A New Normal?

Revisiting the impact of bank capital requirements on lending and real activity

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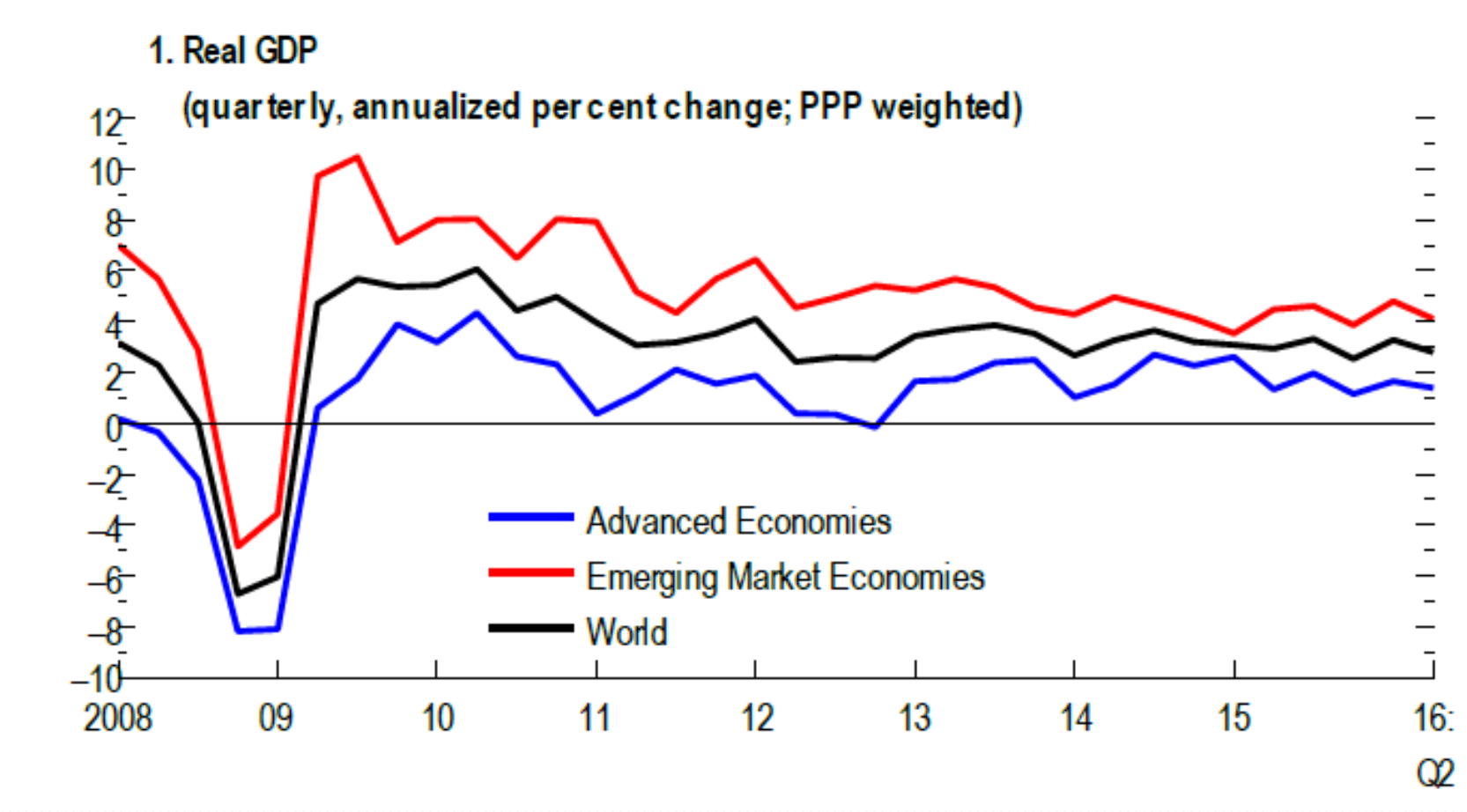
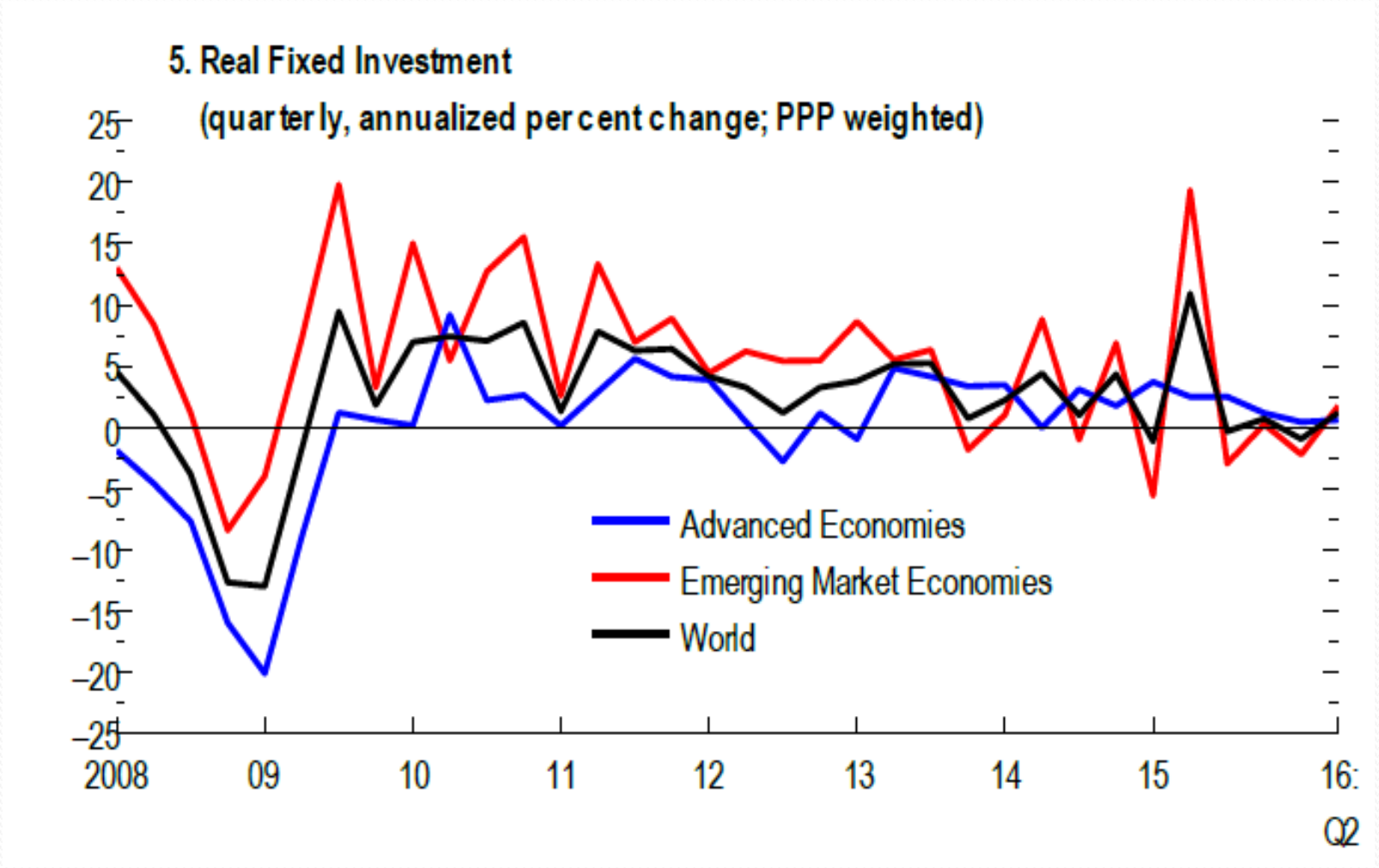
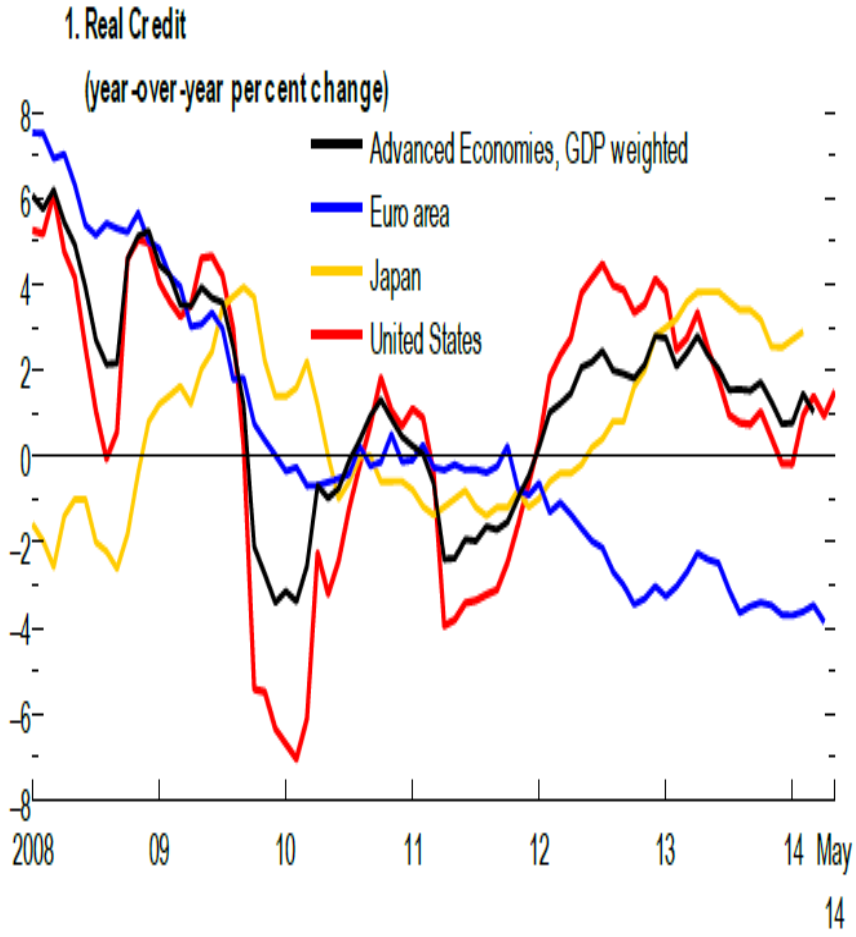
Lower output growth……

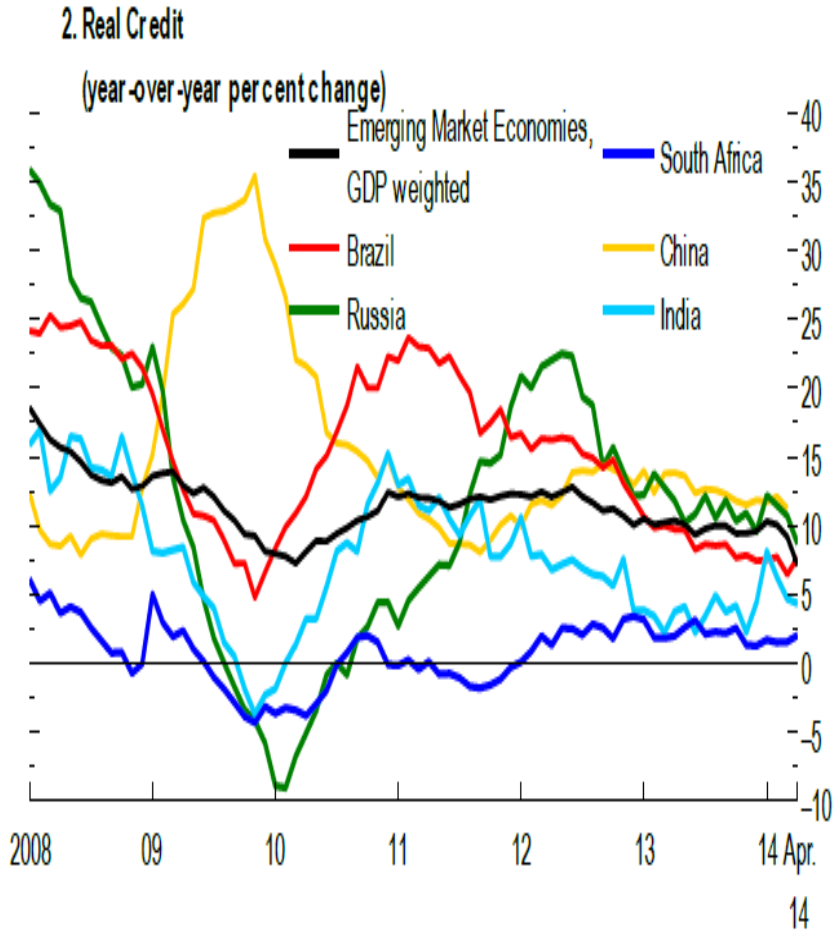


Lower investment growth…..

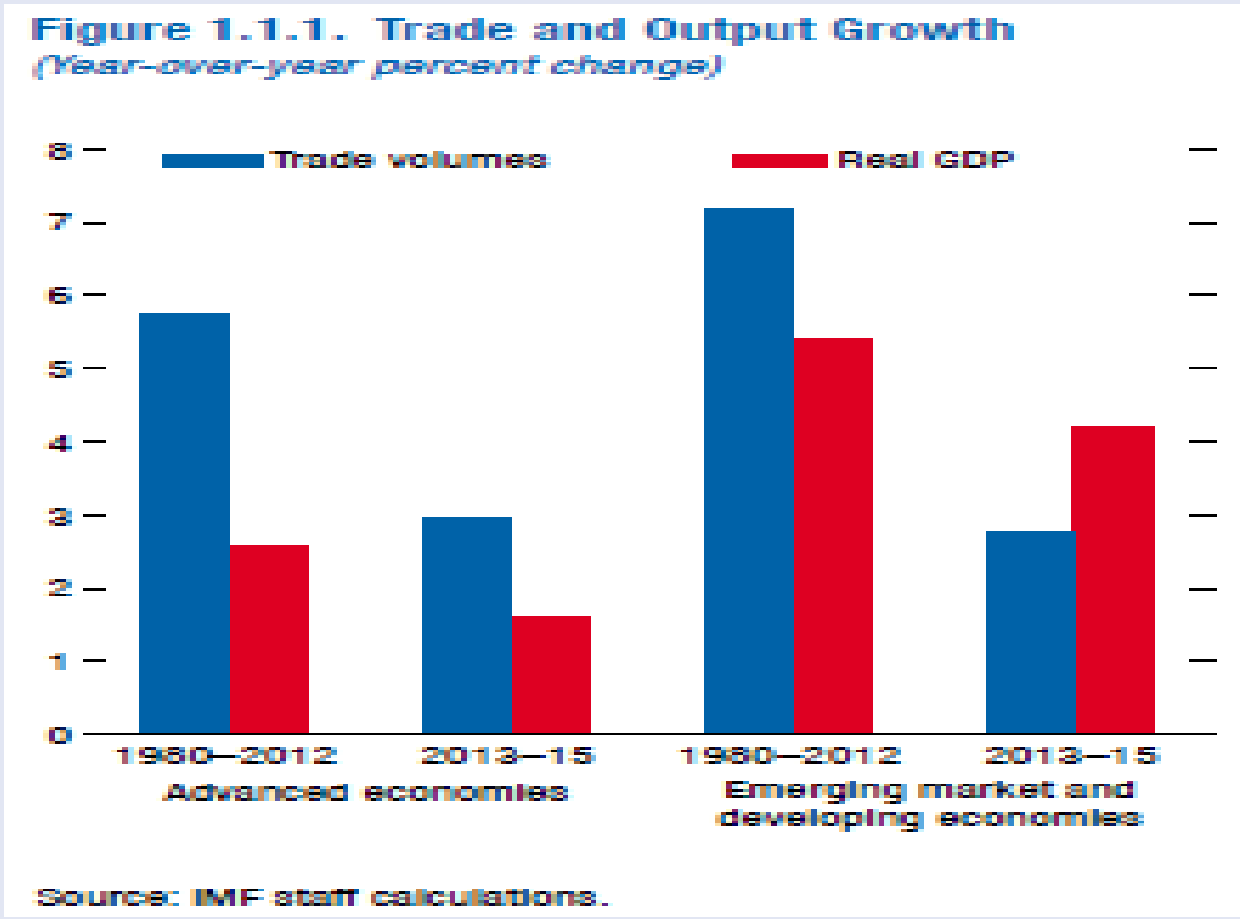


Lower credit growth





Decline in trade……



A New Normal?

- Several potential explanations in the literature:
  - role of private and public deleveraging in the aftermath of a financial crisis
  - Productivity slowdown resulting from reduced innovation and technology adoption
  - Demographic trends

- **The Basel tightening of bank regulation started in 2009 and is on-going.**
- **Is this tightening related to these trends?**

Revisiting the impact of bank capital requirements on lending and real activity

- Earlier studies found a relatively small impact of an increase in capital requirements on lending and real activity both in the short- and long-run.

- The calibrations of some recent equilibrium models deliver a significantly larger impact in the long-run

- Why?

- I revisit the issue by
  - Briefly reviewing the recent literature
  - Presenting new evidence using international data panels at a firm and country level.

A preliminary result

- **The impact of an increase in capital requirements on bank lending and real activity appears larger than previously thought.**

- This conclusion seems supported by:
  - The counterfactual experiments of some calibrated equilibrium models
  - New empirical evidence

- What might be the reasons of the apparent discrepancy between earlier and later studies?
  - More important role of financial frictions in some recent calibrated models
  - New evidence based on samples larger than those used previously

Empirical studies

- **Short- run**
- Recent "natural experiment" studies report significantly larger numbers for lending than previous studies

- **Long-run**
- MAG (2010): a one percentage point increase in the target ratio of capital would lead to a decline in the level of GDP of about 0.15 percent relative to baseline

Calibrated models (1)

- **Van den Heuvel (JME, 2008)**
- banks provide liquidity valued by households, and choose the risk of their portfolio, with some risk-shifting due to deposit insurance.
- capital requirements limit bank risk-shifting, but they are costly because they reduce liquidity.

- **Calibration results**:
- (US data) The welfare cost of Basel II regulation is equivalent to a permanent loss in consumption between 0.1% and 1%
- Basel II capital requirements are too high.

The Van Den Heuvel MAG(2010) update

Table A6.1

Steady-state welfare loss due to higher capital requirements in terms of consumption equivalents: formula-based measures[1]

Increase in capital ratio relative to current level	Canada	France	Germany	Italy	Nether-lands	Spain	UK	US	Japan	Avg	St. Dev.
(percentage points)	(percentage deviation from [2008 nominal] consumption)										
2	0.2	0.1	0.1	0.1	0.4	0.2	0.2	0.1	0.1	0.2	0.1
4	0.5	0.1	0.2	0.3	0.8	0.4		0.3	0.2	0.4	0.3
6	0.7	0.2	0.3	0.4	1.1	0.6		0.4	0.3	0.5	0.4

[1] Welfare loss due to tightening of capital requirement as computed in Van den Heuvel (2008).

Calibrated models (2)

- **De Nicolò et al., (RFS, 2014)**
- ***Industry*** composed of homogenous and infinitely lived banks financed by short-term debt, insured deposits and equity, maturity transformation as in Diamond and Dybvig (1983), exposed to credit and liquidity risks
- ***Inverted U-shaped relationship between steady state bank lending and capital requirements***

- **Calibration results for capital requirements (US data)**:
- Required (Tier 1) capital ratio increases ***from 0 to 4 percent***, bank ***lending increases by about 15 percent***.
- Required (Tier 1) capital increases ***from 4 percent to 12*** percent, bank ***lending declines by about 2.5 percent***

Calibrated models (3)

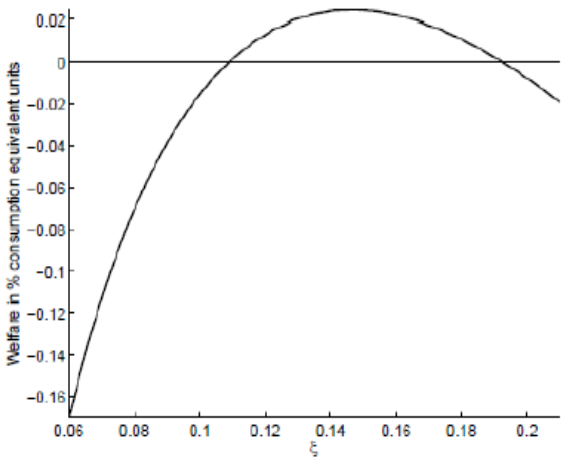
- **Corbae and D'Erasmo. (2014): Banking industry dynamics with heterogeneous banks**
- **Calibration results: an increase in capital requirement from 4 to 6 percent implies an 8 percent fall in bank lending**

- Some recent equilibrium models:
- Moving to the '*optimal*' capital requirement deliver steady state output declines ranging from 1 to 8 percent
- These declines are welfare improving
- Yet, '*optimal*' capital ratios differ considerably

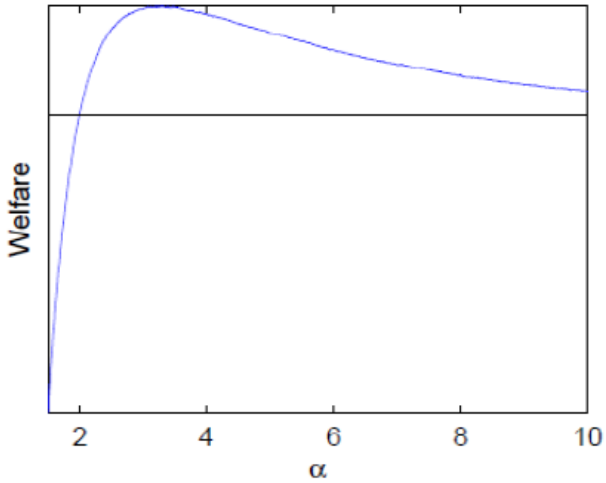
Optimal capital requirements in some recent DSGE models

Begenau (2014)

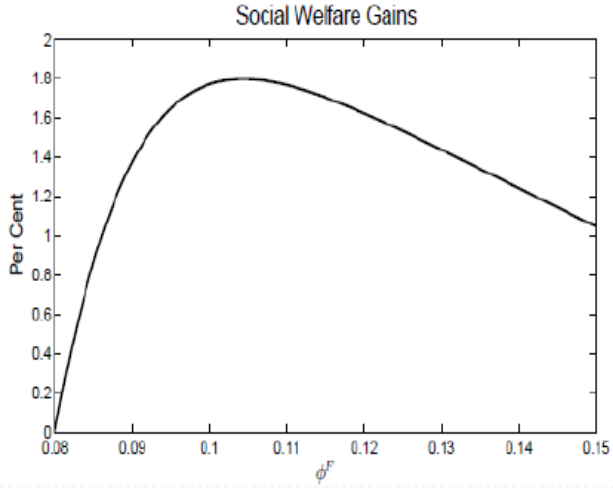
Figure 4: Optimal Level of Risked Based Capital Ratio



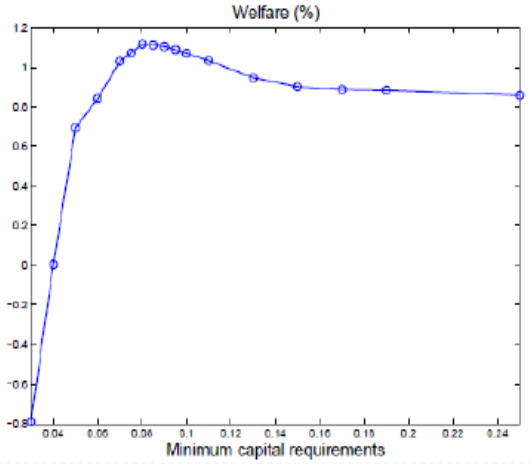
Adrian & Boyachenko (2013)



Clerc & al. (2014)



Nguyen (2013)



New evidence: preliminary results

- Bank-level data: consolidated account and market data for a panel of about 1,400 publicly traded banks in 43 advanced and emerging market economies for the period 1982-2013.
- Statistical model: a version of the specification by Hancock et al. (1995, 1998) (similar to Flannery and Rangan , 2008, Berrospide and Edge, 2010, Francis and Osborne, 2012)

- Country-level data: aggregate banking variables and GDP growth for 89 countries during 1998-2011.
- Statistical model, based on the finance-growth literature:
- bank capitalization => bank credit-to-(nominal) GDP growth .
- bank credit-to-(nominal) GDP growth => real per capita GDP growth .

Bank-level data model: short-run impact

$$\Delta \ln EA_{it} = \lambda_{EA}(\ln EA_{it}^{*} - \ln EA_{it-1}) + \varepsilon_{it} \qquad (1)$$

$$\Delta \ln L_{it} = \lambda_{L}(\ln L^{*}_{it} - \ln L_{it-1}) + \alpha \Delta \ln EA_{it} + \eta_{it} \qquad (2)$$

$$\ln EA_{it}^{*} = \alpha_{EAi} + \gamma_{EAt} + \beta_{EA} X_{it} \qquad (3)$$

$$\ln L_{it}^{*} = a_{Li} + \gamma_{Lt} + A_{L} \ln EA_{it}^{*} + \beta_{L} NIM_{it} + \gamma M_{jt} \qquad (4)$$

$$X_{it} = (\ln TA, ROA, TobinQ); \qquad M_{jt} = (RGDPG, INFL)$$

Panel IV estimation

	US		Advanced (ex. US)		Emerging	
VARIABLES	**ΔIn(EA)**	**ΔIn(Loan)**	**ΔIn(EA)**	**ΔIn(Loan)**	**ΔIn(EA)**	**ΔIn(Loan)**
Ln TA	0.762		-1.672		-7.730***	
	[0.48]		[0.11]		[0.00]	
ROA	11.05***		12.69***		7.532***	
	[0.00]		[0.00]		[0.00]	
TobinQ	-41.81***		-7.957		-0.299	
	[0.00]		[0.641]		[0.574]	
ΔIn(EA)		**-0.163*** **		**-0.105*** **		**-0.181*** **
		[0.00]		[0.00]		[0.00]
Ln Loan (t-1)		-9.715***		-6.035***		-11.07***
		[0.00]		[0.00]		[0.00]
NIM		2.906***		-0.444*		0.362
		[0.00]		[0.07]		[0.21]
RGDPG			-42.32	-22.66**	-66.54*	24.61
			[0.14]	[0.03]	[0.07]	[0.21]
INFL			-1.106***	-0.662***	-0.0295	-0.185**
			[0.00]	[0.00]	[0.84]	[0.03]
SMR			6.508**	17.39***	0.195	21.96***
			[0.02]	[0.00]	[0.95]	[0.00]
Constant	21.61	103.0***	30.68	114.0***	109.0***	169.1***
	[0.12]	[0.00]	[0.13]	[0.00]	[0.00]	[0.00]
Bank-Time effects	Y	Y	Y	Y	Y	Y
Observations	9,439	9,439	6,602	6,602	2,174	2,174
R-squared (within)	0.152	0.27	0.125	0.41	0.092	0.33
Number of banks	749	749	440	440	222	222

Robust pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

Impact of a 1% point change of capital requirement on lending growth

Capital ratio	US	Advanced (ex. US)	Emerging
7	0		
8	-2.33	-1.50	-2.59
9	-2.04	-1.31	-2.26
10	-1.81	-1.17	-2.01
11	-1.63	-1.05	-1.81
12	-1.48	-0.95	-1.65
13	-1.36	-0.87	-1.51
14	-1.25	-0.81	-1.39
15	-1.16	-0.75	-1.29

Country-level data model: long-run impact

Growth of bank credit to the private sector to GDP: $\Delta BC_{it} = \ln BC_{it} - \ln BC_{it-1}$

Real per-capita GDP growth: $G_{it} = \ln RGDPPC_{it} - \ln RGDPPC_{it-1}$

$$\Delta BC_{it} = \alpha_{BCi} + \beta_{BCt} + \gamma_{BC} EAR_{it} + cFMD_{it} + d_{BC} \ln BC_{it-1} + u_{it} \quad \textbf{(1)}$$

$$\Delta G_{it} = \alpha_{Gi} + \beta_{Gt} + \gamma_{G} \Delta BC_{it} + \gamma INFL_{it} + d_{G} \ln RGDPPC_{it-1} + \varepsilon_{it} \quad \textbf{(2)}$$

Banking crisis probability (Pooled Logit), based on the binary variable:

$Z_{it} = 1$ **if crisis year, 0 otherwise**

$$P(Z_{it} = 1) = F(\alpha_c + \beta_C EAR_{it-1} + \gamma_C \Delta G_{it-1} + \delta_C INFL_{it-1} + \eta_{it}) \quad \textbf{(3)}$$

Panel IV estimation

	High Income			Medium to low income		
VARIABLES	**ΔBC**	**ΔG**	**P(Z=1)**	**ΔBC**	**ΔG**	**P(Z=1)**
EAR	**-0.964*** **			**-1.133*** **		
	[0.00]			[0.00]		
FMD	3.677			5.872***		
	[0.14]			[0.00]		
Ln BCGDP(t-1)	-9.380***			-17.31***		
	[0.00]			[0.00]		
ΔBC		**0.304*** **			**0.0525** **	
		[0.00]			[0.05]	
Ln RGDPPC(t-1)		-15.77***			-13.63***	
		[0.00]			[0.00]	
Constant	42.87**	156.2***		64.27***	103.9***	
	[0.00]	[0.00]		[0.00]	[0.00]	
EAR(t-1)			**-0.215** **			**-0.0801** **
			[0.01]			**[0.04]**
ΔG(t-1)			**-0.226** **			**-0.178*** **
			[0.01]			[0.00]
INFL(t-1)			2.866			5.355***
			[0.778]			[0.00]
Constant			1.029			-1.088
			[0.410]			[0.119]
Country-Time	Yes	Yes		Yes	Yes	
Observations	470	470	260	521	521	440
R-squared (within)	0.303	0.47		0.312	0.35	
Pseudo R2			0.34			0.19
Countries	39	39	39	50	50	50

Robust pval in brackets
*** p<0.01, ** p<0.05, * p<0.1

Impact of a 1% point change of capital requirement on lending and real GDP growth

	Bank lending growth	Real per-capita GDP growth
High income countries	-0.96	-0.29
Medium to low income countries	-1.13	-0.06

- These estimates are significantly larger than previous ones for high income (advanced) economies

Net growth benefits

Expected 'steady state' output growth conditional on ΔEAR_i **:**

$$
\begin{aligned}
&EG_i \mid \Delta EAR_i = \\
&[1 - EP(Z_{it}=1) - \Delta P(Z_{it}=1 \mid \Delta EAR_i)]E(\Delta G_i \mid Z_{it}=0) + \\
&[EP(Z_{it}=1) + \Delta P(Z_{it}=1 \mid \Delta EAR_i)]E(\Delta G_i \mid Z_{it}=1) \\
&+E(\Delta G_i \mid \Delta EAR_i)
\end{aligned}
\qquad (4)
$$

$E(\Delta G_i \mid Z_{it}=0)$ ($E(\Delta G_i \mid Z_{it}=1)$) = Average 1998-2011 real GDP growth rate excluding (including) crisis years (predictions from (2) and (3))

$E(\Delta G_i \mid \Delta EAR_i) = \gamma_{BC}\gamma_G \Delta EAR_i$, cost of a change in capital requirement

$\Delta P(Z_{it}=1 \mid \Delta EAR_i) = (\hat{\beta}_C + \hat{\gamma}_C \gamma_{BC}\gamma_G)\Delta EAR_i$ change in crisis probability

$EP(Z_{it}=1)$ = Expected crisis probability (prediction from the Logit model)

Expected 'steady state' ***change*** **in output growth conditional on** ΔEAR_i **:**

$$
\Delta(EG_i \mid \Delta EAR_i) = \{(\hat{\beta}_C + \hat{\gamma}_C \gamma_{BC}\gamma_G)[E(\Delta G_i \mid Z_{it}=1) - E(\Delta G_i \mid Z_{it}=0)] + \gamma_{BC}\gamma_G\}\Delta EAR_i \qquad (5)
$$

Net growth benefit of a 1% point change of capital requirement

	crisis growth loss	dP	Expected benefit	Expected cost	Net benefit
		High income economies			
median	-5.69	-0.020	0.11	0.29	**-0.18**
1% percentile	-11.74	-0.020	0.24	0.29	**-0.06**
		Medium to low income economies			
median	-8.93	-0.005	0.04	0.06	**-0.02**
1% percentile	-23.05	-0.005	0.11	0.06	**0.05**

Issues for discussion

- The impact of an increase in capital requirements on bank lending and real activity appears larger than previously thought…however, updating data and check robustness….

- Yet, the debate has been traditionally focused on what *levels* of minimum capital ratios might be best.
- Comparatively less attention has been devoted to the ***implementation mechanisms***

- **A key result** in De Nicolò et al. (2014): **a form of "prompt corrective action" dominates non-contingent capital requirements in terms of efficiency and welfare.**
- ***How*** capital regulation is implemented might be as important as (and give a different perspective to) what is the best *level* of bank capital requirements.