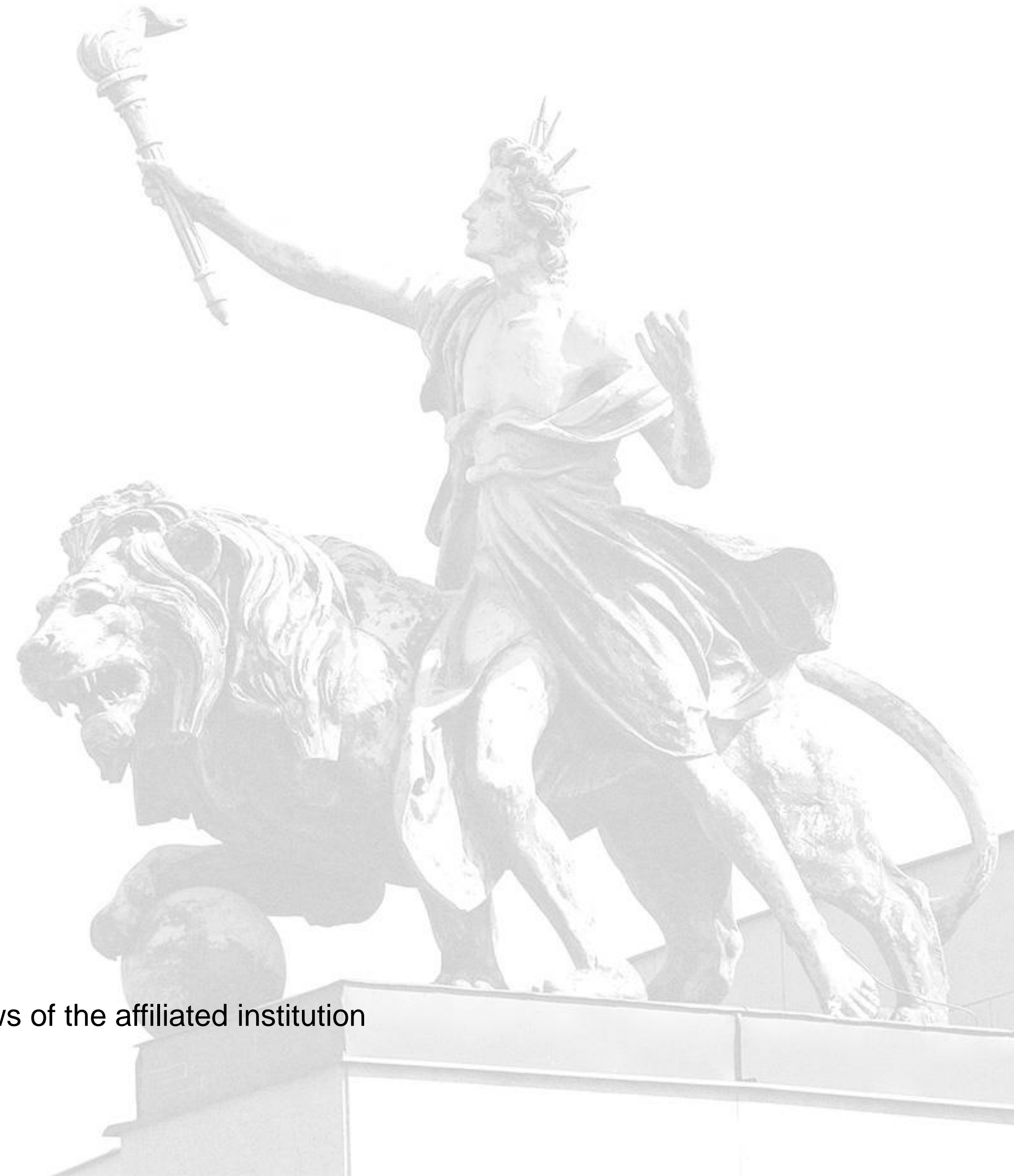# How fast and strong is interest rate pass-through for Czech loans:
Time-varying approach

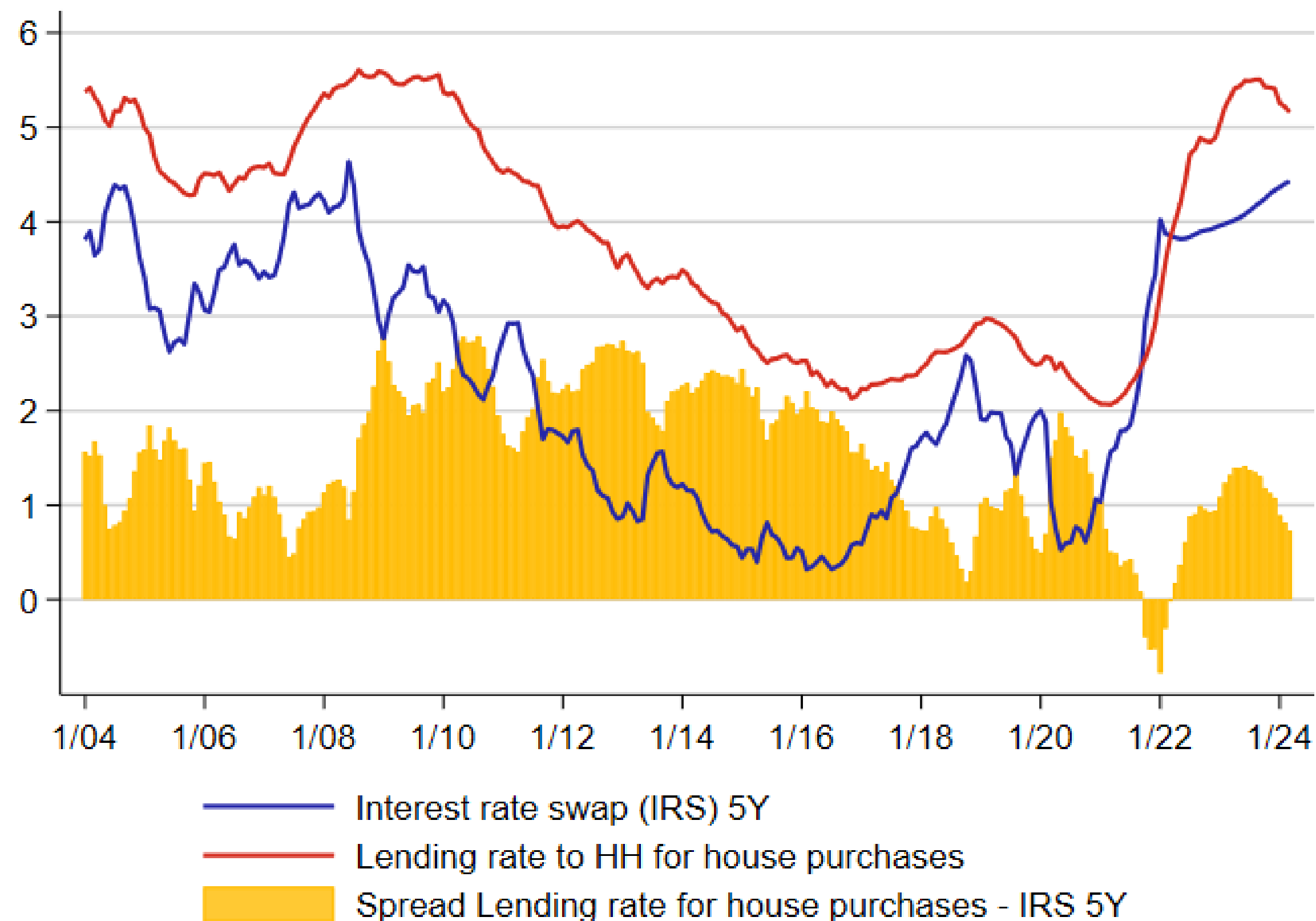Eva Hromádková, Ivana Kubicová, Saxa Branislav

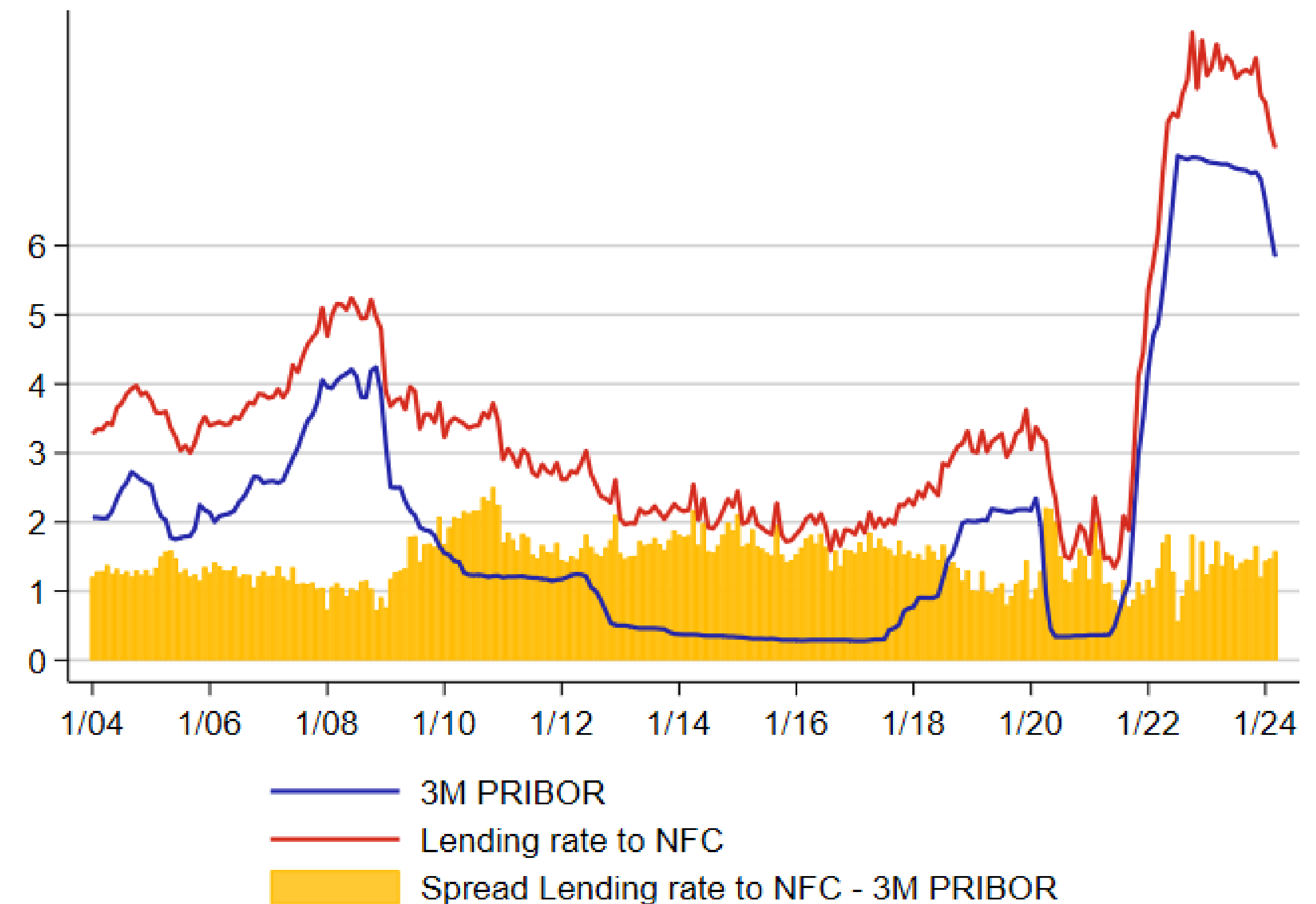Czech National Bank

Outline

Motivation

- For monetary policy makers, functioning **transmission of policy interest rates** to the real economy and ultimately **to the inflation** is of utmost importance

- An essential part at the beginning of the transmission mechanism is the **pass-through from policy interest rate to client rates** (here we focus on mortgages and corporate loans)

- The goal of this paper is to examine the interest rate pass-through from policy to client lending rates in the Czech Republic focusing on possible **changes in the pass-through over time**

Mortgage rate and 5Y IRS

Corporate credit rate and 3M PRIBOR (Prague Interbank OR)

Interest rate swap (IRS) 5Y
Lending rate to HH for house purchases
Spread Lending rate for house purchases - IRS 5Y

3M PRIBOR
Lending rate to NFC
Spread Lending rate to NFC - 3M PRIBOR

Empirical approach

- To estimate the pass through into commercial rates, we use the autoregressive distributed lag model (ARDL model):

$$y_t = c_0 + \sum_{i=1}^{p} \phi_i y_{t-i} + \sum_{i=0}^{q} \boldsymbol{\beta}_i' \boldsymbol{x}_{t-i} + u_t$$

where $y_{t-i}, \ i = 1, \dots, p$ are lagged values of dependent variable, and $\mathbf{x}_{t-i}, \ i = 1, \dots, q$ are lagged values of vector of independent variables $x_j, \ j = 1, \dots, K$

Empirical approach: Mortgages

- ARDL is in fact a special case of structural error correction model (ECM) in the sense that it captures conditional response of one variable to other, potentially endogenously determined, variables, while isolating a cointegration relationship among them

- Thus, in our estimation, we use ECM reparametrisation of ARDL in the form

What are we interested in:

θ_1: Long term coefficient at 5Y IRS
θ_2: Long term coefficient at unemployment
ω_1: Short term coefficient of 5Y IRS
α: Speed of adjustment

$$\Delta y_t = c_0 + \alpha(y_{t-1} - \boldsymbol{\theta} \boldsymbol{x}_{t-1}) + \sum_{i=1}^{p-1} \psi_{yi} \Delta y_{t-i} + \boldsymbol{\omega}' \boldsymbol{\Delta x}_t + \sum_{i=1}^{q-1} \boldsymbol{\psi}'_{\boldsymbol{xi}} \boldsymbol{\Delta x}_{t-i} + u_t$$

Mortgage lending rate

Vector of 5Y IRS and unemployment

Empirical approach: Corporate loans

ECM reparametrisation of ARDL for corporate rates:

What are we interested in:

θ_1: Long term coefficient at 3M PRIBOR
θ_2: Long term coefficient at output gap
ω_1: Short term coefficient of 3M PRIBOR
α: Speed of adjustment

$$\Delta y_t = c_0 + \alpha(y_{t-1} - \boldsymbol{\theta} \boldsymbol{x}_{t-1}) + \sum_{i=1}^{p-1} \psi_{yi} \Delta y_{t-i} + \boldsymbol{\omega}' \boldsymbol{\Delta x}_t + \sum_{i=1}^{q-1} \boldsymbol{\psi}'_{\boldsymbol{xi}} \boldsymbol{\Delta x}_{t-i} + u_t$$

Corporate lending rate

Vector of 3M PRIBOR and output gap

Empirical approach: Rolling windows

- In contrast to most of the available research that estimate pass-through using the entire available time period, we estimate the coefficients for rolling time windows of a constant length of 8 years

- This allows us to identify potential changes in the strength and speed of pass-through to client rates

Data

- We use monthly data for the Czech Republic, aggregated across banks and covering period from January 2004 to March 2024

- Two quantitatively most important loan segments in the Czech Republic are covered – loans to households for house purchase and loans to non-financial companies

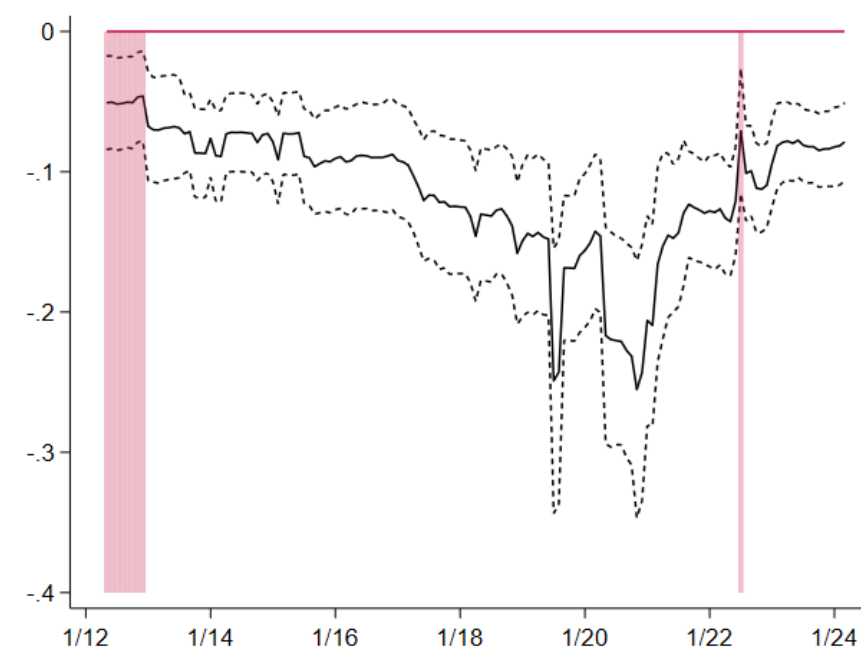- The lending rates are the rates for newly provided loans

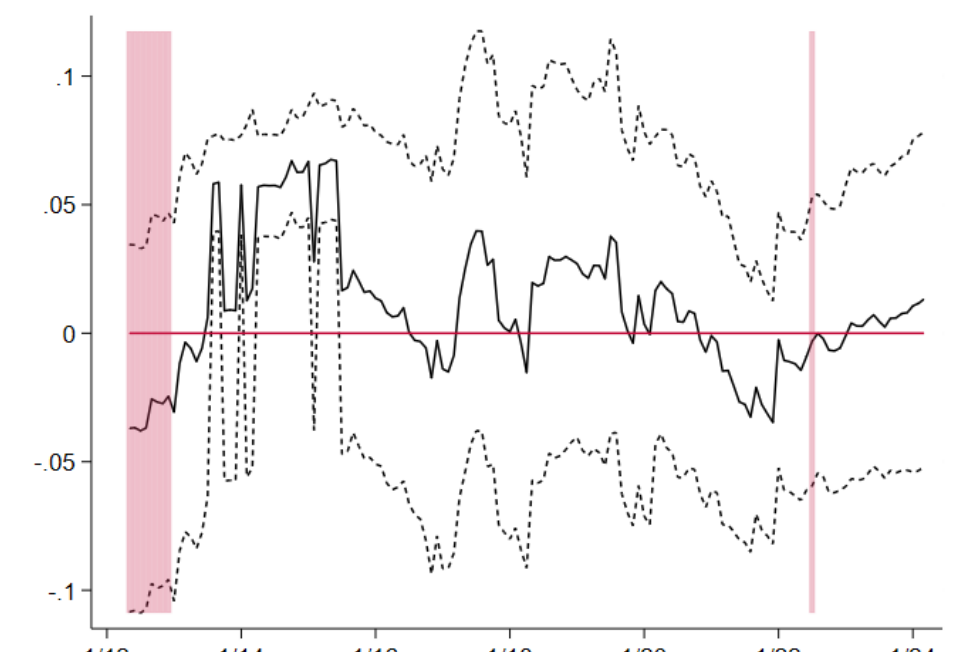Panel A: Long-term coefficient on 5 year IRS rate (θ_1)
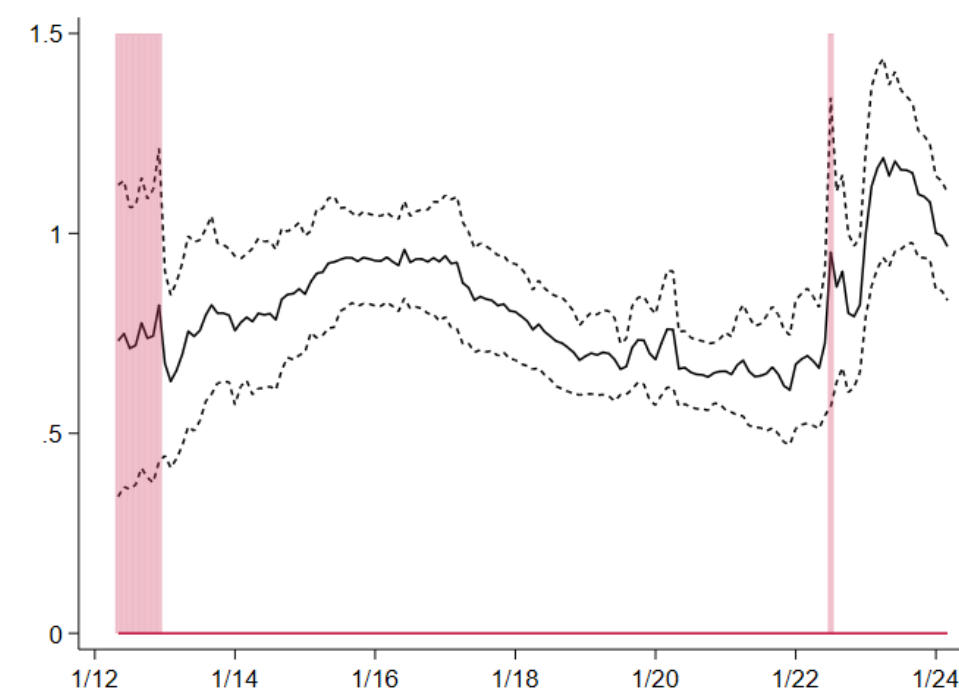
Panel B: Long-term coefficient on unemployment (θ_2)
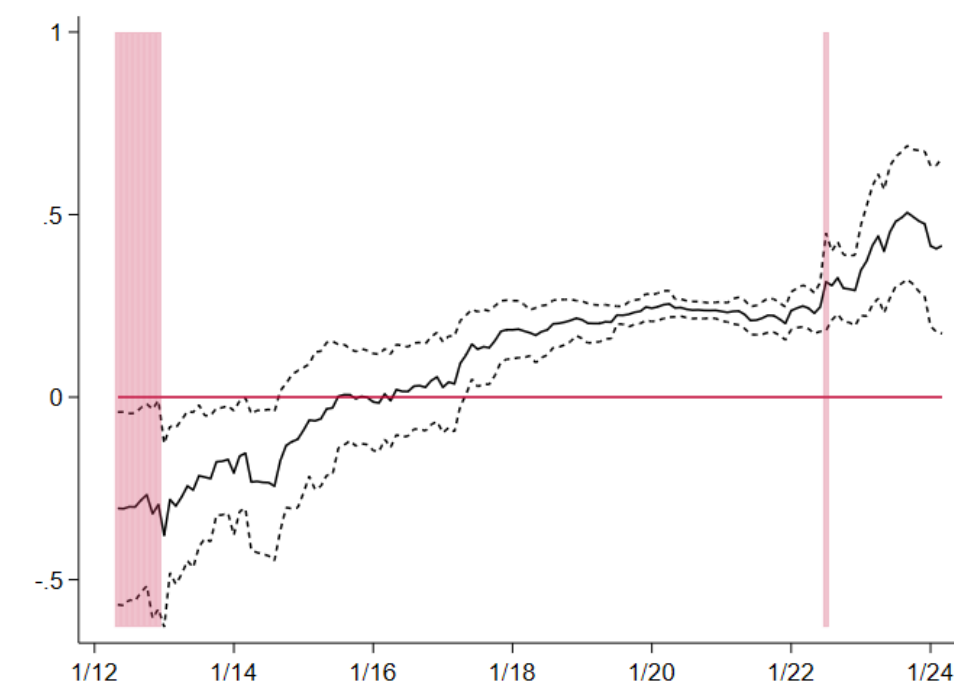
Results: Mortgages

Panel C: Speed of adjustment (α)

Panel D: Short-term coefficient on 5-year IRS rate (ω_1)
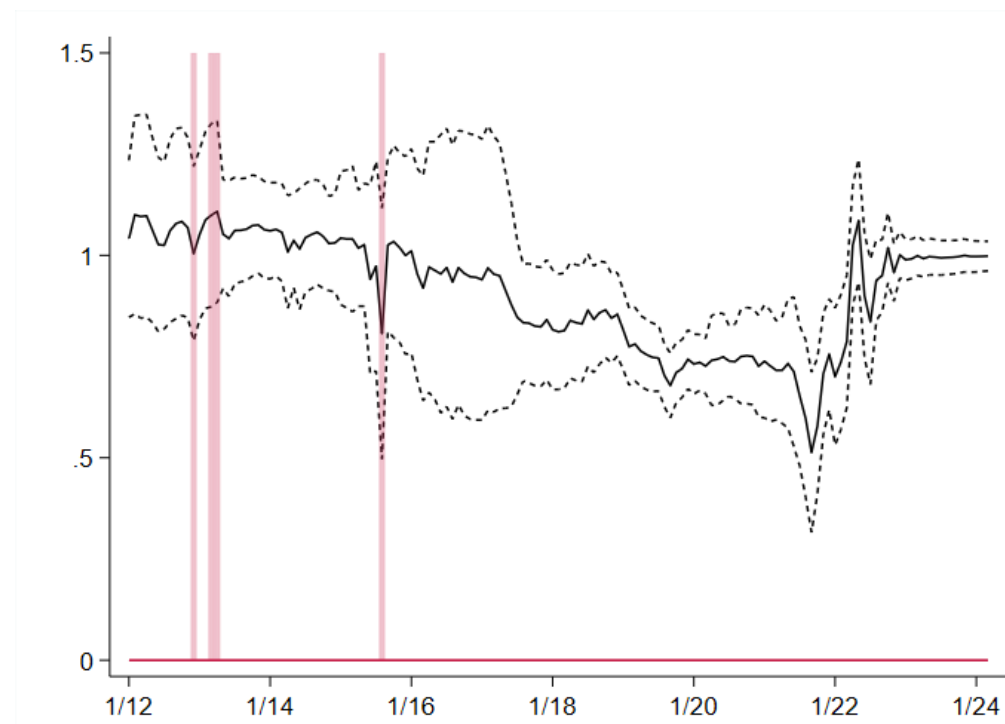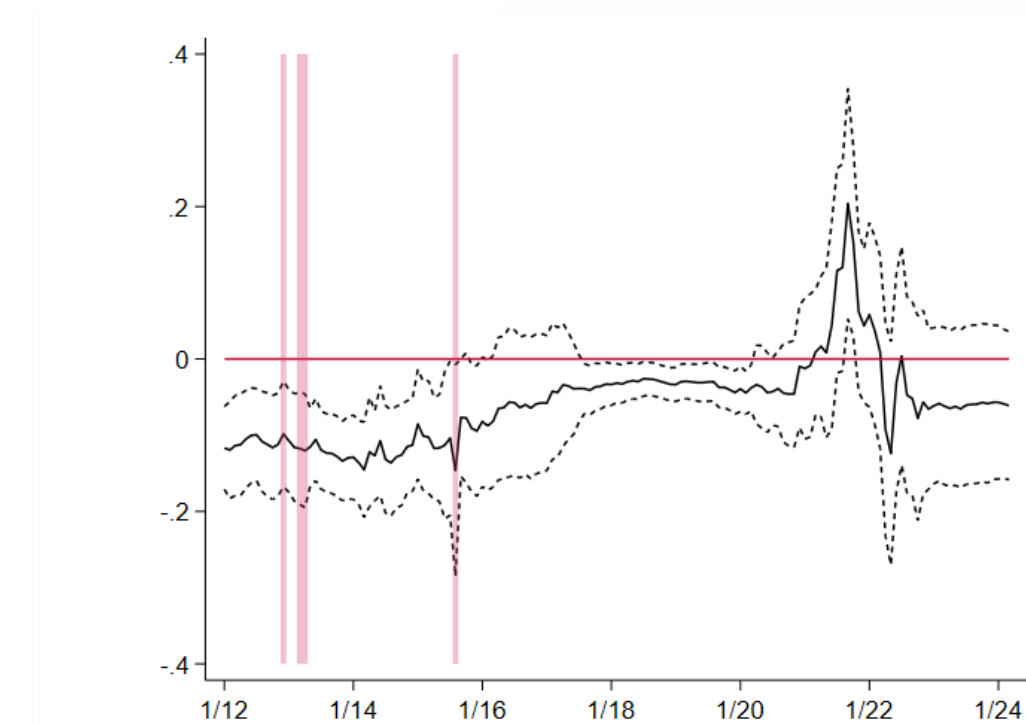

- The typical lag between a change in the reference rate and the maximum impact on the client rate is 4 months (based on AIC consistent with other analyses)

- The key long-term transmission of the 5R IRS change is in the range of 0.6-1 throughout the estimation period

- In recent years, the coefficient at unemployment reached a value of around 0.2-0.3, i.e. an increase in unemployment by 1 p.b. implies an increase in the risk premium for the client mortgage rate by about 0.2-0.3 p.b.

- Speed of adjustment did grow gradually in absolute value until, which indicates an increasing speed of pass-through

Note: The red area denotes period in which cointegration between variables is NOT statistically significant and is computed based on F-statistics a t-statistics of the whole cointegration relationship. If both statistics are significant at least at 10 percent level of significance the long term equilibrium is statistically significant. Dotted line denotes both-sided confidence interval of a size of two standard deviations.
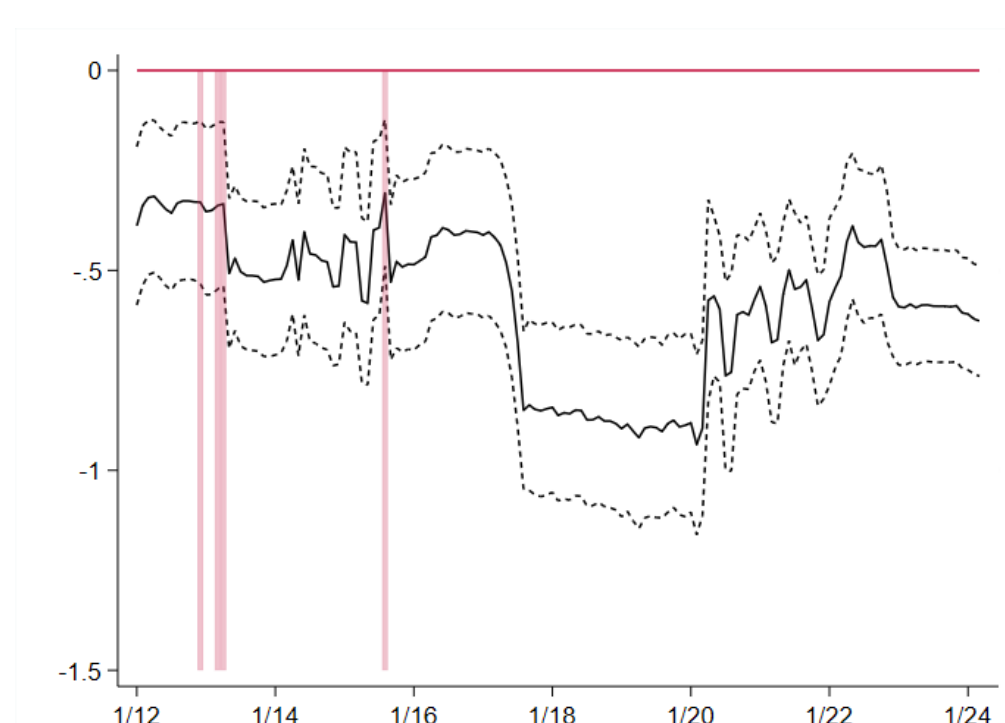
Panel A: Long-term coefficient on 3M PRIBOR (θ_1)

Panel B: Long-term coefficient on output gap (θ_2)

Panel C: Speed of adjustment (α)

Panel D: Short-term coefficient on 3M PRIBOR (ω_1)
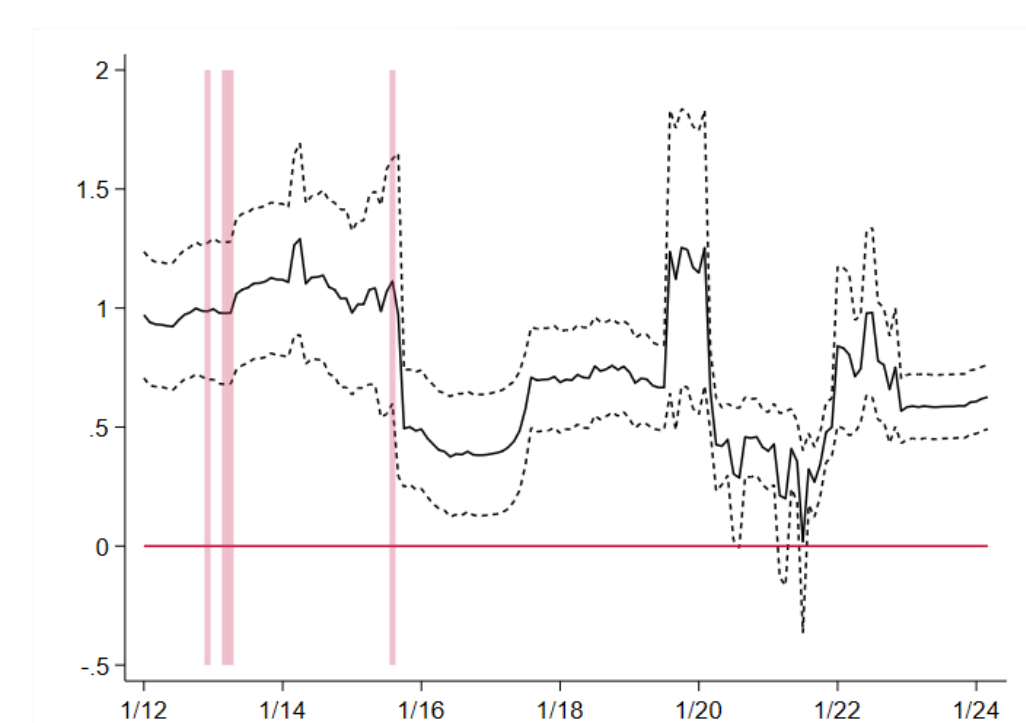
Results: Corporate loans

- According to our estimate, the long-term passthrough of 3M PRIBOR into client interest rates was complete until 2017, after which the coefficient dropped slightly to values around 0.8

- The speed of adjustment grew over time with the increasing absolute value of the coefficient

Note: The red area denotes period in which cointegration between variables is NOT statistically significant and is computed based on F-statistics a t-statistics of the whole cointegration relationship. If both statistics are significant at least at 10 percent level of significance the long term equilibrium is statistically significant. Dotted line denotes both-sided confidence interval of a size of two standard deviations.
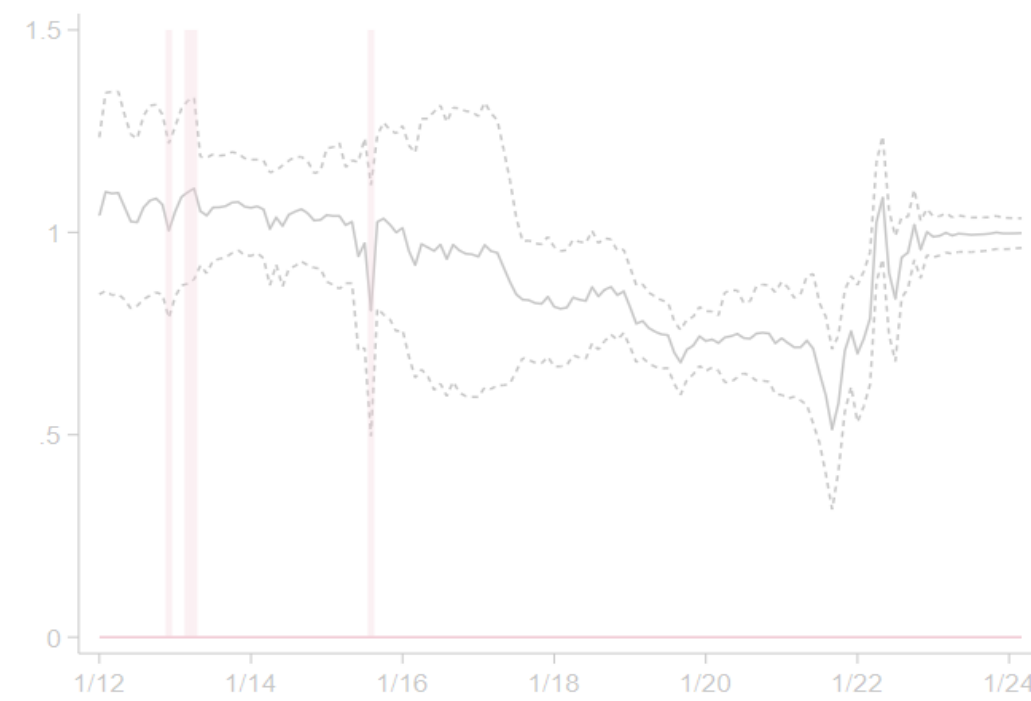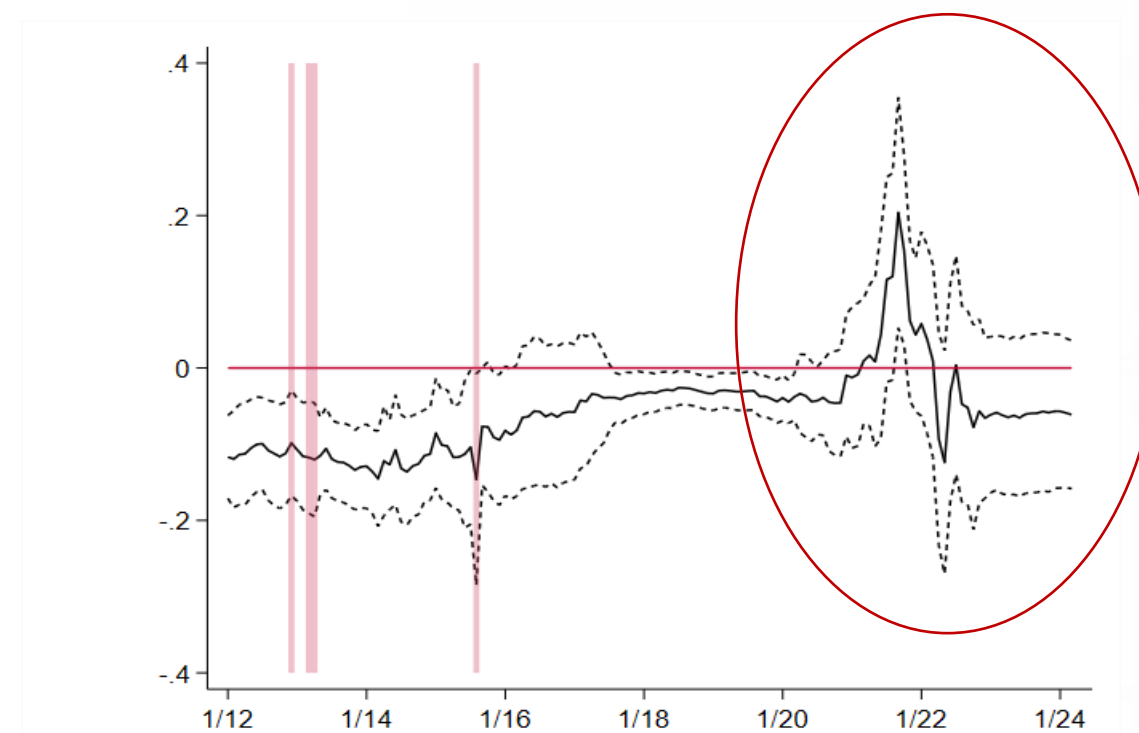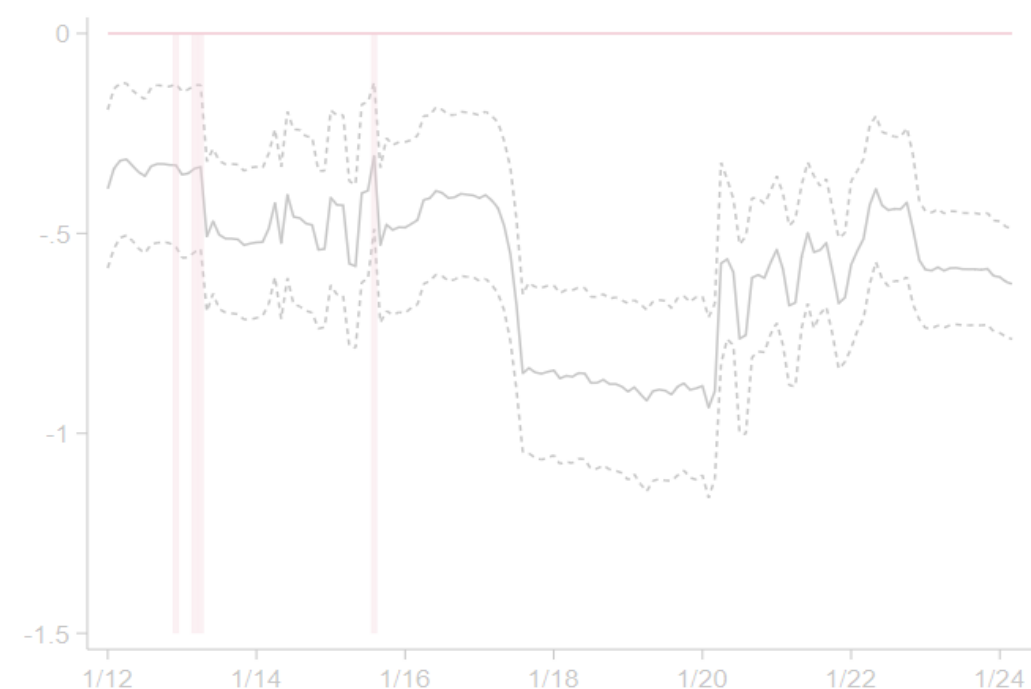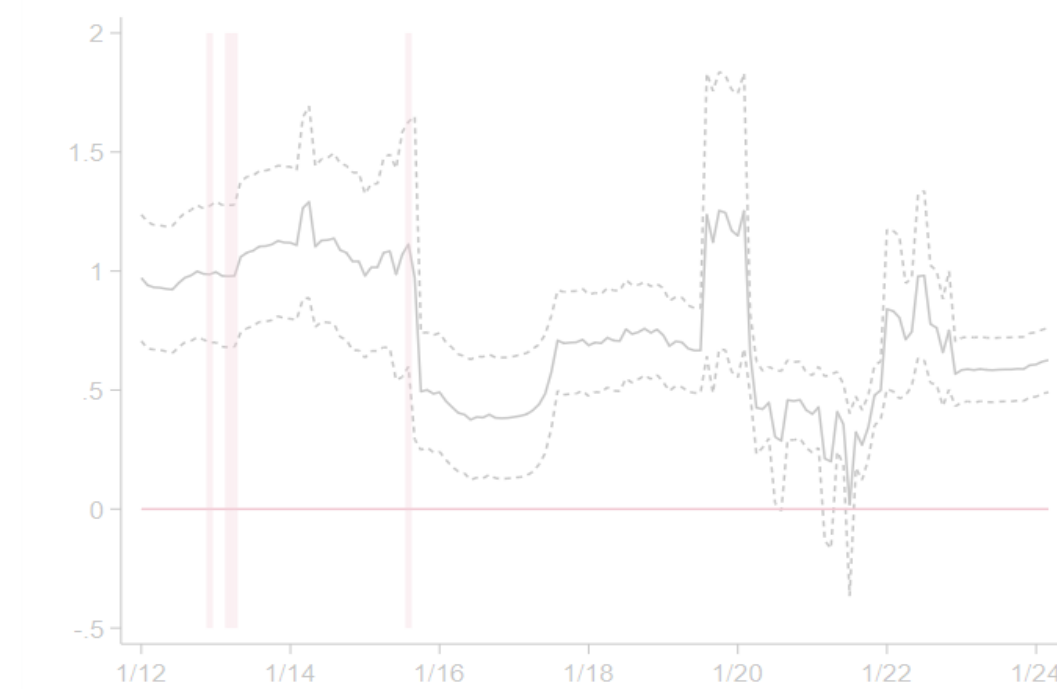
Panel A: Long-term coefficient on 3M PRIBOR (θ_1)

Panel B: Long-term coefficient on output gap (θ_2)

Panel C: Speed of adjustment (α)

Panel D: Short-term coefficient on 3M PRIBOR (ω_1)

Results: Corporate loans

- The coefficient of the output gap (an approximation of the risk premium for non-financial enterprises) was relatively stable in the period before the covid pandemic. With a coefficient of -0.1, a reduction in the output gap by 1 p.b. implies an increase in the risk premium for the client rate from corporate loans by approx. 0.1 p.b.

- Sharp change of the output gap coefficient to positive (and statistically insignificant) values in the windows ending between 2020-2022 was temporary and caused by two factors:

  - The extraordinary uncertainty associated with the estimation of the output gap during the period of the covid pandemic
  - Decoupling of the relationship between the performance of the economy and the valuation of risk during this period, related to credit guarantees and to the government assistance programs that limited the rise in interest rates

Summary

- Housing loans: The transmission of 5Y IRS to client rates is strong in the long term, although it is not complete currently

- An increase in unemployment by 1 p.p. implies an increase in the risk premium for the client mortgage rate by approximately 0.2 p.p.

- Corporate loans: Strong and immediate reaction of client interest rates to the change in 3M PRIBOR, especially until 2015. Although the immediate pass-through weakened in the following years, the change in 3M PRIBOR is almost completely passed on with a minimal delay

- A reduction in the output gap by 1 p.p. implies an increase in the risk premium for the client interest rate on corporate loans by approximately 0.1 p.p.

Further research into transmission at CNB

- Spillover of ECB's monetary policy on the Czech Economy (Gric. Z, Janku J. and Malovana S.) using individual data from Anacredit database

  - Strong spillover effects of the ECB's monetary policy on the Czech economy through corporate lending.

  - Significant substitution effect between corporate loans granted in domestic (CZK) and foreign (EUR) currencies

  - Higher interest rate differential between domestic and foreign rates increases lending in EUR far more than it decreases lending in CZK.

  - Implication => diminished impact of domestic monetary policy through the traditional credit channel.

Does Loan to Value Limit Influence Mortgage Rate? (Hromadkova E., Kubicova I. and Saxa. B)

  - Significant effect of LTV limit recommendations over the period 2015 - 2024 on the pricing of the affected LTV categories

  - Effect is asymmetric (significant under tightening, insignificant under loosening of policy)

  - Implication => interaction between macroprudential tools and monetary policy

Thank you for your attention!

Motivation - explanation

- Project started as an internal evaluation tool, that allowed us to immediately evaluate the

  strength and speed of transmission, as well as compare trends in transmission it over time.
  - Focus on the most important sectors
  - Reliance on the results of the previous studies in the choice of the underlying variables
  - We have chosen the time series that are available at the highest frequencies and reflect current information set (e.g. unemployment vs. NPL)
  - Automatization of the whole process – downloading, testing, estimation and reporting

- Off-project - presentation of the results of the tool with the main lessons learned
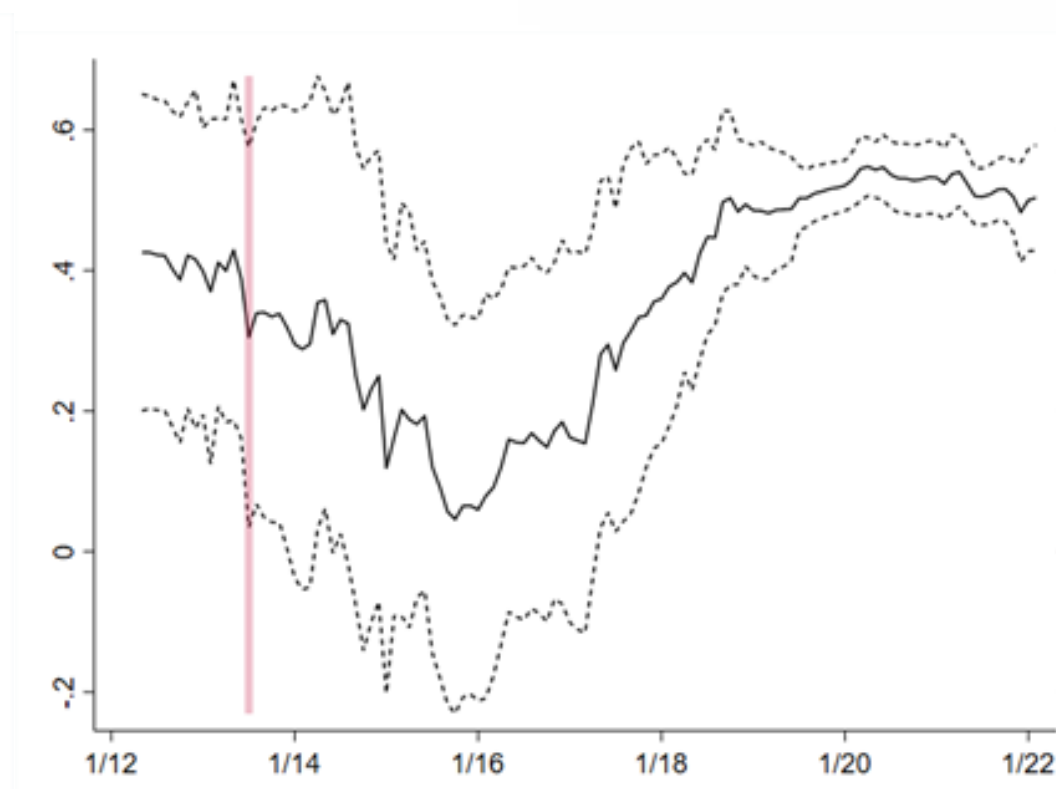
Alternative proxy for credit risk premium

Long-term coefficient at 5 year IRS rate
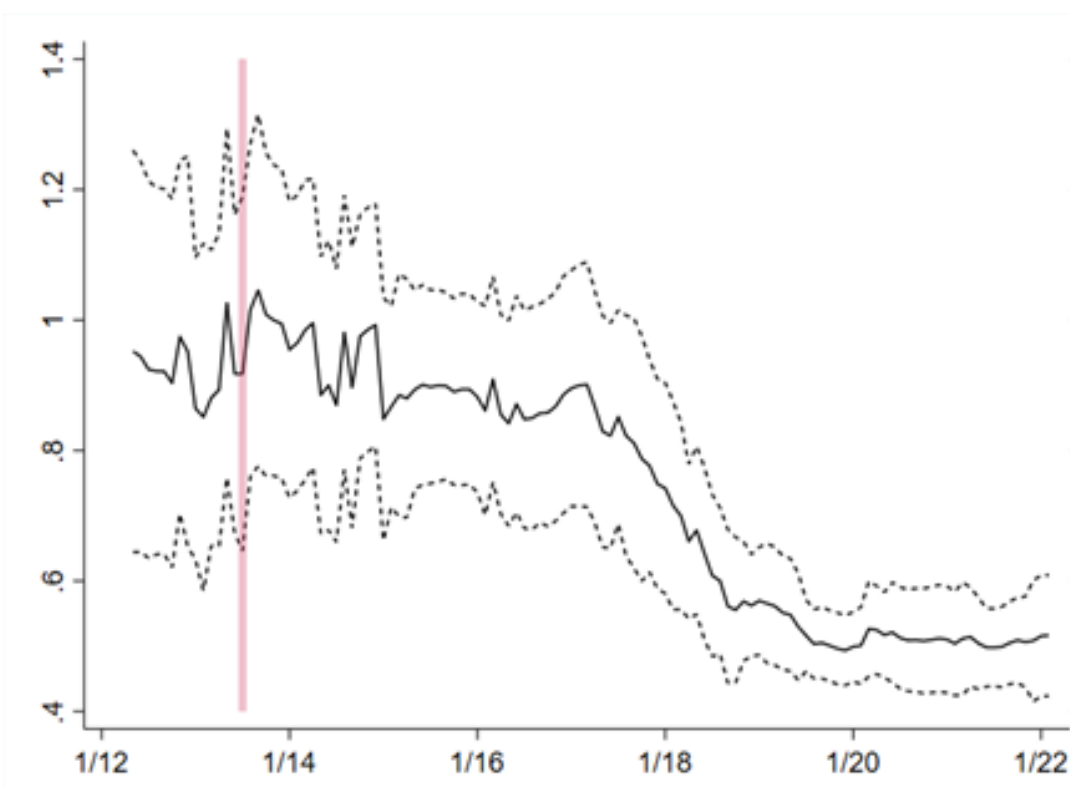
Long-term coefficient at NPL (shift t + 12)

Speed of adjustment
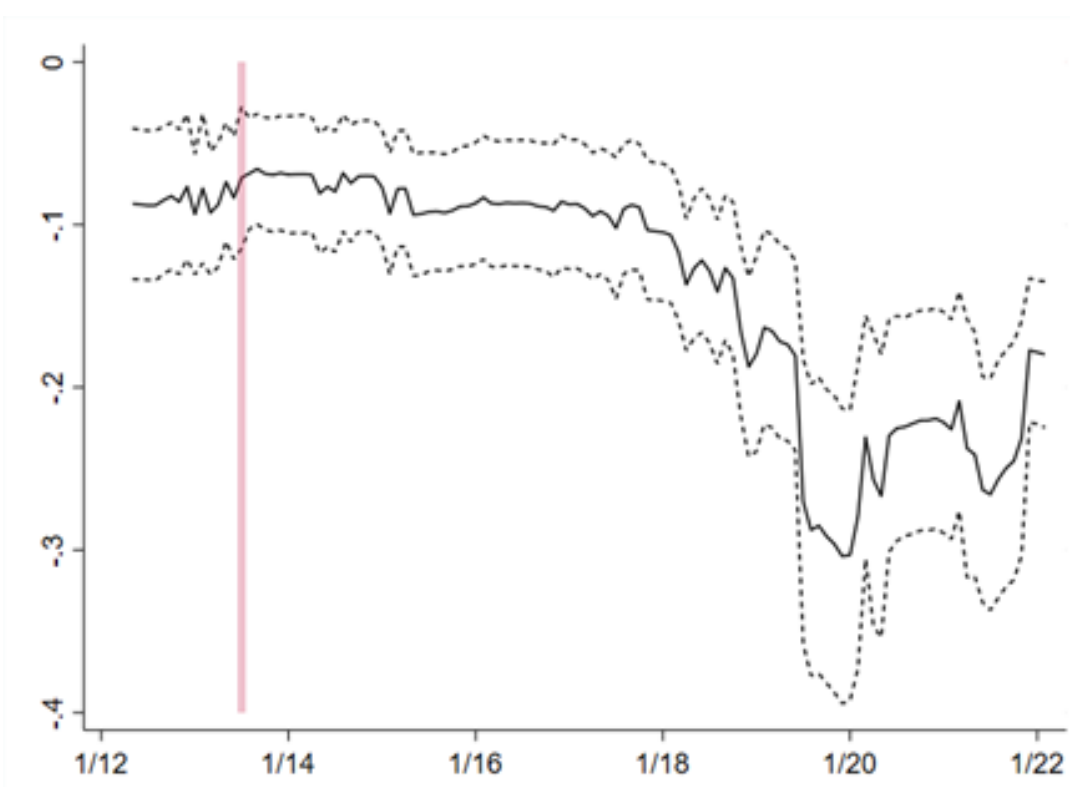
Short-term coefficient at 5 year IRS rate
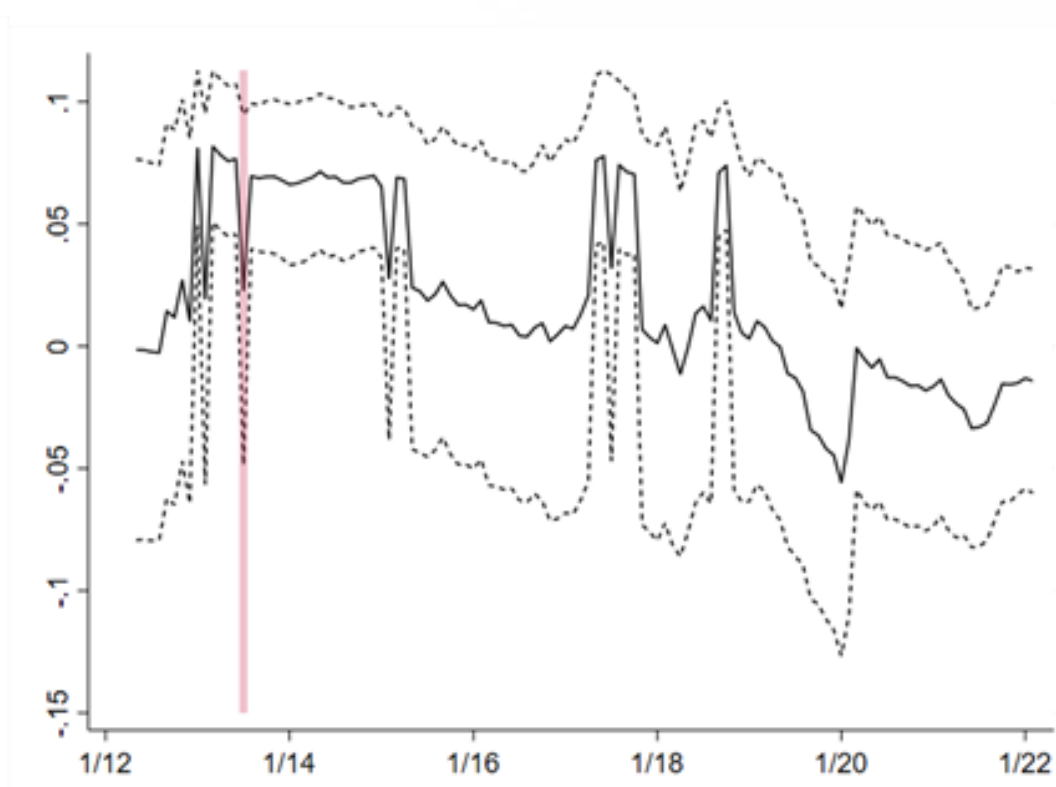
- Sector specific measures of non-performing loans

- Both current values and 1-year ahead (under assumption that banks are able to predict NPL accurately

- Bad results for loans for non-financial corporations (insignificant relationship)

- Good results for mortgages loans, especially using 1-year ahead values (see the Graph for results)

17

Competition in banking sector
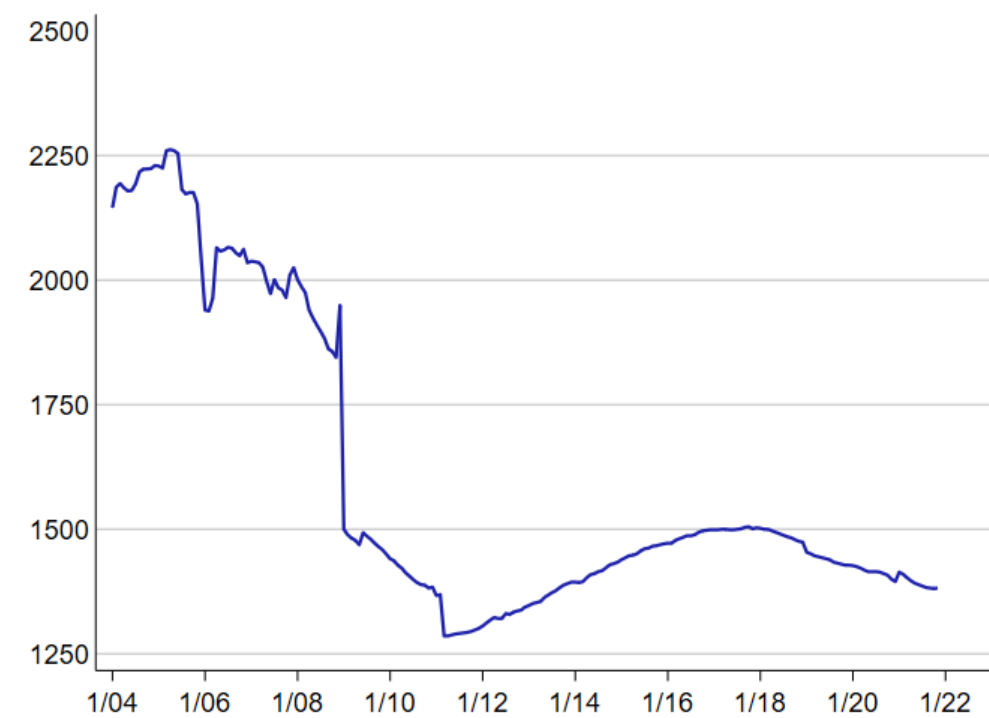
Herfindahl – Hirschman index

Mortgages

Loans to NFCs
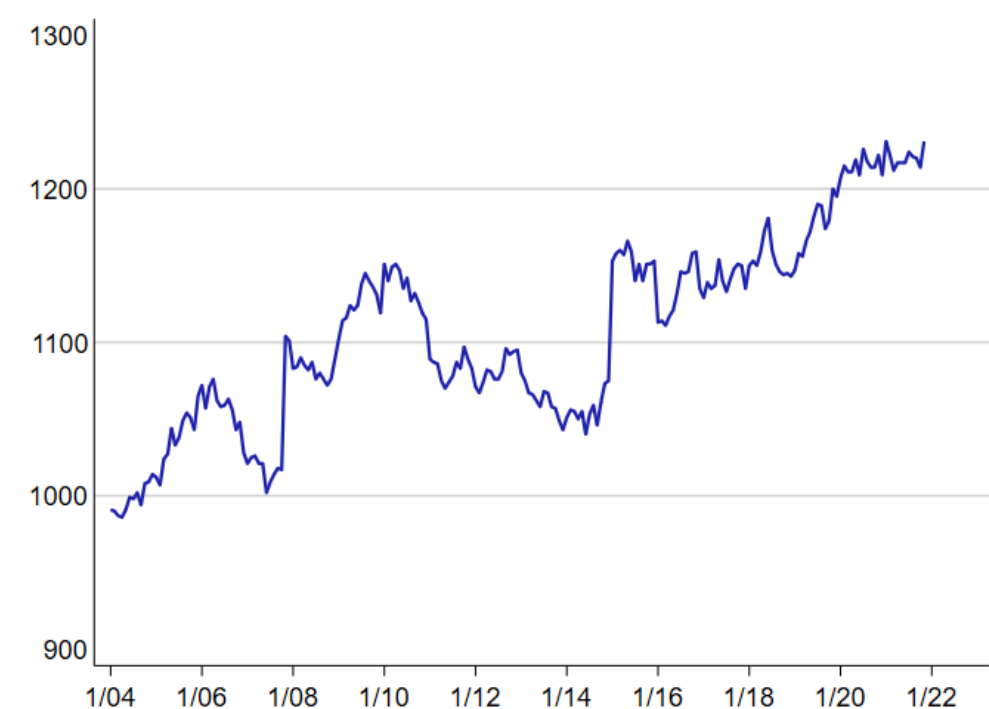
- Higher the competition more banks have to lower the margins – price will be closer to marginal costs

- Proxied by concentration index – Herfindahl-Hirschman
  - Sum of squared roots of market shares – higher the number higher the concentration
  - Higher concentration => lower competition

- Mortgages – significant decrease 2005-2011, afterwards slight increase followed by decrease

- NFC – trend is increasing, the absolute value lower than for mortgages (more "players")

Robustness check – alternative interest rates

- Non-financial corporations: PRIBOR 3M is a standard measure, but we tried correlations and estimation with other types of interest rates as well (e.g. PRIBOR 1M was strong)

- Mortgages: choice based on the pricing policies reported in BLS + analysis of correlations, considered also other durations and government bonds, results have not been so good (stable)

Spread between 3 month PRIBOR and 2 week policy interest rate
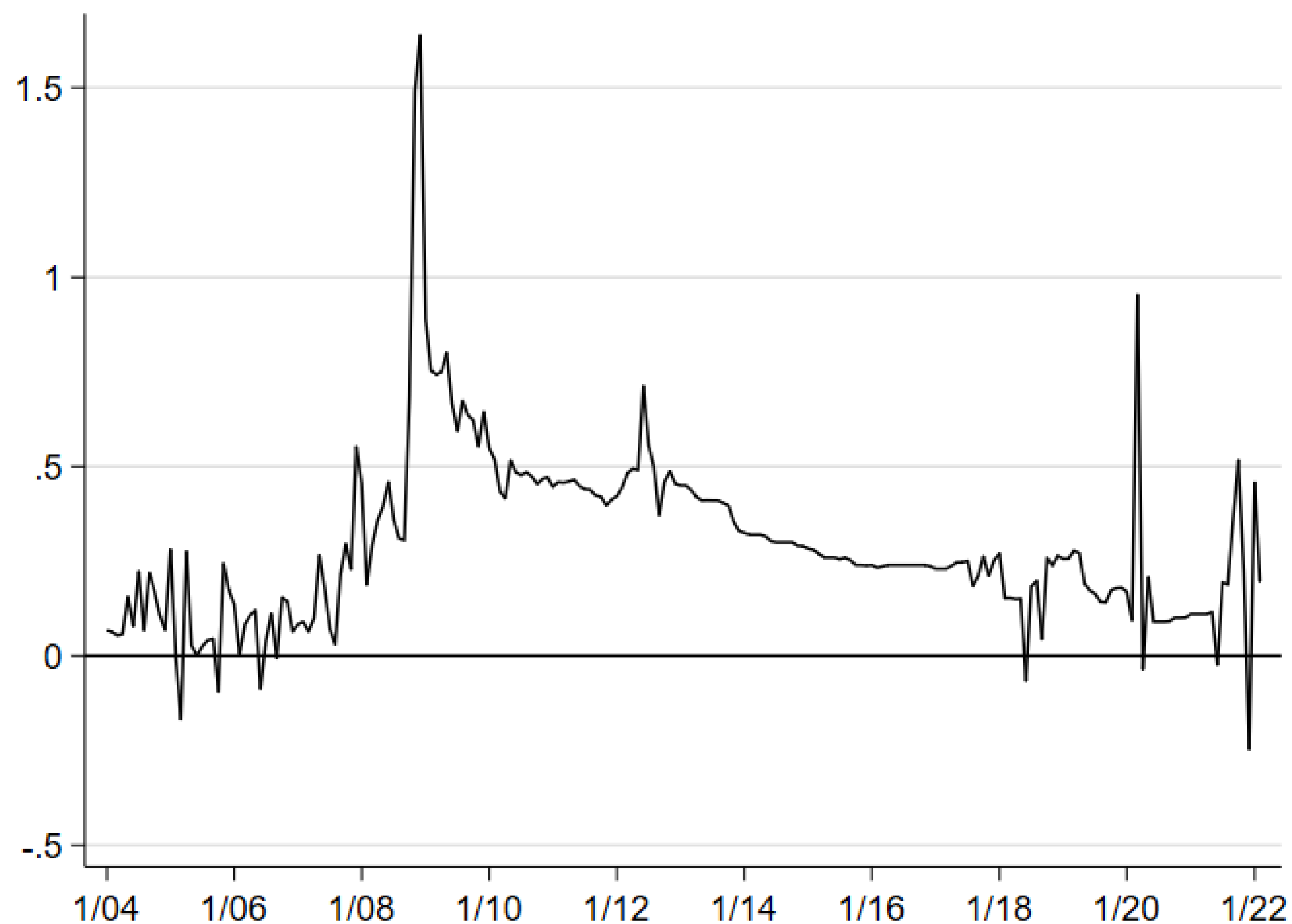
- Pass-through from key monetary policy 2 week repo rate to 3M PRIBOR is relatively straightforward

- Changes in the policy rate show up in the 3M PRIBOR practically immediately and almost fully

- Spread 3M PRIBOR – 2w repo is driven mainly by credit risk premium on the interbank market and the expectations of policy interest rate changes

Response of money market to all 25bp hikes

Response of money market to 7 most surprising 25bp hikes (1W PRIBOR DoD change >20bp)
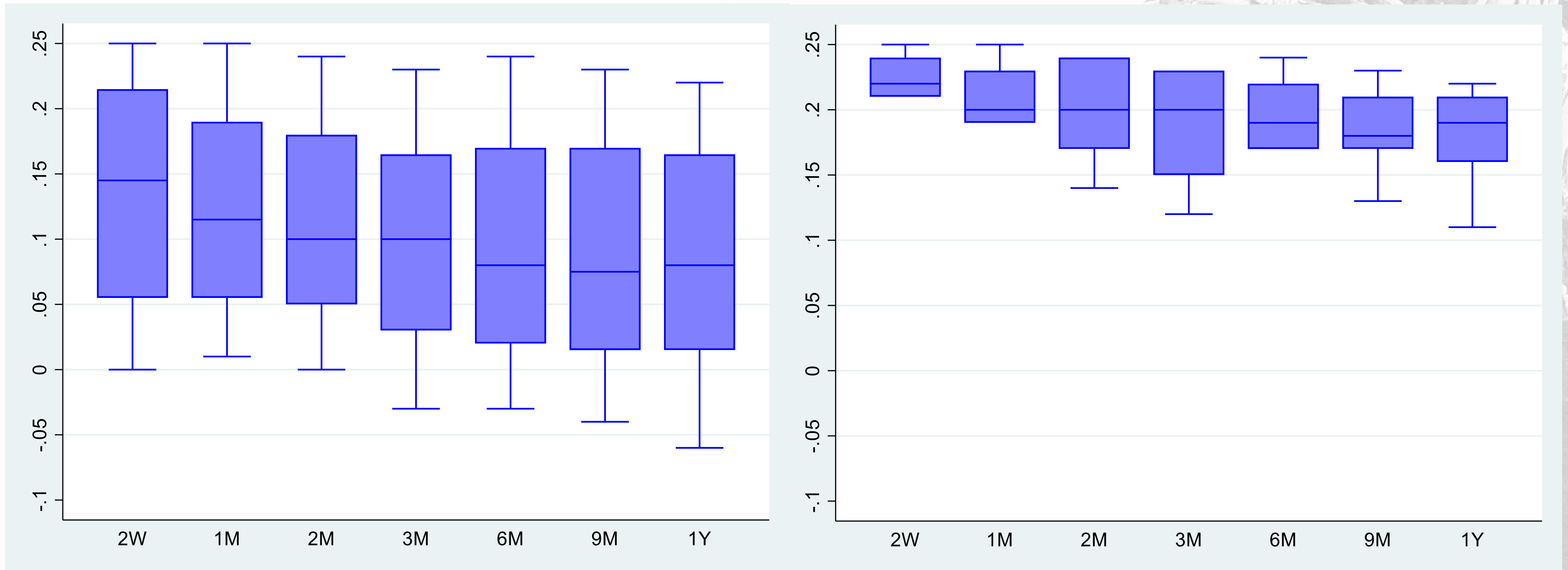
Response of IRS to all 25bp hikes
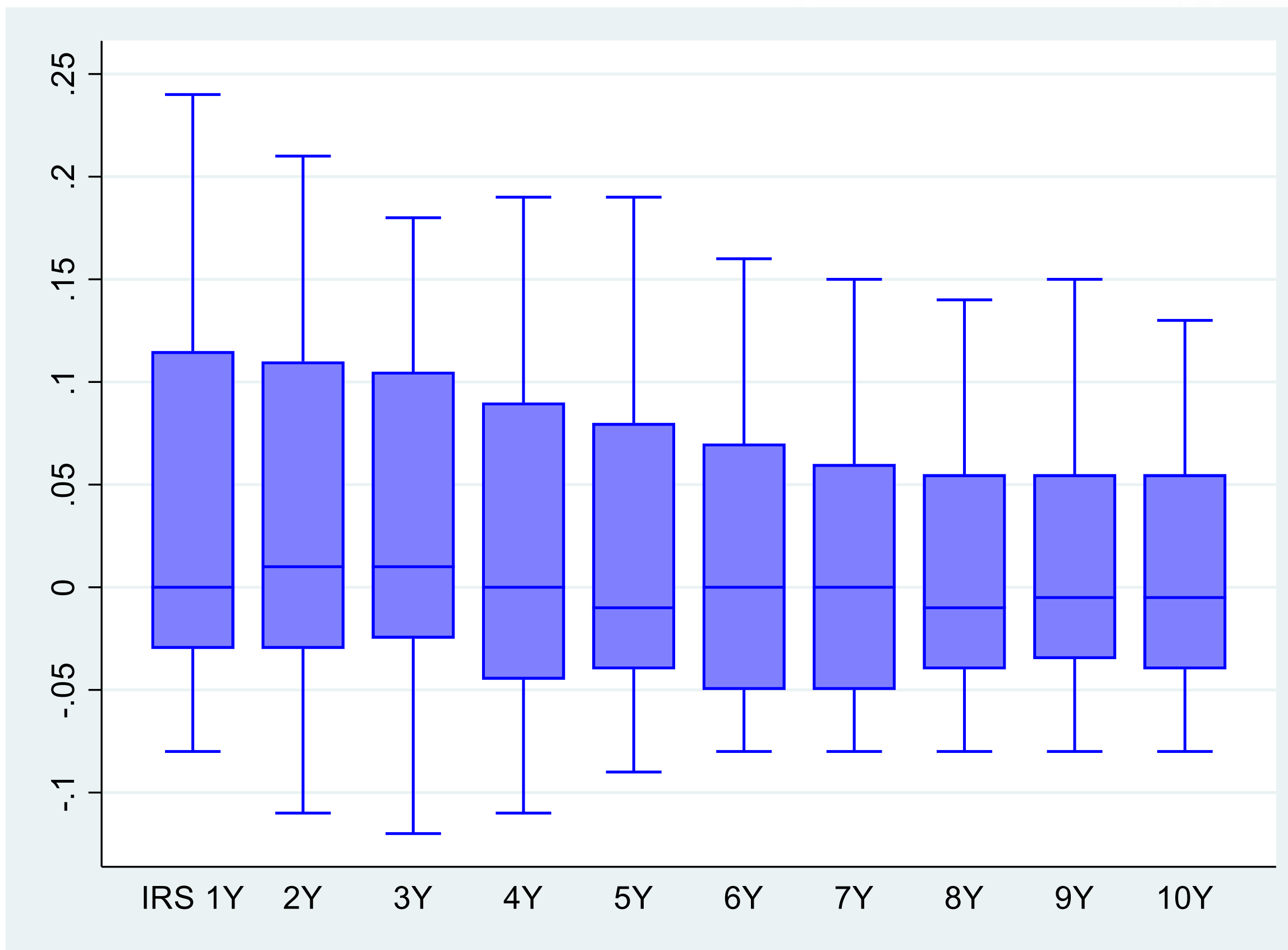
Response of IRS to 7 most surprising 25bp hikes (1W PRIBOR DoD change >20bp)

Surprising hikes and expectations of analysts

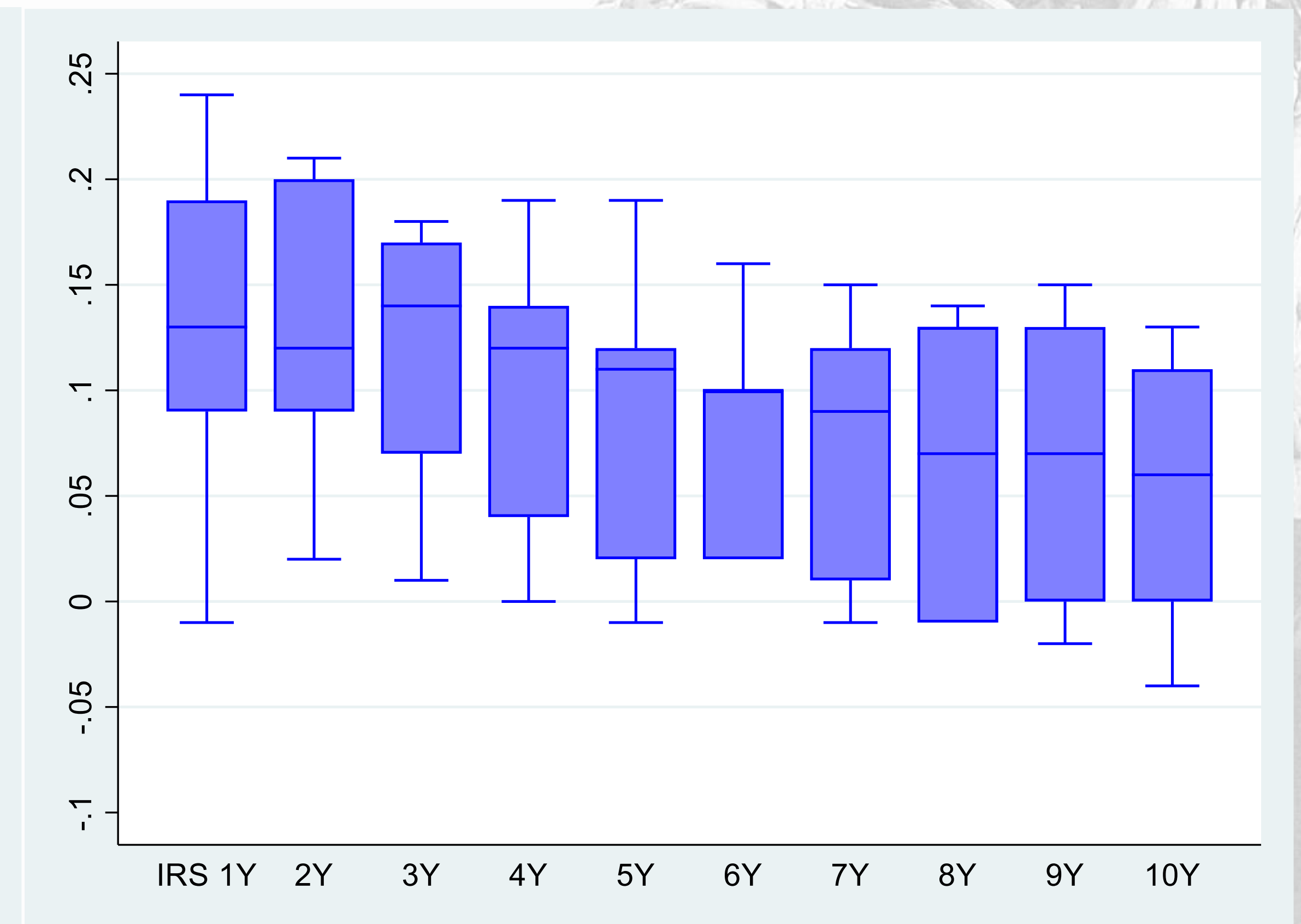|	date	day_id	diff_h1 on	diff_h2 1T	diff_h3 2T	diff_h4 1M	diff_h5 2M	diff_h6 3M	diff_h7 6M	diff_h8 9M	diff_h9 1R	diff_h10 repo	reuters_hike	reuters_all	ioft_hike	ioft_all	bloomberg_hike	bloomberg_all	ratio_hike
124	25.06.2004	125	0,26	0,23	0,22	0,19	0,14	0,12	0,17	0,18	0,19	0,25							
167	27.08.2004	168	1,21	0,02	0,02	0,01	0	-0,01	-0,01	-0,01	0,01	0,25	18	24					75%
464	31.10.2005	465	0,95	0,22	0,21	0,19	0,21	0,22	0,24	0,23	0,22	0,25	0	18					0%
651	28.07.2006	652	1,11	0,05	0,05	0,06	0,05	0,03	0,03	0	-0,01	0,25	15	23					65%
695	29.09.2006	696	1,41	0,1	0,08	0,05	0,05	0,03	0,01	0	0,02	0,25	9	24					38%
863	01.06.2007	864	1,15	0	0,01	0,01	0	0,01	0,01	0,01	0	0,25	14	21					67%
901	27.07.2007	902	1,17	0,01	0	0,02	0,04	0,06	0,05	0,02	0,06	0,25	14	15					93%
926	31.08.2007	927	0,87	0,19	0,2	0,11	0,08	0,07	0,06	0,08	0,08	0,25	7	16					44%
990	30.11.2007	991	1,33	0,1	0,06	0,08	0,05	0,01	-0,01	0,02	0,01	0,25	9	17					53%
1036	08.02.2008	1037	0,59	0,03	0,02	0,04	0,01	-0,03	-0,03	-0,04	-0,06	0,25	15	16					94%
3490	03.11.2017	3491	0,17	0,08	0,07	0,08	0,09	0,08	0,08	0,07	0,08	0,25	16	16					100%
3551	02.02.2018	3552	0,24	0,1	0,08	0,07	0,07	0,08	0,08	0,07	0,08	0,25			14	17			82%
3651	28.06.2018	3652	0,1	0,24	0,25	0,25	0,24	0,23	0,22	0,19	0,19	0,25			4	17			24%
3675	03.08.2018	3676	0,25	0,23	0,21	0,2	0,19	0,18	0,19	0,17	0,16	0,25	10	13					77%
3714	27.09.2018	3715	0,25	0,14	0,13	0,12	0,11	0,12	0,08	0,07	0,06	0,25			13	16			81%
3739	02.11.2018	3740	0,24	0,2	0,16	0,15	0,17	0,14	0,12	0,13	0,13	0,25			14	17			82%
3862	03.05.2019	3863	0,25	0,24	0,22	0,19	0,17	0,15	0,17	0,13	0,11	0,25			7	15	16	19	47%
4055	07.02.2020	4056	0,25	0,24	0,24	0,23	0,24	0,23	0,19	0,21	0,21	0,25	0	1		18	0		0%
4401	24.06.2021	4402	0,23	0,24	0,23	0,22	0,2	0,2	0,17	0,17	0,17	0,25			11	16			69%
4430	06.08.2021	4431	0,25	0,18	0,2	0,15	0,13	0,12	0,12	0,11	0,14	0,25			11	16			69%