Monetary policy and endogenous financial crises

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Impact of monetary policy on financial stability remains a controversial topic

- Loose monetary policy can help to stave off financial crises (e.g. 9/11 terrorist attacks, Covid–19),
- ... but low–for–long rates can also induce search–for–yield and be a cause of financial imbalances/instability (e.g. Great Financial Crisis, Silicon Valley Bank)

Research questions

1. What are the channels through which monetary policy (MP) affects financial stability (FS)?
2. Should monetary policy deviate from price stability to promote financial stability?
3. To what extent may MP itself brew financial vulnerabilities?

$\rightarrow$ **Needed:** models where MP affects the incidence and severity of crises

NK model with endogenous and micro–founded financial crises

- Textbook New Keynesian (NK) model, with capital accumulation and sticky prices
  - + Idiosyncratic productivity shocks → capital reallocation among firms via a credit market
  - + Financial frictions → credit market prone to endogenous collapse when borrowers search for yield
  - + Global solution → capture nonlinearities and dynamics far away from steady state
- MP is the “only game in town” (*e.g.* no macroprudential policy)

Contribution to the literature

Main findings

1. MP affects FS both in the *short run* via aggregate demand and in the *medium run* via capital accumulation

2. By deviating from strict inflation targeting (SIT), and reacting to output and financial fragility alongside inflation, the central bank can improve both FS and welfare

3. MP can lead to a crisis if the policy rate remains too low for too long and then increases abruptly

Roadmap

1. Extended New–Keynesian model
2. Anatomy of financial crises
3. "Divine Coincidence" revisited
4. Monetary policy discretion as a source of financial instability

Extended New–Keynesian model

Model– Agents

- **Central bank**: sets nominal interest rate `Monetary Policy Rules`
- **Household**: representative, works, consumes, saves (nominal bonds, firm equity) `Optimisation problem`
- **Retailers**: monopolistic, diversify intermediate goods, sticky prices `Optimisation problem`
- **Intermediate goods firms**: competitive, issue equity, invest, produce with labor and capital
    - + Idiosyncratic productivity shocks → capital reallocation among firms via a credit market

Intermediate goods firms

- Continuum of 1-period firms indexed by $j \in [0, 1]$
- **End of** $t-1$: Firms are similar and <u>all</u> get start–up equity funding $P_{t-1}Q_{t-1}$ and purchase capital $K_t = Q_{t-1}$

◂ Firms' optimisation ◂ Credit market -reallocation role

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- **Beginning of** t: firm j has access to a production technology

$$Y_t(j) = A_t(\omega_t(j)K_t(j))^{\alpha} N_t(j)^{1-\alpha}, \quad \text{where } \omega_t(j) = \begin{cases} 0 & \text{with probability } \mu \to \text{Unproductive} \\ 1 & \text{with probability } 1-\mu \to \text{Productive} \end{cases}$$

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- Upon observing $\omega_t(j)$, firm j may adjust its capital from K_t to $K_t(j)$ via a credit market

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<u>No credit frictions:</u> $\Rightarrow$ same equilibrium as in the textbook NK model with a representative firm

◂ Firms' optimisation ◂ Credit market -reallocation role

Credit market

- Asymmetric Information: $\omega_t(j)$ is private information
- Limited Commitment: firm j may borrow, purchase capital goods, and abscond with them in search for yield

$\Rightarrow$ Borrowing limit is the same for all firms, and credit market is fragile

Limited commitment only

Credit market

- **Incentive Compatibility Constraint:**

  An unproductive firm has two options:

  1. **Behave:** sell its capital to lend the proceeds at equilibrium loan rate $r_t^c \rightarrow (1 + r_t^c)K_t$
  2. **Misbehave:** borrow to buy more capital $K_t^p - K_t$ (*i.e.* mimic productive), abscond $\rightarrow$ $(1-\delta)K_t^p - \theta(K_t^p - K_t)$

Credit market

- **Incentive Compatibility Constraint:**

Unproductive firms lend *iff* the equilibrium loan rate r_t^c is high enough

$$\rightarrow \begin{cases} (1+r_t^c)K_t \geqslant (1-\delta)K_t^p - \theta(K_t^p - K_t) \\ \text{where } r_t^c \text{ satisfies } \mu K_t = (1-\mu)(K_t^p - K_t) \end{cases} \Leftrightarrow r_t^c \geqslant \bar{r}^k \equiv \frac{(1-\theta)\mu - \delta}{1-\mu}$$

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- **Participation Constraint:**

  Productive firms borrow iff r_t^c is lower than their return on capital r_t^k

$$r_t^c \leqslant r_t^k \equiv \frac{p_t}{P_t}\frac{\alpha Y_t^p}{K_t^p} - \delta = \frac{p_t}{P_t}\frac{\alpha Y_t}{K_t} - \delta$$

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- Trade is possible iff the marginal return on capital $r_t^k \geq \bar{r}^k$

Credit market equilibrium

Normal versus crisis times

- **Normal times:** when $r_t^k \geq \bar{r}^k$ and firms trade on the credit market, $r_t^c = r_t^k \geq \bar{r}^k$, capital is fully reallocated, aggregate production function is as in the credit–frictionless economy

$$Y_t = A_t K_t^{\alpha} N_t^{1-\alpha}$$

- **Crisis times:** when $r_t^k < \bar{r}^k$ and firms don't trade on credit market, capital is not reallocated, unproductive firms keep capital idle and capital mis–allocation lowers TFP

$$Y_t = A_t \left((1-\mu)K_t\right)^{\alpha} N_t^{1-\alpha}$$

MP affects financial fragility in the short and medium run

- **Condition for a crisis**

$$\frac{\alpha Y_t}{\mathcal{M}_t K_t} \leqslant (1-\tau)\left[\frac{(1-\theta)\mu-\delta}{1-\mu}+\delta\right]$$

◂ Two types of polar crises

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- **Short-run:** through macro–economic stabilization → Y– and $\mathcal{M}$–channels

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- **Short-run:** through macro–economic stabilization → Y– and $\mathcal{M}$–channels
- **Medium-run:** through capital accumulation → K–channel

◂ Two types of polar crises

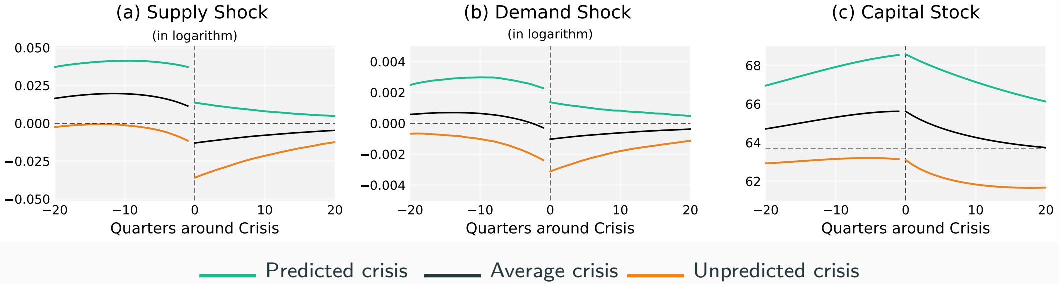
Anatomy of financial crises

Quantitative analysis

- **Quarterly parametrization**. Only two non–standard parameters
  1. μ: share of unproductive firms set to 5% to have a productivity fall by 1.8% due to financial frictions during a crisis
  2. θ: default cost set to 0.52 to have the economy spend 10% of the time in crisis (under TR93)
- **Global solution and simulation** of the (nonlinear) model over ten million periods
- **The analysis focuses on** the dynamics around financial crises and on crisis statistics

◂ Parametrization

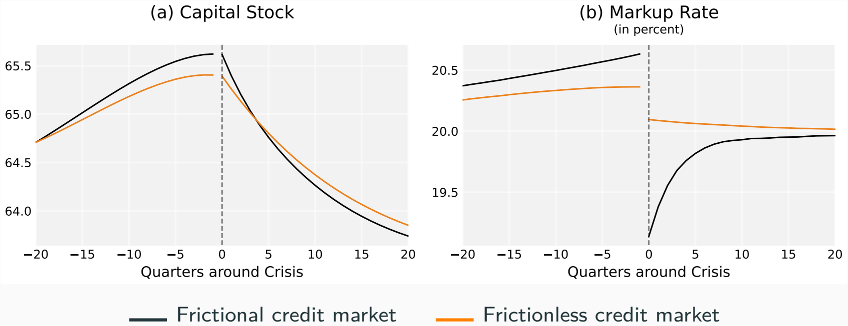
Average crisis dynamics and crisis variety under the Taylor Rule



→ Some crises break out on the back of an investment boom, others follow severe adverse non–financial shocks

Average crisis

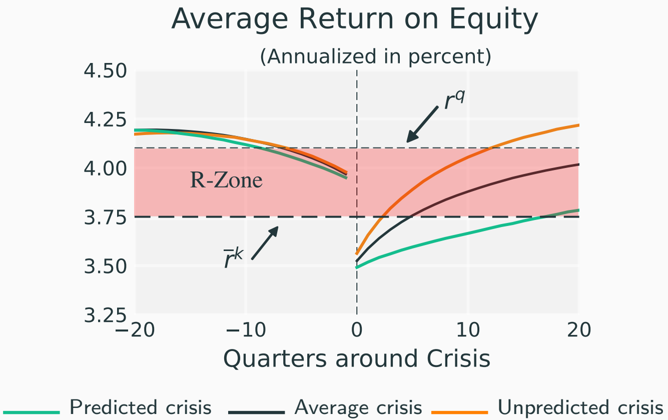
“Precautionary savings” and “markup” externalities



- The household accumulates precautionary savings in anticipation of revenue losses
- Retailers frontload price increases in anticipation of inflationary pressures

⇒ Individual “hedging” behaviors precipitate the crisis via K– and M–channels

The "yield gap" $(1 + r_t^q)/(1 + r^q)$ as index of financial fragility



“Divine Coincidence” revisited

The price–financial stability trade–off

- Under SIT, the economy spends 9.4% in a crisis and prices are fully stable.
- Reducing the incidence of crises below 9.4% necessarily entails deviating from price stability

	Rule parameters			Model with Financial Frictions				
	ϕ_π	ϕ_y	ϕ_r	Time in Crisis/Stress (in %)	Length (quarters)	Output Loss (in %)	Std(π_t) (in pp)	Welfare Loss (in %)
				SIT				
(6)	$+\infty$	–	–	9.4	5.1	8.1	0	0.23

Divine coincidence Why? Full table

The price–financial stability trade–off

- Under SIT, the economy spends 9.4% in a crisis and prices are fully stable.
- Reducing the incidence of crises below 9.4% necessarily entails deviating from price stability
- E.g.: when the central bank reacts to output, financial fragility and inflation, the incidence of crises can be lowered to 5.4%, but inflation volatility rises to 1.16 pp (in standard deviations)

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SIT								
(6)	$+\infty$	–	–	9.4	5.1	8.1	0	0.23
Augmented Taylor–type Rules								
(7)	1.5	0.125	5.0	5.4	3.9	5.5	1.16	0.65

Divine coincidence Why? Full table

Deviating from price stability can improve welfare

- E.g.: Reacting to output and financial fragility alongside inflation can improve welfare upon SIT

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(9)	5.0	0.125	25.0	6.9	4.7	6.6	0.19	0.18
(10)	10.0	0.125	75.0	6.3	4.6	6.4	0.09	0.16

Welfare gains can be even higher under "backstop rules"

- "Backstop policy rule": state–contingent rule whereby the central bank commits to deviate from its standard rule (e.g. SIT, Taylor rule) in the face of financial stress so as to avoid a crisis
- Under SIT–backstop, welfare gains relative to SIT are larger than under Augmented Taylor–type Rules

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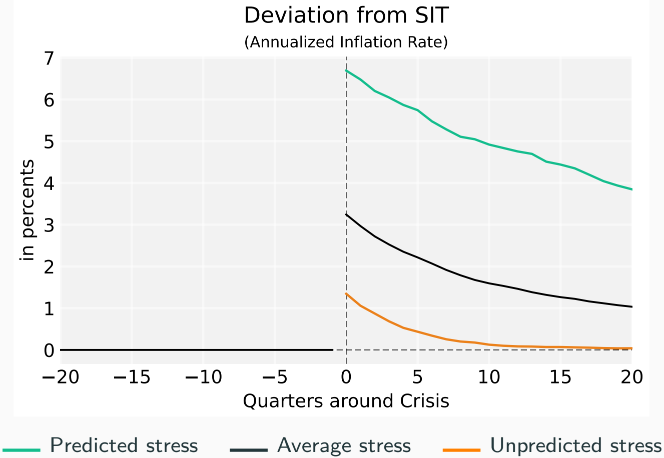
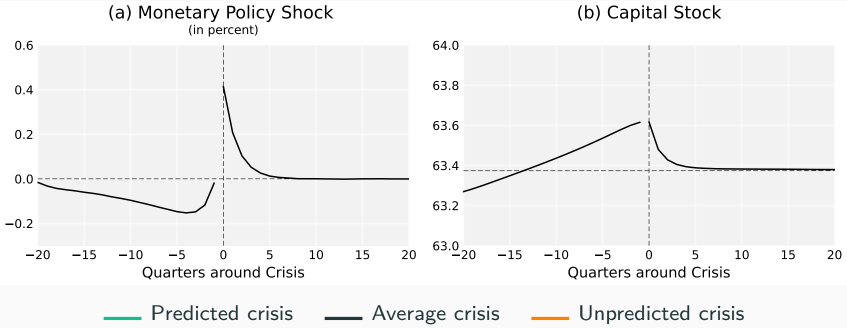
Crises are avoided under "backstop rules" with exceptionally loose policy



Monetary policy discretion as a source of financial instability

Discretionarily keeping rates too low for too long may lead to a crisis



- Discretionary deviations from TR93 → simulate the model with MP shocks only
- Crises occur after a "Great Deviation"...(Taylor (2011)) Deviations from Taylor rule
- ... when the central bank abruptly reverses its policy stance Evidence Schularick et al (2021)

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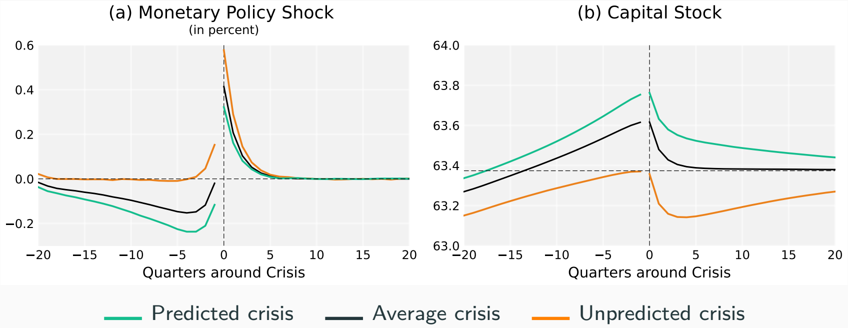

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Takeaways

Takeaways

- NK model with **micro–founded endogenous crises** where MP affects FS via **Y–M–K channels**:
- Several **novel policy insights**:
  - → Systematic response to output and **yield gap** ($\neq$ SIT) improves both FS and welfare
  - → **Backstop policy** is effective and **normalisation path** depends on the nature of the stress
  - → **"Low–for–long"** policy followed by abrupt hike may lead to crisis

APPENDIX

Contribution to the literature

- We study how MP affects FS in a NK model with endogenous microfounded crises
- Monetary policy and financial stability (reduced form models of endogenous crises)
  Woodford (2012), Filardo and Rungcharoentkitkul (2016), Svensson (2017), Gourio, Kashyap, Sim (2018), Ajello, Laubach, Lopez–Salido, Nakata (2019), Cairo and Sim (2018), Borio, Disyatat and Rungcharoentkitkul (2019)
- Micro–founded models of endogenous financial crises
  Boissay, Collard, Smets (2016), Benigno and Fornaro (2018), Gertler, Kiyotaki, Prestipino (2019), Paul (2020)
- Our approach: fragility of financial markets ($\neq$ institutions) and search–for–yield behaviours ($\neq$ collateral constraints)

Back to main

Central bank

- Sets nominal interest rate i_t on risk–free public bond B_t according to a Taylor-type policy rule:

$$1 + i_t = \frac{1}{\beta}(1 + \pi_t)^{\phi_\pi} \left(\frac{Y_t}{\bar{Y}}\right)^{\phi_y}$$

- We also experiment with alternative rules including financially–augmented Taylor rules and SIT

Back to main

Households

- The representative household consumes a basket of goods C_t, works N_t, invests in a private nominal bond B_t in zero net supply and in intermediate goods firm $j \in [0,1]$'s equity $Q_t(j)$

$$\max_{C_t, N_t, B_t, Q_t(j)} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\frac{C_t^{1-\sigma}}{1-\sigma} - \chi \frac{N_t^{1+\varphi}}{1+\varphi} \right]$$

s.t. $$\int_0^1 P_t(i) C_t(i) \mathrm{d}i + B_t + P_t \int_0^1 Q_t(j) \mathrm{d}j \leq W_t N_t + (1 + i_{t-1}^b) B_{t-1} + P_t \int_0^1 (1 + r_t^q(j)) Q_{t-1}(j) \mathrm{d}j + \Upsilon_t$$

where

$$i_t^b \equiv \frac{1 + i_t}{Z_t} - 1$$

is the private bond yield, with Z_t the wedge between the private yield and the policy rate i_t

- Z_t acts as an aggregate demand shock

Households' optimality conditions:

$$\frac{\chi N_t^{\varphi}}{C_t^{-\sigma}} = \frac{W_t}{P_t}$$

$$1 = \beta(1 + i_t^b)\mathbb{E}_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\frac{1}{1+\pi_{t+1}}\right]$$

$$1 = \beta\mathbb{E}_t\left[\left(\frac{C_{t+1}}{C_t}\right)^{-\sigma}\left(1 + r_{t+1}^q(j)\right)\right] \quad \forall j \in [0,1]$$

$$Q_t(j) = Q_t \quad \forall j \in [0,1]$$

Back to main

Retailers

- Monopolistic retailer $i \in [0,1]$ produces a differentiated final good using intermediate goods and sets its price subject to quadratic adjustment costs à la Rotemberg (1982):

$$\max_{P_t(i),Y_t(i)} \mathbb{E}_0 \sum_{t=0}^{\infty} \Lambda_{0,t} \left[\frac{P_t(i)}{P_t} Y_t(i) - \frac{(1-\tau)p_t}{P_t} Y_t(i) - \frac{\varsigma}{2} \left(\frac{P_t(i)}{P_{t-1}(i)} - 1 \right)^2 Y_t \right]$$

$$\text{s.t. } \; Y_t(i) = \left(\frac{P_t(i)}{P_t} \right)^{-\epsilon} Y_t$$

where $Y_t = C_t + I_t + \frac{\varrho}{2} Y_t \pi_t^2$, with $I_t \equiv K_{t+1} - (1-\delta)K_t$

- Price setting behaviour:

$$(1+\pi_t)\pi_t = \mathbb{E}_t \left(\Lambda_{t,t+1} \frac{Y_{t+1}}{Y_t} (1+\pi_{t+1})\pi_{t+1} \right) - \frac{\epsilon - 1}{\varrho} \left(\frac{\mathcal{M}_t - \mathcal{M}}{\mathcal{M}_t} \right)$$

- Markup $\mathcal{M}_t \equiv \frac{P_t}{(1-\tau)p_t}$ will be important for the effect of MP on FS

Back to main

Intermediate goods firms

$$\max_{N_t(j),K_t(j)} D_t(j) = \frac{p_t}{P_t} A_t(\omega_t(j) K_t(j))^\alpha N_t(j)^{1-\alpha} - \frac{W_t}{P_t} N_t(j) + (1-\delta) K_t(j) - (1+r_t^c)(K_t(j) - K_t)$$

Defining $r_t^k = \frac{p_t}{P_t} \frac{\alpha Y_t(j)}{K_t(j)} - \delta = \frac{p_t}{P_t} \frac{\alpha Y_t}{K_t} - \delta$ we obtain:

- Choices of an unproductive firm j with $\omega_t(j) = 0$:

$$\max_{K_t(j)} r_t^q(j) \equiv \frac{D_t(j)}{K_t} - 1 = r_t^c - (r_t^c + \delta) \frac{K_t(j)}{K_t}$$

- Choices of a productive firm j with $\omega_t(j) = 1$:

$$\max_{K_t(j)} r_t^q(j) \equiv \frac{D_t(j)}{K_t} - 1 = r_t^c + (r_t^k - r_t^c) \frac{K_t(j)}{K_t}$$

Back to main

Credit market – reallocation role:

- In the absence of credit frictions,

  (i) Unproductive firms sell their capital K_t and lend the proceeds on the credit market: $K_t^u = 0$

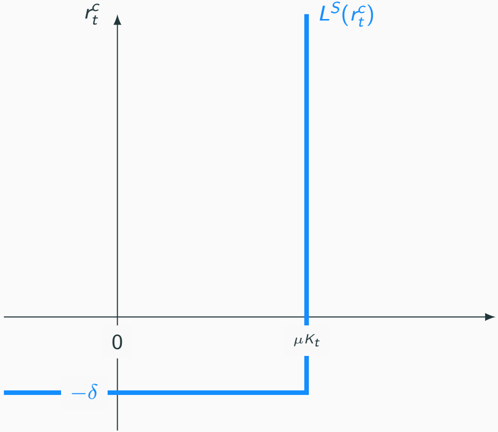
  (ii) Productive firms borrow and use the funds to buy $K_t^p - K_t > 0$ additional units of capital

  $\Rightarrow$ The credit market helps reallocate capital: $\mu K_t = (1-\mu)(K_t^p - K_t)$

  $\Rightarrow$ Equilibrium of the textbook NK model with a representative firm

Back to main

Credit market (given r_t^k)

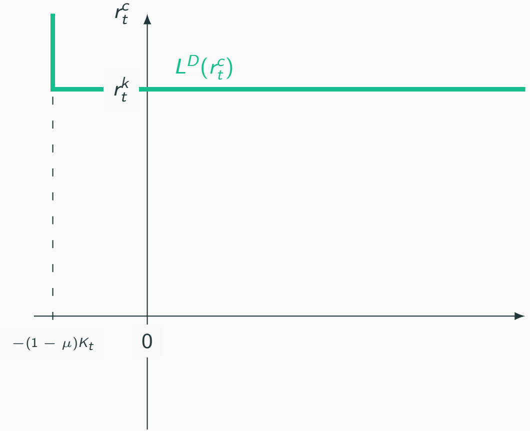


- Unproductive firms' net loan supply

$$L^S(r_t^c) = \begin{cases} \mu K_t & \text{for } r_t^c > -\delta \\ (-\infty, \mu K_t] & \text{for } r_t^c = -\delta \\ -\infty & \text{for } r_t^c < -\delta \end{cases}$$

Back to main

Credit market (given r_t^k)



- Productive firms' net loan demand

$$L^D(r_t^c) = \begin{cases} -(1-\mu)K_t & \text{for } r_t^c > r_t^k \\ [-(1-\mu)K_t, +\infty) & \text{for } r_t^c = r_t^k \\ +\infty & \text{for } r_t^c < r_t^k \end{cases}$$

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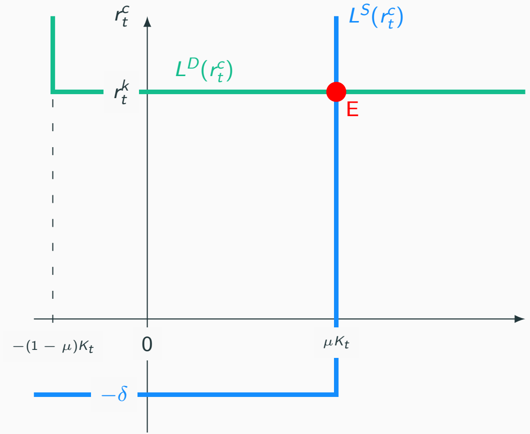
Credit market (given r_t^k)



- In E, $r_t^k = r_t^c$ and capital is perfectly reallocated to productive firms:

$$\mu K_t = (1-\mu)(K_t^p - K_t)$$

- Model boils down to the textbook NK model with one representative firm

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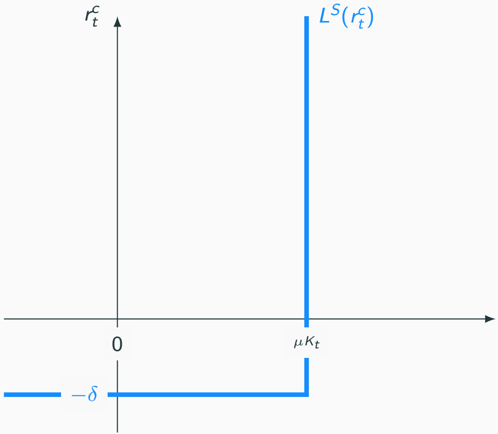
Credit market (given r_t^k)



- Unproductive firms' net loan supply...

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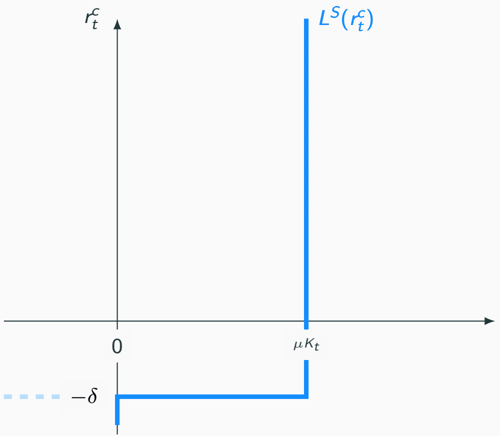
Credit market (given r_t^k)



- Unproductive firms' net loan supply...

  ... now with IC constraint

$$L^S(r_t^c) = \begin{cases} \mu K_t & \text{for } r_t^c > -\delta \\ [0, \mu K_t] & \text{for } r_t^c = -\delta \\ 0 & \text{for } r_t^c < -\delta \end{cases}$$

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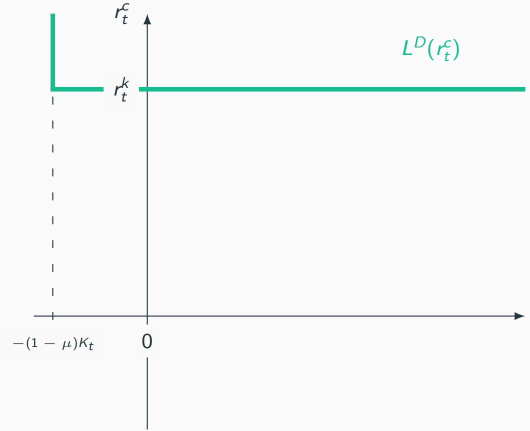
Credit market (given r_t^k)



- Productive firms' net loan demand...

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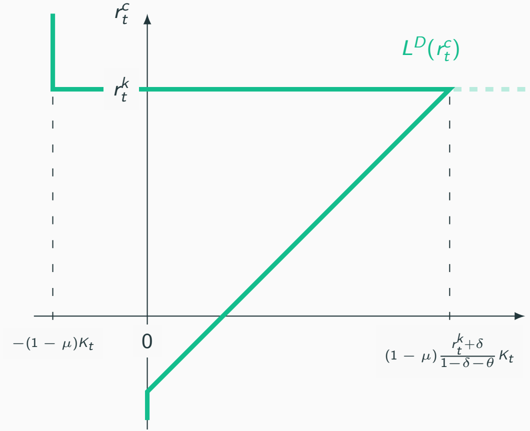
Credit market (given r_t^k)



- Productive firms' net loan demand...

  ... now with IC constraint

$$L^D(r_t^c) = \begin{cases} -(1-\mu)K_t & \text{for } r_t^c > r_t^k \\ \left[-(1-\mu)K_t, (1-\mu)\frac{r_t^k+\delta}{1-\delta-\theta}K_t\right] & \text{for } r_t^c = r_t^k \\ (1-\mu)\max\{\frac{r_t^c+\delta}{1-\delta-\theta}, 0\}K_t & \text{for } r_t^c < r_t^k \end{cases}$$

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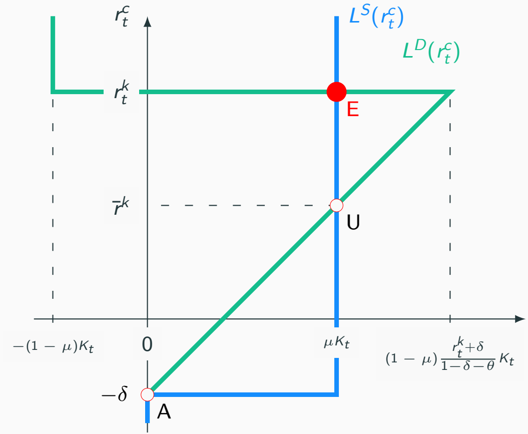
Credit market (given r_t^k)



- Equilibrium E is the same as in the frictionless case and textbook model:

$$\mu K_t = (1-\mu)(K_t^p - K_t)$$

- Aggregate outcome is the same in E and U
- Absence of coordination failure rules out equilibrium A

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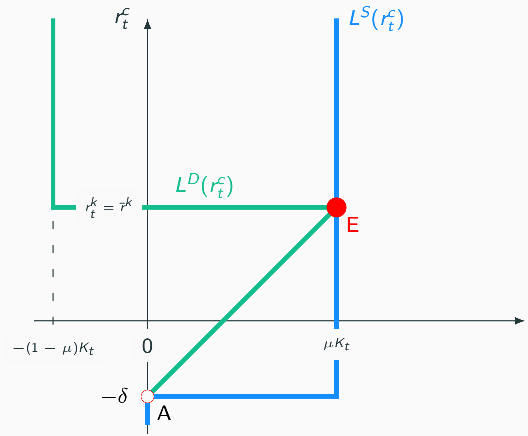
Credit market (given r_t^k)



- $\bar{r}^k$ is the minimum loan rate that ensures that all unproductive firms lend (i.e. there is no rationing)

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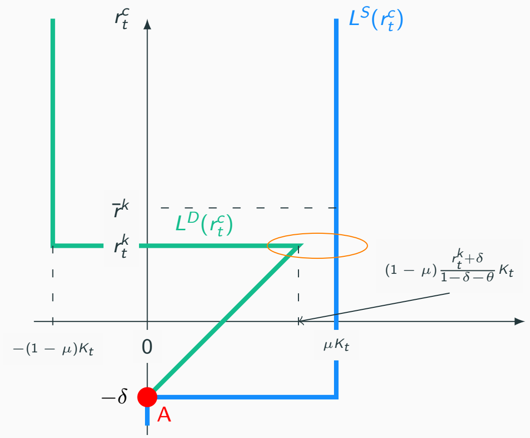
Credit market (given r_t^k)



- $\bar{r}^k$ is the minimum loan rate that ensures that all unproductive firms lend (i.e. there is no rationing)
- When $r_t^k < \bar{r}^k$, there is excess supply and every unproductive firm left out has an incentive to borrow and abscond
- In this case, A (autarky) is the unique equilibrium

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Perfect Information Case

- Unproductive firms do not get any loan
- Productive firm js' borrowing limit is given by the incentive compatibility constraint

$$(1-\delta)K_t(j) - \theta(K_t^p - K_t) \leq (1 + r_t^q(j))K_t = (1 + r_t^c)K_t + \left(r_t^k - r_t^c\right) K_t(j)$$

$$\Leftrightarrow K_t(j) - K_t \leq \frac{r_t^k + \delta}{1 - \delta - \theta + r_t^c - r_t^k} K_t$$

$$\Rightarrow L^D(r_t^c) \equiv (1-\mu)(K_t(j) - K_t) = (1-\mu)\frac{r_t^k + \delta}{1 - \delta - \theta + r_t^c - r_t^k} K_t \quad \text{if } r_t^k \geq r_t^c$$

- Aggregate loan demand monotonically decreases with r_t^c

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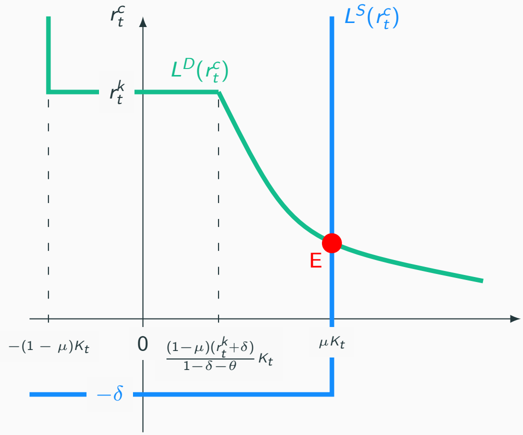
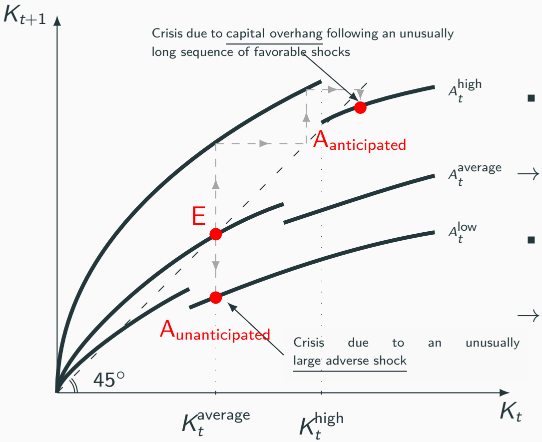
Perfect Information Case



Two polar types of crisis



Optimal decision rules $K_{t+1}(K_t, A_t)$

- Crises due to capital overhang following an unusually long sequence of favorable shocks

→ **MP may reduce their incidence via K–channel**

- Crises which break out in the face of an unusually large adverse shock

→ **MP may reduce their incidence via Y– and M–channels**

Equation Summary

1. $1 = \beta \mathbb{E}_t \left[\frac{C_{t+1}^{-\sigma}}{C_t^{-\sigma}} \frac{1+i_t}{1+\pi_{t+1}} \right]$
2. $1 = \beta \mathbb{E}_t \left[\frac{C_{t+1}^{-\sigma}}{C_t^{-\sigma}} (1 + r_{t+1}^q) \right]$
3. $\chi N_t^\varphi C_t^\sigma = \frac{\epsilon}{\epsilon-1} \frac{(1-\alpha)Y_t}{\mathcal{M}_t N_t}$
4. $r_t^q + \delta = \frac{\epsilon}{\epsilon-1} \frac{\alpha Y_t}{\mathcal{M}_t K_t}$
5. $Y_t = C_t + X_t - \frac{\varrho}{2} \pi_t^2$
6. $K_{t+1} = X_t + (1-\delta) K_t$
7. $Y_t = A_t (\omega_t K_t)^\alpha N_t^{1-\alpha}$
8. $\omega_t = \begin{cases} 1 & \text{if } r_t^q \geq \frac{\mu(1-\theta)-\delta}{1-\mu} \\ 1-\mu & \text{otherwise} \end{cases}$
9. $(1+\pi_t)\pi_t = \beta \mathbb{E}_t \left(\frac{C_{t+1}^{-\sigma}}{C_t^{-\sigma}} \frac{Y_{t+1}}{Y_t} (1+\pi_{t+1})\pi_{t+1} \right) - \frac{\epsilon-1}{\varrho} \left(1 - \frac{\epsilon}{\epsilon-1} \cdot \frac{1}{\mathcal{M}_t} \right)$
10. $1 + i_t = \frac{1}{\beta} (1+\pi_t)^{\phi_\pi} \left(\frac{Y_t}{Y} \right)^{\phi_y}$

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Parametrisation

Parameter	Target	Value
Preferences		
β	4% annual real interest rate	0.989
σ	Logarithmic utility on consumption	1
φ	Inverse Frish elasticity equals 2	0.5
χ	Steady state hours equal 1	0.81
Technology and price setting		
α	64% labor share	0.36
δ	6% annual capital depreciation rate	0.015
ϱ	Same slope of the Phillips curve as with Calvo price setting	58.22
ϵ	20% markup rate	6
Aggregate TFP (supply) shocks		
ρ_a	Standard persistence	0.95
σ_a	Volatility of inflation and output in normal times (in %)	0.81
Aggregate Demand shocks		
ρ_z	Standard persistence	0.95
σ_z	Volatility of inflation and output in normal times (in %)	0.16
Interest rate rule		
ϕ_π	Response to inflation under TR93	1.5
ϕ_y	Response to output under TR93	0.125
Financial Frictions		
μ	Productivity falls by 1.8% due to financial frictions during a crisis	0.05
θ	The economy spends 10% of the time in a crisis	0.52

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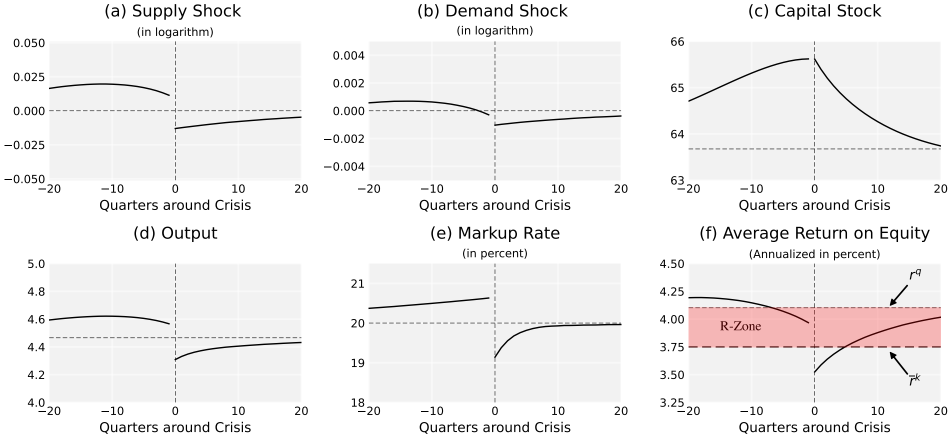
Anatomy of the average crisis



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The "Divine Coincidence" revisited

- No credit frictions: SIT eliminates simultaneously inefficient fluctuations in prices and output gap and achieves the first best allocation – "divine coincidence" (Blanchard and Galí (2007))
- Credit frictions: SIT does not deliver the first best allocation $\Rightarrow$ may not be optimal anymore

- Should central banks deviate from price stability to promote financial stability?
- To answer this question, we study:
  - The trade-off between price and financial stability
  - Compare welfare under SIT with that under alternative policy rules: (i) Taylor-type rules, (ii) Taylor-type rules augmented with the yield gap, (iii) regime–contingent backstop rules

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Welfare and crisis statistics under alternative monetary policy regimes

	Rule parameters			Model with Financial Frictions					Frictionless
	ϕ_π	ϕ_y	ϕ_r	Time in Crisis/Stress (in %)	Length (quarters)	Output Loss (in %)	Std(π_t) (in pp)	Welfare Loss (in %)	Welfare Loss (in %)
Standard Taylor–type Rules									
(1)	1.5	0.125	–	[10]	4.8	6.6	1.2	0.82	0.56
(2)	1.5	0.250	–	7.2	4.0	5.4	1.8	1.48	1.21
(3)	1.5	0.375	–	4.1	3.1	4.4	2.5	3.10	2.07
(4)	2.0	0.125	–	9.7	5.0	7.2	0.6	0.41	0.17
(5)	2.5	0.125	–	9.6	5.1	7.5	0.5	0.31	0.08
SIT									
(6)	$+\infty$	–	–	9.4	5.1	8.1	0	0.23	0.00
Augmented Taylor–type Rules									
(7)	1.5	0.125	5.0	5.4	3.9	5.5	1.16	0.65	–
(8)	5.0	0.125	5.0	8.8	5.0	7.4	0.18	0.22	–
(9)	5.0	0.125	25.0	6.9	4.7	6.6	0.19	0.18	–
(10)	10.0	0.125	75.0	6.3	4.6	6.4	0.09	0.16	–
Backstop Rules									
(11)	1.5	0.125	–	15.5	–	–	1.21	0.56	–
(12)	$+\infty$	–	–	17.1	–	–	0.50	0.10	–

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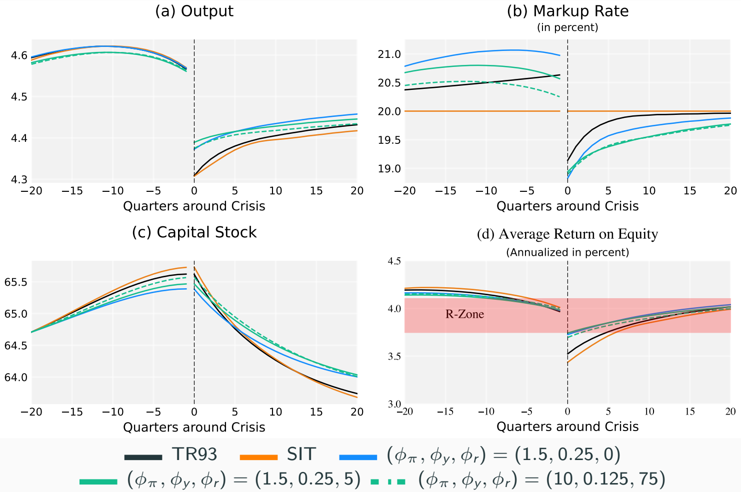
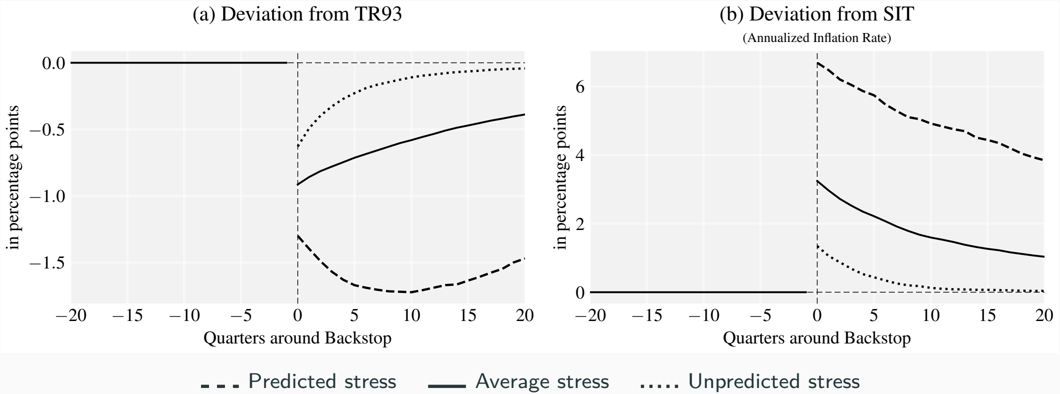
Why do Taylor rules improve FS over SIT?



- **Short run:** The Taylor–type rules cushion better the fall in r_t^k in the face of adverse shocks

"Backstop rules" and normalisation paths



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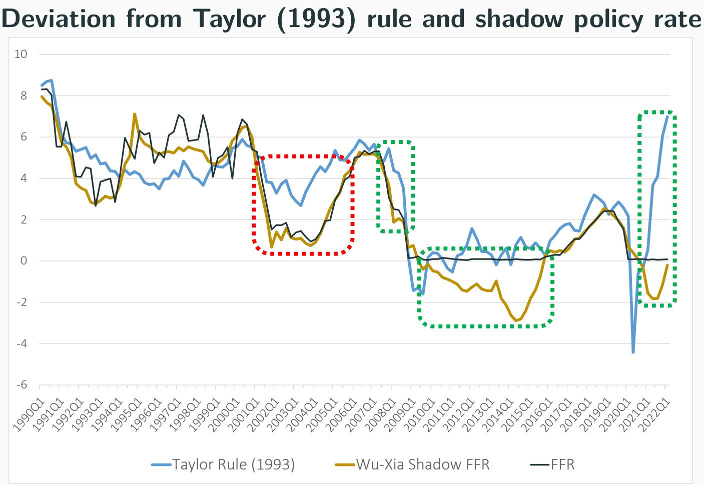
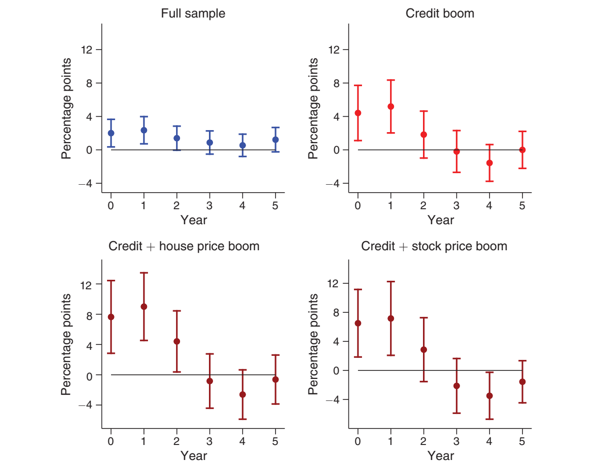
Deviation from Taylor (1993) rule and shadow policy rate



Source: Federal Reserve Bank of Atlanta

Schularick at al (2021)

Effect on annual crisis probability of an unexpected 1 pp policy rate hike



*"Based on the near-universe of advanced economy financial cycles since the nineteenth century, we show that **discretionary** leaning against the wind policies during credit and asset price booms are more likely to trigger crises than prevent them".*

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