



EUROPEAN CENTRAL BANK

EUROSYSTEM

# Rescuing the Interest Rate Pass-Through: Role of Unconventional Policies & Banks' Financing Choices

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*We are responsible for any error, and the views in this presentation do not necessarily reflect  
those of the ECB*

## Introduction

- A display of the crisis was a collapse of several financial market segments.
- Acute financial fragmentation, brought risks of financial implosion in some cys.
- Unconventional monetary policies maintained liquidity provision to financial market participants: even those that had lost market access.
- What happened to monetary transmission mechanism (MTM) during the crisis - even when break-up risks peaked in 2011 and 2012 ?

### **Question: how has the interest-rate channel (IRC) – part of the MTM - performed during crisis?**

- We focus on the IRC and the role of banks because they are under the purview of central banks
- It is one of the crisis thermometers and fast to respond to changing policies;
- Has not yet been completely investigated.

### **Our contribution is threefold:**

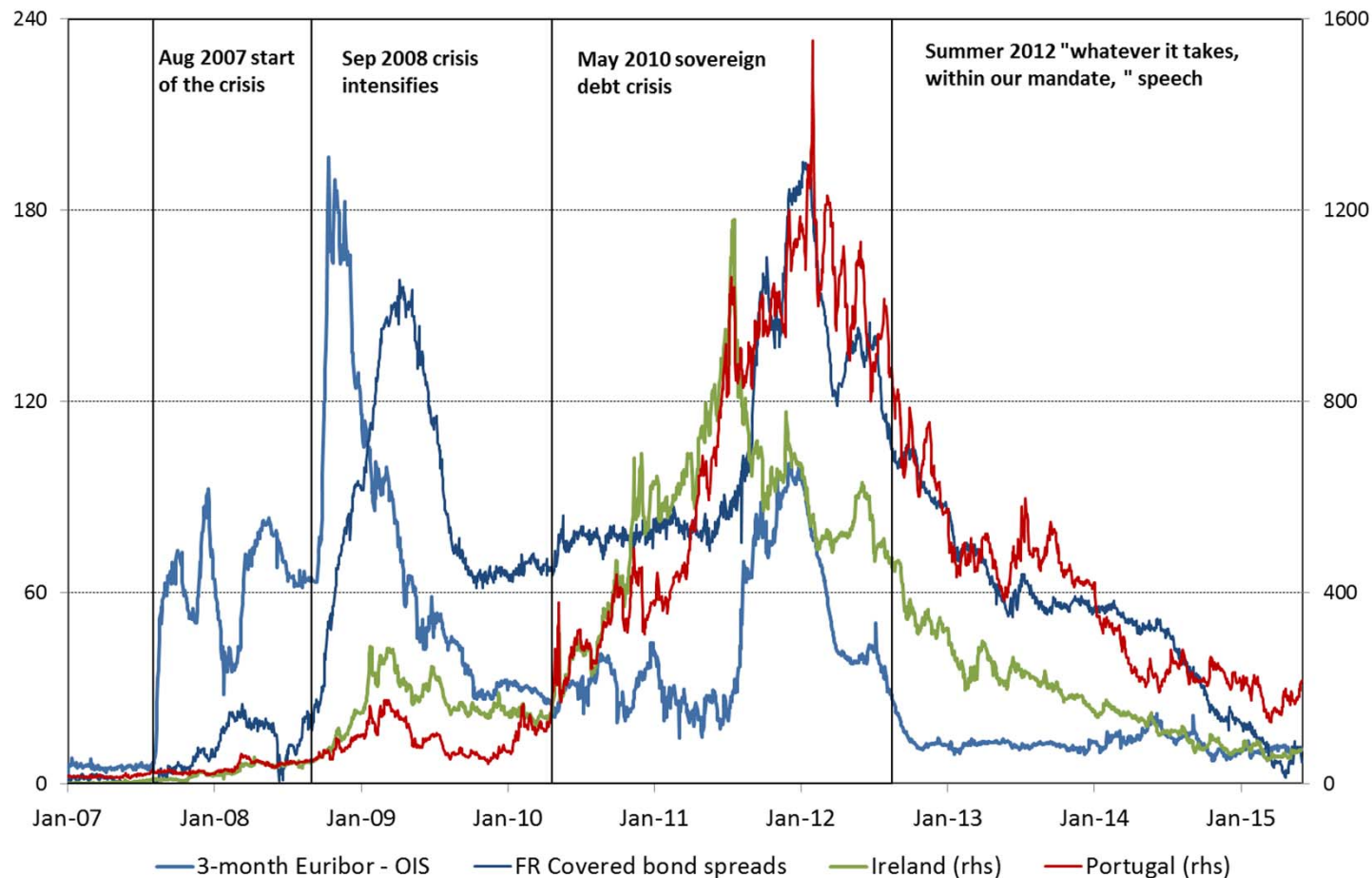
1. Offer a revised theoretical model to explain determination of bank financing and lending rates;
2. Use a novel database capturing banks' financing choices; and
3. Estimate a set of regressions capturing also the effects of NSMs.

# 1. Motivation

Before the crisis, interest rate pass-through models could largely ignore effects of:

- Time varying credit risk premium, and unit costs faced by banks
- Banks' risk aversion related to size & composition of their loan portfolio, and tensions in bank's funding conditions

→ **But, all this changed with the crisis.**

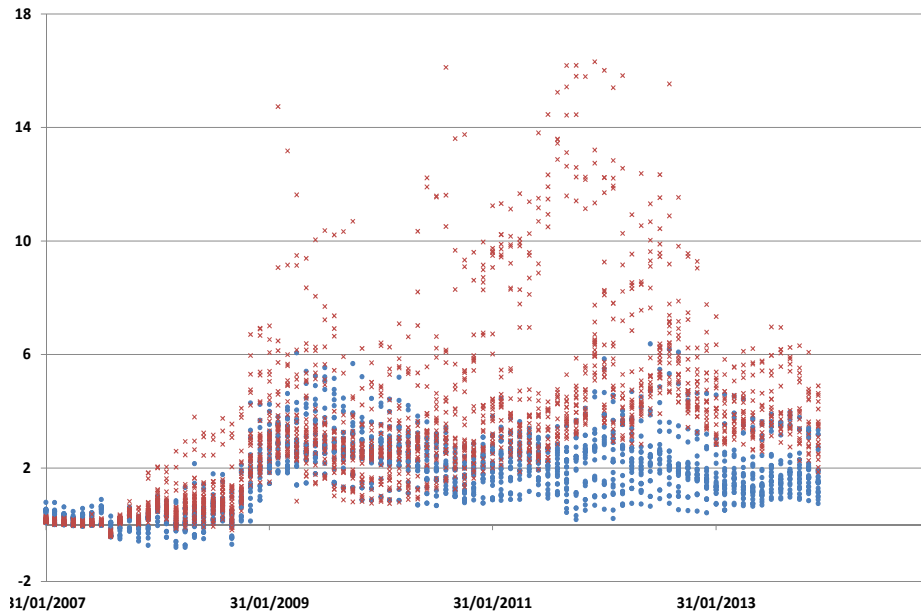


# 1. Motivation

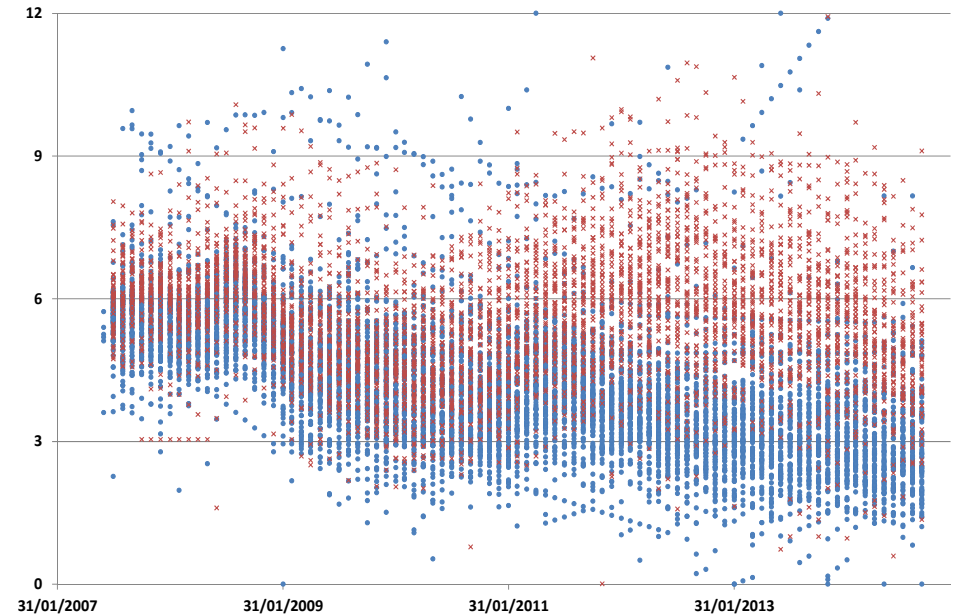
If we look at “granular data”, then tensions in bank’s funding conditions and lending are even more pronounced.

- Bank level heterogeneity has become very large.
- **This is what we research in the rest of the paper**

### Corporate bond yield spread



### Bank lending rate to SME (medium-term)



Sources: ECB Individual MFI interest rate statistics, Thomson Reuters and ECB calculations.

Notes: bank level data, every symbol represents a point observation for a bank of the spread between the yield paid for medium-term unsecured debt and the 3-month Euribor rate. A red cross symbol is used for banks in euro area countries under financial stress, and a blue dot for banks in euro area countries not under financial stress..

## 2. How are financing tensions reflected in interest settings?

We start from Ho and Saunders (1981), plus Angbazo (1997) and Gambacorta (2004) -- simply **HS-AG** -- that assume:

- Banks maximize expected utility of their wealth, and are risk averse (const. RA).
- They apply optimal mark-up for deposit and loan services
- Their market power remains constant & planning horizon is a single period.
- Loan demand depends (linearly) on bank lending rate.
- Deposit collection depends (linearly) on bank deposit rate.
- Bank rates set optimally to maximise expected utility → protect profit margins.
- Source of uncertainty: financing risks in money markets.

Bank lending rate spread:

$$r_L - r = \frac{1}{2} \frac{\alpha}{\beta} + \frac{1}{4} R(Q - 2C_0) \sigma^2$$

*Market  
competition*

*risk aversion  
coefficient*

*Refinancing risks  
in money markets*

With:

- $C_0$  net cash holdings.
- $Q$  potential volume of new loans.
- $R$  coefficient of relative risk aversion

## 2. Yet, HS-AG no longer adequate to capture crisis developments

Assuming steady pass-through as in HS-AG  $\rightarrow r_L - r = \text{constant}$  is no longer adequate for:

- forecasting exercise;
- capturing disparities between market rates & lending rates, but also
- capturing need for banks to rebuild profit margins in a deleveraging context

–Emergence of time-varying excess liquidity allowed by the ECB's FRFA has introduced disparities between policy rate and market rates, impacting the dynamics of interest rates and the effectiveness of the pass-through

–By introducing the FRFA, the ECB abandoned the exogeneity of money supply to allow banks to determine themselves aggregated liquidity in the system subject to their liquidity needs (but also to the level of market stress).

### Our contribution:

–**Contribution #1 – we add a role for issuing debt:** Future unexpected loans not matched by deposits will need to be financed in the money markets at an unknown price reflecting a random shock  $Z_r$ .

## 2. HS-AG no longer adequate to...

But, the bank can insure itself against the risks & costs from future money market financing by issuing debt today at a known banks bond spread  $\mathbf{S_B = r_B - r}$ .

$$\begin{aligned} B &= f_B \left( \frac{\alpha}{\beta}, R, \sigma^2, \sigma_L^2, s \right) \\ r_L - r &= f_{r_L} \left( \frac{\alpha}{\beta}, R, \sigma^2, \sigma_L^2, B, s \right) \longleftarrow \\ r_D - r &= f_{r_D} \left( \frac{\alpha}{\beta}, R, \sigma^2, B, s \right) \end{aligned}$$

**Decisions for banks to take:**  
*Issue or not issue debt, and which amount? Endogenous debt financing.*  
*Where to set deposit and lending rates*

**Contribution #2** – we add the possibility that banks have to refinance themselves exclusively at the central bank because they lost market access or because the market seized up (due to ‘liquidity hoarding’ phenomenon).

→ In presence of excess liquidity facilitated by the FRFA, the refinancing of these banks take place at penalty rate (i.e. at an interest rate higher than the interbank rate).

**Contribution #3** – we add fixed rate loans and floating rate loans

### 3. HS-AG & CDM model now captures....

.... various characteristics of the crisis, including:

- Non-linearity of risk aversion of banks and the required compensation;
- Interest spreads are affected by cross-elasticities of banks' deposits and loans;
- Interest spreads are also affected by financial fragmentation and banks competition as well as market volatility;
- Ceteris paribus, less competition & higher fragmentation reduces thrust of interest rate pass-through; and
- Dynamics of bank lending rates is not exclusively driven by changes in policy rates steered by Central Banks.

$$r_L - r = \frac{1}{2} \frac{\alpha}{\beta} + \frac{1}{4} \frac{R}{1 - R(W_0 r - B_S)} \left[ (Q + 2L_0)\sigma_L^2 + [Q - 2(C_0 + B)]\sigma^2 \right]$$

Diagram illustrating the components of the interest rate spread equation:

- Market competition** points to  $\frac{1}{2} \frac{\alpha}{\beta}$
- ADJUSTED risk aversion coefficient** points to  $\frac{1}{4}$
- Cost of debt financing effect** points to  $\frac{R}{1 - R(W_0 r - B_S)}$
- Credit risk on loan** points to  $(Q + 2L_0)\sigma_L^2$
- Refinancing risks in money markets** points to  $[Q - 2(C_0 + B)]\sigma^2$



### 3. The empirical set-up: data

- Sample July 2007 to October 2014 (covers most of the financial crisis).
- 55 banks level data – anonymised - from Individual MFI Interest rate statistics.
  - Bank lending & deposit rates, plus bank margins
- Cost of bank debt financing constructed from Bloomberg quotes.
- Volume of debt issued by banks is obtained from Dealogic.
- Bank business model:
  - Fixed: BE, CY, DE, FR, NL and SK
  - Floating: AT, EE, ES, FI, GR, IE, IT, LU, MT, PT and SI
- Market financing tensions: stressed (CY, ES, GR, IE, IT and PT) vs non-stressed.
- Lending to SME or large NFCs:
  - SME (loan < 1 million €), Large NFC (loan > 1 million €)
- Lending Short-term or Medium-term:
  - Short-term (up to 1 year), and Medium-term (between 1 and 5 years)

### 3. The empirical set-up: the regressors

**blr:** Bank lending rates: Bank level.

**dep:** Bank deposit rate: Bank level.

- Weighted average of HH i) overnight and ii) 1-year deposits.

**Spread:** Captures tensions in market debt financing. Bank level.

- YTM of 5-year senior unsecured bond minus 3-month Euribor.

**cred:** Credit risk exposures on bank loans. Country level.

- Expected Default Frequency (EDF) of NFC.

**fund:** Funding risks in money markets. Euro area level

- 3-month Euribor minus 3-month OIS.

**Bedf:** Difficulties to raise deposits. Country level.

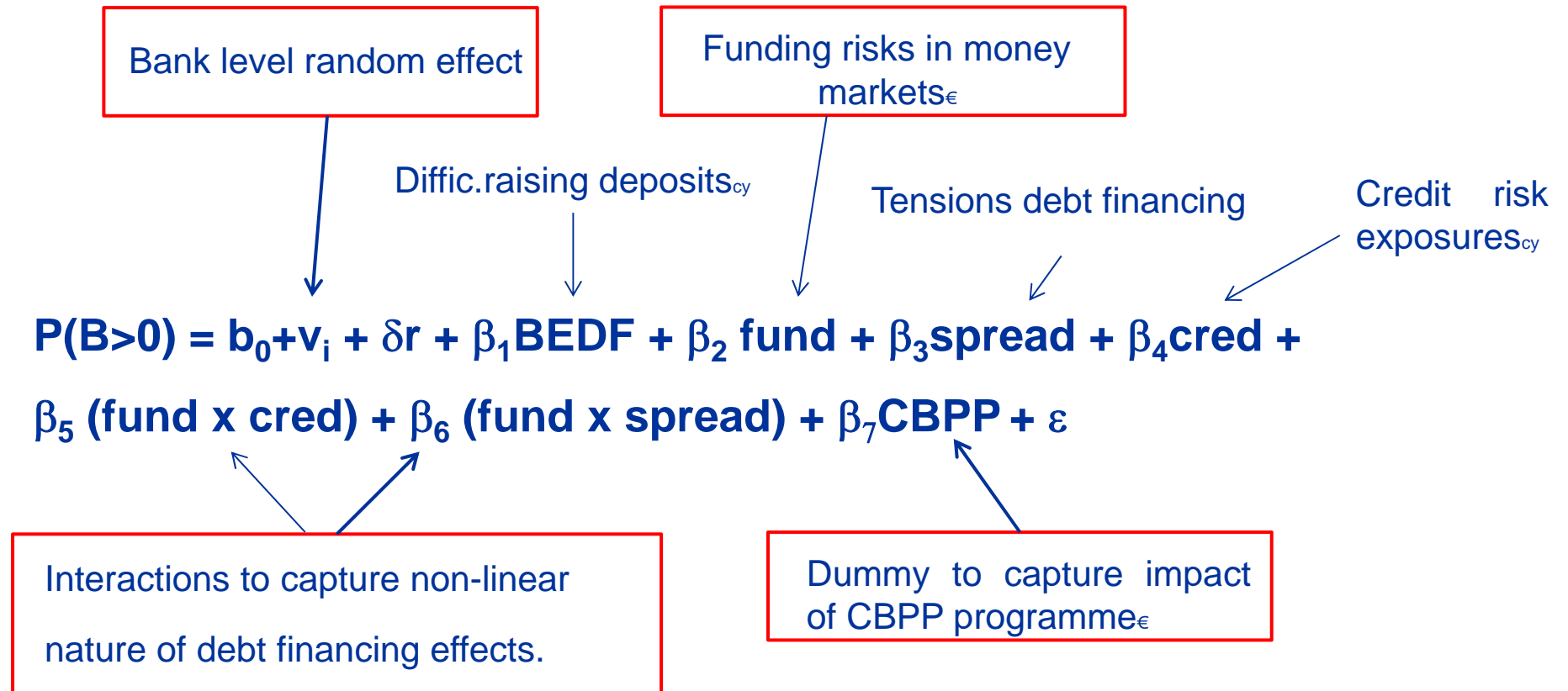
- Expected Default Frequency (EDF) of Banks.

**CBPP:** Impact of CBPP program to ease tensions. Euro area level.

- (0-1) Dummy highlighting when CBPP was active..

### 3. The empirical set-up: PROBIT econometric model

#### PROBIT model to study issuance decisions by banks



### 3. The empirical set-up: linear regression

#### Linear regression for modelling the interest rate pass-through

Bank level random effect

Pass-through at rates close to zero lower bound

- $r^h$  3-m OIS rate when above 100bp
- $r^l$  3-m OIS rate when below 100bp

$$\mathbf{blr} = \mathbf{b}_0 + \mathbf{v}_i + \delta r^h + \gamma r^l + \beta_1 \mathbf{BEDF} + \beta_2 \mathbf{fund} + \beta_3 \mathbf{spread} + \beta_4 \mathbf{cred} + \beta_5 (\mathbf{fund} \times \mathbf{cred}) + \beta_6 (\mathbf{fund} \times \mathbf{spread}) + \varepsilon$$

Interactions to capture non-linear nature of debt financing effects.

## 4. Estimation Results: Probit model

Probability of a bank issuing debt

	All		Fixed rate pricing		Floating rate pricing	
(Intercept)	-1.22**	-1.31**	-1.93**	-1.91**	-1.10**	-1.24**
	(0.22)	(0.22)	(0.56)	(0.56)	(0.23)	(0.24)
3-month OIS	0.05	0.08**	0.07	0.08	0.04	0.08*
	(0.03)	(0.03)	(0.07)	(0.07)	(0.03)	(0.03)
EDF of Banks	-0.08*	-0.10**	-0.03	-0.05	-0.07	-0.09*
	(0.03)	(0.04)	(0.25)	(0.25)	(0.03)	(0.04)
Euribor spread	-0.35*	-0.36**	-0.06	-0.10	-0.29	-0.26
	(0.14)	(0.14)	(0.35)	(0.36)	(0.17)	(0.17)
Bond yield spread	-0.08*	-0.07*	0.02	0.01	-0.09**	-0.08**
	(0.03)	(0.03)	(0.10)	(0.10)	(0.03)	(0.03)
EDF of NFCs	0.21*	0.17*	-0.20	-0.25	0.18*	0.15
	(0.08)	(0.08)	(0.54)	(0.54)	(0.08)	(0.08)
Euribor spread:bond spread	0.10**	0.09**	-0.26	-0.24	0.10*	0.08*
	(0.04)	(0.04)	(0.15)	(0.15)	(0.04)	(0.04)
bond spread:EDF of NFCs	-0.00	-0.00	0.41	0.41	-0.00	0.00
	(0.01)	(0.01)	(0.22)	(0.22)	(0.01)	(0.01)
CBPP		0.30**		0.13		0.33**
		(0.07)		(0.12)		(0.08)

*NSMs encourages issuance*

## 4. Estimation Results: Linear regression

### Bank deposit rate

	All		Fixed rate pricing		Floating rate pricing		Stress countries		No Stress countries	
Intercept	0.28** (0.06)	0.36** (0.06)	0.36 (0.21)	0.41 (0.21)	0.22** (0.05)	0.29** (0.05)	0.36** (0.05)	0.43** (0.05)	0.30* (0.15)	0.33* (0.16)
3-month OIS	0.44** (0.01)		0.47** (0.03)		0.43** (0.01)		0.39** (0.01)		0.50** (0.03)	
EDF of Banks	0.05** (0.01)	0.04** (0.01)	0.13 (0.14)	0.18 (0.14)	0.04** (0.01)	0.03** (0.01)	0.03** (0.01)	0.03** (0.01)	0.06 (0.11)	0.10 (0.11)
Euribor spread	0.69** (0.04)	0.69** (0.04)	0.66** (0.16)	0.65** (0.16)	0.67** (0.03)	0.65** (0.03)	0.55** (0.03)	0.54** (0.03)	0.81** (0.12)	0.81** (0.12)
Bond yield spread	0.08** (0.01)	0.08** (0.01)	0.16** (0.06)	0.16* (0.06)	0.08** (0.01)	0.07** (0.01)	0.06** (0.01)	0.06** (0.01)	0.11* (0.05)	0.12* (0.05)
EDF of NFCs	0.09** (0.02)	0.11** (0.02)	0.08 (0.26)	0.11 (0.26)	0.11** (0.02)	0.13** (0.02)	0.08** (0.01)	0.11** (0.01)	0.04 (0.19)	0.09 (0.19)
Euribor spread:bond spread	-0.05** (0.01)	-0.04** (0.01)	-0.01 (0.07)	-0.01 (0.07)	-0.03** (0.01)	-0.02* (0.01)	-0.01 (0.01)	0.00 (0.01)	-0.05 (0.05)	-0.05 (0.05)
bond spread:EDF of NFCs	-0.00** (0.00)	-0.01** (0.00)	-0.17 (0.09)	-0.17 (0.09)	-0.01** (0.00)	-0.01** (0.00)	-0.00** (0.00)	-0.01** (0.00)	-0.06 (0.07)	-0.06 (0.07)
3-month OIS (large)		0.42** (0.01)		0.46** (0.03)		0.41** (0.01)		0.37** (0.01)		0.48** (0.03)
3-month OIS (small)		0.19** (0.04)		0.27* (0.12)		0.17** (0.03)		0.15** (0.03)		0.27** (0.09)

*Even at low rates there is pass-through*

# 4. Estimation Results: Linear regression

## Bank lending rate Medium-term loans to SME

	All		Fixed rate pricing		Floating rate pricing		Stress countries		No Stress countries	
Intercept	3.36** (0.12)	3.40** (0.13)	2.18** (0.21)	2.21** (0.21)	4.00** (0.13)	4.08** (0.14)	4.15** (0.14)	4.29** (0.15)	2.39** (0.18)	2.40** (0.18)
3-month OIS	0.44** (0.02)		0.66** (0.02)		0.35** (0.02)		0.34** (0.02)		0.61** (0.02)	
EDF of Banks	0.14** (0.02)	0.14** (0.02)	0.12 (0.09)	0.13 (0.09)	0.13** (0.02)	0.12** (0.02)	0.14** (0.02)	0.13** (0.02)	0.20* (0.10)	0.21* (0.10)
Euribor spread	0.74** (0.07)	0.74** (0.07)	0.36** (0.13)	0.35** (0.13)	0.63** (0.10)	0.61** (0.10)	0.65** (0.11)	0.62** (0.11)	0.35** (0.12)	0.35** (0.12)
Bond yield spread	0.24** (0.02)	0.23** (0.02)	0.21** (0.04)	0.21** (0.04)	0.22** (0.02)	0.21** (0.02)	0.21** (0.02)	0.20** (0.02)	0.20** (0.04)	0.20** (0.04)
EDF of NFCs	0.09* (0.04)	0.11* (0.04)	1.30** (0.20)	1.35** (0.21)	-0.03 (0.05)	-0.00 (0.05)	-0.07 (0.05)	-0.03 (0.05)	1.12** (0.20)	1.14** (0.20)
Euribor spread:Bond yield spread	-0.13** (0.02)	-0.13** (0.02)	-0.07 (0.05)	-0.07 (0.05)	-0.10** (0.03)	-0.08** (0.03)	-0.10** (0.03)	-0.07** (0.03)	-0.15** (0.05)	-0.15** (0.05)
Bond yield spread:EDF of NFCs	-0.02** (0.00)	-0.02** (0.00)	-0.12 (0.08)	-0.13 (0.08)	-0.01** (0.00)	-0.01** (0.00)	-0.01** (0.00)	-0.01** (0.00)	-0.02 (0.07)	-0.03 (0.07)
3-month OIS (large)		0.43** (0.02)		0.66** (0.02)		0.33** (0.02)		0.31** (0.02)		0.61** (0.02)
3-month OIS (small)		0.30** (0.07)		0.52** (0.09)		0.09 (0.09)		-0.05 (0.11)		0.55** (0.08)

*Weak result here*



## 5. Final remarks

- The HS-AG + CDM (2015) “compact” captures diverse characteristics of the financial crisis.
- We showed that tensions in both money market financing and cost of debt financing are reflected in higher bank lending rates.
- CBPPs have had a positive impact on debt issuance decisions by banks.
- Access to debt financing by banks contributed to the well-functioning of the interest rate pass-through.
- A pass-through of market interest rates to bank lending rates has been preserved throughout the crisis, even at low level of market rates.
- Disparities in the interest rate pass-through across countries reflects also differences in bank business models.

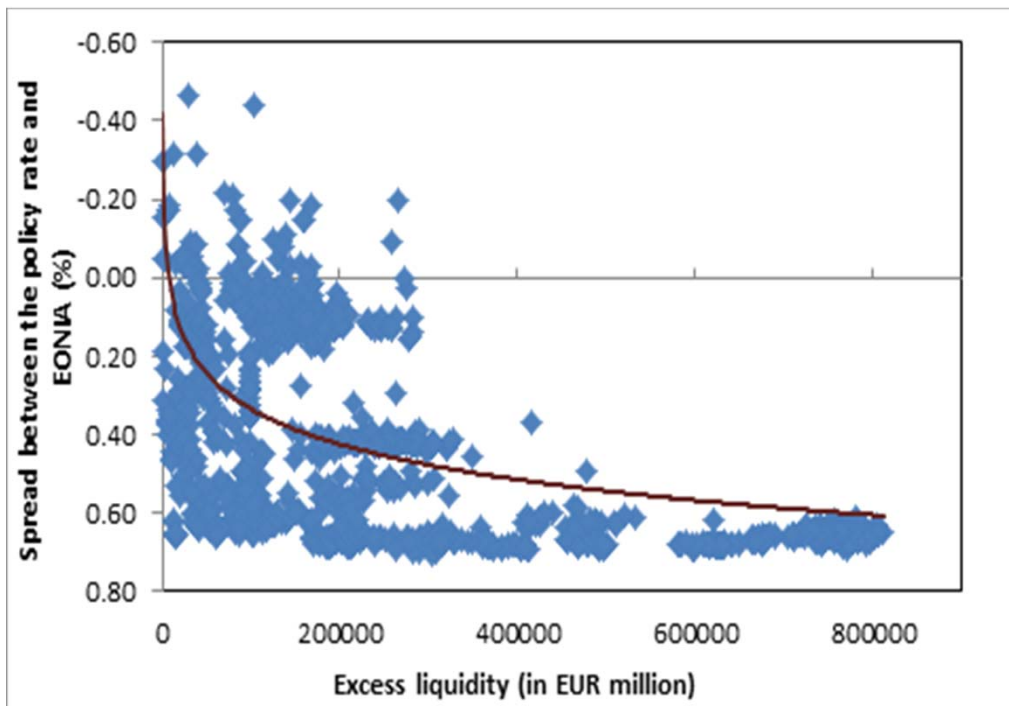
**Thanks for your attention and comments welcome!**



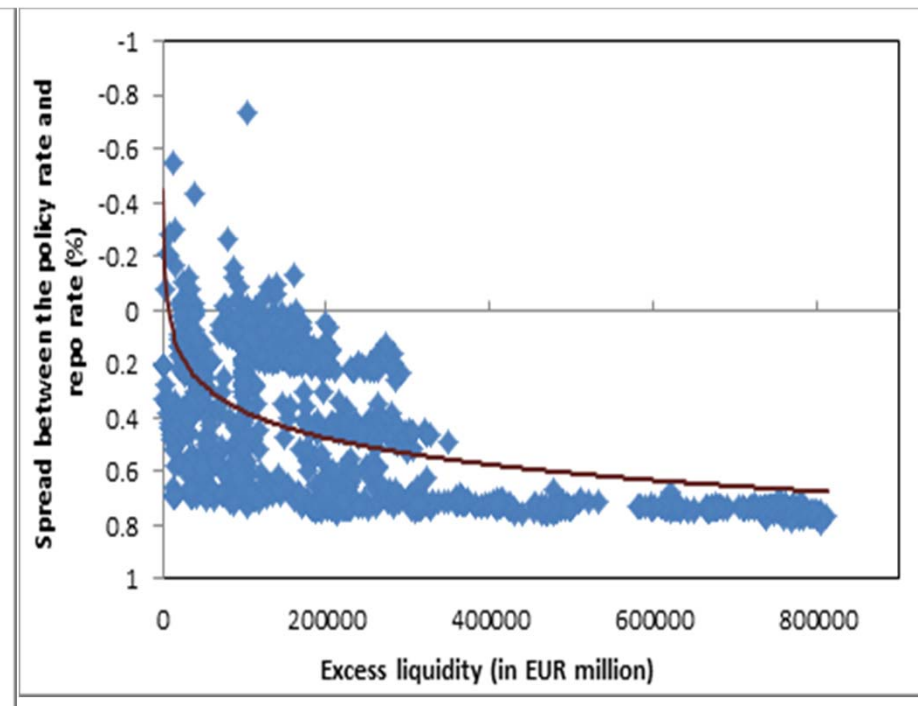
## Model extensions: incorporating excess liquidity into HS-AG + CDM

- Empirical evidence of a L-shape relationship between excess liquidity and market rates

Unsecured (EONIA) segment of the money market



Secured (REPO) segment of the money market



## Extra slide

- When Lehman collapsed, market participants became stressed about
  - **liquidity risk** (inability to have access to market liquidity) and
  - **credit risk** (inability to receive back the money lent due to counterparty's default).
- As a result, market participants hoarded liquidity and **money market seized up**.
- The FRFA gave the ECB an intermediation role when private market became dysfunctional.
- When excess liquidity emerged, downward pressures occurred, which pushed the market rates (both the EONIA and the repo) down towards the floor (the interest rate on the ECB's deposit facility).
- Empirical evidence shows that as from a certain threshold (above EUR 300bn of excess liquidity), market rates are very close to the floor amid very low volatility.
- This implies a L-shape relationship between excess liquidity and market rates.
- Concerning the issue of the impact of excess liquidity on interest rate dynamics
  - *we are still working on the empirical implementation of this step*