Liquidity Management of U.S. Global Banks

Nicola Cetorelli
Federal Reserve Bank of New York

Linda Goldberg
Federal Reserve Bank of New York
NBER

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The views expressed in this paper are those of the individual authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System.
Global banks much in the news recently

Mainly getting a pretty bad rap.

Argument:

- Instrumental to the propagation on a global scale of the 2007 crisis.
- More recently, mechanisms of contagion of the European sovereign crisis.

There is substance to this argument.

- The balance sheet of global banks have acted as a specific channel of international propagation of the crisis.
Regulatory backlash

- Negative subtext places global banking at the center of numerous discussions of future regulatory changes to their operations.

- The discussion is one sided: should global banking operations be curbed?

- Examples: “subsidiarization”, “local funding pools”, “ring fencing”.
Global banks as channel of transmission not new discovery but growing in importance

Global international claims
1983-2011
$ Billion

Series 1

Cetorelli and Goldberg
How do banks transmit shocks?

<table>
<thead>
<tr>
<th>Liquid assets</th>
<th>Deposits</th>
<th>Other Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic loans</td>
<td></td>
<td>External borrowing</td>
</tr>
<tr>
<td>Cross-border loans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Global bank**

**Domestic parent balance sheet**
How do banks transmit shocks?

Global bank

Domestic parent balance sheet

- Liquid assets
  - Loans
    - Domestic loans
    - Cross-border loans
  - Deposits
    - Other Funds
      - External borrowing
      - Internal borrowing
    - Capital

Foreign affiliate balance sheet

- Foreign liquid assets
  - Loans
    - Foreign local loans
  - Deposits
    - Other Funds
    - Capital
  - Internal lending
Global banks manage liquidity globally

- Funding rebalancing achieved through active internal capital market channels.

- Cross-border internal reallocation of funds.

- Motives can be welfare enhancing:
  - Considerations -- risk sharing, efficiency, portfolio diversification, response to financial frictions.

- This is NOT a crisis-specific feature
  - Cetorelli and Goldberg (*Journal of Finance*, Forthcoming)
Internal funding flows are large

**Gross U.S. International inter-bank and intra-bank flows**

- **Inter-bank flows**
- **Intra-bank flows**

Source: FFIEC 009 and BIS Consolidated Banking Statistics

Note: Intra-bank flows are computed as the sum of net due to (from) of affiliates (in absolute value), from FFIEC 009. Interbank flows are computed as the sum of foreign claims of the U.S. vis-a-vis rest of world and of rest of world vis-a-vis the U.S., from BIS.

Cetorelli and Goldberg 8
During crisis very big as well
Little is known of drivers of global banks liquidity management

- What are the factors determining actual cross border, internal funds dynamics?
- Deeper understanding has crucial normative implications
  - Are foreign banks a source of concern?
  - Should entry and/or mode of operations subject to restrictions?
- These themes on our research agenda
Global banks manage liquidity globally

Domestic head office

Internal funding flows

Foreign operations
Two conjectures

1. Organizational pecking order

Foreign offices balance sheets subordinated to head office

Funds move in ebb and flow

A shock at home means a repatriation of funds across locations for each parent bank.
Global banks manage liquidity globally

Domestic head office

Foreign operations
Organizational pecking order

Domestic head office

Foreign operations
Organizational pecking order

Domestic head office

Foreign operations

Internal funding flows
Two conjectures

- 2. **Locational pecking order**

Each bank manages liquidity needs taking into account relative costs and benefits from pulling and allocating a marginal dollar across each location of operation.

No obvious organizational subordination
Two bank-specific dimensions driving liquidity management strategies

- Local Funding.
  - Each foreign location different in terms of importance in raising local funds

- Local Investment.
  - Each foreign location different in terms of contribution to total foreign claims
Global bank more likely to …

- Draw funds from locations that are normally significant *local funding sources*
  - reflects a comparative advantage in obtaining access to external market funds

- Shield locations that are normally considered important *investment sinks*
  - reflects better returns on investment.
  - such locations may be net receivers of funds.

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Locational pecking order

Domestic head office

Foreign operations
Locational pecking order

- Domestic head office
- Funding sources
- Foreign operations
- Investment sinks
Locational pecking order

Domestic head office

Funding sources

Foreign operations

Internal funding flows

Investment sinks
Locational pecking order

- Domestic head office
- Foreign operations
- Internal funding flows
- Funding sources
- Investment sinks
Preview of Main Findings

Support for locational pecking order conjecture

Given an adverse shock to the parent, affiliate markets:

- Funds drawn relatively more from core funding locations
- Core investment locations supported relative to periphery
- Economic significance of results are large
- Traditional, host country-specific metrics of distance between parent and affiliate markets are less important
Data description

  - Quarterly. Filed by every U.S bank or its holding company, and foreign bank subsidiaries in U.S.
    - claims, assets, liabilities - by country of destination
    - Internal borrowing and lending of affiliates in each foreign location
  - Add in parent bank characteristics from *Federal Financial Institutions Examinations Council (FFIEC) 031 “Call Reports”*
  - Plus distance characteristics of destination countries

Cetorelli and Goldberg
### Table 1 Counts of U.S. Banks With Foreign Affiliates

<table>
<thead>
<tr>
<th>ALL banks</th>
<th>2006q1</th>
<th>2007q1</th>
<th>2008q1</th>
<th>2009q1</th>
<th>2010q1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>42</td>
<td>41</td>
<td>39</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>US-owned</td>
<td>27</td>
<td>26</td>
<td>26</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>foreign-owned</td>
<td>15</td>
<td>15</td>
<td>13</td>
<td>18</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: Authors’ computations based on FFIEC 009 reporting by quarter.

All of these banks have at least one affiliate abroad.

A larger number of U.S. banks borrow and lend internationally, without having foreign branches or subsidiaries.
Figure 2: Number of U.S. Banks with Affiliates in Countries

- 1-2
- 3-5
- 6-10
- 11-15
- 16-30

Source data: Author calculations using 2007Q2 FFIEC009 regulatory reports filed by U.S. banks.
Identification strategy

- **Pre-crisis period: 2006Q1 – 2007Q2**

- **Shock 1: 2007Q3 to 2007Q4.** Dollar funding pressure resulted from the subprime market collapse. Adverse shock on balance sheet of the parent banks.

- **Shock 2: 2008Q1 - 2008Q2.** Federal Reserve institutes the Term Auction Facility (late December 2007) to provide emergency funding to banks. Positive balance sheet shock. We leave out the post-Lehman quarters on purpose.
Identification strategy

- **Dependent variable**: $\Delta (\text{Net internal borrowing})_{ij}$

- **Business model variables**:
  - Core funding locations:
    $\left(\frac{\text{Local liabilities}}{\text{Internal} + \text{Local liabilities}}\right)_{ij}$
  - Core investment locations:
    $\frac{\text{Total claims}_{ij}}{\text{Total claims}_i}$

- **“Pre-existing condition”**: Ex-ante exposure of bank $i$ to ABCP programs (Acharia, Schnabl and Suarez, 2009, Acharia and Schnabl, 2010, Kacperczyk and Schnabl, 2010)

Parent banks denoted by $i$, affiliate locations by $j$. 

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Identification strategy

- Location $j$ Fixed Effects (local demand conditions)
- Bank $i$ Fixed Effects
- Vector of bank characteristics
- Vector of location characteristics

- Exploit both intra- and inter-bank heterogeneity
Econometric methodology

\[ \Delta NetDueTo^{1}_{ijt} = \]

\[ NetDueTo_{ijt|\text{average}(2007Q3-2007Q4)} - NetDueTo_{ijt|\text{average}(2006Q1-2007Q2)} \]

\[ \Delta NetDueTo^{2}_{ijt} = \]

\[ NetDueTo_{ijt|\text{average}(2008Q1-2008Q2)} - NetDueTo_{ijt|\text{average}(2007Q3-2007Q4)} \]
Econometric methodology

$$\Delta \text{NetDueTo}_{ij}^p = \beta_0 + \beta_1 \cdot \text{Shock}_i + \beta_2 \cdot X_{it} + \beta_3 \cdot X_j + \beta_4 \cdot X_{ijt} + \varepsilon_{ijt}$$

$$\beta_1 = \gamma_0 + \gamma_1 \cdot X_{it} + \gamma_2 \cdot X_j + \gamma_3 \cdot X_{ijt}$$

Conjectures:
- Organization pecking order $\gamma_0 \neq 0 \quad \gamma_3 = 0$
- Locational pecking order $\gamma_0 \neq 0 \quad \gamma_3 \neq 0$
## Explanatory variables

### Table 3 Summary of Explanatory Variables

<table>
<thead>
<tr>
<th>Regression Sample</th>
<th>By Banking Organization</th>
<th>By Affiliate Location</th>
<th>By Bank-Affiliate Location</th>
<th>Initial shock scaling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$X_i$</td>
<td>$X_j$</td>
<td>$X_{ij}$</td>
<td></td>
</tr>
<tr>
<td>$Solv_i$, $Liquid_i$, $FMshare_i$, $Herf_i$, $Fowner_i$, $Size$</td>
<td>$Distance_j$, $Polity_j$, $Dollarpeg_j$, $ChinnKC_j$, $OFC_j$, $Localshare_{ij}$, $Loanshare_{ij}$</td>
<td>$ABCP_i$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Change in Affiliate Borrowing from Parents
Testing Organizational v. Locational Pecking Order – Shock 1

<table>
<thead>
<tr>
<th></th>
<th>Column (a)</th>
<th>Column (b)</th>
<th>Column (c)</th>
<th>Column (d)</th>
<th>Column (e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock&lt;sub&gt;i&lt;/sub&gt;</td>
<td>-5427**</td>
<td>-7395**</td>
<td>-4682*</td>
<td>-9698***</td>
<td>-1041**</td>
</tr>
<tr>
<td>Shock&lt;sub&gt;i&lt;/sub&gt;*CoreFunding&lt;sub&gt;ij&lt;/sub&gt;</td>
<td>-885***</td>
<td>-948**</td>
<td>-875.6***</td>
<td>-755**</td>
<td>-1041**</td>
</tr>
<tr>
<td>Shock&lt;sub&gt;i&lt;/sub&gt;*CoreInvestment&lt;sub&gt;ij&lt;/sub&gt;</td>
<td>14420***</td>
<td>13890***</td>
<td>13946***</td>
<td>13209***</td>
<td>18814*</td>
</tr>
<tr>
<td>Constant</td>
<td>-134</td>
<td>-846.8**</td>
<td>-261.6</td>
<td>-3475.8</td>
<td>-510.3</td>
</tr>
<tr>
<td>Bank Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Country Controls</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Foreign Office Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country FE</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bank FE</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>500</td>
<td>500</td>
<td>474</td>
<td>500</td>
<td>423</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.30</td>
<td>0.39</td>
<td>0.31</td>
<td>0.36</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Full sample, OLS  Drop Caymens, OLS  US Only
Table 4: Change in Affiliate Borrowing from Parents Testing Organizational v. Locational Pecking Order – Shock 2

<table>
<thead>
<tr>
<th></th>
<th>(a)</th>
<th>(b)</th>
<th>(c)</th>
<th>(d)</th>
<th>(e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{Shock}_i$</td>
<td>5700***</td>
<td>6498***</td>
<td>3003</td>
<td></td>
<td>6218**</td>
</tr>
<tr>
<td>$\text{Shock}<em>i \times \text{CoreFunding}</em>{ij}$</td>
<td>1673***</td>
<td>1679***</td>
<td>634***</td>
<td>1720***</td>
<td>2052***</td>
</tr>
<tr>
<td>$\text{Shock}<em>i \times \text{CoreInvestment}</em>{ij}$</td>
<td>-9437***</td>
<td>-8994***</td>
<td>-2206</td>
<td>-9828***</td>
<td>-12930**</td>
</tr>
<tr>
<td>$\text{Constant}$</td>
<td>-785</td>
<td>398</td>
<td>-67</td>
<td>-7841</td>
<td>-887</td>
</tr>
<tr>
<td>Bank Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Country Controls</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Foreign Office Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country FE</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bank FE</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>513</td>
<td>513</td>
<td>485</td>
<td>513</td>
<td>438</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.28</td>
<td>0.37</td>
<td>0.34</td>
<td>0.30</td>
<td>0.33</td>
</tr>
</tbody>
</table>
### Economic significance of core v. periphery features of affiliates

**Difference in Change in Net Borrowing of Affiliates from Parents: Core v. periphery comparisons in Financing and Lending**

High ABCP exposed parents ($mil)

<table>
<thead>
<tr>
<th></th>
<th>Shock1</th>
<th>Shock 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core funding</td>
<td>-$586 M</td>
<td>$1148 M</td>
</tr>
<tr>
<td>Core investment</td>
<td>$236 M</td>
<td>-$154 M</td>
</tr>
<tr>
<td>Diff High v. Low</td>
<td>-$586 M</td>
<td>$236 M</td>
</tr>
<tr>
<td>% change of initial net due</td>
<td>-53</td>
<td>12</td>
</tr>
</tbody>
</table>

From Table 3, column **. US banks only. Note: ABCP low 0.2, high 0.78. Percent change of initial net due of 75th percentile ABCP exposed bank, high local finance or high loan share. The average NetDueTo_{ijt} value prior to the crisis for banks of high ex-ante exposure, in relatively important core funding locations, was -1,094 million, i.e. a $1 billion net creditor vis-à-vis the rest of its banking organization.
Fig 5 Predicted inflows & outflows after first shock
By country, share of total gross flows

Shows differences across banks within affiliate markets
Overview of Findings

Support for locational pecking order conjecture

- Given an adverse shock to the parent, affiliate markets:
  - Do not similarly source funds to the parent
  - Funds drawn relatively more from core funding locations
  - Core investment locations supported relative to periphery
  - Economic significance of results are large

- We provide insight into the structure of international transmission through internal capital markets
- Different transmission possible if banks otherwise instructed!
Normative considerations

- Host country perspective on foreign shock transmission
  - less about overall “openness” to international banking
  - more about the specific characteristics of individual foreign banks engaged in its economy.
  - Bank-to-country specific characteristics matter: Argentina may be a core funding market for Santander but a core investment market for Citi

- Policies that constrain global liquidity management?
  - May be ultimately a good thing, but not sure
  - Mechanisms and dynamics still not well-understood.
Reference slides
### Table 2 Basic Balance Sheet Information of U.S. Banks with Foreign Affiliates (2007Q2 unless otherwise indicated)

<table>
<thead>
<tr>
<th>Statistics on U.S. Banking Organization</th>
<th>All Banks</th>
<th>Lower LL</th>
<th>Higher LL</th>
<th>Lower IC</th>
<th>Higher IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of parent banks</td>
<td>median</td>
<td>42</td>
<td>23</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>(2006Q1-2010Q4 average quarterly)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank asset size (billions USD)</td>
<td>median</td>
<td>552.56</td>
<td>552.56</td>
<td>1395.62</td>
<td>552.56</td>
</tr>
<tr>
<td>Total Net Due From / assets (%)</td>
<td>median</td>
<td>0.74</td>
<td>0.88</td>
<td>1.77</td>
<td>0.74</td>
</tr>
<tr>
<td>Foreign loans / assets (%)</td>
<td>median</td>
<td>4.11</td>
<td>4.11</td>
<td>4.11</td>
<td>4.11</td>
</tr>
<tr>
<td>Bank liquid assets / total assets (%)</td>
<td>median</td>
<td>7.75</td>
<td>7.75</td>
<td>24.24</td>
<td>7.75</td>
</tr>
<tr>
<td>Bank solvency ratio (%)</td>
<td>median</td>
<td>7.61</td>
<td>7.61</td>
<td>6.07</td>
<td>6.95</td>
</tr>
</tbody>
</table>

Source: Authors’ computation using FFIEC 009 data
Table 2 (cont.) Basic Balance Sheet Information of U.S. Banks with Foreign Affiliates (2007Q2 unless otherwise indicated)

<table>
<thead>
<tr>
<th>Statistics by Affiliated Banking Organizations</th>
<th>All Banks</th>
<th>Lower LL</th>
<th>Higher LL</th>
<th>Lower IC</th>
<th>Higher IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of bank-affiliate observations</td>
<td>median</td>
<td>550</td>
<td>180</td>
<td>180</td>
<td>264</td>
</tr>
<tr>
<td>(2006Q1-2010Q4 average quarterly)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local liabilities / total affiliate liabilities [LL] (%)</td>
<td>median</td>
<td>77.63</td>
<td>20.45</td>
<td>100.00</td>
<td>79.86</td>
</tr>
<tr>
<td>Local and cross border claims / total affiliate local and cross border claims (immediate counterparty basis) [IC] (%)</td>
<td>median</td>
<td>0.50</td>
<td>1.04</td>
<td>0.85</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Source: Authors’ computation using FFIEC 009 data
The crisis provided a natural experiment for testing changes in liquidity allocation across global firms.

Spread of One Month Rates to OIS

Discount window

LIBOR

ABCP AA

August 8, 2007
i) Africa, Asia, and Australia

- Crisis starts
- TAF begins
- Lehman failure
- Bear Sterns event
- Expanded CB dollar swaps

ii) North America

- Crisis starts
- TAF begins
- Bear Sterns event
- Lehman failure
- Expanded CB dollar swaps

iii) Europe

- Crisis starts
- TAF begins
- Lehman failure
- Bear Sterns event
- Expanded CB dollar swaps

iv) Central and South America

- Crisis starts
- TAF begins
- Lehman failure
- Bear Sterns event
- Expanded CB dollar swaps