Repo Market Functioning:
The Role of Capital Regulation

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Disclaimer: This presentation represents our own views and not necessarily those of the Bank of England or its staff.
What is repo?

**REPO**

- **Securities provider**
- **Repo start date**
  - Bonds
  - Cash
- **Repo unwind date**
  - Bonds
  - Cash + interest
- **Cash provider**
What is repo?

Securities provider

Repo start date
Bonds ← Cash

Securities provider

Repo unwind date
Bonds ← Cash + interest

Cash provider

REVERSE REPO
Cash provider
Repo market: Why do we care?

- Key source of short-term funding
- Low risk and liquid investment for cash
- Main vehicle sourcing and financing (government) bonds
- Very large: $12 trillion outstanding

→ Essential financial stability and transmission monetary policy
This paper

- Despite importance, much workings still unknown
- Including: reaction to Basel III regulation
- This paper: leverage ratio
Leverage ratio and repo market

Leverage ratio  →  Repo market

- Capital/Total assets
- Same treatment risky/safe asset

Relative more costly
Leverage ratio and repo market

Leverage ratio
- Capital/Total assets
- Same treatment risky/safe asset

Repo market
- Safe/low margin activity
- Counts towards balance sheet
Leverage ratio and repo market

\[ LR = \frac{Capital}{Total \ Assets} \]

Dealer Engaging in Repo Transaction

- + Cash
- + Repo Payable

Assets

Liabilities

Repo expands balance sheet and increases exposure measure
Leverage ratio and repo market

Leverage ratio

- Capital/Total assets
- Same treatment: risky/safe asset

Repo market

- Safe/low margin activity
- Counts towards balance sheet
- Relative more costly
Empirical evidence mixed

- Reduced repo after announcement US leverage ratio
  Allahrakha, Cetina and Munjan, 2018; Anbil and Senyuz, 2018

- No impact European dealers outside reporting dates
  Baldo, Bucalossi and Scalia, 2018

- No drop repo liquidity after announcement UK leverage ratio
  Bicu, Chen and Elliott, 2017
Identification complicated

- Exogenous variation in capital requirements
  - Policy not randomly assigned
  - Banks typically adjust ahead of implementation

- No other shocks at the same time
  - After crisis many regulatory changes, often implemented together

- Distinguish supply from demand
This paper: quasi-natural experiment

• Not announcement, but tightening leverage ratio

• Change in reporting requirement UK
  - January 2016: Introduction 3% leverage ratio
  - 7 stress-tested banks
  - January 2017: “monthly averaging” to “daily averaging”
  - Reduces ability to window dress
  - Tightens leverage ratio
  - Affected 4 dealers in repo market, 12 unaffected
This paper: quasi-natural experiment

• Key advantages
  – Natural control and treatment group
  – Even when LR not binding, incentive to react
  – No other regulatory change or (U)MP
  – No incentive to adjust prior to the shock
Affected dealers reacted to this shock
Affected dealers reacted to this shock
Non-affected dealers did not
Focus: bilateral repo market

• Central role during GFC
  Gorton & Metrick, 2012; Gorton, Laarits and Metrick, 2017

• Very important segment
  – 50-70 percent of repo market (US and UK)

• Functioning not well understood
  – Lack of data
  – UK supervisory transaction level data
Bilateral vs triparty repo

• Key differences
  – Cash lenders diverse, not only sophisticated financial intermediaries
  – Both cash and securities driven transactions
  – Allows for re-hypothecation (re-use of collateral)
    – Important source financing/profits dealers

• Reaction to LR might be different in both markets
  – Financial crisis: run on bilateral repo but not triparty repo (re-hypothecation)
Main findings

• Initial impact
  – Affected dealers reduce repo trading activity
    – Only affects small clients
    – Volume, pricing and extensive margin
  – Substitution by foreign dealers

• Steady-state
  – Transitory effect lasting about 4 months
  – Re-adjustment via reverse repo
    – Increase haircuts small clients
Sterling Money Market Database (SMMD)

- Near-universe gilt repo transactions
- From February 2016 onward
- 23 reporting banks (95% market)
- Size, rate, maturity, collateral etc.
- Dealer and client known
- No reliance on algorithms (Furfine, 2009)
Sterling Money Market Database (SMMD)

• Cleaning
  – Aggregate legal entities into parent companies
  – Only clients with at least two dealers (>99% volume)

• Our sample
  – 15 dealers, 38 clients, 126 dealer-client pairs
Model: Difference-in-Differences

Change LR Reporting:
January 01, 2017

Pre: 21 Nov – 16 Dec
Dealer i → Client j

Post: 05 Jan – 01 Feb
Dealer i → Client j

ΔVolume
Initial effect: baseline

$$ΔY_{ij} = β_1 \text{Affected}_i + β_2 \text{Relationship}_{ij} + μ_j + ε_{ij}$$

$ΔY_{ij}$: Pre-post change repo volume accepted by dealer $i$ from client $j$

$\text{Affected}_i$: D=1 if dealer affected by leverage ratio

$\text{Relationship}_{ij}$: Frequency transactions $ij$ in pre-period

$μ_j$: Client fixed effects

OLS, clustering at dealer level
## Initial effect: baseline

<table>
<thead>
<tr>
<th></th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
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</thead>
<tbody>
<tr>
<td><strong>Affected Dealer</strong></td>
<td>-0.387**</td>
<td>-0.568*</td>
<td>-0.656**</td>
</tr>
<tr>
<td></td>
<td>0.168</td>
<td>0.318</td>
<td>0.295</td>
</tr>
<tr>
<td><strong>Relationship</strong></td>
<td>-2.667***</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0.777</td>
<td></td>
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<tr>
<td><strong>Constant</strong></td>
<td>0.126</td>
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<td></td>
<td>0.110</td>
<td></td>
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<tr>
<td><strong>Client FE</strong></td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>128</td>
<td>128</td>
<td>128</td>
</tr>
<tr>
<td><strong>R²</strong></td>
<td>0.027</td>
<td>0.340</td>
<td>0.392</td>
</tr>
</tbody>
</table>

Significance Levels:  .01***; .05**; .1*
Initial effect: heterogeneous

• Tightening LR makes repo more costly, but does not prevent

• Ways to mitigate costs:
  – Avoid repo to count toward balance sheet → netting
  – Ensure high (indirect) return → ancillary business

• Both more likely large clients

• Expect impact primarily small clients
Initial effect: small vs large

\[ \Delta Y_{ij} = \beta_1 \text{Affected}_i \times \text{Small}_j + \beta_2 \text{Relationship}_{ij} + \mu_j + \phi_i + \epsilon_{ij} \]

\( \Delta Y_{ij} \): Pre-post change repo volume accepted by dealer \( i \) from client \( j \)

\( \text{Affected}_i \): D=1 if dealer affected by leverage ratio

\( \text{Small}_j \): D=1 if client below median repo activity pre - period

\( \mu_j \): Client fixed effects

\( \phi_i \): Dealer fixed effects
Initial effect: small vs large

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<tr>
<td>Affected Dealer * Small</td>
<td>-0.784***</td>
<td>-1.332***</td>
<td>-1.252***</td>
<td>-1.112***</td>
</tr>
<tr>
<td></td>
<td>0.243</td>
<td>0.37</td>
<td>0.307</td>
<td>0.303</td>
</tr>
<tr>
<td>Affected Dealer</td>
<td>-0.165</td>
<td>-0.256</td>
<td></td>
<td></td>
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<tr>
<td>Small</td>
<td>0.463**</td>
<td></td>
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<td></td>
<td>0.211</td>
<td>0.294</td>
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<tr>
<td>Relationship</td>
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<td>0.896</td>
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<td>0.136</td>
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<tr>
<td>R²</td>
<td>0.053</td>
<td>0.383</td>
<td>0.469</td>
<td>0.501</td>
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Significance Levels: .01***; .05**; .1*
Initial effect: small vs large

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<td>( R^2 )</td>
<td>0.053</td>
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Significance Levels: .01***; .05**; .1*

No impact large clients
No-impact other client types

• Relationship
• Foreign
• Long-term repo
Other loan terms

• Adjustment
  – Lower repo rates
  – Fewer transactions

• No adjustment
  – Haircut (credit risk)
  – Maturity (business model)

• Consistent supply side shock due to tightening leverage ratio
Market adjustment

• Affected dealers step away from small clients
  – Small clients can place 23% (2.9 billion) less cash

• Substitution non-affected dealers
  – No decline total repo activity small clients
  – Non-affected dealers increased market share (39 to 49%)
Persistent or temporary impact?

- Extend sample period: October – April
Persistent or temporary impact?

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Persistent or temporary impact?

- Extend sample period: October – April
Transitory impact: repo volume

Affected * Small

![Graph showing parameter estimates over time, with labels for Client Level and Repo Level.](image_url)
Transitory impact: repo volume

Affected * Small

Initial effect
Transitory impact: repo volume

Affected * Small

Over time effect dissipates
Repo rates and extensive margin

5a. Repo rate

5b. Frequency transactions
Why taking back small clients?

- Alternative way overcome cost stricter regulation
- Bilateral market allows for rehypothecation
- Way to extract profits
Why taking back small clients?

Cash Borrowers

$100 collateral
$ 90 cash

Dealers

$100 collateral
$ 90 cash

Cash Lenders

$100 collateral
$100 cash

Haircut = 10%

Haircut = 0%

Cash Surplus = $10
Why taking back small clients?

• Increase haircut reverse repo, haircut repo unchanged
• Recapture cost repo via reverse repo
  – Especially when inflow of collateral via liability driven clients
• Exploit market power and set higher haircuts small clients
Reverse repo haircuts

Affected * Small

Over time haircuts reverse repo small clients increase
Repo haircuts

Affected * Small

No change repo haircuts
Conclusion

• Tightening LR no impact repo market liquidity
• Immediate impact
  • Affected dealers isolate their large clients
  • Step away from small clients
  • But unconstrained dealers step in
• Move away from small clients transitory
  – Dealers readjust by changing contracting terms in reverse repo
THANK YOU
## Netting

Possibility netting lower for small clients

|                | Repos/(Repos+Reverse Repos) | Pr(Reverse Repos=0 | Repos>0) |
|----------------|-----------------------------|-------------------|
|                | [1]                         | [2]               | [3]      | [4]      |
| Small Client   | 0.069**                     | 0.070**           | 0.264**  | 0.263*** |
|                | 0.028                       | 0.026             | 0.085    | 0.078    |
| Dealer FE      | no                          | yes               | no       | yes      |
| N              | 128                         | 128               | 128      | 128      |
| $R^2$          | 0.016                       | 0.217             | 0.081    | 0.207    |