

# **ADAPTING LENDING POLICIES WHEN NEGATIVE RATES HIT BANKS' PROFITS**

**Óscar Arce, Miguel García-Posada, Sergio Mayordomo and Steven Ongena**

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**These views are the author' ones and do not represent those of Banco de España or the Eurosystem**

## THE GENERAL QUESTION

- Several CBs around the world set negative policy rates (ECB, BoJ, DK, SE, CH) to push up aggregate demand and inflation.
- Very low rates have been often cited as a negative contributor to banks' profitability (yield curve flattening, ZLB on deposits, interest rate margin compression...).
- But banks may mitigate the negative effect of falling interest rates by **raising lending volumes, increasing fees** or **taking more risk...**
- The adjustment of previous **lending policies** will depend on the **channel** through which interest rates shape bank profitability.

## THIS PAPER: MOTIVATING QUESTIONS

- This paper does **NOT** assess the impact of negative rates on bank profitability.
- We rather exploit banks' **own assessment** about negative rates and interest rate margins contained in the Eurosystem's BLS to shed light on three questions:
  1. Which **bank characteristics** shape the link between negative rates and interest rate margins?
  2. Do negative rates restrain the overall supply of credit (i.e. are current ECB rates below the "**reversal rate**")?
  3. How do negative interest rates affect banks' **risk taking**?

# DATA



- **Europe:** Individual Bank Lending Survey (**iBLS**) and Individual Balance Sheet Items (**IBSI**).
- The iBLS contains confidential, non-anonymized replies to the ECB's Bank Lending Survey (BLS) for a subsample of banks participating in the BLS.
  - 122 banks from 13 euro area countries
- **Spain:** **Central Credit Register** (CRR). 10 banks.
- The **coverage** in both cases is **60%** of total credit outstanding by June 2014.

# DATA

## KEY VARIABLES

- **The BLS asks banks, on a quarterly basis, about the evolution of**
  - **credit standards** applied to their new loans or credit lines to enterprises (i.e. loan approval criteria)
  - **non-price terms and conditions** (non-interest charges, collateral requirements, maturity and size of the loan).
  - **risk tolerance**
- **The BLS asks banks, on a semiannual basis, an ad-hoc question on the negative deposit facility rate (NDFR):**
  - “Given the ECB’s negative deposit facility rate, did this measure, either directly or indirectly, contribute to a decrease / increase of your bank’s net interest income (nii) over the past six months?”
  - 2 types of banks: **affected** banks (banks whose nii decreases) and **non-affected** banks (the rest)
  - **73%** of observations correspond to affected banks (NDFR=1)



Banks whose profitability is adversely affected by negative rates have lower capital



Banks adversely affected by negative rates and with low capital may curtail lending supply

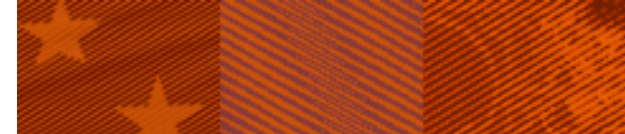


Banks may also adjust terms and conditions to take less risk and increase non-interest charges to build up capital organically



Is it supported by loan level data?

## NEGATIVE INTEREST RATES & BANK CAPITAL



Variable	NDFR=1		NDFR=0		Difference in means	
	Obs	Mean	Obs	Mean	Diff	P-value
Size	1,206	10.69	452	10.67	0.02	0.77
Capital ratio	1,206	10.34	448	11.51	-1.17	0.00
Liquidity ratio	1,206	8.75	452	6.92	1.83	0.00
Loan-to-deposit ratio (log)	1,197	0.27	429	0.69	-0.42	0.00
Deposit ratio	1,206	42.67	452	37.05	5.62	0.00
Eurosystem borrowing	1,206	1.16	452	0.66	0.50	0.00
Excess liquidity	863	2.63	319	1.68	0.96	0.00
Loan maturity	1,199	60.13	440	58.32	1.81	0.03
Weight overdraft loans	1,199	0.15	440	0.15	0.00	0.80
Weight loans up to 1 year	1,199	0.23	440	0.24	-0.01	0.31
Deposit maturity	1,197	4.12	429	4.44	-0.33	0.27
Weight overnight deposits	1,197	0.65	429	0.64	0.00	0.69

- During the period of the negative DFR (2014Q2-2017Q3), affected banks:
  - were **less capitalized** (Brunnermeier and Koby, 2017),
  - had more deposits (Heider et al, 2018), and
  - had more excess liquidity (Demiralp et al, 2017 and Basten and Mariathan, 2018).

# NEGATIVE INTEREST RATES & BANK CAPITAL



- Why are the lending margins of banks with worse capital ratios more affected by negative interest rates?
- Negative (low) interest rates adversely affect net interest income.
- Banks can compensate it by:
  - i. increasing fees
  - ii. lending more
  - iii. taking more risk.



# NEGATIVE INTEREST RATES & BANK CAPITAL



- ... but banks with low capital
  - i. **increasing fees  $\checkmark$**
  - ii. **lending more X**
  - iii. **taking more risk X**
- Hence, low capital banks' profitability is more affected than that of high capital banks.
- In addition, low profitability prevents the use of retained earnings to build capital organically...
- ... forcing low capital banks to take even less risks (**amplification effect**).



Banks whose profitability is adversely affected by negative rates have lower capital



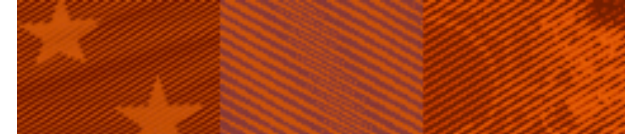
Banks adversely affected by negative rates and with low capital may curtail lending supply



Banks may also adjust terms and conditions to take less risk and increase non-interest charges to build up capital organically



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- Diff-in-diff for 2011Q3-2017Q3:

$$\Delta Credit_{ict} = \alpha_{ct} + \alpha_i + \beta NDFR_{it} + \gamma X'_i + \varepsilon_{ict}$$

$\alpha_{ct}$ : country-time fixed effects

$\alpha_i$ : bank fixed effects

$X'_i$ : bank controls, demand controls, and **controls for banks' self-assessment of their financial conditions.**

## CREDIT SUPPLY. CREDIT GROWTH (II)



	(1) credit growth	(2) credit growth
NDFR	0.184 (0.223)	0.219 (0.231)
Lagged dependent variable	NO	YES
Bank controls	YES	YES
Demand controls	YES	YES
Bank FE	YES	YES
Country-Time FE	YES	YES
Observations	2,246	2,146
R-squared	0.259	0.262

**No impact** of the negative DFR on **loan supply**, as measured with credit growth.



- Ordered probit for 2014Q2-2017Q3:

$$\Delta CS_{ict}^* = \alpha_{ct} + \beta NDFR_{it} + \gamma X_i' + \varepsilon_{ict}$$

where  $\Delta CS_{ict}^*$  are the latent changes in credit standards

$\alpha_{ct}$ : country-time fixed effects

$X_i'$ : bank controls, demand controls, and **controls for banks' self-assessment of their financial conditions.**

## CREDIT SUPPLY. CREDIT STANDARDS (II)



Variables	(1) P(credit standards=eased)	(2) P(credit standards=tightened)
NDFR	0.018 (0.013)	-0.006 (0.004)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	1,516	1,516

**No impact** of the negative DFR on **loan supply**, as measured with credit standards.

## CREDIT SUPPLY. CREDIT STANDARDS (III)



- Regressions analysis applied to banks with **NDFR = 1**.
- Instead of NDFR we use **low capital** (dummy indicating capital below 25<sup>th</sup> percentile)

Variables	(1)	(2)
	P(credit standards=eased)	P(credit standards=tightened)
Low Capital	0.007 -0.015	-0.002 (0.004)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	899	899

**No impact** of the negative DFR on **loan supply** of banks with **low capital**.



Banks whose profitability is adversely affected by negative rates have lower capital



Banks adversely affected by negative rates and with low capital may curtail lending supply



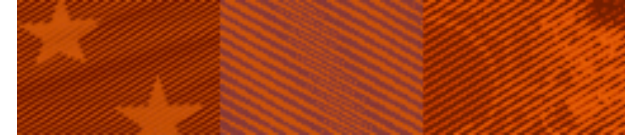
Banks may also adjust terms and conditions to take less risk and increase non-interest charges to build up capital organically



Is it supported by loan level data?



# TERMS AND CONDITIONS: COLLATERAL & MATURITY



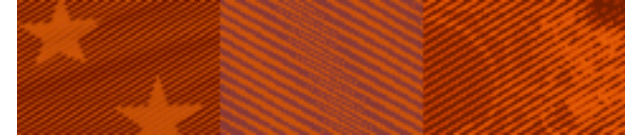
<b>Panel A</b>		
	(1)	(2)
Variables	P(collateral=eased)	P(collateral=tightened)
NDFR	-0.014 (0.015)	0.004 (0.005)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	1,511	1,511

<b>Panel B</b>		
	(1)	(2)
Variables	P(maturity=increased)	P(maturity=decreased)
NDFR	-0.037*** (0.013)	0.016** (0.007)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	1,511	1,511

Affected banks **less likely to increase maturity** and **more likely to decrease it**.  
**No effect on collateral**: maturity and collateral “strategic substitutes”.

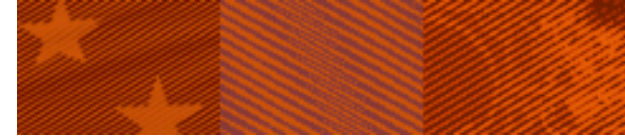
# TERMS AND CONDITIONS: SIZE AND NON-INTEREST CHARGES



Panel C		
Variables	(1) P(size=increased)	(2) P(size=decreased)
NDFR	-0.022 (0.014)	0.003 (0.002)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	1,511	1,511
Panel D		
Variables	(1) P(non-interest charges=decreased)	(2) P(non-interest charges=increased)
NDFR	-0.027*** (0.010)	0.023*** (0.009)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	1,510	1,510

**No differential impact on loan size.** Affected banks **less likely to decrease non-interest charges** and **more likely to increase them.**

# TERMS AND CONDITIONS AND LOW CAPITAL



- Regressions analysis applied to banks with **NDFR = 1**.
- Instead of NDFR we use **low capital** (dummy indicating capital below 25<sup>th</sup> percentile)

## Negative interest rates, terms and conditions and capital

	P(collateral=eased)	P(collateral=tightened)
Low capital	0.026 (0.016)	-0.005 (0.003)
	P(maturity=increased)	P(maturity=decreased)
Low capital	-0.059*** (0.022)	0.032** (0.015)
	P(size=increased)	P(size=decreased)
Low capital	0.014 (0.026)	-0.002 (0.004)
	P(fees=decreased)	P(fees=increased)
Low capital	-0.052** (0.021)	0.049*** (0.019)
Bank + Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	898	898

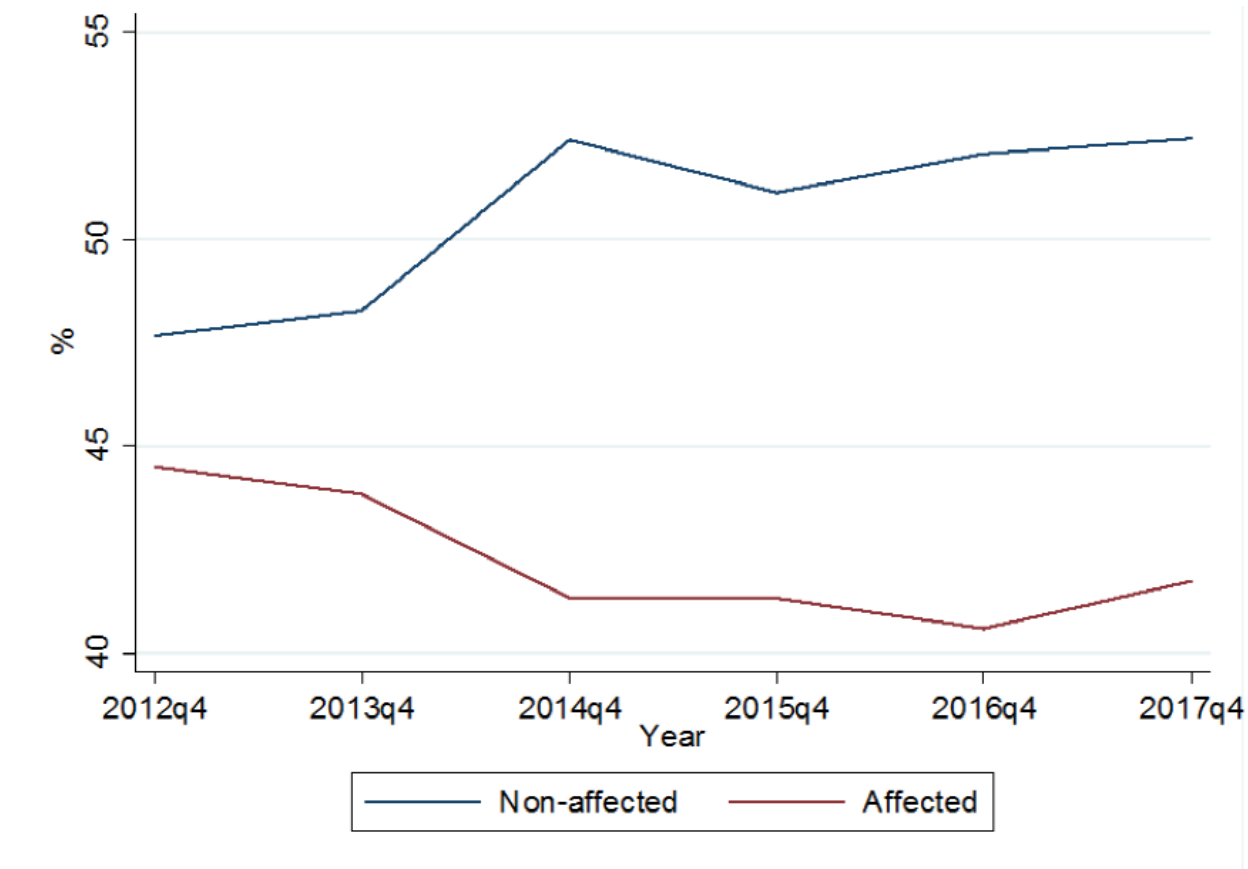
# RISK TOLERANCE



Variables	(1) P(risk tolerance=increased)	(2) P(risk tolerance=decreased)
NDFR	-0.034*** (0.010)	0.040*** (0.011)
Bank and Demand Controls	YES	YES
Country-Time FE	YES	YES
Observations	1,205	1,205

Affected banks **less likely to increase risk tolerance** and **more likely to decrease it**.

## RISK-WEIGHTED ASSETS OVER TOTAL ASSETS (I)



**Figure 2: RWA over total assets.** This figure summarizes the evolution of the median ratio of RWA over total assets at the end of each year for affected banks and non-affected banks.

Affected banks **reduce RWA** while non-affected banks increase them.

## RISK-WEIGHTED ASSETS OVER TOTAL ASSETS (I)



- Diff-in-diff for 2011Q3-2017Q3:

$$RWA/TA_{ict} = \alpha_{ct} + \alpha_i + \beta NDFR_{it} + \gamma X'_i + \varepsilon_{ict}$$

where  $RWA/TA_{ict}$  is risk-weighted assets over total assets

Variables	RWA over total assets
NDFR	-2.698** (1.357)
Bank controls	YES
Bank FE	YES
Country-Time FE	YES
Observations	2,177
R-squared	0.324

This decrease represents **5.2%** of the **average ratio of RWA over TA**

Affected banks react by **reducing** their **risk-weighted assets**.



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Banks adversely affected by negative rates and with low capital may curtail lending supply



Banks may also adjust terms and conditions to take less risk and increase non-interest charges to build up capital organically



Is it supported by loan level data?

## ADDITIONAL ANALYSIS (SPAIN)

### CREDIT SUPPLY (I)

- Diff-in-diff in first differences

$$\Delta \ln(\textit{Credit})_{ib} = \alpha_i + \beta_1 \textit{NDFR}_b + \gamma X'_b + \varepsilon_{ib}$$

where  $\Delta \ln(\textit{Credit})_{ib}$  is credit growth between June 2013 (pre-event) and June 2015 (post-event),  $\alpha_i$  firm fixed effects,  $X_b$  are bank controls.

- Differentiating between safe and risky firms

$$\Delta \ln(\textit{Credit})_{ib} = \alpha_i + \beta_1 \textit{NDFR}_b + \beta_2 \textit{NDFR}_b \cdot \textit{DISTRESS}_i + \gamma X'_b + \varepsilon_{ib}$$

where  $\textit{DISTRESS}_i = 1$  if the firm is the distress zone according to the Altman's Z-score.



## ADDITIONAL ANALYSIS (SPAIN)

### CREDIT SUPPLY (II)

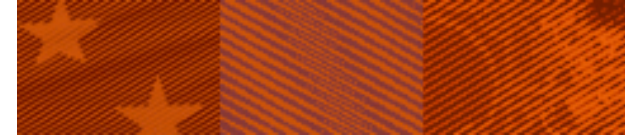


	(1)	(2)	(3)
NDFR	-0.002 [0.006]	0.009 [0.009]	0.028** [0.012]
NDFR * DISTRESS			-0.047*** [0.011]
Bank Characteristics	YES	YES	YES
Firm FE	YES	YES	YES
Observations	210,862	170,410	89,260
R-squared	0.432	0.457	0.436

- (1) & (2) **no significant** differences between the two types of banks
- (3) affected banks **increase** the **supply of credit to safe firms** more than non affected banks (i.e.,  $\beta_1 > 0$ )
- (3) affected banks **reduce** the **supply of credit to risky firms** more than non-affected banks (i.e.,  $\beta_1 + \beta_2 < 0$ )

## ADDITIONAL ANALYSIS (SPAIN)

### MATURITY AND COLLATERAL



$$\Delta Y_{ib} = \alpha_i + \beta_1 NDFR_b + \gamma X'_b + \varepsilon_{ibt}$$

where  $Y_{ib}$  = SR Maturity or Guarantee $_{ib}$  (proportion of firm  $i$ 's short-term loans or collateralised loans)

	(1)	(2)
	SR Maturity (1-year)	Guarantee
NDFR	0.033*** [0.003]	0.031*** [0.002]
Bank Characteristics	YES	YES
Firm FE	YES	YES
Observations	210,861	210,862
R-squared	0.413	0.439

- Affected banks shorten the **maturity** of their loan portfolio and require more **collateral** (vis-à-vis non-affected)

## CONCLUSIONS



- Analysis of the effect of **negative interest rates** on banks' lending policies and risk taking in Europe and Spain.
- Affected banks:
  - i. Have more deposits, more excess liquidity and **lower capital**.
  - ii. Adjust terms & conditions (shorter **maturity** and more **collateral**).
  - iii. Reduce **risk tolerance** & **risk weights**.
  - iv. Increase **non-interest charges**.
  - v. Particularly **poorly capitalized banks** to improve **capital ratios**.
- No significant differences in the **supply of credit** between affected and non-affected banks: the “reversal rate” has not been reached.



**THANK YOU**

## RELATED LITERATURE: CHANNELS



- **Heider et al. (2017): affected banks have a high share of retail deposits**
  - Negative interest rates regarded as a negative shock to banks' net worth.
  - Affected banks lend less and to riskier borrowers.
  - Syndicated loan market.
- **Demiralp et al. (2017), Basten and Mariathan (2018): affected banks hold excess liquidity**
  - Affected banks extend more loans, hold more non-domestic government bonds and rely less on wholesale funding.
- **Brunnermeier and Koby (2017): reversal interest rate**
  - lower net interest margins and lower net worth.
  - binding capital constraints.**
  - less lending and less risk taking.
- Also: Altavilla et al. (2018)

# THE ROLE OF MARKET CONCENTRATION



	LOW HHI		HIGH HHI	
Variables	(1) P(collateral=eased)	(2) P(collateral=tightened)	(3) P(collateral=eased)	(4) P(collateral=tightened)
NDFR	0.007 (0.013)	-0.001 (0.003)	-0.008 (0.013)	0.004 (0.007)
Observations	730	730	855	855
Variables	(1) P(maturity=eased)	(2) P(maturity=tightened)	(3) P(maturity=eased)	(4) P(maturity=tightened)
NDFR	-0.004 (0.014)	0.001 (0.004)	-0.053*** (0.019)	0.026** (0.011)
Observations	730	730	708	708
Variables	(1) P(size=increased)	(2) P(size=decreased)	(3) P(size=increased)	(4) P(size=decreased)
NDFR	-0.025 (0.017)	0.002 (0.002)	-0.048** (0.024)	0.013* (0.008)
Observations	730	730	708	708
Variables	(1) P(fees=decreased)	(2) P(fees=increased)	(3) P(fees=decreased)	(4) P(fees=increased)
NDFR	0.002 (0.014)	-0.001 (0.006)	-0.031** (0.014)	0.035** (0.014)
Observations	729	729	708	708

The tightening of terms & conditions and the increase of non-interest charges only occurs in markets with **high concentration**.



## 1. Credit growth analysis

- i. Similar results without bank FE
- ii. Similar results for the sample period 2014Q2-2017Q3

## 2. Terms and conditions

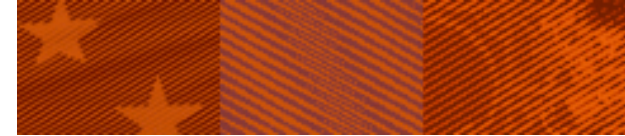
- i. No significant effect for any term and condition in a placebo period (2009Q1-2012Q2)
- ii. Similar results for a shorter period (comprising survey responses): 2015Q4-2017Q3

## 3. Risk tolerance

- i. No significant changes in other two segments of credit (i.e., mortgages and consumer credit)

# DATA

## SAMPLE (EUROPE)



Country	Number of banks (2017Q3)		Number of observations (2014Q2-2017Q3)	
	Freq.	Percent	Freq.	Percent
AT	8	6.56	109	6.49
BE	4	3.3	56	3.3
DE	26	21.3	375	22.3
EE	4	3.3	56	3.3
ES	10	8.2	140	8.3
FR	14	11	196	12
IE	7	5.74	98	5.83
IT	22	18.0	284	16.9
LT	4	3.3	44	2.6
LU	5	4.1	70	4.2
NL	8	6.6	112	6.7
PT	5	4	70	4
SK	5	4.1	70	4.17
Total	122	100	1,680	100

Sample: 122 banks from 13 euro area countries for the period 2014Q2 - 2017Q3.



## Definition of variables (I)



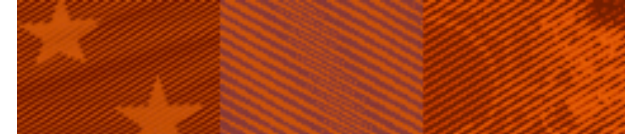
<p><b><i>Dependent variables</i></b></p> <p>credit standards            credit growth            non interest charges            loan size            collateral            maturity            risk tolerance</p>	<p>Change in the overall credit standards applied to new loans or credit lines to enterprises.            Quarterly growth rate of loans to non-financial corporations.            Change in the non-interest charges for new loans or credit lines to enterprises.            Change in the size of the loans or credit lines to enterprises.            Change in the collateral requirements of the loans or credit lines to enterprises.            Change in the maturity of the loans or credit lines to enterprises.            Change in the level of the bank's risk tolerance.</p>
<p><b><i>Demand variables</i></b></p> <p>demand_sme            demand_large            demand_short_term            demand_long_term            demand_investment            demand_inventories            demand_mergers            demand_debt_refinancing</p>	<p>Change in the demand for loans or credit lines to small and medium enterprises.            Change in the demand for loans or credit lines to large firms.            Change in the demand for short-term loans or credit lines to enterprises.            Change in the demand for long-term loans or credit lines to enterprises.            Change in the demand for loans or credit lines to enterprises for fixed investment.            Change in the demand for loans or credit lines to enterprises for inventories and working capital.            Change in the demand for loans or credit lines to enterprises for mergers/acquisitions and corporate restructuring.            Change in the demand for loans or credit lines to enterprises for debt refinancing/restructuring and renegotiation.</p>

## Definition of variables (II)



<i>Bank variables</i>	
NDFR	Dummy that equals 1 if the negative deposit facility rate contributed to a decrease in the bank's net interest income.
size	Logarithm of the bank's total assets.
capital ratio	Capital and reserves over total assets (%)
liquidity ratio	Cash + government securities + Eurosystem deposits over total assets (%)
loan-to-deposit ratio	Loans to non-financial corporations and households over deposits by non-financial corporations and households. In logs.
deposit ratio	Deposits by households and non-financial corporations over total assets (%).
eurosystem borrowing	Total borrowing from the Eurosystem (marginal lending facility + main refinancing operations + fine-tuning operations) over total assets (%)
excess liquidity	Excess liquidity (deposit facility + current account - minimum reserve requirements) over total assets (%)
market_share	Ratio between a bank's total assets and the total assets of the country's banking sector (%).
legal_form: foreign branch	Dummy that equals 1 if the bank is a branch of a foreign bank.
legal_form: foreign subsidiary	Dummy that equals 1 if the bank is a subsidiary of a foreign bank.
legal_form: head institution	Dummy that equals 1 if the bank is the head institution of the banking group.
legal_form: national subsidiary	Dummy that equals 1 if the bank is a subsidiary of a domestic bank.

## Dependent variables



Variable	Obs	Mean	Std. Dev.	Min	Max
<b><i>Credit</i></b>					
credit standards: eased	1,611	0.05	0.22	0	1
credit standards: unchanged	1,611	0.93	0.26	0	1
credit standards: tightened	1,611	0.02	0.14	0	1
credit growth	1,502	0.20	3.64	-7.93	7.49
RWA	1,310	43.55	14.16	16.57	85.56
<b><i>Terms and conditions</i></b>					
non_interest_charges: eased	1,603	0.04	0.21	0	1
non_interest_charges: unchanged	1,603	0.93	0.26	0	1
non_interest_charges: tightened	1,603	0.03	0.17	0	1
loan_size: eased	1,604	0.06	0.24	0	1
loan_size: unchanged	1,604	0.93	0.26	0	1
loan_size: tightened	1,604	0.01	0.10	0	1
collateral: eased	1,603	0.05	0.21	0	1
collateral: unchanged	1,603	0.94	0.23	0	1
collateral: tightened	1,603	0.01	0.10	0	1
maturity: eased	1,601	0.07	0.25	0	1
maturity: unchanged	1,601	0.92	0.27	0	1
maturity: tightened	1,601	0.02	0.12	0	1
<b><i>Risk tolerance</i></b>					
risk tolerance: increased	1,241	0.02	0.14	0	1
risk tolerance: unchanged	1,241	0.96	0.19	0	1
risk tolerance: decreased	1,241	0.02	0.13	0	1

## Bank variables



Variable	Obs	Mean	Std. Dev.	Min	Max
NDFR	1,680	0.73	0.44	0	1
size	1,644	10.69	1.54	2.77	13.88
capital ratio	1,640	10.68	6.06	0.25	100.00
liquidity ratio	1,644	8.21	6.35	0.00	32.38
loan-to-deposit ratio (log)	1,612	0.39	1.42	-1.57	10.00
deposit ratio	1,644	40.78	22.45	0.00	87.00
eurosystem borrowing	1,644	1.03	2.51	0.00	17.39
excess liquidity	1,168	2.29	4.42	0.00	27.71
market_share	1,651	6.05	7.64	0.00	41.92
legal_form: foreign branch	1,680	0.04	0.19	0	1
legal_form: foreign subsidiary	1,680	0.20	0.40	0	1
legal_form: head institution	1,680	0.50	0.50	0	1
legal_form: national subsidiary	1,680	0.26	0.44	0	1
capital position costs: eased	1,596	0.01	0.12	0	1
capital position costs: unchanged	1,596	0.97	0.18	0	1
capital position costs: tightened	1,596	0.02	0.14	0	1
access market financing: eased	1,546	0.02	0.14	0	1
access market financing: unchanged	1,546	0.98	0.14	0	1
access market financing: tightened	1,546	0.00	0.04	0	1
liquidity position: eased	1,592	0.04	0.20	0	1
liquidity position: unchanged	1,592	0.96	0.21	0	1
liquidity position: tightened	1,592	0.00	0.06	0	1