



Banks' Foreign Currency Revaluations and Liquidity Creation

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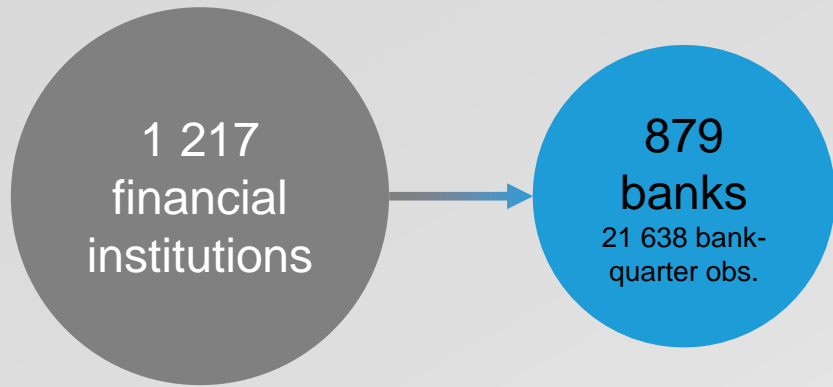
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Banks' FX-USD exposure and banks' liquidity creation


- Banks accept deposits and give out loans denominated in foreign currency, which exposes them to FX revaluations in the domestic currency
- We exploit the unique feature of the Russian banking data that reports the value of revaluations (*Reval*) in the domestic currency of individual banks' FX-denominated assets and liabilities
- We study the impact of net revaluations of FX-denominated assets and liabilities on liquidity creation by banks
- Specifically, we study the effect of change in banks' profits due to *Reval* on liquidity creation index constructed by Berger and Bouwman (2009)
- We investigate the strength of the effect by separately studying banks that operate in cities with higher and lower levels of banking competition



2010-2021
period

Excluded data

- not-for-profit organizations
- banks that do not disclose secondary accounts' data
- banks with only 1 bank-quarter obs.

Data	Source
The highly detailed data on secondary accounts of turnover balance sheets (101 form), primary data on P&L statements (102 form), and the data on mandatory ratios (123, 134, 135 forms)	 The Central Bank of Russia
M&A history	Bloomberg
Bank branches density	Banki.ru

The liquidity creation measure's construction of Berger and Bouwman (2009)

It simultaneously considers the category and maturity of loans and other balance sheet's items using highly detailed information from turnover balance sheet

$$\text{Balance sheet's class}_{i,n,t} = \sum_{k=1}^S \text{Liq. weight}_k \cdot \text{Bank accounts}_{k,t}$$

Liquidity weight equals to $-\frac{1}{2}$, 0 , or $\frac{1}{2}$ according to the liquidity creation theory.

For instance, the maximum amount of liquidity is created when there is a transformation of \$1 of illiquid assets into \$1 of liquid liabilities. In this case, a weight of $\frac{1}{2}$ is assigned, and liquidity creation is equal to $\frac{1}{2} \times \$1 + \frac{1}{2} \times \$1 = \$1$.

$$LqdALE = LqdA + LqdL + LqdE \quad \text{where:}$$

Asset side of the bank balance sheet

Liability side of the bank balance sheet

Equity side of the bank balance sheet

$$LqdA = \sum_{i=1}^{13} \text{Balance sheet's class}_i$$

$$LqdL = \sum_{i=15}^{22} \text{Balance sheet's class}_i$$

$$LqdE = \sum_{i=24}^{35} \text{Balance sheet's class}_i$$

i – the index number of balance sheet class in the bank balance sheet

$LqdALE$ – liquidity creation (“catmat nonfat” in terms of Berger and Bouwman (2009) study), $LqdAL$ – liquidity creation on both asset and liability sides, $LqdA$ – liquidity creation on asset side, $LqdL$ – liquidity creation on liability side, $LqdE$ – liquidity creation on equity side

Numerical example

Bank balance sheet			
Assets		Liabilities	
Cash	100	Deposits	800
		- 4 months	500
		- 2 years	300
		Total liabilities	800
Loans	900	Equity	
- 1 month consumer loans	300	Equity	200
- 5 years car loans	600		
Total assets	1000	Total equity	200

$$\begin{aligned}
 LqdALE &= Cash \cdot \left(-\frac{1}{2}\right) + 1 \text{ month Loans} \cdot \left(-\frac{1}{2}\right) + 5 \text{ years Loans} \cdot \frac{1}{2} - \\
 &\quad - Provisions \cdot \frac{1}{2} + Capital \cdot \left(-\frac{1}{2}\right) - Treasury \text{ shares} \cdot \left(-\frac{1}{2}\right) + 4 \text{ months Deposits} \cdot \frac{1}{2} + \\
 &\quad + 2 \text{ years Deposits} \cdot \left(-\frac{1}{2}\right) = 100 \cdot \left(-\frac{1}{2}\right) + 350 \cdot \left(-\frac{1}{2}\right) + 650 \cdot \frac{1}{2} - 100 \cdot \frac{1}{2} + 220 \cdot \left(-\frac{1}{2}\right) - 20 \cdot \left(-\frac{1}{2}\right) + \\
 &\quad + 500 \cdot \frac{1}{2} + 300 \cdot \left(-\frac{1}{2}\right) = 50
 \end{aligned}$$

Foreign Currency (FX) Revaluations

- All banks in Russia are required to report the revaluation value of assets and liabilities that are denominated in foreign currency

$$Pos.Reval_{i,t} = FX_Assets^{\$}_{i,t-1} * \Delta S^+ + FX_Liab^{\$}_{i,t-1} * \Delta S^-$$

$$Neg.Reval_{i,t} = FX_Assets^{\$}_{i,t-1} * \Delta S^- + FX_Liab^{\$}_{i,t-1} * \Delta S^+$$

$$Net\ Reval_{i,t} = \ln\left(\frac{Pos.Reval_{i,t}}{Tot_Income_{i,t}}\right) - \ln\left(\frac{Neg.Reval_{i,t}}{Tot_Expences_{i,t}}\right)$$

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

$$FCM_{i,t} = \frac{FX_Liab^{\$}_{i,t} - FX_Assets^{\$}_{i,t}}{Total\ Bank\ Assets^{\$}_{i,t}}$$

Banking market concentration

- Following Drechsler *et al.* (2017, 2021) we use the standard measure of market concentration a Herfindahl-Hirschman index (HHI) to calculate the intensity of banking competition at the city level

$$City\ HHI_c = \sum_{i=1}^L Branches\ City\ Share_{i,c}^2$$

- We calculate a bank-level HHI index by averaging the city-level HHIs, using each bank's share of branches located in each city as weights across all K cities where bank i operates

$$Bank\ HHI_i = \sum_{c=1}^K Branches\ Bank\ Share_{i,c} * City\ HHI_c$$

- Bank with the low level of $Bank\ HHI_i$ has most of its business in the cities with a high level of banking competition compared to a bank with a high level of $Bank\ HHI_i$ which are dominant in the cities of their presence

The “Financial fragility – crowding out” hypothesis

1. Financial fragility structure (Diamond, Rajan, 2000)

a bank maintains **fragile capital structure**

deserves depositors’ trust and collects more deposits

higher capital increases the bargaining power of banks and reduces their incentives to monitor loans and thus **destroys liquidity**

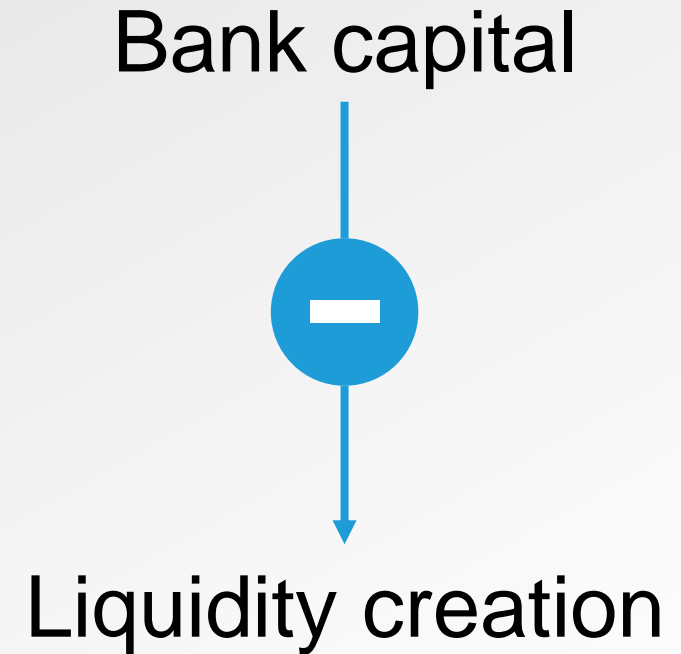
2. Crowding out of deposits (Gorton, Winton, 2000)

a regulator **tightens capital requirements**

investors of a bank are forced to shift funds from liquid deposits to illiquid equity

which **destroys liquidity**

3. Banks that are monopolists are less threatened by the market discipline mechanisms of the depositors’ run-on banks and are less sensitive to an increase in capital due to positive FX revaluations hence their liquidity creation is expected to respond less to such FX shocks



Empirical strategy

Hypothesis 1: Net revaluations positively/negatively affect future values of LC_Liabilities/LC_Assets and negatively LC_Total.

$$LC_{i,t}^k = \beta_0 + \beta_1 \text{Net Reval}_{i,t-1} + \beta_2 \text{TCR}_{i,t-1} + \gamma' \mathbf{X}_{i,t-1} + \alpha_i + \tau_t + \varepsilon_{i,t},$$

Hypothesis 2: Net revaluations and total capital ratio jointly have a significantly negative impact on total liquidity creation which is in line with the “financial fragility-crowding out hypothesis”.

$$LC_{i,t}^k = \beta_0 + \beta_1 \text{Net Reval}_{i,t-1} + \beta_2 \text{TCR}_{i,t-1} + \beta_3 \text{Net Reval}_{i,t-1} \times \text{TCR}_{i,t-1} + \gamma' \mathbf{X}_{i,t-1} + \alpha_i + \tau_t + \varepsilon_{i,t},$$

Hypothesis 3: Net revaluations and their interaction with the total capital ratio influence total liquidity creation for negatively FX-mismatched banks.

Hypothesis 4: Net revaluations and total capital ratio jointly have a more pronounced negative impact on the total liquidity creation of banks located in more competitive cities compared to banks located in the cities where banks are dominant.

Revaluation of FX-denominated items and liquidity creation in domestic currency

Panel A. Full sample of banks Q1.2010-Q4.2021 period

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	LC_Tot_RUB	LC_Tot_RUB	LC_Asst_RUB	LC_Asst_RUB	LC_Liab_RUB	LC_Liab_RUB
Net Reval _{t-1}	-0.006	0.025**	0.015**	0.033***	-0.034***	-0.029***
	(0.007)	(0.013)	(0.006)	(0.010)	(0.005)	(0.010)
TCR _{t-1}	-0.406***	-0.415***	-0.329***	-0.334***	0.066***	0.065**
	(0.037)	(0.037)	(0.031)	(0.031)	(0.025)	(0.025)
Net Reval _{t-1} × TCR _{t-1}		-0.085**		-0.052**		-0.013
		(0.037)		(0.026)		(0.026)
Bank Controls _{t-1}	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,563	25,563	25,563	25,563	25,563	25,563
Num. Banks	839	839	839	839	839	839
Adj. R-squared	0.621	0.622	0.681	0.681	0.724	0.724

Revaluation of FX-denominated items and liquidity creation in domestic currency

Panel B. *Negative* FX-mismatch banks: FCM < median

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	LC_Tot_RUB	LC_Tot_RUB	LC_Asst_RUB	LC_Asst_RUB	LC_Liab_RUB	LC_Liab_RUB
Net Reval _{t-1}	-0.004 (0.009)	0.037** (0.016)	0.019** (0.008)	0.041*** (0.013)	-0.031*** (0.006)	-0.016 (0.012)
TCR _{t-1}	-0.411*** (0.049)	-0.421*** (0.049)	-0.341*** (0.037)	-0.346*** (0.037)	0.052 (0.033)	0.048 (0.033)
Net Reval _{t-1} × TCR _{t-1}		-0.102** (0.045)		-0.054* (0.032)		-0.039 (0.030)
Bank Controls _{t-1}	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,125	13,125	13,125	13,125	13,125	13,125
Num. Banks	418	418	418	418	418	418
Adj. R-squared	0.648	0.649	0.700	0.701	0.734	0.734

Revaluation of FX-denominated items and liquidity creation in domestic currency

Panel C. *Positive* FX-mismatch banks: FCM > median

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	LC_Tot_RUB	LC_Tot_RUB	LC_Asst_RUB	LC_Asst_RUB	LC_Liab_RUB	LC_Liab_RUB
Net Reval _{t-1}	-0.009 (0.010)	0.007 (0.020)	0.009 (0.008)	0.026* (0.015)	-0.038*** (0.007)	-0.051*** (0.016)
TCR _{t-1}	-0.402*** (0.044)	-0.409*** (0.045)	-0.298*** (0.056)	-0.305*** (0.057)	0.077** (0.035)	0.082** (0.036)
Net Reval _{t-1} × TCR _{t-1}		-0.052 (0.058)		-0.056 (0.045)		0.042 (0.052)
Bank Controls _{t-1}	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,438	12,438	12,438	12,438	12,438	12,438
Num. Banks	421	421	421	421	421	421
Adj. R-squared	0.582	0.582	0.650	0.650	0.716	0.716

Revaluation and liquidity creation by banks located in competitive or concentrated areas

Panel A. *High competition location: HHI < median*

Dependent variable:	LC_Tot	LC_Tot		LC_Asst	LC_Asst		LC_Liab	LC_Liab
Net Reval _{t-1}	-0.006	0.026		0.010	0.052***		-0.029***	-0.037***
	(0.009)	(0.016)		(0.008)	(0.015)		(0.006)	(0.013)
TCR _{t-1}	-0.374***	-0.379***		-0.313***	-0.320***		0.068**	0.069**
	(0.034)	(0.035)		(0.038)	(0.037)		(0.031)	(0.031)
Net Reval _{t-1} × TCR _{t-1}		-0.075*			-0.095***			0.017
		(0.040)			(0.033)			(0.029)
Bank Controls _{t-1}	Yes	Yes		Yes	Yes		Yes	Yes
Bank FE	Yes	Yes		Yes	Yes		Yes	Yes
Time FE	Yes	Yes		Yes	Yes		Yes	Yes
Observations	12,258	12,258		12,258	12,258		12,258	12,258
Num. Banks	392	392		392	392		392	392
Adj. R-squared	0.614	0.615		0.685	0.686		0.713	0.713

Revaluation and liquidity creation by banks located in competitive or concentrated areas

Panel B. High concentration location: HHI \geq median

Dependent variable:	LC_Tot	LC_Tot		LC_Asst	LC_Asst		LC_Liab	LC_Liab
Net Reval _{t-1}	-0.012*	-0.002		0.009	0.002		-0.034***	-0.028***
	(0.007)	(0.012)		(0.006)	(0.011)		(0.006)	(0.010)
TCR _{t-1}	-0.342***	-0.346***		-0.251***	-0.247***		0.046	0.044
	(0.051)	(0.051)		(0.042)	(0.042)		(0.034)	(0.034)
Net Reval _{t-1} × TCR _{t-1}		-0.028			0.023			-0.018
		(0.028)			(0.027)			(0.026)
Bank Controls _{t-1}	Yes	Yes		Yes	Yes		Yes	Yes
Bank FE	Yes	Yes		Yes	Yes		Yes	Yes
Time FE	Yes	Yes		Yes	Yes		Yes	Yes
Observations	13,247	13,247		13,247	13,247		13,247	13,247
Num. Banks	402	402		402	402		402	402
Adj. R-squared	0.601	0.601		0.687	0.687		0.739	0.739

Conclusions

- ✓ Construction of the new liquidity creation measure
- ✓ Verification of the “Financial fragility – crowding out” hypothesis
- ✓ We find a significant positive effect of net revaluations on the asset-side and a negative effect on the liability-side components of the liquidity creation index
- ✓ We find strong evidence supporting the hypothesis on the joint effect of higher capital and net revaluations - have a significantly negative effect on the total liquidity creation index
- ✓ Banks that operate in *High concentration location* enjoy high-profit margins due to their monopolistic power and are less sensitive to the Net revaluation effect on banks’ profits