Complexity and Funding Stability

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Two Dimensions of Funding

- Core and non-core funding
- Short-term and long-term funding

- Both distinctions bear on the procyclicality of the financial sector, but the former is more important
  - Complexity of the financial system is about former
  - Risk-taking behavior is mostly about former
Punchline

“If you take care of the aggregates, the complexity will take care of itself”
Three Modes of Leveraging Up

Mode 1: Increased leverage due to equity buyback

Mode 2: Increased leverage due to fall in asset value

Mode 3: Increase borrowing to fund asset growth

Figure 1. Three modes of leveraging up: Mode 1 is through an equity buyback through a debt issue. Mode 2 is through a dividend financed by asset sale. Mode 3 is through increased borrowing to fund new assets. In each case the grey area indicates balance sheet component that is held fixed.
Figure 2. BNP Paribas: annual change in assets, equity and debt (1999-2010) (Source: Bankscope)
Figure 3. Société Générale: annual change in assets, equity and debt (1999-2010) (Source: Bankscope)
An Analogy

- Bank capital $\leftrightarrow$ Foundations of building
- Bank lending $\leftrightarrow$ Building itself
- Leverage $\leftrightarrow$ Relationship between height of building relative to its foundations

Leverage regulation $\leftrightarrow$ Building code stipulating how tall the building can be relative to foundation
Figure 4. Sutyagin House, Archangel
Core and Non-Core Bank Liabilities

- **Core**: Liabilities to domestic household and non-financial claim holders
- **Non-Core**: Liabilities to financial intermediaries and foreign creditors

Ratio of non-core to core liabilities is:

- Procyclical
- Mirrors lowering of credit standards
Figure 5. **Spain**: banking sector total domestic credit (Source: Bank of Spain)
Figure 6. Spain: Core liabilities of banking sector (Source: Bank of Spain)
Figure 7. **Spain**: funding gap of Spanish banks (Source: Bank of Spain)
Figure 8. **Spain**: funding gap of Spanish banks (Source: Bank of Spain)
Figure 9. Mortgage covered bonds outstanding by country and by year (Source: European Covered Bond Council Factbook 2012)
Figure 10. Mortgage covered bonds outstanding by country and by year (Source: European Covered Bond Council Factbook 2012)
Figure 11. **Spain**: stock and new issuance of mortgage covered bonds (Source: European Covered Bond Council)
Figure 12. Liabilities of Northern Rock (1998 - 2007) (Source: Shin (2009))
Comparing Spain and Korea

- Both Korea and Spain highlight role of non-core liabilities

- Korea’s non-core is
  - Short maturity
  - Denominated in foreign currency

- Spain's non-core is
  - Medium to long maturity
  - Denominated in domestic currency
Figure 13. Non-core liabilities of Korean banks (Source: Shin and Shin (2010), data from Bank of Korea)
Figure 14. Non-core liabilities of Korean banks as proportion of M2 (Source: Shin and Shin (2010), data from Bank of Korea)
Figure 15. Capital flows for Korea in equity and banking sector  (Source: Shin and Shin (2010), data from Bank of Korea)
Complexity and Non-Core Liabilities
Figure 16. Stylized Financial System for Credit
<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans to firms, households</td>
<td>Liabilities to non-banks (e.g. deposits)</td>
</tr>
<tr>
<td>Claims on other banks</td>
<td>Liabilities to other banks</td>
</tr>
<tr>
<td></td>
<td>Equity</td>
</tr>
</tbody>
</table>

**Individual bank**

Figure 17. Balance Sheet of Individual Bank
<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total lending to ultimate borrowers</td>
<td>Total debt liabilities to non-banks</td>
</tr>
<tr>
<td>(firms, households govt)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total equity</td>
</tr>
</tbody>
</table>

**Banking sector**

Figure 18. Aggregate Balance Sheet of Banking Sector
An Accounting Identity

Aggregate lending and aggregate funding satisfy:

\[ \sum_{i=1}^{n} y_i = \sum_{i=1}^{n} e_i z_i (\lambda_i - 1) + \sum_{i=1}^{n} e_i \]

where

- \( z_i \) is proportion of bank \( i \)'s liabilities held by non-banks
- \( \lambda_i \) is leverage of bank \( i \)
- \( e_i \) is equity of bank \( i \)
An Accounting Identity

When leverage $\lambda_i$ increases, but outside funding remains “sticky” the consequences are twofold:

- Non-core to core funding ratio increases for individual banks ($z_i$ declines)
- Complexity of the system increases ($z_i$ declines)
Figure 19. Complexity and leverage
Short and Long Intermediation Chains

- Households → Mortgage Bank → Households

- Households → Mortgage Pool → ABS Issuer → ABS

- ABS Issuer → Securities Firm → Commercial Bank

- Households → Money Market Fund

- Money Market Fund → Commercial Bank

- Commercial Bank

- Mortgage Bank

- ABS Issuer

- Securities Firm

- Money Market Fund
Punchline (Again)

“If you take care of the aggregates, the complexity will take care of itself”
Implications for Early Warning Indicators

• Quantities matter
  – Credit
  – Bank liabilities
  – Monetary aggregates

• Ratio of non-core to core liabilities most informative
  – But what counts as non-core depends on financial system and context

• Double-counting adds to usefulness of the non-core measure
  – Double-counting matters when complexity increases
  – Double-counting enhances signal/noise ratio