Wege zur neuen Finanzarchitektur
Markus K. Brunnermeier

- Berlin Finance Lecture 2010 -
Overview

- Role of financial intermediaries
  - Banks
  - Shadow banking system
- Challenges to financial stability
  - Macroprudential regulation
- Challenges to monetary stability
Traditional Banking

Role of banks

- Securitization
  - Pooling
  - Tranching
  - Insuring (CDS)
- Dual purpose
  - Tradable asset
  - Collateral
  - feeds repo market for levering

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Changing banking landscape

- **Traditional Banking**
  - Role of banks
  - Securitization
    - Pooling
    - Tranching
    - Insuring (CDS)
  - Dual purpose
    - Tradable asset
    - Collateral
  - Feeds repo market for levering

- **Originate & distribute**
  - Securitization
  - Pooling
  - Tranching
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Two trends

1. Shift towards shadow banking system
2. Increasing reliance on short-term funding

Growth in Funding Liquidity

Source: Adrian, NYFed
Two trends

1. Shift towards shadow banking system
2. Increasing reliance on short-term funding
   - Allows for higher leverage (lower margins)
   - Less info sensitive, .... but sharper switch
     lower delta, but higher gamma (option language)

- Maturity rat race
Two trends

1. Shift towards **shadow banking system**
2. Increasing reliance on **short-term funding**
   - Less *info sensitive*, .... but sharper switch
     - lower delta, but higher gamma (option language)

- Maturity rat race
Current regulation

1. Risk of each institution in isolation → Value at Risk

2. Procyclical capital requirements
   - VaR and ratings are countercyclical

3. Focus on asset side of the balance sheet


Response to current regulation: “take positions that drag others down when you are in trouble” (maximize bailout probability) become big, interconnected, hold similar positions
Challenges ....

1. Focus on externalities – systemic risk contribution
   - Internalize externalities (... just like pollution)
   - Fire-code analogy: fire-protection wall
   - $\text{CoVaR}_i = \text{VaR}_{\text{system}}|_{i \text{ in distress}}$

2. Countercyclical regulation
   - Regulate based on characteristics that give rise to \textit{future} systemic risk contributions

3. Incorporate funding structure
   - asset-liability interaction, debt maturity, liquidity risk

4. Objective regulatory criteria across financial institutions
   - Banks, broker-dealers, insurance companies, hedge funds,...

.... Bankruptcy procedure, living will, .... (see Geneva Report)
1. Externalities

Internalities within financial sector

1. Direct effect: Network externalities – interconnectedness
   - counterparty credit risk due to interlocking of claims
   - Hiding own’s commitment → uncertainty for counterparties

2. Price effect: Pecuniary (fire-sale) externality
   - Maturity mismatch + Leverage
   - Fire-sales depress prices for others

2. Credit Crunch: Precautionary hoarding externality due to volatility effect

3. Runs – dynamic co-opetition

Externalities to real economy

- Bonus payouts occur to early
1.1 Fire-sale externality & Liquidity

Funding liquidity
- Can’t roll over short term debt
- Margin-funding is recalled
## 1.1 Fire-sale externality & Liquidity

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<td><strong>Market liquidity</strong></td>
<td><strong>Funding liquidity</strong></td>
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<tr>
<td>▪ Can only sell assets at fire-sale prices</td>
<td>▪ Can’t <strong>roll over</strong> short term debt</td>
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<td>▪ <strong>Margin</strong>-funding is recalled</td>
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<td>Ease with which one can raise money by <strong>borrowing</strong> using the asset as collateral</td>
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<td>Each asset has <strong>two</strong> values/prices</td>
</tr>
<tr>
<td></td>
<td>1. price</td>
</tr>
<tr>
<td></td>
<td>2. collateral value</td>
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Ease with which one can raise money by **selling** the asset

Ease with which one can raise money by **borrowing** using the asset as collateral

Each asset has two values/prices
1. price
2. collateral value

- Low funding liquidity = excessive maturity mismatch
  - Dynamic
- Low capital = excessive leverage
Liquidity problems

### Market Liquidity
- Can only sell assets at **fire-sale prices**

### Funding Liquidity
- Can’t **roll over** short term debt
- **Margin**-funding is recalled

<table>
<thead>
<tr>
<th>Measures</th>
<th>Quantity</th>
<th>Price</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>static</td>
<td>Trading volume</td>
<td>Bid-ask</td>
<td>Unsecured vs. collateralize funding</td>
<td>TED spread (term spread)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIX Downside correlation</td>
<td>Haircuts/margins/LTV</td>
<td></td>
</tr>
<tr>
<td>dynamic</td>
<td></td>
<td></td>
<td>Debt maturity to</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Asset maturity</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Asset market liq</td>
<td></td>
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1. Externalities

"stability is a public good"

- Externalities within financial sector
  1. Direct effect: Network externalities – interconnectedness
     - counterparty credit risk due to interlocking of claims
     - Hiding own’s commitment uncertainty for counterparties
  2. Price effect: Pecuniary (fire-sale) externality
     - Maturity mismatch + Leverage
       - Fire-sales depress prices for others
  3. Credit Crunch: Precautionary hoarding externality due to volatility effect
  4. Runs – dynamic co-opetition

- Externalities to real economy
  - Bonus payouts occur to early FAT
2. Procyclicality: Bubbles & Liquidity spirals

- Risk *builds up* during (credit) bubble
  - Why did nobody delever/act against it earlier?
    - Ride bubble: “dance as long as the music plays”
    - Lack of coordination/synchronization as to when to go against the bubble
  - ... and materializes in a crisis

- Credit bubble led to housing bubble
  - Note similarity to Nordic countries, Japan, ...
    (foreign capital, agency problems were less of an issue there)

2. Procyclicality – Liquidity spirals

Unstable dynamics due to (nonlinear) liquidity spirals

Loss spiral (outer)
very pronounced in mark-to-market accounting regime

Magin/haircut spiral (inner)
more pronounced in mark-to-model accounting regime
Overview – next steps

- Who should be regulated?
  - Financial Institutions versus instruments (shadow baking system)
  - Micro-prudential versus macro-prudential

- How much?
  - Based on contribution to systemic risk (externalities)
  - Objective risk contribution measure – like CoVaR

- Countercyclicality
  - Predict future CoVaR with high frequency variables
  - Laddered response

- How?
  - Caps: capital ratio requirements – Basel III
  - Pigouvian tax - “bank levy”
  - (Private) insurance scheme (bank fund)
Financial Institutions vs. Instruments

- Financial institutions
  - Based on objective criteria across all financial institutions
  - “Boundary problem”
  - Shadow banking system
  - Style
    - Top-down
    - bottom-up
      - Assets by asset....

- Financial instruments/markets
  - ... get handle on shadow banking system
  - Margins/haircuts
    - Limit change to enforce higher initial margin
### Macro- vs. Micro-prudential regulation

**Fallacy of the Composition:**
what’s micro-prudent need not be macro-prudent

<table>
<thead>
<tr>
<th>Balance sheet</th>
<th>action</th>
<th>micro-prudent</th>
<th>macro-prudent</th>
</tr>
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<tbody>
<tr>
<td>Asset side</td>
<td>(fire) sell assets</td>
<td>Yes</td>
<td>Not feasible in the aggregate</td>
</tr>
<tr>
<td></td>
<td>no new loans/assets</td>
<td>Yes</td>
<td>Forces others to fire-sell + credit crunch</td>
</tr>
<tr>
<td>Liability side</td>
<td>(raise long-term debt)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>raise equity</td>
<td>Yes</td>
<td>Yes</td>
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- **Micro:** based on risk in isolation
- **Macro:** Classification on systemic risk contribution measure, e.g. CoVaR
- **Ratios versus Dollars**
Who should be regulated?

<table>
<thead>
<tr>
<th>group</th>
<th>examples</th>
<th>micro-prudential</th>
<th>macro-prudential</th>
</tr>
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<tbody>
<tr>
<td>“individually systemic”</td>
<td>International banks (national champions)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>“systemic as part of a herd”</td>
<td>Leveraged hedge funds</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>non-systemic large</td>
<td>Pension funds</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>“tinies”</td>
<td>unlevered</td>
<td>No</td>
<td>No</td>
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- Includes shadow banking system

- **Clone property**: split i in n identical clones, \( \text{CoVaR}_i = n\text{CoVaR}_c \)
How to regulate?

- **Size limits:**
  - **Problem 1:** “too big to fail” ≠ “too systemic to fail”
  - split “individually systemic” institution into 10 clones
    - (clones perfectly comove with each other)
    - “systemic as part of a herd”

  **Lessons:**
  - Regulation should provide incentive to be heterogeneous
  - Spillover risk measure should satisfy “clone property”

- **Problem 2:**
  - one-dimensional threshold
  - “bunching” below threshold

  **Lesson:** Smooth transition -- “have to pay” in leverage ...

- Mix of size, leverage, maturity mismatch, connectedness, risk pockets, crowded trades, business model, ...
  - .... but what weights?
1. Find **optimal mix/trade-offs** between size, leverage, ...., across institutions
   objective weights

2. **Countercyclical implementation** forward-looking weights

**Method:**

- **Predict** $\Delta$CoVaR using frequently observed characteristics
  - Size, maturity mismatch, leverage,
  - ..... special data only bank supervisors have
    (e.g. crowdedness, interconnectedness measures)
How to measure externalities: CoVaR

- $\text{VaR}_q^i$ is implicitly defined as quantile
  \[ \Pr(X^i \leq \text{VaR}_q^i) = q \]

- $\text{CoVaR}_{q|j|i}$ is the VaR, $\text{VaR}_q^j$ conditional on institute $i$ (index) being in distress (i.e., at it’s VaR level)
  \[ \Pr(X^j \leq \text{CoVaR}_{q|j|i}^i \mid X^i = \text{VaR}_q^i) = q \]

- $\Delta \text{CoVaR}_{q|j|i} = \text{CoVaR}_{q|j|i}^i - \text{VaR}_{q|j{|\text{normal times}}}^i$ q-prob. event

Various conditionings? (direction matters!)

- $\Delta \text{CoVaR}$
  - $Q_1$: Which institutions move system (in a non-causal sense)
    - VaR$^{\text{system}}$ | institution $i$ in distress
  - Exposure $\Delta \text{CoVaR}$
    - $Q_2$: Which institutions are most exposed if there is a systemic crisis?
      - $\text{VaR}_q^i \mid$ system in distress
  - Network $\Delta \text{CoVaR}$
    - VaR of institution $j$ conditional on $i$ in non-causal sense!
Network CoVaR

- conditional on origin of arrow
**Quantile Regressions: A Refresher**

- **OLS Regression:** min sum of squared residuals

  \[ \beta^{OLS} = \arg\min_\beta \sum_t (y_t - \alpha - \beta x_t)^2 \]

  - **Predicted value:** \( E[y \mid x] = \alpha + \beta x \)

- **Quantile Regression:** min weighted absolute values

  \[ \beta^q = \arg\min_\beta \sum_t \left\{ \begin{array}{ll}
  q |y_t - \alpha - \beta x_t| & \text{if } y_t - \alpha - \beta x_t \geq 0 \\
  1-q |y_t - \alpha - \beta x_t| & \text{if } y_t - \alpha - \beta x_t < 0
  \end{array} \right. \]

  - **Predicted value:** \( \text{VaR}_q \mid x = F_y^{-1}(q \mid x) = \alpha_q + \beta_q x \)

  Note out (non-traditional) sign convention!
**CoVaR** and **VaR** unrelated in cross-section

*CoVaR* vs. *VaR* - Returns

- **CoVaR** does not capture systemic risk contribution
- **ΔCoVaR**
- Data up to 2006/12

Institution VaR

- Commercial Banks
- Investment Banks
- Insurance Companies
- GSEs
Translating analysis in systemic risk charges

- **Suppose**
  - 8% microprudential capital requirement = leverage < 12.5 : 1
  - Focus on 5% CoVaR, 1 year in the future

- **Size-leverage tradeoff**
  - Small bank with 5% market share has 8.0% capital requirement
  - Large bank with 10% market share has 8.7% capital requirement

- **Maturity mismatch-leverage tradeoff**
  - Bank with 50% MMM has 8.0% capital requirement
  - Bank with 55% MMM has 10.3% capital requirement,

  where MMM = (short-term debt – cash) / total assets

- Tax-base for “bank levy” can be based on same analysis
What type of charge?

- Capital charge (incl. systemic risk/liquidity surcharge)
  - Binds in crisis, less in booms!
  - Might stifle competition
  - + cap and trade

- Pigouvian tax + (uncertain) government insurance
  - Paid in booms (countercyclical) + very salient
  - generates revenue
  - In times of crisis it is cheap to issue debt for some governments

- (Private) insurance scheme – bank rescue fund
  - Fees will be lowered after a prolong boom phase
  - Too small
  - Moral hazard - requires lots of regulation

- Financial activity tax (FAT) - the VAT for the financial sector
**Countercyclical Regulation**

- **When market is relaxed**
  - Strict Laddered Response
    - **Step 1:** supervision enhanced
    - **Step 2:** forbidden to pay out dividends
      - See connection to debt-overhang problem
    - **Step 3:** No Bonus for CEOs
    - **Step 4:** Recapitalization within two months + debt/equity swap

- **When market is strict**
  - Relax regulatory requirement
Countercyclical instruments

- Lean against credit bubbles/buildup of risk + capture externalities
  - Time-varying capital/liquidity requirements – Loan-to-Value (systemic risk surcharge)
  - Dynamic provisioning
  - Pigouvian tax – Obama tax
  - Lending criteria
  - Communication policy – warnings of risk buildup
    - Coordinate/synchronize investors to go against a bubble
    - use financial stability reports.
  - Interest rate policy
    - Effective only in early phase
    - SIV financing would have been much less attractive

Independence of a political pressure!
Regulating shadow banking system

- Regulate assets (financial products) directly
- Problem: haircut/margin spiral
- Proposal:
  - Allow lenders to adjust margin only infrequently
    - = long-term loans (instead of short-term loans)
    - Less (funding) liquidity risk due to maturity mismatch
    - Endogenous response:
      - Margins/haircuts will be higher
      - Leverage will be lower
  - FED can reinstate policy requiring margins
    - Has to be extended to many financial instruments
    - Easy to get around it
Regulation T

- The Fed decided the initial margins in US stock market, which kept unchanged since 1974.
Figure 1
Margins for S&P 500 futures
The figure shows margin requirements on S&P 500 futures for members of the Chicago Mercantile Exchange as a fraction of the value of the underlying S&P 500 index multiplied by the size of the contract. (Initial or maintenance margins are the same for members.) Each dot represents a change in the dollar margin.
Prompt resolution bankruptcy for holdings

- **Problem:** Bankruptcy resolution is too slow for financial institutions.
  - Shareholder approval is needed for “forced merger” (bailout)
  - Prompt resolution framework that was introduced only for commercial banks (and executed by FDIC) after the S&L crisis

- **Debt-overhang problem**
  
  Extend prompt resolution framework to all financial institutions (worldwide) (include bank holding companies and investment banks)
  
  Convert long-term debt in equity if needed
  - Based on aggregate state of the economy
Capital flows – Information systems

- Fund flow
  - Who is indebted?
    - Households
    - Banks
    - Governments
  - Which instruments
    - Equity versus debt

- Information collection – risk topography
  - “catch all systems” unrealistic
  - Division of labor (make use of banks’ expertise)
    - Banks report
      - Sensitivity to risk factors
      - Reaction
    - Regulators derive general equilibrium effects and liquidity effects
Challenges to Monetary Policy

- HICP index of several Euro countries
Financial versus monetary stability

- **When is there a trade-off?**
  - Times of “great moderation”:
    - Inflation is (seems to be) contained
    - Credit and asset price expansion – “credit bubble”
    - **Build-up of risk**, which will only materialize later
    - After burst,
      - deflationary pressure
      - monetary transmission mechanism can be impaired
      - bailouts + government deficits (potentially leading to long-run inflation?)
  - Should interest rate be increased
    - Price stability (inflation targeting) No
    - Financial stability Yes

- **New rationale for modified monetary aggregates**
  - Was the ECB ahead of the Fed?
  - Modify monetary aggregates to reflect new rationale
Defusing “benign neglect policy”

1. Difficult to identify bubble
   1. Any policy is a decision under uncertainty
   2. Risk management approach

2. Clean versus lean
   1. Asset bubble vs. credit bubble

3. Interest rate is not most effective tool to prick bubbles
   1. Effective in early face and when spreads are thin

4. Too crude
   1. Bubbles affect large part of economy
   2. Other instruments

5. Pricking bubble led to disastrous outcomes (US 1928, Japan 1989)
Credit aggregates

Credit (growth) aggregates
Credit lines
- Excessive draws on credit lines are signs of upcoming troubles
- Newly extended credit lines
Repo growth
+ asset bubbles + “bubble anecdotes”

Features
- Maturity structure
- Counterparties (banks, households)

Money aggregates (related)
- Portfolio shifts to shorter maturity, safer assets
Optimal Currency Area - reconsidered

- **Traditional view**
  - Asymmetry of shocks
  - Fiscal integration
  - Labor mobility
  Lose instrument, since same interest in whole area

- **New view** (see Brunnermeier 2010)
  - Regional/segmented banking landscape
  - More (region specific) tools
    - Collateral policy
    - Haircut/margin regulation
    - Purchase regional MBS
    - Financial supervision

  control regional bubbles/blows

Justifies larger currency area, but needs clear governance structure
Unconventional monetary policy

credit risk

target

Relevant rate for business

“Credit easing”

maturity

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<th>Credit easing</th>
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<tr>
<td>buy</td>
<td>Long-term government securities</td>
<td>Commercial paper MBS,...</td>
</tr>
<tr>
<td>lend against</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(collateral policy)</td>
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Conclusion

1. Regulate institutions and products (top down, bottom up)
2. Focus on externalities – systemic risk contribution
3. Countercyclical regulation
4. CoVaR Method: quantify optimal policy mix across various measures
5. Smart data collection system
6. Modify monetary policy
7. Misc - Other issues
   - Prompt resolution for bank holding corporation and debt-equity swaps
   - Living will – prepackaged bankruptcy
   - Remuneration
   - Big banks-small countries problem
   - Loan-to-Value Ratio limitations
   - Credit Rating Agencies
   - Year-end spikes