Intra-Financial Lending, Credit, and Capital Formation

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Thanks to...

Institute for New Economic Thinking
Background and Data
  Motivation
  Data

Baseline Results
  VAR estimates
  Robustness tests

Extensions
  Block Bootstrap
  Rolling VARs
Background and Data
  Motivation
  Data

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  VAR estimates
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Background

- Vast expansion of the financial system...
- Intra-financial lending: banks lending to each other
- Since the 1980s, intra-financial assets as a share of total financial assets (IFA share) has increased dramatically
- What impacts has this had on the real economy?
Figure: Intra-Financial Assets as a percent of GDP
3 perspectives

Potential impacts of increased IFA:

1. Financial efficiency view
   - lower cost of capital
   - liquidity services
   - risk dispersal
   - higher credit and investment
3 perspectives

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2. Financial instability view
   - greater “interconnectedness” → risk concentration
   - higher leverage and financial fragility
   - increased credit during bubble phase but unsustainably
3 perspectives

Potential impacts of increased IFA:

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   - lower cost of capital
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3. Financial inefficiency / rent-extraction view
   - greater rent extraction along intermediation chain
   - capital is “diverted” away from investment in real sector
   - lower credit and investment
Data

- Flow of Funds Accounts (FoF)
- The ideal would be to have micro-level data
- FoF is not meant to answer this kind of question
- Can’t directly observe “network structure” of financial system
- But with a few (heroic) assumptions we can come up with some rough estimates
What we can observe...

\[ a_1 + a_2 = l_1 + l_2 \]

where 1, 2 are different financial instruments (i.e. bonds, loans, etc.)

But we would like to observe...

\[ a^f + a^n = l^f + l^n \]

where \( f, n \) denote the financial and non financial sectors, respectively
Data

\[
\text{Fin. Sector Liab.} = \alpha \times \text{Fin. Sector Asset: Corporate & Foreign Bonds} + (1-\alpha) \times \text{NonFin. Sector Liab.}
\]
Methodology: calculating intra-financial lending

- Bhatia and Bayoumi (2012)
- Assume “fixed portfolio shares” for each instrument class
- In other words, assume financial sector claims on other financial institutions for each instrument reflect the sector’s share of outstanding liabilities of that instrument
- That is,

\[ \alpha_i = \frac{\text{financial sector liabilities}_i}{\text{total liabilities}_i} \]
Once we calculate the share $\alpha_i$, intra-financial assets for each instrument type are given by:

$$a_i^f = \alpha_i a_i$$

And total intra-financial assets are:

$$a^f = \sum_i \alpha_i a_i$$

Therefore, the IFA share is:

$$\text{IFA share} = \frac{a^f}{a}$$
Figure: Intra-Financial Asset Share
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**Methodology: VAR estimates**

\[ y_t = C + A_1 y_{t-1} + A_2 y_{t-2} + u_t \]  \hspace{1cm} (1)

where

\[ y_t = \begin{bmatrix} \text{IFA share} \\ \text{Credit} \\ \text{Investment} \end{bmatrix} \]  \hspace{1cm} (2)
Figure: Orthogonalized impulse response functions

(a) IFA share $\rightarrow$ Credit

(b) IFA share $\rightarrow$ Investment

(c) Credit $\rightarrow$ Investment

(d) Investment $\rightarrow$ IFA share

These baseline results are consistent with the hypothesis that the IFA share affects aggregate investment through the provision of credit to the private sector. A shock to the IFA share has a negative short-run effect on credit supply. Since firms appear to be credit constrained, as evidenced by the strong immediate positive effect of credit on investment, this should depress investment in subsequent periods.

Granger causality test results are reported in Table 4. As can be seen in the table, we fail to reject the null hypothesis that the endogenous variables do not granger cause the dependent variable in each of the three specified equations. However, the baseline model appears to exhibit residual non-normality. As can be seen in Table 5, the Jarque-Bera test that the residuals are normally distributed is rejected at the one percent level for both the investment and IFA share equations. This issue is potentially quite severe as it calls into question inference based on the standard $t$-tests. We deal with the problem of residual non-normality below by implementing a block bootstrapping routine.
Model assumptions violated...

- Null hypothesis of normally distributed residuals is rejected
- Serial correlation
Robustness checks:

- Restricted sample (1950Q1-1999Q4)
- Additional lags
- Exogenous controls (NBER recession dummy, 3 month Treasury, corporate profit index)
- Main results not affected by robustness tests
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The Block Bootstrap

Solution: bootstrapping

- Does not impose distributional assumption
- Time series data means traditional bootstrap not valid
- Need to preserve “time dependent” data structure
- Randomly draw “blocks” of contiguous observations

Main results are not affected by residual non-normality
Figure: Distribution of bootstrap point estimates

(a) IFA share $\rightarrow$ Investment (t-1)  (b) IFA share $\rightarrow$ Investment (t-2)
Figure: Distribution of bootstrap point estimates

(c) IFA share → Credit (t-1)  
(d) IFA share → Credit (t-2)
Figure: Distribution of bootstrap point estimates

(e) Credit → Investment (t-1)  (f) Credit → Investment (t-2)
Table 12: Baseline VAR model with block bootstrapped confidence intervals. (1) Refers to the IFA share equation while (2) and (3) refer to the credit and investment equations, respectively. This VAR covers all 250 observations from the entire sample period (1950Q3-2012Q4). Asterisks (*) next to the point estimates denote significance at the 5 percent level.

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>(1) IFA 95 C.I.</th>
<th>(2) Credit 95 C.I.</th>
<th>(3) Investment 95 C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Å</td>
<td>Lower</td>
<td>Upper</td>
</tr>
<tr>
<td>IFA (t-1)</td>
<td>0.580*</td>
<td>0.518</td>
<td>0.678</td>
</tr>
<tr>
<td>IFA (t-2)</td>
<td>0.050</td>
<td>0.000</td>
<td>0.118</td>
</tr>
<tr>
<td>Credit (t-1)</td>
<td>-0.250*</td>
<td>-0.686</td>
<td>-0.086</td>
</tr>
<tr>
<td>Credit (t-2)</td>
<td>0.268*</td>
<td>0.186</td>
<td>0.649</td>
</tr>
<tr>
<td>Investment (t-1)</td>
<td>0.107*</td>
<td>0.067</td>
<td>0.177</td>
</tr>
<tr>
<td>Investment (t-2)</td>
<td>-0.047</td>
<td>-0.156</td>
<td>0.018</td>
</tr>
<tr>
<td>Constant</td>
<td>0.000</td>
<td>-0.001</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations.
Rolling VARs

Parameter stability concerns

- Do the parameters vary significantly across time?
- How stable is the estimated relationship?
- Does intra-financial lending have different effects during different periods?

Rolling VAR

- Estimate VAR model over continuous sample “windows”
- Advance estimation window one “step” at a time Allows examination of how the effects evolve over time
Consider a case with...

- Baseline 3 endogenous variable VAR model
- Window size: 80 observations (20 years at quarterly frequency)
- Step size: 1 period
Data is consistent with both the *financial inefficiency* & *financial instability* views

There are two “regimes”

**Capital diversion regime** – 1950 to 1995 & 2008 to 2012
- ↑ IFA share → ↓ credit → ↓ investment

**Bubble regime** – 1995 to 2008
- IFA share and credit are complementary, but credit growth is probably unsustainable
- ↑ IFA share → ↑ credit → ↑ investment
Figure: Rolling IRF (IFA share $\rightarrow$ Investment)
Figure: Rolling IRF (IFA share $\rightarrow$ Credit)
Figure: Rolling IRF (IFA share → Investment)

[Graph showing the response over time with estimation window end periods marked as 1970, 1980, 1990, 2000, and 2010.]
Figure: Rolling IRF (IFA share → Credit)
Conclusions...

- Higher intra-financial lending is associated with slower investment
- May operate through credit channel
- No support for financial efficiency view
- Support for both financial inefficiency and instability views
- Dramatic increase in intra-financial lending has probably lowered investment
Thank You
## Table: Granger causality tests

<table>
<thead>
<tr>
<th>Equation</th>
<th>Excluded</th>
<th>$\chi^2$</th>
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<tbody>
<tr>
<td>Investment</td>
<td>IFA share</td>
<td>18.38***</td>
</tr>
<tr>
<td></td>
<td>Credit</td>
<td>20.162***</td>
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<tr>
<td></td>
<td>All</td>
<td>46.246***</td>
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<tr>
<td>IFA share</td>
<td>Investment</td>
<td>15.510***</td>
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<tr>
<td></td>
<td>Credit</td>
<td>8.302**</td>
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<tr>
<td></td>
<td>All</td>
<td>31.978***</td>
</tr>
<tr>
<td>Credit</td>
<td>Investment</td>
<td>4.318</td>
</tr>
<tr>
<td></td>
<td>IFA share</td>
<td>10.525***</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>13.466***</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1
**Table**: Jarque-Bera residual normality test and Lagrange multiplier autocorrelation test

<table>
<thead>
<tr>
<th></th>
<th>$\chi^2$</th>
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<tbody>
<tr>
<td>IFA share</td>
<td>733.324***</td>
</tr>
<tr>
<td>Credit</td>
<td>23.418***</td>
</tr>
<tr>
<td>Investment</td>
<td>21.054***</td>
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<tr>
<td>All</td>
<td>777.797***</td>
</tr>
</tbody>
</table>

*** $p<0.01$, ** $p<0.05$, * $p<0.1$
# Intra-Financial Lending, Credit, and Capital Formation

## Outline
- Background and Data
- Baseline Results
- Extensions

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## Figure: Investment equation robustness tests

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>1950Q1-2012Q4</th>
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<th>1950Q1-1999Q4</th>
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<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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<tr>
<td>IFA share (t-1)</td>
<td>-0.113</td>
<td>0.113</td>
<td>-0.132</td>
<td>0.139</td>
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<tr>
<td>IFA share (t-2)</td>
<td>-0.228**</td>
<td>0.112</td>
<td>-0.231**</td>
<td>0.111</td>
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<tr>
<td>Credit (t-1)</td>
<td>0.539***</td>
<td>0.171</td>
<td>0.555***</td>
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<tr>
<td>Credit (t-2)</td>
<td>-0.128</td>
<td>0.174</td>
<td>-0.107</td>
<td>0.173</td>
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<tr>
<td>Investment (t-1)</td>
<td>0.708***</td>
<td>0.064</td>
<td>0.643***</td>
<td>0.067</td>
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<tr>
<td>Investment (t-2)</td>
<td>-0.062</td>
<td>0.058</td>
<td>0.028</td>
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<tr>
<td>Constant</td>
<td>0.696</td>
<td>0.438</td>
<td>0.573</td>
<td>0.659</td>
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<td>Observations</td>
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<table>
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<tr>
<td>Corporate profits</td>
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</tr>
</tbody>
</table>

Standard errors in parentheses

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