Lecture 3
Financial Regulation and Monetary Policy

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Acknowledgements

Plantin, Sapra and Shin (2008) “Marking to Market: Panacea or Pandora’s Box?” *Journal of Accounting Research*


Credit Crisis of 2007/8

First puzzle:

The credit crisis has hit some markets severely, but not others.

- Effects were most acute for:
  - Interbank market
  - ABCP
  - CDOs
  - Jumbo mortgages

- But other markets were less affected:
  - Stock market
  - Sovereign bonds
  - Corporate bonds
London Interbank Offered Rate:

- **Overnight**
- **1-Month**
- **3-Month**

Source: Financial Times.
Jumbo Mortgage Spread

Source: BankRate.com.
Asset Backed Commercial Paper

Asset-Backed Commercial Paper Yields:

- Overnight
- 1 Month

Source: Federal Reserve Board.
Commercial Paper Outstanding

Source: Federal Reserve Board.
Second Puzzle

Subprime is small in the larger scheme of things.

- US Home Mortgage Debt Outstanding = $10 trillion
- Subprime ARM Mortgage Debt Outstanding = $800 billion
- Total Subprime mortgages = 1.2 trillion
  - Assume 50% default rate = $600 billion
  - Assume 50% loss on collateral = $300 billion
  - (less than 2% of US stock market capitalization).

FSF estimate of $400 billion (Tokyo G7 meeting, Feb 2008)
≈ 2.5% of US market cap
Domino Hypothesis Revisited

- Capital rules aim to stem financial contagion through chain of defaults.
- But in 2007/8 crisis, direction of contagion is the reverse.
  - Bear Stearns and Northern Rock crises were runs on the liabilities side.
Security Dealers and Brokers

Total Assets and Leverage
Leverage and Total Assets Growth
Asset weighted, 1992Q3-2008Q1, Source: SEC

![Graph showing the relationship between Leverage and Total Assets Growth.](image-url)
Explaining Leverage

Capital $K$ is set to total value at risk (VaR)

$$K = V \times A$$

Hence, leverage $L$ satisfies:

$$L = \frac{A}{K} = \frac{1}{V}$$

Procyclical leverage arise from *counter*-cyclical nature of value at risk. *Measured* risk is low during booms and high during busts.
Assets and VaR/Assets

Log VaR/Assets vs. Log Assets

- 2007-4 Bear
- 2008-1 Bear
- 2008-1 Leh
- 2007-4 Leh

Bear Sterns Goldman Sachs
Lehman Brothers Merrill Lynch
Morgan Stanley Fitted values

Log Assets
Log VaR/Assets

-0.5 0 0.5 1
-0.5 0 0.5 1
Explosive Combination

“The value added of a good risk management system is that you can take more risks.”

[Anonymous risk manager, May 2007]

“While many believe that irresponsible borrowing is creating a bubble in housing, this is not necessarily true. At the end of 2004, U.S. households owned $17.2 trillion in housing assets, an increase of 18.1% (or $2.6 trillion) from the third quarter of 2003. Over the same five quarters, mortgage debt (including home equity lines) rose $1.1 trillion to $7.5 trillion. The result: a $1.5 trillion increase in net housing equity over the past 15 months.”

[Wall Street Journal commentator, May 31, 2005]
Marking to Market

Initial balance sheet

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities, 100</td>
<td>Equity, 10</td>
</tr>
<tr>
<td></td>
<td>Debt, 90</td>
</tr>
</tbody>
</table>

Assume price of debt approximately constant. Suppose the security price increases by 1% to 101.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities, 101</td>
<td>Equity, 11</td>
</tr>
<tr>
<td></td>
<td>Debt, 90</td>
</tr>
</tbody>
</table>
Leverage falls to

\[ \frac{101}{11} = 9.18 \]

If bank targets **constant leverage**, it must take on additional debt of $D$ to purchase $D$ worth of securities on the asset side so that

\[ \frac{\text{assets}}{\text{equity}} = \frac{101 + D}{11} = 10 \]

The solution is $D = 9$. In other words, the bank takes on additional debt worth 9, and with this money purchases securities worth 9.

**The demand curve is upward-sloping.**
The new balance sheet looks like this.

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities, 110</td>
<td>Equity, 11</td>
</tr>
<tr>
<td></td>
<td>Debt, 99</td>
</tr>
</tbody>
</table>

The leverage is now back up to 10.

The mechanism works in reverse, too. Suppose there is shock to the security price so that

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities, 109</td>
<td>Equity, 10</td>
</tr>
<tr>
<td></td>
<td>Debt, 99</td>
</tr>
</tbody>
</table>

Leverage is too high ($109/10 = 10.9$).
Sell securities worth 9, paydown debt of 9.

<table>
<thead>
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<th>Assets</th>
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<tr>
<td>Securities, 100</td>
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</tr>
<tr>
<td></td>
<td>Debt, 90</td>
</tr>
</tbody>
</table>

Back to leverage of 10.

**Supply curve is downward-sloping.**
Amplification

Adjust leverage

Stronger balance sheets → Increase B/S size → Asset price boom → Adjust leverage

Weaker balance sheets → Reduce B/S size → Asset price decline → Adjust leverage
Issues for Accounting Rules

• Mark to market accounting amplifies financial cycles

• Extreme choices are:
  – Using degraded market signals (marking to market)
  – Using obsolete historical information (historical cost accounting)

• Smoothing may be optimal: set value to be average over some interval of time.

• Accounting rules have economic impact, but accounting standard setters do not see it as part of their remit to consider wider economic impact

• Accounting may be too important to be left just to the accountants
Issues for Financial Regulation

- Basing financial regulation on “best practice” of private sector may not be enough.

- Value at risk targeting drives procyclical leverage

- Value at risk targeting drives liquidity cycles
Issues for Financial Regulation

- Default is not the primary channel of contagion

- Capital rules are not enough. Liquidity rules are necessary complements.
  - For the creditors of Northern Rock or Bear Stearns, reducing loan exposures was a prudent reduction of risk
  - But from the viewpoint of Northern Rock or Bear Stearns, such reduction of exposures is a run.
Financial System Run

Balance sheet identity of bank $i$ in market values:

$$y_i + \sum_j \pi_{ji} x_j = e_i + x_i$$

Interpret as

$$\underbrace{x_i}_{\text{debt capacity}} = \underbrace{y_i + \sum_j \pi_{ji} x_j - e_i}_{\text{collateral value}}$$

$$[x_1, \cdots, x_n] = [x_1, \cdots, x_n] \begin{bmatrix} \Pi \\ \end{bmatrix} + [y_1, \cdots, y_n] - [e_1, \cdots, e_n]$$

or

$$x = x\Pi + y - e$$
Debt capacity is recursive. Each bank’s debt capacity is increasing in the debt capacity of other banks. Solve for $y$ as

$$y = e \left( \Lambda (I - \Pi) + \Pi \right)$$

$\Lambda$ is the diagonal matrix $[\lambda_i]$

Total lending to end-users depends on

1. how much equity $e$ there is in the banking system
2. how much leverage is permitted
3. structure of the interbank market (given by $\Pi$)
Simple Chain

\[ y_1 = \lambda_1 e_1 \]
\[ = e_1 + \lambda_2 e_2 \]
\[ = e_1 + e_2 + \lambda_3 e_3 \]
\[ = e_1 + e_2 + \cdots + e_{n-1} + \lambda_n e_n \]
For the financial system as a whole to support debt level of $y_1$, all of the following inequalities must hold.

\[
\begin{align*}
    y_1 & \leq \lambda_1 e_1 \\
    y_1 & \leq e_1 + \lambda_2 e_2 \\
    y_1 & \leq e_1 + e_2 + \lambda_3 e_3 \\
    & \vdots \\
    y_1 & \leq e_1 + e_2 + \cdots + e_{n-1} + \lambda_n e_n \\
\end{align*}
\]

Financial system debt capacity $y^*$ is given by

\[
y^* = \min_i \left\{ \sum_{j=1}^{i-1} e_j + \lambda_i e_i \right\}
\]
The bank $i$ for which $\sum_{j=1}^{i-1} e_j + \lambda_i e_i$ is the lowest among all banks is the “pinch point” in the financial system.

If $y^* < y_1$, then there is a run in the manner of Northern Rock or Bear Stearns.

Even if bank 1 has capacity to borrow, it is a bank further up the chain that chokes off lending.

The system as a whole then runs out of lending capacity.
Aggregate Liquidity

Liquidity is the rate of growth of aggregate balance sheets.

Strong balance sheets ⇒ surplus marked-to-market capital ⇒ “surplus capacity” in banking system

• For surplus capacity to be utilized, intermediaries expand their balance sheets.
  – On the liabilities side, take on more short-term debt.
  – On the asset side, search for potential borrowers

• How hard do financial intermediaries search for borrowers?
  – Sub-prime mortgage market
  – Debt financing of private equity / LBOs
What is the link between liquidity and monetary policy?

- Broad money is liability of deposit-taking banks.
- In financial systems dominated by deposit-taking banks, money stock tracks aggregate balance sheets.
  - 19th and early 20th centuries, developing countries today
  - but poor indicator of aggregate liquidity for market-oriented financial system
- Focus on the right analogies for classical notion of money.
  - Repos are the rightful successors of "money"
Liquidity and Monetary Policy


- Taylor rule:

\[
\text{Fed Funds Target} = 1.3 + 0.8 \times \text{Output Gap} + 1.3 \times \text{Inflation Rate}
\]

\[
\text{Rule based Monetary Policy} + \text{Taylor Rule Residual}
\]

\[
\text{Discretionary Monetary Policy}
\]

- The \( R^2 \) is 75%, i.e. one quarter of monetary policy is discretionary.
Figure 5: Repo Growth of Primary Dealers and Taylor Rule Residuals
<table>
<thead>
<tr>
<th></th>
<th>Primary Dealer Repo Growth</th>
<th>Financial Commercial Paper Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(i)</td>
<td>(ii)</td>
</tr>
<tr>
<td>Fed Funds Target</td>
<td>coef. -2.29</td>
<td>4.77</td>
</tr>
<tr>
<td></td>
<td>p-value 0.02 ***</td>
<td>0.00 ***</td>
</tr>
<tr>
<td>Taylor Rule Residuals</td>
<td>coef. -4.68</td>
<td>5.61</td>
</tr>
<tr>
<td></td>
<td>p-value 0.00 ***</td>
<td>0.00 ***</td>
</tr>
<tr>
<td>Taylor Rule Fed Funds Prediction</td>
<td>coef. -1.11</td>
<td>5.49</td>
</tr>
<tr>
<td></td>
<td>p-value 0.40</td>
<td>0.00 ***</td>
</tr>
<tr>
<td>Constant</td>
<td>coef. 23.64</td>
<td>-9.35</td>
</tr>
<tr>
<td></td>
<td>p-value 0.00 ***</td>
<td>0.00 ***</td>
</tr>
<tr>
<td></td>
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<td>0.00 ***</td>
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<td>0.00 ***</td>
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<tr>
<td></td>
<td></td>
<td>0.00 ***</td>
</tr>
<tr>
<td>R-squared</td>
<td>12%</td>
<td>18%</td>
</tr>
<tr>
<td></td>
<td>59%</td>
<td>59%</td>
</tr>
</tbody>
</table>
Rehabilitating Balance Sheet Quantities

• Balance sheet quantities seem to matter for overall financial market conditions (“liquidity”), which have an impact on the real economy.

• Current orthodoxy is to downplay the overnight interest rate as an important price variable in its own right.

• Rehabilitate balance sheet quantities, but with one twist.
  – For bank-based financial systems, money stock (e.g. M2) could serve as aggregate measure of bank liabilities (Japan, 1980s property bubble, China today)
  – For market-based financial systems, other balance sheet quantities (such as repos) may be better gauge of liquidity.
Broad Notions of Transparency

- Promote better understanding of central bank objectives
- Promote better understanding of its reaction function
- Promote better understanding of its decision making procedure

These imperatives are an integral part of the accountability of the central bank.
Narrower Notion of Transparency from Inflation Targeting

Argument turns on the transmission mechanism of monetary policy, as working through the IS curve.

Two central propositions:

- Long rates are the prices that matter.
  - Overnight rate are important only as a way to influence expectations
  - Overnight rate has little significance as a price variable in its own right

- Expectations theory of the yield curve holds
  - Long rates are determined by the expectations of future short rates
– Communication shapes expectations

(Blinder (1998), Bernanke (2004), Woodford (2005), Svensson (2004))
Policy Prescriptions on Communication

- More forward-looking statements on assessments: forecasts of future fundamentals, future path of short rates, etc.

- Greater guidance on future course of central bank actions:
  - short rates to be kept low for “considerable period” in 2003-2004 in the US
  - gradual adjustments, not drastic changes
Short Rates

“central banks generally control only the overnight interest rate, an interest rate that is relevant to virtually no economically interesting transactions. Monetary policy has important macroeconomic effects only to the extent that it moves financial market prices that really matter - like long-term interest rates, stock market values and exchange rates.” [Blinder (1998)]

Echoed by Bernanke (2004), Woodford (2005), Svensson (2004) and others.
Short Rates

- Claim of unimportance of short rates sits uncomfortably with the events in credit markets in 2007. Far from the short term rates being unimportant, they have been in the limelight, stealing all the headlines.

- Short rates figure prominently in debates on how much of the current credit crisis can be traced back to the low short term interest rates in the United States in 2002 - 2004.
Global Spillovers in Monetary Policy

Net interoffice accounts (in red, right hand scale) and difference between overnight rates in Japan and simple average of USD, EUR and AUD overnight rates (in green, left hand scale).

Source: Hattori and Shin (2007) IMES discussion paper, BOJ.
Interest Rate Differential

Scatter chart of the net interoffice accounts and interest rate differential

\[ t \text{ statistic} = -7.8 \]
Monthly Changes

Monthly changes in interest differential explain fluctuations in carry trade

![Graph showing monthly changes in interest differential and net interoffice accounts.](image-url)
Balance Sheet Trail

Following the trail of leveraged bets

Wall St Bank
NY Head Office

Interoffice accounts

Wall St Bank
Japan Office

JPY interbank market

Japanese Banks

Hedge Fund
Some Lessons for Monetary Policy

- Short rates may be important prices in their own right. They determine the overall liquidity conditions in financial market.

- Monetary policy has global spillover effects.

- Focusing on expectations management at the expense of all else misses importance of liquidity.
  
  – “Mopping up” strategy has failed.
  – Forward-looking guidance on short rates provides favorable environment for carry trades and other leveraged bets
  – Forward-looking statements about future actions may amplify liquidity cycles (e.g. rates being held low “for a considerable period” in the U.S. in 2003 - 2004).
There is a need to rehabilitate balance sheet quantities for monetary policy, but with one twist. Traditional preoccupation with the money stock should give way to other liabilities on banks’ balance sheets, notably collateralized borrowing.

All this is compatible with the broad notion of transparency and central bank accountability.
Rehabilitating Balance Sheet Quantities

To reiterate,

- Balance sheet quantities seem to matter for overall financial market conditions (“liquidity”), which have an impact on the real economy.

- Current orthodoxy is to downplay the overnight interest rate as an important price variable in its own right.

- Rehabilitate balance sheet quantities, but with one twist.
  - For bank-based financial systems, money stock (e.g. M2) could serve as aggregate measure of bank liabilities (Japan, 1980s property bubble, China today)
  - For market-based financial systems, other balance sheet quantities (such as repos) may be better gauge of liquidity.