Negative Interest Rates, Bank Profitability and Risk-taking

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Motivation

Following the 2008-2009 Global Financial Crisis, several central banks implemented unconventional monetary policies:

- Quantitative Easing
- Credit Easing
- Forward Guidance
- Negative Interest Rates Policy (NIRP)

Since 2012, 7 major central banks in Europe and Japan have pushed their main policy rate to negative territory:

- Danmarks Nationalbank, Bank of Japan, Magyar Nemzeti Bank, Bulgarian National Bank, European Central Bank, Swiss National Bank & Sveriges Riksbank

Motivation

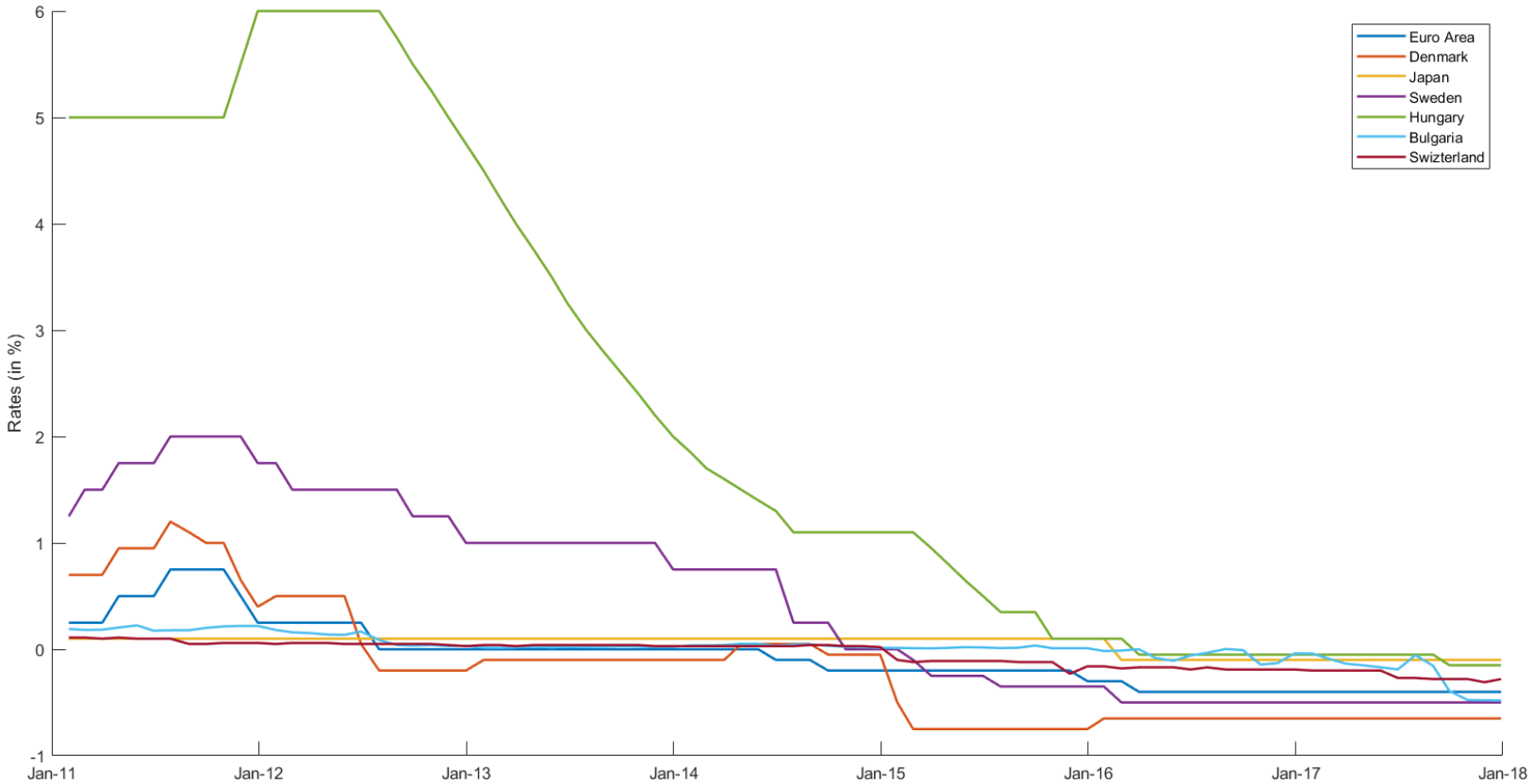


Figure 1: Main policy rates

Motivation

The motivation of NIRP:

- Tax banks' liquidity excess to increase credit supply
- Lower financing costs (banks and borrowers)
- Increase supply and demand for loans

Motivation

The terms of the debate on NIRP effects:

- Positive economic and financial effects
  "By and large,our negative interest rate policy has been a success [...] We haven't seen bank profitability go down as a matter of fact it's ging up." Mario Draghi (2017)

- Financial stability concerns
  In the medium and long term, the effects on profitability could encourage banks to "Search for yield" *(Rajan, 2006; Taylor, 2009; Gambacorta, 2009; Coeuré, 2016)*.

Motivation

Why should there be any sort of asymmetry at zero?

- Banking is not a level business but rather a spread business.
  - Spread business: The difference between banks' credit (i_l) and deposit interest rate (i_d).

Motivation

Assets	**Liabilities**
Securities	Own funds
Loans(i_l)	**Retail deposits(i_d)**
CB Reserves	

Table 1: Simplified bank balance sheet

- Declining credit rates for new loans + re-pricing of the outstanding loans (mostly at variable-rate) compress banks' net interest margins when the deposit rate cannot go below zero (Zero Lower Bound - ZLB).

This paper

- This paper aims to document the effects of negative interest rates on the profitability and risk-taking of European banks.

3 research questions:

- Q1: What are the effects of negative rates on European banks' profitability?
- Q2: Would negative interest rates encourage an increase in banks risk-taking?
- Q3: In a negative interest rates environment, what are the effects of banks' profitability on risk-taking?

What we do

We conduct a panel analysis on the 28 member countries of the EU with a sample of 2442 banks.

Using dynamic panel models (System GMM):

- We assess the impact of negative interest rates on the soundness of the European banking sector in terms of profitability and risk-taking.
- We compare the effects of positive and negative rates on banks.
- In the presence of negative interest rates, we determine the impact of profitability on risk-taking.

Contribution

- We use a wide range of data (2442 banks operating in the 28 countries of the European Union).
- Using a 3 NIRP variables (continuous, discrete and interaction), we assess the effects of negative interest rates on both bank profitability and risk-taking.
- To the best of our knowledge, this is the first paper to study the effects of bank profitability on risk-taking in presence of negative rates.

Related literature

Interest rates and banks' profitability

- Low or negative interest rates could impact bank profitability:
  - Negative effects *(Genay and Podjasek, 2014; Bush and Memmel, 2015; Dell'Ariccia et al., 2017; Kerbl and Sigmund, 2017; Eisenschmidt and Smets, 2018)*.
  - Positive (or moderate) effects *(Scheiber et al, 2016; Jobst and Lin, 2017; Madaschid and Nuevo, 2017; Basten and Mariathasan, 2018)*.
- These effects depend on:
  - The impact of monetary policy on macroeconomic conditions *(Borio et al, 2017; Altavilla et al, 2017)*.
  - Banks' ability to diversify their sources of revenue and increase their banks fees *(Artera et al, 2016; Scheiber et al, 2016)*.

Related literature

The risk-taking channel *(Borio and Zhu, 2012; Adrian and Shin, 2014)*

- Low rates encourage banks to take excessive risks
  - Low rate *(Maddaloni and Peydro, 2011; Andries et al, 2016; Caselli, 2016; Bikker and Vervliet, 2017; Malovana et al, 2018)*
  - Negative rate *(Nucera et al, 2017; Jobst and Lin, 2017; Heider et al, 2018; Basten and Mariathasan, 2018)*
- The effect would depend on:
  - Bank profitability *(Keeley, 1990; Martynova et al, 2015)*
  - Bank business model *(Arseneau, 2017; Nucera et al, 2017)*
  - Bank capitalization level *(Dell'Ariccia et al, 2017; Delis and Kouretas, 2011; Rahman et al, 2015)*

Preview results

- Negative interest rates have reduced the Net Interest Margins (NIM) of European banks.
- The effects of negative rates on banks margins are greater than positive rates.
- The decline in NIM has led to a reduction in banks' risk-taking.

Data

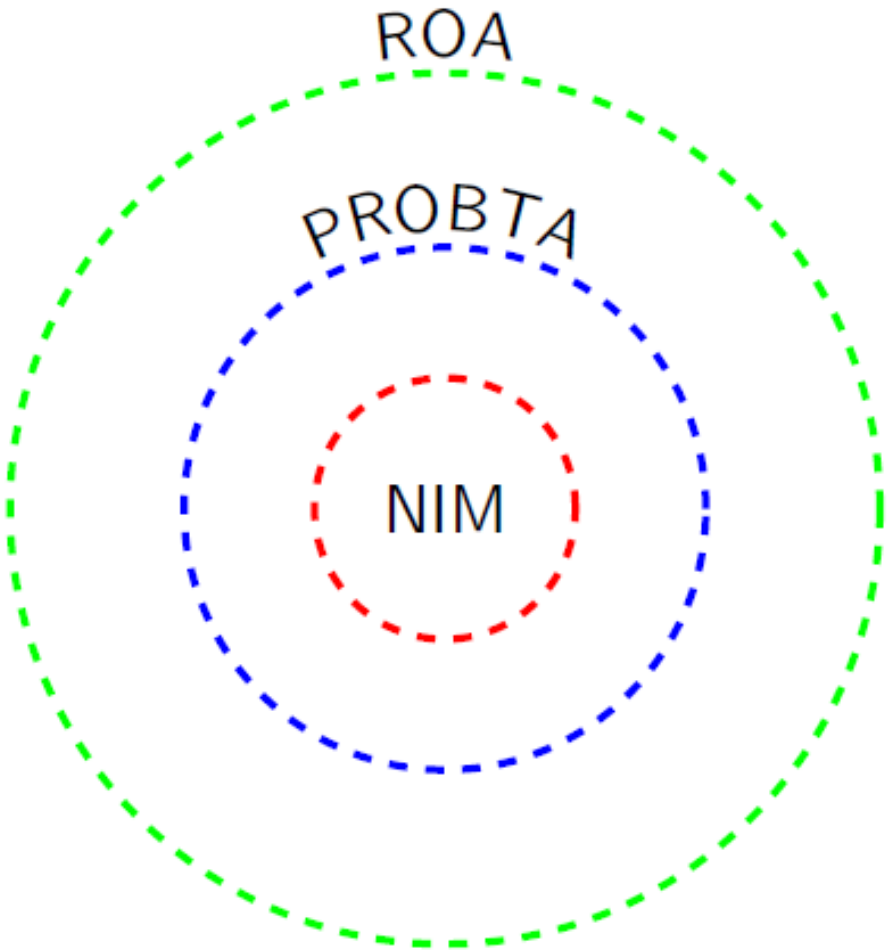
- 2442 European banks
- 2011 – 2017 (annual frequency)
- 28 countries from the European Union
  $\rightarrow$ 19 EA countries
  Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain.
  $\rightarrow$ 9 non-EA countries
  Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and UK.
- Sources: Orbis Bank Focus, central banks, OECD, DataStream

Data

Measures of bank profitability

- **Bank's Margin**
  - Net Interest Margin (NIM): Net interest income to total assets
- **Bank's Profit**
  - PROBTA: Profit before tax to total assets
  - Return on Assets (ROA): Net income to total assets

Data



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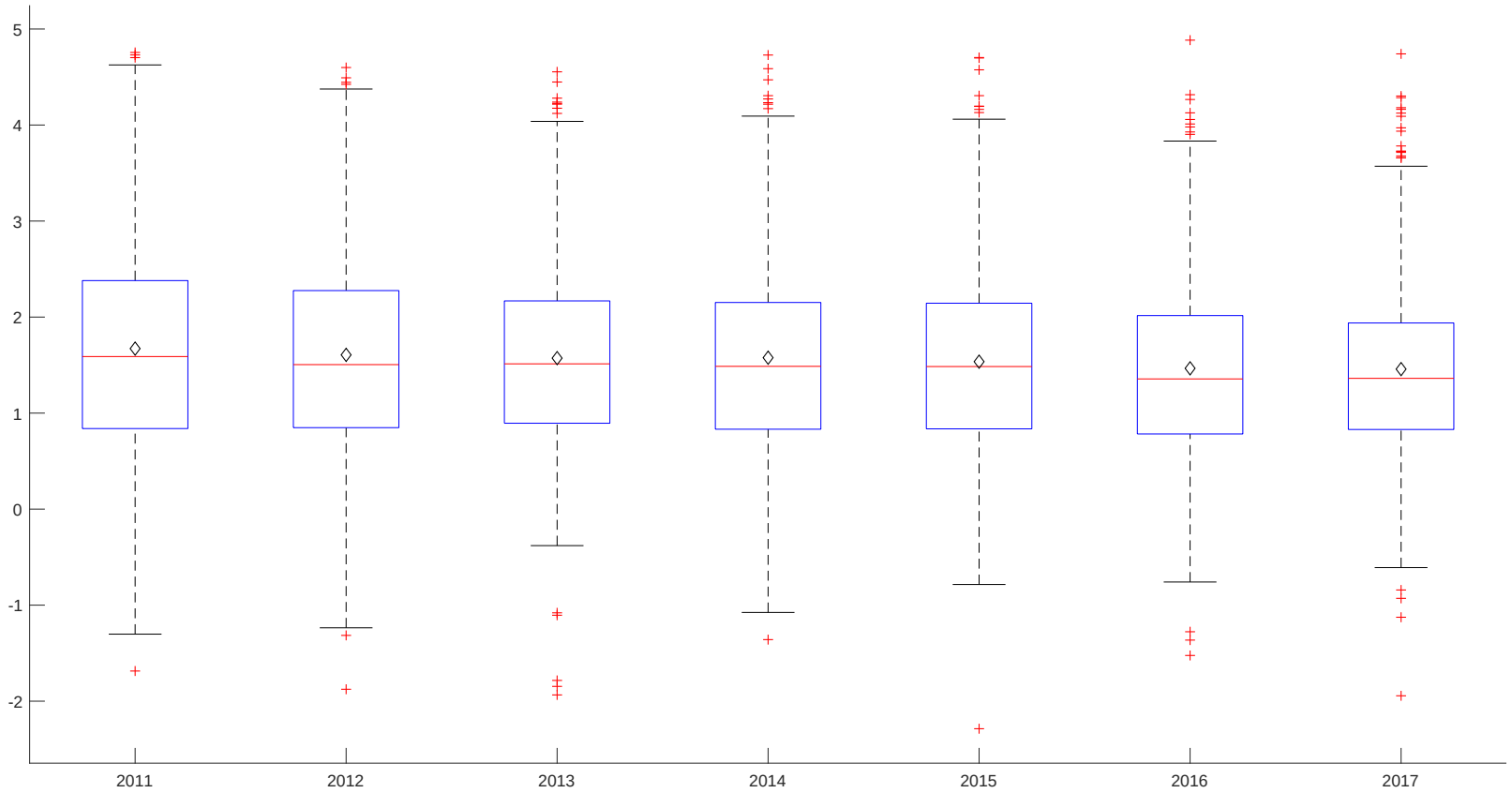

Figure 2: Net Interest Margin

Data

Measures of bank risk-taking

- NPLs: Non-Performing Loans to gross loans
- Provisions: Loans loss provision to gross loans
- Log (Z-score): Measure based on equity capital and profit volatility

Data

Negative Interest Rate Policy (NIRP) variables

- i : the central bank main policy rate which became negative $\rightarrow$ continuous variable (annual average over all observations)
- D_{NIRP} : Dummy variable that takes the value of 1 when NIRP is implemented $\rightarrow$ year of adoption is categorized as 1 if after June.
- $i \cdot D_{NIRP}$: interaction term

Data

Bank-specific controls:

- Size: The natural logarithm of total assets
- Capitalization: Equity to asset ratio
- Liquidity: Liquid assets to total assets ratio
- Efficiency: Cost to income ratio

Country-specific controls:

- Herfindahl-Hirschman Index (HHI)
- Inflation rate
- Real GDP growth rate
- The yield curve slope

The empirical model

$$Z_{i,k,t} = c + \alpha_0 Z_{i,k,t-1} + \alpha_1 MP_{k,t} + \alpha_2 X_{i,k,t} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t}$$

- $Z_{i,k,t}$: profitability (or risk-taking) measures
- $MP_{k,t}$: NIRP measures
- $X_{i,k,t}$: bank-specific controls
- $Y_{k,t}$: country-specific controls
- θ_t : time fixed-effects
- λ_k : country fixed-effects
- for bank *i*, country *k* and date *t*

Endogeneity issues

Potential sources:

- Reverse causality (between MP and Profit / Risk)
- The problem of omitted variables

Possible solutions:

- Lag structure: bank-specific controls introduced in t-1
- The dynamic System Generalized Method of Moments (SGMM) panel methodology *(Blundell and Bond, 1998)* :
  - Endogenous variables: MP and bank-specific controls in t-1
  - Exogenous variables: country-specific controls

Estimates Q1

$$Profit_{i,k,t} = c + \alpha_0 Profit_{i,k,t-1} + \alpha_1 MP_{k,t} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t}$$

	NIM				PROBTA				ROA			
	OLS	SGMM	SGMM	SGMM	OLS	SGMM	SGMM	SGMM	OLS	SGMM	SGMM	SGMM
i	0.122^a	0.429^a		0.420^a	-0.026^c	-0.07		-0.945	-0.137^a	-0.136		1.696^c
	[0.03]	[0.13]		[0.16]	[0.01]	[0.20]		[0.71]	[0.05]	[0.21]		[0.88]
D_{NIRP}			-2.097^a	0.582^a			0.033	0.279			0.061	0.348
			[0.60]	[0.22]			[0.14]	[0.26]			[0.53]	[0.39]
$i \cdot D_{NIRP}$				0.603^a				2.508^a				-1.60^c
				[0.22]				[1.06]				[0.94]
$i + (i \cdot D_{NIRP})$				1.022^a				1.562^b				0.095
				[0.28]				[0.56]				[0.26]
$Profit_{i,k,t-1}$	0.958^a	0.705^a	0.172	0.828^a	0.655^a	0.163	0.942^a	0.348	0.406^a	0.701^a	0.883^a	0.690^a
	[0.01]	[0.18]	[0.13]	[0.11]	[0.02]	[0.28]	[0.22]	[0.23]	[0.06]	[0.25]	[0.33]	[0.17]
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Obs.	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*
Hansen p-val		*0.111*	*0.641*	*0.514*		*0.03*	*0.501*	*0.11*		*0.673*	*0.143*	*0.418*

Robust standard errors in brackets. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Discussion

- We find strong evidence that there is a threshold effect at zero.
- The implementation of negative rates in the EU has squeezed the banks' NIMs.
- No effect on banks' profit due to an increase in the non-interest income.

Estimates Q2

$$Risk_{i,k,t} = c + \alpha_0 Risk_{i,k,t-1} + \alpha_1 MP_{k,t} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t}$$

	NPLs				**Provisions**				**Log(z-score)**			
	OLS	SGMM	SGMM	SGMM	OLS	SGMM	SGMM	SGMM	OLS	SGMM	SGMM	SGMM
i	0.302^a	2.358^a		-1.733^b	0.239^a	0.978^a		-0.425	-0.209^a	-0.746^b		0.472^b
	[0.11]	[0.77]		[0.80]	[0.02]	[0.26]		[1.89]	[0.04]	[0.37]		[0.22]
D_{NIRP}			-2.883^a	-3.213^b			-1.016^c	-0.716			0.663^c	0.872^a
			[1.00]	[1.34]			[0.53]	[0.47]			[0.37]	[0.31]
$i \cdot D_{NIRP}$				1.245^c				1.879				-0.257
				[0.74]				[2.51]				[0.23]
$i + (i \cdot D_{NIRP})$				-0.487				1.454				0.215
				[0.544]				[1.28]				[0.137]
$Risk_{i,k,t-1}$	0.922^a	0.932^a	0.936^a	0.880^a	0.627^a	0.979^a	0.726^a	-0.412	0.744^a	0.553^a	0.554^a	0.949^a
	[0.01]	[0.07]	[0.04]	[0.04]	[0.02]	[0.18]	[0.25]	[0.52]	[0.01]	[0.07]	[0.07]	[0.13]
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Obs.	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*
Hansen p-val		*0.14*	*0.112*	*0.598*		*0.061*	*0.198*	*0.057*		*0.844*	*0.127*	*0.188*

Robust standard errors in brackets. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Discussion

- During the period of implementation of negative interest rates, banks took less risk.
- European banks have reduced non-performing loans and provisions on their balance sheets.

The issue of bank heterogeneity

- Interest rates (fixed or variable) on loans to households and non-financial corporations
- Banks' size (small or large)
- Banks' holding of liquid assets (low or high)

Sensibility analyses

- Last observation of the policy rate (31 December)
- Without Germany
- Without the UK
- Subsample of countries with negative rates (Bulgaria, Denmark, Hungary, Sweden and Euro Area)
- The overnight rate on the interbank market

Q3

How does profitability affect risk-taking because of negative interest rates?

$$Risk_{i,k,t} = c + \alpha_0 Risk_{i,k,t-1} + \alpha_1 \widehat{NIM_{i,k,t}} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t}$$

- $\widehat{NIM_{i,k,t}}$ is the fitted value of NIM predicted by NIRP

Estimates Q3

$$Risk_{i,k,t} = c + \alpha_0 Risk_{i,k,t-1} + \alpha_1 \widehat{NIM_{i,k,t}} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t}$$

	NPLs		**Provisions**		**Log(z-score)**	
	OLS	SGMM	OLS	SGMM	OLS	SGMM
$\widehat{NIM_{i,k,t}}$	0.791^a	5.436^b	0.559^a	0.749	-0.520^a	-1.775^b
	[0.26]	[2.41]	[0.06]	[1.11]	[0.11]	[0.88]
$Risk_{i,k,t-1}$	0.921^a	0.799^a	0.632^a	0.413^b	0.750^a	0.553^a
	[0.01]	[0.08]	[0.01]	[0.19]	[0.01]	[0.07]
Bank	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Country	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Obs.	*4750*	*4750*	*4750*	*4750*	*4750*	*4750*
Hansen p-val		*0.834*		*0.842*		*0.844*

Robust standard errors in brackets. ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Main messages

- By focusing on period 2011-2017, we study the effects of negative interest rates on the profitability and risk-taking of banks in the European Union.
- We find evidence of a threshold effect when interest rates are below zero.
- During their implementation, negative rates reduced banks' margins.
- In addition, banks compensated for the reduction in margins by increasing non-interest income.
- As a result, they took less risk.

Thank you for your attention