

Banking Dynamics and Capital Regulation

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Insanely Preliminary

MOTIVATION: A FEATURE OF NEW BANKING REGULATIONS, BASEL III

- Counter-cyclical capital buffer
- Why?
 1. Maintain the Public Purse safe when there is Deposit Insurance
 2. Banking Activity (lending) is more socially valuable in Recessions when banks could have to drastically reduce their lending to comply if adversely affected.
- We want to **Measure** the trade-offs involved when taking into account many (quantitatively) relevant features.
- Analyze a change in minimum capital requirements on the onset of a recession.
 - How much extra credit?
 - How much extra banking loses?

COUNTER-CYCLICAL CAPITAL BUFFER (CCyB)

- Raise the resilience of the banking sector by conserving capital in good times that can be used in the period of stress. (Basel Committee on Banking Supervision 2011)
- Regulator is aiming to smooth aggregate credit cycles. So banks making loans is more valuable in Recessions.
- Credit can recover faster if after bad outcomes banks can temporarily go under the capital requirement ratio.

- Davydiuk (2017).
 - There is overinvestment due the moral hazard of investors (banks) that do not pay depositors
 - The overinvestment is larger in expansions because of decreasing returns and bailout wedge increasing in lending.
 - Nicely built on top of an infinitely lived RA business cycle model.
- Corbae et al. (2016) is quite similar except, single bank problem with market power, and constant interest borrowing and lending. Done to have structural models of stress testing.

WHAT IS A BANK?

- A costly to start technology that has an advantage at
 1. Attracting deposits at zero interest rates (provides services)
 2. Matching with borrowers and can grant long term “risky loans” at interest rate r with low, but increasing, emission costs.
 3. It can borrow in addition to deposits and default.
- Its deposits are insured but its loans and its borrowing are not.
- There is a moral hazard problem.

FEATURES TO INCLUDE

- 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. Enormous 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.

MODEL: NO AGGREGATE UNCERTAINTY

- A bank is $\xi = [\xi_d, \xi_\ell]$, exogenous, Markovian with transition Γ^ξ . Its access to deposits; its costs of making new loans.
- At bank has liquid assets a that can (and are likely to) be negative and long term loans ℓ (decay at rate λ).
- Banks make new loans n , distribute dividends c and issue risky bonds b' at price $q(\xi, \ell, n, b')$.
- The bank is subject to shrinkage shocks to its portfolio of loans δ , π_δ , that may bankrupt it. Costly liquidation ensues.
- New banks can enter drawing ξ from γ^ξ at cost \bar{c}^e
- The steady state is a measure x of banks that reproduces itself via banks decisions and shocks (a la Hopenhayn)

MODEL: BANK'S PROBLEM

$$V(\xi, a, \ell) = \max \{0, W(a, \ell, \xi)\}$$

$$W(\xi, a, \ell) = \max_{n \geq 0, c \geq b'} \left\{ u(c) + \beta \sum_{\xi'} \Gamma_{\xi, \xi'} \sum_{\delta'} \pi_{\delta} V[\xi', a'(\delta'), \ell'(\delta')] \right\} \text{ s.t.}$$

$$(TL) \quad \ell' = (1 - \lambda)(1 - \delta')\ell + n$$

$$(TA) \quad a' = (\lambda + r)(1 - \delta')\ell + r n - \xi_d - b'$$

$$(BC) \quad c + \bar{c}^f + n + \xi_n(n) \leq a + q_b(b', n, \ell, \xi')b' + \xi_d$$

$$(KR) \quad \frac{n + \ell - \xi_d + q(\xi', \ell, n, b')b'}{\omega^r(n + \ell) + \omega^s \mathbf{1}_{b' < 0} b' q(\xi', \ell, n, b')} \geq \theta$$

Note that the bank can lend $b' < 0$, it has operating costs \bar{c}^f (nonlinear u and functions ξ^n are convex).

MODEL: SOLUTION OF BANKS PROBLEM GIVEN $q(\xi', \ell, n, b')$

- The solution to this problem is a pair of functions
 - $b'(\xi, a, \ell)$
 - $n(\xi, a, \ell)$
- The solution yields a probability of a bank failing
 - $\delta^*(\xi', \ell, n, b')$

The only relevant equilibrium condition is

1. Zero profit in the bonds markets:

$$q(\xi', \ell, n, b') = \frac{1 - \delta^*(\xi', \ell, n, b')}{1 + \bar{r}}$$

- The choices of the bank $\{n(\xi, a, \ell), b'(\xi, a, \ell)\}$ and the exogenous shocks $\{\xi, \delta\}$ generate a transition for the state of the bank that can be used to update the measure of banks.

Definition

A Steady state is a measure of banks x^* , a price of bonds q , and decisions for $\{n, b'\}$ such that banks maximize profits, lenders get the market return, and the measure is stationary.

STEADY STATE TARGETS (SIMILAR SIZE BANKS)

CAPITAL REQUIREMENT: $\theta = .08$

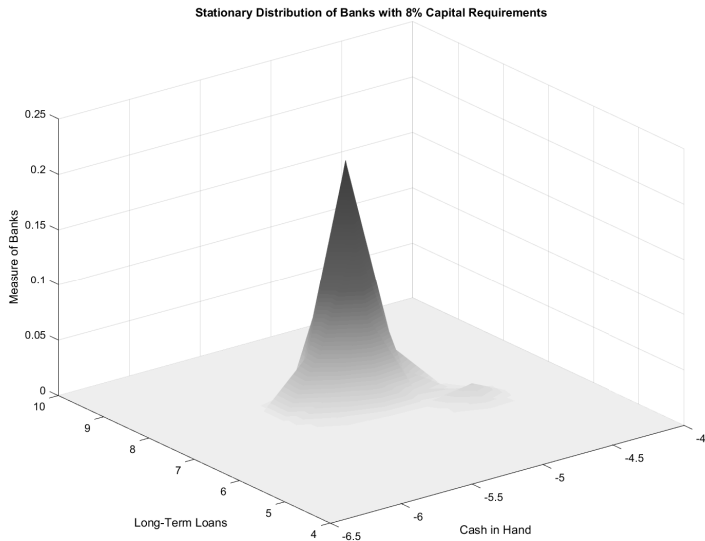
- We have the following industry properties

	(Canadian) Data	Model
Bank failure rate	0.22%	0.08%
Capital ratio	14.4%	16.93%
Wholesale Funding	49.0%	27.40%

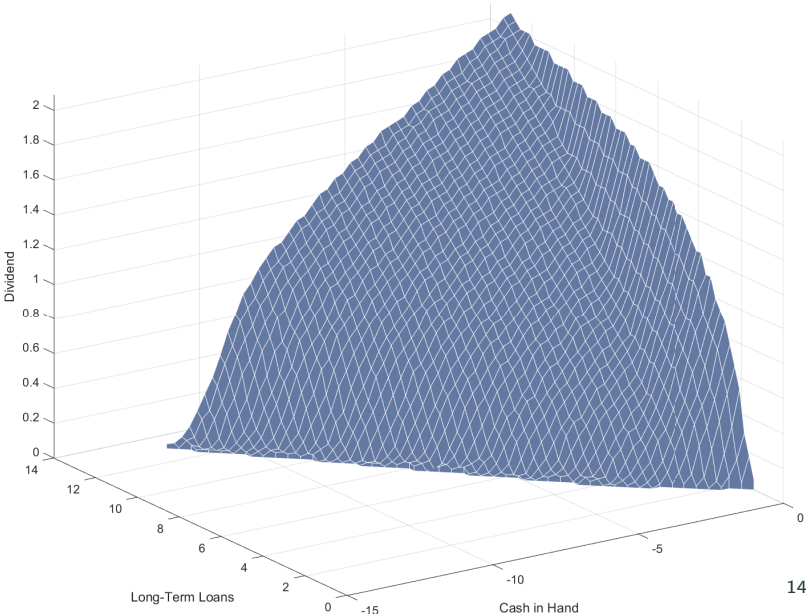
T-Account of Banking Industry

New Loans	1.61	Deposits	5
Existing Loans	7.36	Wholesale Funding	2.46
		Own Capital	1.51
All	8.97	All	8.97

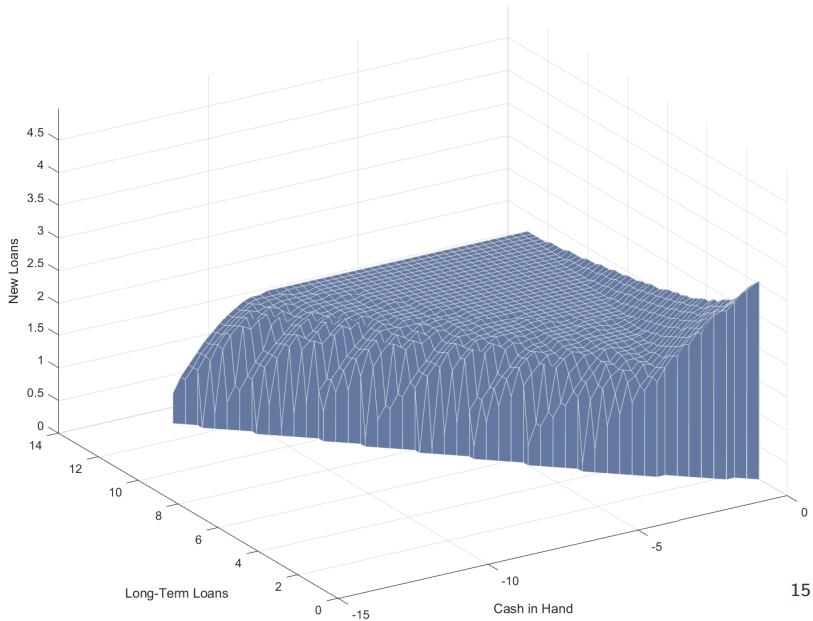
DISTRIBUTION OF BANKS



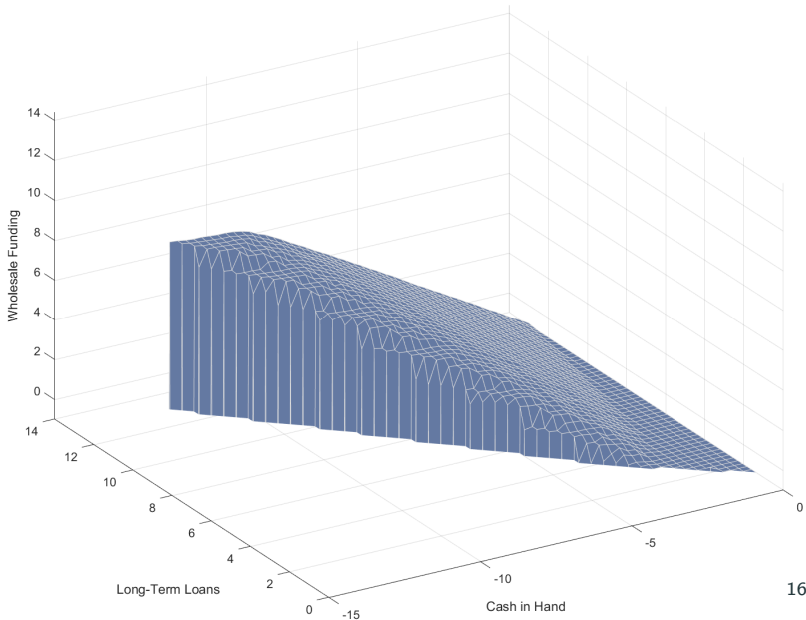
BANKS DIVIDENDS



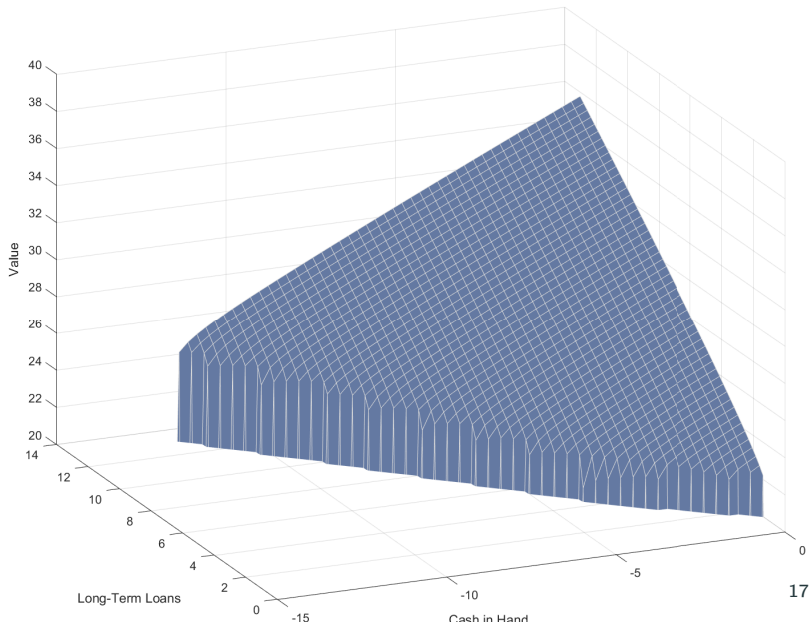
BANKS NEW LOANS ISSUE



BANKS WHOLESALE FUNDING (DEPOSITS PLUS BONDS)



BANKS VALUE FUNCTION

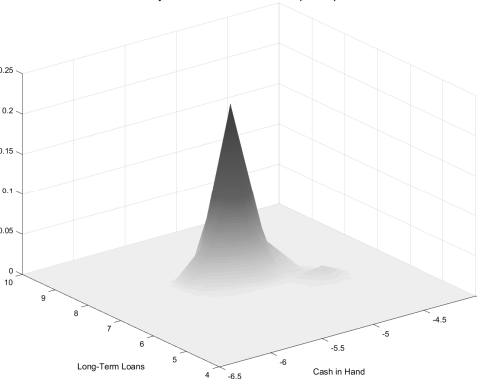


A NASTY CRISIS WITH AND WITHOUT CCyB

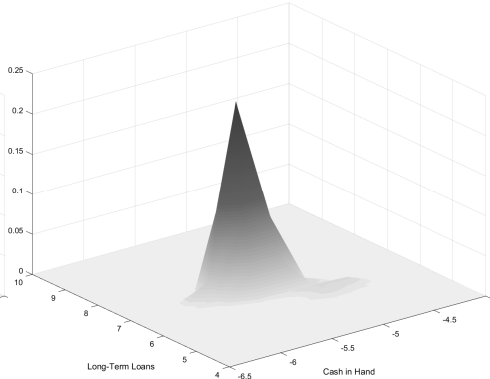
- Imagine the shock $\delta = .1$ hits all banks. (MIT?)
 - Some banks are in better financial shape than others.
 - We explore the recovery of the Banking sector under a tight $\theta = .08$ and a looser $\theta = .04$ Capital Requirement. starting in the period after the shock and thereafter.
1. With a harsh definition of capital requirement: Violation implies bankruptcy.
 2. Less strict definition: Violation implies no dividends and no additional loans, but may have to borrow.

A NASTY CRISIS WITH AND WITHOUT CCyB

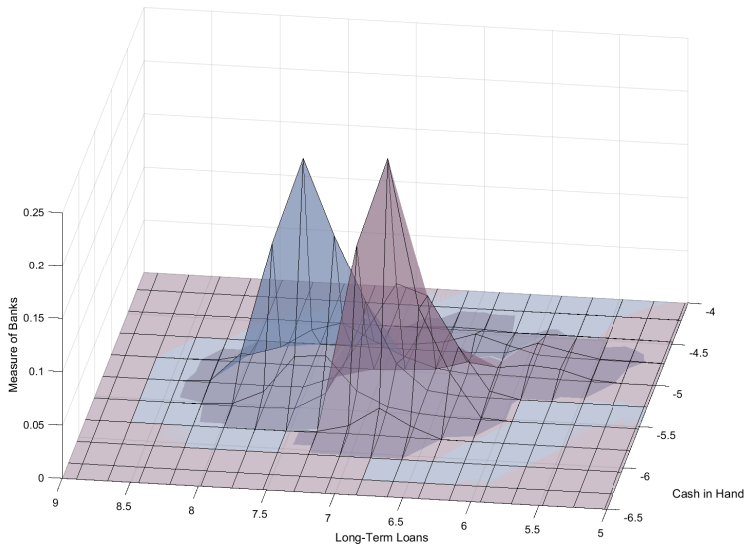
Stationary Distribution of Banks with 8% Capital Requirements



One Period After the Shock

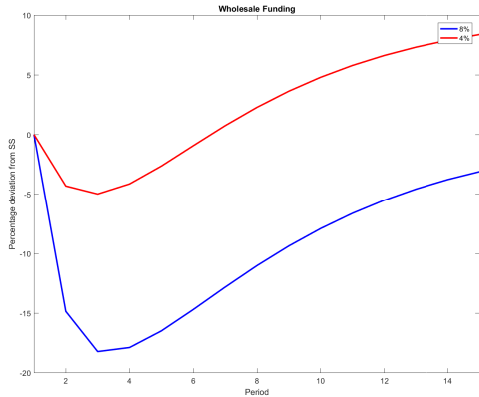
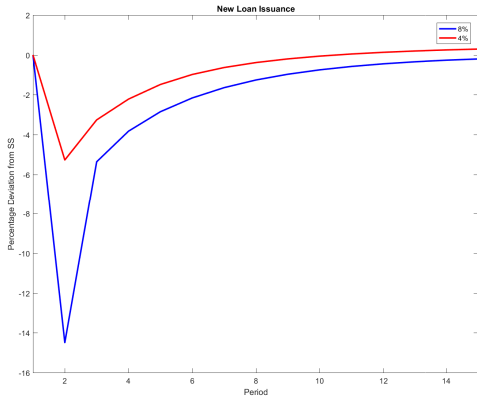


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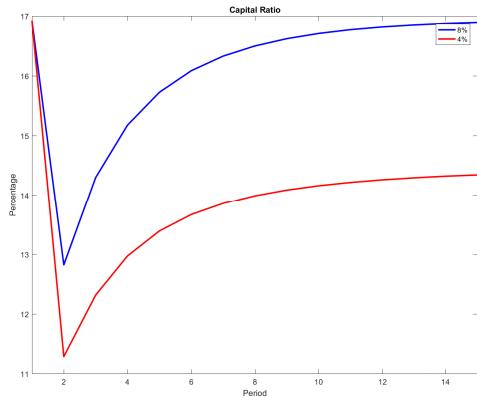
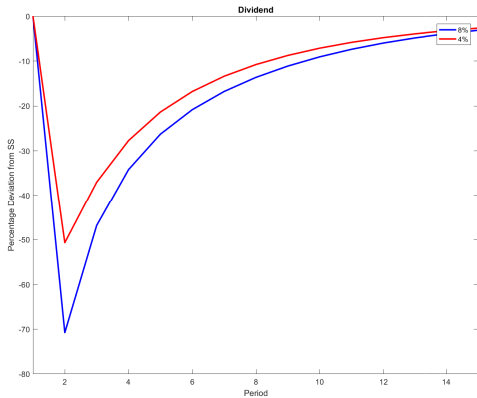
BORROWING/LENDING BY BANKS 8% 4%

HARSH NOTION OF CAPITAL REQUIREMENT



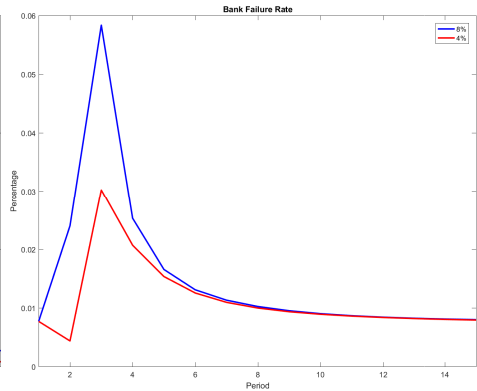
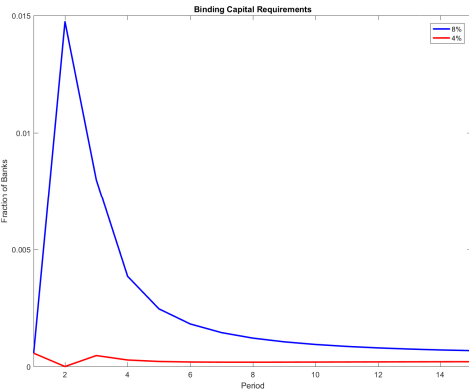
DIVIDENDS/CAPITAL RATIO 8% 4%

HARSH NOTION OF CAPITAL REQUIREMENT



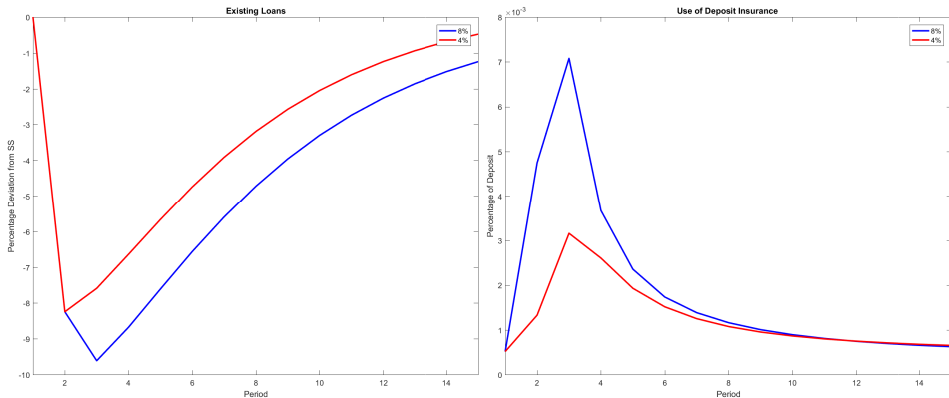
BINDING CAPITAL REQUIREMENT/FAILURE RATES 8% 4%

HARSH NOTION OF CAPITAL REQUIREMENT



TOTAL LENDING/DEPOSIT INSURANCE USED 8% 4%

HARSH NOTION OF CAPITAL REQUIREMENT



HARSH NOTION OF CAPITAL REQUIREMENT

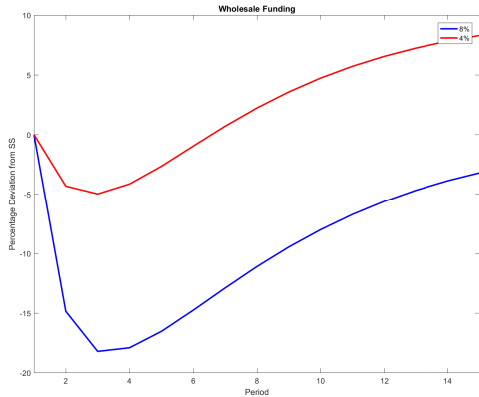
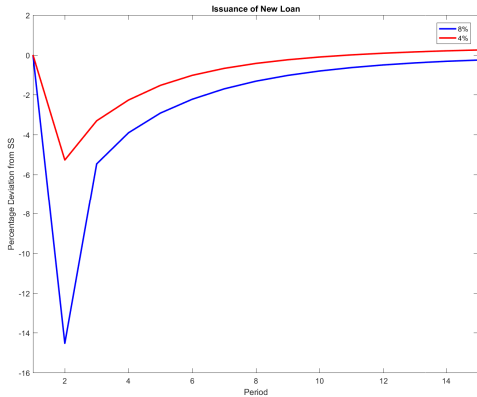
- It is a no brainer.
- Lowering the Capital Requirement is a win win Situation
 1. More Loans
 2. Less disbursement of Deposit Insurance

ALTERNATIVE, SOFTER, INTERPRETATION OF CAPITAL REQUIREMENTS

- Violation of Capital Requirement does not lead to bankruptcy.
- It leads to zero Loans, zero Dividends, and borrowing whatever is needed.

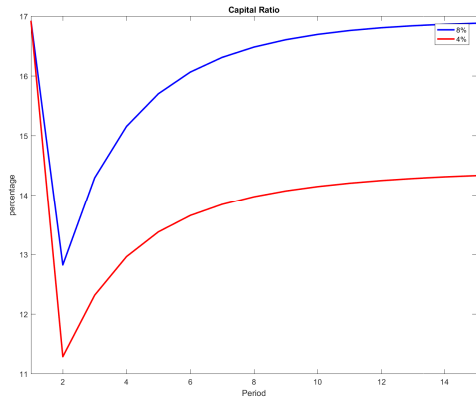
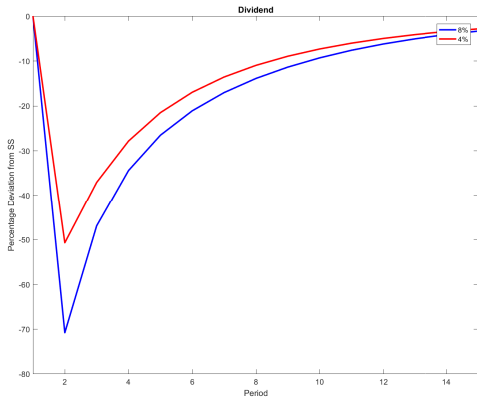
BORROWING/LENDING BY BANKS 8% 4%

SOFT NOTION OF CAPITAL REQUIREMENT



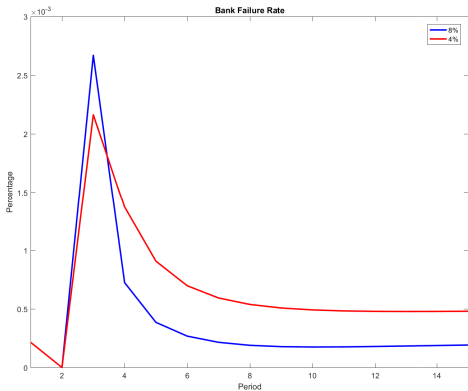
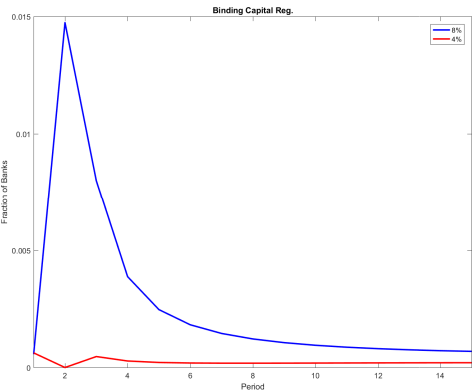
DIVIDENDS/CAPITAL RATIO 8% 4%

SOFT NOTION OF CAPITAL REQUIREMENT



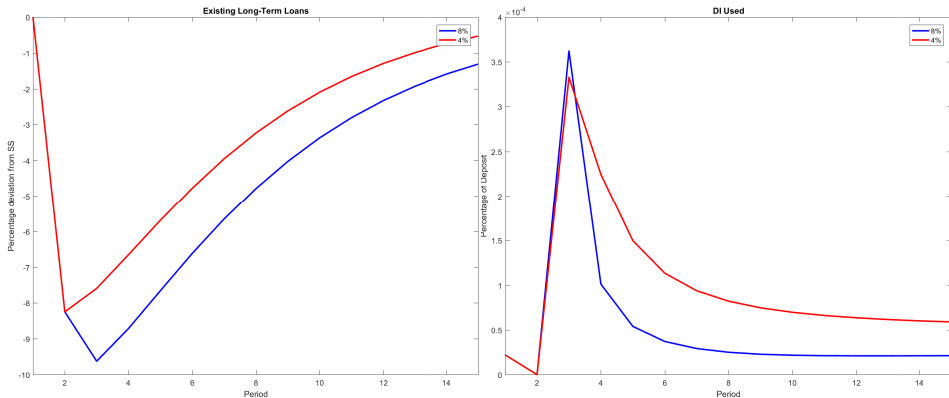
BINDING CAPITAL REQUIREMENT/FAILURE RATES 8% 4%

SOFT NOTION OF CAPITAL REQUIREMENT



TOTAL LENDING/DEPOSIT INSURANCE USED 8% 4%

SOFT NOTION OF CAPITAL REQUIREMENT



SOFT NOTION OF CAPITAL REQUIREMENT

- There is a trade-off: A CCyB implies
 1. More Loans (8-10% more)
 2. Slightly and longer disbursement of Deposit Insurance.

CONCLUSION I

- A model to measure effects of countercyclical capital requirements.
- We insist in the model capturing certain 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 two effects
 1. Leads surviving banks to take more risk through lowering capital ratio/raising leverage
 2. Allows some banks that would otherwise fail due their infeasibility to satisfy the requirements

CONCLUSION II

- The quantitative effects on loans do not seem to be affected by how harsh is the punishment for violation of CCyB.
- The amount paid as Deposit Insurance is affected by that harshness.
- Preliminary findings are that CCYB generates more loans and somewhat more Deposit Insurance payments.
- But it is still Preliminary

References

Corbae, Dean, Pablo D'Erasmus, Sigurd Galaasen, Alfonso Irarrazabal, and Thomas Siemsen. 2016. "Structural Stress Tests." Mimeo, University of Wisconsin.

Davydiuk, Tetiana. 2017. "Dynamic Bank Capital Requirements."
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