Taming a Minsky Cycle

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Macroprudential Policy

- Macroprudential policies motivation…
  - financial fragility
  - *aggregate demand* stabilization
  - monetary policy constraints or dilemmas

- Farhi-Werning (2013, 2014, 2015)…
  - Applications: capital controls, fiscal unions, deleveraging
  - General model: pecuniary + demand externalities
  - Formula: MPCs + Wedges

- New Today…
  - Financial intermediaries a la He-Krishnamurthy
  - Non-rational expectations, extrapolation

Farhi-Werning (2016)

$$\text{tax on asset}_i \text{ held by } j = \sum_{\text{good}} \text{wedge}_{\text{good}} \times \text{MPC}^j_{\text{good}}$$

- Macropru formula: linked to MPCs and wedges
- General model: incomplete markets, financial constraints with prices etc. (pecuniary externalities)

Main New Ingredients

- Financial Intermediaries
  - expert banks intermediate for households (He-Krishnamurthy, Gertler-Kiyotaki, Holmstrom-Tirole, etc.)
  - risk-taking capacity (capital requirements)

- Irrational Expectations
  - Credit and Financial Cycle (Jordà-Schularick-Taylor, López-Salido-Stein-Zakrajšek, Borio)
  - Diagnostic/Extrapolative Expectations evidence (Bordalo-Gennaioli-Ma-Shleifer)

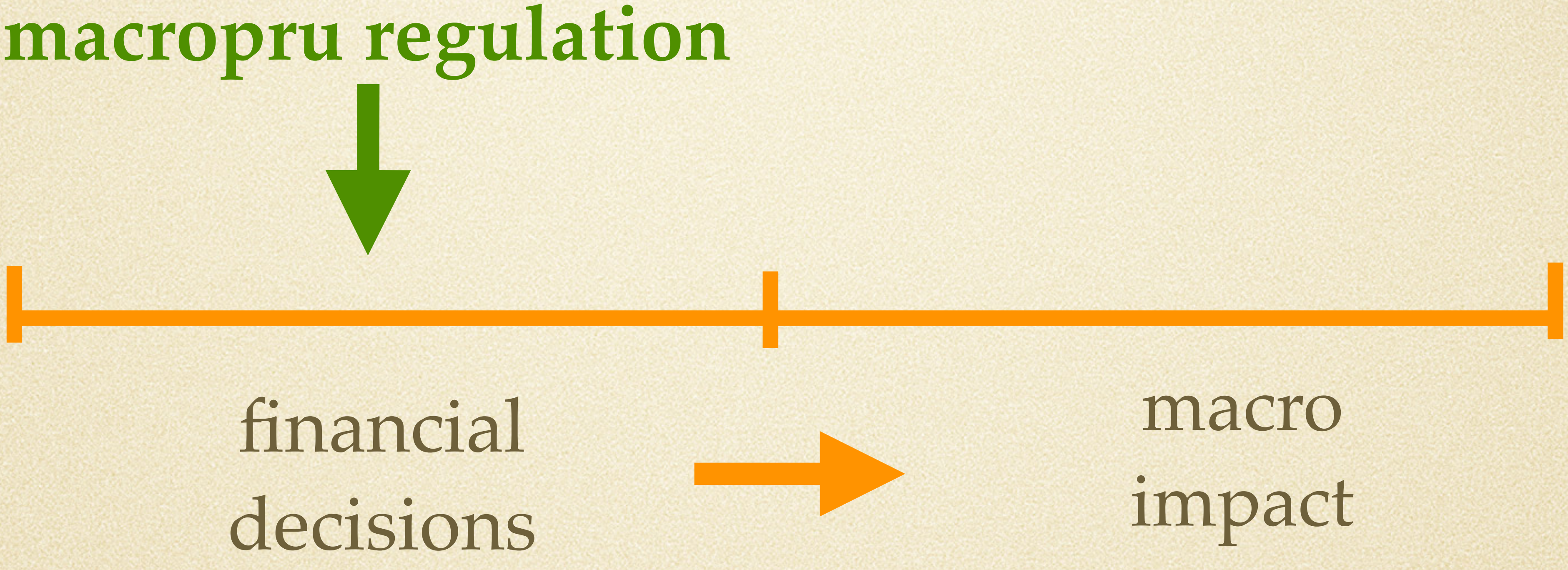
Macroprudential

financial decisions → macro impact

e.g. credit boom
high leverage and risk taking

e.g. low return shock
lower future loans

Macroprudential



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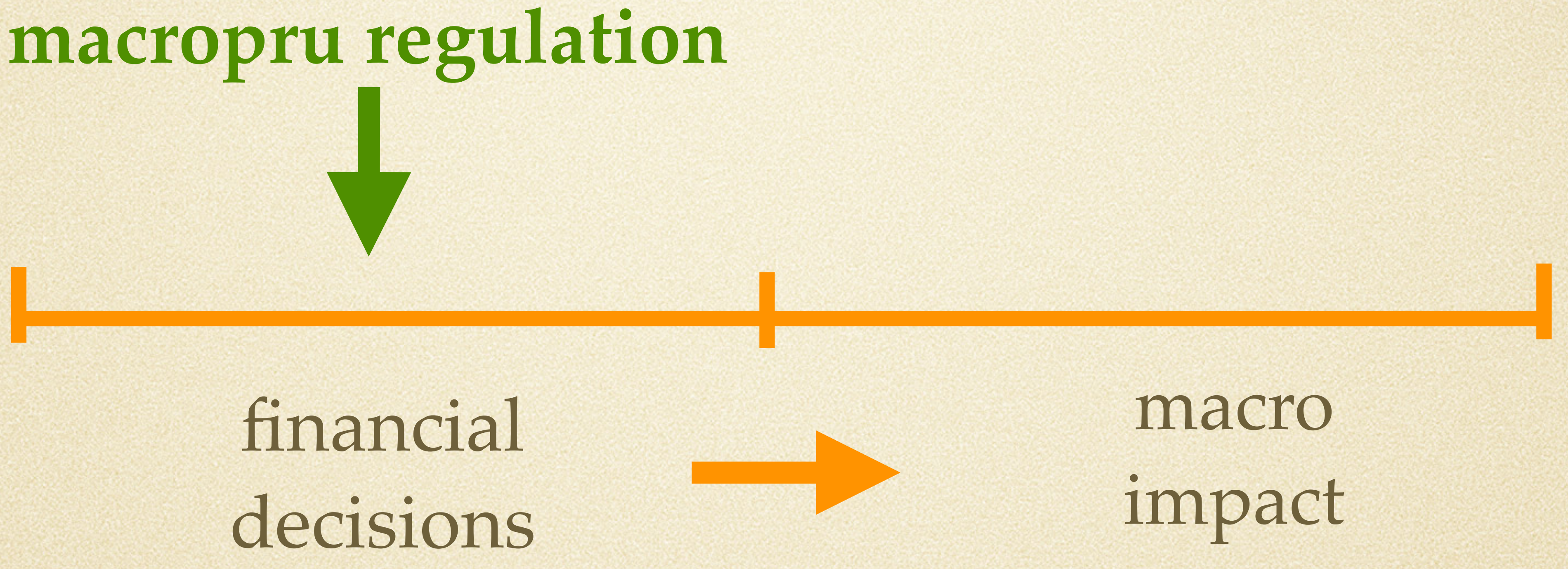

e.g. credit boom
high leverage and risk taking

e.g. low return shock
lower future loans

Is there a market failure?
Not necessarily.
Externality needed.

Macroprudential

monetary policy?

macropru regulation

financial decisions → macro impact

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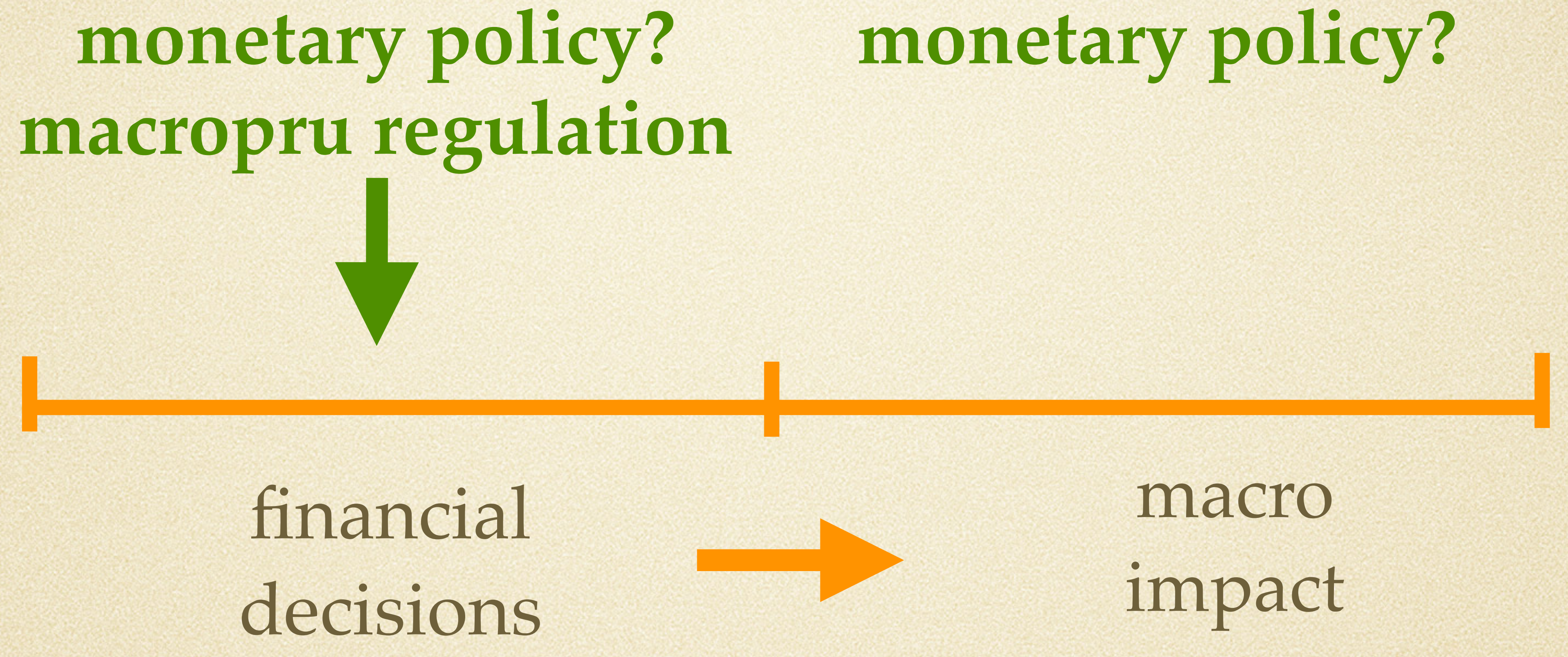

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Policy Debate

- A debate…
  - Monetary policy: Use monetary policy to lean against credit booms (e.g. BIS view, Borio, Stein, ...)
  - Macroprudential policy: Monetary policy focused on targeting inflation and employment, other macroprudential policies and regulations should be used instead (e.g. Krugman, Evans, Svensson, ...)

	Monetary	Monetary + Macropru
Rational Expectation		

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Rational Expectation	IT	

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Extrapolative Expectations		

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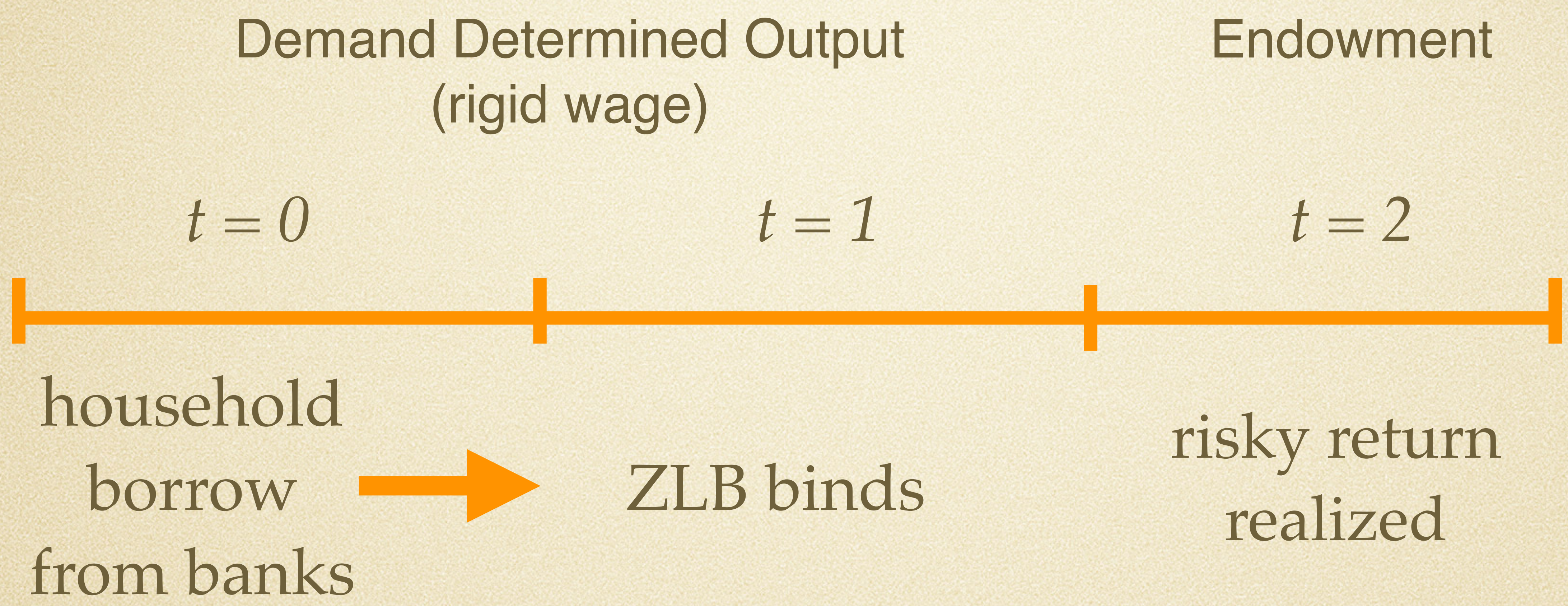
Extrapolative Expectations	Lean Against Boom	

	Monetary	Monetary + Macropru
Rational Expectation	IT	IT + Macropru
Extrapolative Expectations	Lean Against Boom	IT + Macropru

Model

Financial Intermediaries

- He-Krishnamurthy (2013)
  - asset pricing model
  - adds nominal rigidities + optimal policy
- Incomplete markets…
  - risky asset (Lucas tree)
  - risk-free short-term bond
- Two agents…
  - households: save risk-free
  - bankers/experts
    - invest in risky asset
    - borrow risk-free
- Three periods $t=0,1,2$
- Consumption good produced 1-to-1 with labor
- Rigid wages, no inflation


Demand Determined Output
(rigid wage)
Endowment
$t = 0$
$t = 1$
$t = 2$
household
borrow
from banks
ZLB binds
risky return
realized

Households and Bankers

- Household and Bankers: fractions ϕ^B and ϕ^H
  - utility

$$\log c_0 - h(y_1) + \beta(\log c_1 - h(y_2)) + \beta^2 \log c_2$$

  - budget constraint

$$c_t + q_t b_{t+1} + P_t a_{t+1} = y_t + b_t + (D_t + P_t)a_t$$

- Market segmentation
  - households $a_t = 0$
  - bankers a_t unrestricted
- Risky asset $D_0 = D_1 = 0$

Equilibrium

- All agents equally rationed in labor market $y_t = Y_t$
- Bankers hold all risky assets
- Households
  - save in risk free
  - constant fraction of wealth (log utility)

- Assuming ZLB binds at *t=1* then $q_1 = 1$
- Policy instruments
  - monetary policy: q_0
  - macroprudential policy: B_1
  - redistributive taxes
- Solve equilibrium backwards from t=1,2, then planner

- Consumption at t=1

$$c_1^H = (1-\beta)(B_1 + Y_1)$$

$$c_1^B = (1-\beta)(\frac{P_1}{\phi^B} + Y_1 - \frac{\phi^H}{\phi^B} B_1)$$

$$c_2^B = \frac{D_2}{\phi^B} - \beta(\frac{\phi^H}{\phi^B} B_1 + \frac{\phi^H}{\phi^B} Y_1)$$

- Euler equations for Banker

$$\frac{1}{c_1^B} = \frac{\beta}{1-\beta} E\left[\frac{\phi^B}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]$$

$$\frac{1}{c_1^B} = \frac{\beta}{1-\beta} E\left[\frac{D_2}{P_1} \frac{\phi^B}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]$$

- Output

$$Y_1 = \phi^H c_1^H + \phi^B c_1^B$$

$$Y_1 = (1-\beta)(\phi^H B_1 + \phi^H Y_1) + \frac{1-\beta}{\beta} \frac{1}{E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]}$$

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$$\frac{\partial Y_1}{\partial B_1} = \frac{\phi^H (1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right]}{1 - \phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right]} < 0$$

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zero if no risk!

Intuition

- Output and Asset Price are linked…

$$Y_1 = (1-\beta)(P_1 + Y_1)$$

$$\frac{\partial P_1}{\partial B_1} = \frac{\beta}{1-\beta}\frac{\partial Y_1}{\partial B_1} < 0$$

- Two intuitions…
  - higher debt → lower risk-taking capacity → higher risk premia → lower asset price → lower consumption
  - higher debt → higher precautionary motive → lower natural rate →lower consumption
- Risk always key here; without it, no effect.

Planning problem

- Value functions for *t=1,2*

$$\begin{aligned}V^H(B_1) =&(1-\beta)\log[(1-\beta)(B_1+Y_1(B_1))]\\&-(1-\beta)h(Y_1(B_1))+\beta\log[\beta(B_1+Y_1(B_1))]\end{aligned}$$

$$\begin{aligned}V^B(B_1) = (1-\beta)\log[(1-\beta)(\frac{1}{\phi^B}P_1(B_1)+Y_1(B_1)-\frac{\phi^H}{\phi^B}B_1)] - (1-\beta)h(Y_1(B_1))\\+\beta E\left[\log[(\frac{1}{\phi^B}D_2-\frac{\phi^H}{\phi^B}\beta(B_1+Y_1(B_1)))]\right].\end{aligned}$$

$$\begin{aligned}\max \phi^H\lambda^H[(1-\beta)\log(c_0^H)-(1-\beta)h(Y_0)+\beta V^H(B_1)]\\+\phi^B\lambda^B[(1-\beta)\log(c_0^B)-(1-\beta)h(Y_0)+\beta V^B(B_1)]\end{aligned}$$

Monetary Policy

- Euler at *t=0*

$$1 = \frac{\beta}{1-\beta}\frac{c_0^i}{c_1^i}R$$

- Guess and verify
  - *R=1/q* affects c_0 but NOT c_1 nor B_1…
  - more general result (Werning, 2015 “IMAD”)
  - neutrality depends on log utility, but can go either way

Monetary Policy.
Cannot affect B_1.
Optimum targets labor wedge at *t=0*.

	Monetary	Monetary + Macropru
Rational Expectation	IT	
Extrapolative Expectations		

Macroprudential Policy

$$\max \phi^H \lambda^H [(1-\beta)\log(c_0^H) - (1-\beta)h(Y_0) + \beta V^H(B_1)]$$
$$+\phi^B \lambda^B [(1-\beta)\log(c_0^B) - (1-\beta)h(Y_0) + \beta V^B(B_1)]$$

$$\phi^H c_0^H + \phi^L c_0^B = Y_0$$

Macroprudential Policy

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$$\lambda^H \frac{1-\beta}{c_0^H} = \lambda^B \frac{1-\beta}{c_0^B} = \phi^H \lambda^H (1-\beta) h'(Y_0) + \phi^B \lambda^B (1-\beta) h'(Y_0)$$

Macroprudential Policy

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$$\tau_{0,L} = 0$$

$$\tau_{0,L} = \frac{\phi^H \lambda^H \frac{\tau_{0,L}^H}{1-\tau_{0,L}^H} + \phi^B \lambda^B \frac{\tau_{0,L}^B}{1-\tau_{0,L}^B}}{\phi^H \lambda^H + \phi^B \lambda^B}$$

$$\lambda^H \frac{1}{c_0^H} = \lambda^B \frac{1}{c_0^B}$$

$$\phi^H \lambda^H V^{H\prime}(B_1) + \phi^B \lambda^B V^{B\prime}(B_1) = 0$$

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↓

$$\frac{c_0^H}{c_1^H}\left[1 + \tau_{1,L} Y_1'(B_1) \frac{\phi^H \lambda^H + \phi^B \lambda^B}{\phi^H \lambda^H} \frac{1 - \tau_{1,L}^H}{1 - \tau_{1,L}}\right] = \frac{c_0^B}{c_1^B}$$

→

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$$\downarrow$$

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- Negative effect on output from higher debt not internalized by private agents

  → discourage borrowing by banks

Optimal Policy:

1. Macropru: Binding leverage/capital requirement.

2. Monetary policy: targets zero labor wedge.

- Maps into general framework
  - results broadly in line with previous applications
  - now connects with broad macro-finance literature
- Model very stylized, but likely generalizes

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Rational Expectation		

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Extrapolative Expectations

Extrapolative Expectations

$$\mathbb{E}_t^{sub} R_{t+1} = (1-\lambda)\mathbb{E}_t^{obj} R_{t+1} + \lambda R_t$$

- Two states G and B

$$D_{2G} > D_{2B}$$

- Probabilities…
  - subjective (π_G, π_B)
  - objective $(\bar{\pi}_G, \bar{\pi}_B)$

- Can do this for
  - *t=0* irrational exuberance
  - t=1 irrational pessimism

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Note: same results if extrapolation on <u>dividends</u> instead of returns

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- Can do this for
  - *t=0* irrational exuberance **TODAY**
  - t=1 irrational pessimism

Extrapolation t=0,1

- Assume

$$\frac{P_1^e}{P_0} = (1-\lambda)\frac{P_1}{P_0} + \lambda\frac{P_0}{P_{-1}}$$

solving…

$$P_1^e(B_1, P_0) = (1-\lambda)P_1(B_1) + \lambda\frac{P_0^2}{P_{-1}}$$

- As before

$$Y_1^e(B_1, P_0) = \frac{1-\beta}{\beta}P_1^e(B_1, P_0)$$

- Create subject beliefs about dividends that justify these beliefs about prices…

Extrapolation t=0,1

- at t=1,2 just as before…

$$Y_1 = (1-\beta)(\phi^H B_1 + \phi^H Y_1) + \frac{1-\beta}{\beta} \frac{1}{E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]}$$

$$P_1 = \frac{\beta}{1-\beta} Y_1$$

- Subjective beliefs defined by…

$$P_1^e(B_1, P_0) = (1-\lambda) P_1(B_1) + \lambda \frac{P_0^2}{P_{-1}}$$

$$P_1^e(B_1, P_0) = \mathbb{E}^e \left[\frac{\beta}{1-\beta} \frac{c_1^{B,e}(B_1, P_0)}{c_2^{B,e}(B_1, P_0)} D_{2,s} \right]$$

Planner Problem

Planner Problem

- Two planning problems:
  - non-paternalistic: respect subjective beliefs
  - paternalistic: use objective beliefs

Planner Problem

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  - paternalistic: use objective beliefs **TODAY**

Monetary Policy Only

- Monetary Policy at t = 0
  - lowers output during boom
  - lowers expectations on assets and future output
  - … lowers leverage/borrowing by banks

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$$\rightarrow \frac{d\log Y_1}{d\log R} > 0$$

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Extrapolative Expectations	Lean against Boom	

	Monetary	Monetary + Macropru
Rational Expectation	IT	IT + Macropru
Extrapolative Expectations	Lean against Boom	?

Macroprudential Policy

- With macroprudential policy…
  - can control B_1 directly: this takes care of t=1,2
  - at t=0 irrational beliefs:
    - affect price and interest rate
    - but central bank should still target efficient allocation: zero labor wedge
- Non-rational beliefs neither a problem nor a blessing here

Optimal Policy:
1. Macropru: Binding leverage/capital requirement.
2. Monetary policy targets zero labor wedge.

Intuition

- Contractionary Monetary Policy…
  - cools economy during boom
  - cools expectations of returns
  - cools borrowing
  - low borrowing beneficial in future
- Non-rational expectations essential here
- "Take the punch bowl away when the party is still going"

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Extrapolative Expectations	Lean Against Boom	IT + Macropru

Other Cases

- Similar results for…
  - non-paternalistic planner:
    respecting subjective probabilities
  - Extrapolative expectations between t = 1,2
    - now monetary policy cools boom at t=0
    - makes fall at t=1 look less bad
    - tempers pessimism in bust
      (versus before: control optimism in boom)

Conclusion

- General theory of macropru + monetary policy
  - workhorse for many applications
  - general formula: MPCs and wedges
- Financial Intermediaries
  - macroprudential capital requirements to protect risk-taking capacity
  - intuitions: via asset price and/or natural rate
- Non-Rational Expectations
  - expectation management: interventions attempt to mitigate financial crashes in prices
  - dilemma: may affect monetary policy

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Extrapolative Expectations		

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Extrapolative Expectations	Lean Against Boom	

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Rational Expectation	IT	IT + Macropru
Extrapolative Expectations	Lean Against Boom	IT + Macropru