Capital Allocation, the Leverage Ratio Requirement and Banks' Risk-Taking

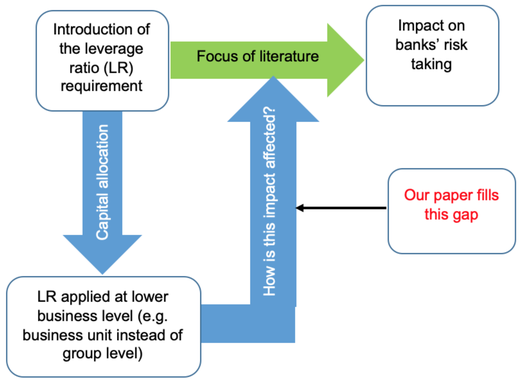
Ioana Neamțu, Quynh-Anh Vo (Bank of England)

Motivation and research question

Research question: How does the banks' allocation of regulatory requirements - *Risk weighted* (RW) and *Leverage Ratio* (LR) - to business units impact their risk-taking?

Methods:

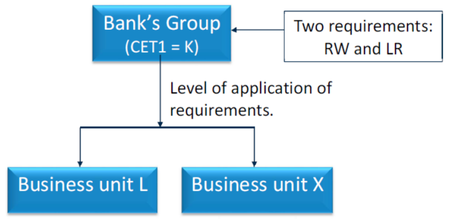
- *Positive approach:* compare optimal investments when a bank applies requirements at the group level vs. when it applies them at the business unit level.
- Theoretical model and calibration to UK banks.



Theoretical model

Setup

- A banking group with two business units: high-risk, high-returns unit (lending L) and low-risk, low-returns unit (repo X), with debt D and equity K (fixed).



- It maximises profits by choosing optimal investments L and X, subject to LR and RW requirements.

Measures of the bank's asset risk

$$w = \frac{L}{X+L} \quad or \quad ARW = \frac{RWA}{Leverage \quad exposure}$$

Results

- If the group is LR bound, allocating constraints to business units will either maintain or decrease the bank's asset risk.
- If the group is RW bound, asset risk may increase under certain conditions.

Calibration

- Calibrate model on 15 largest UK banks.
- Simulate optimal investment choices on a range of (fixed) initial capital K.
- **Data sources:** repo and reverse repo rates from confidential BoE repo gilt data (SMMD), bank balance sheet from S&P 2015-2018.

Table 3: Calibration UK

Description	Parameters	Calibrated Value
VaR confidence level	a	0.001
Leverage requirement	χ	0.03
Coupon on government bond	c	1.0172
Bank's borrowing cost	R	1.0114
Lending unit		
Marginal return on loan	g_1	1.0356
Curvature of loan return	g_2	$-2.22 \cdot 10^{-5}$
Log-normal parameter of Z	μ_Z^{log}	-4.568
(Mean Z)		(0.015)
Log-normal parameter of Z	σ_Z^{log}	0.913
(Standard deviation Z)		(0.018)
Repo unit		
Return on reverse repo - repo	β_1	0.000427
Diminishing return parameter	β_2	$-6.943 \cdot 10^{-4}$

Business model calibration

- Split sample in retail, and wholesale and capital oriented banks (Roengpitya et al., 2014).

Key Results and conclusion

Analytical findings:

Impact on the asset risk depends on the binding requirement at the group level:

- LR binding $\Rightarrow$ no increase in asset risk
- RW binding $\Rightarrow$ asset risk may increase
- Results depend on (i) Average Risk Weights (ARW) of each business (ii) diversification gains of applying requirements at the group level, and (iii) associated marginal costs of capital (K) for each additional unit of investment, which in turn depends on the most binding constraint the bank faces.

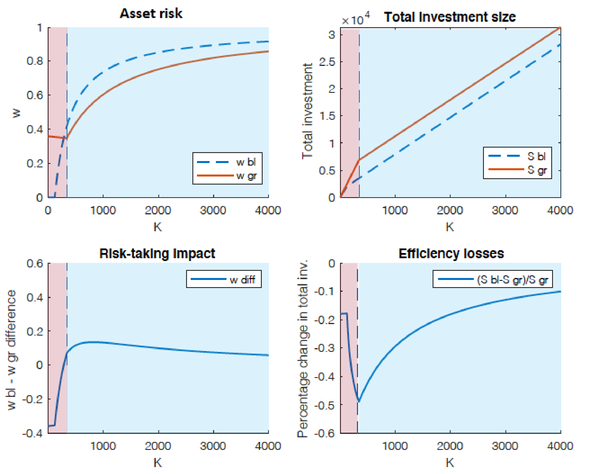
Simulation for UK banks:

- Average bank: when it is RW bound, asset risk increases if capital requirements are applied at the business-unit level.
- Business model classifications
  - Retail bank $\sim$ average bank
  - Wholesale and cap. markets oriented banks: decrease in asset risk

Policy implications: Potential cost of applying regulatory constraints below the group-consolidated level.

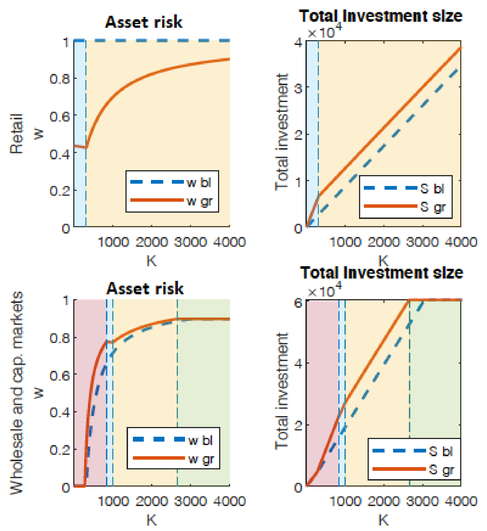
Simulation results

Overall sample



- Pink - both LR and RW binding; Blue -RW binding
- Initial K $\Rightarrow$ optimal w^*, $S^* = L + X$; w_{bl}/w_{gr} - optimal asset risk when constraints are applied at business unit level/group.
- Overall sample - asset risk increases when constraints are applied at the business-unit level.

Business model split



- Pink -LR binding; Beige - RW binding; Green - unconstrained
- Retail bank behaves similarly as the average bank. Wholesale and capital markets oriented bank shows a decrease in asset risk.