Are low interest rates firing back? Interest rate risk in the banking book and bank lending in a rising interest rate environment

Seventh annual AWG and MPAG workshop

Latvijas Banka

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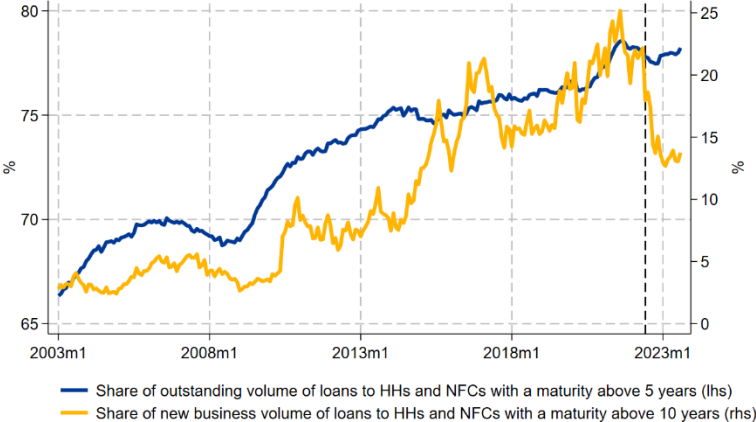
Focus of the paper

- **Descriptively show banks' build up of interest rate risk (IRR)**
  - Low for long interest rate environment altered the duration of bank balance sheets
  - Unexpected pace of the MP tightening led to materialization of interest rate risk

- **Look at the implications of banks' exposure to interest rate risk for monetary policy transmission to lending supply in a rising interest rate environment**
  - Banks with a larger exposure to IRR contract lending more than their peers
  - Banks reshuffle their lending away from long-term loans and fixed-rate loans

- **Identify borrowers affected by the contraction/reshuffling in lending supply**
  - Micro, small, and medium firms (MSMEs)
  - No full substitution from banks with a lower exposure to IRR

What happened during the low interest rate environment?

- Banks issued more fixed rate loans with a long maturity to compensate for compressed margins
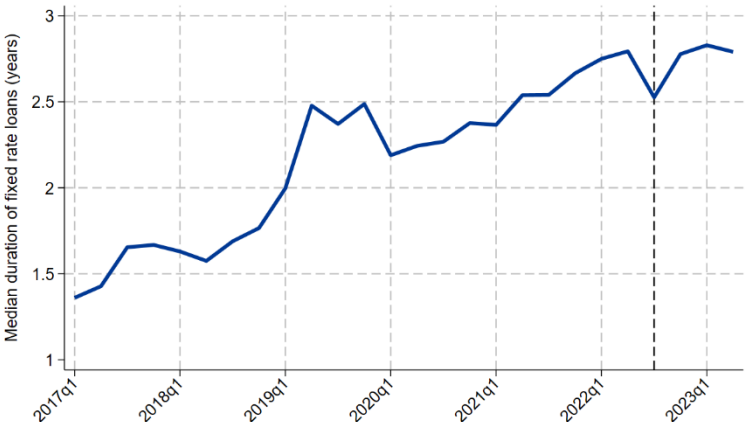- This increased the duration of banks' asset-side

Share of loans with a long maturity
Jan 2003 – July 2023, percentages

Duration of fixed rate loans
2017Q1-2023Q2, years

Share of outstanding volume of loans to HHs and NFCs with a maturity above 5 years (lhs)
Share of new business volume of loans to HHs and NFCs with a maturity above 10 years (rhs)

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What happened during the low interest rate environment?

- There was a large inflow of *sticky overnight deposits*, which behaviourally have a larger duration than term and redeemable deposits

- This increased the duration of banks' liabilities, counterbalancing the increase in the duration of the assets

Share of deposit types in total deposits to HHs and NFCs
Jan 2003 – July 2023, percentages
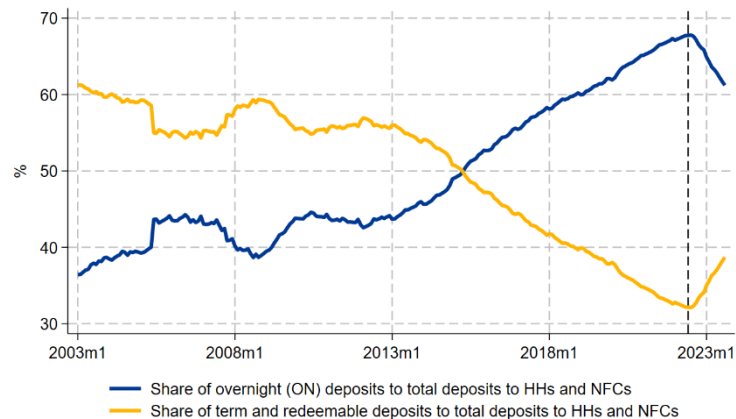
Share of overnight (ON) deposits to total deposits to HHs and NFCs
Share of term and redeemable deposits to total deposits to HHs and NFCs

Duration of deposit types
Average pre-tightening, years

Weighted average duration of non-maturity deposits
Weighted average duration of deposits other than non-maturity deposits

What happened since interest rates started to increase?

- There has been a material shift from overnight to term and redeemable deposits, reducing the duration of banks' liability-side
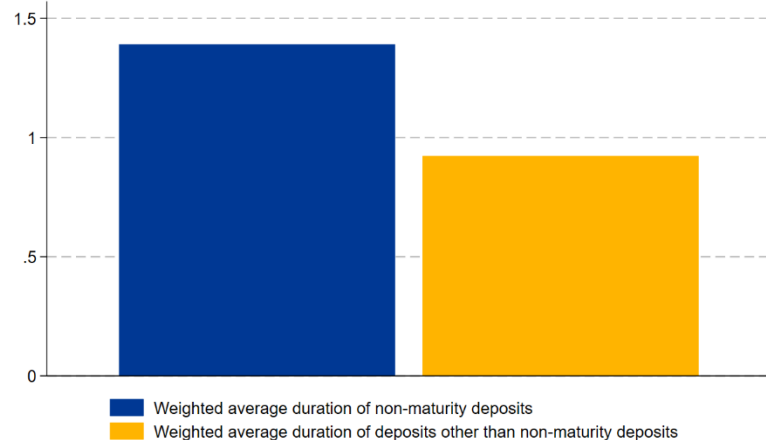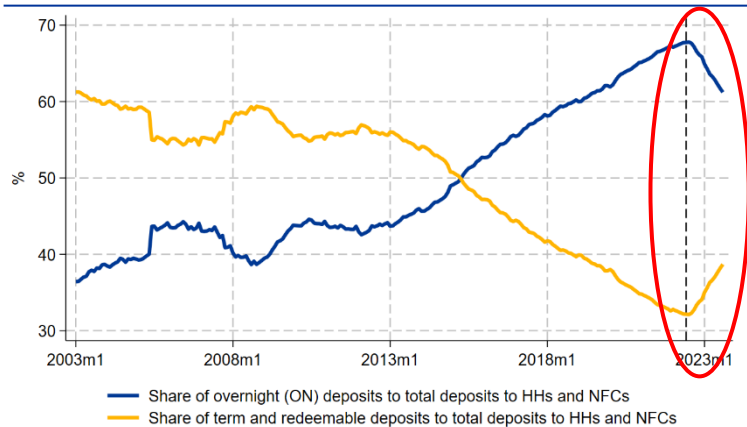
Share of deposit types in total deposits to HHs and NFCs
Jan 2003 – July 2023, percentages

Duration of deposit types
Average pre-tightening, years

Legend (left chart):
— Share of overnight (ON) deposits to total deposits to HHs and NFCs
— Share of term and redeemable deposits to total deposits to HHs and NFCs

Legend (right chart):
■ Weighted average duration of non-maturity deposits
■ Weighted average duration of deposits other than non-maturity deposits
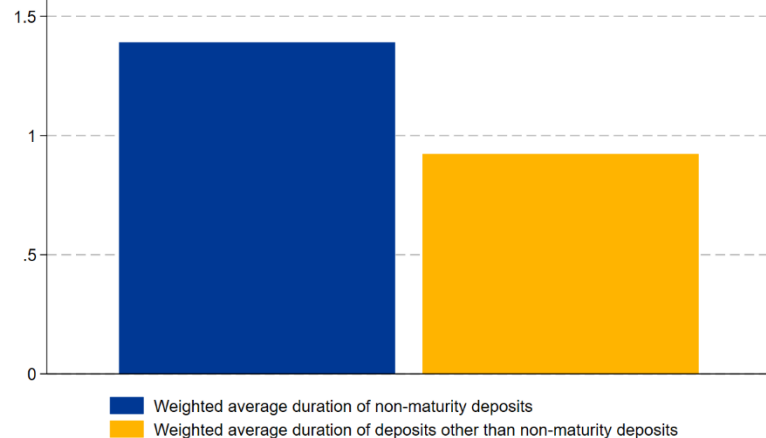
What happened since interest rates started to increase?

- **Materialisation of interest rate risk (net duration risk)**

Duration gap of euro area banks
Scaled by total assets, 2021Q1-2023Q2, percentages
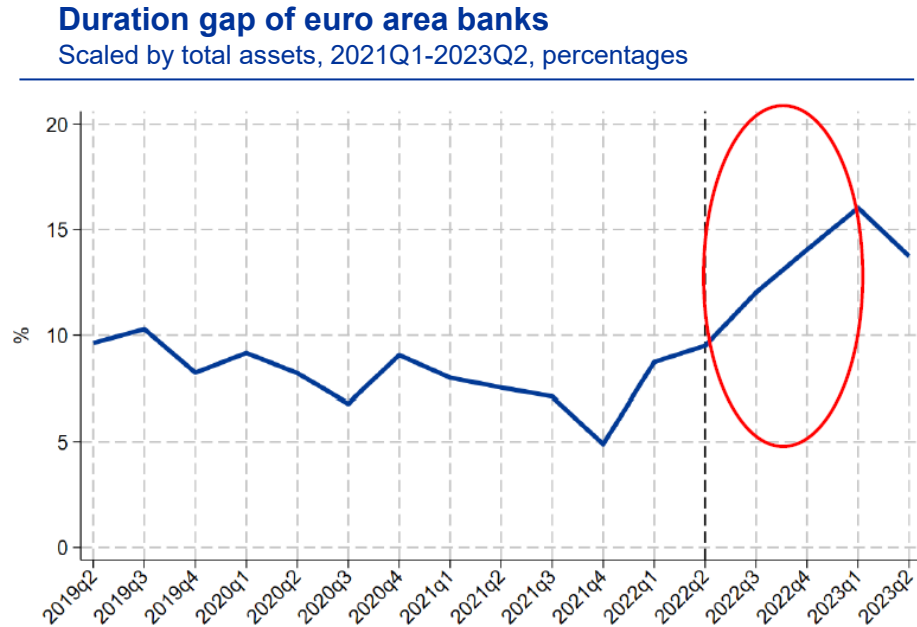
Measuring interest rate risk from an Economic Value of Equity perspective

$$DurationGap = \sum_{j=1}^{14} \frac{DUR_j}{1+i} \left(\frac{A^j - L^j}{Z} \right)$$

Where j represent the maturity buckets and Z represents total assets

- **Difference** between **time to reprice** of the cash-flows from the **asset side** and time to reprice of the cash-flows from the **liability side** (weighted by the modified duration)

- **Positive** duration gap signals **losses** in **economic value of equity** when interest rates increase

- Based on bank-level supervisory data on **cash-flows for each repricing/maturity bucket**

- Takes into account **behavioural assumptions** and **hedging**

Why should interest risk matter for bank lending?

- Banks try to have stable duration gap over time (Drechsler et al. 2021) and to match the duration of assets and liabilities (Kirti 2020) to **avoid a decline in the economic value of equity** over the short term when interest rates increase and to **lock in long-term profits with stable funding**

- Higher IRR entails, ceteris paribus, **lower expected profitability** and, consequently, **capital accumulation** in the medium to long run

- Banks want to **avoid supervisory scrutiny** and capital surcharges in the form of P2R and P2G

Empirical strategy

$$\Delta\log(loans)_{c,b,f,t} = \beta_1 DurGap_{c,b,t-1} + \beta_2\left(DurGapc_{,b,t-1} * \Delta PolRate_t\right) + \beta_3 \tilde{X}_{c,b,t-1} + \beta_4(\tilde{X}_{c,b,t-1} * \Delta PolRate_t) + \propto_{f,t,i} + \propto_{c,t} + \varepsilon_{b,f,t}$$

- Bank-firm-quarter level data on firm lending growth from **_AnaCredit_** combined with bank-level characteristics (bank size, profitability, funding structure, capitalization, liquidity, NPL)

- Firm-time FE interacted with interest rate type FE **to compare how much credit with the same interest rate type a given firm received from multiple banks with a different duration gap.**

- Time frame: 2021Q1-2023Q2

- 73 significant institutions

- > 2 million observations

Baseline results

Intensive margin

	Dependent variable: Δ Log (loans)			
	(1)	(2)	(3)	(4)
Duration gap/TA (lag)	0.000144	0.000193*	0.000144	0.000194*
	(1.34)	(1.75)	(1.33)	(1.72)
Duration gap/TA (lag) $\times$ Δpolicy rate	-0.0292**	-0.0300***	-0.0294**	-0.0302***
	(-2.26)	(-3.04)	(-2.25)	(-3.00)
Observations	2028673	2013105	2028661	2013091
Control variables $\times$ Δpolicy rate	No	Yes	No	Yes
Borrower$\times$Time$\times$Interest rate type FE	Yes	Yes	Yes	Yes
Country$\times$Time FE	No	No	Yes	Yes

Note: ***: 0.01,**: 0.05,*: 0.1. Standard errors are two-way clustered at both bank and firm level. T-statistics are reported in parenthesis.

- When interest rates increase by 100 bps, banks with a 1 p.p. larger duration gap **reduce the bank-firm lending supply by about 2.8-2.9 bps more** on a quarter-on-quarter basis compared to banks with a smaller duration gap.

- When interest rates increase by 100 bps, a bank with a duration gap at the 75th percentile **reduces lending by around 90 bps more** than a bank at the 25th percentile

- Similar results on the probability of issuing a new loan

Baseline results

Portfolio reshuffling

	Short-term loans (maturity ≤ 2 years)				Long-term loans (maturity > 2 years)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Duration gap/TA (lag)	0.000182	0.000235	0.000113	0.000164	0.000227	0.000277	0.000223	0.000276
	(0.42)	(0.59)	(0.25)	(0.41)	(1.52)	(1.65)	(1.49)	(1.61)
Duration gap/TA (lag) × Δpolicy rate	-0.00230	0.0222	0.00615	0.0350	-0.0607***	-0.0557***	-0.0610***	-0.0561***
	(-0.05)	(0.48)	(0.12)	(0.74)	(-2.82)	(-3.08)	(-2.79)	(-3.04)
Observations	43873	43178	43847	43158	1781033	1767958	1781017	1767942
Control variables × Δpolicy rate	No	Yes	No	Yes	No	Yes	No	Yes
Borrower×Time×Interest rate type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country×Time FE	No	No	Yes	Yes	No	No	Yes	Yes

Note: ***: 0.01,**: 0.05,*: 0.1. Standard errors are two-way clustered at both bank and firm level. T-statistics are reported in parenthesis.

- Banks with a larger duration gap especially **reduce their long-term lending** to reduce their exposure to interest rate risk and avoid supervisory scrutiny when interest rates increase
- The effect is twice as large compared to the baseline results (between -5.5 and -6.1 bps)
- No significant effect on short-term lending

Which borrowers are most affected?

Firm size

	Dependent variable: Δ Log (loans)			
	(1)	(2)	(3)	(4)
Duration gap/TA (lag)	0.0000182	0.0000170	0.0000154	0.0000187
	(0.16)	(0.18)	(0.13)	(0.19)
Duration gap/TA (lag) × Δpolicy rate	-0.00443	-0.00233	-0.00475	-0.00316
	(-0.35)	(-0.22)	(-0.36)	(-0.28)
Medium-sized firm × Duration gap/TA (lag) × Δpolicy rate	-0.0210*	-0.0222**	-0.0205*	-0.0210*
	(-1.95)	(-2.09)	(-1.90)	(-1.97)
Small-sized firm × Duration gap/TA (lag) × Δpolicy rate	-0.0461***	-0.0491***	-0.0456***	-0.0479***
	(-4.03)	(-4.56)	(-3.92)	(-4.38)
Micro-sized firm × Duration gap/TA (lag) × Δpolicy rate	-0.0214**	-0.0281**	-0.0211**	-0.0271**
	(-2.61)	(-2.55)	(-2.42)	(-2.36)
Observations	1981398	1966119	1981386	1966105
Control variables × Δpolicy rate	No	Yes	No	Yes
Double interactions	Yes	Yes	Yes	Yes
Borrower×Time×Interest rate type FE	Yes	Yes	Yes	Yes
Country×Time FE	No	No	Yes	Yes

Note: ***: 0.01,**: 0.05,*: 0.1. Standard errors are two-way clustered at both bank and firm level. T-statistics are reported in parenthesis.

- Banks with a larger duration gap banks **reduce their lending to MSMEs** compared to large firms when interest rates increase

- When interest rates increase by 100 bps, a bank with a duration gap at the 75th percentile **reduces lending by 90-97 bps more to small firms**, while this is between **40-56 bps for micro- and medium-sized firms**

Which borrowers are more affected?

Substitution effects

	Dependent variable: Δ Log (borrowing)	
	(1)	(2)
High exposure	0.0152***	0.0168***
	(24.61)	(21.67)
High exposure $\times$ Δpolicy rate	-0.750***	-0.744***
	(-9.17)	(-7.13)
Observations	6400463	6375657
Bank-level control variables $\times$ Δpolicy rate	No	Yes
ILS$\times$Time$\times$Interest rate type FE	Yes	Yes

Note: ***: 0.01,**: 0.05,*: 0.1. Standard errors are two-way clustered at the firm level. T-statistics are reported in parenthesis.

- Firms **cannot (fully) substitute the contraction in borrowing** coming from high-duration gap banks

- When interest rates increase by 100 bps, firms exposed to banks with a higher duration gap exhibit **around 75 bps lower borrowing** in relative terms

Conclusions

- Banks with a larger duration gap (i.e. higher interest rate risk exposure) **deleverage and reduce long-term (and fixed rate) lending more** when interest rates increase to reduce their duration gap and avoid supervisory scrutiny

- **Small firms** are most affected by this deleveraging and affected firms **cannot fully substitute** the contraction in lending

- Important **policy implications**

    - Heterogeneity in the transmission of monetary policy

    - Excessive (long-term) lending contraction can lead to economic downturn, with most pronounced effects for MSMEs

Q&A

Annex

Related literature and references

Contribution to the literature

1. Evaluating the effects of banks' exposure to interest rate risk on lending after a monetary tightening subsequent to a prolonged period of low interest rates

2. Detailed and extensive loan-level credit registry data for the euro area (AnaCredit)

3. Unique supervisory dataset to capture the behavioral maturity mismatch across the whole maturity/repricing structure of the balance sheet, including information on hedging

Related literature

Interest rate risk during low interest rate environment

- Chaudron (2018), Esposito et al. (2015), Hoffmann et al. (2018), Molyneux et al. (2022)

Banks maturity transformation and monetary policy

- Drechsler et al. (2017, 2021), Paul (2023)

Interest rate risk and lending

- Beutler et al. (2020): banks with a larger duration gap reduce lending more when interest rates rise to remain in compliance with capital requirements (Swiss bank-level data, 2001Q2-2013Q3)
- Gomez et al. (2021): banks with a larger income gap reduce lending less when interest rates increase because of increased net interest income (US bank and bank-firm level data, 1986Q1-2013Q4)

Our paper

- Detailed and extensive loan-level credit registry data for the euro area (AnaCredit)
- Evaluating the effects of duration gap on lending after a monetary tightening after a prolonged period of low interest rates

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Annex

Data and descriptives

Data and descriptive statistics

- The average bank in our sample has a positive duration gap, although there is a considerable share of banks with a negative duration gap

- The duration gap is not significantly correlated to the other bank-specific characteristics we include in the regressions
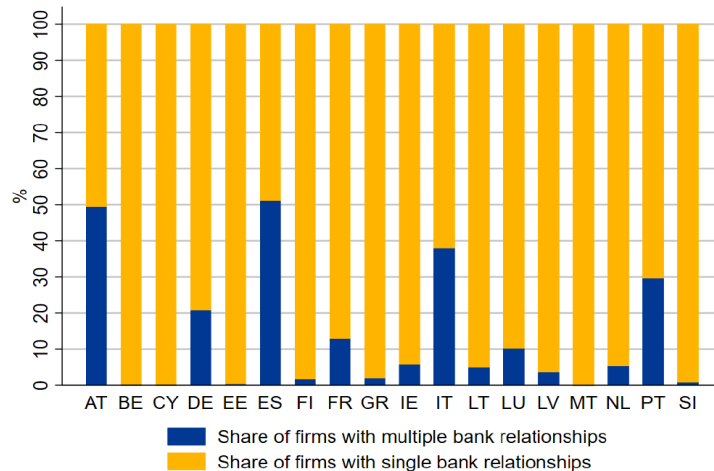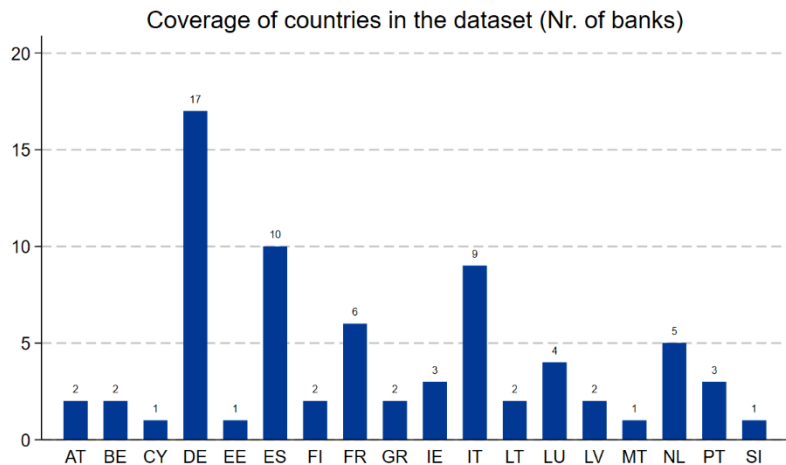
Table 1: Descriptive statistics

	N	Mean	Std.dev.	p25	p75	Min.	Max.
Endogenous variables:							
$\Delta Log(loans)$ (%)	14,582,455	-2.407	25.415	-6.558	0	-100.606	119.647
Variable of interest:							
Duration gap/TA (%)	17,167,090	4.119	26.366	-11.335	19.791	-62.315	80.843
Bank control variables:							
Income gap/TA (%)	17,167,090	4.090	7.276	-1.152	9.776	-53.903	39.449
Log TA	17,167,090	12.909	1.183	11.896	13.671	8.057	14.718
Cash/TA (%)	17,167,090	14.599	4.461	11.800	17.376	1.025	36.560
ROA (%)	17,167,090	0.491	0.385	0.286	0.648	-0.907	1.941
Debt securities/TA (%)	17,129,892	10.554	6.403	7.971	11.139	0	37.618
NPL ratio (%)	17,167,052	3.534	1.422	2.769	4.197	0.465	13.303
Distance to MDA (%)	17,167,090	4.615	2.663	3.189	5.403	0.420	26.085

Table 2: Regression of the duration gap on the set of control variables using bank-level data from the pre-tightening period.

	Dependent variable: Duration gap/TA							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income gap/TA	-0.610 (-1.32)	-0.309 (-0.63)						
Log TA	-2.588 (-1.07)		-1.350 (-0.63)					
Cash/TA	-0.401 (-0.76)			-0.0601 (-0.14)				
ROA	4.80 (0.72)				4.32 (0.68)			
Debt securities/TA	0.254 (0.64)					0.198 (0.73)		
NPL ratio	-1.33 (-0.62)						-0.794 (-0.43)	
Distance to MDA	-0.607 (-0.83)							-0.0549 (-0.11)
Observations	403	418	418	418	418	406	412	418

Data and descriptives

Anacredit coverage

Coverage of countries in the dataset (Nr. of banks)

Share of firms with multiple bank relationships
Share of firms with single bank relationships

Annex

Additional results and robustness checks

Empirical challenges

- **Controlling for credit demand** by using firm-time or industry-location-size-time fixed effects

- **Controlling for interest rate type** by using interest rate type fixed effects

- **Controlling for positive impact of MP tightening on bank profits in the short-term** by controlling the heterogeneous impact of NII on lending after MP tightening

- **Exogeneity of monetary policy?**

Interest rate increase expectations
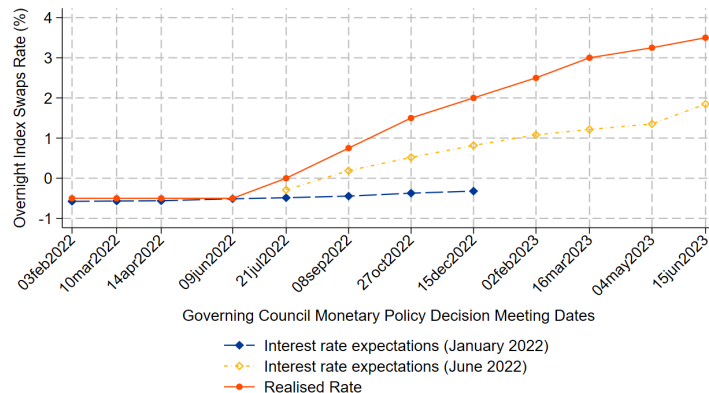
Sources: Bloomberg

Why should interest risk matter for bank lending?

- Banks try to have stable duration gap over time (Drechsler et al. 2021) and to match the duration of assets and liabilities (Kirti 2020) to **avoid a decline in the economic value of equity** when interest rates increase and to **lock in long-term profits with stable funding**

- Higher IRR entails, ceteris paribus, **lower expected profitability** and, consequently, **capital accumulation** in the medium to long run

- Banks want to **avoid supervisory scrutiny** and capital surcharges in the form of P2R and P2G

Impact of duration gap on projected ΔNII
Coefficients and 95% confidence bands, p.p.
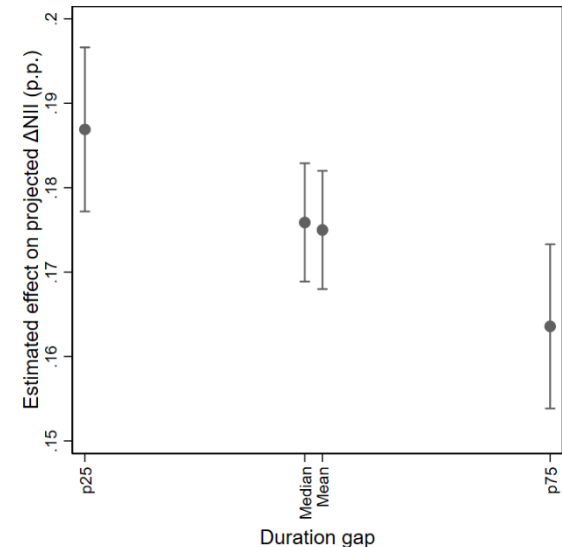
Sources: ECB Supervisory data. Notes: 2021Q1-2023Q2, regressions include bank-level characteristics, bank and time fixed effects. The dependent variable is the self-reported forecasted change in NII within 12 months under a parallel interest rate shock of 200bps.

Firm-quarter level analysis

$$\Delta log(borrowing)_{f,t} = \gamma HighExposure_{f,t} + \beta \left(HighExposure_{f,t} * \Delta PolicyRate_t \right)$$

$$+ \kappa \tilde{X}_{b,t-1} + \lambda \left(\tilde{X}_{f,t-1} * \Delta PolicyRate_t \right) + \eta_{ILS,t,i} + \epsilon_{f,t}$$

- Firm-quarter level data on change in borrowing of firm f at time from **AnaCredit** combined with bank-level characteristics using the bank-firm-quarter level exposures to compute the weighted average at firm-quarter level

- The dummy *High Exposure*$_{f,t}$ takes the value of 1 when a firm borrows for more than 50% from a bank with a high exposure to duration risk. A bank is considered to have a high exposure to duration risk when it is in the top quartile of the distribution in 2021Q1

- To control for credit demand, we make use of industry-location-size (ILS)-time-interest rate type fixed effects, since the use of firm-time fixed effects is not possible on firm-time level data

- Standard errors are clustered at the firm level

Main robustness checks

- Fixed rate lending
- Single bank-firm relationships
- Predetermined duration gap
- Excluding mixed rate loans
- Additional control variables

Baseline results

Portfolio reshuffling

	Dependent variable: Δ Log (loans)			
	(1)	(2)	(3)	(4)
Duration gap/TA (lag)	0.000197*	0.000243**	0.000197*	0.000240**
	(1.80)	(2.11)	(1.80)	(2.07)
Duration gap/TA (lag) $\times$ Δpolicy rate	-0.0249*	-0.0272**	-0.0248*	-0.0268**
	(-1.76)	(-2.58)	(-1.75)	(-2.53)
Duration gap/TA (pre/lag) $\times$ Δpolicy rate $\times$ Floating	-0.00361	0.00458	-0.00394	0.00410
	(-0.19)	(0.29)	(-0.21)	(0.25)
F-test floating rate loans	-0.0285	-0.0226*	-0.0288	-0.0227
	(-1.66)	(-1.77)	(1.62)	(-1.67)
Observations	2803531	2780145	2803522	2780140
Control variables $\times$ Δpolicy rate	No	Yes	No	Yes
Double interactions	Yes	Yes	Yes	Yes
Borrower$\times$Time	Yes	Yes	Yes	Yes
Country$\times$Time FE	No	No	Yes	Yes

Note: ***: 0.01,**: 0.05,*: 0.1. Standard errors are two-way clustered at both bank and firm level. T-statistics are reported in parenthesis.

- Estimations without interest rate type fixed effects

- Banks with a high duration gap especially reduce their **fixed rate lending** to reduce their exposure to duration risk and avoid supervisory scrutiny when interest rates increase

Effects on the probability of issuing a new loan

	Dependent variable: new loan			
	(1)	(2)	(3)	(4)
Duration gap/TA (lag)	0.000369***	0.000380**	0.000375***	0.000388**
	(2.66)	(2.42)	(2.68)	(2.41)
Duration gap/TA (lag) × Δpolicy rate	-0.0503**	-0.0603***	-0.0504**	-0.0607***
	(-2.23)	(-3.59)	(-2.19)	(-3.53)
Income gap/TA (lag)		-0.000657		-0.000656
		(-1.09)		(-1.07)
Income gap/TA (lag) × Δpolicy rate		0.0459		0.0458
		(0.95)		(0.93)
Log TA (lag)		0.00336		0.00335
		(0.90)		(0.89)
Log TA (lag) × Δpolicy rate		-1.025***		-1.030***
		(-3.21)		(-3.20)
Cash/TA (lag)		0.00312***		0.00316***
		(3.52)		(3.57)
Cash/TA (lag) × Δpolicy rate		-0.0988		-0.0982
		(-1.26)		(-1.24)
ROA (lag)		0.0149		0.0152
		(1.55)		(1.57)
ROA (lag) × Δpolicy rate		-1.61**		-1.62**
		(-2.09)		(-2.09)
Debt securities/TA (lag)		-0.00224***		-0.00225***
		(-3.49)		(-3.46)
Debt securities/TA (lag) × Δpolicy rate		0.180***		0.180***
		(2.85)		(2.81)
NPL ratio (lag)		0.000637		0.000686
		(0.21)		(0.22)
NPL ratio (lag) × Δpolicy rate		0.0451		0.0438
		(0.17)		(0.16)
Distance to MDA (lag)		0.00189		0.00189
		(1.33)		(1.31)
Distance to MDA (lag) × Δpolicy rate		0.0662		0.0674
		(0.48)		(0.49)
Observations	2028673	2013105	2028661	2013091
Borrower/ILS*Time*Interest rate type FE	Borr	Borr	Borr	Borr
Country*Time FE	No	No	Yes	Yes

Effects on the probability of issuing a new loan

Short- vs long-term lending

	New loan (maturity ≤ 2 years)				New loan (maturity > 2 years)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Duration gap/TA (lag)	0.0000188	-0.0000506	-0.00000241	-0.0000898	0.000392***	0.000415***	0.000397***	0.000421***
	(0.07)	(-0.18)	(-0.01)	(-0.31)	(3.08)	(3.02)	(3.10)	(2.97)
Duration gap/TA (lag) × Δpolicy rate	0.0460	0.0630*	0.0503*	0.0676*	-0.0611***	-0.0649***	-0.0616***	-0.0654***
	(1.60)	(1.75)	(1.73)	(1.85)	(-3.26)	(-4.40)	(-3.24)	(-4.33)
Income gap/TA (lag)		0.00104		0.000920		-0.000813*		-0.000823
		(0.84)		(0.73)		(-1.67)		(-1.66)
Income gap/TA (lag) × Δpolicy rate		-0.0908		-0.0820		0.0579		0.0586
		(-0.91)		(-0.81)		(1.47)		(1.46)
Log TA (lag)		-0.00132		-0.00228		0.00646*		0.00642*
		(-0.21)		(-0.36)		(1.81)		(1.79)
Log TA (lag) × Δpolicy rate		-0.399		-0.194		-0.981***		-0.989***
		(-0.50)		(-0.24)		(-3.17)		(-3.17)
Cash/TA (lag)		0.00334**		0.00364**		0.00324***		0.00328***
		(2.18)		(2.38)		(3.90)		(3.95)
Cash/TA (lag) × Δpolicy rate		-0.0583		-0.109		-0.107		-0.105
		(-0.27)		(-0.51)		(-1.30)		(-1.27)
ROA (lag)		0.0326		0.0339		0.0144		0.0147
		(1.33)		(1.37)		(1.53)		(1.55)
ROA (lag) × Δpolicy rate		-6.622**		-6.974**		-1.989**		-2.019**
		(-2.28)		(-2.38)		(-2.60)		(-2.61)
Debt securities/TA (lag)		-0.00352**		-0.00332**		-0.00136**		-0.00134**
		(-2.38)		(-2.16)		(-2.58)		(-2.49)
Debt securities/TA (lag) × Δpolicy rate		0.580***		0.535**		0.145**		0.145**
		(2.75)		(2.44)		(2.38)		(2.36)
NPL ratio (lag)		-0.00529		-0.00601		0.00300		0.00299
		(-0.65)		(-0.73)		(1.00)		(0.98)
NPL ratio (lag) × Δpolicy rate		-0.0458		0.0802		0.262		0.261
		(-0.05)		(0.09)		(0.98)		(0.96)
Distance to MDA (lag)		0.00202		0.00199		0.00120		0.00117
		(0.69)		(0.66)		(0.93)		(0.89)
Distance to MDA (lag) × Δpolicy rate		-0.675		-0.714		0.124		0.124
		(-1.55)		(-1.60)		(0.92)		(0.91)
Observations	43873	43178	43847	43158	1781033	1767958	1781017	1767942
Borrower*Time*Interest rate type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Time FE	No	No	Yes	Yes	No	No	Yes	Yes

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Effects on the probability of issuing a new loan

Fixed vs floating rate loans

	Dependent variable: new loan			
	(5)	(6)	(7)	(8)
Duration gap/TA (lag)	0.000287*	0.000251	0.000292*	0.000252
	(1.94)	(1.44)	(1.96)	(1.43)
Duration gap/TA (lag) × Δpolicy rate	-0.0299	-0.0394*	-0.0304	-0.0395*
	(-1.06)	(-1.88)	(-1.07)	(-1.89)
Duration gap/TA (pre/lag) × Δpolicy rate × Floating	-0.0124	-0.0233	-0.0114	-0.0234
	(-0.32)	(-0.65)	(-0.29)	(-0.65)
Income gap/TA (lag)		-0.000382		-0.000396
		(-0.69)		(-0.70)
Income gap/TA (lag) × Δpolicy rate		0.0237		0.0249
		(0.53)		(0.55)
Log TA (lag)		0.00268		0.00264
		(0.72)		(0.71)
Log TA (lag) × Δpolicy rate		-1.147***		-1.148***
		(-3.93)		(-3.88)
Cash/TA (lag)		0.00328***		0.00331***
		(3.78)		(3.82)
Cash/TA (lag) × Δpolicy rate		-0.119		-0.118
		(-1.39)		(-1.37)
ROA (lag)		0.0146*		0.0147*
		(1.80)		(1.79)
ROA (lag) × Δpolicy rate		-1.570**		-1.570**
		(-2.19)		(-2.12)
Debt securities/TA (lag)		-0.00206***		-0.00204***
		(-2.92)		(-2.86)
Debt securities/TA (lag) × Δpolicy rate		0.182***		0.181***
		(3.42)		(3.32)
NPL ratio (lag)		-0.0000771		-0.000159
		(-0.02)		(-0.05)
NPL ratio (lag) × Δpolicy rate		-0.174		-0.163
		(-0.67)		(-0.60)
Distance to MDA (lag)		0.134		0.134
		(1.53)		(1.52)
Distance to MDA (lag) × Δpolicy rate		0.031		0.032
		(0.38)		(0.39)
F-test floating rate loans	-0.0424	-0.0627**	-0.0417	-0.0629**
	(-1.37)	(2.16)	(-1.32)	(-2.06)
Observations	2803531	2780145	2803522	2780140
Double interactions	Yes	Yes	Yes	Yes
Borrower*Time	Yes	Yes	Yes	Yes
Country*Time FE	No	No	Yes	Yes

Single bank-firm relationships

- The results are stronger when (only) considering single bank-firm relationships compared to the baseline

	Dependent variable: Δ Log (loans)				Dependent variable: Δ Log (loans)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Duration gap/TA (lag)	0.000212*	0.000267**	0.000237*	0.000289**	0.000232**	0.000292***	0.000268**	0.000319***
	(1.70)	(2.27)	(1.83)	(2.35)	(2.23)	(2.77)	(2.43)	(2.88)
Duration gap/TA (lag) × Δpolicy rate	-0.0338*	-0.0359***	-0.0349*	-0.0352***	-0.0334*	-0.0357***	-0.0349*	-0.0335***
	(-1.82)	(-3.07)	(-1.84)	(-3.08)	(-1.89)	(-3.12)	(-1.91)	(-3.07)
Income gap/TA (lag)		-0.000183		-0.000147		-0.000107		-0.0000538
		(-0.68)		(-0.53)		(-0.40)		(-0.20)
Income gap/TA (lag) × Δpolicy rate		0.0194		0.0170		0.0146		0.0111
		(0.92)		(0.79)		(0.71)		(0.54)
Log TA (lag)		0.00393		0.00418		0.00348		0.00377
		(1.42)		(1.44)		(1.37)		(1.40)
Log TA (lag) × Δpolicy rate		-0.517		-0.397		-0.508		-0.327
		(-1.66)		(-1.24)		(-1.54)		(-0.95)
Cash/TA (lag)		0.000987*		0.00102*		0.000706		0.000728
		(1.81)		(1.80)		(1.53)		(1.48)
Cash/TA (lag) × Δpolicy rate		-0.0410		-0.0441		-0.0235		-0.0271
		(-0.69)		(-0.70)		(-0.45)		(-0.47)
ROA (lag)		0.00988*		0.00981*		0.00977**		0.00972**
		(1.87)		(1.85)		(2.15)		(2.16)
ROA (lag) × Δpolicy rate		-2.18**		-2.49**		-2.20***		-2.66***
		(-2.45)		(-2.65)		(-2.72)		(-3.04)
Debt securities/TA (lag)		-0.000710		-0.000796*		-0.000626		-0.000736*
		(-1.66)		(-1.78)		(-1.54)		(-1.70)
Debt securities/TA (lag) × Δpolicy rate		0.0518		0.0308		0.0401		0.0108
		(0.86)		(0.48)		(0.66)		(0.16)
NPL ratio (lag)		0.000768		0.00127		0.0000110		0.000617
		(0.33)		(0.51)		(0.01)		(0.27)
NPL ratio (lag) × Δpolicy rate		0.590*		0.788**		0.575*		0.871***
		(1.87)		(2.53)		(1.82)		(2.78)
Distance to MDA (lag)		-0.000943		-0.000819		-0.00102		-0.000887
		(-1.07)		(-0.87)		(-1.27)		(-1.01)
Distance to MDA (lag) × Δpolicy rate		0.260		0.341*		0.266		0.379**
		(1.55)		(1.98)		(1.46)		(2.03)
Observations	8511563	8437194	8511563	8437194	6463860	6405467	6463868	6405479
ILS*Time*Interest rate type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Time FE	No	No	Yes	Yes	No	No	Yes	Yes

Predetermined duration gap

- Collapsed regressions pre (2022Q2) - and post (2023Q2) monetary policy tightening

- Predetermined duration gap (2022Q2)

	Collapsed regressions		Dependent variable: Δ Log (T Pre-determined duration gap	
	(1)	(2)	(3)	(4)
Duration gap/TA (pre/lag)	-0.00103*	-0.00108	0.000223**	0.000240**
	(-1.68)	(-1.66)	(2.41)	(2.43)
Duration gap/TA (pre/lag) × Δpolicy rate			-0.0202**	-0.0215*
			(-2.01)	(-1.99)
Income gap/TA (pre/lag)	-0.00372	-0.00387*	-0.000641**	-0.000646**
	(-1.65)	(-1.71)	(-2.21)	(-2.19)
Income gap/TA (pre/lag) × Δpolicy rate			0.0531**	0.0535**
			(2.30)	(2.28)
Log TA (pre/lag)	-0.0203*	-0.0202*	0.00416*	0.00419*
	(-1.81)	(-1.78)	(1.91)	(1.89)
Log TA (pre/lag)× Δpolicy rate			-0.339*	-0.329
			(-1.71)	(-1.61)
Cash/TA (pre/lag)	0.834***	0.828***	0.00158***	0.00161***
	(4.66)	(4.52)	(3.62)	(3.69)
Cash/TA (pre/lag)× Δpolicy rate			-0.0616	-0.0631
			(-1.24)	(-1.26)
ROA (pre/lag)	-4.30*	-4.53*	0.0109*	0.0110*
	(-1.76)	(-1.83)	(1.77)	(1.77)
ROA (pre/lag)× Δpolicy rate			-2.11***	-2.14***
			(-3.02)	(-3.03)
Debt securities/TA (pre/lag)	0.233	0.236	-0.000667**	-0.000664**
	(1.23)	(1.22)	(-2.18)	(-2.13)
Debt securities/TA (pre/lag)× Δpolicy rate			0.0381	0.0364
			(0.84)	(0.78)
NPL ratio (pre/lag)	4.38***	4.37***	0.00311	0.00324
	(3.42)	(3.29)	(1.49)	(1.50)
NPL ratio (pre/lag)× Δpolicy rate			0.762***	0.769***
			(3.84)	(3.77)
Distance to MDA (pre/lag)	0.191	0.220	-0.00124	-0.00127
	(0.48)	(0.54)	(-1.35)	(-1.35)
Distance to MDA (pre/lag)× Δpolicy rate			0.292**	0.299**
			(2.29)	(2.28)
Deposits/TA (lag)				
Deposits/TA (lag)× Δpolicy rate				
Off BS/TA (lag)				
Off BS/TA (lag)× Δpolicy rate				
Log weighted maturity				
Observations	187845	187845	2013105	2013091
Borrower*Interest rate type FE	Yes	Yes	-	-
Country FE	No	Yes	-	-
Borrower*Time*Interest rate type FE	-	-	Yes	Yes
Country*Time FE	-	-	No	Yes

Excluding mixed rate loans and extra control variables

	Excluding mixed rate loans		Extra control variables	
	(5)	(6)	(7)	(8)
Duration gap/TA (pre/lag)	0.000194*	0.000195*	0.000227***	0.000229**
	(1.75)	(1.73)	(2.68)	(2.63)
Duration gap/TA (pre/lag) × Δpolicy rate	-0.0304***	-0.0305***	-0.0285***	-0.0283***
	(-3.08)	(-3.03)	(-4.14)	(-3.99)
Income gap/TA (pre/lag)	-0.000461	-0.000468	0.000216	0.000239
	(-1.62)	(-1.60)	(0.73)	(0.79)
Income gap/TA (pre/lag) × Δpolicy rate	0.0392*	0.0398*	-0.0128	-0.0147
	(1.75)	(1.74)	(-0.54)	(-0.60)
Log TA (pre/lag)	0.00502**	0.00505**	0.00970***	0.00979***
	(2.10)	(2.07)	(4.27)	(4.31)
Log TA (pre/lag)× Δpolicy rate	-0.415**	-0.405**	-0.327	-0.312
	(-2.12)	(-2.02)	(-1.60)	(-1.48)
Cash/TA (pre/lag)	0.00149***	0.00151***	0.00103**	0.00103**
	(3.16)	(3.19)	(2.45)	(2.43)
Cash/TA (pre/lag)× Δpolicy rate	-0.0682	-0.0692	-0.0617	-0.0636
	(-1.20)	(-1.20)	(-1.14)	(-1.15)
ROA (pre/lag)	0.0130*	0.0131*	0.0147**	0.0150**
	(1.95)	(1.94)	(2.50)	(2.53)
ROA (pre/lag)× Δpolicy rate	-2.25***	-2.29***	-2.05***	-2.09***
	(-3.08)	(-3.09)	(-3.56)	(-3.57)
Debt securities/TA (pre/lag)	-0.000894***	-0.000898***	0.00166***	0.00171***
	(-2.75)	(-2.69)	(2.83)	(2.86)
Debt securities/TA (pre/lag)× Δpolicy rate	0.0464	0.0456	-0.0180	-0.0182
	(1.05)	(1.01)	(-0.31)	(-0.31)
NPL ratio (pre/lag)	0.00285	0.00287	0.00539***	0.00552***
	(1.27)	(1.24)	(3.17)	(3.16)
NPL ratio (pre/lag)× Δpolicy rate	0.730***	0.746***	0.544**	0.557**
	(3.40)	(3.39)	(2.49)	(2.48)
Distance to MDA (pre/lag)	-0.000855	-0.000844	-0.000445	-0.000500
	(-0.99)	(-0.96)	(-0.65)	(-0.73)
Distance to MDA (pre/lag)× Δpolicy rate	0.287**	0.291**	0.339***	0.343***
	(2.39)	(2.38)	(3.57)	(3.52)
Deposits/TA (lag)			0.243***	0.247***
			(4.28)	(4.30)
Deposits/TA (lag)× Δpolicy rate			-3.986	-3.969
			(-0.96)	(-0.94)
Off BS/TA (lag)			0.00402	0.00282
			(0.12)	(0.08)
Off BS/TA (lag)× Δpolicy rate			-5.901	-6.070
			(-1.34)	(-1.36)
Log weighted maturity			-0.0135***	-0.0134***
			(-3.86)	(-3.84)
Observations	2010213	2010199	1808666	1808652
Borrower*Interest rate type FE	-	-	-	-
Country FE	-	-	-	-
Borrower*Time*Interest rate type FE	Yes	Yes	Yes	Yes
Country*Time FE	No	Yes	No	Yes