Capital and liquidity buffers and the resilience of the banking system in the euro area

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The views expressed here are those of the authors.

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Outline

Research questions

- How do business cycle fluctuations, standard and non-standard monetary policy affect individual bank lending?
- How do bank's capitalisation and maturity mismatch affect the propagation of macroeconomic and monetary policy shocks?
- Financial stability dimension (outside of the scope of the presentation): a data-driven tool with bank-level information for cost-benefit analysis of supervisory tools, the assessment of spillover effects, simple top-down stress-testing.

Inspiration

Step 1: Bank-level responses to structural shocks:

- Factor Augmented (FA)VAR: Stock and Watson (2002), Bernanke et al. (2005)
- **FAVAR applied to bank-level data**: Buch et al. (2014), Igan et al. (2013), Dave et al. (2013), Jimborean and Mesonnier (2010)

Step 2: Bank-level regressions incl. bank capitalisation and maturity mismatch measures:

- Changes in bank lending: Berger and Udell (1994), Kashyap and Stein (1994), Ehrmann et al. (2001), Kishan and Opiela (2000), Loupias et al. (2002), Gambacorta and Mistrulli (2004), Engler et al. (2007)
- **Responses of bank lending to structural shocks**: Buch et al. (2014)

Findings: the business cycle

- High bank capitalisation translates in less procyclical long-term NFC loans and interest rates on loans (more procyclical short-term NFC and household loans);
- Analogous and independent impact of bank liquidity.

Findings: the transmission of monetary policy

- Similar effects of standard and unconventional monetary policy;
- Accomodative monetary policy leads to more (high risk-weighted) long-term NFC and less (lower risk-weighted) short-term NFC and household lending (portfolio rebalancing);
- These are different banks that respond to standard versus unconventional policies;
- **Higher bank capitalisation**: Weaker portfolio rebalancing toward long-term NFC lending (less reduction in short-term NFC loans);
- **Higher bank liquidity**: Increased pass-through into NFC loans (mostly for unconventional monetary policy).

Outline

A FAVAR model

A VAR augmented with latent factors:

$$\begin{bmatrix} F_t^y \\ F_t^x \end{bmatrix} = A(L) \begin{bmatrix} F_{t-1}^y \\ F_{t-1}^x \end{bmatrix} + A_0 \epsilon_t, \tag{1}$$

$$\epsilon_t \sim \mathcal{N}(0, I) \tag{2}$$

F_t^y – a vector of observed economic variables: MRO rate, EONIA spread, ECB total assets, EA GDP deflator, EA GDP
F_t^x – a vector of latent factors
$A(L)$ - a matrix lag polynominal
ϵ_t - independently distributed structural innovations

A FAVAR model

$$X_t = \Delta^y F_t^y + \Delta^f F_t^x + u_t \tag{3}$$

$$u_t \sim \mathcal{N}(0, H) \tag{4}$$

X_t (sufficiently large) - vector of observed series: bank-level information
Δ^f - a loading matrix
Δ^y – a matrix of coefficients

$$E[u_{i,t} F_t] = 0 \tag{5}$$

$$E[u_{i,t} u_{j,s}] = 0 \tag{6}$$

Bank-level information

- Individual Balance Sheet Items (iBSI) and Individual Monetary Interest Rates (iMIR) statistics covering the banking sector in the EA;
- (Sub)consolidated.

Table: Descriptive statistics of bank-level time series August 2007 – March 2015

Variables	N. of series	Mean	Std.dev.	5th quantile	95th quantile	Transformation
LoanNFClong	123	0.215	1.440	-1.775	2.443	m-o-m growth rate in perc.
LoanNFCshort	114	-0.234	8.125	-9.678	8.691	m-o-m growth rate in perc.
LoanHH	120	0.106	1.207	-1.090	1.445	m-o-m growth rate in perc.
InterestNFClong	98	-0.031	0.776	-1.188	1.064	m-o-m change in pp
InterestNFCshort	114	-0.031	0.558	-0.837	0.697	m-o-m change in pp
InterestHH	118	-0.027	0.370	-0.510	0.419	m-o-m change in pp
CDS	22	1.720	24.319	-27.606	35.548	m-o-m growth rate in perc.
StockPrice	43	-2.166	16.763	-25.232	18.435	m-o-m growth rate in perc.

FAVAR estimation

- Step 1: Estimate a set of orthogonal K latent factors F^x, jointly with Δ^f, Δ^y;
- Step 2: Estimate a reduced-form VAR(p) with a Normal-Wishart prior;
- Step 3: Obtain IRFs of $F_t^{'} = [F_t^{x'}, F_t^{y'}]$ to structural innovations ϵ_t. For each draw from the posterior of reduced-form parameters draw the conditional uniform distribution of variance-covariance transformation matrix along with Arias et al. (2014);
- Step 4: Convert IRFs of F_t into IRFs of bank-level variables in X_t resting on the estimate of Δ^y, Δ^x.

Structural shocks: sign and zero restrictions

Table: Observable variables (columns) and the indentification of shocks (rows)

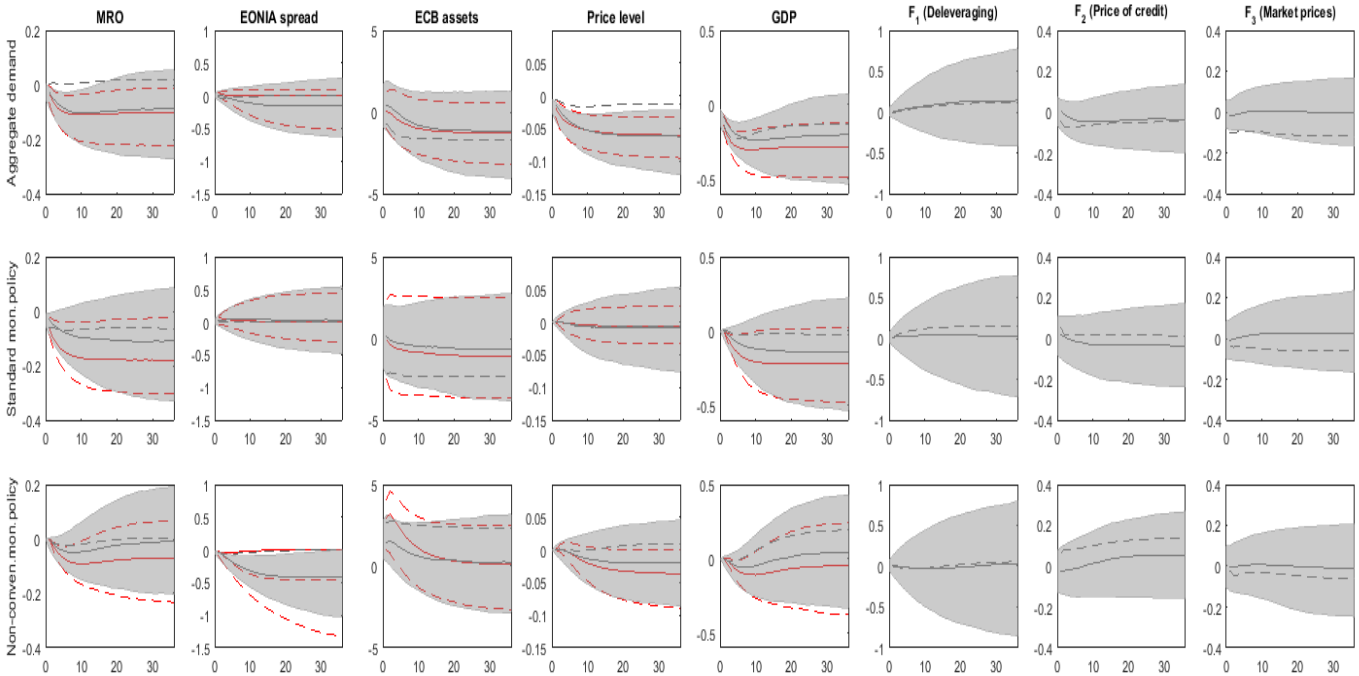
	MRO rate	EONIA spread	ECB total assets	EA GDP deflator	EA GDP
Aggregate demand				+	+
Aggregate supply				-	+
Standard monetary policy	-			0	0
Non standard monetary policy	0	-	+	0	0

- Aggregate demand and supply shocks: restriction imposed in quarters 0 – 3, monetary policy shocks: only contemporaneous;
- Identification of unconventional monetary policy shocks follows Lenza et al. (2010) and Boeckx et al. (2014).

Outline

IRFs of macro-financial aggregates

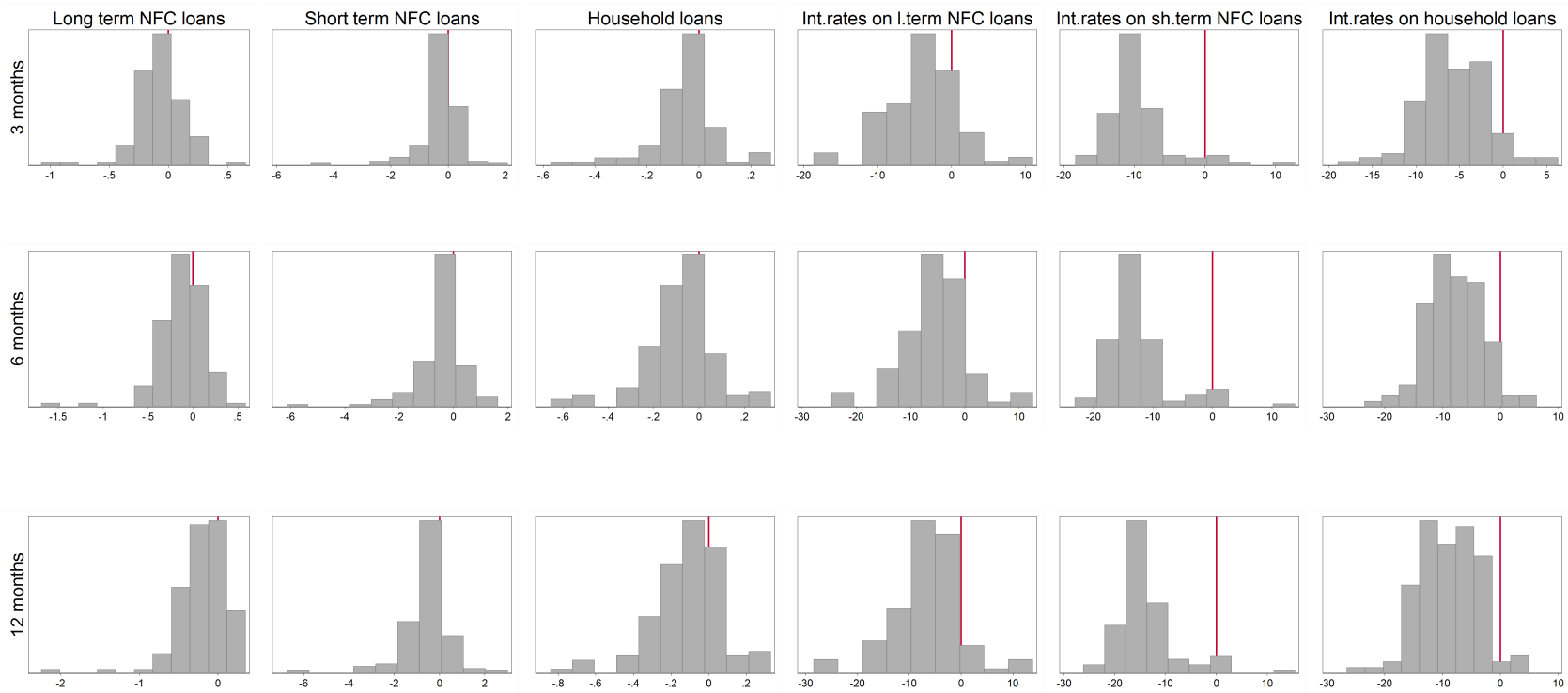
Figure: FA-VAR (red) vs. VAR (grey) specification



Legend: MRO rate, EONIA spread in perc. point deviation from the baseline. The ECB assets, GDP deflator and GDP levels in perc. deviaton from the baseline. Grey shaded areas represent 70% uncertainty bands for the benchmark FAVAR model. Grey solid line represents the median IRF. Grey broken line represents the impulse response functions from the model withIRFs closest to the median. Red broken lines mark uncertainty bands covering 70% posterior density of IRFs from a VAR model. Red solid line represent the median IRF.

Bank-level IRFs: aggregate demand

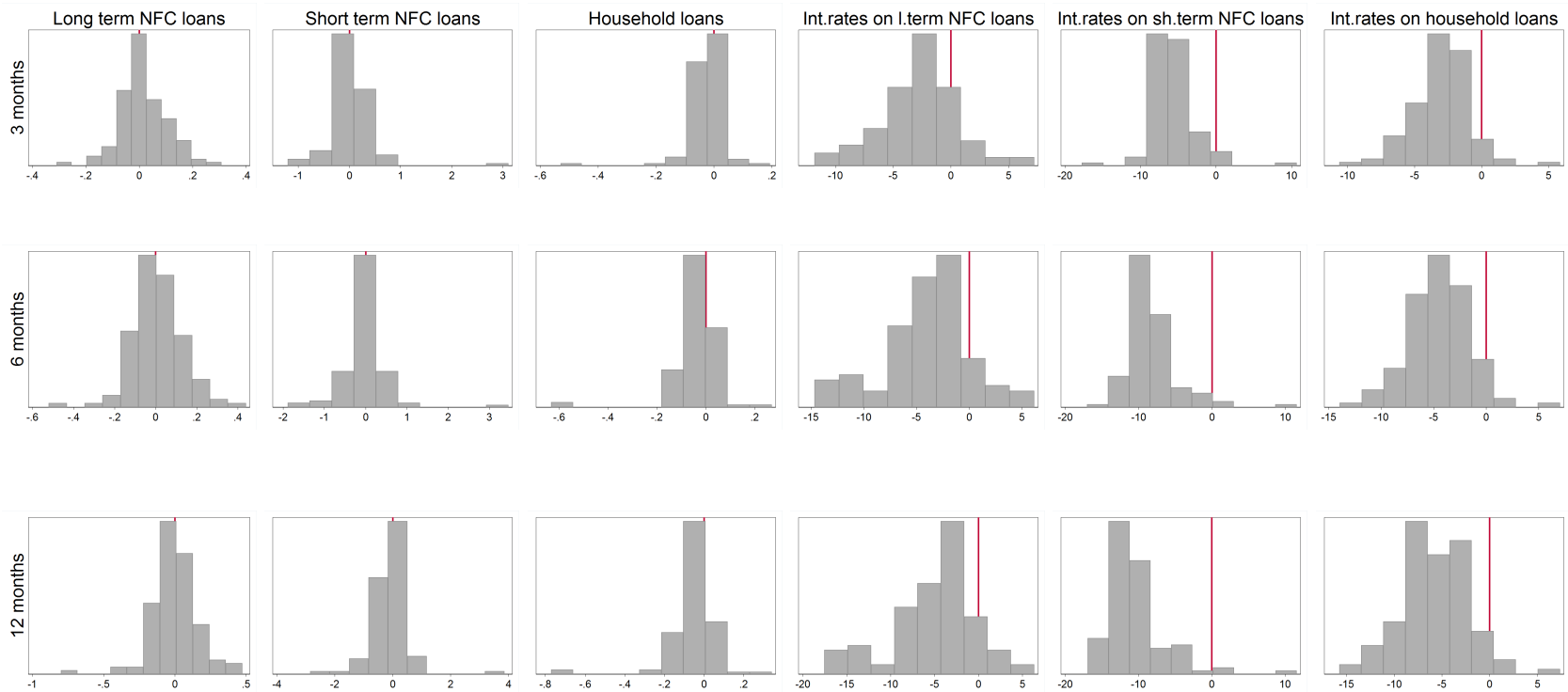
Figure: The median cumulated IRFs to a one standard deviation adverse shock (in perc. deviation from the baseline)



Legend: Red vertical line marks 0% on the x-axis. All non-financial private sector loans measured as notional stocks, interest rates as interest rates on new loans.

Bank-level IRFs: standard monetary policy

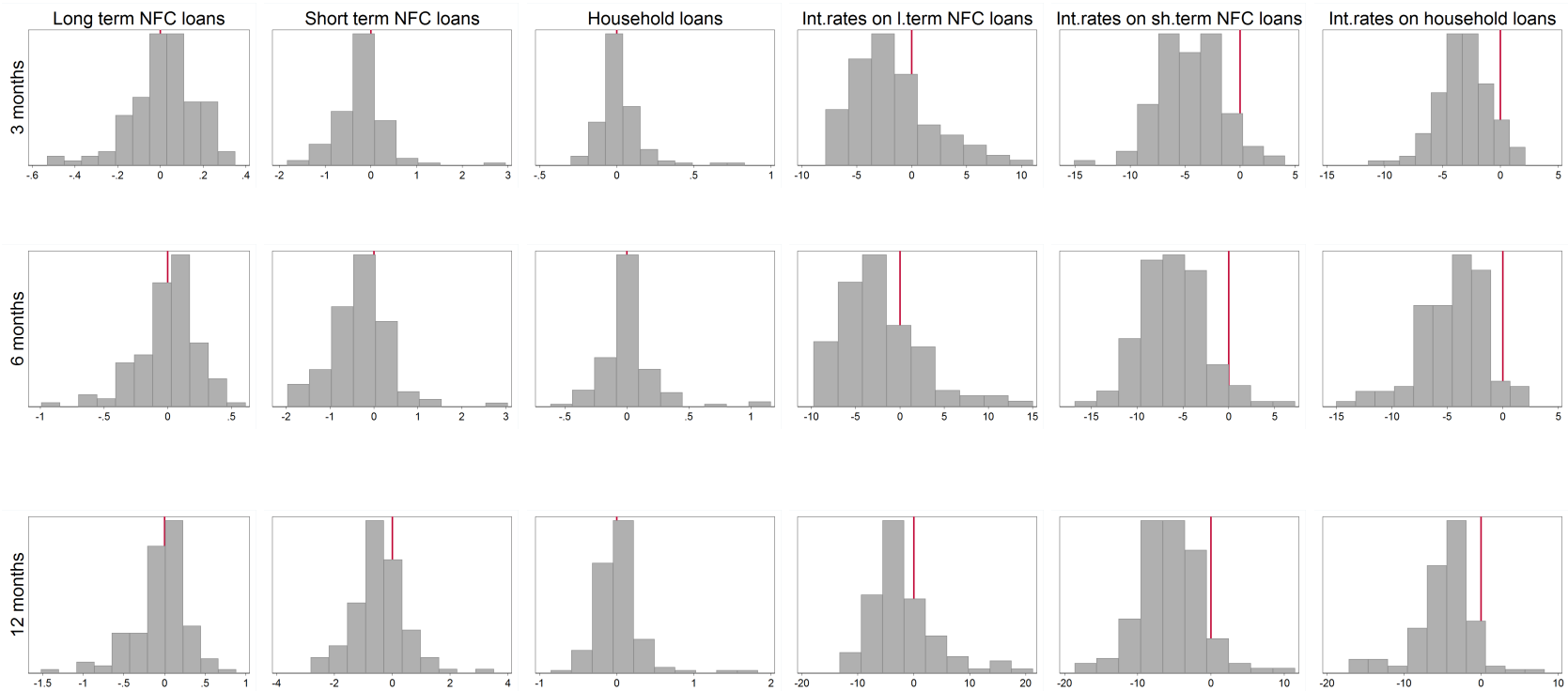
Figure: The median cumulated IRFs to a one standard deviation adverse shock (in perc. deviation from the baseline)



Legend: Red vertical line marks 0% on the x-axis. All non-financial private sector loans measured as notional stocks, interest rates as interest rates on new loans.

Bank-level IRFs: non-standard monetary policy

Figure: The median cumulated IRFs to a one standard deviation adverse shock (in perc. deviation from the baseline)



Legend: Red vertical line marks 0% on the x-axis. All non-financial private sector loans measured as notional stocks, interest rates as interest rates on new loans.

Bank-level IRFs: cross-correlation

Table: The correlation coefficients between bank responses to structural shocks a year after the shock

	Adv. agg. demand	Accom. standard mon. policy	Adv. agg. demand	Accom. standard mon. policy	Adv. agg. demand	Accom. standard mon. policy
	LoanNFClong		*LoanNFCshort*		*LoanHH*	
Accom. standard mon. policy	0.357***		−0.048		0.543***	
Accom. non-standard mon. policy	0.586***	−0.203**	0.399***	−0.265***	0.555***	−0.262***
	InterestNFClong		*InterestNFCshort*		*InterestHH*	
Accom. standard mon. policy	−0.157		0.046		-0.026	
Accom. non-standard mon. policy	0.219**	−0.323***	0.040	−0.397***	0.166*	−0.297***

Legend: The correlations are derived on cumulated IRFs 12 months after a shock for a FAVAR model closest to the median as in Fry and Pagan (2005). Weights proportional to the percentage of variance captured by FAVAR observed variables and latent factors are applied. *** - statistically significant at below 1% level, ** - statistically significant at 5% level, * - statistically significant at 10% level.

Outline

Bank-level regressions

$$irf_i^{j,s,h} = \alpha z_i + bG_i + \epsilon_i. \quad (7)$$

$irf_i^{j,s,h}$ - the cumulated bank-level responses of bank i, for bank-level variable j, structural shock s, and horizon h
z - bank capitalisation or liquidity z
G - control variables (bank size, country dummies)

Bank capitalisation and liquidity

Table: Descriptive statistics of banks' balance sheet indicators (mean values 2006 – 2007)

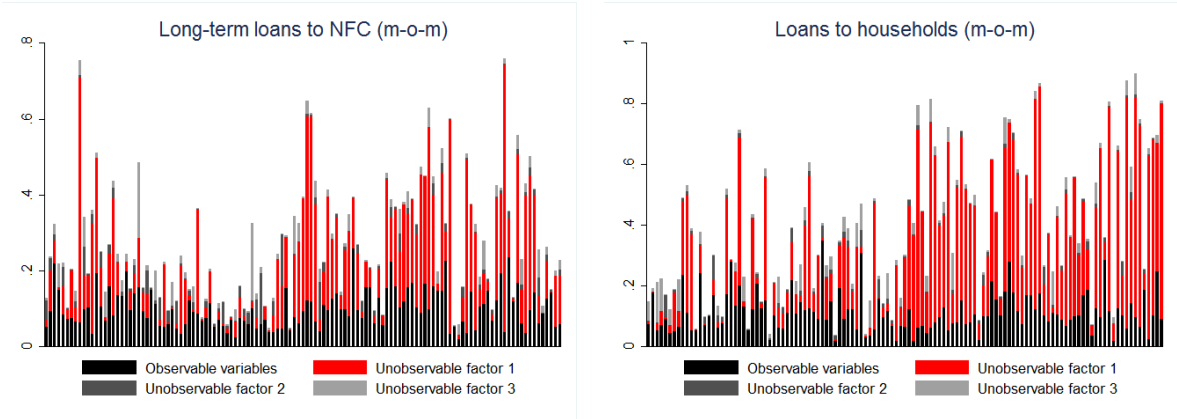
Variables	N	Mean	Std.dev.	Min	Max
*Tier*1 / *RWA*	82	7.773	1.262	5.400	10.700
CAR	84	10.728	1.365	7.560	14.200
*Tier*1 / *TA*	77	4.233	1.589	1.442	8.273
Liq.assets / *Dep.*	106	32.123	19.985	1.880	86.540
Liq.assets / *TA*	116	20.225	11.298	1.159	46.447
LTD	102	72.053	27.407	12.715	139.295

- High correlation between *CAR* vs. *Tier*1 / *RWA* and *Liq.assets* / *Dep.* vs. *Liq.assets* / *TA*;
- Low correlation between the risk-sensitive measures vs. *Tier*1 / *TA* and the shorter-term maturity mismatch measures vs. *LTD*.

Estimation of regressions

- A weighted OLS estimator: weights proportional to the perc. of the variance of a bank-level variable explained by F^y and F^x (addresses heteroscedasticity in the residuals);
- Explores the full posterior distribution of IRFs rather than their median (answer to broad uncertainty bands of IRFs).

Figure: The share of variance of bank-level variables explained by observable variables and latent factors



The role of bank capitalisation

Table: The median* percentage change in the magnitude of bank responses corresponding with an increase in Tier1 capital ratios by 1pp

	Loan volumes			Interest rates		
	Long-term NFC	Short-term NFC	Households	Long-term NFC	Short-term NFC	Households
Agg. demand	-1.771	-1.560	$+5.997$	-4.881	-5.622	-0.561
Standard mon. policy	$\times$	-1.288	$+2.516$	-10.888	-4.578	$\times$
Non-standard mon. policy	-2.304	-7.547	-1.120	$\times$	$\times$	$+0.846$

Legend: * the median of median individual bank responses. $\times$ - an estimate of the coefficient on Tier1 capital ratio not significant at 10% confidence level.

The role of bank maturity mismatches

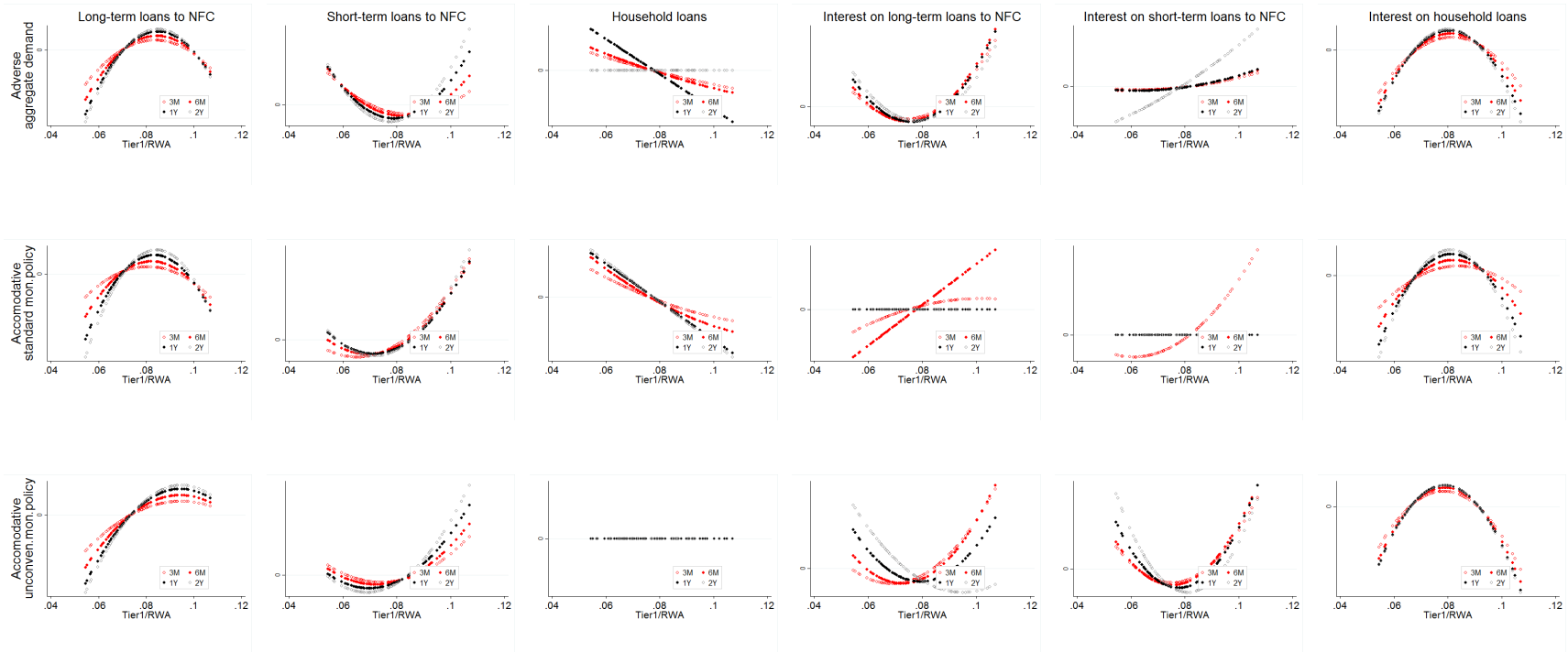
Table: The median* percentage change in the magnitude of bank responses corresponding with an increase in liquid assets to customer deposits ratios by 10pp

	Loan volumes			Interest rates		
	Long-term NFC	Short-term NFC	Households	Long-term NFC	Short-term NFC	Households
Agg. demand	-3.376	-4.747	$\times$	$+2.004$	$\times$	-2.757
Standard mon. policy	$+0.170$	-0.285	-0.329	-2.200	$+1.492$	$\times$
Non-standard mon. policy	$+1.034$	-3.880	$+0.260$	$+2.808$	-0.598	$+0.443$

Legend: * the median of median individual bank responses. $\times$ - an estimate of the coefficient on liquid assets to customer deposit ratio not significant at 10% confidence level.

Testing for non-linearity: bank capitalisation

Figure: The non-linear effect of Tier1 to RWA ratio on the response of banks to structural shocks



Legend: Charts include demeaned predicted values of variable responses to a shock based on the actual Tier1 ratio and keeping all other exogenous variables in the regression at zero.

Outline

Conclusions

- Positive evidence on the transmission of both standard and unconventional monetary policies into bank lending in 2007 – 2015;
- However: where do the differences between banks stem from?;
- A step to understand the role of prudential policies and their interactions with monetary policy;
- Higher capital buffers and banks' liquidity increase resilience of bank lending to NFC („productive loans") to business cycle fluctuations;
- Tentative evidence on the positive impact of bank capitalisation on limiting risk-taking behaviour of banks in response to loose monetary policy;
- Impact of capital on bank lending may be non-linear: are there limits to the effectiveness of regulation?;
- Disclaimer to all results: the time-span 2007 – 2015 not sufficient to capture the full cycle (or to account for asymmetries).