Banks' Performance After a Policy Rate Shock: The Role of Interest Rate Sensitivity

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Motivation

- Since 2008 Central Banks of many leading countries kept interest rates at the historically low level. Currently the world is in the interest rate hiking cycle
- Banks vary in terms of their sensitivity to interest rates and are differently exposed to interest rate shocks
- Deposit insurance creates an environment when banks may offer higher rates on insured deposits that do not reflect riskiness of banks leading to a moral hazard problem

Our research questions

Following a policy rate shock how do banks respond to a sudden interest rate hike? How sensitivity of banks with respect to interest rates impacts this dynamics? How stability of the banking system is affected?

- Important implications for policy directed at reducing the moral hazard behavior of banks

Paper in the literature

- We contribute to the literature that studies monetary policy transmission into the banking sector (e.g., Drechsler, Savov and Schnabl (2017, 2021), Kashyap and Stein (2000), Cao and Dinger (2021), Acharya and Mora (2015), Claessens et al. (2018))
- We contribute to the literature on how deposit insurance affects banks (e.g., Chernykh and Kotomin (2022), Chernykh and Cole (2011), Karas et al. (2013))

Causal evidence from a quasi-natural experiment

We use exogenous shock to the policy rate caused by the Central Bank of Russia unexpected rate hike in December 2014 following the sanctions and currency devaluation pressures.

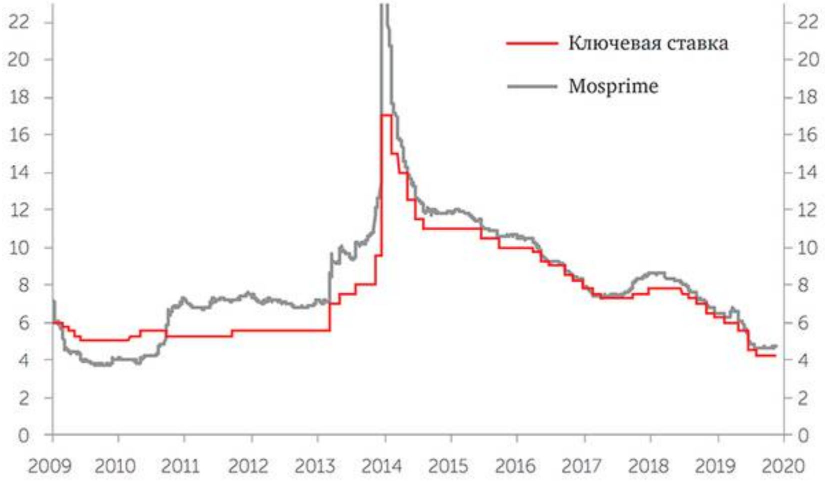
The Policy rate shock

- After sharp ruble devaluation pressures the Central Bank of Russia increased its policy rate from 10.5% to 17.0% on 16.12.2014 causing the extraordinary distress for a banking sector

- This unexpected increase significantly increased the costs of funding for banks on the liability side and negatively affected the value of banks' portfolios and collateral on the asset side which should be leveled by corresponding decrease of banks' capital

- In this paper we calculate sensitivity of each bank to interest rates based on the methodology of Drechsler et al. (2021) and study how unexpected policy rate shock transmits into banks' performance depending on their sensitivity

Mosprime rate dynamics



Data

- We use individual bank's financial information from forms 101 and 102 available from the CBR and calculate interest income, interest expense, interest earning assets and interest bearing liabilities according to the publicly available instructions of the Central Bank of Russia (2332- from 12.11.2009, 4212- from 24.11.2016, 4927- from 08.10.2018).
- We obtained individual deposit rates and conditions on all deposits offered by banks from *banki.ru* and calculated the maximum deposit rates offered by each bank in a given quarter on *insured* and *uninsured* deposits
- We use quarterly data from 2013Q4 till 2016Q1 that enables us to capture pre- and post-shock periods allowing us to do the event study and employ the difference-in-differences methodology

Variables construction

- Independent variables:
  - We followed Drechsler et al. (2021) and calculated the interest income and interest expenses sensitivities (betas) by running the following time-series regressions for each bank during the pre-shock period 2010-2013

$$\Delta Cost\ \ of\ \ Funds_{i,t} = \delta_i + \tau_t + \sum_{n=0}^{3} \beta^{E}_{i,n} * \Delta MosPrime_{t-n} + \varepsilon_{i,t}$$

$$\Delta Asset\ \ Yield_{i,t} = \delta_i + \tau_t + \sum_{n=0}^{3} \beta^{I}_{i,n} * \Delta MosPrime_{t-n} + \varepsilon_{i,t}$$

- Dependent variables:
  1. Maximum deposit rate offered by bank in a given maturity and *(un)insured* bracket
  2. Uninsured deposit premium=Rate on uninsured deposit - Rate on insured deposit
  3. Share of deposits of given maturity in total deposits
  4. Interest income, Interest expense margins; Net Interest Spread (NIS)

Summary statistics

	Mean	St. Dev.	Min	p50	Max	N. obs.
Interest expense beta (β^E)	0.131	0.962	-2.169	0.051	3.322	448
Interest income beta (β^I)	0.162	1.690	-4.947	0.183	5.237	448
Short *uninsured* rate	0.101	0.025	0.038	0.096	0.210	786
Short *insured* rate	0.097	0.026	0.030	0.093	0.218	786
Long *uninsured* rate	0.107	0.020	0.048	0.103	0.220	786
Long *insured* rate	0.101	0.022	0.048	0.100	0.209	786
Insured term spread	0.004	.015	-0.1	0.005	0.070	786
Uninsured term spread	0.006	.015	-0.09	0.006	0.121	786
Short *uninsured* premium	0.004	0.017	-0.085	0.005	0.115	786
Long *uninsured* premium	0.005	0.014	-0.080	0.005	0.119	786
NIS	0.067	0.037	-0.015	0.063	0.201	4,490
Bank size (Ln)	16.327	1.368	13.590	16.202	19.900	4,490
CAR	20.942	13.063	4.770	16.075	106.856	4,490
Deposit-to-assets	0.376	0.185	0.000	0.385	0.750	4,490
Loans-to-assets	0.644	0.156	0.100	0.674	0.955	4,490

Empirical specification: Effect of bank's interest rate sensitivity on performance

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t} \tag{1}$$

- τ_t capture change in the dependent variable for a given quarter
- γ_t capture the differential response of banks to a shock in a given quarter conditional on bank's interest rate sensitivity

$$Y_{i,t} = 1\{Post\text{-}Shock\} + \gamma \ \beta_i^E \times 1\{Post\text{-}Shock\} + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t} \tag{2}$$

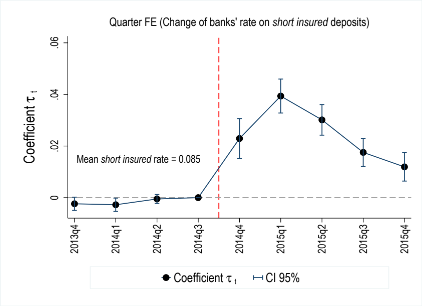
- $1\{Post\text{-}Shock\}$ takes value zero for quarters spanning 2013Q4-2014Q3 and one for 2014Q4-2015Q4, it captures change in the dependent variable in the post-shock period
- γ captures the differential response of banks to a shock in the post-shock period conditional on bank's interest rate sensitivity
- δ_i capture bank's fixed effects

Hypotheses development

- In the environment when monitoring of banks' quality by the retail investors is costly it is rational for banks to attract depositors by means of favorable terms on *insured* deposits which are not subject to credit risk. This strategy should make depositors indifferent to the credit quality of banks, thus allowing banks to compete only in terms of their ability to offer attractive terms on retail deposits.
- **Hypothesis 1:** Banks with higher pre-determined expense beta β_i^E offer higher deposit rates on *insured* retail deposits relative to *uninsured* ones.
- **Hypothesis 2:** Banks with higher pre-determined expense beta β_i^E offer higher deposit rates on their *insured short-term* retail deposits relative other deposit categories.

Policy rate shock pass-through into ruble short-term retail deposit rates: Level effect

A: *Insured* deposit rate < 1Y



B: *Uninsured* deposit rate < 1Y

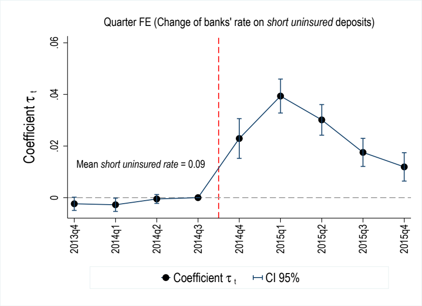
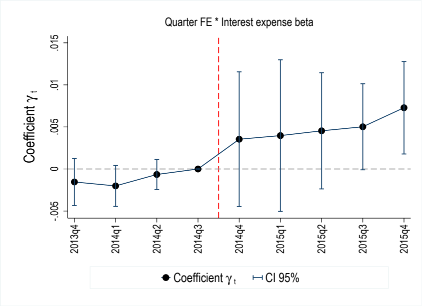


Figure: Coefficients plot: This picture plots the dynamics of coefficients τ_t of banks' quarterly short-term insured and uninsured deposit rates for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Policy rate shock pass-through into retail short-term deposit rates: Effect through sensitivity

C: Impact of β^E on *Insured* rate $<$1Y



D: Impact of β^E on *Uninsured* rate $<$1Y

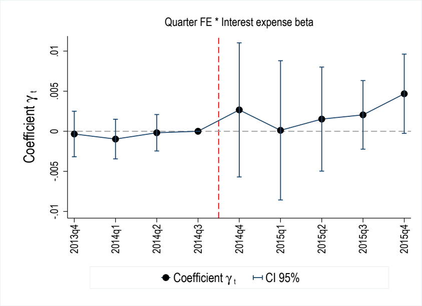
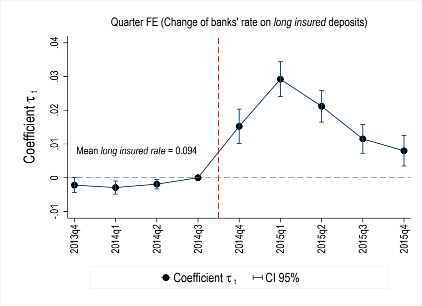


Figure: Coefficients plot: This picture plots the dynamics of coefficients and γ_t of banks' quarterly short-term insured and uninsured deposit rates for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Policy rate shock pass-through into individual long-term deposit rates: Level effect

A: *Insured* deposit rate > 1Y



B: *Uninsured* deposit rate > 1Y

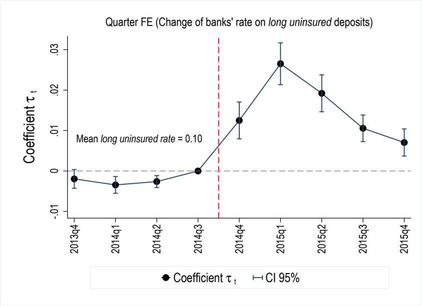
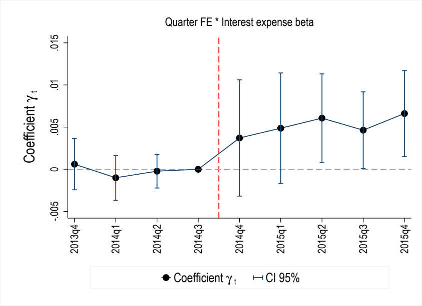


Figure: Coefficients plot: This picture plots the dynamics of coefficients τ_t of banks' quarterly long-term insured and uninsured deposit rates for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Policy rate shock pass-through into individual long-term deposit rates: Effect through sensitivity

C: Impact of β^E on *Insured* rate >1Y



D: Impact of β^E on *Uninsured* rate >1Y

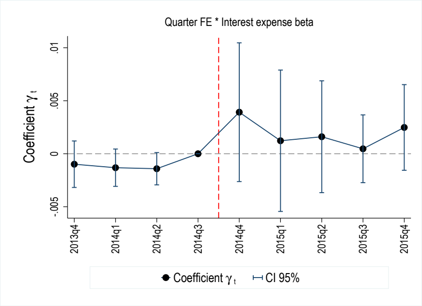


Figure: Coefficients plot: This picture plots the dynamics of coefficients and γ_t of banks' quarterly long-term insured and uninsured deposit rates for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

(Un)insured deposits and sensitivity to policy rates:

$$Y_{i,t} = 1\{Post\text{-}Shock\} + \gamma\ \beta_i^E \times 1\{Post\text{-}Shock\} + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Dependent variable :	ShortUninsured	ShortInsured	LongUninsured	LongInsured
Post-shock	0.0248***	0.0283***	0.0184***	0.0205***
	(0.0022)	(0.0025)	(0.0018)	(0.0020)
β_i^E $\times$Post-shock	0.0023	0.0052*	0.0027	0.0049**
	(0.0028)	(0.0027)	(0.0019)	(0.0021)
Bank size$_{i,t}$ (Ln)	-0.0089	-0.0144**	-0.0040	-0.0058
	(0.0062)	(0.0066)	(0.0053)	(0.0056)
CAR$_{i,t}$	-0.0006*	-0.0002	-0.0002	-0.0001
	(0.0003)	(0.0003)	(0.0002)	(0.0003)
Deposits/TA$_{i,t}$	-0.0131	-0.0460*	-0.0139	-0.0441**
	(0.0210)	(0.0248)	(0.0177)	(0.0192)
Loan/TA$_{i,t}$	0.0110	0.0071	-0.0042	-0.0000
	(0.0147)	(0.0130)	(0.0095)	(0.0128)
Bank FE (*i*)	YES	YES	YES	YES
R-squared	0.306	0.360	0.293	0.321
N. banks	152	152	152	152
Observations	786	786	786	786

Hypotheses development

- **Hypothesis 1a:** The risk premium on *uninsured* versus *insured* deposit rates offered by banks will decrease for banks with higher pre-determined expense beta β_i^E. This suggests that banks offer relatively higher *insured* deposit rates that narrows the premium.
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$$Unins.\ premium_{i,t}^T = Max\ rate\ uninsured\ deposit_{i,t}^T - Max\ rate\ insured\ deposit_{i,t}^T,$$

- **Hypothesis 2a:** The *Term spread* on *insured* deposits will decrease more relative to *Term spread* on *uninsured* deposit rates for banks with higher pre-determined expense beta β_i^E.

$$Term\ spread_{i,t}^S = Max\ long\ deposit\ rate_{i,t}^S - Max\ short\ deposit\ rate_{i,t}^S,$$

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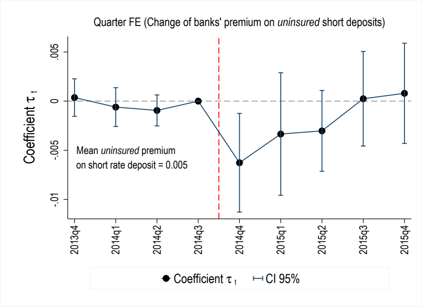
Uninsured premiums on short and long-term deposits

A: *Uninsured* premium on short deposits



B: *Uninsured* premium on long deposits

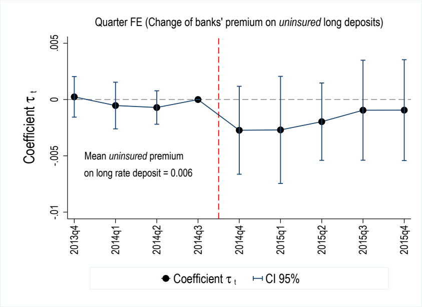
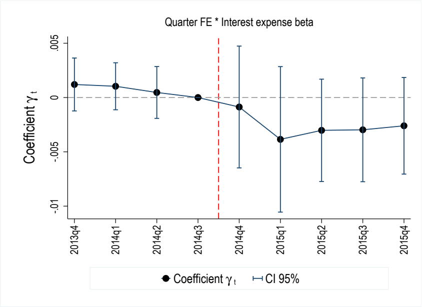


Figure: Coefficients plot: This picture plots the dynamics of coefficients τ_t of banks' quarterly uninsured premium on short and long-term deposits for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Uninsured premiums on short and long-term deposits

C: β^E impact on *uninsured* short prem. D: β^E impact on *uninsured* long prem.



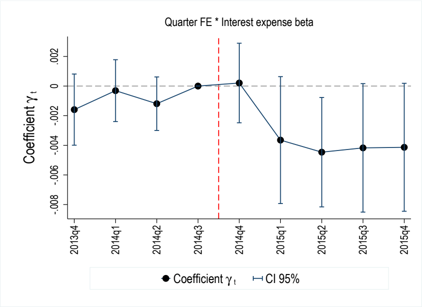
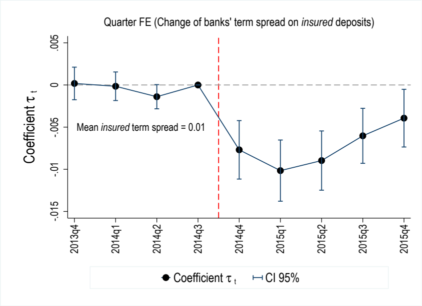


Figure: Coefficients plot: This picture plots the dynamics of coefficients and γ_t of banks' quarterly uninsured premium on short and long-term deposits for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Term spread on individual deposits and sensitivity to interest rates after a policy rate shock

A: Term spread on *insured* deposits



B: Term spread on *uninsured* deposits

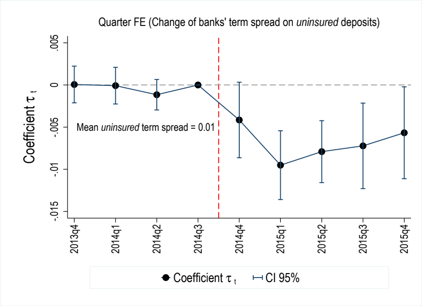
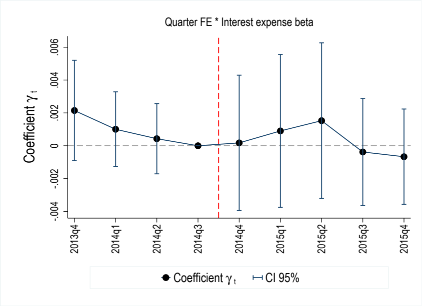


Figure: Coefficients plot: This picture plots the dynamics of coefficients τ_t of banks' quarterly term spreads on insured and uninsured deposits for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Term spread on individual deposits and sensitivity to interest rates after a policy rate shock

C: β^E impact on *insured* term spread



D: β^E impact on *uninsured* term spread

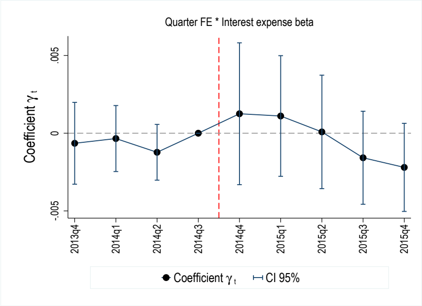


Figure: Coefficients plot: This picture plots the dynamics of coefficients and γ_t of banks' quarterly term spreads on insured and uninsured deposits for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Term spreads and *Uninsured deposits premiums*

$$Y_{i,t} = 1\{Post\text{-}Shock\} + \gamma\ \beta_i^E \times 1\{Post\text{-}Shock\} + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Dependent variable:	TermSprIns	TermSprUnins	ShortUninsPremium	LongUninsPremium
Post-shock	-0.0078***	-0.0064***	-0.0035*	-0.0021
	(0.0015)	(0.0014)	(0.0020)	(0.0016)
β_i^E ×Post-shock	-0.0003	0.0004	-0.0029	-0.0022**
	(0.0016)	(0.0015)	(0.0022)	(0.0010)
Bank size$_{i,t}$ (Ln)	0.0086***	0.0049	0.0055	0.0018
	(0.0032)	(0.0032)	(0.0041)	(0.0032)
CAR$_{i,t}$	0.0001	0.0004	-0.0004	-0.0001
	(0.0003)	(0.0002)	(0.0004)	(0.0002)
Deposits/TA$_{i,t}$	0.0019	-0.0009	0.0330*	0.0301*
	(0.0138)	(0.0133)	(0.0194)	(0.0173)
Loan/TA$_{i,t}$	-0.0072	-0.0152	0.0038	-0.0042
	(0.0088)	(0.0100)	(0.0107)	(0.0089)
Bank FE (i)	YES	YES	YES	YES
R-squared	0.135	0.066	0.040	0.026
N. banks	152	152	152	152
Observations	786	786	786	786

Hypotheses development

- **Hypothesis 3:** Banks with higher pre-determined expense beta β_i^E attract more *short-term* deposits relative to *long-term* retail deposits.

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$$Maturity\ share\ of\ retail\ deposits_{i,t}^{M} = \frac{Retail\ deposits\ of\ maturity_{i,t}^{M}}{Total\ retail\ deposits_{i,t}},$$

- **Hypothesis 4:** Banks with higher pre-determined expense beta β_i^E exhibit higher interest rate expenses which negatively affects NIS in the post-shock period. Banks with higher pre-determined income beta β_i^I exhibit higher interest rate income which positively affects NIS in the post-shock period.

$$Net\ Interest\ Spread_{i,t} = Interest\ income\ return_{i,t} - Interest\ expense\ return_{i,t},$$

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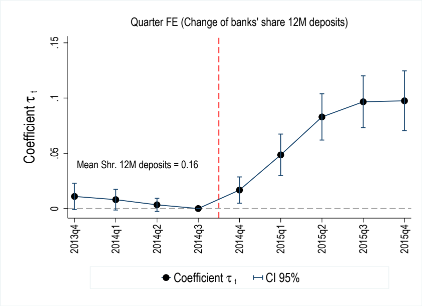
Maturity composition of individual deposits after a policy rate shock: Level effect

A: Share of 1Y deposits



B: Share of 3Y deposits

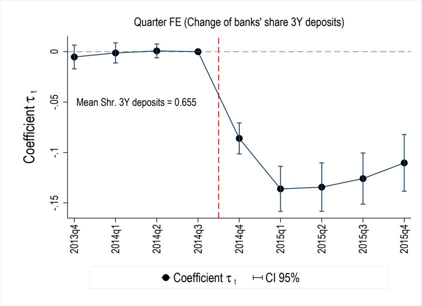
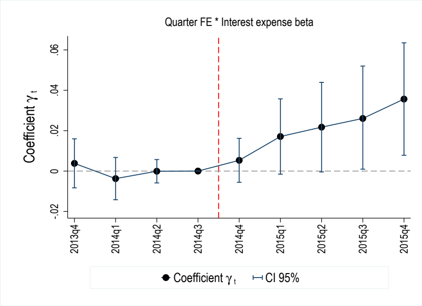


Figure: Coefficients plot: This picture plots the dynamics of coefficients τ_t of banks' quarterly shares of individual deposits for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Maturity composition of individual deposits after a policy rate shock: sensitivity to interest rates

C: Impact of β^E on Shr. of 1Y deposits



D: Impact of β^E on Shr. of 3Y deposits

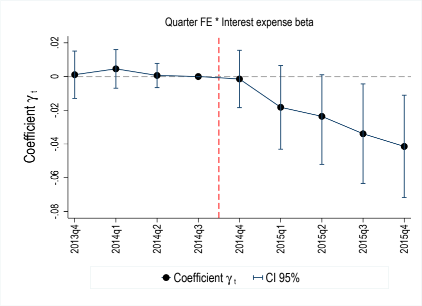


Figure: Coefficients plot: This picture plots the dynamics of coefficients and γ_t of banks' quarterly shares of inividual deposits for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^E \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

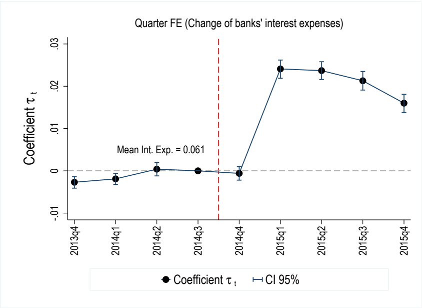
Share of short and long-term reatil deposits

$$Y_{i,t} = 1\{Post\text{-}Shock\} + \gamma\ \beta_i^E \times 1\{Post\text{-}Shock\} + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Dependent variable :	Shr. 6M	Shr. 12M	Shr. 3Y	Shr. >3Y
Post-shock	0.0773***	0.0577***	-0.1156***	-0.0193***
	(0.0061)	(0.0088)	(0.0104)	(0.0052)
β_i^E ×Post-shock	-0.0055	0.0205**	-0.0250**	0.0100
	(0.0066)	(0.0100)	(0.0128)	(0.0069)
Bank size$_{i,t}$ (Ln)	-0.0846***	0.0070	0.1062***	-0.0286**
	(0.0254)	(0.0262)	(0.0269)	(0.0140)
CAR$_{i,t}$	-0.0013*	0.0008	0.0001	0.0004
	(0.0007)	(0.0011)	(0.0012)	(0.0006)
Deposits/TA$_{i,t}$	-0.2953***	0.2647***	0.1267	-0.0960**
	(.0851)	(0.0760)	(0.1127)	(0.0426)
Loan/TA$_{i,t}$	-0.1284**	-0.0493	0.0990	0.0788
	(0.0531)	(0.0728)	(0.0929)	(0.0547)
Bank FE (i)	YES	YES	YES	YES
R-squared	0.124	0.080	0.135	0.043
N. banks	462	462	462	462
Observations	4,084	4,084	4,084	4,084

Policy rate shock pass-through into interest expense and income margins: Level effect

A: Interest Expenses



B: Interest Income

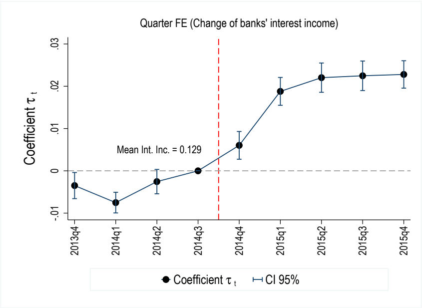
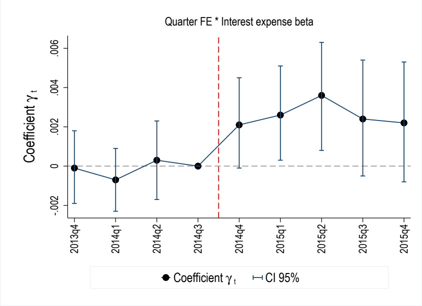


Figure: Coefficients plot: This picture plots the dynamics of coefficients τ_t of banks' quarterly ruble interest expenses and income margins for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^K \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Policy rate shock pass-through into interest expense and income margins: Effect through sensitivities

C: Impact of β^E on Interest Expenses



D: Impact of β^I on Interest Income

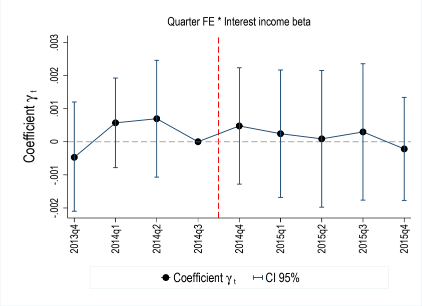


Figure: Coefficients plot: This picture plots the dynamics of coefficients and γ_t of banks' quarterly ruble interest expenses and income margins for the following model:

$$Y_{i,t} = \tau_t + \sum_{t \in 2013q4-2015q4} \gamma_t \quad \beta_i^K \times \tau_t + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Bank's performance and sensitivity to policy rates

$$Y_{i,t} = 1\{Post\text{-}Shock\} + \gamma\ \beta_i^K \times 1\{Post\text{-}Shock\} + \delta_i + \boldsymbol{X}_{i,t}\theta' + \varepsilon_{i,t}$$

Dependent variable :	Int.Expenses	NIS	Int.Income	NIS
Post-shock	0.0172***	0.0032***	0.0208***	0.0031***
	(0.0008)	(0.0009)	(0.0011)	(0.0009)
β_i^E ×Post-shock	0.0027***	-0.0024**		
	(0.0010)	(0.0012)		
β_i^I ×Post-shock			0.0001	-0.0003
			(0.0005)	(0.0003)
Bank size$_{i,t}$ (Ln)	0.0094***	-0.0072*	-0.0002	-0.0075**
	(0.0032)	(0.0037)	(0.0043)	(0.0037)
CAR$_{i,t}$	0.0001	-0.0001	0.0001	-0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Deposits/TA$_{i,t}$	0.1329***	-0.0559***	0.0679***	-0.0550***
	(0.0082)	(0.0097)	(0.0119)	(0.0097)
Loan/TA$_{i,t}$	0.0062	0.0225***	0.0271**	0.0247***
	(0.0057)	(0.0083)	(0.0133)	(0.0085)
Bank FE (i)	YES	YES	YES	YES
R-squared	0.386	0.045	0.209	0.042

Conclusion

- Using the policy rate shock engineered by the Bank of Russia in December 2014 we find:

  1. Interest expense sensitivity of banks has a significant positive impact on *insured* deposit rates but insignificant impact on *uninsured* deposit rates
  2. In the post-shock period the premium paid by banks on *uninsured* deposits over *insured* deposits significantly declined. Furthermore, interest expense sensitivity of banks has contributed to this decline for long-term rates
  3. Banks significantly increased share of short-term individual deposits in the post-shock period and interest expense sensitivity of banks significantly contributed to this dynamics
  4. Interest rate sensitivity of banks on the liability side allows them to immediately pass-through the interest rate shock to their depositors, while interest rate sensitivity of banks' on the assets side is insignificant in passing the policy shock to banks' borrowers.