Monetary Policy Macroprudential Policy and the Financial 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

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

macropru regulation

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Is there a market failure?

Not necessarily.

Externality needed.

Macroprudential

monetary policy?

macropru regulation

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Macroprudential

monetary policy?
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monetary policy?

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Not necessarily.

Externality needed.

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, ...)

General Model

- Farhi-Werning (2013, 2014, 2016)
- Arrow-Debreu with frictions:
  - price rigidities
  - constraints on monetary policy

- Instruments:
  - monetary policy
  - macroprudential policy

- Constrained efficient allocations (2nd best)

Results

- Monetary policy not sufficient...
  - private financial decisions
    → **aggregate demand externalities**
  - ... macroprudential policies beneficial
- Formula for optimal policies...
  - intuition
  - sufficient statistics: MPCs and wedges

Results

- Financial Intermediaries…
  - limited risk capacity
  - optimal macroprudential policy limits leverage (capital requirements)
  - monetary policy: IT/output gap target
- Irrational Beliefs…
  - rationale for deviating monetary policy
  - further motive for macropru
  - both paternalistic vs. non-paternalistic welfare

	Monetary	Monetary + Macropru
Rational Expectation		

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Rational Expectation	IT	

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Extrapolative Expectations		

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

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

Outline

- General Model
- Financial Intermediaries
- Non-Rational Expectations

General Model

Farhi-Werning (2016)

- Agents $i \in I$

- Goods $\{X^i_{j,s}\}$ indexed by...
  - "state" $s \in S$
  - commodity $j \in J_s$

- "States":
  - states, periods
  - trade across states...financial markets
  - taxes or quantity controls available

(preferences)

$$\sum_{s \in S} U^i(\{X^i_{j,s}\}; s)$$

(preferences)

$$\sum_{s \in S} U^i(\{X^i_{j,s}\}; s)$$

(technology)

$$F(\{Y_{j,s}\}) \leq 0$$

(preferences) (technology)

$$\sum_{s\in S} U^i(\{X^i_{j,s}\}; s) \qquad F(\{Y_{j,s}\}) \leq 0$$

$$\sum_{s\in S} D^i_s Q_s \leq \Pi^i$$

$$\sum_{j\in J_s} P_{j,s} X^i_{j,s} \leq -T^i_s + (1 + \tau^i_{D,s}) D^i_s$$

$$\{X^i_{j,s}\} \in B^i_s$$

(preferences)

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macroprudential
financial tax

borrowing
constraints

(preferences)

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$$\{X^i_{j,s}\} \in B^i_s$$

borrowing constraints

macroprudential financial tax

$$\Gamma(\{P_{j,s}\}) \leq 0$$

(nominal rigidities and monetary policy)

(preferences)

$$\sum_{s \in S} U^i(\{X^i_{j,s}\}; s)$$

(technology)

$$F(\{Y_{j,s}\}) \leq 0$$

$$\sum_{s \in S} D^i_s Q_s \leq \Pi^i$$

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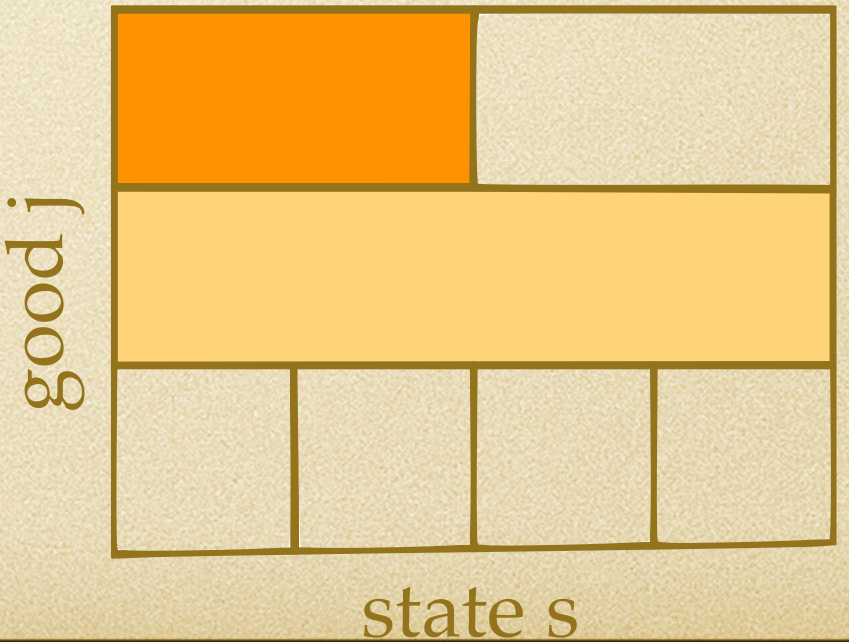
(nominal rigidities
and monetary policy)



Equilibrium

1. Agents optimize
2. Government budget constraint satisfied
3. Technologically feasible
4. Markets clear
5. Nominal rigidities

Wedges

- Define wedges $\tau_{j,s}$ given reference good $j^*(s)$

$$\frac{P_{j^*(s),s}}{P_{j,s}}\frac{F_{j,s}}{F_{j^*(s),s}} = 1 - \tau_{j,s}$$

- First best... $\tau_{j,s} = 0$

Proposition (Corrective Financial Taxes).

$$\frac{\tau^i_{D,s}}{1+\tau^i_{D,s}} = \sum_{j \in J_s} P_{j,s} X^i_{I,j,s} \tau_{j,s}$$

- Macropru formula: linked to MPCs and wedges
- Result extends with…
  - incomplete markets, financial constraints with prices etc. (pecuniary externalities)
  - affect monetary policy condition, but not macropru

Aggregate Demand Externalities

- Assume "state" where depressed economy
- Force agents with high propensity to spend to move income to that "state"...
- ... increases spending...income...spending....
- ...stabilization benefits...
- ...not internalized by private agents

Aggregate Demand Externalities

- Assume “state” where depressed economy
- Force agents with high propensity to spend to move income to that “state”...

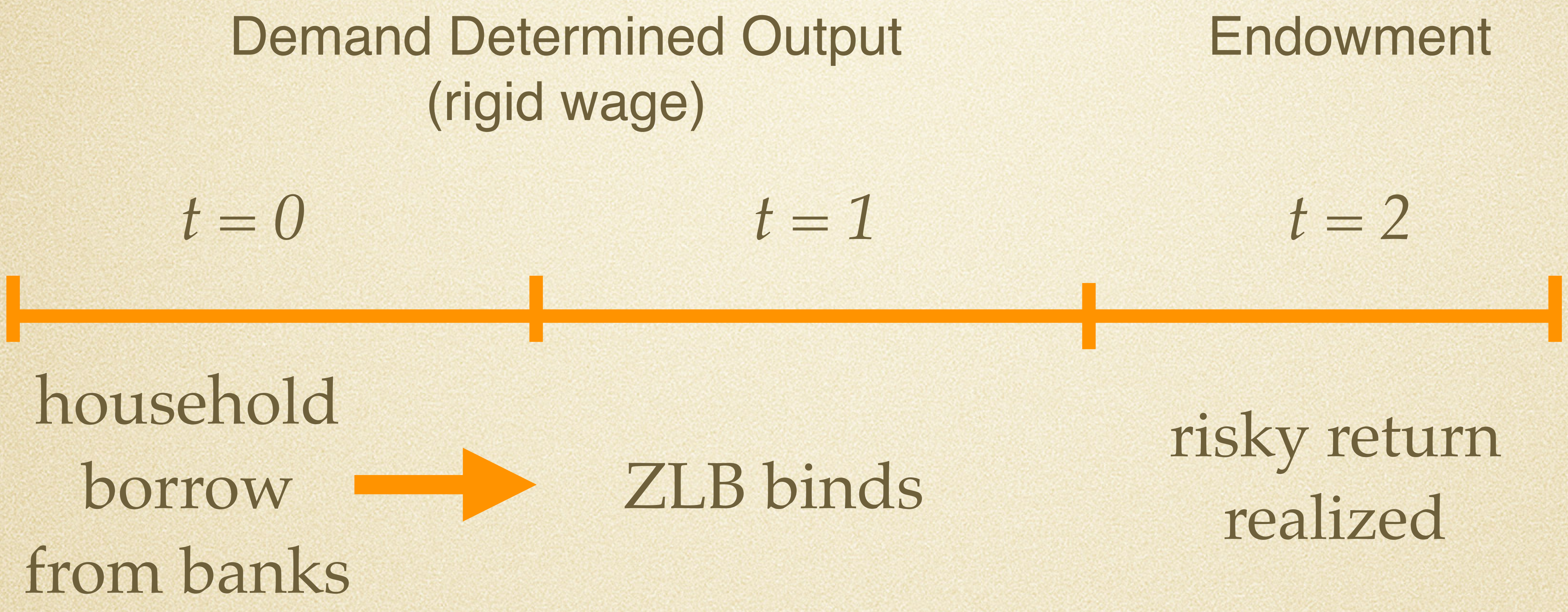
Keynesian cross

- ... increases spending...income...spending....
- ...stabilization benefits...
- ...not internalized by private agents

Financial Intermediaries

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*

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

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

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		

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

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

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

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

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

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

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

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

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

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

↓

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

→

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

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

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↓

$$\frac{c_0^H}{c_1^H}\left[1 + \underbrace{\tau_{1,L} Y_1'(B_1) \frac{\phi^H \lambda^H + \phi^B \lambda^B}{\phi^H \lambda^H} \frac{1-\tau_{1,L}^H}{1-\tau_{1,L}}}_{\text{shadow tax on borrowing for banks}}\right] = \frac{c_0^B}{c_1^B}$$

- 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

Extrapolative Expectations

- Two states G and B

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

- Probabilities…
  - subjective
  - objective

$$(\pi_G, \pi_B)$$

$$(\bar{\pi}_G, \bar{\pi}_B)$$

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

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

Planning Problem

- Policy tools: just as before
  - monetary policy at t=0
  - macropru at t=0
  - redistribution
- Two planning problems:
  - non-paternalistic: respect subjective beliefs
  - paternalistic: use objective beliefs

Feedback

- System as before, but with subjective beliefs

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

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

- note: now P_1 feeds back into *E[.]!*
- solution: $Y_1(B_1, P_0)$ $P_1(B_1, P_0)$

$$\frac{\partial Y_1}{\partial B_1} = \frac{\phi^H (1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]\right]^2}\right]}{1 - \phi^H (1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]\right]^2}\right] - \frac{\frac{\partial \pi_G}{\partial P_1}\left[\frac{1}{D_{2B} - \beta(\phi^H B_1 + \phi^H Y_1)} - \frac{1}{D_{2G} - \beta(\phi^H B_1 + \phi^H Y_1)}\right]}{\left[E\left[\frac{1}{D_2 - \beta(\phi^H B_1 + \phi^H Y_1)}\right]\right]^2}} < 0$$

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extra negative term due to feedback on expectations!

$$\frac{\partial Y_1}{\partial B_1} = \frac{\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right]}{1-\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right] - \frac{\frac{\partial \pi_G}{\partial P_1}\left[\frac{1}{D_{2B}-\beta(\phi^H B_1+\phi^H Y_1)} - \frac{1}{D_{2G}-\beta(\phi^H B_1+\phi^H Y_1)}\right]}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}} < 0$$

extra negative term due to feedback on expectations!

higher asset price now makes agents more optimistic…
…. further increasing asset price and output

$$\frac{\partial Y_1}{\partial B_1} = \frac{\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right]}{1-\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right] - \frac{\frac{\partial \pi_G}{\partial P_1}\left[\frac{1}{D_{2B}-\beta(\phi^H B_1+\phi^H Y_1)} - \frac{1}{D_{2G}-\beta(\phi^H B_1+\phi^H Y_1)}\right]}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}} < 0$$

extra negative term due to feedback on expectations!

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no longer directly dependent on risk and prudence

$$\frac{\partial Y_1}{\partial B_1} = \frac{\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right]}{1-\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right] - \frac{\frac{\partial \pi_G}{\partial P_1}\left[\frac{1}{D_{2B}-\beta(\phi^H B_1+\phi^H Y_1)} - \frac{1}{D_{2G}-\beta(\phi^H B_1+\phi^H Y_1)}\right]}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}} < 0$$

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$$\frac{\partial Y_1}{\partial P_0} = \frac{1-\beta}{\beta}\frac{\frac{\partial \pi_G}{\partial P_0}\left[\frac{1}{D_{2B}-\beta(\phi^H B_1+\phi^H Y_1)} - \frac{1}{D_{2G}-\beta(\phi^H B_1+\phi^H Y_1)}\right]}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2} < 0$$

$$\frac{\partial Y_1}{\partial B_1} = \frac{\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right]}{1-\phi^H(1-\beta)\left[1 - \frac{E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]^2}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}\right] - \frac{\frac{\partial \pi_G}{\partial P_1}\left[\frac{1}{D_{2B}-\beta(\phi^H B_1+\phi^H Y_1)} - \frac{1}{D_{2G}-\beta(\phi^H B_1+\phi^H Y_1)}\right]}{\left[E\left[\frac{1}{D_2-\beta(\phi^H B_1+\phi^H Y_1)}\right]\right]^2}} < 0$$

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analogously, if previous boom was higher
crash is bigger

Planning Problem

- Policy tools: just as before
  - monetary policy at t=0
  - macropru at t=0
  - redistribution
- Two planning problems:
  - non-paternalistic: respect subjective beliefs
  - paternalistic: use objective beliefs

Planning Problem

$$\max \phi^H \lambda^H [(1-\beta)\log(c_0^H) - (1-\beta)h(Y_0) + \beta V^H(P_0, B_1)]$$
$$+\phi^B \lambda^B [(1-\beta)\log(c_0^B) - (1-\beta)h(Y_0) + \beta V^B(P_0, B_1)]$$

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

$$c_0^B = c_0^B(P_0, B_1)$$

with

$$\frac{\phi^B c_0^B(P_0, B_1)}{(1-\beta)(P_1(P_0, B_1) + \phi^B Y_1(P_0, B_1) - \phi^H B_1)} \frac{\beta}{1-\beta} \frac{P_1(P_0, B_1)}{P_0} = 1$$

Planning Problem

$$\max \phi^H \lambda^H [(1-\beta)\log(c_0^H) - (1-\beta)h(Y_0) + \beta V^H(P_0, B_1)]$$
$$+\phi^B \lambda^B [(1-\beta)\log(c_0^B) - (1-\beta)h(Y_0) + \beta V^B(P_0, B_1)]$$

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

Irrational beliefs

$$c_0^B = c_0^B(P_0, B_1)$$

with

$$\frac{\phi^B c_0^B(P_0, B_1)}{(1-\beta)(P_1(P_0, B_1) + \phi^B Y_1(P_0, B_1) - \phi^H B_1)} \frac{\beta}{1-\beta} \frac{P_1(P_0, B_1)}{P_0} = 1$$

- First order condition

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

- First order condition

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

for small enough λ

$$\rightarrow \tau_{0,L} = \nu \frac{1-\beta}{\phi^H \lambda^H + \phi^B \lambda^B} h'(Y_0) > 0$$

- First order condition

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

for small enough λ

$$\rightarrow \tau_{0,L} = \nu \frac{1-\beta}{\phi^H \lambda^H + \phi^B \lambda^B} h'(Y_0) > 0$$

- Monetary policy tighter at *t=0*
- Intuition…
  - lower Y_0
  - lowers P_0
  - drop in price, less overreaction

Paternalistic Planner

- Now assume planner computes expected utility with objective probabilities
- Behavior still driven by subjective beliefs

Optimal Policy:

1. Macropru: Binding leverage/capital requirement.

2. Monetary policy **tighter** than zero labor wedge

Extrapolation t=0,1

- Previously low price makes you optimistic
- Now assume extrapolation is earlier

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

define

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

- As before

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

- In background: create subject beliefs about dividends that justify these beliefs about prices

Results

- Now:
  - beliefs and ZLB no longer interact
  - does not change outlook at t=1
- Result:
  - standard macropru + undo wrong beliefs
  - … even stronger macropru

Optimal Policy:

1. Macropru: Binding leverage/capital requirement.

2. Monetary policy targets zero labor wedge.

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

	Monetary	Monetary + Macropru
Rational Expectation		

	Monetary	Monetary + Macropru
Rational Expectation	IT	

	Monetary	Monetary + Macropru
Rational Expectation	IT	IT + Macropru

	Monetary	Monetary + Macropru
Rational Expectation	IT	IT + Macropru
Extrapolative Expectations		

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

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