

Surviving the perfect storm: the role of the lender of last resort

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Monetary policy pass-through and credit markets

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Historical role of the lender of last resort (LLR)

Bagehot (1837):

The Bank of England [...] must in time of panic do what all other similar banks must do; [...] it must advance freely and vigorously to the public out of the reserve.

What is the role of the lender of last resort?

- Extensive theoretical literature: Bagehot (1837), Goodfriend and King (1998), Kaufman (1991), Flannery (1996), Rochet and Tirole (1996), Goodhart (1999), Freixas et al. (1999), Freixas, Parigi and Rochet (2004), Rochet and Vives (2004), Repullo (2005), Ratnovski (2009).

- Where is the empirical evidence???

- Drechsler, Drechsel, Marquez-Ibanez and Schnabl (2016, JF), Who borrows from the lender of last resort?
 - Weekly data on bank-level ECB borrowing
 - Euro area banks used central bank funding to invest in distressed-sovereign debt (carry trade)
 - This risk-shifting behavior was stronger for weakly-capitalized banks.
- These findings are **inconsistent** with the classical predictions of the lender of last resort theory: banks should borrow from the lender of last resort to avoid fire sales of their existing asset holdings. This should allow banks to continue lending to the economy, thereby **preventing a credit crunch**.

A perfect lab to look at the role of central banks during a crisis

*"From May 2010 on, Portuguese banks lost access to international medium and long term wholesale debt markets."
Financial Stability Report BdP, May 2012*

This setting provides a unique setting to empirically assess the role of the lender of last resort in a crisis setting.

In the early days of the global financial crisis...

...Portuguese banks were hardly affected:

- no exposure to subprime markets; residual exposure to US markets (including to Lehman)
- some constraints in access to interbank funding during this period (Iyer et al, 2014, RFS) were easily accommodated with occasional access to monetary policy operations and with the issuance of bonds with government guarantees
- loan flows were hardly hit during this period, with credit growth rates remaining significantly above those of the euro area.

But all "good" things come to an end

Spring 2010

- **Suddenly**, Portuguese banks entirely lost access to funding in international wholesale debt markets.
- Not due to intrinsic fragilities in the Portuguese banking system.
- Environment of heightened uncertainty in the beginning of the euro area crisis: after Greece asked for a bailout, investors were guessing who would be next.

Portugal's economy

The importance of not being Greece

A government desperate to persuade markets that it is better than they fear

Apr 22nd 2010, 10:36 | From the print edition

FORGET slogans about golden beaches or vinho verde. What the Portuguese government wants the world to know is simpler: Portugal is not Greece.

Europe's government-bond markets

That sinking feeling

The bail-out has slowed but not stopped investor flight from Europe's periphery

May 20th 2010, 7:11 | From the print edition

WHEN Europe's finance ministers emerged in the early hours of May 10th to announce a €750 billion (\$950 billion) rescue of the embattled euro zone, some joked that they had thrown everything at the problem "including the kitchen sink".

Was this shock important?

- Portuguese banks were highly dependent on wholesale funding.
- This sudden loss of access to markets would be big enough to compromise the survival of many Portuguese banks.

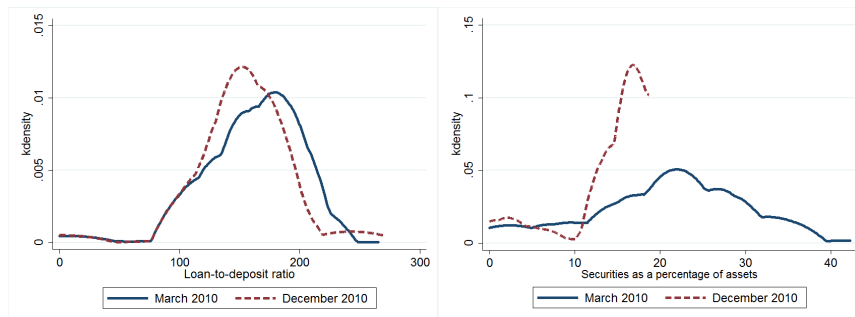


Figure: Estimated kernel densities weighted by banks' assets

The puzzle

- Despite this huge shock, credit and total assets remained broadly stable. How did banks cope?

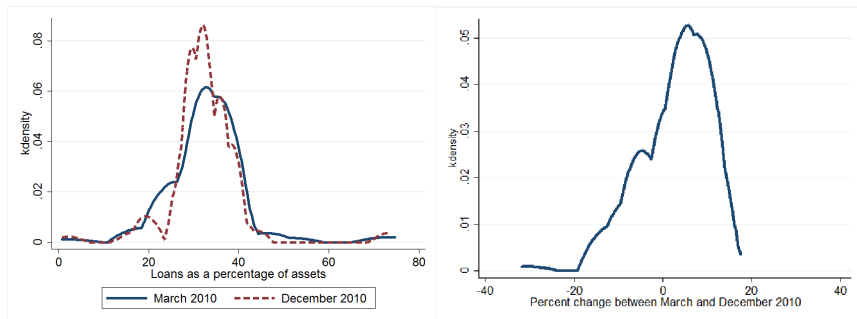


Figure: Estimated kernel densities weighted by banks' assets

The answer to the puzzle

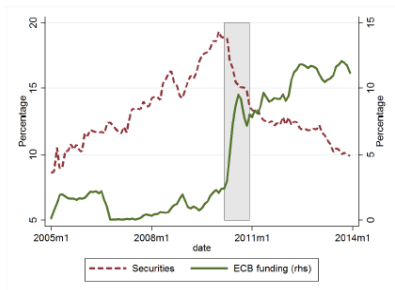


Figure: Funding by securities and through the ECB as a percentage of total assets

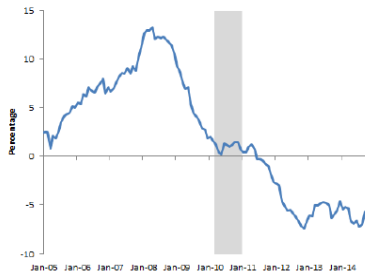


Figure: Annual growth rate of loans to NFC

- The answer to this apparent puzzle lies in the lender of last resort support by the ECB.
- In less than two months, ECB funding increased by almost 25 p.p. of GDP.

- Central Credit Register (CRC) has data on all Portuguese bank loans (type of loan, amount and debtor). Select:
 - debtors: non-financial corporations
 - period: 2005-2013; monthly data
- Supervisory data on banks:
 - balance sheet items
 - detailed liquidity reports
- Banks' holdings of sovereign debt
- Monetary policy data:
 - Banks' recourse to ECB funding
 - Banks' collateral pool

Our identification strategy

$$\Delta loan_{ijT} = c + \alpha_i + \beta \Delta ECB_funding_{jT-4} + \delta X_{jT-9} + \varepsilon_{ijT}$$

i firm, j bank, T fixed to December 2010.

$\Delta loan_{ijT}$ defined at the firm-bank level; includes unused credit lines; log change between March 2010 and December 2010.

$\Delta ECB_funding_{jT-4}$ change in ECB funding between March 2010 and August 2010.

X_{jT-9} bank controls measured at March 2010 (to mitigate endogeneity concerns).

Our identification strategy

- Using micro data at the bank-firm level is critical for identification: we need to know which banks had access to ECB funding and to whom did they lend to.
- We consider only firms with at least two lending relationships (Khwaja and Mian, 2008).
- We use firm fixed effects.
- This strategy allows to control for loan demand at the firm level.

An attempt to estimate the broad effect of LLR

Dependent variable: $loan_growth_{ij}$

	(1)	(2)	(3)	(4)	(5)
$\Delta ECB\ funding_{jT-4}$	-0.0263 (0.352)	0.0457 (0.366)	-0.118 (0.329)	-0.169 (0.388)	-0.328 (0.298)
$\ln(\text{assets})_{jT-9}$			-1.091 (1.550)	-1.300 (1.788)	-0.263 (1.316)
Loan-to-dep $_{jT-9}$			-0.0747* (0.0370)	-0.0905** (0.0420)	-0.0243 (0.0317)
Liq ratio $_{jT-9}$			0.334* (0.186)	0.343 (0.220)	0.205 (0.165)
Solv ratio $_{jT-9}$			0.552*** (0.0808)	0.578*** (0.0946)	0.423*** (0.0680)
Constant	-10.83*** (3.614)	-11.32*** (3.541)	17.71 (37.98)	25.03 (43.17)	-5.596 (33.08)
Firm FE	N	Y	Y	Y	N
Unused credit lines Relationships	Y	Y	Y	N	Y
	Multiple	Multiple	Multiple	Multiple	All
Banks	29	29	29	29	29
Firms	72 772	72 772	68 378	66 266	180 974
N obs	182,685	182,685	178,291	159,417	316,279
Prob>F	0.9409	0.9016	0.0000	0.0000	0.0000

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent.

Exploring firm heterogeneity

By firm size

	Micro	Small	Medium	Large
Δ ECB funding $_{jT-4}$	-0.034	-0.093	0.261	-0.300
	(0.352)	(0.348)	(0.324)	(0.546)
Clustered s.e.	bank	bank	bank	bank
Firm fixed effects	Y	Y	Y	Y
Bank variables	Y	Y	Y	Y
Unused credit lines	Y	Y	Y	Y
Observations	77,350	52,413	16,402	3,720
Banks	25	26	28	26
Firms	33,030	18,101	4,115	778

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent.

Exploring firm heterogeneity

By loan maturity

	Short-term	Long-term
Δ ECB funding $_{jT-4}$	-0.225	-0.075
	(0.870)	(0.282)
Clustered s.e.	bank	bank
Firm fixed effects	Y	Y
Bank variables	Y	Y
Unused credit lines	Y	Y
Observations	47,415	77,477
Banks	25	26
Firms	32,736	47,739

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent.

Exploring firm heterogeneity

By firm type (risky firms)

	No default	Default
Δ ECB funding $_{jT-4}$	-0.037	-0.397
	(0.335)	(0.518)
Clustered s.e.	bank	bank
Firm fixed effects	Y	Y
Bank variables	Y	Y
Unused credit lines	Y	Y
Observations	139,184	39,107
Banks	29	26
Firms	52,944	15,504

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent.

Exploring bank heterogeneity

Bank size

	Big 5		Others
Δ ECB funding $_{jT-4}$	-2.244	***	-0.203
	(0.151)		(0.165)
Clustered s.e.	bank		bank
Firm fixed effects	Y		Y
Bank variables	Y		Y
Unused credit lines	Y		Y
Observations	89,672		34,018
Banks	5		24
Firms	37,863		14,248

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent..

Exploring bank heterogeneity

Bank capital

	Low capital	High capital	
Δ ECB funding $_{jT-4}$	0.466	-1.876	***
	(0.293)	(0.458)	
Clustered s.e.	bank	bank	
Firm fixed effects	Y	Y	
Bank variables	Y	Y	
Unused credit lines	Y	Y	
Observations	47,525	43,516	
Banks	15	12	
Firms	19,917	19,925	

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent..

Exploring bank heterogeneity

Bank liquidity

	Low LTD		High LTD		Low liq gap		High liq gap
Δ ECB fund $jT-4$	-0.736	*	-0.381		-2.203	**	0.987
	(0.382)		(0.346)		(0.974)		(0.708)
Clustered s.e.	bank		bank		bank		bank
Firm fixed effects	Y		Y		Y		Y
Bank variables	Y		Y		Y		Y
Unused credit lines	Y		Y		Y		Y
Observations	37,837		55,528		52,516		40,254
Banks	12		15		14		14
Firms	16,262		24,310		23,277		17,392

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent..

Exploring bank heterogeneity

Collateral eligible for ECB operations

	Low collateral		High collateral	
$\Delta \text{ ECB fund}_{jT-4}$	-1.185	***	1.365	***
	(0.367)		(0.228)	
Clustered s.e.	bank		bank	
Firm fixed effects	Y		Y	
Bank variables	Y		Y	
Unused credit lines	Y		Y	
Observations	30,700		48,287	
Banks	15		12	
Firms	13,585		20,972	

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent..

Testing banks' sensitivity to the shock

- ECB funding may be an endogenous choice
- Alternative specification: what was the effect of the negative shock on banks' lending to firms?

$$\Delta loan_{ijT} = c + \alpha_i + \beta_1 \Delta Securities_{jT-4} + \delta X_{jT-9} + \varepsilon_{ijT}$$

Testing banks' sensitivity to the shock

	(1)	(2)	(3)
$\Delta \text{Securities}_{jT-4}$	0.0141 (0.281)	0.0002 (0.295)	-0.0646 (0.326)
$\Delta \text{ECB funding}_{jT-4}$		-0.101 (0.341)	
Liq gap $_{jT-9}$			0.443 (0.401)
$\text{Ln}(\text{assets})_{jT-9}$	-1.871 (1.738)	-1.665 (1.805)	-0.644 (1.742)
Loan-to-dep $_{jT-9}$	-0.0729 (0.0465)	-0.0692 (0.0476)	-0.0622 (0.0463)
Liq ratio $_{jT-9}$	0.357* (0.196)	0.351 (0.206)	0.379** (0.172)
Solv ratio $_{jT-9}$	0.567*** (0.132)	0.567*** (0.129)	0.358 (0.252)
Constant	35.07 (43.19)	30.20 (43.84)	6.277 (42.07)
Banks	18	18	18
Firms	68 260	68 260	68 260
N obs	172,333	172,333	172,333
Prob>F	0.0000	0.0000	0.0000

Constructing a counterfactual

$$Y_{it} = c + \alpha_j + \beta_1 \text{securities}_{it-3} + \beta_2 X_{it-12} + t + \varepsilon_{it}$$

Where Y_{it} can be either:

- total bank assets
- total loans to firms (including credit lines)

X_{it} are bank variables (liquidity and solvency ratios); t is a time trend.

What if...?

$$Y_{it} = c + \alpha_j + \beta_1 (\text{securities} + \text{ECB funding})_{it-3} + \beta_2 X_{it-12} + t + \varepsilon_{it}$$

The beta of the counterfactual relation

		$Y_{it} = \text{Loans}$		Obs.	$Y_{it} = \text{Assets}$		Obs.
Before the shock <i>2005-09</i>	securities _{<i>t</i>-3}	0.555	***	1032	1.597	***	1031
	sec+ECB _{<i>t</i>-3}	0.480	***	864	1.444	***	864
After the shock <i>2010-11</i>	securities _{<i>t</i>-3}	-0.112	**	436	0.054		436
	sec+ECB _{<i>t</i>-3}	-0.110	*	427	0.352	***	427

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent.

The financial repression hypothesis

Did the money go somewhere else?

Panel data regression at bank level:

$$\text{Sov assets}_{it} = c + \alpha_i + \beta_1 \text{ECB funding}_{it-3} + \beta_2 X_{it-12} + t + \varepsilon_{it}$$

<i>ECB funding</i> _{it-3}	<i>Sov assets</i> _{it}	Obs.
2005-09	0.027	705
2010-11	0.204 ***	331

Note: * significance at 10 per cent; ** significance at 5 per cent; *** significance at 1 per cent.

Main take aways

- Unconventional monetary policy measures fulfilled the LLR role in a "sudden stop" scenario for banks' funding.
- Unique lab for the analysis of this role (unexpected exogenous and large liquidity shock).
- Negative relation between ECB borrowing and lending to firms for banks with:
 - high capital ratio
 - larger size
 - less ECB eligible collateral.
- Evidence supporting the financial repression hypothesis.