The Macroeconomics of Debt Overhang

Thomas Philippon

New York University

November 2009
What is Debt Overhang?

- The life cycle of bankers
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  - Stage 1: Lever up. Make a lot of deals.
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  - Stage 1: Lever up. Make a lot of deals.
  - Stage 2: Drink away bonuses

Initial Balance Sheet (Market Values)

Assets: 100
- Mortgages, C&I loans: 100

Liabilities: 100
- Debt: 95 (par value 100)
- Equity: 5

Philippon (NYU)
What is Debt Overhang?

The life cycle of bankers

- Stage 1: Lever up. Make a lot of deals.
- Stage 2: Drink away bonuses
- Stage 3: Bonus Hangover. Ask for Ibuprofen.
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-清楚化
- 初期バランスシート
- 資産: 100
  - 預貸、C&Iローン: 100
- 負債: 100
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What is Debt Overhang?

New Investment Opportunity (Myers 77)

- Cost 8, expected revenue 10, financed by junior debt

- **Assets:** 110
  - Legacy assets: 100
  - New assets: 10

- **Liabilities 110**
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Conclusion:
Equity holders will oppose the project.

Macro Debt Overhang
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The Relevance of Debt Overhang

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In 20 minutes and without complicated equations ...
Model

- Closed economy
- Households
  \[ U = E \left[ c_1 + \frac{c_2}{\delta} \right] \]
- Financial intermediaries
Fig 1: Timing, Technology and Balance Sheets

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Book values
Closed Economy
Fig 1: Timing, Technology and Balance Sheets

Households

Financial Intermediaries

Households own financial firms
Fig 1: Timing, Technology and Balance Sheets

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Banks own all domestic mortgages
Fig 1: Timing, Technology and Balance Sheets

Households

\[ \begin{array}{c|c}
A & L \\
\hline
b & m \\
e & \\
\end{array} \]

Financial Intermediaries

\[ \begin{array}{c|c}
A & L \\
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m & b \\
z & e \\
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Consolidated corporate sector
Fig 1: Timing, Technology and Balance Sheets

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Financing
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Model: investment & first best

- Productivity $q$
  \[ y_2 = z + qx \]

  with Leontieff technology

\[ x \in \{0, X\} \]

First Best

- Since $q > \delta$, efficient to invest as much as possible
- Assume initial endowment large enough

\[ \bar{x} = X \]

and

\[ c_1 = \bar{y}_1 - X \]
Debt Overhang Assumption: The initial banks’ bonds $b$ (resp. households’ loans $m$) are senior to the claims that can issued at date 1.
Debt overhang makes maximization program convex: either save everything, or consume everything.

There exist a threshold $\hat{m}$

$$\hat{m} \equiv (r - \delta) \left( y_1 + \frac{\bar{\rho}_b + \bar{e}}{r} \right)$$

- Excessive short term consumption when $m > \hat{m}$
- Maximum saving when $m < \hat{m}$
- Depends on rate spread and wealth
- Bad macro performance, lower wealth, higher defaults
Same idea as in simple numerical example

There is a threshold $\hat{b}$

$$\hat{b} \equiv z + \bar{\rho}_m + (q - r) X.$$ 

Banks with debt $b > \hat{b}$ do not finance new investments

Threshold depends on performance of outstanding loans

Expect non performing loans $\rightarrow$ impaired balance sheet $\rightarrow$ debt overhang $\rightarrow$ less investment
Mortgage Performance Cycle

Households

Solvent:
- Save
- Repay mortgages

Insolvent:
- Short term consumption
- Default on mortgages

Banks

Solvent:
- Invest
- Pay debt + equity

Insolvent:
- No investment
- Debt recovery
Mortgage Performance Cycle

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Complementarities: Investment

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Complementarities: Investment

Households
- **Solute**: Save, Repay mortgages
- **Insolvent**: Short term consumption, Default on mortgages

Banks
- **Solute**: Invest, Pay debt + equity
- **Insolvent**: No investment, Debt recovery
Complementarities: Savings

Closed economy: crowding out of investment by the current consumption of highly levered households

Households

Solvent: Save
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Insolvent: Short term consumption
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Banks

Solvent: Invest
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The Macroeconomics of Debt Overhang

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At cost $\kappa$, renegotiation can take place. Nash bargaining (ex-post efficient).

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  Intuition: households are both bondholders and shareholders.
Bailouts

- **Financial bailouts**
  - Inject equity
  - Guarantee new debt
  - Buy back impaired assets

- Philippon & Schnabl (09): absent private information, all these programs are equivalent
  - Focus here on a pure cash transfer financed by lump-sum taxes
Bailouts

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<td>Prod.</td>
<td>0</td>
<td>Spend.</td>
<td>x</td>
</tr>
<tr>
<td>m</td>
<td>b</td>
<td>m</td>
<td>b</td>
</tr>
<tr>
<td>z</td>
<td>e</td>
<td>z</td>
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<tr>
<td></td>
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<td>n</td>
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<tr>
<td></td>
<td></td>
<td>x</td>
<td>e</td>
</tr>
</tbody>
</table>

NPV

Dilution of shareholders
Bailouts

Households

<table>
<thead>
<tr>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>m</td>
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<tr>
<td>e</td>
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</tbody>
</table>

Financial Intermediaries

<table>
<thead>
<tr>
<th>A</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>m</td>
<td>b</td>
</tr>
<tr>
<td>z</td>
<td>e</td>
</tr>
</tbody>
</table>

Prod. $y_i$

Cons. $c_i$

A | L
---|---
| b | m
| n | e

Spend. $x$

A | L
---|---
| m | b
| z | $n - \tau$
| x | e

Endowment

Tax $\tau$
Proposition: *In a debt overhang equilibrium, financial bailouts increase welfare by increasing investment and increasing the fraction of solvent households.*
Global bond and equity markets: $\alpha$ share of foreign assets in domestic households’ portfolios.

Integration of mortgage markets: $\beta$ share of foreign mortgages in domestic banks’ portfolios.

Notes: direct or indirect. MBS bought by SIVs sponsored by European banks.
Closed Economy

\[ t = 0 \]
Open Economy

t = 0

Households

Financial Intermediaries

\[(1 - \alpha)b, \alpha b^*\]

\[(1 - \alpha)e, \alpha e^*\]

\[(1 - \beta)m, \beta m^*\]

\[z\]
Open Economy

t = 0

Households

Financial Intermediaries

Rest of the World

Households

Financial Intermediaries

Rest of the World

$A$

$L$

$(1 - \alpha)b, \alpha b^*$

$(1 - \alpha)e, \alpha e^*$

$(1 - \beta)m, \beta m^*$

$z$

$m$

$b$

$e$

$\beta m$

$\alpha b$

$\alpha e$

$\alpha b^*$

$\alpha e^*$

$\beta m^*$

$z$

$\beta m$

$\alpha b$

$\alpha e$
t = 0

Households

A \( (1-\alpha)b, \alpha b^* \)

Financial Intermediaries

A \( (1-\beta)m, \beta m^* \)

Rest of the World

\( \beta m \)

\( \alpha b \)

\( \alpha e \)
Notice: Previous analysis applies to world economy. Bailouts improve macroeconomic outcome when there is debt overhang. However:

- **Proposition**: *Domestic financial bailouts are less attractive when banks operate internationally* $$(\beta)$$, *and when households diversify their financial portfolios* $$(\alpha)$$.  

- *When $$\alpha$$ is high, domestic bailouts increase mortgage defaults!*
- A new channel of international spillover
- Similar to fiscal policy in open economies
- **Corollary**: *Inefficient Nash equilibrium. Financial globalization creates the need for coordination in financial bailouts.*