DETERMINANTS OF BANK'S INTEREST MARGIN IN THE AFTERMATH OF THE CRISIS:

THE EFFECT OF INTEREST RATES AND THE YIELD CURVE SLOPE

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1. INTRODUCTION

- In recent years, the effect of an extended period of low –or even negative- interest rates on banks' profitability has been a topic of discussion and a cause of concern.

- On the one hand, the **IMF**´s position is that it is difficult to estimate the net impact of falling interest rates on bank profitability, since it depends on factors such as:
  - Banks' ability to pass on cuts in interest rates to both lending and borrowing rates.
  - Relative importance of net interest margins in total revenues.
  - Potential to generate other forms of income.

- On the other hand, the **ECB** justifies the net positive effect on the basis of the opinions of banks which profitability increased in the months after the main non-conventional measures (such as the expanded debt purchase programme).

1. INTRODUCTION

What are the aims of this study?

- Analysing the determinants of banks'net interest margin during the period 2008-2014, which are the years of expansionary monetary policy measures.

- Quantifying the impact of both the **slope of the yield curve** and the **level of short-term interest rates** on net interest margin, and therefore, profitability.

We carry out an empirical analysis for a sample of banks for 32 OECD countries, estimating a model where the net interest margin depends on the determinants usually included in the literature.

2. LITERATURE REVIEW

The previous literature falls into **three groups**.

The **first group** takes the seminal model of **Ho and Saunders (1981)** as its starting point.

This model is extended by:

- **Allen (1988)** to incorporate crossed elasticity of demand between banking products.
- **Angbanzo (1995)** to incorporate the risk of default.
- **Maudos and Fernández de Guevara (2004)** to include average operating costs.
- **Entrop et al. (2015)** to include a cost of maturity transformation.

2. LITERATURE REVIEW

The **second group** of papers includes **Zarruck (1989)** analysing how banks' net interest margin varies in relation to conditions of uncertainty and risk aversion, subsequently expanded by **Wong (1997)** to include operating costs.

The **third group** includes the contribution by **Borio, Gambacorta and Hofmann (2015)** which puts forward a modified version of the Monti-Klein model incorporating: a cost of maturity transformation, a capital requirements coefficient and an equation for provisions to cover loan losses.

3. DATA

- The sample includes all banks for **32 OCDE countries.**
- The source is **BankScope**.
- The period analysed is **from 2008 to 2014**.
- Observations excluded:
  - Banks with no information for any explanatory variable.
  - Banks with prices of production factors (needed for the construction of the Lerner index) outside $mean \pm 2.5\ standard\ deviations$.
- The panel of data used comprises **26,149 observations**.

3. DATA: VARIABLES

We combine the determinants of the Ho and Saunders (1981) model and posterior expansions with the framework of Borio et al. (2015).

All in all, we include the following **determinants of net interest margin**:

- **Interest rate level (+)**. The three-month interbank market interest rate is used as a proxy for short-term interest rate.

  The square of the variable is introduced to capture a posible non-linear relationship.

- **Slope of the yield curve (+).** The difference between the interest rate on a ten-year bond and the three-month interbank interest rate is used as a proxy.

  The square of the variable is also include.

3. DATA: VARIABLES

- **Market power (+)**. The Lerner index is used to proxied it.

$$Lerner_i = \frac{P_i - MC_i}{P_i}$$

- **Bank size (+)**. Two alternatives:

$$Size = log(loans)$$

$$Size = log(total\ assets)$$

- **Risk aversion (+)**.

$$Risk\ aversion = Equity\ \ /\ Total\ Assets$$

- **Credit risk (+)**. Two alternatives:

$$Credit\ risk = Provisions\ /\ Volume\ of\ credit\ granted$$

$$Credit\ risk = Loans\ /\ Total\ Assets$$

3. DATA: VARIABLES

- **Interest rate risk (+)**. Coefficient of variation calculated with monthly data on the three-month inter-bank interest rate.

- **Interaction between credit risk and interest rate risk (+)**.

$$Risk\ interaction = Credit\ risk\ * Interest\ rate\ risk$$

- **Average cost of transactions (+)**.

$$Average\ cost = Total\ operating\ costs\ /\ Total\ Assets$$

- **Liquid reserves (+)**.

$$Liquid\ reserves = Liquid\ reserves\ / Total\ Assets$$

3. DATA: VARIABLES

Control variables:

- **Implicit interest payments (+)**.

$$IP = \frac{(Operating\ expenses - Net\ fees + Other\ operating\ charges)}{Total\ Assets}$$

- **Management quality (-)**.

$$Operating\ ratio = Operating\ expenses\ \ / \ Operating\ income$$

- **GDP growth (+)**.

- Dependent variable: **Net interest margin per unit of assets.**

  To capture the inertia in the trend in net interest margin, its time lag is included as an explanatory variable.

4. METHODOLOGY

- We estimated a dynamic panel data model, using the **generalised method of moments (GMM)** based on Arellano and Bond (1991) and Blundell and Bond (1998).

- Potential **endogeneity problems** were corrected by estimating the model in first differences and using the variables on levels time-lagged by a set number of periods.

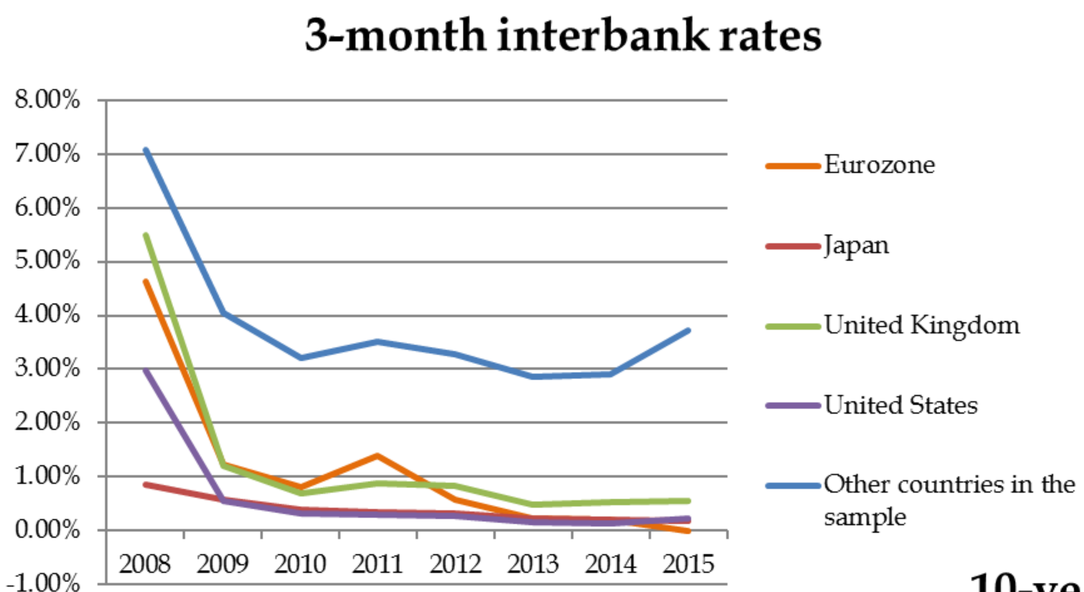
- The estimation includes **time effects** to reflect the effects of specific variables in each year affecting the net interest margin.

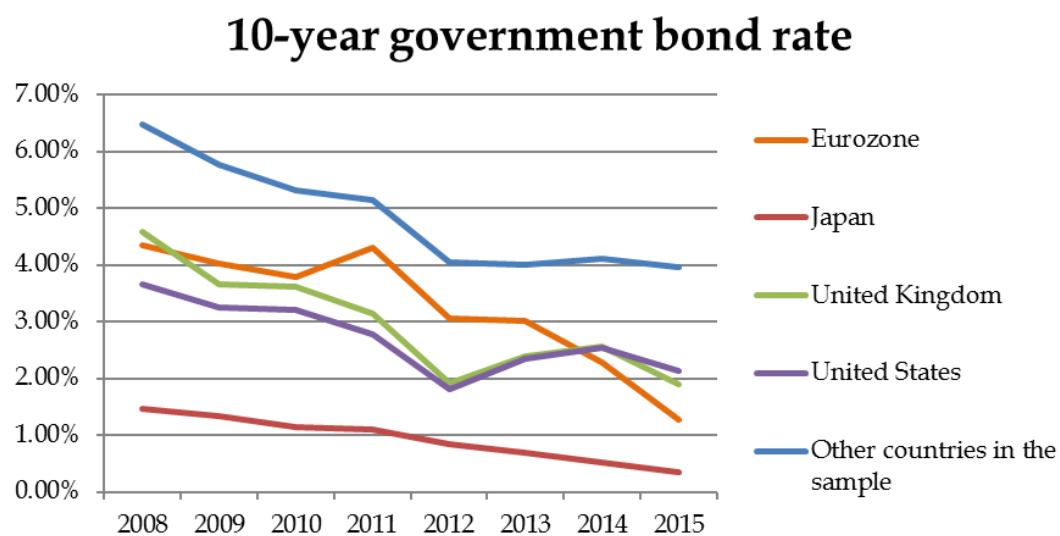
4. METHODOLOGY

The **equation to estimate** is the following:

$$NII_t = f(NII_{t-1}, Short\ interest\ rate_t, Short\ interest\ rate_t^2, Slope\ of\ the\ yield\ curve_t, Slope\ of\ the\ yield\ curve_t^2, Implicit\ interest\ payments_t, Efficiency_t, Lerner\ index_t, Interest\ rate\ risk_t, Credit\ risk_t, Risk\ covariance_t, Size_t, Risk\ aversion_t, Average\ cost_t, Reserves_t, GDP\ growth_t)$$

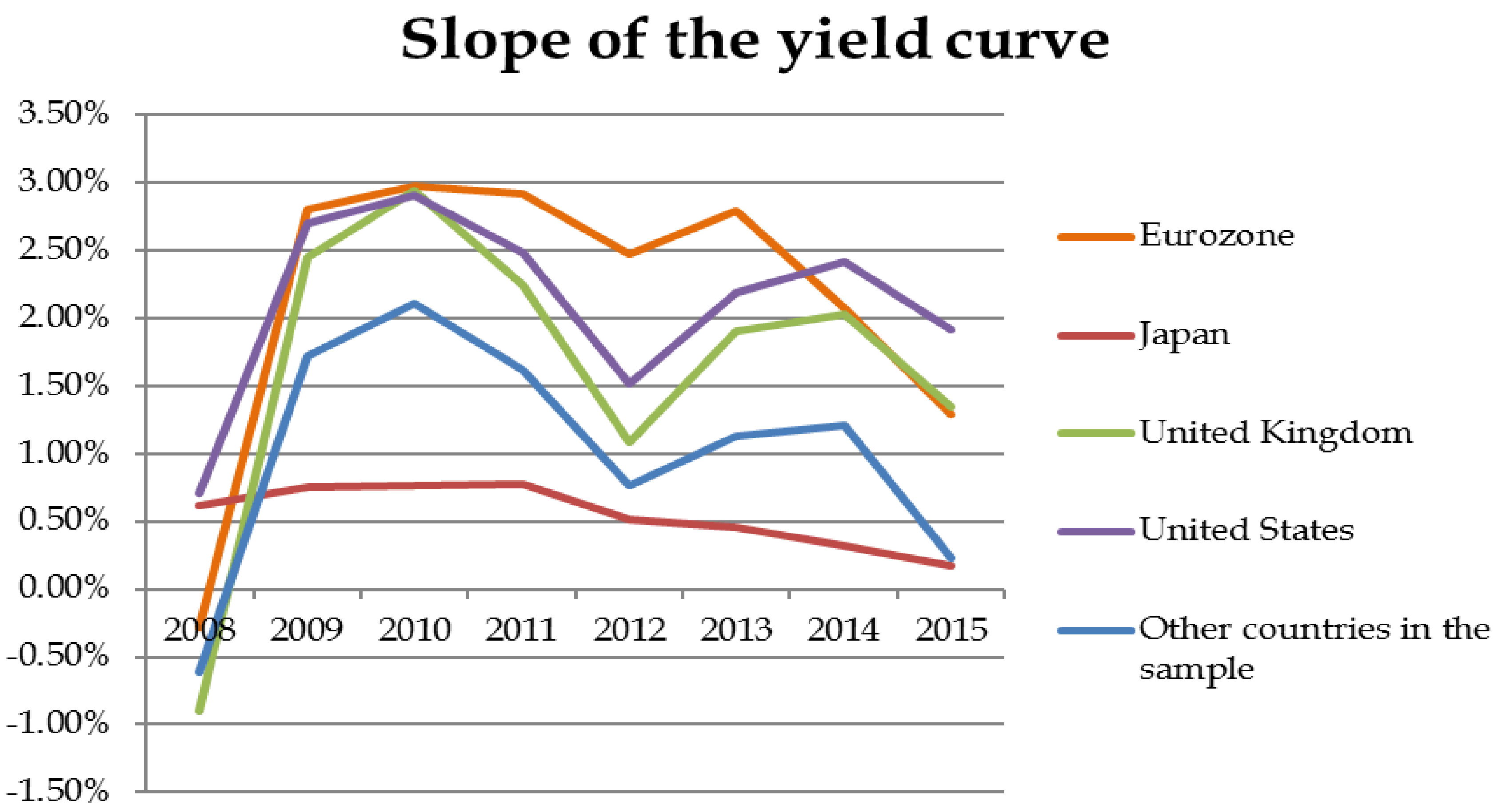
5. RESULTS





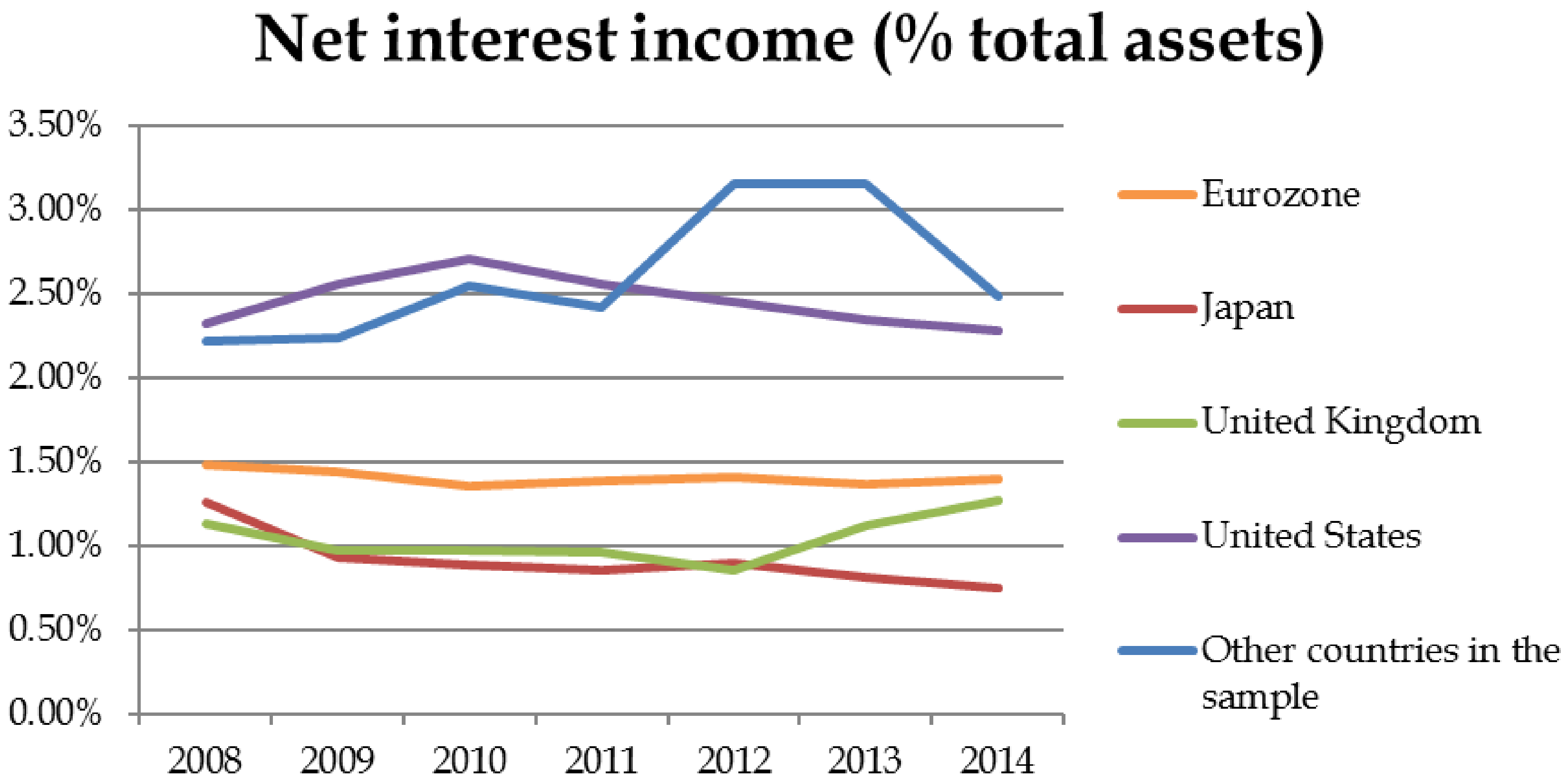
Source: OCDE

5. RESULTS



Source: OCDE and authors' calculations

5. RESULTS



Source: BankScope and authors' calculations

5. RESULTS

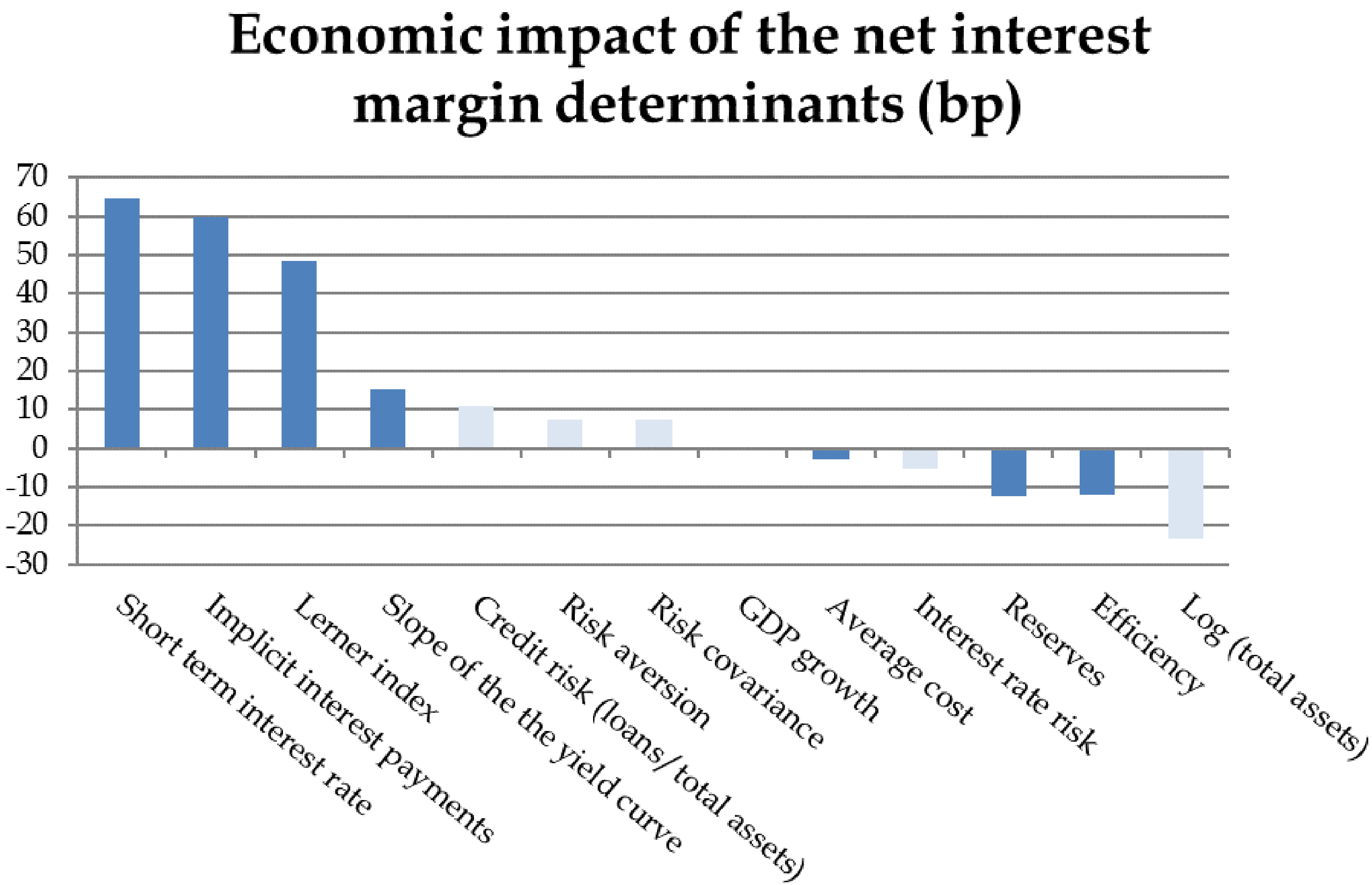
	[1]	[2]	[3]	[4]	[5]
NIM-1	0.564 ***	0.471 ***	0.479 ***	0.490 ***	0.497 ***
	(0.069)	(0.070)	(0.070)	(0.067)	(0.067)
Short term interest rate	0.066 **	0.211 ***	0.205 ***	0.195 ***	0.193 ***
	(0.031)	(0.046)	(0.047)	(0.050)	(0.049)
Short term interest rate^2		-1.134 ***	-1.112 ***	-0.900 **	-0.887 **
		(0.335)	(0.336)	(0.390)	(0.379)
Slope of the yield curve	0.012	0.086	0.077	0.133 **	0.129 **
	(0.020)	(0.057)	(0.055)	(0.055)	(0.055)
Slope of the yield curve^2		-0.786	-0.692	-1.296 **	-1.252 **
		(0.554)	(0.547)	(0.516)	(0.514)
Implicit interest payments	0.398 ***	0.514 ***	0.520 ***	0.488 ***	0.483 ***
	(0.106)	(0.103)	(0.103)	(0.101)	(0.100)
Efficiency	-0.006 ***	-0.005 ***	-0.005 ***	-0.005 ***	-0.005 ***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Lerner index	2.987 ***	3.625 ***	3.759 ***	3.079 ***	3.204 ***
	(0.853)	(0.820)	(0.822)	(0.677)	(0.675)
Interest rate risk	0.001	0.001	0.001	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.006)	(0.006)
Credit risk (provisions/loans)	0.008 **	0.007 **	0.007 **		
	(0.003)	(0.003)	(0.003)		
Credit risk (loans/total assets)				0.005	0.004
				(0.006)	(0.005)

5. RESULTS

Risk covariance	-0.018	-0.011	-0.011	0.004	0.004
	(0.016)	(0.015)	(0.015)	(0.009)	(0.009)
Log (loans)	-0.055	-0.014		-0.056	
	(0.054)	(0.055)		(0.065)	
Log (total assets)			-0.054		-0.083
			(0.070)		(0.075)
Risk aversion	0.020	0.013	0.011	0.012	0.011
	(0.015)	(0.014)	(0.014)	(0.013)	(0.013)
Average cost	-0.005	-0.007	-0.010	-0.009 *	-0.011 *
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Reserves	-0.041 ***	-0.039 ***	-0.041 ***	-0.034 ***	-0.035 ***
	(0.013)	(0.012)	(0.012)	(0.010)	(0.010)
GDP growth	0.011	-0.002	0.000	-0.001	0.000
	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Constant	0.005	-0.004	0.002	0.000	0.005
	(0.007)	(0.007)	(0.010)	(0.007)	(0.010)
Max. short term interest rate		0.093	0.092	0.108	0.109
Max. slope yield curve		0.055	0.056	0.051	0.052
Number observations	16479	16479	16479	16479	16479
Arellano-Bond test for AR(1) in first differences [p-valor]	-3.13 [0,002]	-3.27 [0.001]	-3.28 [0.001]	-3.52 [0.000]	-3.59 [0.000]
Arellano-Bond test for AR(2) in first differences [p-valor]	-0.24 [0.809]	-0.18 [0.859]	-0.18 [0.858]	-0.19 [0.851]	-0.18 [0.855]
Sargan test of overid. Restrictions [p-valor]	56.79 [0.237]	47.55 [0.491]	46.65 [0.528]	56.58 [0.213]	57.32 [0.194]

* p<0.10, ** p<0.05, *** p<0.01

5. RESULTS



Source: Authors' calculations

Observed changes in interest rate and yield slope curve and predicted changes in net interest margin (bp)

	Change in 3-month interest rate 2008-14	Predicted change in net interest margin 2008-14	Change in yield slope curve 2010-14	Predicted change in net interest margin 2010-14	Change in 3-month interest rate 2010-14	Predicted change in net interest margin 2010-14	Total Predicted change in net interest margin 2010-14
Eurozone	-442	-68	-90	-11	-60	-11	-22
United States	-284	-48	-49	-6	-19	-4	-10
United Kingdom	-495	-74	-90	-11	-15	-3	-14
Japan	-64	-12	-45	-6	-18	-3	-9
Other countries in the sample	-418	-65	-91	-11	-31	-6	-16

Source: Authors' calculation

6. CONCLUSIONS

- **The expansionary monetary policy measures have had a negative impact on net interest margins** both via the reduction in interest rates and –less powerfully- the flattening of the yield curve.

- Given that in both cases **the relationship is concave**, a potential normalisation of monetary policy would have highly beneficial effects on restoring margins and, therefore, profitability.

- In the case of **European banks**, the current scenario of low profitability may affect **financial stability**.

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