Macroeconomics of Financial Markets

Some Relation with Empirical Evidence

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Crises are Common

- Just since 1970, about 147 financial crises around the world.
  - Not just events from the past.
  - Not just in emerging markets.

- Around 75% of all these crises involved a banking crisis.
## Crises in Developed Economies

<table>
<thead>
<tr>
<th>Country</th>
<th>Financial Crisis (first year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1893, 1989</td>
</tr>
<tr>
<td>Canada</td>
<td>1873, 1906, 1923, 1983</td>
</tr>
<tr>
<td>Denmark</td>
<td>1877, 1885, 1902, 1907, 1921, 1931, 1987</td>
</tr>
<tr>
<td>France</td>
<td>1882, 1889, 1904, 1930, 2008</td>
</tr>
<tr>
<td>Germany</td>
<td>1880, 1891, 1901, 1931, 2008</td>
</tr>
<tr>
<td>Japan</td>
<td>1882, 1907, 1927, 1992</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1897, 1921, 1931, 1988</td>
</tr>
<tr>
<td>Norway</td>
<td>1899, 1921, 1931, 1988</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1870, 1910, 1931, 2008,</td>
</tr>
<tr>
<td>United States</td>
<td>1873, 1884, 1893, 1907, 1929, 1984, 2007</td>
</tr>
</tbody>
</table>
Banking Crises Around the World

Systemic banking crises before the World Financial Crisis

Source: Laeven and Valencia (2012)
CRISES FOLLOW PATTERNS

- Credit booms precede banking crises.

- Schularick and Taylor (AER, 2012).

14 developed countries, 1870-2008.

\[
\text{Logit}[\text{Crisis}_{j,t}] = \alpha + \beta \Delta \text{Credit}_{j,[t,t-5]} + \Gamma \text{Controls}_{j,t} + e_{j,t}
\]

0.021***
Credit booms that are characterized by high productivity growth are less likely to end in a banking crisis.

Gorton and Ordonez (JEEA, 2020).

34 countries (18 EMEs), 1960-2015.

\[
\text{Logit}[\text{Crisis}_{j,t}] = \alpha + \beta \Delta \text{Credit}_{j,[t,t-5]} + \gamma \Delta \text{Prod}_{j,[t,t-5]} + \Gamma \text{Controls}_{j,t} + e_{j,t}
\]

- \text{LP} \rightarrow 0.012^{**} - 0.017^{**}
- \text{TFP} \rightarrow 0.015^{**} - 0.018^{**}
Not Any Credit Boom Precedes a Crisis!

▶ Credit booms that are characterized by high popularity growth are more likely to end in crisis.

▶ Herrera, Ordonez and Trebesch (JPE 2020).

60 countries (40 EMEs), 1984-2010.

\[
\text{Logit}[\text{Crisis}_{j,t}] = \alpha + \beta \Delta \text{Credit}_{j,[t,t-5]} + \gamma \Delta \text{Pop}_{j,[t,t-5]} + \Gamma \text{Controls}_{j,t} + \epsilon_{j,t}
\]

All \quad \rightarrow \quad 0.012^{**} \quad 0.000

EME \quad \rightarrow \quad 0.012^{**} \quad 0.021^{**}
”Good Booms, Bad Booms” in more detail.
Identifying Booms
Empirical Findings

- Productivity evolves differently in good booms and in bad booms.

(a) Total Factor Productivity  
(b) Labor Productivity
Empirical Findings

- H-P filtering misses all this.

<table>
<thead>
<tr>
<th>Number</th>
<th>As a ratio of HP booms</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP boom-years in GO</td>
<td>161</td>
</tr>
<tr>
<td>HP booms included in GO</td>
<td>40</td>
</tr>
<tr>
<td>HP booms</td>
<td>44</td>
</tr>
<tr>
<td>HP booms included in GO starting</td>
<td></td>
</tr>
<tr>
<td>- in the same year</td>
<td>2</td>
</tr>
<tr>
<td>- a year later</td>
<td>6</td>
</tr>
<tr>
<td>- two years later</td>
<td>3</td>
</tr>
<tr>
<td>- three years later</td>
<td>4</td>
</tr>
<tr>
<td>- more than three later</td>
<td>25</td>
</tr>
</tbody>
</table>

Finally, we examine the crises in our sample. Our procedure was to start with our definition of a credit boom, apply it to each country, and examine to see if the boom ended in a crisis. Laeven and Valencia have many more countries in their sample than we do, so overall they have more booms. We can reverse this procedure by first identifying all the crises that occur in our sample, based on Laeven and Valencia, and then seeing how they are related to our definition of a boom. Table 8 is a summary of the financial crises in our sample, based on . There are 89 crises in Laeven and Valencia that are in our sample, of which 32 are associated with a boom that ends in one of these crises. There are 57 crises that either happen during a boom that does not end with the crisis, or that do not happen during a credit boom. So, there are good booms and bad booms, but also crises unrelated to the end of booms, or with booms at all. Subsequently, in a Logit analysis of what is associated with crises, we will use all of the crises.

Table 8: Financial Crises in the Sample

- Total number of crises in the sample 89
- Number of crises occurring at the end of a boom 32
- Number of crises occurring not at the end of a boom 41
- Number of crises not associated with booms 16
Empirical Findings

- H-P filtering misses all this.

(a) Total Factor Productivity  
(b) Labor Productivity
Empirical Findings

- Low productivity growth is correlated with bad booms.

\[ Pr(BadBoom_{j,t} | Boom_{j,t}) = \text{Logit}(\alpha + \beta \Delta Prod_{j,t}) \]

\[ \text{LP} \rightarrow -0.08^{***} \]
\[ \text{TFP} \rightarrow -0.06^{***} \]

- Credit growth predicts crises, but mitigated by productivity.

\[ Pr(Crisis_{j,t}) = \text{Logit}(\alpha + \beta \Delta Credit_{j,t-1} + \gamma \Delta Prod_{j,t-1}) \]

\[ \text{LP} \rightarrow 0.012^{**} \quad -0.017^{**} \]
\[ \text{TFP} \rightarrow 0.015^{**} \quad -0.018^{**} \]
Model

- Single Period (for now).
- Households (mass 1): $\bar{K} > K^*$. 
- Firms (mass 1): $L^*$ (no disutility)

\[ K_i' = \begin{cases} 
A \min\{K_i, L_i\} & \text{with prob. } q_i \\
0 & \text{otherwise} 
\end{cases} \]

Denote the mass of active firms by $\eta$.
Projects are rank-ordered, then $\frac{\partial q_\eta}{\partial \eta} < 0$ and $\frac{\partial \hat{q}(\eta)}{\partial \eta} < 0$.
Assume $q_1 A > 1$, then optimal that all firms operate at $K^* = L^*$.
- Agents are risk-neutral and consume at the end of the period.
Model

- Single Period (for now).
- Households (mass 1): $K > K^*$. 
- Firms (mass 1): $L^*$ (no disutility) and a unit of land.

\[
\text{Land Value} = \begin{cases} 
C > K^* & \text{with prob. } p_i \\
0 & \text{otherwise}
\end{cases}
\]

- Agents can privately learn the type of land at cost
  - $\gamma_l$ (in terms of $K$) for households.
  - $\gamma_b$ (in terms of $L$) for firms.
Symmetric Information

- Lenders break even and debt is risk free

\[ p[\hat{q}(\eta)R_{IS} + (1 - \hat{q}(\eta))x_{ISC}] = pK + \gamma_{l} + p\gamma_{b}(qA-1) \]

\[ R_{IS} = x_{ISC} \]
In this picture $\gamma = p\gamma_b(qA - 1)$
Symmetric Ignorance

- Lenders break even and debt is risk free

\[ \hat{q}(\eta) R_{II} + (1 - \hat{q}(\eta)) x_{II} p C = K \]

\[ R_{II} = x_{II} p C \]

- Subject to loans not triggering private information acquisition.
Symmetric Ignorance

Beliefs $p$

$E(\text{Investment})$

$pC$

$K^*$
E(Investment)

Borrowers do not acquire information if \( p(K^* - K)(qA - 1) \leq p\gamma_b(qA - 1) \)

Lenders do not acquire information if \( (1 - p)(1 - \hat{q}(\eta))K \leq \gamma_l \)
Borrowers do not acquire information if \( K \geq K^* - \gamma_b \)

Lenders do not acquire information if

\[
K \leq \frac{\gamma_l}{(1-\tilde{q}(\eta))(1-p)}
\]
Informational Regimes

$E(\text{Investment})$

Beliefs $p$

IS

II

0

1
If $\eta$ increases $\implies$ II regime shrinks
Simple Aggregation

\[ \eta = f(\hat{p}) + f(1) \]
DYNAMICS

How does the distribution of beliefs (and the number of active firms) evolve over time?

• Dynamic extension.

  • OG: ”young” households, ”old” firms.

  • Land is storable, $K$ is not.

  • Land is transferable across generations.

  • We assume away bubbles and multiplicity.

  • Price is $pC$ (i.e., single match and buyers’ negotiation power).
- A fraction $\eta$ of firms with collateral $p>0$ and project $q$
- Each borrows $K$ with II or IS debt (conditions $R$ and $x$)
- Lenders or borrowers can privately observe the type of collateral.

**Market for loans**

- Project realization
- Debts are paid off and any info is revealed ($p'$)
- Firms sell land at $p'C$ to households.

**Market for land**
- A fraction $\eta$ of firms w/ collateral $p>0$ and project $q$

- Each borrows $K$ w/ II or IS debt (conditions $R$ and $x$)

- Lenders or borrowers can privately observe the type of collateral.

- Project realization

- Debts are paid off and any info is revealed ($p'$)

- Firms sell land at $p'C$ to households.

Market for loans

Market for land
SHOCKS ON COLLATERAL

- Important assumption: Mean reversion of collateral.

- Simplifying assumptions
  - No aggregate shocks: Fraction of good land is always $\hat{p}$.
  - Idiosyncratic shocks
    - Occur with probability $(1 - \lambda)$
    - Land becomes good with probability $\hat{p}$.
    - The shock is observable, the realization is not.
No Boom

\[(1 - \hat{p})\]
No Boom

\[ \lambda(1 - \hat{p}) \]

\[ (1 - \lambda)(1 - \hat{p}) \]

\[ (1 - \lambda)\hat{p} \]
(1 - \(\hat{p}\))

\(\hat{p}\) → → → 1

(1 - \(\lambda\))(1 - \(\hat{p}\))

\(\hat{p}\)

\(\hat{p}\) (1 - \(\lambda\))\(\hat{p}\)

No Boom!
Good Booms

Exogenous increase in $\hat{q}(\eta)$

$(1 - \hat{p})$
Good Booms

Boom!

Increase in $\eta$

$\lambda(1 - \hat{p})$

$(1 - \hat{p})(1 - \lambda)$

$(1 - \lambda)\hat{p}$

0  $\rightarrow$  $\rightarrow$  $\rightarrow$  $\rightarrow$  1

$\lambda \hat{p}$
**Good Booms**

Further increase in $\eta$

- $\lambda^2 (1 - \hat{p})$
- $\lambda^2 \hat{p}$
- $(1 - \lambda) \lambda (1 - \hat{p})$
- $(1 - \lambda) \lambda \hat{p}$

Boom!
Good Booms

Boom ends without crisis!
Bad Booms

Smaller exogenous increase in $\tilde{q}(\eta)$

$(1 - \hat{p})$
Bad Booms

$$\hat{p} \leftarrow (1 - \lambda) \hat{p}$$

$$\lambda (1 - \hat{p})$$

 Boom!
Bad Booms

\[
\lambda^2(1 - \hat{p}) \quad \rightarrow \quad (1 - \lambda)\lambda(1 - \hat{p}) \quad \rightarrow \quad \hat{p} \quad \leftarrow \quad (1 - \lambda)\lambda\hat{p} \quad \rightarrow \quad 1
\]

Boom!
Bad Booms

\[ \lambda^t (1 - \hat{p}) \]

\[ (1 - \lambda) \lambda^{t-1} (1 - \hat{p}) \]

Crisis!

\[ (1 - \lambda^t) \]

\[ \lambda^t \hat{p} \]

\[ (1 - \lambda) \lambda^{t-1} \hat{p} \]
Bad Booms
Bad Booms

New Boom!
An Illustration - Different Jumps of $q$

Output with constant exogenous growth of $A$

- Good Booms
  - Larger increase of $q$
- Bad Booms
  - Increase of $q$
An Illustration - Different Jumps of $q$

Active firms and probability of success

- **Good Booms**: Larger increase of $q$
- **Bad Booms**: Increase of $q$
- **No Boom**
An Illustration - Different Growth of $q$

Output with constant exogenous growth of $A$

- **Good Booms**: Further growth of $q$
- **Bad Booms**: No more growth of $q$

Increase in $q$
An Illustration - Different Growth of $q$

Active firms and probability of success

- **Increase in $q$**
- **Good Booms**
  - Further growth of $q$
- **Bad Booms**
  - No more growth of $q$

No Boom
Decomposing TFP

- In the model, $TFP = qA$.
  - The literature assumes $q = 1$, but this is the component that affects the likelihood of crises, not $A$!

- Problem: Not comprehensive data on $q$.
  - We proxy $q$ by the distance to solvency, $\frac{1}{vol}$, where $vol$ is the volatility of firms’ equity returns (as in Atkeson et al. (2013)).
Distance to solvency is a significant component of TFP.

\[ \Delta(TFP)_{j,t} = \alpha + \beta \Delta \frac{1}{vol_{j,t}} + \epsilon_{j,t} \]

0.02***

Distance to solvency predicts bad booms.

\[ Pr (BadBoom_{j,t}|Boom_{j,t}) = \text{Logit} \left( \alpha + \beta \frac{1}{vol_{j,t-1}} \right) \]

−0.10***
Most macro models rely on exogenous contemporaneous “negative technology shocks”. Not the case in the recent crisis!
Final Remarks

- We propose a unified model of booms and crises, where crises may be the result of a contemporaneous shock, but also the result of previous endogenous dynamics!

  The seeds of a crisis may be planted years beforehand!

- Aggregate fluctuations are related to low frequency phenomena.

  The trend affects the cycle!

- We have decomposed credit into household and corporate in the data and extended the model to capture mortgages.

  Same results and same forces!
### Summary Statistics

#### Table 2: Descriptive Statistics - All Economies

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<th>Booms without a Crisis</th>
<th>t-Statistic for Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Credit growth (%)</td>
<td>3.83</td>
<td>-2.41</td>
<td>8.96</td>
<td>15.02</td>
<td>9.84</td>
<td>8.30</td>
<td>1.27</td>
</tr>
<tr>
<td>Avg. H’d Cr’d growth (%)</td>
<td>6.07</td>
<td>3.93</td>
<td>7.55</td>
<td>1.07</td>
<td>6.71</td>
<td>8.47</td>
<td>-1.64</td>
</tr>
<tr>
<td>Avg. C’t Cr’d growth (%)</td>
<td>1.76</td>
<td>-0.83</td>
<td>3.58</td>
<td>6.39</td>
<td>3.57</td>
<td>3.59</td>
<td>-0.04</td>
</tr>
<tr>
<td>Avg. TFP growth (%)</td>
<td>0.83</td>
<td>0.78</td>
<td>0.87</td>
<td>0.62</td>
<td>0.47</td>
<td>1.17</td>
<td>-3.57</td>
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<tr>
<td>Avg. Pt Gnt’d growth (%)</td>
<td>0.17</td>
<td>0.17</td>
<td>0.18</td>
<td>0.00</td>
<td>-0.68</td>
<td>0.93</td>
<td>-0.50</td>
</tr>
<tr>
<td>Avg. rGDP growth (%)</td>
<td>2.56</td>
<td>2.29</td>
<td>2.78</td>
<td>3.08</td>
<td>2.40</td>
<td>3.07</td>
<td>-3.28</td>
</tr>
<tr>
<td>Avg. INV growth (%)</td>
<td>1.48</td>
<td>1.08</td>
<td>1.79</td>
<td>2.19</td>
<td>1.67</td>
<td>1.88</td>
<td>-0.49</td>
</tr>
<tr>
<td>Avg. LP growth (%)</td>
<td>2.52</td>
<td>2.45</td>
<td>2.57</td>
<td>0.72</td>
<td>2.06</td>
<td>2.96</td>
<td>-4.29</td>
</tr>
<tr>
<td>Avg. Duration (years)</td>
<td>10.68</td>
<td></td>
<td></td>
<td></td>
<td>11.76</td>
<td>9.98</td>
<td>0.93</td>
</tr>
<tr>
<td>Avg. Time spent in boom</td>
<td>27.32</td>
<td></td>
<td></td>
<td></td>
<td>11.76</td>
<td>15.56</td>
<td></td>
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<tr>
<td>Number of Booms</td>
<td>87</td>
<td></td>
<td></td>
<td></td>
<td>34</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Sample Size (years)</td>
<td>1695</td>
<td>766</td>
<td>929</td>
<td></td>
<td>400</td>
<td>529</td>
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</tbody>
</table>
**Summary Statistics**

Table 2: Descriptive Statistics - All Economies

<table>
<thead>
<tr>
<th></th>
<th>Whole Sample</th>
<th>Non Booms</th>
<th>Booms</th>
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</thead>
<tbody>
<tr>
<td>Avg. Credit growth (%)</td>
<td>4.26</td>
<td>-0.94</td>
<td>7.37</td>
<td>8.55</td>
<td>7.31</td>
<td>7.42</td>
<td>-0.06</td>
</tr>
<tr>
<td>Avg. H’d Cr’d growth (%)</td>
<td>3.87</td>
<td>1.10</td>
<td>5.46</td>
<td>6.60</td>
<td>5.78</td>
<td>5.03</td>
<td>1.16</td>
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<tr>
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<td>1.98</td>
<td>0.11</td>
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</tr>
<tr>
<td>Avg. TFP growth (%)</td>
<td>0.74</td>
<td>0.77</td>
<td>0.73</td>
<td>-0.21</td>
<td>0.37</td>
<td>1.04</td>
<td>-2.91</td>
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<tr>
<td>Avg. Pt Gnt’d growth (%)</td>
<td>-2.24</td>
<td>-2.64</td>
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<td></td>
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<td>Sample Size (years)</td>
<td>834</td>
<td>312</td>
<td>522</td>
<td></td>
<td>239</td>
<td>283</td>
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Table 3: Descriptive Statistics - Advanced Economies

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<td></td>
<td>1.25</td>
</tr>
<tr>
<td>Avg. Time spent in boom</td>
<td>29.00</td>
<td></td>
<td>13.28</td>
<td></td>
<td>15.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Booms</td>
<td>39</td>
<td></td>
<td>15</td>
<td></td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size (years)</td>
<td>834</td>
<td>312</td>
<td>522</td>
<td></td>
<td>239</td>
<td>283</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Descriptive Statistics - Emerging Economies

<table>
<thead>
<tr>
<th></th>
<th>Whole Sample</th>
<th>Non Booms</th>
<th>Booms</th>
<th>t-Statistic for Means</th>
<th>Booms with a Crisis</th>
<th>Booms without a Crisis</th>
<th>t-Statistic for Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Credit growth (%)</td>
<td>3.40</td>
<td>-3.41</td>
<td>11.00</td>
<td>14.30</td>
<td>13.60</td>
<td>9.31</td>
<td>2.95</td>
</tr>
<tr>
<td>Avg. H’d Cr’d growth (%)</td>
<td>14.80</td>
<td>11.03</td>
<td>19.96</td>
<td>0.75</td>
<td>19.31</td>
<td>20.18</td>
<td>-0.16</td>
</tr>
<tr>
<td>Avg. C’t Cr’d growth (%)</td>
<td>0.92</td>
<td>-3.13</td>
<td>6.46</td>
<td>4.30</td>
<td>8.82</td>
<td>5.67</td>
<td>1.15</td>
</tr>
<tr>
<td>Avg. TFP growth (%)</td>
<td>0.91</td>
<td>0.78</td>
<td>1.06</td>
<td>1.15</td>
<td>0.63</td>
<td>1.33</td>
<td>-2.00</td>
</tr>
<tr>
<td>Avg. Pt Gnt’d growth (%)</td>
<td>3.40</td>
<td>2.75</td>
<td>4.17</td>
<td>0.29</td>
<td>-0.57</td>
<td>8.38</td>
<td>-1.28</td>
</tr>
<tr>
<td>Avg. rGDP growth (%)</td>
<td>2.63</td>
<td>2.26</td>
<td>3.04</td>
<td>3.09</td>
<td>2.72</td>
<td>3.24</td>
<td>-1.45</td>
</tr>
<tr>
<td>Avg. INV growth (%)</td>
<td>1.32</td>
<td>1.09</td>
<td>1.59</td>
<td>0.98</td>
<td>1.35</td>
<td>1.72</td>
<td>-0.46</td>
</tr>
<tr>
<td>Avg. LP growth (%)</td>
<td>2.13</td>
<td>1.98</td>
<td>2.32</td>
<td>1.07</td>
<td>1.54</td>
<td>2.76</td>
<td>-2.42</td>
</tr>
<tr>
<td>Avg. Duration (years)</td>
<td>8.48</td>
<td></td>
<td>8.47</td>
<td></td>
<td>8.48</td>
<td></td>
<td>-0.00</td>
</tr>
<tr>
<td>Avg. Time spent in boom</td>
<td>22.61</td>
<td></td>
<td>8.94</td>
<td></td>
<td>13.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Booms</td>
<td>48</td>
<td></td>
<td>19</td>
<td></td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size (years)</td>
<td>861</td>
<td>454</td>
<td>407</td>
<td></td>
<td>161</td>
<td>246</td>
<td></td>
</tr>
</tbody>
</table>
Household Credit

To get at this further, and to focus on credit to households, we repeat the analysis of the previous section using only HHCredit, in which case we get 32 booms, 17 of which ended in a crisis, compared to 87 booms in the full data set using credit to the private sector divided by GDP, of which 34 ended in a crisis. Of the 32 booms based on credit to households, 28 start within two years of the start of the booms defined previously.

Table 15 shows that over the booms defined with HHCredit, there is a significantly larger average TFP and LP growth in good booms relative to bad booms. However, unlike the large literature on growth in credit predicting crises, HHCredit growth does not predict crises (in a logit context as above, omitted here to save space).

### Table 15: Descriptive Statistics using Credit to Households

<table>
<thead>
<tr>
<th></th>
<th>Whole Sample</th>
<th>Non Booms</th>
<th>Booms</th>
<th>t-Statistic for Means</th>
<th>Booms with a Crisis</th>
<th>Booms without a Crisis</th>
<th>t-Statistic for Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. TFP growth (%)</td>
<td>0.53</td>
<td>0.29</td>
<td>0.69</td>
<td>1.82</td>
<td>0.41</td>
<td>1.15</td>
<td>-2.65</td>
</tr>
<tr>
<td>Avg. Pt Gnt’d growth (%)</td>
<td>-0.81</td>
<td>-2.14</td>
<td>-0.00</td>
<td>0.72</td>
<td>2.76</td>
<td>-4.84</td>
<td>1.72</td>
</tr>
<tr>
<td>Avg. rGDP growth (%)</td>
<td>2.28</td>
<td>1.83</td>
<td>2.58</td>
<td>3.16</td>
<td>2.23</td>
<td>3.16</td>
<td>-2.91</td>
</tr>
<tr>
<td>Avg. INV growth (%)</td>
<td>1.87</td>
<td>1.60</td>
<td>2.04</td>
<td>0.89</td>
<td>1.92</td>
<td>2.24</td>
<td>-0.47</td>
</tr>
<tr>
<td>Avg. LP growth (%)</td>
<td>2.13</td>
<td>2.07</td>
<td>2.17</td>
<td>0.47</td>
<td>1.95</td>
<td>2.54</td>
<td>-2.09</td>
</tr>
<tr>
<td>Avg. Duration (years)</td>
<td>11.53</td>
<td></td>
<td></td>
<td></td>
<td>13.41</td>
<td>9.40</td>
<td>1.61</td>
</tr>
<tr>
<td>Avg. Time spent in boom</td>
<td>18.45</td>
<td></td>
<td></td>
<td></td>
<td>11.40</td>
<td>7.05</td>
<td></td>
</tr>
<tr>
<td>Number of Booms</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Sample Size (years)</td>
<td>610</td>
<td>241</td>
<td>369</td>
<td></td>
<td>228</td>
<td>141</td>
<td></td>
</tr>
</tbody>
</table>

During a credit boom, credit to households is highly correlated with other types of credit. Household credit does not seem to be divorced from the positive technology shock that starts the credit boom. Instead, household credit seems to be a part of the overall phenomenon, which responds to the technology shock and results in an investment boom. For our purposes it is not necessary, however, to take a strong stand on the possible separate role of household credit. Even though we will present...
Figure A.5: Changes in Default and Productivity

(a) Whole Sample

(b) United States