

**Selva Demiralp**  
Koç University

**Jens Eisenschmidt**  
European Central Bank

**Thomas Vlassopoulos**  
European Central Bank

# **The impact of negative rates on bank balance sheets: Evidence from the euro area**

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# Introduction and motivation

- Are negative policy rates “special” as regards their transmission through the banking system?
- Standard literature on MTM (interest rate channel, credit channel, risk-taking channel) silent on this question
- Study euro area bank balance sheet adjustment in the face of the introduction of negative deposit facility rate

# Overview

- 1 Why might negative rates be “special”?
- 2 Bank adjustment in the face of negative rates
- 3 The introduction of a negative policy rate in the euro area
- 4 APP, excess liquidity and negative rates
- 5 Empirical strategy
- 6 Empirical results
- 7 Conclusions and way forward

## There are various plausible frictions that may impart “specialness” to negative rates

- In principle, what should matter is the **spread** between the return on assets and the WACC
- The **level** of interest rates is relevant to the extent that it affects the spread:
  - Slope of the yield curve affects intermediation margins but this is not unique to negative rates
  - Pricing of retail deposits (mark-down on market rates) and zero lower bound

- **Institutional** aspects:
  - Internal bank rules
  - Legal restrictions or uncertainty
  - Asymmetric tax treatment of negative/positive interest income
  - Formulation of existing financial contracts (money market funds, FRNs)
  - Operational problems (IT systems etc.)
- The plethora of possible frictions, led us to expect a more significant reaction to excess liquidity the more pervasive the holdings of it in any one country are.

## Possible adjustment channels to reduce excess liquidity

**0 Initial situation**

A		L
Loans		Retail deposits
Government bonds		Interbank deposits
Central bank cash	RR EL	Securities issued
$\Sigma$		$\Sigma$

**1 Wholesale borrowing channel**

A		L
Loans		Retail deposits
Government bonds		Interbank deposits ↓
↓ Central bank cash	RR EL	Securities issued ↓
$\Sigma$ ↓		$\Sigma$ ↓

**2 Government bond channel**

A		L
Loans		Retail deposits
↑ Government bonds		Interbank deposits
↓ Central bank cash	RR EL	Securities issued
$\Sigma$ →		$\Sigma$ →

**3 Loan channel**

A		L
↑ Loans		Retail deposits
Government bonds		Interbank deposits
↓ Central bank cash	RR EL	Securities issued
$\Sigma$ →		$\Sigma$ →

### **Adjustment is, however, not seamless**

- Excess liquidity circulates in a closed system, so **on aggregate cannot be eliminated by banks** except through:
  - Acquisition of banknotes (costly)
  - Repayment of borrowing from the Eurosystem (distribution matters)
  - Increase in reserve requirements through extension of loans (very drawn out)
- Adjustment is **constrained** by:
  - Regulation (e.g. capital and liquidity requirements)
  - Availability of other assets to be acquired (e.g. demand for bank loans in the economy)
  - Banks' business models (slow to adapt)

## Identification exploits cross-sectional variation in motivation for adjustment

- Identification of effects caused by negative rates is blurred by the confluence of MP measures, which are **common across banks**
- **Intensity of motivations** for adjustment to negative rates depends on the size of each bank's excess liquidity
- **Cross-sectional variation** in the intensity of the motivations → **identification**
- Approach requires the use of **micro data**
- Expectation of continued volume also matters → **banks that typically end up with high excess liquidity have reinforced motivations**



## Implementation of the strategy

### Data

- Bank-level balance sheet and interest rate data (IMFI) matched with data on banks' "exposure" to the Eurosystem
- Sample: Aug 2007 – May 2015 (one full year of negative rates)

### Empirical approach

- Panel fixed effects (bank and time fixed effects)
- Estimate models of the following type:

$$Y_{i,t} = T_t + B_i + \beta_0 Y_{i,t-1} + \beta_1 EL_{i,t-1}(1 - D^{NIR}) + \beta_2 EL_{i,t-1}(D^{NIR}) + \Gamma X_{i,t-1} + \varepsilon_{it}$$

where  $Y$  denotes the purchases of **government bonds**, the extension of **loans to the NFPS** or the change in **wholesale funding** (ratios over main assets) and  $X$  is a vector of bank-specific and macro controls

## Adjustment through extension of loans

- Evidence of **significant adjustment** to excess liquidity in negative rate period for loan extension
- Results driven by banks in **less-vulnerable countries** and by **listed banks**
  - “Vulnerable countries” refers to Ireland, Greece, Spain, Italy, Cyprus, Portugal and Slovenia
- Banks that typically have **high excess liquidity** drive the adjustment → identification reinforced
- Adjustment is stronger if source of excess liquidity is **higher deposits** and if they are **better capitalised**

# Dependent variable: Lending to households and NFCs

		I.	II.	III.	IV.	V.	VI.	VII.
		Full sample	Vulnerable countries	Less vulnerable countries	Highest EL	Highest EL in less vulnerable countries	Non-listed	Listed
1.	Lagged dependent variable	0.00	-0.01	-0.02	0.01	-0.02	0.04	-0.01
		0.04	-0.64	-1.07	0.28	-0.58	1.51	-0.68
2.	$EL\ ratio_{t-1} \times (1 - D^{NIR})$	0.0002**	-0.02	0.0002**	0.0002**	0.0003**	-0.02**	0.0002**
		7.05	-1.28	12.96	9.21	18.74	-2.20	7.75
3.	$EL\ ratio_{t-1} \times (D^{NIR})$	<b>0.00</b>	<b>-0.27**</b>	<b>0.01**</b>	<b>0.01*</b>	<b>0.01**</b>	<b>-0.11</b>	<b>0.01**</b>
		0.66	-2.39	2.56	1.90	2.03	-1.03	2.40
4.	Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5.	Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6.	Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7.	Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Number of cross sections	180	64	116	40	30	70	110
	Adjusted R <sup>2</sup>	0.12	0.22	0.12	0.09	0.09	0.19	0.10

Regressions include a constant. *t*-ratios under coefficient estimates. \*\*/\* reflects significance at 95/90 percent level of confidence. Regressions include cross section and period fixed effects as well as the following controls:

Liquidity ratio<sub>*i,t-1*</sub>, Leverage ratio<sub>*i,t-1*</sub>, BLS demand<sub>*t*</sub>, BLS credit standards<sub>*t*</sub>,  $r_{i,t-1}^{Loan}$ , Core ratio<sub>*i,t-1*</sub>, Borrowing ratio<sub>*i,t-1*</sub>,  $\log(Assets)_{i,t-1}$ ,  $\log(IP)_{j,t-12}$ , Wholesale ratio<sub>*i,t-1*</sub>, Bond ratio<sub>*i,t-1*</sub>

## Robustness check 1: are results driven by high excess liquidity banks?

		I.	II.
		Less vulnerable countries	Listed
1.	$EL\ ratio_{t-1} \times (1 - D^{NIR})$	0.0002** 12.93	0.0002** 7.72
2.	$EL\ ratio_{t-1} \times (D^{NIR}) \times (1 - D^{EL})$	0.05 0.95	0.02 0.31
3.	$EL\ ratio_{t-1} \times (D^{NIR}) \times (D^{EL})$	<b>0.01**</b> 2.56	<b>0.01**</b> 2.39
	Number of cross sections	116	110

Regressions include a constant. *t*-ratios under coefficient estimates. \*\*/\* reflects significance at 95/90 percent level of confidence. Regressions include cross section and period fixed effects as well as the following controls: Liquidity ratio<sub>*i,t-1*</sub>, Leverage ratio<sub>*i,t-1*</sub>, BLS demand<sub>*t*</sub>, BLS credit standards<sub>*t*</sub>,  $r_{i,t-1}^{loan}$ , Core ratio<sub>*i,t-1*</sub>, Borrowing ratio<sub>*i,t-1*</sub>, log(Assets)<sub>*i,t-1*</sub>, log(IP)<sub>*j,t-12*</sub>, Wholesale ratio<sub>*i,t-1*</sub>, Bond ratio<sub>*i,t-1*</sub>

## Robustness check 2: the role of deposits and capital

	Banks in less vulnerable countries	I.	II.	III.
1.	$EL\ ratio_{t-1} \times (1 - D^{NIR})$	0.0002**	0.0002**	0.0002**
		12.93	12.89	12.90
2.	$EL\ ratio_{t-1} \times (D^{NIR}) \times (1 - D^{EL})$	0.05	0.05	0.05
		0.95	0.98	1.03
3.	$EL\ ratio_{t-1} \times (D^{NIR}) \times (D^{EL})$	<b>0.01**</b>	<b>0.01**</b>	<b>0.01**</b>
		2.56	2.48	2.44
4.	$EL\ ratio_{t-1} \times (D^{NIR}) \times (D^{EL}) \times (D^{Dep})$	--	<b>0.04**</b>	<b>0.04**</b>
		--	3.02	3.07
5.	$EL\ ratio_{t-1} \times (D^{NIR}) \times (D^{EL}) \times (D^{Lev})$	--	--	<b>0.21*</b>
		--	--	1.88
	Number of cross sections	116	116	116

Regressions include a constant.  $t$ -ratios under coefficient estimates. \*\*/\* reflects significance at 95/90 percent level of confidence. Regressions include cross section and period fixed effects as well as the following controls: Liquidity ratio $_{i,t-1}$ , Leverage ratio $_{i,t-1}$ , BLS demand $_t$ , BLS credit standards $_t$ ,  $r_{i,t-1}^{Loan}$ , Core ratio $_{i,t-1}$ , Borrowing ratio $_{i,t-1}$ ,  $\log(Assets)_{i,t-1}$ ,  $\log(IP)_{j,t-12}$ , Wholesale ratio $_{i,t-1}$ , Bond ratio $_{i,t-1}$

- We do not observe a significant increase in bond holdings or a significant decline in wholesale funding (not shown)

- We find evidence that **banks' reaction to the negative rate is indeed special:**
  - Extension of loans to the non-financial private sector
- This reaction is driven by banks in **less vulnerable countries** and in particular by those that **hold large amounts of excess liquidity**.
- These results can be seen as suggesting that the **negative deposit facility rate has acted as an empowerment to the ECB's large-scale asset purchases**.
- Further interesting avenues to be explored:
  - Adjustment via holdings of non-euro area assets
  - Impact on bank profitability and loan pricing

# Background



## Dependent variable: Lending to NFPS

		I.	II.	III.	IV.	V.	VI.	VII.
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1.	Lagged dependent variable	0.00	-0.01	-0.02	0.01	-0.02	0.04	-0.01
		0.04	-0.64	-1.07	0.28	-0.58	1.51	-0.68
2.	$EL\ ratio_{t-1} \times (1 - D^{NIR})$	0.0002**	-0.02	0.0002**	0.0002**	0.0003**	-0.02**	0.0002**
		7.05	-1.28	12.96	9.21	18.74	-2.20	7.75
3.	$EL\ ratio_{t-1} \times (D^{NIR})$	<b>0.00</b>	<b>-0.27**</b>	<b>0.01**</b>	<b>0.01*</b>	<b>0.01**</b>	<b>-0.11</b>	<b>0.01**</b>
		0.66	-2.39	2.56	1.90	2.03	-1.03	2.40
4.	Liquidity ratio <sub>t-1</sub>	0.003**	0.01**	0.00	0.00	0.00	0.00	0.004**
		2.32	2.58	1.27	0.93	-0.08	0.27	2.39
5.	Leverage ratio <sub>t-1</sub>	0.01	0.00	0.03**	0.02	0.05**	0.02	0.01
		0.44	0.69	2.21	0.64	3.37	1.24	0.39
6.	BLS demand <sub>t</sub>	0.00	0.00001*	0.00	0.00	0.00	0.00	0.00
		0.68	1.68	0.36	0.41	0.37	1.62	0.07
7.	BLS credit standards <sub>t</sub>	0.00002**	0.00	0.00002**	0.00003**	0.00003**	0.00002**	0.00002**
		4.14	-1.05	2.10	1.93	1.93	3.37	2.49
8.	$r_{t-1}^{Loan}$	-0.0002**	0.00	0.00	0.00	0.00	0.00	0.00
		-2.15	0.86	-0.32	-0.58	-0.06	-0.99	-1.35
9.	Core ratio <sub>t-1</sub>	0.004*	0.01**	0.00	0.01	0.01**	0.00	0.01*
		1.66	3.59	0.95	1.22	3.41	0.60	1.79
10.	Borrowing ratio <sub>t-1</sub>	-0.003**	0.00	0.00	0.00	0.001*	-0.01*	0.00
		-2.06	-0.03	0.73	-0.79	1.77	-1.74	-1.49
11.	log(Assets) <sub>t-1</sub>	0.00	0.00	0.00	0.0002**	0.001**	-0.001*	0.00
		0.49	-0.91	0.56	1.94	2.96	-1.91	0.92
12.	log(IP) <sub>t-12</sub>	0.01**	-0.01**	0.00	0.01*	0.00	0.00	0.004*
		2.69	-2.00	0.73	1.71	0.46	1.37	1.79
13.	Wholesale ratio <sub>t-1</sub>	0.01**	0.00	0.004**	0.01**	0.003**	0.00	0.01**
		5.48	0.76	2.38	2.70	1.97	0.50	5.07
14.	Bond ratio <sub>t-1</sub>	-0.02	0.00	-0.03*	-0.02	-0.03**	0.00	-0.02*
		-1.60	0.23	-1.69	-1.26	-1.93	0.05	-1.87
15.	Number of cross sections	180	64	116	40	30	70	110
16.	Adjusted R <sup>2</sup>	0.12	0.22	0.12	0.09	0.09	0.19	0.10

Regressions include a constant, cross section and period fixed effects. *t*-ratios under coefficient estimates. \*\*/\* reflects significance at 95/90 percent level of confidence.

# Summary statistics

	p25	p50	p75	mean	sd	N
<i>Gov. Bond ratio</i>	-0.0354	0.0000	0.0725	0.0219	1.2627	22,034
<i>Domestic Gov. Bond ratio</i>	-0.0087	0.0000	0.0340	0.0250	0.9532	22,067
<i>Non – Domestic Gov. Bond ratio</i>	-0.0012	0.0000	0.0000	-0.0032	0.7730	22,034
<i>Loans ratio</i>	-0.1458	0.0176	0.2793	0.0566	1.6961	22,116
<i>EL ratio</i>	0.000	0.000	0.004	0.048	1.304	19,174
<i>Liquidity ratio</i>	0.218	0.316	0.459	0.352	0.209	22,201
<i>Leverage ratio</i>	0.042	0.067	0.101	0.080	0.204	22,201
$r^{Loan} - r^{10y}$	-0.671	0.546	1.323	0.113	2.580	16,233
<i>Core ratio</i>	0.055	0.306	0.507	0.319	0.254	22,201
$\log(\text{Assets})$	9.471	10.449	11.359	10.395	1.429	22,201
<i>Rating</i>	5.000	6.000	8.000	7.010	4.163	14,823
$\log(IP)$	4.562	4.610	4.676	4.616	0.086	23,782
$\Delta\log(IP)$	-0.011	0.000	0.010	-0.001	0.025	23,529
<i>BLS demand</i>	-25.606	-2.993	14.069	-7.182	30.725	23,137
<i>BLS credit standards</i>	-0.458	4.766	19.366	12.769	23.144	23,137
$r^{Loan}$	2.569	3.585	4.996	3.826	1.588	16,233
<i>Borrowing ratio</i>	0.000	0.000	0.029	0.036	0.091	22,201

Note: *Gov. Bond ratio*, *Domestic Gov. Bond ratio*, *Non-Domestic Gov. Bond ratio* and *Loans ratio* have been multiplied by 100.