Banking Dynamics and Capital Regulation

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The Ohio State University,  
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WORK IN PROGRESS
• A threshold of a ratio between own capital and risk weighted assets.

**C A P I T A L  B U F F E R S  A S  A  F O R M  O F  R E G U L A T I O N**
Capital Buffers as a Form of Regulation

- A threshold of a ratio between own capital and risk weighted assets.

- Below this threshold, bank activities are limited to not issue dividends, nor to make new loans, while the capital recovers.
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If own capital gets very low (another threshold, say 2%) banks may get intervened or liquidated.
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• If own capital gets very low (another threshold, say 2%) banks may get intervened or liquidated.

• Rationale is to Protect the Public Purse safe when there is Deposit Insurance in the presence of moral hazard on the part of the bank.
To ease the regulation in recessions.
New Regulations, Basel III: Counter-cyclical capital buffer

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- Why?
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- How much extra credit?
- How much extra banking loses?
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- Banks cannot issue new equity or sell assets (today).
Banks may be worth saving even if bankrupt:

1. New loans are partially independent of old loans.
2. Capacity to attract deposits is valuable.
3. May get better over time on average.
4. Large bankruptcy costs.

Banks may take time to develop. They grow slowly in size due to exogenous loan productivity process and need for internal accumulation of funds.

Useful also for Shadow Banking.
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• New banks enter small $\xi$ at cost $\bar{c}^e$
Model: What are Aggregate Shocks

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• Determines the distribution of $\delta$ and may determine the transition of $\xi$.

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Note that in this version there is no interaction between banks. The distribution is not a state variable of the banks’ problem.
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- The state of the economy is a measure $x$ of banks that evolves over time itself via banks decisions and shocks (an extension of Hopenhayn’s classic)
Model: Bank's Problem

\[ V(z, \xi, a, \ell) = \max \{0, W(z, a, \ell, \xi)\} \]
**Model: Bank’s Problem**

\[ V(z, \xi, a, \ell) = \max \{0, W(z, a, \ell, \xi)\} \]

\[ W(z, \xi, a, \ell) = \max_{n \geq 0, c \geq b'} \left\{ u(c) + \beta \sum_{z', \xi', \delta'} \Gamma_{z\xi, z'\xi'} \pi_{\delta'|z'} V[z', \xi', a'(\delta'), \ell'(\delta')] \right\} \]

s.t. Note that the bank can lend \( b' < 0 \), it has operating costs and functions \( u \) and \( \xi_n \) are convex.
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\[ V(z', \xi', a'(\delta'), \ell'(\delta')) \]

s.t.

\[(TL) \quad \ell' = (1 - \lambda) (1 - \delta') \ell + n\]
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s.t.

\[ (TA) \quad a' = (\lambda + r)(1 - \delta')\ell + r n - \xi_d - b' \]
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\[ (BC) \quad c + \bar{c}^f + n + \xi_n (n) \leq a + q(z, \xi, n, \ell, b') b' + \xi_d \]
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\[ (KR) \quad \frac{n + \ell - \xi_d - q(z, \xi, \ell, n, b') b'}{\omega^r (n + \ell) + \omega^s 1_{b' < 0} b' q(z, \xi, \ell, n, b')} \geq \theta(z) \] or
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The solution to this problem is a set of functions

\[ q(\xi', \ell, n, b') \]
Model: Solution of Banks Problem given $q(\xi', \ell, n, b')$

- The solution to this problem is a set of functions
  - $b'(z, \xi, a, \ell)$ bonds borrowing (or safe lending)

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The solution yields a probability of a bank failing:

- \( \delta^*(z, \xi, \ell, n, b') \)
The only relevant equilibrium condition is

1. Zero profit in the bonds markets:

\[ q(z, \xi, \ell, n, b') = \frac{1 - \delta^*(z, \xi, \ell, n, b')}{1 + \bar{r}} \]
Model: Aggregate State, \( \{z, x\} \)

- The choices of the bank \( \{n(z, \xi, a, \ell), b'(z, \xi, a, \ell), c(z, \xi, a, \ell)\} \) and the exogenous shocks \( \{z', \xi', \delta'\} \) generate a transition for the state of each bank and in turn of the distribution of banks.
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Definition

A, equilibrium is a function \( x' = G(z, x) \), a price of bonds \( q \), and decisions for \( \{n, b', c\} \) such that banks maximize profits, lenders get the market return, and the measure is updated consistently with decisions and shocks.
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● Describe Targets
Plan

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- Describe properties of the stationary allocation in good times.
• Describe Targets

• Describe properties of the stationary allocation in good times.

• Describe the transition when the economy switches to a recession.
We have the following industry properties

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Normalized T-Account of Banking Industry

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<td>Deposits</td>
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</tr>
<tr>
<td>$\xi^1_n$</td>
<td>0.15</td>
<td>Loan issuance cost: $\chi(n, \xi_n) = \xi^0_n n + 0.5 \xi^1_n$</td>
</tr>
<tr>
<td>$\xi_d$</td>
<td>5</td>
<td>Deposits</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.95</td>
<td>Subjective discount factor</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>0.2</td>
<td>Maturity rate of long-term loans</td>
</tr>
<tr>
<td>$r$</td>
<td>0.1</td>
<td>Bank lending rate</td>
</tr>
<tr>
<td>$r_f$</td>
<td>0.005</td>
<td>Risk-free rate</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>0.9</td>
<td>$u(c) = c^\sigma$</td>
</tr>
<tr>
<td>$\omega_r$</td>
<td>1</td>
<td>Risk weight on risky loans</td>
</tr>
<tr>
<td>$\omega_s$</td>
<td>0</td>
<td>Risk weight on safe assets</td>
</tr>
<tr>
<td>$\Gamma_{z=G,z'=G}$</td>
<td>0.99</td>
<td>$\Pr(z' = G</td>
</tr>
<tr>
<td>$\Gamma_{z=B,z'=B}$</td>
<td>0.80</td>
<td>$\Pr(z' = B</td>
</tr>
<tr>
<td>$E(\delta</td>
<td>z = G)$</td>
<td>0.025</td>
</tr>
<tr>
<td>$V(\delta, Z = G)$</td>
<td>0.0015</td>
<td>$\alpha(Z = G) = 0.3847, \beta(Z = G) = 15.0011$</td>
</tr>
</tbody>
</table>
DISTRIBUTION OF BANKS
Banks Dividends
Banks New Loans Issue

![Graph showing new loans and cash in hand over time](image-url)
Banks Wholesale Funding (Deposits plus Bonds)
Banks Value Function
• Imagine the shock $\triangle E(\delta) = 0.015$ (from .025 to .04) hits all banks, which happens with a very small probability, 0.01. The crisis continues for two periods and ends to go back to the good aggregate state thereafter.

• Some banks are in better financial shape than others.

• We explore the recovery of the Banking sector under the four scenarios.

• What happens upon
A Nasty Crisis with and without CCyB

Bank distribution - one period after the shock
Comparison of bank distributions before and after the shock
Recall that it is a recession for two periods and then we have a recovery.

We compare Countercyclical Capital Requirement with a constant weight to risk assets (left) and with a variable weight (right).

We look at impulse responses.
Small difference between non-contingent policy and CCyB during the downturn. CCyB (if low capital requirement extends for a longer period) provides some help during the recovery.
Stock of Loans

Always 10.5%
CCyB 8% during recovery

• Almost no difference between non-contingent policy and CCyB
DIVIDENDS

- Again almost no difference

Percentage Change from the common initial state
Dividend
Always 10.5%
CCyB
8% during recovery
## Wholesale Funding

![Wholesale Funding Graph](image)

- **Percentage Change from the common initial state**
  - Wholesale Funding (QB)
  - Always 10.5%
  - CCyB 8% during recovery

### Explanation

The graph illustrates the percentage change from the common initial state for Wholesale Funding (QB) under different scenarios:

- **Always 10.5%**: A constant percentage change of 10.5%.
- **CCyB 8% during recovery**: A scenario where CCyB is applied with an 8% change during recovery.

The graph shows the trend over time, with axes representing time in increments of 2 units and percentage change in increments of 10 units.
• Almost no difference, the capital ratios go up under both non-contingent and CCyB.
Bank Default Probability

Always 10.5%
CCyB 8% during recovery
Bank Equity

- Own capital is somewhat affected.

- Equity:
  - Always 10.5%
  - CCyB 8% during recovery
This is what the Counter Cyclical Capital Requirement directly does.
Directions of Current Work

- To replicate the Industry structure properly
Directions of Current Work

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  - Size of Banks in terms of Numbers and Dollars (large and small banks)
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Outside financing (bonds)
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SHORTCOMINGS AND EXTENSIONS

- Competitive Theory of Lending (Corbae and D’Erasmo (2016))
Shortcomings and Extensions

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Bank Runs:
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- Contagion, financial crisis. This needs serious thinking.
We measure the effects of countercyclical capital requirements.

• We insist in capturing the margins that we deem important:
  1. Moral Hazard
  2. Bank’s risk taking that can lead to its failure
  3. Endogenous bank funding risk premium
  4. Maturity mismatch between long-term loans & short-term funding

• Lowering capital requirements has little effect because banks are already concerned.

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New Lending by Banks: with 8% Capital Requirement during Recovery
Consider a household with per period utility function $u(c, d)$, where $d$ stands for deposits’ services.
General Equilibrium

- Consider a household with per period utility function $u(c, d)$, where $d$ stands for deposits’ services.
- Deposits are created via matches with banks. Total (and per capita) deposits are the aggregate of bank services. We can think of a matching function with banks.

$$D = \int \xi_d \, dx$$
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• Deposits are created via matches with banks. Total (and per capita) deposits are the aggregate of bank services. We can think of a matching function with banks.

$$D = \int \xi_d \, dx$$

• Households own shares of a mutual fund
References


Representative Bank-Representative Household
version of Dynamics and Capital Regulation

José-Víctor Ríos-Rull       Tamon Takamura       Yaz Terajima
University of Pennsylvania  Bank of Canada            Bank of Canada

May 25, 2017
1 Linear Costs for Banks
There is a household sector with indivisible labor (many workers in a household).

There is a banking sector that produces deposits’ services and make loans with CRS.

There is a productive sector with a putty clay technology.

Otherwise it is a growth model.

There may be shocks to TFP, to the destruction of new and old firms, and to the banking management losses.

But we start looking at a steady state
Households

- Period utility $u(c, n, d)$, where $n$ is the fraction employed and $d$ stands for deposits’ services. Discount rate $\beta$.

- Deposits are created via matches with banks. We can think of a matching function with banks.

- A household has a measure one of workers that may or may not have a job. Employment in loan firms is $n^l$ while employment in equity firms is $n^e$, $n^l + N^e \leq 1$. A household member that does not work gets $\bar{c}$ units of utility consumption.

$$u(c, n, d) = \log c + (1 - n)b + v(d)$$
Firms create plants with one worker using loans in a putty-clay fashion $y = A k^\alpha$.

There is free entry of these firms. Upon entry, firms (which are worth zero) join a mutual fund with their liabilities.

With prob $\lambda$ loans are paid off.

All firms get destroyed with probability $\delta \sim \gamma \delta$.

Extensive margin: There are $N^n$ new firms each period.

Intensive margin: Each period firms invest $k$ units.

Total amount of new loans is $L^n = k * N^n$.

The whole distribution of firms can be summarized by two aggregates (as in Choi and Ríos-Rull (2010) and others)

Employment or the number of plants is

$$N' = (1 - \delta)N + N^n.$$  

Output is

$$Y' = (1 - \delta')Y + N^n A k^\alpha.$$
**Investment and Firms**

- Firms borrow at rate $r^\ell$.
- The value a newly opened firm with capital $k$ using the effective household interest rate $r^b$ is

$$\frac{\Pi^f(k)}{1 + r^b} = \left[ Ak^\alpha - w(k) + \frac{1 - \delta'}{1 + r^b} \Pi^f(k) \right]$$

where $w(k)$ are wages and $r^b$ is the market discount rate. So

$$\Pi^f(k) = \frac{1 + r^b}{r^b + \delta} \left[ Ak^\alpha - w(k) \right].$$

- The cost of a loan of size $k$ is

$$\sum_{t=1}^{\infty} k \left[ r^\ell + \frac{\lambda}{1 - \lambda} \right] \left( \frac{1 - \lambda}{1 + r^b} \right)^t = k \left[ r^\ell + \frac{\lambda}{1 - \lambda} \right] \frac{1 - \lambda}{r^b + \lambda}.$$
So the optimal size satisfies

\[
\max_k \frac{A k^\alpha - w(k)}{r^b + \delta} - k \left[ r^\ell + \frac{\lambda}{1 - \lambda} \right] \frac{1 - \lambda}{r^b + \lambda}.
\]

With FOC

\[
A \alpha k^{\alpha - 1} - w_k(k) = \left( (1 - \lambda) r^\ell + \lambda \right) \frac{r^b + \delta}{r^b + \lambda}.
\]

Firms enter until there are zero profits from doing so

\[
\frac{A k^\alpha - w(k)}{r^b + \delta} = k \left[ r^\ell + \frac{\lambda}{1 - \lambda} \right] \frac{1 - \lambda}{r^b + \lambda}.
\]
Because upon creation firms are worth zero there is no need to worry about their value.

Once created, firm’s profits or loses go to the households who do not buy and sell firms and take those profits as given.

Profits of all firms are

\[ \pi^f = Y - WN - L[(1 - \lambda)r^\ell + \lambda] \]
Wage Determination

- A bargaining process between the firm and the worker. V: (We may change this to get more wage rigidity and avoid the Shymer puzzle)

- The bargaining process is repeated every period and if unsuccesfull neither firm nor worker can partner with anybody else within a period. Let $\mu$ be the bargaining weight of the worker. Then, because of log utility, we have

$$w(k) = \mu A k^\alpha + (1 - \mu) \frac{b}{C}$$

- Total (per capita) Labor Income paid in the Economy are

$$WN = N \left[ \mu A k^\alpha + (1 - \mu) \frac{b}{C} \right] = \mu Y + (1 - \mu) \frac{Nb}{C}$$
- A CRS banking industry uses output to produce deposits and to make loans.
- Loans are long term and decay at rate $\lambda$. Deposits are short term.
- It borrows and lends short term bonds $B'$ at interest rate $r^b$.
- A fraction $\delta^\ell$ of the loans are destroyed.

\[ D' = \kappa_d Y^d \]
\[ L^n = \kappa_\ell Y^\ell \]
\[ L' = (1 - \delta'^\ell)(1 - \lambda)L + L^n \]

- Banks cash position

\[ A' = (\lambda + r^\ell(1 - \lambda))(1 - \delta'^\ell)L + r^\ell L^n - D'(1 + r^d) - B'(1 + r) \]
• Bank’s Budget Constraint \( \pi^B \) are dividends

\[
\pi^B + L^n \left( 1 + \frac{1}{\kappa_\ell} \right) = A + B' + D' \left( 1 - \frac{1}{\kappa_d} \right)
\]

• Due to linearity of technology banks have zero steady state profits. \( \pi^B = 0 \).

• This is not the case outside steady state.
• Let \( r^\ell(r^b) \) and \( r^b(r^b) \) be the interest rates of bonds and deposits when the Capital Requirement constraint is not binding.

\[
1 + \frac{1}{\kappa_\ell} = \sum_{t=1}^{\infty} \left[ \frac{(1 - \lambda)(1 - \delta)}{1 + r^b} \right]^{t-1} [(1 - \lambda)r^\ell + \lambda]
\]

\[
r^d = r^b - \kappa_d
\]

\[
r^\ell = \left[ \left(1 + \frac{1}{\kappa_\ell} \right) \frac{r^b + \lambda + \delta - \lambda \delta}{(1 + r^b)} - \lambda \right] \frac{1}{1 - \lambda}
\]
Households lend funds to banks at rate $r^b$. We call them bonds, $B$. 
• Budget constraint of households

\[ c + d' + b' = b(1 + r^b) + d(1 + r^d) + W n + \pi^f + \pi^b \]
**Definition of a Steady-State Equilibrium**

- Stocks: \( Y, N, \Pi, A, B, L, D \),
- Choices: \( K, C, A', B', D', L^N, N^n \), s.t.
- Prices \( r^\ell, r^b, r^d, W, w(k) \)
- Profits \( \pi^f, \pi^B \)

1. Plant sizes are optimal
2. Entry yields zero profits
3. Households solve their problem \( r^b = \beta^{-1}, u_c = u_d \frac{1}{\kappa_d} \)
4. Wages are determined by Nash bargaining
5. The choices imply that the stocks repeat themselves
Non-Steady-State Equilibrium: Shocks for $\eta = \{z, \delta, \delta^l\}$

- As is standard in putty-clay models, there is no need to keep track of the whole distribution of firms. Only of output and number of plants/workers. The aggregate state vector $S$ consists of
  - The shocks $\eta$
  - $Y$ Output
  - $N$ Employment or number of plants
  - $A$ Banks Cash
  - $B$ Bonds
  - $D$ Deposits
  - $L$ Loans
- Households also have an idiosyncratic state vector $s = \{b, d, n\}$. 
\[ \nu(S, s) = \max_{c, b', d'} u(c, d, n) + \beta E \{ \nu(S', s') | S, s \} \quad \text{s.t.} \]

\[ c + d' + b' = b[1 + r^b(S)] + d[1 + r^d(S)] + W(S) n + \pi^f(S) + \pi^b(S) \]

\[ N'(S) = (1 - \delta')N + N^n(S) \]

\[ n'(S, s) = (1 - \delta')n(S, s) + N^n(S) \]

\[ Y'(S) = (1 - \delta')Y + N^n(S) z A k(S)^\alpha \]

\[ L'(S) = (1 - \delta'^\ell)(1 - \lambda)L + L^n(S) \]

\[ A'(S) = A'(S) \]

\[ B'(S) = B'(S) \]

\[ D'(S) = D'(S) \]

- With solution \( d'(S, s) \) and \( b'(S, s) \), as well as \( \nu(S, s) \)
Firms’ Problem

- The value of firms with loans $\Pi^\ell$ and of firms without loans $\Pi^e$ is

  $$\Pi^\ell(S, k) = zAk^\alpha - w(S, k) - kr^\ell(S) +$$

  $$E\left\{ (1 - \delta') \left( (1 - \lambda)\Pi^\ell(S', k) + \lambda [\Pi^e(S', k) - k] \right) \bigg| S \right\}$$

  $$\Pi^e(S, k) = zAk^\alpha - w(S, k) + E\left\{ (1 - \delta') \frac{\Pi^e(S', k)}{1 + r^b(S')} \bigg| S \right\}$$

- The cost of a loan of size $k$ is $E\left\{ \frac{kr^\ell(S') + \Phi(S'', k)}{1 + r^b(S')} \bigg| S \right\}$

  $$\Phi(S, k) = k[(1 - \lambda)r^\ell + \lambda] + (1 - \lambda) E\left\{ \frac{(1 - \delta^\ell)\Phi(S', k)}{1 + r^b(S')} \bigg| S \right\}$$
Firms’ Problem II

- So the optimal size satisfies

\[
\max_k \mathbb{E} \left\{ \frac{\pi^\ell(S', k)}{1 + r^b(S')} - \frac{kr^\ell(S') + \Phi(S'', k)}{1 + r^b(S'')} \bigg| S \right\}
\]

- V: COMPUTE THE FOC

- Firms enter until there are zero profits from doing so

\[
\mathbb{E}\left\{ \frac{\pi^\ell(S', k)}{1 + r^b(S')} \bigg| S \right\} = \mathbb{E}\left\{ \frac{kr^\ell(S') + \Phi(S'', k)}{1 + r^b(S'')} \bigg| S \right\}
\]
Recursive Competitive Equilibrium

- Laws of motion $N'(S), Y'(S), L'(S), B'(S), D'(S),$
- Decision rules and value functions for households $d'(S, s), b'(S, s),$ and $v(S, s),$ and firms $k(S), N^n(S), \Pi^\ell(S), \Pi^e(S).$
- Prices $r^b(S), r^\ell(S), r^d(S), w(S, k), W(S),$ and Profits $\pi^f(S), \pi^B(S)$

1. Households and Firms solve their problems
   1.1 Euler equation of Households $u_c(S) = E\{\beta(1 + r^b(S'))u_c(S') \mid S\}.$
   1.2 Marginal utility of deposits equals $E\left\{\frac{r^b(S') - r^d(S')}{1 + r^b(S')} \mid S\right\}$
   1.3 Optimal choice of $k$
2. Rep Agent: $B'(S) = b'(S, s(S)), D'(S) = D'(S, s(S)), n'(S, s(S)) = N'(S).$
3. Interest rates yield zero expected profits to banks
4. Realized profits are
   $$\pi^f(S) = zY - NW - L[(1 - \lambda)r^b + \lambda L]$$
   $$\pi^B(S) = A - (1 - \lambda)(1 - \delta)L$$
5. Wages are set by Nash bargaining.
2 Non-linear Costs for Banks
Banks use output to produce deposits and to make loans, $d' = \kappa_d y^d$ and $\ell^n = \kappa_\ell y^\ell$.

Loans are long term and decay at rate $\lambda$. Deposits are short term.

It borrows and lends short term bonds $B'$ at interest rate $r^b$.

A random fraction $\delta^{\ell}$ of the loans are destroyed. There are increasing costs with that destruction: $\ell' = (1 - \delta'^{\ell})(1 - \lambda)\ell + \ell^n$

Banks cash position

$$a' = (\lambda + r^{\ell}(1 - \lambda))(1 - \delta^{\ell})\ell + r^{\ell}\ell^n - d'(1 + r^d) - b'(1 + r^b) - \xi(\delta^{\ell})\ell$$

There is a capital requirement

$$\frac{\ell + \ell^n - d' - b'}{\ell + \ell^n} \geq \theta$$

There is curvature in the bank’s dividends $\Phi(m)$
**Banking Industry: Banks Problem**

\[ \Omega(S, a, \ell) = \max_{d', b', \ell^n} \Phi \left[ a - \ell^n \left( 1 + \frac{1}{\chi \ell} \right) + d' \left( 1 - \frac{1}{\chi \ell} \right) + b' \right] + \]

\[ + E \left\{ \frac{\Omega[S', a'(S'), \ell'(S')]}{1 + r^b(S')} \middle| S \right\} \quad \text{s.t.} \]

\[ a'(S') = (\lambda + r^\ell(S')(1 - \lambda))(1 - \delta^\ell)\ell + r^\ell(S')\ell^n - d'[1 + r^d(S')] - b'[1 + r^b(S')] - \xi(\delta^\ell)\ell \]

\[ \ell'(S') = (1 - \delta'^\ell)(1 - \lambda)\ell + \ell^n \]

\[ \theta \leq \frac{\ell + \ell^n - d' - b'}{\ell + \ell^n} \]
Dividends and bonds interest rates are linked mechanically as they are perfect substitutes for banks. Wrt new loans $\ell^n$ we have

$$-\Phi_m \left(1 + \frac{1}{\chi_\ell}\right) + E\left\{\frac{r\ell \Omega' + \Omega'_3}{1 + rb(S')}\right\} + \mu(KREQ) = 0$$

WRT bonds we have

$$\Phi_m - E\{\Omega'_2\} - \mu(KREQ) = 0$$

The envelope conditions tell us that

$$\Omega_2 = \phi_m + \frac{\partial \ell^n}{\partial a} \left[\phi_m \left(1 + \frac{1}{\chi_\ell}\right) + E\left\{\frac{r\ell \Omega' + \Omega'_3}{1 + rb(S')}\right\} + \mu(KREQ)\right]$$

$$\Omega_3 = E\{\lambda + r\ell(S')(1 - \lambda)(1 - \delta\ell) - \xi(\delta\ell)\} + E\{(1 - \delta'\ell)(1 - \lambda)\Omega'_3\}$$
Let $r^\ell(r^b)$ and $r^b(r^b)$ be the interest rates of bonds and deposits when the Capital Requirement constraint is not binding.

\[
1 + \frac{1}{\kappa_\ell} = \sum_{t=1}^{\infty} \left[ \frac{(1 - \lambda)(1 - \delta)}{1 + r^b} \right]^{t-1} \left[ (1 - \lambda)r^\ell + \lambda \right]
\]

\[
r^d = r^b - \kappa_d
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r^\ell = \left[ \left(1 + \frac{1}{\kappa_\ell} \right) \frac{r^b + \lambda + \delta - \lambda \delta}{(1 + r^b)} - \lambda \right] \frac{1}{1 - \lambda}
\]
Brought to center stage by the troubles of Home Capital in Canada

Because financial institutions specialize, this does not add state variables.

Still need a theory of why are they trouble.
Model: An Extension Shadow Banking

- Brought to center stage by the troubles of Home Capital in Canada
- No deposits ($\xi_d = 0$), just bonds, but particularly good at issuing high risk loans.
Brought to center stage by the troubles of Home Capital in Canada

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Brought to center stage by the troubles of Home Capital in Canada

No deposits ($\xi_d = 0$), just bonds, but particularly good at issuing high risk loans.

The only thing to add is a distinction between low and high risk loans.

Because financial institutions specialize, this does not add state variables.

Still need a theory of why are they trouble.