Monetary and Macroprudential Policy: An Integrated Analysis

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Motivation

- Financial crises can cause significant economic dislocation (e.g., emerging markets and recent global crisis).
- An important question is whether their likelihood and severity is affected by *excessive* borrowing in normal times (i.e. overborrowing)
- And hence there is an ongoing policy debate on the role of "macro-prudential" policies (ex-ante policies) aimed at preventing overborrowing

Is there a role for monetary policy?

- Lax monetary policy may have contributed to recent crisis
  - (Taylor 2009)
  - Interest in adding a macro-prudential component to monetary policy
- Monetary policy may not have contributed to crisis
  - Regulatory policy should remain main tool for financial stability
  - Monetary policy should focus on price/output stability (Svensson 2010)
- In our most recent contribution we study these issues in a model with macroeconomic and financial stability objectives

Literature (partial list)

- Benigno et al. (2009, 2010,2011), Bianchi (2011), Bianchi and Mendoza (2010); Jeanne and Korinek (2011a,b), Nikolov (2009) have focused on variations a simple macroeconomic model:

1. Occasionally binding constraint (crisis is endogenous event);
2. Heterogeneity of agents mainly characterized in terms of small open economy;
3. Real model with no role for traditional monetary policy.

- Benigno et al (2011), Fornaro (2011), Vlieghe (2009) focus on models in which financial frictions interact with nominal rigidities.

Outline

- Simple model with only financial frictions;
- Mechanisms behind inefficient borrowing and policy implications
- Briefly present optimal policy results
- Extentions to nominal model and role of monetary policy
- Preliminary results
- Conclusions

Role of policy coming from financial frictions

- General idea (e.g., Arnott, Greenwald and Stiglitz, 1994): in economies with *financial frictions*, agents do not take into account the consequences of their individual actions on the key market prices on which financial frictions are defined.
- Because of this externality (pecuniary externality or systemic externality) borrowing decisions may be inefficient even in normal times.

Policy analysis

- Policy analysis: compare competitive allocation with social planner allocation where the social planner faces financial friction as in the competitive allocation (constrained-efficient social planner problem).
- Focus on borrowing decisions in normal times by comparing agents' borrowing decisions in the two allocations.
- If there is overborrowing or excessive leverage $\Rightarrow$ macro-prudential policies

Model: Preferences

- Households maximize:

$$U^j \equiv E_0 \sum_{t=0}^{\infty} \left\{ \beta^t \frac{1}{1-\rho} \left(C_{j,t} - \frac{H_{j,t}^{\delta}}{\delta} \right)^{1-\rho} \right\},$$

- Consumption basket C is a composite of tradable and non-tradables goods:

$$C_t \equiv \left[\omega^{\frac{1}{\kappa}} \left(C_t^T \right)^{\frac{\kappa-1}{\kappa}} + (1-\omega)^{\frac{1}{\kappa}} \left(C_t^N \right)^{\frac{\kappa-1}{\kappa}} \right]^{\frac{\kappa}{\kappa-1}}.$$

- Budget constraint:

$$C_t^T + P_t^N C_t^N = \pi_t + W_t H_t - B_{t+1} + (1+i) B_t,$$

- Imperfect access to international financial markets:

$$B_{t+1} \geqslant -\frac{1-\phi}{\phi} \left[\pi_t + W_t H_t \right]$$

- The constraint limits B to a fraction of current income (constraint binds only occasionally)

Model: Firms

- Traded and Nontraded goods are produced with variable labor input:

$$Y_t^N = A_t^N H_t^{1-\alpha^N}, Y_t^T = A_t^T H_t^{1-\alpha^T}$$

- The firm (owned by the consumer) chooses labor to maximize profits:

$$\pi_t = A_t^T \left(H_t^T\right)^{1-\alpha^T} + P_t^N A_t^N \left(H_t^N\right)^{1-\alpha^N} - W_t H_t.$$

- Labor demand schedules:

$$W_t = \left(1-\alpha^N\right) P_t^N A_t^N \left(H_t^N\right)^{-\alpha^N},$$

:

$$W_t = \left(1-\alpha^T\right) A_t^T \left(H_t^T\right)^{-\alpha^T}.$$

Model: Aggregate Equilibrium Conditions

- Resource constraint on tradables

$$C_t^T = Y_t^T - B_{t+1} + (1+i)\, B_t.$$

- Resource:constraint on nontradable goods

$$C^N = Y^N = A_t^N \left(H_t^N\right)^{1-\alpha^N}$$

- Credit constraint from a country perspective:

$$B_{t+1} \geq -\frac{1-\phi}{\phi}\left[Y^T + P_t^N Y^N\right],$$

- Pricing function:

$$P_t^N = \frac{(1-\omega)^{\frac{1}{\kappa}}\left(C_t^T\right)^{\frac{1}{\kappa}}}{\omega^{\frac{1}{\kappa}}\left(C_t^N\right)^{\frac{1}{\kappa}}} = \frac{MPL_t^T}{MPL_t^{NT}}$$

Figure 1: Policy functions for Foreign Borrowing

CE and SP

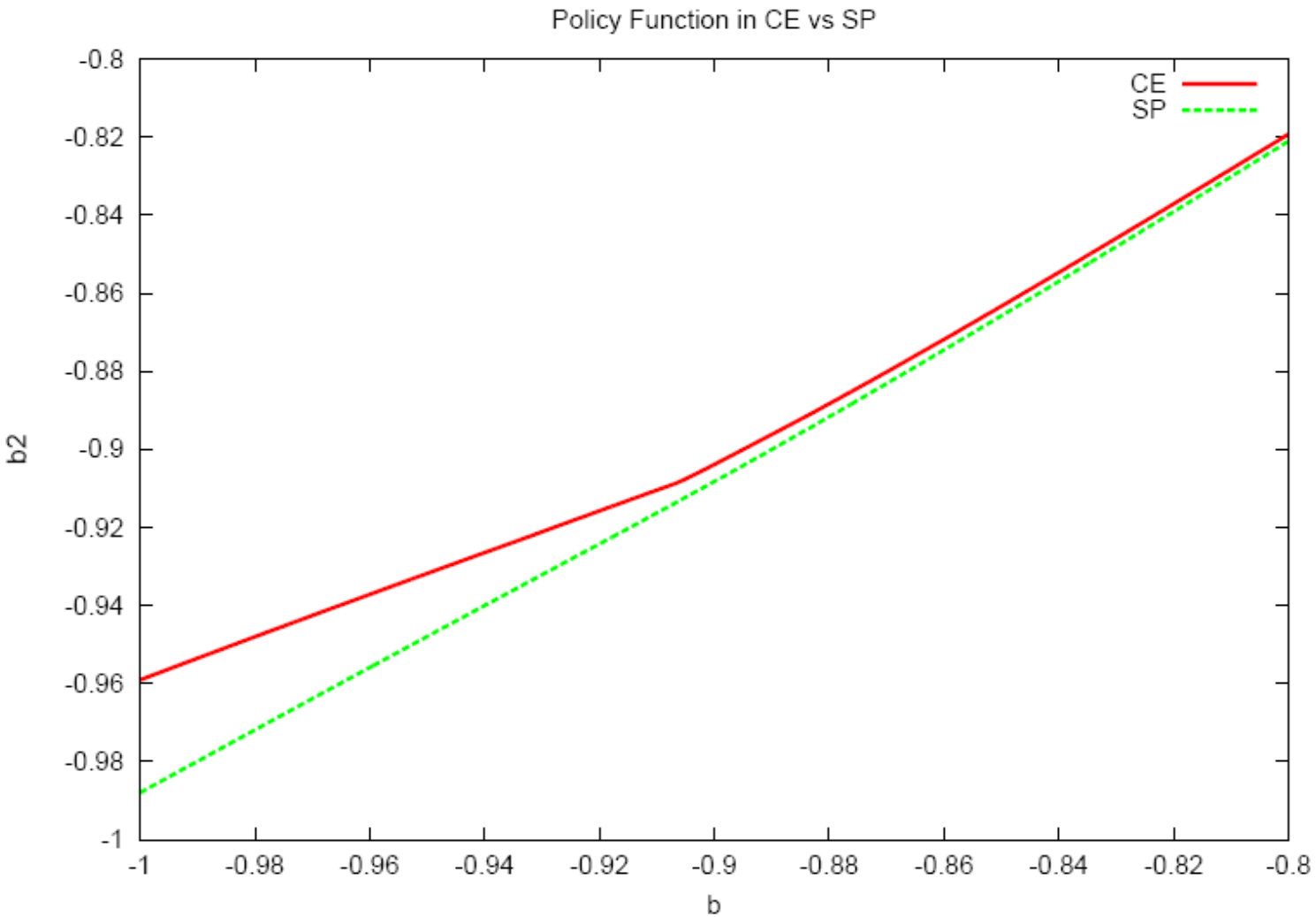
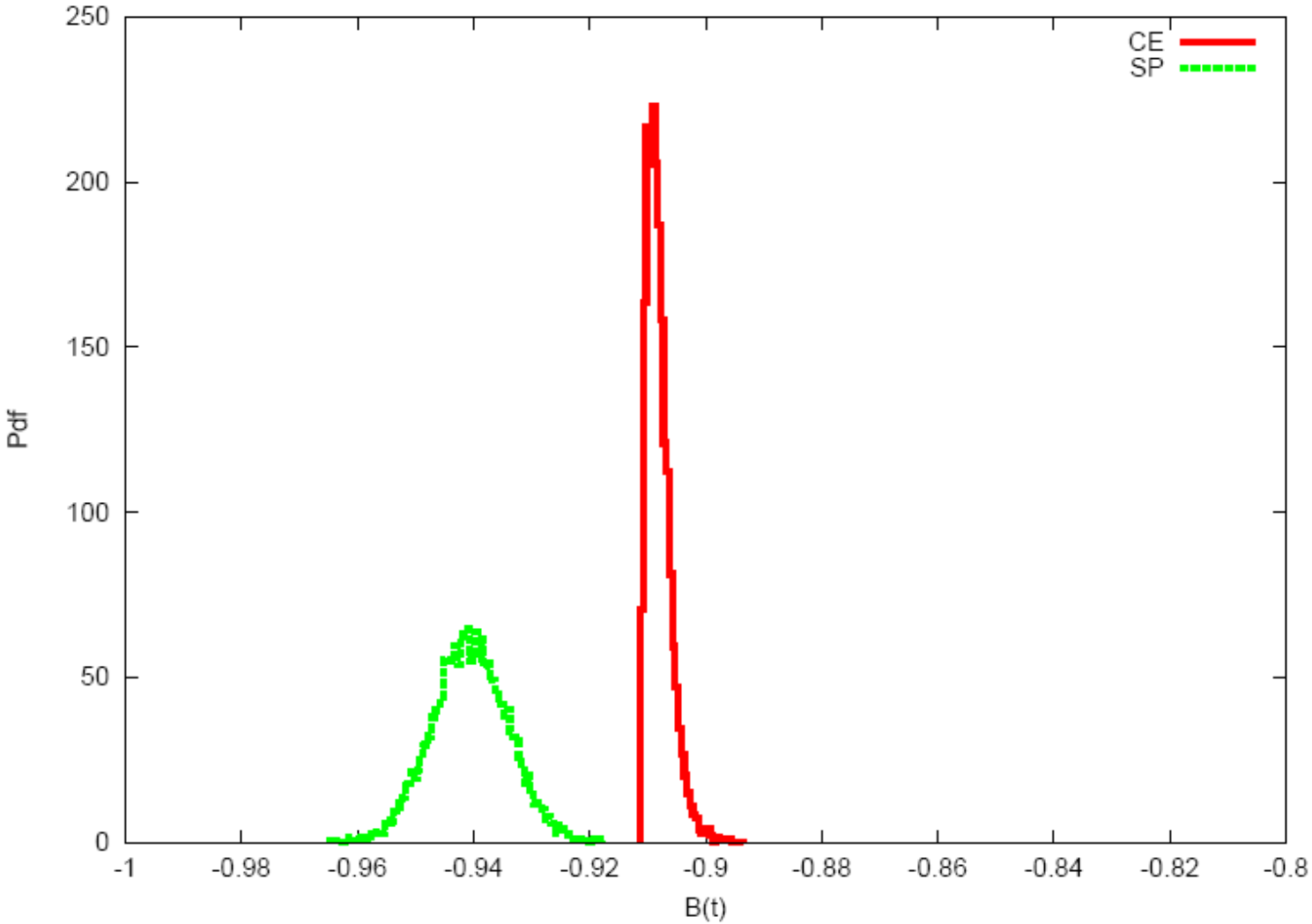


Figure 4: Ergodic distribution for Debt

CE and SP



Intuition

- Euler equation in the competitive equilibrium

$$\mu_{1,t}^{CE} = \beta (1+i) E_t \left[\lambda_{t+1}^{CE} + \beta (1+i) E_t \left[\mu_{1,t+2}^{CE} \right] \right],$$

- Euler equation from the planner perspective in fact becomes

$$\mu_{1,t}^{SP} = \beta (1+i) E_t \left[\lambda_{t+1}^{SP} + \beta (1+i) E_t \left[\mu_{1,t+2}^{SP} \right] \right],$$

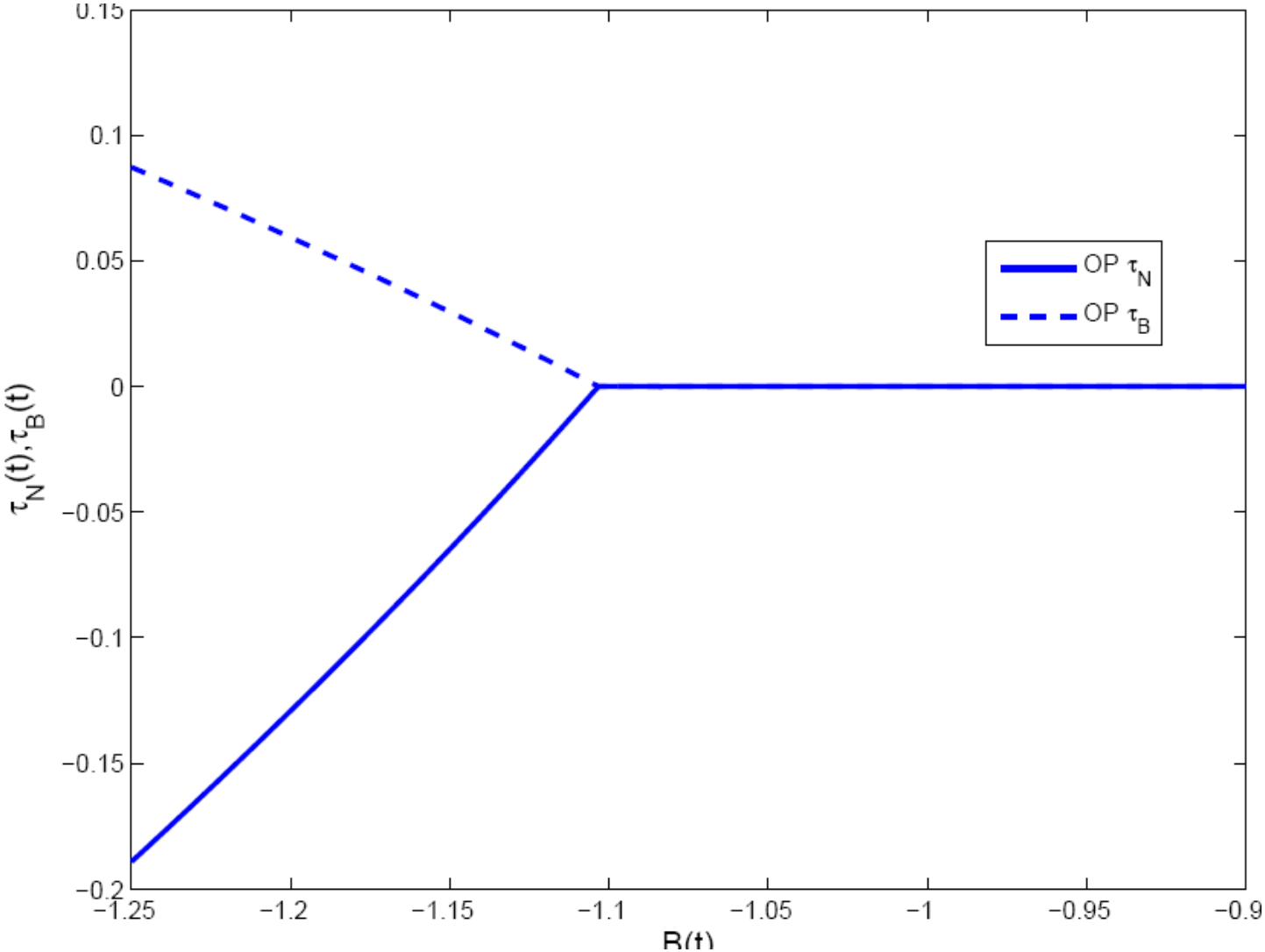
- $\mu_{1,t}$ is the marginal utility of tradeable consumption (the higher, the more I value saving)
- λ_{t+1} measure the severity of the crisis (the lower the less severe is the crisis)
- Pecuniary externality effect $\mu_{1,t+2}^{CE} < \mu_{1,t+2}^{SP}$
- Reallocation of resources effect in crisis $\lambda_{t+1}^{SP} < \lambda_{t+1}^{CE}$
- Effect on borrowing behavior (saving) in normal time depends on relative strenght of these two forces.

Policy Implications

1. In our benchmark production economy there is underborrowing $\Rightarrow$ case for capital controls in this class of model economies is weak (without implications for macro-prudential regulation of financial intermediaries)
2. There is a potential role for policy both ex-ante and ex-post (quantitative is small in both normal times and crisis times).
3. Welfare gaps are larger in crisis states $\Rightarrow$ ex-post policies are more important than ex ante policies (in a model in which both can be relevant)

Optimal Policy Analysis

- Solve for the Ramsey problem under various policy tools:
  1. Tax on borrowing (∼capital control);
  2. Distortionary tax on non-tradeable consumption (∼managing the real exchange rate)
- Design of optimal policy depends on which tools are available:
  -if you have only one policy tool (capital control or exchange rate policy) you intervene in normal times and in crisis times.
  -if you have both tools the possibility of using both tools during the crisis limit their use in normal times.
  -in general intervention is quantitatively more relevant in crisis times (gains from ex-ante policies are small)


0.15
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
−1.25
−1.2
−1.15
−1.1
−1.05
−1
−0.95
−0.9
B(t)
$\tau_N(t), \tau_B(t)$
OP τ_N
OP τ_B

Framework with Monetary Policy Role

- Stilized model
- Three period New Open Economy Macro version of Jeanne and Korinek (2010, AER PP)
  - Nominal friction gives rise to New Keynesian (price stability objective)
  - Occasionally Borrowing constraint depends on asset value (financial stability objective)

Key Questions

- Is there a tradeoff between macroecomic and financial stability?
  - Take an interest rate rule that addresses nominal rigidity
  - Apply rule in model with financial friction
- Can an 'adjusted' interest rate rule help?
  - Add borrowing to rule (implicit current account targeting)
  - Compare welfare

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Very Preliminary Results

- Welfare cost of the nominal rigidity is larger than the welfare cost of the financial friction
  - Recent literature finds small welfare gains with this financial friction
  - (Bianchi and Mendoza 2010 and Benigno et al. 2009, 2010, 2011)
- Macroprudential component appended to interest rate rule is welfare reducing
  - Same policy applies in good and bad times
  - Monetary policy should not be burdened with macroprudential objectives
- There is no trade off between macroeconomic and financial frictions
  - Conditional on model and parameterization

Households

- Two countries, H (Home) and F (Foreign)
  - Home country is a small open economy
- Consumer receives utility from consumption in each of 3 periods
  - Consumption is a composite good of tradable and non-tradable goods
- Tradeable goods are a composite of home and foreign tradeables

Households

- The period t budget constraint for the home country:

$$Q_t A_{t+1} + P_t C_t + B_{t+1} + S_t B^*_{t+1} =$$
$$B_t (1 + i_0) + S_t B^*_t (1 + i^*_0) + A_t (D_t + Q_t) + W_t L_t + F_t$$

- The collateral constraints are expressed as limits on foreign borrowing:

$$B^*_{t+1} \geq \frac{-\psi Q_t A_{t+1}}{S_t}$$

- Asset price appreciation and exchange rate appreciation modify borrowing capacity of household for given asset holdings.

Interplay between monetary policy and financial frictions

- International parity conditions

$$E_t\left[\frac{C_1^{-\rho}}{P_1}(1+i_0)\right] = \left[\mu_0 + E_t\left[\frac{C_1^{-\rho}}{P_1}\frac{S_1}{S_0}(1+i^*)\right]\right]$$

When the constraint is binding, the real return on domestic currency bonds increases through an expected appreciation of the nominal exchange rate or an increase in the domestic nominal interest rate.
- if during crisis, monetary policy is very accomodative, exchange rate tends to depreciate worsening the borrowing capacity of agents
- in normal times more aggressive monetary policy tends to be coupled with appreciation of the currency that improves borrowing capacity of agents.

Interplay between monetary policy and financial frictions

- Asset price determination:

$$Q_t = \frac{\lambda_{t+1}\left(D_{t+1} + Q_{t+1}\right)}{\lambda_t - \mu_t \psi} \quad t = 0, 1$$

- An increase in the nominal interest rate in normal times tend to lower asset prices lowering borrowing capacity of agents (other things being equal)

Firms

- Two-sector production economy (tradeable and non-tradeable goods).
- Domestic agents hold shares in home firms.
- Firms in the tradables sector operate in a monopolistic competitive environment
  - Only some firms can adjust prices in periods 0 and 1.
  - In period 2 prices are fully flexible for all firms.
- Firms in the non-tradables sector operate under decreasing return to scale in a competitive environment.

Monetary Policy

- Traditional monetary policy is a pure inflation targeting rule:

$$(1+i_t) = \beta\bar{\Pi}\left(\frac{\Pi_t^H}{\bar{\Pi}}\right)^{\phi_\pi}, \tag{1}$$

- The macroprudential component adds the level of borrowing to GDP

$$(1+i_t) = \beta\bar{\Pi}\left(\frac{\Pi_t}{\bar{\Pi}}\right)^{\phi_\pi}\left(1-\frac{S_t B^*_{t+1}}{P_t C_t}\right)^{\phi_{B^*}} \tag{2}$$

  - Raises the nominal interest rate as borrowing increases
  - This acts as a tax on borrowing (macro prudential intervention)

Very preliminary parametrization

- Tradeable sector technology shock is a two-state Markov process
  - crisis probability=probability of remaining in bad states
  - but, debt and crisis are endogenous
- Frequency of adjusting prices is 50 percent
- The rule coefficient is $\phi_\pi = 1.5$ or 2
- The borrowing parameter ψ is set,
  - so the constraint is never binding in period 0
  - and so that the constraint might bind if the economy remains in the bad state in period 1 (a value of 2.5).
  - thus the financial friction is a leverage constraint that limits foreign currency denominated borrowing in period 1 to 2.5 times the value of collateral in nominal terms
- Solution is fully nonlinear

Flexible Prices: With and Without Leverage Constraint

- Welfare and Consumption higher without the constraint
  - If bad state occurs in Period 1 constrained economy cannot smooth consumption
- Exchange rate has an expansionary expenditure switching effect and a contractionary balance sheet effect
- Both Nominal and Real exchange rates are more depreciated in constrained economy
  - Debt repayment is front loaded
  - Increase exports yielding a larger current account surplus

More Aggressive Inflation Targeting

- Increase inflation coefficient from 1.5 to 2 in interest rate rule
  - Main variables move towards flexible price allocation
- No trade off between monetary and financial stability
- Conventional monetary policy has a macroprudential component
  - A more aggressive rule towards inflation reduces debt
  - There are two channels through which higher interest rate affects borrowing decision
    - ★ Dampening asset price value
    - ★ Appreciate exchange rate so increases borrowing capacity

Macro Prudential Rule

- Add Debt/GDP ratio to rule
  - As debt rises, raises the interest rate to curtail borrowing
- Welfare is lower relative to rule with only inflation
  - Rule applies in every period
  - Prudential component distorts economy in all periods and states
  - Conventional rule already has some macro-prudential implications via asset prices

Preliminary Results

- Built an integrated model to study interaction between monetary and financial stability objective
- Preliminary analysis suggests that there is not a strong case for tasking interest rate rule with macro-prduential objectives
- We plan to investigate robustness of results
- Study two part rules and state contingent rules