Shadow Banking and Financial Intermediation

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San Diego
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What is shadow banking?
- Institutional approach
- Instrumental approach

Why it matters?
- Its central position in U.S. financial markets
- Interest rate and asset prices
- Financial instability

Empirical Analyses
Conclusion
Shadow banking, called *fringe banking* and *parallel banking* until recently, has become a central element for the US financial system.

- The integration of banking with capital market developments (Adrian and Shin, 2009a).
- A barometer of overall funding conditions (Adrian and Shin, 2009b)
- Replacement of traditional banking in the U.S. (D’Arista, 2018)
- Financial instability (McCulley, 2009; Pozsar *et al.* 2012)

Need for an empirical and aggregate approach
Shadow Banking

Definition

What is shadow banking?
Credit, liquidity and maturity transformation beyond the regular banking system
Borrowing in order to lend (or invest)

Is it different than commercial banking?
In a commercial bank, borrowing (deposits) and lending (loans) takes place under one roof
In shadow banking, a daisy-chain of non-bank financial intermediaries operate in multi-steps
Dependence on short-term funding to lend (or invest) long-term
Lack of backstops and instability
Subject to runs and fire sales
Shadow Banking

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Shadow Banking

An example

I Loan origination, funded by commercial paper (CP) and medium-term notes (MTNs).
II Loan warehousing, funded through asset-backed commercial paper (ABCP).
III The pooling and structuring of loans into term asset-backed securities (ABS), funded by repo
IV ABS warehousing, funded by ABCP and repo
V The pooling and structuring of ABS into Collateral Debt Obligations (CDO), funded by CP and repo
VI ...etc.
Shadow bank assets are defined as the total assets of money market mutual funds (MMMFs), government sponsored enterprises (GSE), Agency- and GSE-backed mortgage pools, issuers of Asset-backed securities (ABS), real estate investment trusts (REITs), security brokers and dealers, and finance companies.
Total Assets as a ratio of GDP

Figure: Total Assets as a ratio of GDP
Introduction

Shadow Banking

Empirical Analyses

Conclusion

Definition

Institutions

Instruments

US CDO/CLO Outstanding (USD Billions)

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Shadow Banking and Financial Intermediation
US CDO/CLO Outstanding (USD Billions)
An alternative definition, beyond non-bank lending and securitization

Repurchase agreements (repo), reverse repo, securities lending/borrowing, pledges; securities finance

...grew out of the securitization of assets

...gave leveraged trade opportunities and economized the use of cash holdings

...experienced rapid growth in 1990s and 2000s

...enabled shadow banking to integrate with the rest of the financial system.
Repo with Treasury Bonds

<table>
<thead>
<tr>
<th>Insurance Company</th>
<th>Dealer</th>
<th>Hedge Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>A</strong></td>
<td><strong>A</strong></td>
</tr>
<tr>
<td>+Reverse repo (bond)</td>
<td>+Reverse repo (bond)</td>
<td>+MBS</td>
</tr>
<tr>
<td>-Cash</td>
<td>+Repo (bond)</td>
<td>+Repo (bond)</td>
</tr>
</tbody>
</table>

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## Shadow Banking

### Instruments

<table>
<thead>
<tr>
<th>Cash Borrowers</th>
<th>Cash Lenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedge Funds</td>
<td>Money Market Mutual Funds</td>
</tr>
<tr>
<td>Mortgage REITs</td>
<td>Government-Sponsored Enterprises</td>
</tr>
<tr>
<td>Broker-dealers</td>
<td>Commercial Banks</td>
</tr>
<tr>
<td></td>
<td>Insurance Companies</td>
</tr>
<tr>
<td></td>
<td>Municipalities</td>
</tr>
<tr>
<td>Securities Lenders</td>
<td>Securities Borrowers</td>
</tr>
<tr>
<td>Pension Funds</td>
<td>Hedge Funds</td>
</tr>
<tr>
<td>Sovereign Wealth Funds</td>
<td>Broker-dealers</td>
</tr>
<tr>
<td>Mutual Funds</td>
<td></td>
</tr>
<tr>
<td>Insurance Companies</td>
<td></td>
</tr>
<tr>
<td>Exchange Traded Funds</td>
<td></td>
</tr>
</tbody>
</table>

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Summary

- A fusion of direct and indirect finance
- Settlement of short- and long-term interest rates, and asset prices
- Lack of backstops and instability
- The impact of shadow banking on
  - indirect finance, i.e. commercial bank lending (MSAR and MSDR models)
  - direct finance, i.e. term structure and risk premium (impulse-response functions)
MSAR Model

\[ y_t = \mu_t + x_t \alpha + z_t \beta_{st} + \sum_{i=1}^{n} \phi_{ist} (y_{t-i} - \mu_{t-i} - x_{t-i} \alpha - z_{t-i} \beta_{st-i}) + \epsilon_{st} \]  

\[ \epsilon_{st} \sim i.i.d. \ N(0, \sigma_s^2) \]  

- \( y_t \) is the dependent variable
- \( \mu_t \) is state-invariant intercept
- \( x_t \) is state-invariant coefficient, \( \alpha \)
- \( z_t \) is vector of state-dependent coefficients, \( \beta_{st} \)
- \( \phi_i \) is state-invariant ith AR term
Variables

- Sample: 1983Q1-2016Q4
- Total loans of depository institutions normalized by GDP
- Total assets of shadow banking normalized by GDP
- Real GDP growth rate
- Risk premium (3-month commercial paper rate and 3-month Treasury bill)
- Term spread (10-year Treasury bond and 3-month Treasury bill yields)
- difference form
### Results

**Table 1**: Estimation results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>z</th>
<th>$P &gt; z$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mu_t$</td>
<td>0.0002</td>
<td>0.003</td>
<td>0.07</td>
<td>0.943</td>
</tr>
<tr>
<td>$GDP_t$</td>
<td>0.0003*</td>
<td>0.0002</td>
<td>1.74</td>
<td>0.082</td>
</tr>
<tr>
<td>$AR(1)$</td>
<td>-0.015</td>
<td>0.089</td>
<td>-0.18</td>
<td>0.859</td>
</tr>
<tr>
<td>$AR(2)$</td>
<td>0.212***</td>
<td>0.071</td>
<td>2.98</td>
<td>0.003</td>
</tr>
<tr>
<td>$AR(3)$</td>
<td>0.134</td>
<td>0.93</td>
<td>1.44</td>
<td>0.15</td>
</tr>
<tr>
<td>$AR(4)$</td>
<td>0.553***</td>
<td>0.78</td>
<td>7.07</td>
<td>0.000</td>
</tr>
<tr>
<td>$shad_{it}$</td>
<td>-0.073**</td>
<td>0.0302</td>
<td>-2.42</td>
<td>0.015</td>
</tr>
<tr>
<td>$risk_{it}$</td>
<td>-0.006**</td>
<td>0.002</td>
<td>-2.46</td>
<td>0.014</td>
</tr>
<tr>
<td>$term_{it}$</td>
<td>-0.002</td>
<td>0.001</td>
<td>-1.29</td>
<td>0.198</td>
</tr>
<tr>
<td>$shad_{it}$</td>
<td>0.214***</td>
<td>0.034</td>
<td>6.31</td>
<td>0.000</td>
</tr>
<tr>
<td>$risk_{it}$</td>
<td>0.007***</td>
<td>0.002</td>
<td>3.5</td>
<td>0.000</td>
</tr>
<tr>
<td>$term_{it}$</td>
<td>-0.004***</td>
<td>0.001</td>
<td>-4.18</td>
<td>0.000</td>
</tr>
<tr>
<td>$\sigma_1$</td>
<td>0.002</td>
<td>0.0005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\sigma_2$</td>
<td>0.004</td>
<td>0.0003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{11}$</td>
<td>0.836</td>
<td>0.078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{12}$</td>
<td>0.163</td>
<td>0.078</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{21}$</td>
<td>0.064</td>
<td>0.041</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{22}$</td>
<td>0.935</td>
<td>0.041</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>525.588</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *, **, *** denote significance at 10%, 5%, and 1%. 
Smooth probabilities for State 1
Smooth probabilities for State 2
MSDR Model

\[ y_t = \mu_t + x_t \alpha + z_t \beta_{st} + \epsilon_{st} \]  (2)

\[ \epsilon_{st} \sim i.i.d. \ N(0, \sigma_s^2) \]

- \( y_t \) is the dependent variable
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Variables

- Total lending in securities finance
- Term spread (10-year Treasury bond and 3-month Treasury bill yields)
- GDP growth rate and risk premium dropped
- difference form
## MSDR Results

**Table 2.: MSDR Results**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coefficient</th>
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</thead>
<tbody>
<tr>
<td>$\mu_t$</td>
<td>0.001</td>
<td>0.0001</td>
<td>9.99</td>
<td>0.000</td>
</tr>
<tr>
<td>State 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$secin_t$</td>
<td>-0.171</td>
<td>0.033</td>
<td>-5.12</td>
<td>0.000</td>
</tr>
<tr>
<td>$term_t$</td>
<td>0.006</td>
<td>0.002</td>
<td>2.82</td>
<td>0.005</td>
</tr>
<tr>
<td>State 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$secin_t$</td>
<td>0.100</td>
<td>0.025</td>
<td>3.92</td>
<td>0.000</td>
</tr>
<tr>
<td>$term_t$</td>
<td>-0.007</td>
<td>0.001</td>
<td>-7.01</td>
<td>0.000</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>0.001</td>
<td>0.0007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{11}$</td>
<td>0.811</td>
<td>0.069</td>
<td></td>
<td></td>
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<tr>
<td>$P_{12}$</td>
<td>0.198</td>
<td>0.069</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{21}$</td>
<td>0.058</td>
<td>0.028</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{22}$</td>
<td>0.941</td>
<td>0.028</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Log likelihood</strong></td>
<td><strong>1200.982</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
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Note: All estimates are significant at 1%.
Smooth probabilities for State 1
Smooth probabilities for State 2
Orthogonalized impulse-response functions
Conclusion
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- Dual role of shadow banks
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- Dual role of shadow banks
  - Expansion
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- Settling asset prices, short-term and long-term interest rates
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- Yield curve
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- Backstops and instability
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- The role of Fed?
- Cross-border flows?
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- The role of Fed?
- Cross-border flows?
- Regulation? Sharing the risk vs. wager