Collateral Crises

Gary Gorton, Yale and NBER
Guillermo Ordoñez, Yale

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Financial Crises

1. Financial crises are not rare.
2. Crises are preceded by credit booms.
3. Crises occur at/near business cycle peaks, when the macroeconomy weakens.
4. The longer the credit boom the deeper the recession.
5. Financial crises are sudden and always involve private money - - money market in recent crisis.
6. Crises not “large” shocks.
7. Crises systemic: “banking system” insolvent if not for suspension or government/central bank intervention.
Overview: Crises related to the Macro Information Environment

- In a world of collateralized short-term debt, it may not be optimal to produce information about the quality of collateral.
- Opacity, which makes it hard to distinguish good collateral from bad collateral has:
  - Benefits: Ignorance-based Credit Boom – Firms with bad collateral get loans that they otherwise would not.
  - Costs: Fragility – System very susceptible to small shocks.
- As “ignorant credit” grows, system becomes increasingly fragile.

Low probability events, tail events, are endogenous.
Micro Foundations

Financial intermediation is about the provision of trading securities: money.

- Gorton and Pennacchi (1990): banks exist to create information-insensitive debt (riskless) for trading.
  - Agents trade; need a security to protect against adverse selection.
  - Liquidity $\Rightarrow$ information-insensitivity; but debt exogenous.

- Dang, Gorton, Holmström (2011): debt is the optimal trading security because it is information-insensitive (not just riskless).
  - Crisis $\Rightarrow$ fear of adverse selection reduces amount traded (and hence welfare); Crisis: info-insensitive $\Rightarrow$ info-sensitive.
Model

• Two overlapping generations every period.
  - Young/Households: Endowment and no labor.
  - Old/Firms: Labor but no endowment.

• Two goods that can be used to consume or produce.
  - Numeraire (K): Perishable and reproducible.
  - Land (X): Non-perishable and non-reproducible.
Land Collateral

- Land type unknown without info production.

- Good land: Generates $C$ units of numeraire (only once).

- Bad land: Generates 0 units of numeraire (only once).

- Each unit of land has a common belief $p$ of being good.

  $X = \begin{cases} 
  C & \text{with probability } p \\
  0 & \text{with probability } (1 - p) 
  \end{cases}$

- Learning whether a unit of land if good or bad costs $\gamma$ in terms of $K$. 
<table>
<thead>
<tr>
<th>Credit Market</th>
<th>Land Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Firm w/ collateral of quality p</td>
<td>- Project realizations</td>
</tr>
<tr>
<td>- Borrows K w/ II or IS debt</td>
<td>- Debt paid off</td>
</tr>
<tr>
<td>- Lenders choose to produce info on collateral quality or not</td>
<td>- Firms sell land</td>
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</tbody>
</table>
Optimal Debt

- Info-sensitivity of debt depends on beliefs, $p$. 

\[
pK^*(qA - 1) - \gamma \leq \frac{\gamma}{(1 - q)(1 - p)} (qA - 1) 
\]
Multiple Periods

- Evolution of collateral value:
  - Collateral value remains unchanged.
  - Idiosyncratic shock: Collateral value changes, becomes good with probability $\hat{p}$

- Each collateral is characterized by one of three possible beliefs:
  - $p = 0$, if information is that the collateral is bad and no shock.
  - $p = 1$, if information is that the collateral is good and no shock.
  - $p = \hat{p}$, if no information after the last shock.

- Assume that at $t=0$ all collateral qualities are known.
- Assume (for now) no aggregate shock.
INITIAL DISTRIBUTION OF COLLATERAL QUALITY
NEXT PERIOD DISTRIBUTION OF COLLATERAL QUALITY
NEXT PERIOD DISTRIBUTION OF COLLATERAL QUALITY
LONG-TERM DISTRIBUTION OF COLLATERAL QUALITY
Aggregate Shocks

• **Negative shock**: transforms a fraction \((1 - \eta)\) of good collateral into bad collateral.

• Shock observable, but which collateral changes quality is not observable.

• Example, negative shock:
  - Collateral with \(p = 1\) becomes \(p' = \eta\) after the shock.
  - Collateral with \(p = \hat{p}\) becomes \(p' = \eta\hat{p}\) after shock.
  - Collateral with \(p = 0\) remains \(p' = 0\) after shock.
Numerical Simulations

• Pick parameter values for: $\lambda$, $q$, $A$, $\bar{K}$, $L^*$, $K^*$, $\gamma$, $C$, $\beta$.

• Parameters are such that $\hat{p} > p^H$.

• Simulate for 100 periods.

• Assume:
  - Transitory negative shock in periods 5 and 50.
  - Transitory positive shock in period 30.
Aggregate Consumption (Welfare)

η = 0.97

Always produce information about idiosyncratic shocks

η = 0.90

η = 0.91
Choice of Collateral

- Firms want to choose high $\hat{p}$ and high $\gamma$ collateral. E.g., complex securities linked to land!

- Borrowing is maximized by increasing complexity (higher $\gamma$).

- Complexity of securities is endogenous.
**Policy Implications**

- The planner maximizes discounted utility of all cohorts:

\[ U_t = E_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} W_{t}. \]

- Planner faces same restrictions as households; info costly to produce.

- Key question: Is leverage desirable?

- Proposition: Some fragility can be optimal.
Empirical Tests

• Focus on the prediction that during a credit boom the standard deviation of beliefs declines. The change in credit trough-to-peak should be negatively correlated with the change in beliefs about “quality.”

• Measure “beliefs” with the standard deviation of the cross section of stock returns.

• Credit boom measure by total bank assets or, in the early periods, by industrial production (Davis) and number of years T-to-P.
<table>
<thead>
<tr>
<th>Period</th>
<th>Number of Cycles (Trough-to-Peak)</th>
<th>No. Years and $\Delta$Beliefs</th>
<th>Davis Boom and $\Delta$Beliefs</th>
<th>$\Delta$Beliefs with $\Delta$Total Assets</th>
<th>$\Delta$H-P Beliefs and $\Delta$Total Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1823-1914</td>
<td>13</td>
<td>-0.16</td>
<td>-0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1837-1914</td>
<td>10</td>
<td>-0.27</td>
<td>-0.10</td>
<td></td>
<td></td>
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<tr>
<td>National Banking Era, 1863-1914</td>
<td>12</td>
<td>-0.37</td>
<td>-0.33</td>
<td></td>
<td></td>
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<tr>
<td>Federal Reserve Era, 1914-2010</td>
<td>17</td>
<td>-0.09</td>
<td>-0.002</td>
<td></td>
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<tr>
<td>Whole Period: 1863-2010</td>
<td>29</td>
<td>-0.23</td>
<td>-0.05</td>
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Final Comments

• It is not optimal to produce information all the time. It is optimal to **NOT** produce information. But, although Information-insensitive debt may be socially desirable, it is vulnerable to a sudden loss of confidence in its insensitiveness.

• Macroeconomic implications:
  - Info dynamics leads to credit booms and increased fragility.
  - The switch from info-insensitive to info-sensitive regimes causes a loss of welfare.
  - Fragility may be optimal.
  - Volatility of beliefs leads to volatility of production and consumption.