Monetary Aggregates and the Central Bank’s Financial Stability Mandate

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Money Demand as Portfolio Choice

Figure 1. Money demand as the outcome of a portfolio choice problem
Money Demand as Funding Supply

![Diagram of money and financial intermediation]

Figure 2. Money and financial intermediation
Money Demand as Funding Supply II

Borrowers

Ultimate Borrowers, [Firms, Households, Governments]

Intermediaries

Illiquid Assets

Liquid Liabilities

Global Banks

Liquid Assets

Liquid Liabilities

Illiquid Assets

Wholesale Funding

Figure 3. Global banking and monetary aggregates
Monetary Aggregates and Procyclicality

- Money is counterpart to bank lending

- Highly procyclical components of money
  - Bank lending in booms
  - Vulnerable to reversal

- Relative size of direct/intermediated credit reflects risk premiums

- Core and Non-core liabilities

Hahm, Mishkin, Shin and Shin (2012), Hahm, Shin and Shin (2011)
Figure 4. HP-filtered monthly growth rates (log differences) of M2, non-core liabilities and FX borrowing of the Korean banking sector.
Corporate Finance of Banking

<table>
<thead>
<tr>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Equity</td>
</tr>
<tr>
<td></td>
<td>Debt</td>
</tr>
</tbody>
</table>
Lehman Brothers (1994Q1 - 2008Q2)

\[ y = 0.0029x + 404.05 \]
\[ R^2 = 0.9997 \]

![Graph showing quarterly changes in debt and equity versus quarterly change in assets.](image)

- Debt Change
- Equity Change
Figure 5. Scatter chart of quarterly changes in assets, equity and debt of Goldman Sachs and Morgan Stanley (Source: SEC 10Q filings)
Figure 6. Plots of the VIX index, leverage of Goldman Sachs and Morgan Stanley and the implied volatility of their equity options. All series are measured as standard deviations from the mean during 2001Q3 - 2006Q4. (Source: SEC 10Q and CBOE)
Figure 7. Six categories of non-core bank liabilities in Korea (right panel) and time series of the ratio of non-core to M2 in Korea (left panel) (Source: Shin and Shin (2010) and Bank of Korea)
Figure 8. Growth rate of eurozone M1, M2 and M3 money stocks. Six month growth rates are shown and growth is defined as log differences (Source: European Central Bank)
## ECB Monetary Aggregates

<table>
<thead>
<tr>
<th>Description</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
</tr>
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<tbody>
<tr>
<td>Currency in circulation</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Overnight deposits</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Deposits with an agreed maturity up to 2 years</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Deposits redeemable at a period of notice up to 3 months</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Repurchase agreements</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Money market fund (MMF) shares/units</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Debt securities up to 2 years</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Figure 9. Components of eurozone monetary aggregates (Source: European Central Bank)
Figure 10. Cross-border euro-denominated claims and liabilities of eurozone banks (Source: BIS Locational Statistics, Table 5A)
Figure 11. Four quarter growth rate of cross-border euro-denominated liabilities of eurozone banks (Source: BIS Locational Banking Statistics Table 5A)
Landscape of Global Banking

Figure 12. Three stages of cross-border banking sector flows.
Double-decker model of Global Liquidity

Figure 13. Regional and global bank balance sheets (Source: Bruno and Shin (2011))
Capital Flows and Domestic Credit

Market clearing for $L$

\[
\frac{E_R}{\frac{1+f}{1+r} \cdot \frac{1}{\varphi} - 1} = \frac{E_G}{1 - \frac{1+f}{1+i} \psi}
\]

Private credit

\[
C = \frac{E_G + E_R}{1 - \frac{1+f}{1+i} \varphi \psi}
\]

Total private credit

\[
= \frac{\text{Aggregate bank capital (regional + global)}}{1 - \text{spread} \times \frac{\text{regional leverage}}{\text{global leverage}}}
\]
Equilibrium stock of cross-border lending $L$

\[
L = \frac{E_G + E_R \cdot \frac{1+r}{1+i} \varphi \psi}{1 - \frac{1+r}{1+i} \varphi \psi}
\]

Total cross-border lending = Global and weighted regional bank capital
\[1 - \text{spread} \times \text{regional leverage} \times \text{global leverage}\]
Covered Interest Parity (CIP) Deviation

(Price, Quantity) pair given by

- CIP deviation
- FX liabilities of banking sector

\[
\text{CIP deviation} = 3\text{-month CD rate} - 3\text{-month dollar LIBOR rate} - 3\text{-month swap rate}
\]
Figure 14. VIX index and the 3 month Covered Interest Parity deviation (CID)
VAR with Sign Restrictions

\[ Y_t = B(L)Y_{t-1} + u_t \]

\( Y_t = (R_t, \Delta m_t)' \) is (price, quantity) pair

Cholesky factorization of \( \Sigma = TT' \)

\[ Y_t = (I - B(L)L)^{-1}T\eta_t, \]

Sign-restriction on shocks

<table>
<thead>
<tr>
<th></th>
<th>( R_t )</th>
<th>( \Delta m_t )</th>
</tr>
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<tbody>
<tr>
<td>Supply shock</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Demand shock</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Rotation matrix $2 \times 2$ matrix $Q(\theta)$ such that $Q(\theta)' Q(\theta) = Q(\theta) Q(\theta)' = I$.

$$Q(\theta) = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix},$$

$$Y_t = (I - B(L)L)^{-1}TQ(\theta)' Q(\theta) \eta_t,$$

BayesianVAR, uniform prior

Contemporaneous impulse responses

200 iterations: keep draws that satisfy sign restrictions

Median values as estimates, 84th and 16th percentile error bands

Chadha et al. (2010), Uhlig (2005)
Figure 15. Historical decomposition of monthly growth in FX liabilities of the Korean banking sector (top panel) and the covered interest parity (CIP) spread (bottom panel). The charts show the 12-month moving averages of identified demand and supply shocks on FX liabilities and CIP spread from contemporaneous impulse response in the VAR. Data are from the Bank of Korea.
Domestic Non-Core Liabilities and AA Corporate Spread

Figure 16. Historical decomposition of monthly growth in domestic non-core liabilities of the Korean banking sector (top panel) and the AA-corporate credit spread (bottom panel). The charts show the 12-month moving averages of identified demand and supply shocks on domestic non-core liabilities and AA-corporate credit spread from contemporaneous impulse response in the VAR. Data are from the Bank of Korea.
Figure 17. Short-term FX liabilities of domestic Korean banks and foreign bank branches in Korea (Source: Bank of Korea)
Where Next?

• Bank of Korea granted formal mandate for financial stability (2011 amendment of Bank of Korea law)
  – Crying wolf all the time is not an option: analytical framework for vulnerability is needed
  – Cross-border bank liabilities are consistently the best predictor of crises (Hahm, Shin and Shin (2011))

• Link with macroprudential policies (Ministry of Finance)
  – Non-core liabilities levy in Korea, in effect from August 2011
    – 20 bps for short-term FX bank liabilities, adjustable up to 100 bps

• Cross-border bank liabilities both a signal and Pigovian tax base