**CAPITAL ALLOCATION, THE LEVERAGE RATIO REQUIREMENT AND BANKS’ RISK-TAKING**

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Disclaimer: The views expressed in this paper are those of the authors, and not necessarily those of the Bank of England or its Committees.

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**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.**

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**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**

\[ w = \frac{L}{X+L} \quad \text{or} \quad \text{ARW} = \frac{\text{RWA}}{\text{Leverage exposure}} \]

**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.

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**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>
<thead>
<tr>
<th>Description</th>
<th>Parameters</th>
<th>Calibrated Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VaR confidence level a</td>
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<tr>
<td>Leverage requirement ( \lambda )</td>
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<tr>
<td>Coupon on government bond ( \theta )</td>
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<tr>
<td>Bank’s borrowing cost ( R )</td>
<td></td>
<td>1.0141</td>
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**Lending unit**

- Marginal return on loan \( g_L \) = 1.0356
- Curvature of loan return \( g_L^2 \) = -2.22 \times 10^{-3}
- Log-normal parameter of \( Z \) \( \mu^* = -4.56 \) (Mean Z)
- Log-normal parameter of \( Z \) \( \sigma^* = 0.913 \) (Standard deviation Z)

**Repo unit**

- Return on reverse repo - repo \( \beta_1 \) = 0.000427
- Diminishing return parameter \( \beta_0 \) = -6.941 \times 10^{-4}

**Business model calibration**

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

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**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 ~ 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.

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**Simulation results**

*Overall sample*:

- Pink - both LR and RW binding; **Blue** - RW binding
- Initial K \( \Rightarrow \) optimal \( w^*, S^* = L + X; w_{ig}/w_{fr} \) - 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.