy, which combats domestic currency devaluation with higher domestic policy interest rates. Elevated short-term policy rates typically pass through to short-term deposit and loan rates. The overall effect on liquidity creation by the banking sector will depend on how expectations regarding future short-term policy rates influence long-term rates and shape the yield curve. Existing models highlight a wide range of channels through which monetary policy affects risk premia and the cost of capital in the economy (e.g., Ireland, 2015; Drechsler *et al*., 2017 a, b). This complexity leads us to anticipate no straightforward relationship between net revaluations and ruble-denominated liquidity creation components without further conditional analysis.

Hypothesis 2: Net revaluations are not significantly associated with liquidity creation in ruble-denominated assets and liabilities.

Subsample analysis of *negatively* and *positively* FX-mismatched banks may reveal a significant association between net revaluations and ruble liquidity creation due to the more pronounced influence of revaluations on liquidity creation in "dollar"-denominated accounts and the subsequent substitution effects.

On the assets side, *negatively* FX-mismatched banks, which specialize in foreign currency loans and create "dollar" liquidity during high revaluation episodes, may reduce ruble liquidity creation during these episodes due to crowding out of ruble-denominated lending.

Conversely, on the liability side, *positively* FX-mismatched banks, exhibit negative "dollar" liquidity creation during high revaluation periods due to an influx of long-term "dollar" deposits. It is unlikely that the banking sector as a whole attracts more savings in such periods meaning that depositors in this group of banks convert long-term ruble deposits into long-term "dollar" deposits, shortening the maturity of ruble funding on banks' balance sheets and leading to the subsequent increased liquidity creation in rubles on the liability side.

Hypothesis 2a: The negative association between net revaluations and liquidity creation in ruble-denominated assets is stronger for banks that are negatively FX-mismatched (FX-denominated assets exceed FX-denominated liabilities).

Hypothesis 2b: The positive association between net revaluations and liquidity creation in ruble-denominated liabilities is stronger for banks that are positively FX-mismatched (FX-denominated liabilities exceed FX-denominated assets).

Using the panel data on 909 Russian banks for the period 2011Q1-2021Q4, we can test *Hypotheses 1 and 2* by estimating the following baseline model, which captures the direct association between net revaluations and liquidity creation.

$$LC_{i,t}^{k} = \beta_0 + \beta_1 Net\ Rev^{-}{}_{i,t-1} + \beta_2 Net\ Rev^{+}{}_{i,t-1} + \beta_3 TCR_{i,t-1} + \gamma' \boldsymbol{X}_{i,t-1} + \theta' \Gamma_{t-1} + \alpha_i + \varepsilon_{i,t}, \quad (10)$$

where dependent variable $LC_{i,t}^{k}$ is one of the components of the liquidity creation index (total, asset-side, liability-side) by bank *i* during quarter *t*. We also calculate liquidity creation indices separately for all accounts that are originated/denominated in rubles and in foreign currency.

Net_Reval^{-} and *Net_Reval*$^{+}$ are calculated according to formula (4). Since *Net_Reval*$^{-}$ is always negative by construction a negative sign of the coefficient estimate β_1 means that higher negative net revaluations correspond to higher liquidity creation. On the opposite a positive sign of the coefficient estimate β_1 means that higher negative net revaluations correspond to lower liquidity creation. Mamonov *et al.* (2024) find that *revaluations* are largely driven by currency exchange rate fluctuations making net revaluations weakly exogenous with respect to liquidity creation measures.

$\boldsymbol{X}_{i,t}$ is a set of variables that control for banks' observable time variable characteristics; $\boldsymbol{\Gamma}_t$ is a set of macroeconomic variables that control for business cycle fluctuations and monetary policy outcomes and are discussed in section 2.

α_i is the bank's fixed effect which controls for unobserved time-invariant characteristics. We have experimented with specification (10) by employing the time-fixed effects instead of the macroeconomic control variables. All estimates reported in the following section remain qualitatively unchanged in terms of the coefficient signs and statistical significance, the economic magnitude of the estimates does not vary by a big margin.

To account for possible serial residual correlation across periods within a bank we cluster all standard errors by banks.

3.2 Net revaluations and liquidity creation conditional on the bank's regulatory capital

As highlighted by a substantial body of existing literature, banks' capital ratio is a significant predictor of liquidity creation (e.g., Berger and Bouwman's (2009); Distinguin *et al.* (2013); Horváth *et al.* (2014)). These studies test the "financial fragility" hypothesis of Diamond and Rajan (2000, 2001) which posits that banks create liquidity by transforming liquid depositors' funds into illiquid assets. The underlying mechanism involves an agency problem: while banks have information about borrowers' probabilities of default, depositors lack this knowledge. To mitigate this asymmetry, banks charge a premium for their monitoring efforts. If depositors are unwilling to pay this premium, banks may threaten to reduce their monitoring and loan-collecting activities. Such actions disproportionately affect the recovery of long-term assets with high book values, leading to more severe financial consequences.

In equilibrium, depositors, aware of the potential risks, are cautious and may withhold funds if they lose trust in the bank's commitment to proper monitoring. As a result, banks are compelled to adopt a fragile financial structure to gain and maintain depositors' trust. This fragility incentivizes banks to actively monitor borrowers and ensure effective loan collection, as a failure to do so could trigger depositor withdrawals, leaving the bank without sufficient liquidity. Conversely, high capital levels enhance the bank's bargaining power, reducing its dependence on depositors and thereby diminishing its incentive to maintain stringent monitoring and collection efforts.

Our objective is to examine whether the capitalization of banks impacts the strength of the relationship between net revaluations and liquidity creation.

Hypothesis 3: Regulatory capital ratio offsets the effect of net revaluations on total liquidity creation in rubles and in foreign currency.

$$LC_{i,t}^{k} = \beta_0 + \beta_1 Net\ Reval^{-}{}_{i,t-1} + \beta_2 Net\ Reval^{+}{}_{i,t-1} + \beta_3 TCR_{i,t-1} + \beta_4 Net\ Reval^{-}{}_{i,t-1} \times TCR_{i,t-1} +$$
$$+\beta_5 Net\ Reval^{-}{}_{i,t-1} \times TCR_{i,t-1} + \gamma' \boldsymbol{X}_{i,t-1} + \theta' \Gamma_{t-1} + \alpha_i + \varepsilon_{i,t}, \quad (11)$$

Here we interact our variables of interest *Net_Reval*$^{-}$ and *Net_Reval*$^{+}$ with *Total capital ratio (TCR)* and interpret the estimate of the coefficients β_4 and β_5 as the differential response of banks to *Net_Reval*$^{-}$ and *Net_Reval*$^{+}$ conditional on the level of *TCR*.

We posit that higher bank capitalization may reduce the monitoring efforts of banks due to substantial capital buffers. Well-capitalized banks are less likely to face critical regulatory challenges, such as meeting the *TCR*, even during adverse exchange rate movements. As a result, these banks are less sensitive to FX risk, as their strong capital reserves can absorb FX-related losses without compromising regulatory compliance or financial stability. Consequently, well-capitalized banks may deprioritize FX risk management, relying on their capital buffers to mitigate potential losses. This combination of high capital levels and the effects of net revaluations can diminish banks' incentives to create liquidity.

4. Results

4.1 Baseline results

Liquidity creation for accounts denominated in FX-USD: We present the estimation results for specification (10) on the liquidity creation index in foreign currency in Panel I of Table 3. Leveraging the detailed nature of Russian banking data, we calculate liquidity creation indices separately for accounts originated (denominated) in foreign currency on the asset side (column 1), the liability side (column 2), and in total (column 3). To the best of our knowledge, this study is the first in the broader liquidity creation literature to distinguish between domestic and foreign currency components of bank accounts.

The results reported in the first column of Table 3 indicate that net revaluations contribute to liquidity creation in foreign currency on the assets side. Specifically, the negative sign of the coefficient estimate β_1 for the lagged value of *Net_Reval*$^{-}$ suggests that higher negative net revaluations are associated with greater liquidity creation in assets. The positive coefficient estimate β_2 for the lagged value of *Net_Reval*$^{+}$ shows that positive net revaluations also correlate with increased liquidity creation in assets. A one-standard-deviation increase in net positive revaluations is associated with an increase in liquidity creation by 0.012 percentage points (= 1.691×0.007).

In contrast, the coefficents estimates for β_1 and β_2 in column 2 reveal opposing effects on the liability side. Both negative net revaluations *Net_Reval*$^-$ and positive *Net_Reval*$^+$ contribute to the liquidity destruction in FX-USD on the laibility sides. A one-standard-deviation increase in net positive revaluations is associated with decrease in liquidity creation by 0.016 percentage points (= -2.270×0.007).

As expected, the simultaneous liquidity creation in assets and destruction in liabilities results in no statistically significant impact of net revaluations on the total liquidity creation index, as shown in column 3.

Notably, the coefficient patterns in columns (1–3) align closely with the slopes of the fitted lines in the bin-scatter plots illustrated in Figures 3(a, b, c) of Section 2.4. This demonstrates the robustness of our findings within a full-fledged panel regression framework.

Overall, these results provide strong evidence rejecting the null hypothesis of no effect of net revaluations on liquidity creation components in FX-USD. They confirm *Hypothesis 1* for the full sample of banks.

Liquidity creation for accounts denominated in rubles: We report the estimation results of specification (10) for the liquidity creation index in the domestic currency (rubles) in Panel II of Table 3. In column 4, the dependent variable is the asset-side liquidity creation index (*LC_Asst_RUB*). Column 5 uses the liability-side liquidity creation index (*LC_Liab_RUB*) as the dependent variable. Finally, column 6 presents results using the total liquidity creation index *LC_Tot_RUB* as the dependent variable.

An examination of the coefficients β_1 and β_2 for the lagged values of *Net_Reval*$^-$ and *Net_Reval*$^+$ reveals their uniform statistical insignificance across all columns. This indicates that net revaluations are not associated with liquidity creation in the domestic currency for the full sample of banks. Consequently, the data provides strong support for *Hypothesis 2*.

Bank-level and macro variables: Given the tight linkage between liquidity creation and both individual bank characteristics and the macroeconomic cycle, it is crucial to analyze the coefficient estimates for all control variables.

Table 3. Net revaluation of FX-denominated items and liquidity creation in foreign and domestic currencies (Full sample, 2011Q1-2021Q4 period)

	I. Liquidity creation in FX-USD			II. Liquidity creation in rubles		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*LC_Asst_FX*	*LC_Liab_FX*	*LC_Tot_FX*	*LC_Asst_RUB*	*LC_Liab_RUB*	*LC_Tot_RUB*
$Net\ Reval^{-}_{i,t-1}$	-1.681**	2.795***	1.483	-0.088	-0.720	0.732
	(0.873)	(0.754)	(1.003)	(0.505)	(0.555)	(0.792)
$Net\ Reval^{+}_{i,t-1}$	1.691**	-2.270***	-0.820	-0.129	-0.039	-1.118
	(0.756)	(0.671)	(0.859)	(0.534)	(0.522)	(0.754)
$TCR_{i,t-1}$	-0.069***	0.136***	0.061**	-0.250***	0.013	-0.324***
	(0.024)	(0.026)	(0.025)	(0.018)	(0.017)	(0.024)
Total assets$_{i,t-1}$ *(ln)*	0.030***	0.013	0.042***	0.011	-0.023***	0.020**
	(0.008)	(0.009)	(0.011)	(0.008)	(0.007)	(0.010)
$ROA_{i,t-1}$	-0.011	0.059**	0.049	0.012	0.096***	0.050*
	(0.025)	(0.028)	(0.035)	(0.023)	(0.019)	(0.027)
$NPL_{i,t-1}$	0.084	0.187***	0.280***	0.320***	-0.391***	-0.149**
	(0.068)	(0.068)	(0.087)	(0.041)	(0.048)	(0.058)
Loan-to-assets$_{i,t-1}$	0.000	-0.067**	-0.059*	-0.012	-0.073***	-0.070***
	(0.028)	(0.029)	(0.034)	(0.023)	(0.020)	(0.026)
M&A$_{i,t-1}$ *(0,1)*	0.007	0.010	0.016	0.002	-0.005	-0.008
	(0.012)	(0.013)	(0.017)	(0.010)	(0.010)	(0.012)
Sanctions$_{i,t-1}$ *(0,1)*	0.009	0.025	0.026	-0.015	0.008	-0.003
	(0.031)	(0.033)	(0.043)	(0.021)	(0.024)	(0.025)
Foreign$_{i,t-1}$ *(0,1)*	0.071**	-0.013	0.062	0.033	-0.017	0.006
	(0.036)	(0.033)	(0.048)	(0.025)	(0.024)	(0.036)
Default$_{i,t+1}$ *(0,1)*	0.017*	-0.019*	-0.007	0.024***	-0.075***	-0.053***
	(0.010)	(0.011)	(0.014)	(0.007)	(0.006)	(0.009)
GDP growth$_{t-1}$	0.038	0.178***	0.204***	-0.005	0.427***	0.486***
	(0.051)	(0.055)	(0.068)	(0.037)	(0.032)	(0.044)
CPI_{t-1}	0.403***	-0.757***	-0.359***	0.553***	0.196***	0.898***
	(0.096)	(0.112)	(0.134)	(0.076)	(0.066)	(0.096)
Vol.RUB-USD$_{t-1}$	-0.002	0.007***	0.005***	-0.001	-0.001	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
M2 growth$_{t-1}$	0.300***	0.166*	0.437***	-0.489***	0.907***	0.715***
	(0.085)	(0.104)	(0.127)	(0.066)	(0.058)	(0.079)
Bank FE	YES	YES	YES	YES	YES	YES
Observations	25,797	25,817	25,817	26,160	26,160	26,160
R-squared	0.699	0.617	0.569	0.694	0.717	0.621

Note: This table presents estimates from panel regression specification (10) explaining the total liquidity creation and its components for a sample of 909 Russian banks over 2011Q1-2021Q4. All variables are defined in Table 1. Columns 1-3 report estimates for liquidity creation in FX. Columns 4-6 report estimates for liquidity creation in rubles. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively. We cluster the standard errors (in parentheses) by bank level.

The relationship between the regulatory capital (*TCR*) and liquidity creation in rubles has been examined by Gorodilov and Sokolov (2024). Their findings reveal a negative correlation between *TCR* and asset-side liquidity creation, supporting the "financial fragility" hypothesis proposed by Diamond and Rajan (2000, 2001). As shown in columns 4 and 6 of Table 3, the coefficients β_3 on *TCR* are negative and highly statistically significant. These results confirm the findings of numerous previous studies, which consistently report a pronounced negative impact of higher capital on banks' liquidity creation in domestic currency.

Columns 2 and 3 report results for specifications where the liquidity creation indices for foreign currency (*LC_Liab_FX, LC_Tot_FX)* are used as dependent variables. Here, the coefficients β_3 on *TCR* are positive and significant. Existing liquidity creation theories do not explicitly explain this phenomenon for foreign currency-denominated accounts. One possible explanation is that well-capitalized banks face negligible FX risks but encounter high internal capital costs, prompting them to increase their share of short-term "dollar"-denominated liabilities as a source of cheaper funding. This mechanism is known as the "risk absorption hypothesis" (e.g., Bhattacharya and Thakor, 1993; Repullo, 2004).

Other bank-level controls reported in Table 3 align with expectations. More profitable and larger banks exhibit higher total liquidity creation, consistent with the literature. In contrast, measures of bank riskiness - such as non-performing loans (NPL), loan-to-asset ratios, and default indicators - are negatively associated with liquidity creation. Dummy variables for mergers and acquisitions (M&A), sanctions, and foreign bank ownership are not significantly associated with liquidity creation indices.

At the macroeconomic level, our findings indicate that liquidity creation indices for both ruble- and FX-USD-denominated items are procyclical. Real GDP and M2 growth tend to precede increases in liquidity creation, aligning with findings from previous studies (e.g., Berger and Bouwman, 2017; Chatterjee, 2018; Davydov *et al*., 2018; Davydov *et al*., 2024).

The estimated coefficients on consumer inflation show that high inflation precedes increased liquidity creation by banks in rubles but leads to liquidity destruction in FX-USD. This phenomenon can be explained by economic overheating during high inflation episodes, prompting central banks to raise policy rates as part of countercyclical monetary measures. The resulting higher short-term domestic currency deposit rates incentivize depositors to shift ruble savings into shorter maturities, increasing the liquidity creation index for rubles. At the same time, expectations

of an upcoming recession and domestic currency depreciation incentivize depositors to shift FX-USD deposits to longer maturities, which reduces the liquidity creation index for foreign currency-denominated accounts.

The coefficient estimates on the exchange rate volatility measure also exhibit the opposite relationships with liquidity creation indices for accounts denominated in rubles and FX-USD.[6] Our results suggest that that increase in exchange rate volatility has a short-term effect on depositors' expectations regarding the domestic currency depreciation as they shift their savings to short-term FX-USD deposits, driving up the liquidity creation index for foreign currency denominated items which is in line with previous studies that found a strong relationship between exchange rate volatility and "dollarization" of deposits (e.g., Honohan (2007), Fang and Liu (2021)).

4.2 Results for positively and negatively FX-mismatched banks

To investigate the variation in relationships among banks at different levels of foreign currency mismatch (FCM), we divided our sample into two subsamples based on whether a bank's FCM in the preceding quarter was above or below zero. We then re-estimated equation (10) for each subsample. Panel A of Table 4 presents the results for banks with *negative* FX mismatches, while Panel B focuses on banks with *positive* FX mismatches.

As shown in column (1) of Panels A and B in Table 4, net revaluations significantly influence FX-denominated liquidity creation on the asset side for *negatively* FX-mismatched banks but are insignificant for *positively* FX-mismatched banks. This difference arises because *negatively* FX-mismatched banks tend to hold more FX assets than FX liabilities, making them more likely to engage in FX-denominated lending compared to *positively* FX-mismatched banks.

Column (2) of Panels A and B in Table 4 shows the negative association between net revaluations and FX-denominated liquidity creation on the liability side for both types of banks. During periods of adverse domestic currency depreciation or appreciation relative to foreign currencies, banks attract long-term FX-denominated liabilities. This is likely due to the lower cost of FX-denominated funding compared to domestic currency funding or because depositors prefer this form of savings. The magnitude of the estimated coefficients is three times larger for a subsample of *positively* FX-mismatched banks that rely more on foreign funding and can attract

[6] Deseatnicov, and Klochko (2023) show that exchange rate volatility negatively (positively) affects likelihood of foreign firms' decisions on entry (exit) into the Russian market.

long-term FX-denominated liabilities at a higher pace. A one-standard-deviation increase in net positive revaluations is associated with a decrease in liquidity creation by 0.010 percentage points (=-1.488×0.007) for *negatively* FX-mismatched banks and by 0.029 percentage points (= -4.077×0.007) for *positively* FX-mismatched banks. Both of these findings yield strong support for our *Hypotheses 1a and 1b*.

Column (3) of Panels A and B in Table 4 examines the effect of net revaluations on total FX-denominated liquidity creation (*LC_Tot_FX*). For *negatively* FX-mismatched banks, net revaluations do not significantly affect *LC_Tot_FX* due to offsetting effects on liquidity creation on the asset and liability sides. Conversely, for *positively* FX-mismatched banks, which hold more FX liabilities than FX assets and are less inclined to lend in foreign currencies, net revaluations significantly affect *LC_Liab_FX*. The strength of the negative effect on *LC_Liab_FX* ensures that *LC_Tot_FX* remains significantly impacted for banks with FCM ≥ 0.

Let us move to the investigation of the relationship between net revaluations and ruble-denominated liquidity creations across our subsamples. The coefficients in column 4 of Panels A and B in Table 4 are statistically insignificant, indicating that net revaluations have no measurable effect on ruble-denominated liquidity creation on the asset side for either *negatively* or *positively* FX-mismatched banks. This result contradicts *Hypothesis 2a*, leading to its rejection.

On the liability side, however, the estimates provide support for *Hypothesis 2b*. As shown in column 5 of Panel B, net revaluations have a significant positive effect on *LC_Liab_RUB* for *positively* FX-mismatched banks. This suggests that adverse exchange rate movements encourage these banks to attract more short-term ruble-denominated liabilities as part of their strategy to recalibrate balance sheets and manage funding costs in response to recognized FX risk from the previous quarter.

In column 6, we observe that net revaluations have a statistically significant negative effect on total ruble-denominated liquidity creation (*LC_Tot_RUB*) for *negatively* FX-mismatched banks. This outcome likely reflects a substitution effect, where these banks prioritize FX-denominated lending over liquidity creation in the domestic currency. For *positively* FX-mismatched banks, net revaluations positively affect ruble-denominated liquidity creation, driven by their liability-side adjustments.

Overall, these findings reveal that net revaluations stimulate total ruble-denominated liquidity creation for *positively* FX-mismatched banks while contributing to liquidity destruction

for *negatively* FX-mismatched banks. This suggests that during sharp exchange rate movements, the two groups of banks effectively hedge each other, neutralizing FX risk at the system level.

Table 4. Net revaluations and liquidity creation in foreign and domestic currencies for negatively and positively FX-mismatched banks (2011Q1-2021Q4 period)

Panel A. *Negatively* FX-mismatched banks: $\mathbf{FCM_{i,t-1} < 0}$

	I. Liquidity creation in FX-USD			II. Liquidity creation in rubles		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*LC_Asst_FX*	*LC_Liab_FX*	*LC_Tot_FX*	*LC_Asst_RUB*	*LC_Liab_RUB*	*LC_Tot_RUB*
$Net\ Reval^{-}_{i,t-1}$	-2.187**	1.773**	-0.386	0.223	0.023	2.532***
	(1.087)	(0.727)	(1.099)	(0.628)	(0.687)	(0.991)
$Net\ Reval^{+}_{i,t-1}$	2.266***	-1.488**	0.885	-0.095	-0.732	-1.931**
	(0.838)	(0.635)	(0.853)	(0.578)	(0.566)	(0.841)
$TCR_{i,t-1}$	-0.073***	0.114***	0.036	-0.241***	0.015	-0.305***
	(0.025)	(0.026)	(0.024)	(0.020)	(0.018)	(0.027)
Bank & Macro Controls	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES
Observations	18,367	18,369	18,369	18,375	18,375	18,375
R-squared	0.719	0.620	0.591	0.698	0.739	0.632

Panel B. *Positively* FX-mismatched banks: $\mathbf{FCM_{i,t-1} >= 0}$

	I. Liquidity creation in FX-USD			II. Liquidity creation in rubles		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*LC_Asst_FX*	*LC_Liab_FX*	*LC_Tot_FX*	*LC_Asst_RUB*	*LC_Liab_RUB*	*LC_Tot_RUB*
$Net\ Reval^{-}_{i,t-1}$	-1.266	5.218***	5.276***	0.328	-1.715**	-1.856**
	(1.099)	(1.363)	(1.665)	(0.683)	(0.711)	(0.943)
$Net\ Reval^{+}_{i,t-1}$	0.187	-4.077***	-5.553***	-0.200	1.945***	2.400***
	(1.213)	(1.507)	(1.922)	(0.858)	(0.789)	(0.985)
$TCR_{i,t-1}$	-0.083**	0.233***	0.150***	-0.277***	0.021	-0.370***
	(0.041)	(0.052)	(0.057)	(0.034)	(0.025)	(0.040)
Bank & Macro Controls	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES
Observations	7,337	7,355	7,355	7,699	7,699	7,699
R-squared	0.720	0.666	0.636	0.751	0.738	0.692

Note: This table presents estimates from panel regression specification (10) explaining the total liquidity creation and its components for a sub-sample of negatively FX-matched banks (Panel A) and positively FX-matched banks (Panel B) over 2011Q1-2021Q4. All variables are defined in Table 1. Columns 1-3 report estimates for liquidity creation in FX. Columns 4-6 report estimates for liquidity creation in rubles. Bank and Macro Controls are the same as in Table 3. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. We cluster the standard errors (in parentheses) by bank level.

4.3 Net revaluations and regulatory capital

In this section, we test *Hypothesis 3* by applying specification (11) to the full data sample, focusing on the interaction terms between *TCR* and the components of net revaluations.

As shown in columns 1-3 of Table 5, the coefficients β_1 and β_2 for the lagged values of *Net_Reval*$^-$ and *Net_Reval*$^+$ exhibit the same sign and statistical significance as the main effects of net revaluations from specification (10), reported in Panel I of Table 3. This indicates that banks with very low capitalization (TCR=0) experiencing marginal profit changes from the revaluation of FX-denominated accounts create liquidity in FX-denominated assets and reduce liquidity in FX-denominated liabilities in a manner consistent with the average sample bank.

However, the coefficient estimates β_4 and β_5 for the interaction terms $Net\ Reval^-_{i,t-1} \times TCR_{i,t-1}$ and $Net\ Reval^+_{i,t-1} \times TCR_{i,t-1}$ of specification (11) are statistically insignificant for FX-denominated liquidity creation indices. This suggests that the relationship between net revaluations and FX-denominated liquidity creation does not vary with banks' levels of regulatory capital. Consequently, *Hypothesis 3* is rejected for this aspect of liquidity creation.

Columns 4-6 present the results of fixed-effect regressions with the interaction terms, where the dependent variables are liquidity creation indices in the domestic currency. The coefficients on *Net_Reval*$^-$ and *Net_Reval*$^+$ for *LC_Tot_RUB,* reported in column 6 are marginally significant. Their signs suggest that banks with very low capitalization (TCR=0) tend to create liquidity in the domestic currency when faced with higher net revaluations.

The coefficient estimate β_4 for the interaction term $Net\ Reval^-_{i,t-1} \times TCR_{i,t-1}$ in column 6 is positive and significant. This implies that for every one-unit increase in *TCR*, the slope of the relationship between liquidity creation and negative revaluations increases by one unit. Conversely, the coefficient β_5 for the interaction term $Net\ Reval^+_{i,t-1} \times TCR_{i,t-1}$ is negative and significant at 1% level, indicating that for every one-unit increase in *TCR*, the slope of the relationship between liquidity creation and positive revaluations decreased by one unit. Together, these results suggest that as banks become more capitalized, the liquidity creation effect of net revaluations diminishes.

The combined effect of net revaluations and their interactions with *TCR* on *LC_Tot_RUB* is positive for low-capitalized banks and negative for well-capitalized banks. A critical threshold emerges where the *TCR* fully offsets the positive effects of both net revaluations, leading to a neutral effect on total liquidity creation in the domestic currency.

These findings support *Hypothesis 3* for ruble-denominated liquidity creation. Specifically, ruble-denominated liquidity is destroyed by well-capitalized banks and created by low-capitalized banks. This outcome validates the "financial fragility" hypothesis, demonstrating that well-capitalized banks are less sensitive to FX risk in terms of ruble-denominated total liquidity creation.

Table 5. Net revaluations and liquidity creation in foreign and domestic currencies conditional on banks' regulatory capital (Full sample, 2011Q1-2021Q4 period)

	I. Liquidity creation in FX-USD			II. Liquidity creation in rubles		
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*LC_Asst_FX*	*LC_Liab_FX*	*LC_Tot_FX*	*LC_Asst_RUB*	*LC_Liab_RUB*	*LC_Tot_RUB*
$TCR_{i,t-1}$	-0.064***	0.135***	0.064**	-0.247***	0.018	-0.308***
	(0.025)	(0.027)	(0.026)	(0.019)	(0.018)	(0.024)
$Net\ Reval^{-}_{i,t-1}$	-2.780**	2.319**	0.248	-0.389	-1.741**	-1.986*
	(1.144)	(1.130)	(1.446)	(0.788)	(0.819)	(1.111)
$Net\ Reval^{-}_{i,t-1} \times TCR_{t-1}$	3.930	1.656	4.362	1.119	3.675*	9.812***
	(3.400)	(3.196)	(3.922)	(2.433)	(2.242)	(3.214)
$Net\ Reval^{+}_{i,t-1}$	2.100**	-3.198***	-1.655	1.024	0.929	2.132**
	(1.000)	(1.032)	(1.239)	(0.778)	(0.844)	(1.100)
$Net\ Reval^{+}_{i,t-1} \times TCR_{t-1}$	-1.493	3.341	2.998	-4.169*	-3.512	-11.781***
	(3.015)	(3.030)	(3.439)	(2.502)	(2.484)	(3.280)
Bank & Macro Controls	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES
Observations	25,797	25,817	25,817	26,160	26,160	26,160
R-squared	0.699	0.617	0.569	0.694	0.717	0.622

Note: This table presents estimates from panel regression specification (11) explaining the total liquidity creation and its components conditional on banks' regulatory capital (TCR) over 2011Q1-2021Q4. All variables are defined in Table 1. Columns 1-3 report estimates for liquidity creation in FX. Columns 4-6 report estimates for liquidity creation in rubles. Bank and Macro Controls are the same as in Table 3. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. We cluster the standard errors (in parentheses) by bank level.

5. Robustness

5.1 "Cat nonfat" measure of Berger and Bouwman (2009)

We employ an alternative proxy for the liquidity creation index, based on the original Berger and Bouwman (2009) algorithm, which produces the so-called "cat nonfat" measure. This liquidity index excludes the maturity dimension of banks' assets, making the impact of net revaluations on portfolio adjustments due to maturity changes less pronounced in the analysis.

Table 6 displays the results for specification (10), using total liquidity creation indices in FX-USD and rubles derived from the "cat nonfat" algorithm (*LC_Tot_FX_BB, LC_Tot_RUB_BB*). Columns 1 and 2 show full-sample results, consistent with those reported in columns 3 and 6 of Table 3 for the baseline "catmat nonfat" measure. The behavior of *LC_Tot_FX_BB* in response to net revaluations for *negatively* and *positively* FX-mismatched banks aligns with the estimates in Panels A and B of Table 4, indicating that the maturity shifts of FX-denominated loans are not critical during FX shocks.

However, differences arise with *LC_Tot_RUB_BB*. As shown in columns 4 and 6 of Table 6, the coefficients (β_1) for *negatively* and *positively* FX-mismatched banks lose statistical significance when negative net revaluations Net_Reval^- are considered. This discrepancy highlights that the baseline "catmat nonfat" measure captures the rebalancing of ruble-denominated loan portfolios in terms of maturity structure, a response to FX shocks that the "cat nonfat" index overlooks. This finding underscores the importance of accounting for maturity adjustments in liquidity measures, favoring the baseline "catmat nonfat" approach.

Additionally, the "cat nonfat" measure by Berger and Bouwman (2009) places greater emphasis on off-balance-sheet items, which are more significant for U.S. banks but less critical for the Russian banking sector, as noted by Fungáčová and Weill (2012) and Fungáčová et al. (2017).

Table 6. Net revaluation of FX-denominated items and liquidity creation "cat nonfat" in foreign and domestic currencies (Full sample, 2011Q1-2021Q4 period)

	Full sample		*Negatively* FX-mismatched		*Positively* FX-mismatched	
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var:	*LC_Tot_FX_BB*	*LC_Tot_RUB_BB*	*LC_Tot_FX_BB*	*LC_Tot_RUB_BB*	*LC_Tot_FX_BB*	*LC_Tot_RUB_BB*
$Net\ Rev^{-}_{i,t-1}$	1.711*	0.934	-0.595	2.172	6.246***	-0.641
	(1.030)	(1.292)	(1.029)	(1.743)	(2.019)	(0.941)
$Net\ Rev^{+}_{i,t-1}$	-0.899	-1.747	1.465*	-3.020**	-7.557***	2.465**
	(0.877)	(1.109)	(0.806)	(1.425)	(2.229)	(1.223)
TCR_{t-1}	0.061**	-0.372***	0.025	-0.373***	0.206***	-0.330***
	(0.030)	(0.035)	(0.028)	(0.039)	(0.072)	(0.039)
Controls	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES
Obs.	25,797	26,160	18,367	18,375	7,337	7,699
R-squr.	0.602	0.582	0.638	0.600	0.647	0.655

Note: This table presents estimates from panel regression specification (10) explaining the total liquidity creation with "cat fat" Berger and Bouwman (2009) measure over 2011Q1-2021Q4. All variables are defined in Table 1. Columns 1-2 report estimates for the full sample. Columns 3-4 report estimates for subsample with FCM<0. Columns 5-6 report estimates for subsample with FCM>=0. Bank and Macro Controls are the same as in Table 3. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels respectively. We cluster the standard errors (in parentheses) by bank level.

6. Conclusion

Banks in emerging market economies engage in foreign currency operations on both sides of their balance sheets – they accept deposits and give out loans denominated in foreign currency. This exposes banks to foreign exchange risk if foreign currency assets and liabilities of banks are mismatched.

We study the impact of net revaluations of assets and liabilities denominated in foreign currencies on liquidity creation by banks. We utilize the highly detailed Russian banking data and rely on the methodology of Berger and Bouwman (2009) that simultaneously considers the liquidity category and maturity of a bank's balance sheet items in domestic and foreign currencies and allows us to construct the "catmat nonfat" liquidity creation indices.

Our analysis demonstrates contrasting behaviors in liquidity creation between ruble- and FX-USD-denominated accounts. Net revaluations are significantly associated with liquidity creation in FX-USD on the asset side and drive liquidity destruction on the liability side, resulting in a neutral total effect. In contrast, we find no significant association between net revaluations and ruble-denominated liquidity creation across assets, liability, or total metrics. These results underscore the distinct roles that domestic and foreign currencies play in bank balance sheets and liquidity creation processes.

Subsample analysis reveals that banks with *positive* FX mismatches experience greater liquidity destruction in FX-USD liabilities during large exchange rate movements, likely due to depositor shifts toward long-term "dollar" deposits. *Negatively* FX-mismatched banks, in contrast, use these deposits to extend FX loans, balancing the overall liquidity creation in FX-USD. For rubles, net revaluations are associated with liquidity creation in *positively* FX-mismatched banks and with liquidity destruction in negatively mismatched ones. These opposite liquidity creation trends in rubles for *positively* and n*egatively* FX-mismatched banks result in the overall neutral effect for the whole banking system.

Interestingly, banks' regulatory capital interacts with net revaluations, offsetting their effects on liquidity creation through the financial fragility channel. In conclusion, our findings underscore the intricate interplay between FX risk, regulatory capital, and liquidity creation in emerging market banks. We also provide additional insight into how they interact within the macroeconomic environment.

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Appendix A

<table>
<tr><td colspan="3">ASSETS</td></tr>
<tr><td>liquid
M < 181 days
(weight = -1/2)</td><td>semi-liquid
181 days <= M < 1 year
(weight = 0)</td><td>illiquid
M >= 1 year
(weight = 1/2)</td></tr>
<tr><td>1. Cash and cash equivalents</td><td></td><td></td></tr>
<tr><td>2. Funds in the Central Bank of the Russian Federation</td><td></td><td></td></tr>
<tr><td>3. Funds in credit institutions</td><td></td><td></td></tr>
<tr><td colspan="3">4. Financial assets at fair value through profit or loss:</td></tr>
<tr><td>Sovereign debt obligations, including those guaranteed by them</td><td>Subsovereign and bank debt obligations, stocks</td><td>Reserves and derivatives</td></tr>
<tr><td colspan="3">5. Net loans at amortized cost</td></tr>
<tr><td colspan="3">6. Net investments in financial assets at fair value through other comprehensive income:</td></tr>
<tr><td>Exchange-listed stocks purchased for investments</td><td></td><td>Non-exchange listed stocks and debt</td></tr>
<tr><td colspan="3">7. Net investments in securities and other financial assets measured at amortized cost (except loans):</td></tr>
<tr><td>Exchange-listed debt purchased for investments</td><td></td><td>Overdue debt obligations</td></tr>
<tr><td></td><td></td><td>8. Investments in subsidiaries and affiliates</td></tr>
<tr><td></td><td>9. Current income tax requirements</td><td></td></tr>
<tr><td></td><td></td><td>10. Deferred tax asset</td></tr>
<tr><td></td><td></td><td>11. Fixed assets, right-of-use assets and intangible assets</td></tr>
<tr><td></td><td></td><td>12. Long-term assets held for sale</td></tr>
<tr><td colspan="3">13. Other assets</td></tr>
<tr><td>settlements on transactions with securities and interbank transactions</td><td>accounts receivable</td><td>deferred expenses</td></tr>
<tr><td colspan="3">LIABILITIES and EQUITY</td></tr>
<tr><td>liquid
M < 181 days
(weight = 1/2)</td><td>semi-liquid
181 days <= M < 1 year
(weight = 0)</td><td>illiquid
M >= 1 year
(weight = -1/2)</td></tr>
<tr><td colspan="3">15. Loans, deposits, and other funds of the Central Bank of the Russian Federation</td></tr>
<tr><td colspan="3">16.1. Financial institutions' funds at amortized cost</td></tr>
<tr><td colspan="3">16.2. Customer funds at amortized cost held by non-financial institutions</td></tr>
<tr><td></td><td colspan="2">17. Financial liabilities at fair value through profit or loss</td></tr>
<tr><td colspan="3">18.1. Issued debt securities at fair value through profit or loss</td></tr>
<tr><td></td><td>18.2. Issued debt securities at amortized cost</td><td></td></tr>
<tr><td colspan="2"></td><td>20. Deferred tax liabilities</td></tr>
<tr><td colspan="3">21. Other liabilities</td></tr>
<tr><td>settlements on transactions with securities and interbank transactions</td><td>accounts payable</td><td>deferred income</td></tr>
<tr><td colspan="2"></td><td>22. Provisions for potential losses on contingent credit obligations, other potential losses, and transactions with residents of offshore zones</td></tr>
<tr><td colspan="2"></td><td>24-35. Equity</td></tr>
</table>

This table presents the generalized assignment of liquidity classes to the balance sheet classes, which are constructed based on secondary accounts. The balance sheet subclasses are denoted in italics.

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