Credit Booms, Financial Crises and Macroprudential Policy

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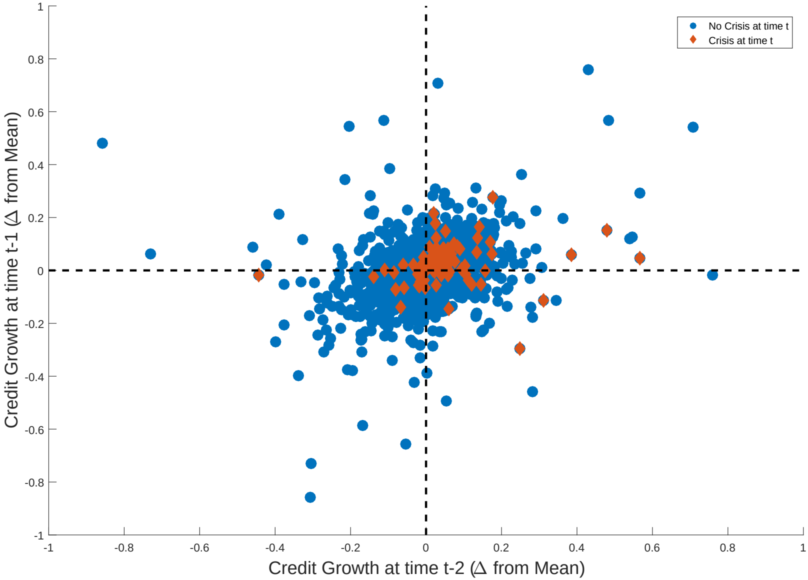
What We Do

- We develop a model of banking panics in which:
  1. Banking crises are usually preceded by credit booms
  2. Credit booms often do not result in crises, i.e. good booms

- We study Macroprudential regulation in this model:
  - How does Macroprudential policy weigh the benefits of preventing a crisis against the costs of stopping a good boom?
  - What are the effects of macroprudential policy and the features of optimal regulation?
    - Unintended consequences of regulation; Countercyclical buffers

Banking Crises in the Data (Schularick and Taylor)



Framework

- Endowment economy version of GKP (2018)
- Focus on how beliefs driven fluctuations can reproduce key empirical properties of banking crises in the data:
  - Boom bust cycles in credit
  - Unpredictability of crises
- Macroprudential regulation

Model Overview

- Capital is fixed $K_t = K = 1$ (normalized to unity)
- $\left(K_t^b\right)$ intermediated by banks; $\left(K_t^h\right)$ directly held by households :

$$1 = K_t^h + K_t^b$$

- Households direct finance entails a quadratic deadweight loss

$$\frac{\alpha}{2}\left(K_t^h\right)^2$$

- Resource constraint is:

$$Y_t = Z_t - \frac{\alpha}{2}\left(K_t^h\right)^2 = C_t$$

where Z_t is an exogenous productivity shock

Marginal Rates of Return on Capital

$Q_t \equiv$ price of capital

- Intermediated capital

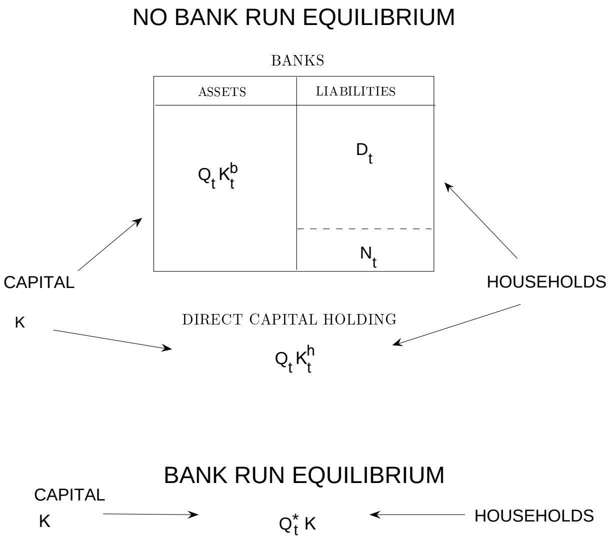
$$R^b_{t+1} = \frac{Z_{t+1} + Q_{t+1}}{Q_t}$$

- Directly held

$$R^h_{t+1} = \frac{1}{1 + \alpha \frac{K^h_t}{Q_t}} R^b_{t+1}$$

i.e. increasing marginal cost of direct finance

Household and Bank Intermediation



Bankers

- Objective

$$V_t = E_t \Lambda_{t,t+1}[(1-\sigma)n_{t+1} + \sigma V_{t+1}]$$

- Net worth n_t accumulated via retained earnings - no new equity issues

$$\begin{aligned} n_{t+1} &= R^b_{t+1} Q_t k^b_t - \overline{R}_t d_t && \text{if no run} \\ &= 0 && \text{if run} \end{aligned}$$

- Balance sheet

$$Q_t k^b_t = d_t + n_t$$

Deposit Contract

$\overline{R}_t \equiv$ deposit rate; $R_{t+1} \equiv$ return on deposits
$p_t \equiv$ run probability; $x_{t+1} < 1 \equiv$ recovery rate

- Deposit contract: (One period)

$$R_{t+1} = \begin{cases} \overline{R}_t \text{ with prob. } 1 - p_t \\ x_{t+1}\overline{R}_t \text{ with prob. } p_t \end{cases}$$

Limits to Bank Arbitrage

- Moral Hazard Problem:
  - After banker borrows funds at t, it may divert fraction θ of assets for personal use.
  - If bank does not honor its debt, creditors can
    - recover the residual funds and
    - shut the bank down.
- $\Rightarrow$ Incentive constraint (IC)

$$\theta Q_t k_t^b \leq V_t$$

Solution

- Can show $V_t = \psi_t n_t$ with $\psi_t \geq 1$ and independent of n_t
- Combine with IC $\rightarrow$ endogenous capital requirement :

$$\kappa_t \equiv \frac{n_t}{Q_t k_t^b} \geq \frac{\theta}{\psi_t}$$

- Note:
  - ψ_t countercyclical $\rightarrow$ market capital requirements relaxed in bad times
  - $n_t \leq 0 \Rightarrow$ bank cannot operate (key for run equilbria)

Bank Runs

- Self-fulfilling "bank run" equilibrium (i.e. rollover crisis) possible if:
  - A depositor believes that if other households do not roll over their deposits, the depositor will lose money by rolling over.
  - Condition met iff banks' net worth n_t goes to zero during a run
    - $n_t = 0 \rightarrow$ banks cannot operate

Conditions for Bank Run Equilibrium (BRE)

- Run equilibrium exists at $t+1$ if

$$\left(Q^*_{t+1} + Z_{t+1}\right) K^b_t < D_t \bar{R}_t \tag{1}$$

  where $Q^*_{t+1} \equiv$ is the liquidation price:

$$Q^*_t = E_t\{\Lambda_{t,t+1}(Z_{t+1} + Q_{t+1}\} - \alpha K^h_t$$

  evaluated at $K^h_t = 1$

- $\iota_{t+1} \equiv$ sunpot variable; if $\iota_{t+1} = 1$ depositors panic when run possible

- Run occurs if (i) equation (1) is satisfied and (ii) $\iota_{t+1} = 1$

Run Probability p_t

- Assume sunspot occurs with probability $\varkappa$.
- $\rightarrow$ The time t probability of a run at $t+1$ is

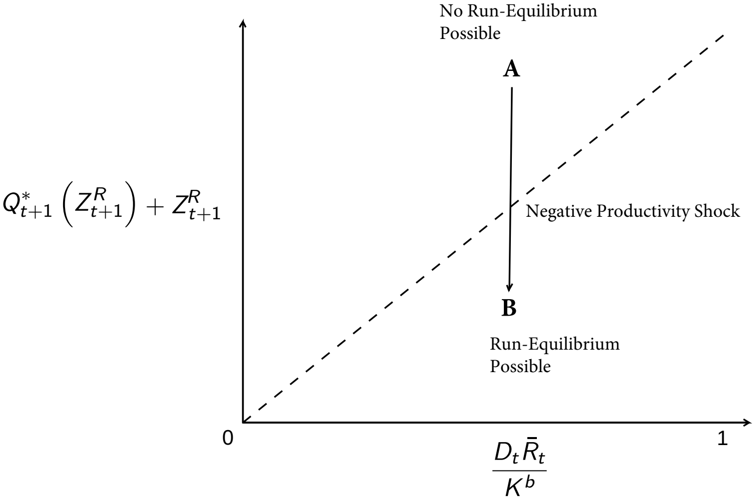
$$p_t = \Pr{}_t\{Z_{t+1} < Z_{t+1}^R\} \cdot \varkappa$$

- Z_{t+1}^R is the threshold value below which a run is possible

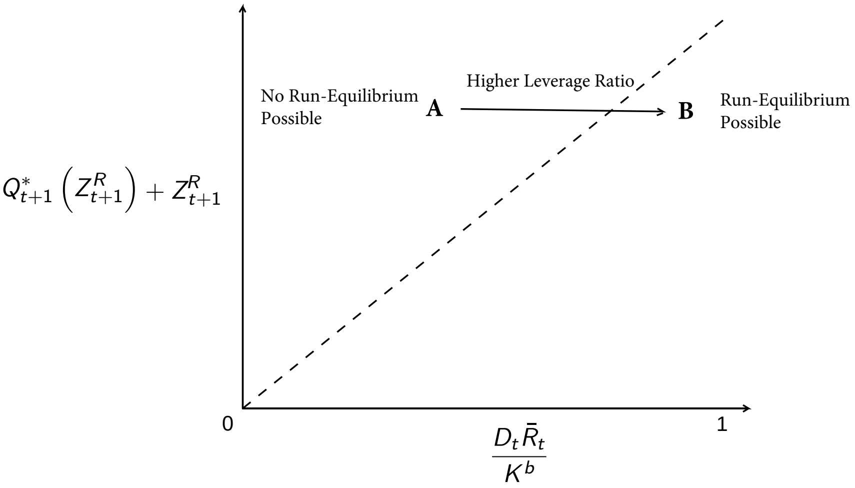
$$Q_{t+1}^*\left(Z_{t+1}^R\right) + Z_{t+1}^R = \frac{D_t \bar{R}_t}{K_t^b}$$

$\rightarrow$ Higher leverage ratios $\frac{D_t \bar{R}_t}{K_t^b}$ increase run probability

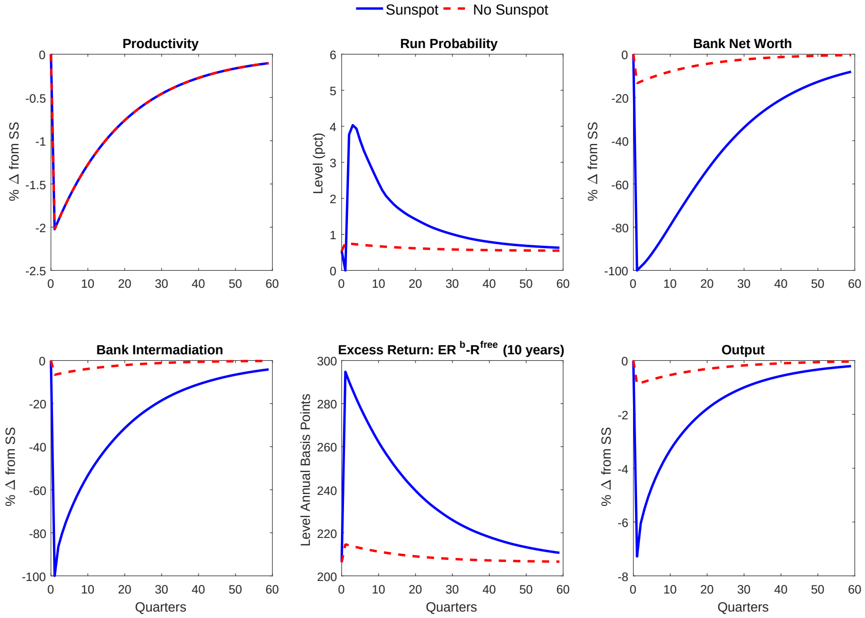
Run Equilibrium



Run Equilibrium



Run After a Negative 2 std Shock



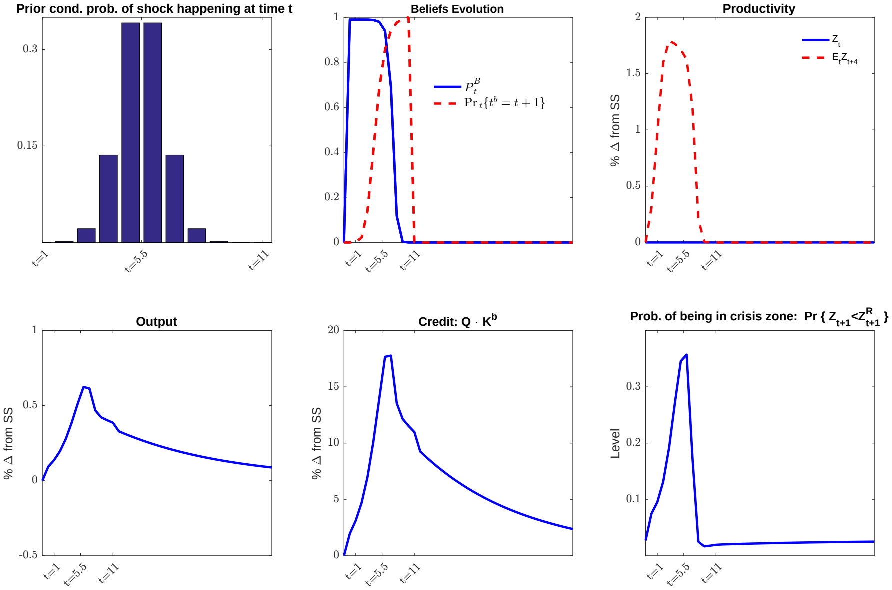
Boom leading to the bust: news driven optimism

- Productivity:

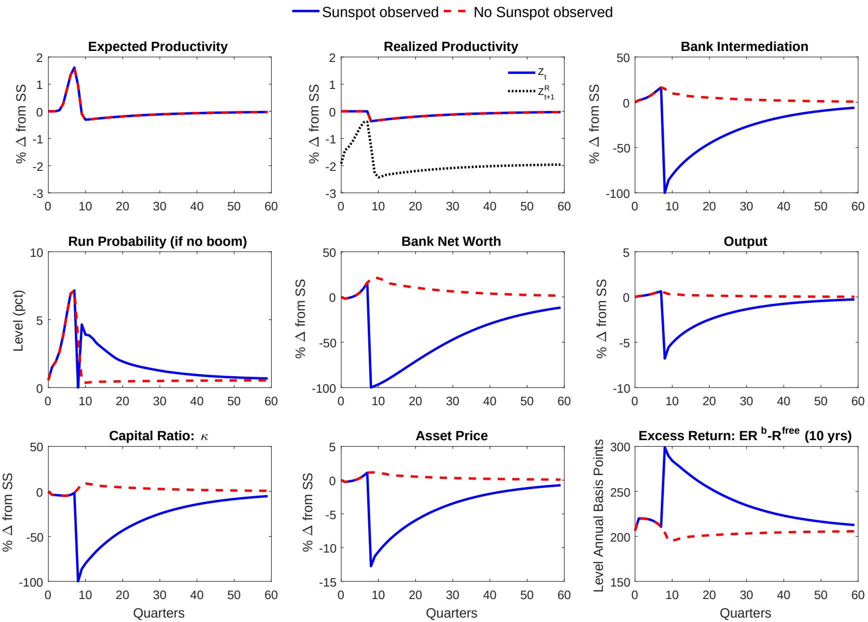
$$Z_{t+1} = \rho Z_t + \epsilon_{t+1}$$

- Normally, $E\{\epsilon_{t+1}\} = 0$
- Occasionally, bankers receive news about future productivity
- If news at t, bankers learn that unusually large realization ϵ_{t^B} of size $B > 0$ will happen at $t^B \in \{t+1, ..., t+T\}$ with prob. $\overline{P}_0^B < 1$
- $\Pr_t\{t^B = t+i\}$ is a truncated Normal (discrete approx.)
- Agents update $\Pr_{t+i}$ and $\overline{P}_{t+i}^B$ by observing ϵ_{t+i}
- Prob. at $t+i$ of shock at $t+i+1$ is $\Pr_t\{t^B = t+i+1\} \cdot \overline{P}_{t+i}^B$

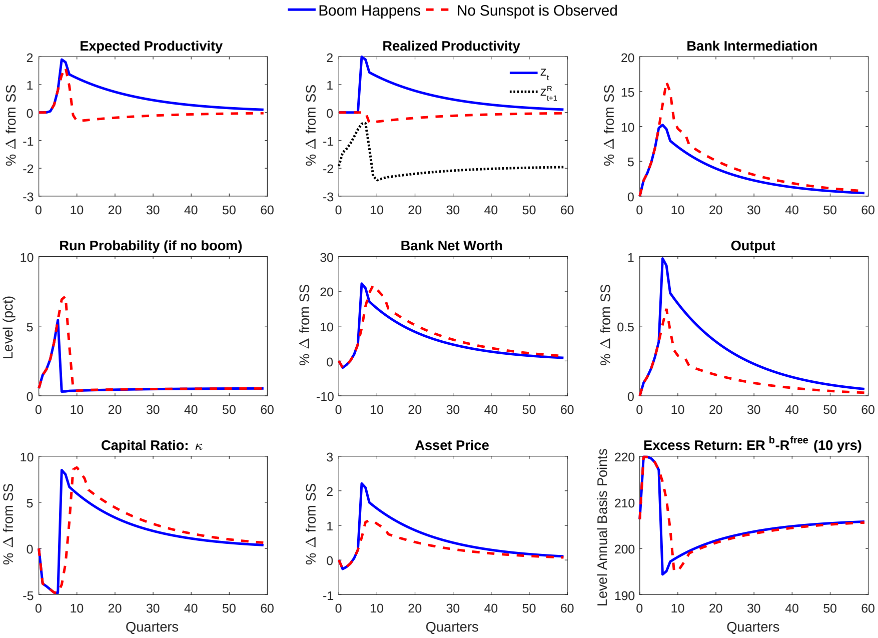
Beliefs Driven Credit Boom



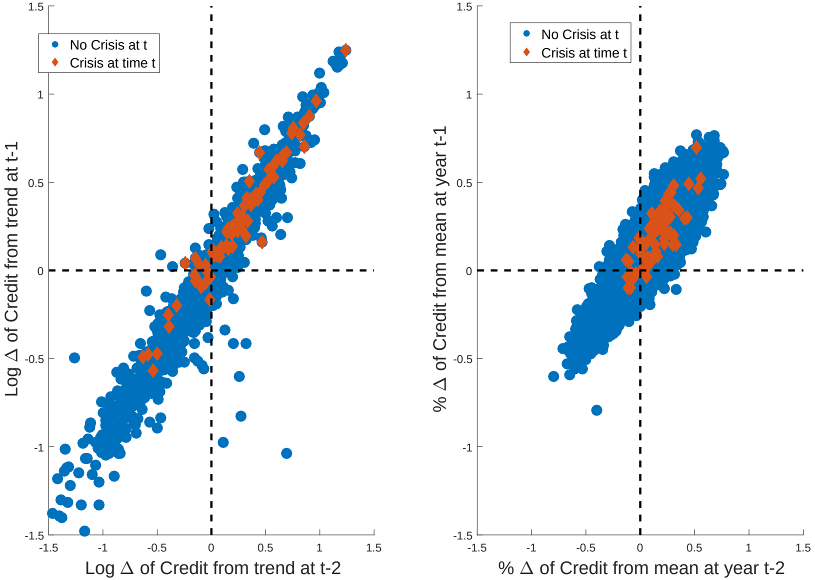
Boom Leading to a bust



False Alarms



Unpredictability of Crises: Data and Model



Regulation

- Macroprudential regulator sets time varying capital requirement $\bar{\kappa}_t$
- Equilibrium capital ratios are

$$\kappa_t = \max\left\{\bar{\kappa}_t, \kappa_t^m\right\}$$

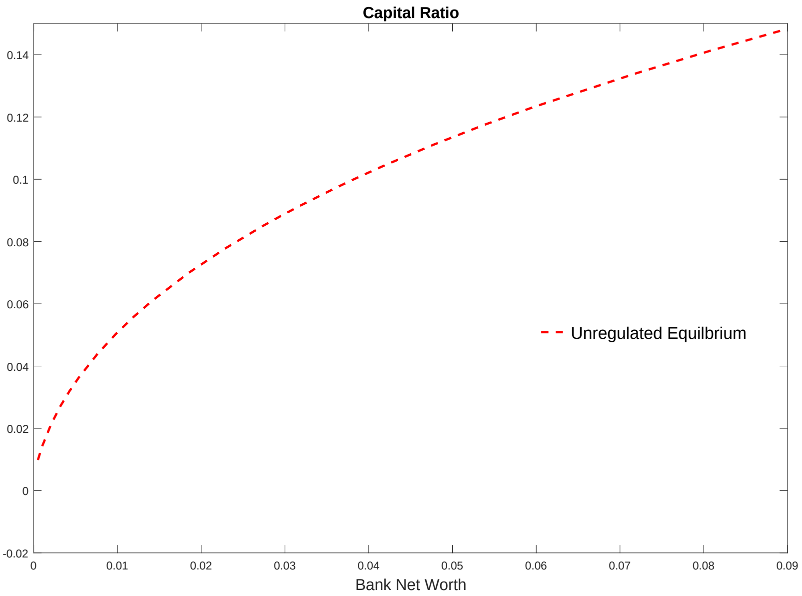
where $\kappa_t^m = \frac{\theta}{\psi_t}$ are the market imposed capital ratios

- We restrict policy to be deteremined by simple rule

$$\bar{\kappa}_t = \begin{cases} \bar{\kappa} & if \;\; N_t \geq \bar{N} \\ 0 & if \;\; N_t < \bar{N} \end{cases}$$

- We look for $\left(\bar{\kappa}, \bar{N}\right)$ that maximize welfare

Regulation



Capital Ratio
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
0
0.01
0.02
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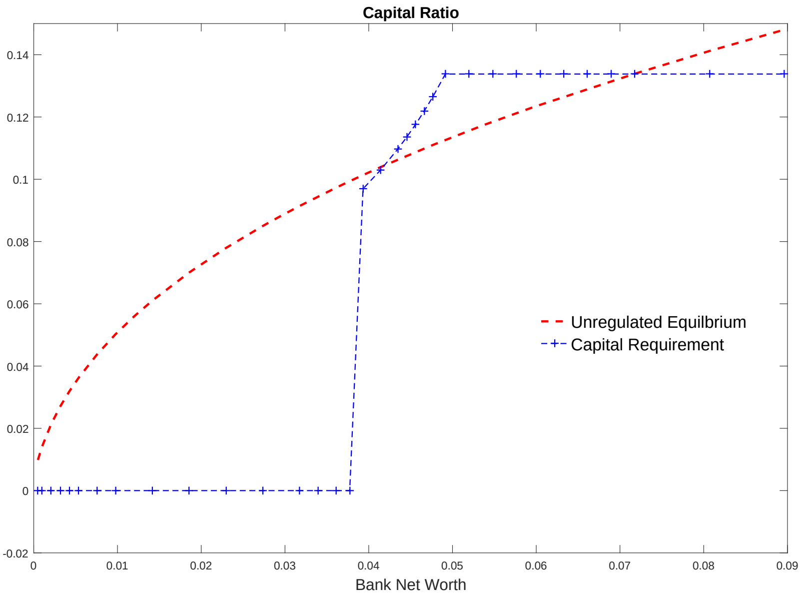
0.04
0.05
0.06
0.07
0.08
0.09
Bank Net Worth
Unregulated Equilbrium

Regulation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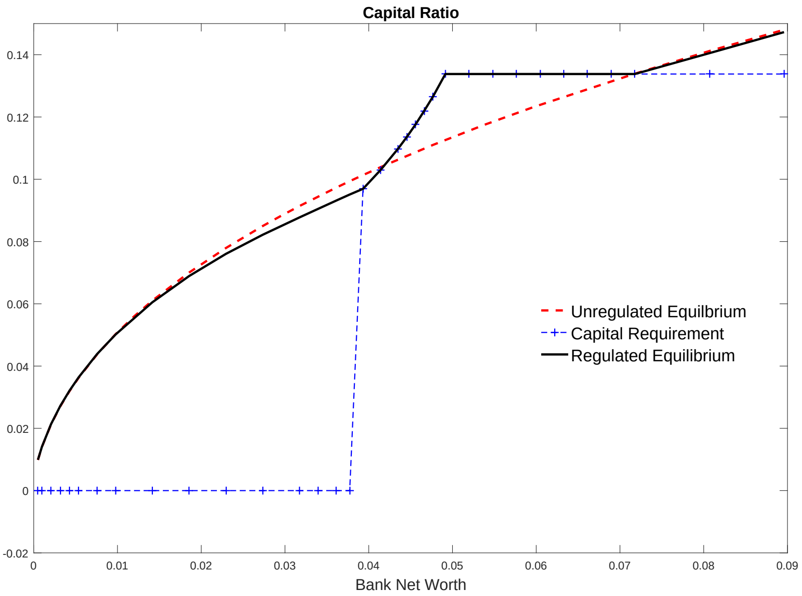
Bank Net Worth
Unregulated Equilbrium
Capital Requirement

Regulation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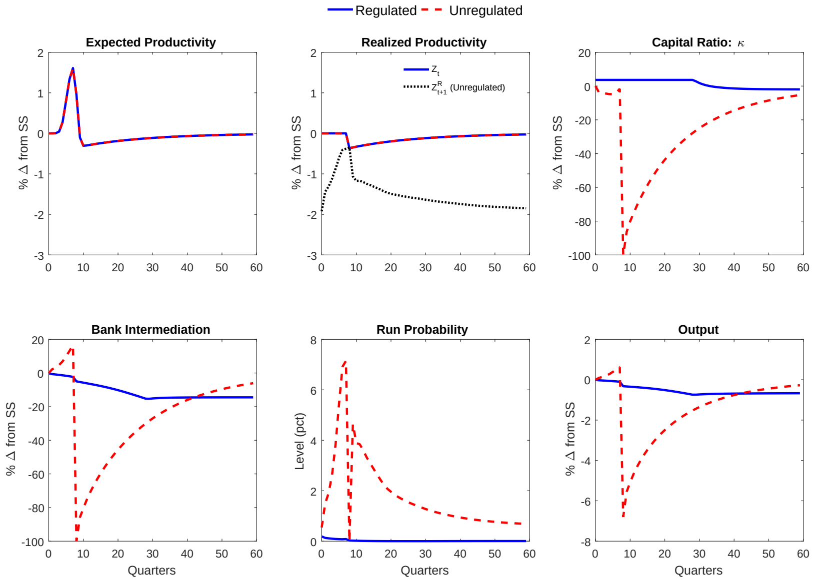
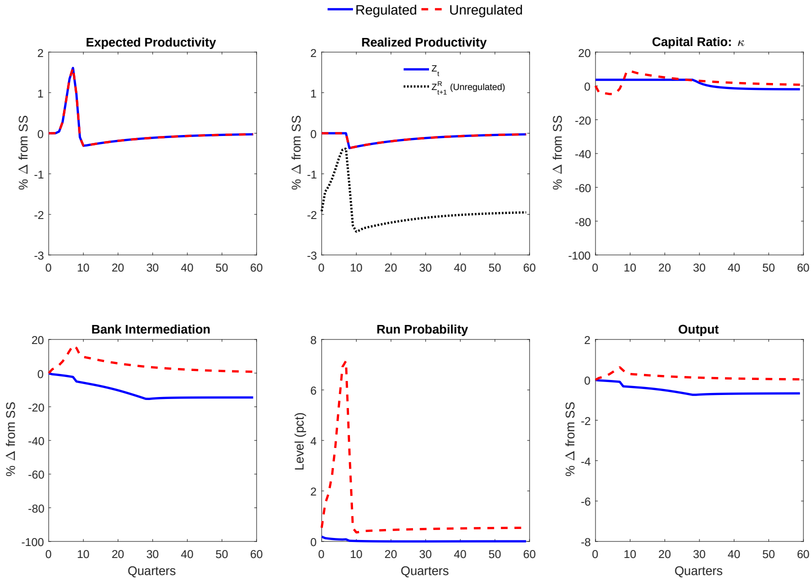
Bank Net Worth
Unregulated Equilbrium
Capital Requirement
Regulated Equilibrium

Avoiding a Run with Regulation



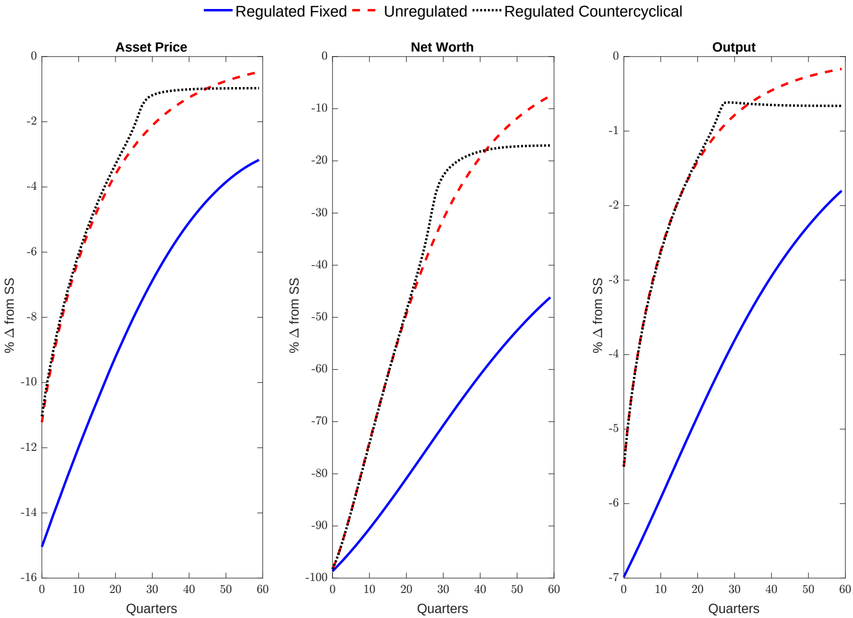
Responding to False Alarms: No Sunspot Observed



Effect of Regulation

	Unregulated Economy $(\bar{\kappa} = 0;\ \bar{N} = 0)$	Optimal Regulation $(\bar{\kappa} = .13;\ \bar{N} = .85 * N_{SS}^{DE})$	Fixed Capital Requirements $(\bar{\kappa} = .13;\ \bar{N} = 0)$
Run Frequency	.8 pct	.45 pct	.3 pct
AVG Output Cond. No Run (Δ *from Decentralized Economy*)	0	−.4 pct	−1.7 pct
AVG Output (**Δ** *from Decentralized Economy*)	0	.1 pct	−.9 pct
Welfare Gain (Δ *Permanent Consumption*)	0	.16 pct	−1.16 pct

Recovery From a Run



Conclusion

- Develop model of banking panics that captures boom-bust cycles and unpredictability of runs
- Study macroprudential policy
- Future work
  - Ex-post intervention
  - Regulated and Unregulated Banks
  - Multiple assets