Macroprudential Policy: Promise and Challenges

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European Central Bank & Central Bank of Ireland Research Workshop
"Macroprudential policy: from research to implementation"
July 10, 2018

The promise

- Macroprudential policy (MPP) aims to weaken credit booms in order to reduce frequency & severity of crises
- Rationale: Credit booms are infrequent, but end in deep, protracted crises. In Mendoza & Terrones (2012):
  1. Credit booms occur with 2.8% frequency
  2. 1/3rd end in banking or currency crises.
  3. After 3 years, GDP is still 5%-8% below trend
- Fisherian models provide useful quantitative framework
  1. Strong financial amplification captures nonlinearities & explains key features of credit booms/crises
  2. Externalities (market-failure) justify policy intervention
  3. Toolbox for evaluation of optimal policy and simple rules

The challenges

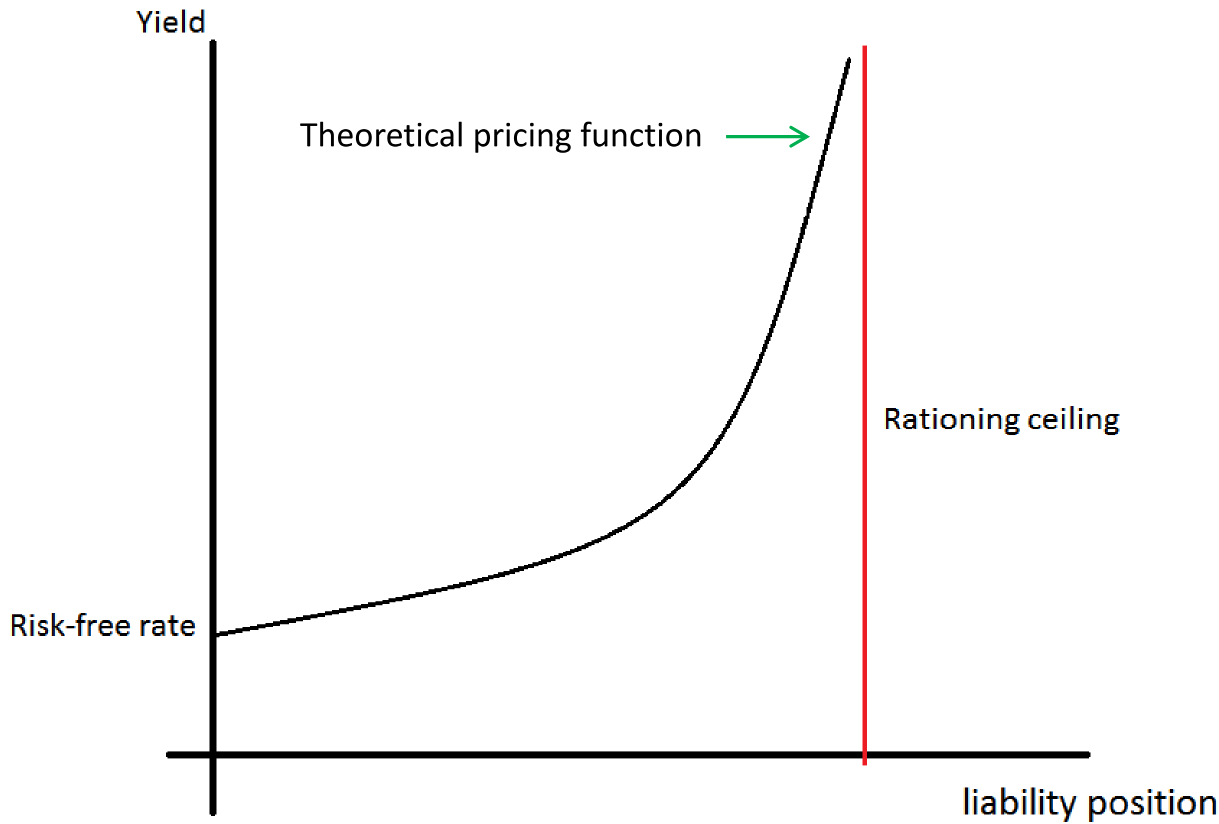
1. *Nonlinearities & amplification:* A general case for global, nonlinear models of credit booms/crises and MPP (particularly Fisherian models)

2. *Complexity & credibility*: Optimal MPP follows complex rules and lacks credibility because of time-inconsistency

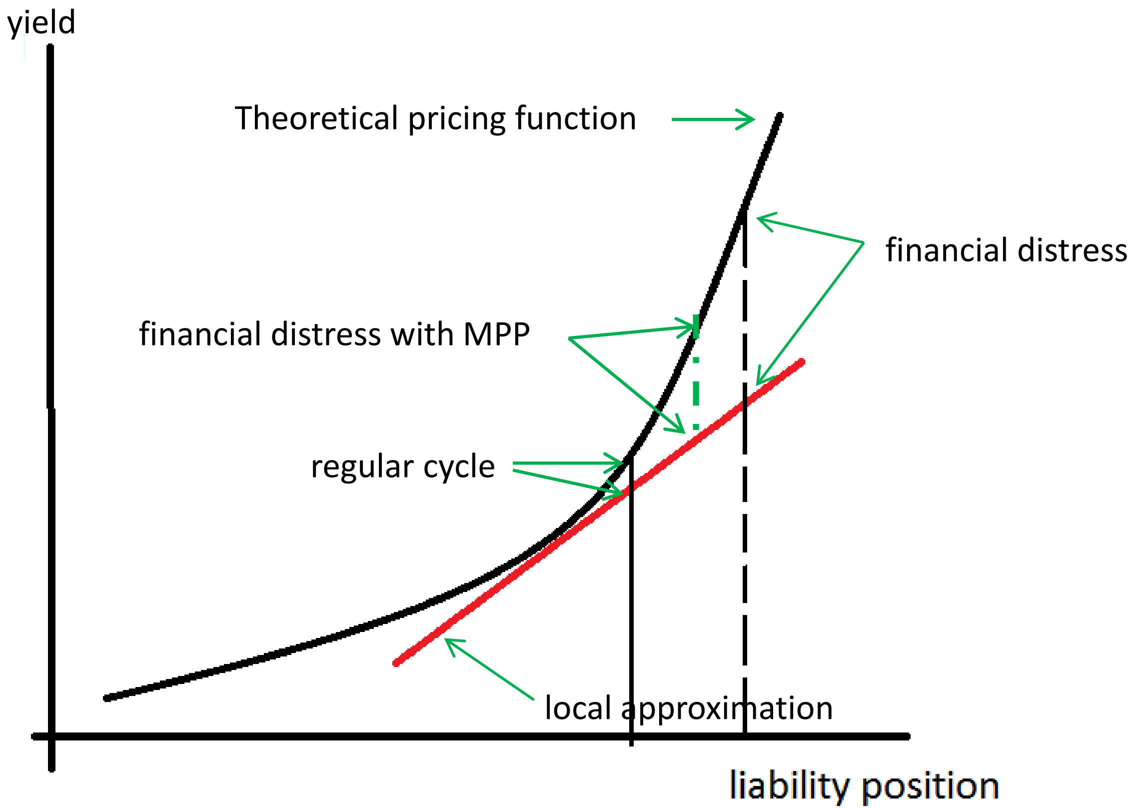
3. *Coordination failure*: Mismanaged interaction with monetary policy yields costly Tinbergen's rule violations and strategic interaction

1. General case for nonlinear models

A “general theory” of risk pricing



What a model of MPP needs to do



2. Fisherian models, market failure and optimal MPP

Fisherian models

- Wide class of models in which market prices affect borrowing capacity (e.g. collateral, scoring, etc.)

- Occasionally binding credit constraints:

$$\frac{b_{t+1}}{R_t} \geq -\kappa_t f(p_t)$$

1. Debt-to-income (DTI) models: $f(p_t^N) = y_t^T + p_t^N y_t^N$
2. Loan-to-value (LTV) models : $f(q_t) = q_t k_{t+1}$

- Market price of collateral determined by aggregate allocations: $f\left(p_t^N(C_t^T, C_t^N)\right)$, $f(q_t(C_t, C_{t+1}))$

- Pecuniary externality: Agents choose debt in "good times" ignoring price responses in "crisis times"

Where is the externality?

- Private agents' Euler eq. for debt choice:

$$u'(t) = \beta R_t E\left[u'(t+1)\right] + \mu_t$$

  - In normal times μ_t=0 => standard Euler equation

- But for a planner choosing debt internalizing the externality, the Euler eq. is:

$$u'(t) = \beta R_t E\left[u'(t+1) + \mu^*_{t+1}\kappa_{t+1} f'(t+1)\frac{\partial p_{t+1}}{\partial \tilde{C}_{t+1}}\frac{\partial \tilde{C}_{t+1}}{\partial b_{t+1}}\right]$$

- **If** social MC of debt exceeds private MC, private agents "overborrow" in good times

Proving the social MC of debt *is* higher

- Higher social MC of debt requires:

$$f'(t+1)(\partial p_{t+1}/\partial \tilde{c}_{t+1})(\partial \tilde{c}_{t+1}/\partial b_{t+1}) > 0$$

- These are trivially positive: borrowing capacity rises with collateral values and consumption rises with wealth
- But the sign of this is a key endogenous equilibrium outcome, which can be proven to be positive:

DTI setup:

$$\frac{\partial p^N_{t+1}}{\partial C^T_{t+1}} = \frac{-p^N_{t+1} u_{c^T c^T}(t+1)}{u_{c^T}(t+1)} > 0$$

LTV setup:

$$\frac{\partial q_{t+1}}{\partial C_{t+1}} = \frac{-q_{t+1} u_{cc}(t+1)}{u_c\ (t+1)} > 0$$

- A large externality is implied if the model is able to generate large price drops during crises!

Optimal MPP

- An optimal "macroprudential debt tax" implements the planner's allocations:

$$\tau_t = \frac{E_t\left[\mu^*_{t+1}\kappa_{t+1}f'(t+1)\frac{\partial p_{t+1}}{\partial \tilde{C}_{t+1}}\frac{\partial \tilde{C}_{t+1}}{\partial b_{t+1}}\right]}{E_t\left[u'(t+1)\right]}$$

  - $\tau_t > 0$ only if the constraint is expected to bind with some probability at t+1.

- Equivalent instruments: capital requirements, regulatory LTV or DTI ratios.

3. Complexity and time-inconsistency

Bianchi & Mendoza (JPE 2018)

1. RBC-SOE model with Fisherian constraint
2. Production w. intermediate goods that require working capital (credit-induced output drop)
3. Rep. firm-household uses assets in fixed supply as collateral for debt and working capital
4. Planner internalizes asset prices (Euler eq. becomes implementability constraint)
5. Shocks: TFP (z_t), world interest rate (R_t), and regime-switching LTV or global liquidity (κ_t).
6. Calibrated to U.S. and OECD data

Rep. firm-household problem

$$\max \; E_0 \left[\sum_{t=0}^{\infty} \beta^t u(c_t - G(n_t)) \right]$$

$$u(c - G(h)) = \frac{\left(c - \chi \frac{h^{1+\omega}}{1+\omega} \right)^{1-\sigma} - 1}{1-\sigma} \quad \omega > 0, \sigma > 1$$

s.t.

$$q_t k_{t+1} + c_t + \frac{b_{t+1}}{R_t} = q_t k_t + b_t + [z_t F(k_t, h_t, v_t) - p_v v_t] \quad (\lambda_t)$$

$$-\frac{b_{t+1}}{R_t} + \theta p_v v_t \leq \kappa_t q_t k_t \quad (\mu_t)$$

Optimality conditions

$$z_t F_h(k_t, h_t, v_t) = G'(h_t)$$

$$z_t F_v(k_t, h_t, v_t) = p_v(1 + \theta \mu_t / u'(t))$$

$$u'(t) = \beta R_t \mathbb{E}_t \left[u'(t+1) \right] + \mu_t$$

$$q_t u'(t) = \beta \mathbb{E}_t \left[u'(t+1) \left(z_{t+1} F_k(k_{t+1}, h_{t+1}, v_{t+1}) + q_{t+1} \right) + \kappa_{t+1} \mu_{t+1} q_{t+1} \right]$$

Commitment & time inconsistency

- When μ_t >0, the planner views the effects of the choice of b_{t+1} on C_{t+1}, and hence on q_t, differently depending on its ability to commit
- *Commitment:* Promise lower C_{t+1} ,to prop up q_t, because $q_t(C_t, C_{t+1})$ is decreasing in C_{t+1}, but at t+1 this is suboptimal=> time inconsistency
- *Discretion:* The planner of date t considers how its choices affect choices of the planner of t+1 => Markov stationarity eq. is time-consistent

Time-consistent social planner

$$V(b,\varepsilon) = \max_{c,b',h,m} \left[\frac{\left(c - \chi \frac{h^{1+\omega}}{1+\omega}\right)^{1-\sigma}}{1-\sigma} + \beta E\left[V(b',\varepsilon')\right] \right]$$

s.t.

$$c + \frac{b'}{R} = b + \left[z 1^{\alpha k} m^{\alpha m} h^{\alpha h} - p^m m \right]$$

$$\frac{b'}{R} - \theta p^m m \geq -\kappa q$$

$$q u_c \left(c - \chi \frac{h^{1+\omega}}{1+\omega} \right) = \beta E \left[u_c \left(\hat{c}' - \chi \frac{\hat{h}'^{1+\omega}}{1+\omega} \right) \left(z' F_k (1, \hat{m}', \hat{h}') + \hat{q}' \right) + \kappa' \hat{\mu}' \hat{q}' \right]$$

Optimal, time-consistent policy

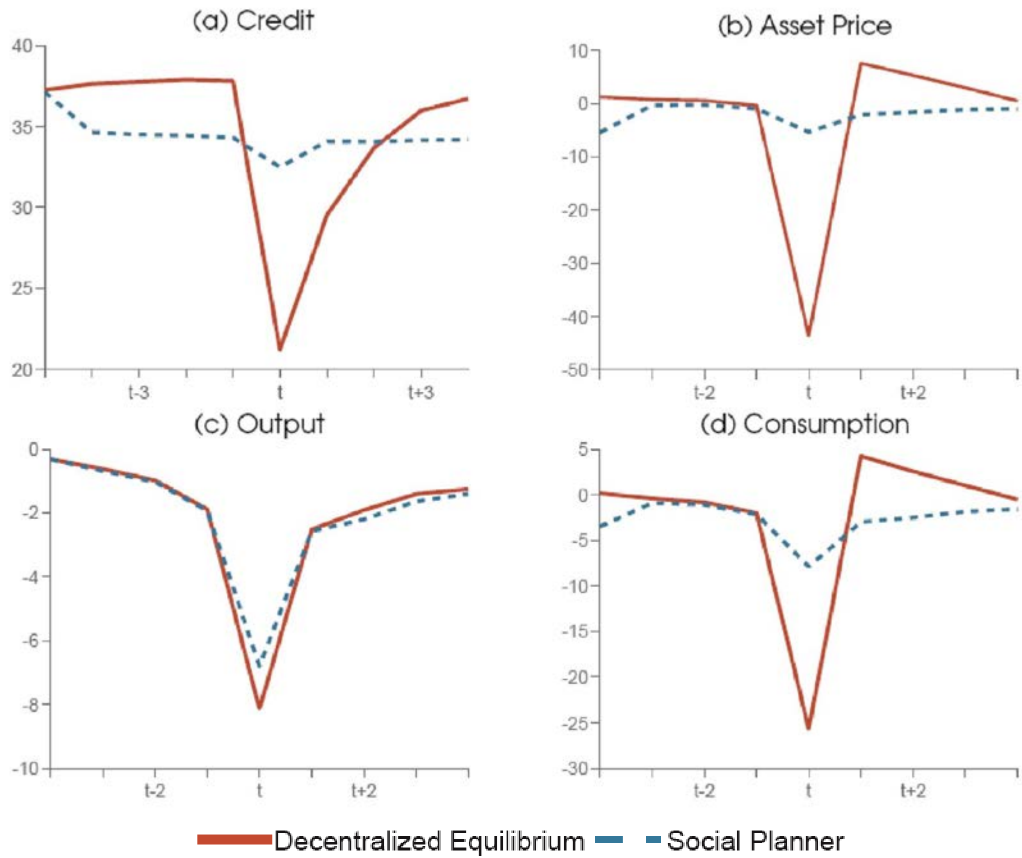
1. Macroprudential component (tackles standard pecuniary externality when μ_t=0 and $E_t[\mu_{t+1}] > 0$):

$$\tau_t^{MP} = \frac{E_t\left[-\kappa_{t+1}\mu_{t+1}^{*}\frac{u_{cc}(t+1)}{u_c(t+1)}Q_{t+1}\right]}{E_t\left[u_c(t+1)\right]}$$

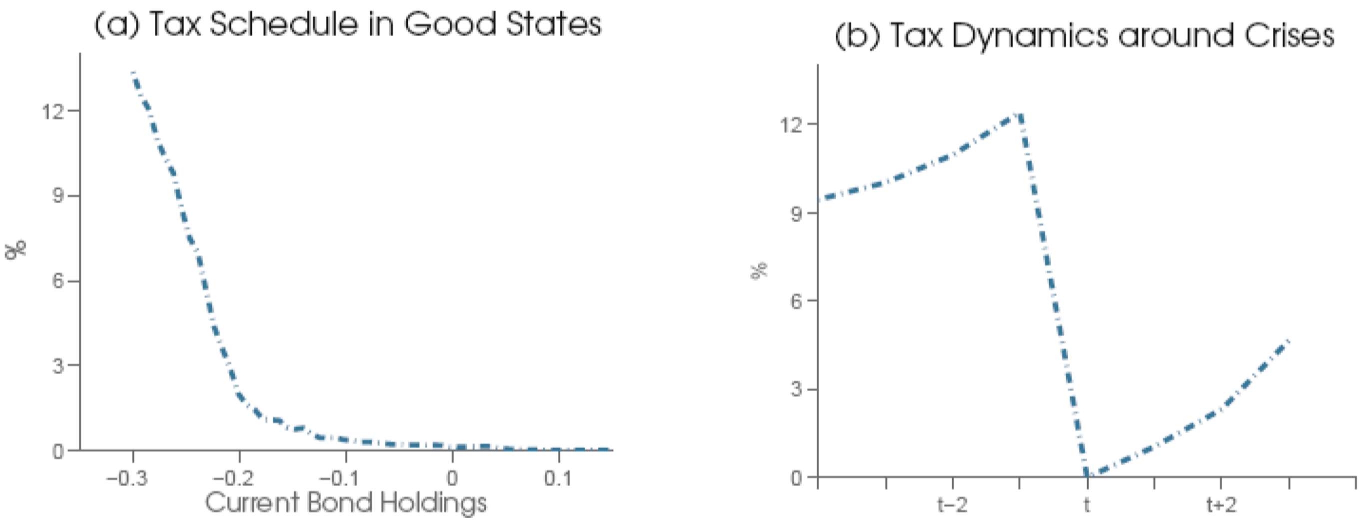
2. Ex-post component (effects on future planners & incentive to prop up value of collateral when $\mu_t > 0$)

$$\tau_t^{FP} = \frac{E_t\left[\frac{\kappa_t\mu_t^{*}}{u_c(t)}\Omega_{t+1}\right]}{E_t\left[u_c(t+1)\right]} + \frac{\kappa_t\mu_t^{*}\frac{u_{cc}(t)}{u_c(t)}q_t}{\beta R_t E_t\left[u_c(t+1)\right]}$$

Financial crises & policy effectiveness



Complexity

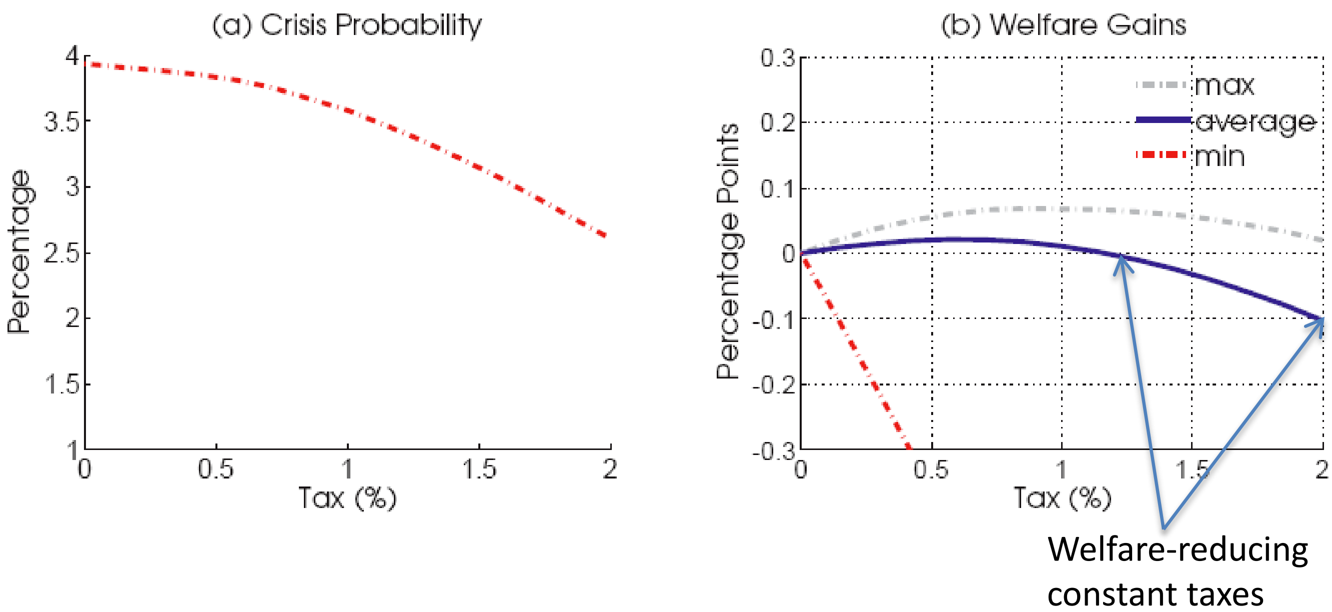

(a) Tax Schedule in Good States
%
12
9
6
3
0
−0.3
−0.2
−0.1
0
0.1
Current Bond Holdings
(b) Tax Dynamics around Crises
%
12
9
6
3
0
t−2
t
t+2

Optimal (TC) policy & simpler rules

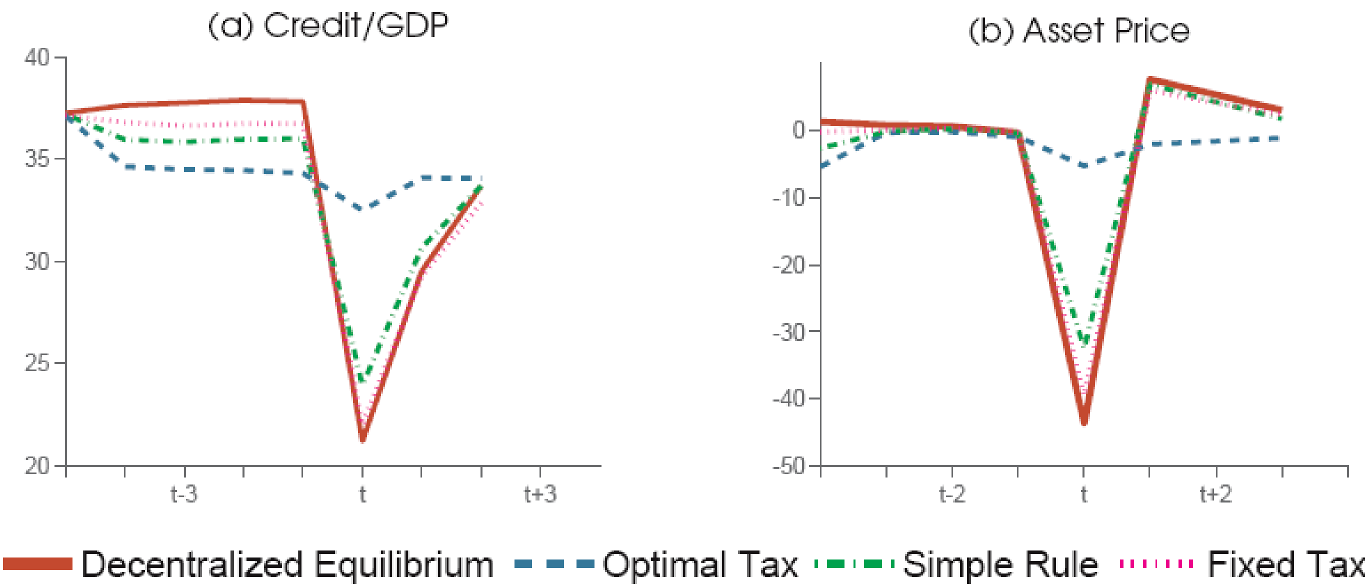
	Decentralized Equilibrium	Optimal Policy	Best Taylor	Best Fixed
Welfare Gains (%)	–	0.30	0.09	0.03
Crisis Probability (%)	4.0	0.02	2.2	3.6
Drop in Asset Prices (%)	−43.7	−5.4	−36.3	−41.3
Equity Premium (%)	4.8	0.77	3.9	4.3
Tax Statistics				
Mean	–	3.6	1.0	0.6
Std relative to GDP	–	0.5	0.2	–
Correlation with Leverage	–	0.7	0.3	–

Financial Taylor Rule: $\tau = \max[0, \tau_0(b_{t+1}/\bar{b})^{\eta_b} - 1]$

Simple rules: constant taxes



Effects of simple policies on magnitude of crises



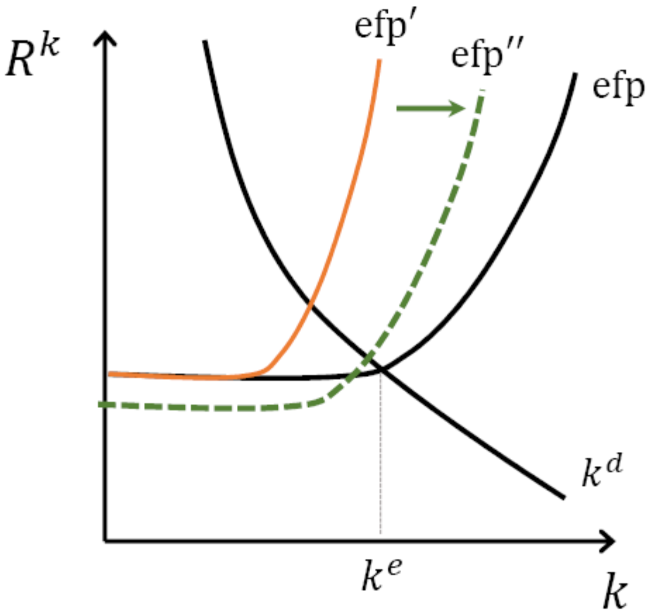
4. Coordination failure in the interaction with monetary policy

Policy interactions in NK-BGG model

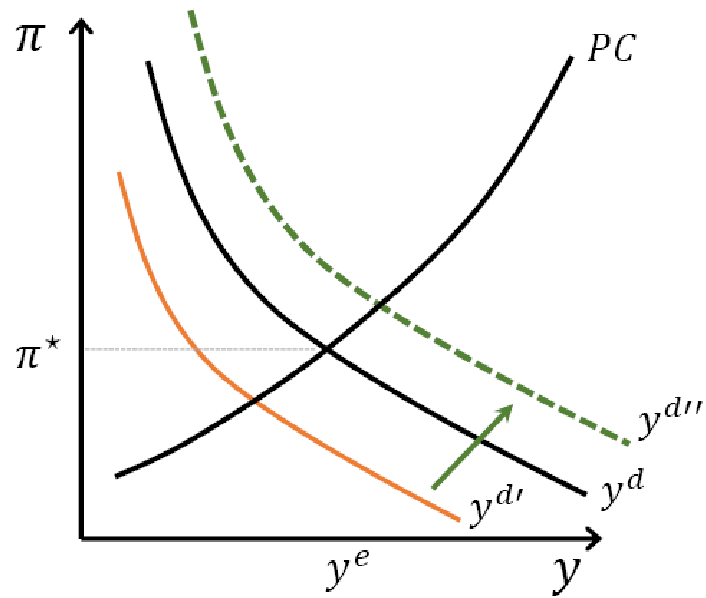
- Carrillo et al. (18) model:
  1. BGG model with risk shocks (Christiano et al. (14))
  2. Calvo pricing=> inefficiencies in goods markets
  3. Costly monitoring=> inefficiencies in credit-capital market
- Risk shocks (fluctuations in variance of entrepreneurs' returns) strengthen financial transmission
- MP instrument is the nominal interest rate, FP instrument is a subsidy to intermediaries (lowers "efp")
- MP (FP) instrument affects target and payoff of FP (MP)
- Two forms of coordination failure: Tinbergen's rule violations and strategic interaction

Policy interactions in response to risk shocks

Credit-capital market



Aggregate supply & demand



Policy regimes

- **STR**: Simple Taylor rule, no financial policy rule

$$R_t = R\left(\frac{1+\pi_t}{1+\pi}\right)^{a_\pi}$$

- **ATR**: Augmented Taylor rule ("leaning against the wind"), no financial policy rule

$$R_t = R\left(\frac{1+\pi_t}{1+\pi}\right)^{a_\pi}\left(\mathrm{E}_t\left\{\frac{r^k_{t+1}}{r_t}\right\}\right)^{-\check{a}_{rr}}$$

- **DRR**: Dual rules regime, STR + financial rule:

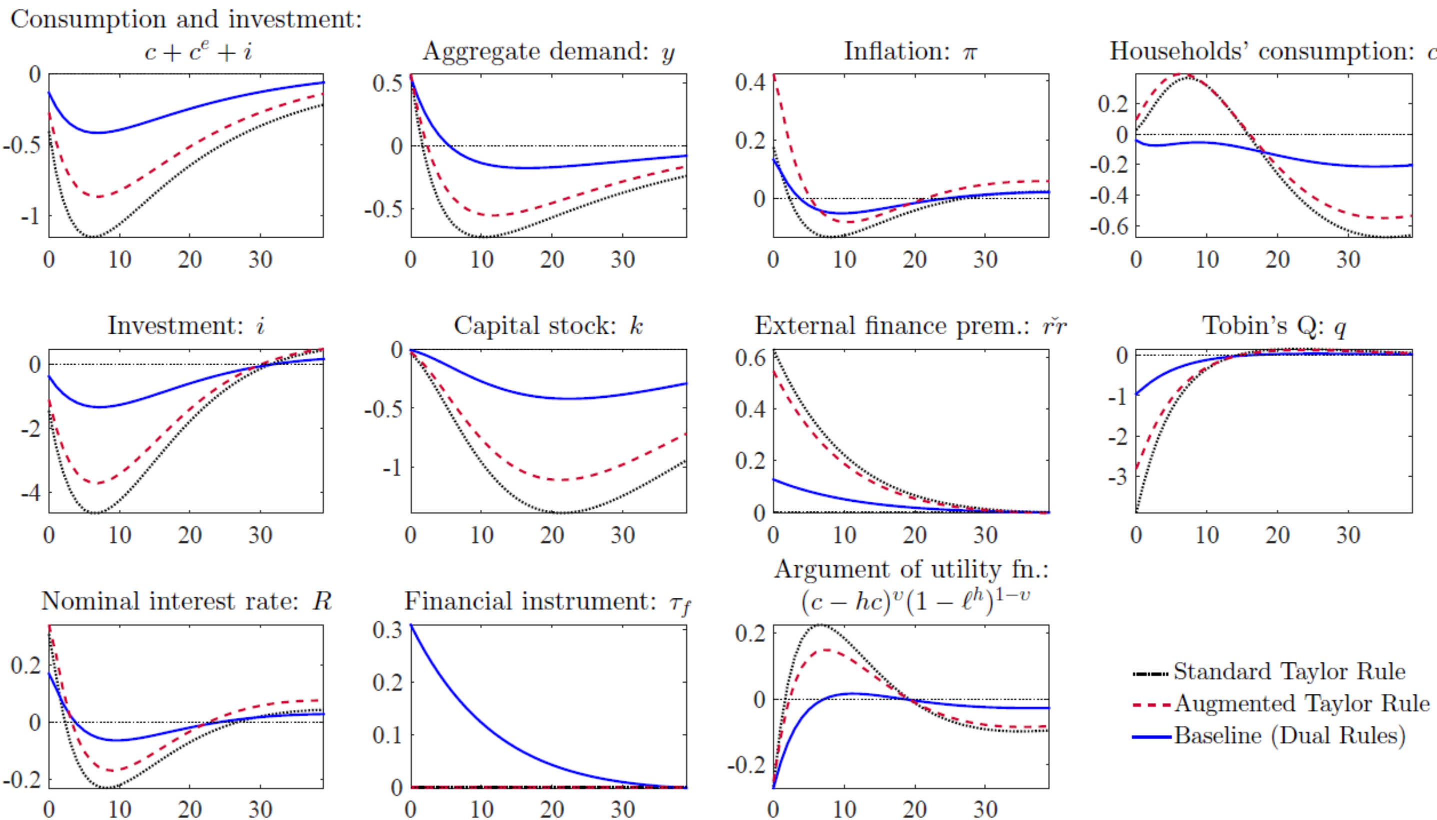
$$R_t = R\left(\frac{1+\pi_t}{1+\pi}\right)^{a_\pi} \qquad \tau_{f,t} = \tau_f\left(\mathrm{E}_t\left\{\frac{r^k_{t+1}}{r_t}\right\}\right)^{a_{rr}}$$

Relevance of Tinbergen's rule

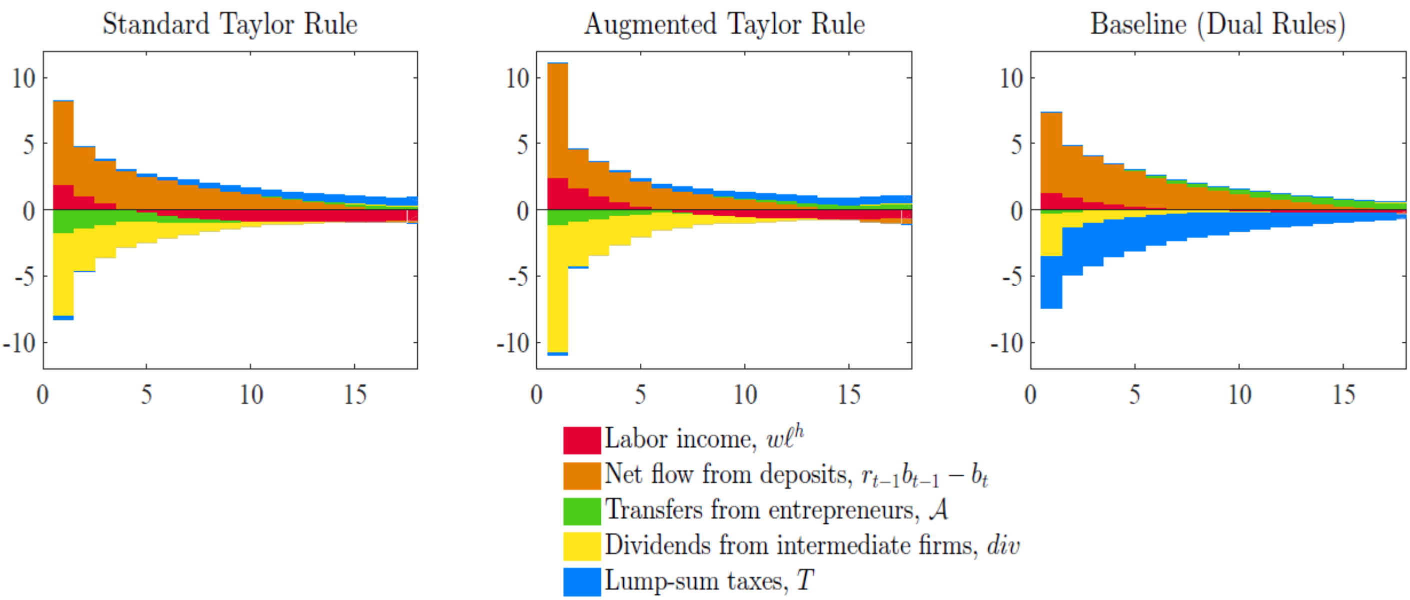
Regime	ce v. DRR	Param. values of x		
		a_π	a_{rr}	$\check{a}_{rr}$
DRR (Best Policy)	–	1.27	2.43	-
Augmented Taylor Rule	-138 bps.	1.27	-	0.36
Standard Taylor rule	-264 bps.	1.75	-	-

- STR & ATR yield large welfare losses
- Policy rules are "too tight" with STR & ATR
- Larger effects from risk shocks under STR & STR

Effects of risk shocks & policy regimes

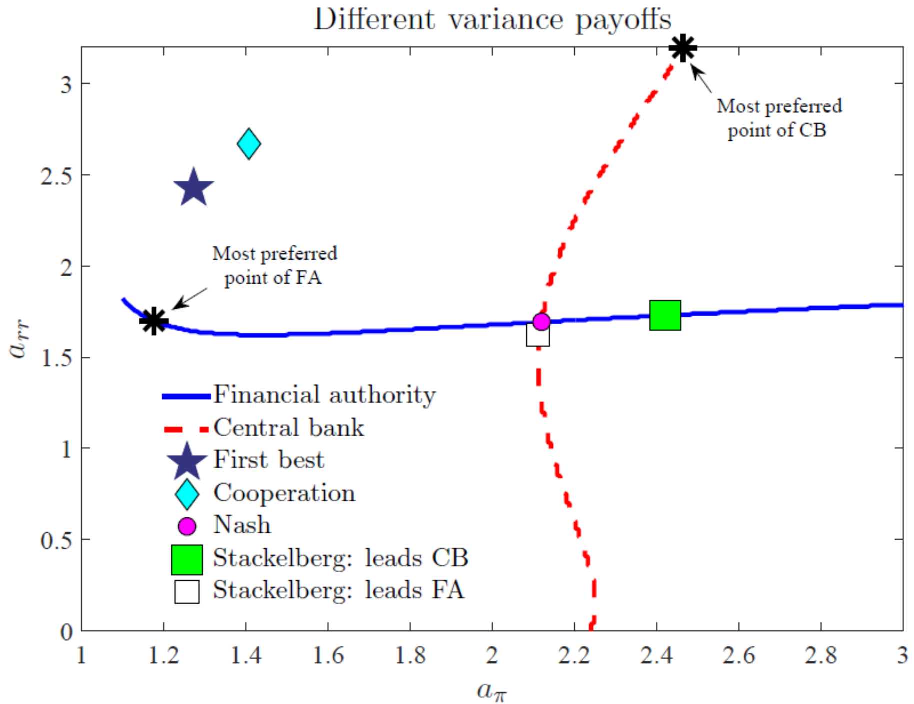


Smoothing consumption under policy regimes



Note: Sources of disposable income measured as weighted deviations from det. steady state (bars add up to percent deviations of consumption in IRF).

Strategic interaction



- MP and FP have sum-of-variances payoffs
- Strategy space is over policy rule elasticities

Relevance of strategic interaction

Regime x *v.* regime y	*ce* bps. diff.	Param. values of x	
		a_π	a_{rr}
Nash *v.* Best Policy (BP)	30	2.12	1.69
Cooperative ($\varphi = 0.5$) *v.* BP	4	1.41	2.67
Cooperative (optimal φ) *v.* BP	1	1.33	2.10
Simple Taylor rule *v.* Nash	234	1.75	-
Dual rules regime *v.* BP	—	1.27	2.43

- Cooperation dominates Nash significantly
- Policies again too tight
- …but even Nash is better than STR & ATR

Conclusions

- *Promise*: Progress in developing quantitative models of fin. crises and MPP, with results showing that it can be a very effective policy
- *Challenges*: Complexity, credibility, coordination. **Careful quantitative evaluation is necessary to avoid outcomes worse than without MPP.**
- *Additional challenges*: fin. innovation, information, heterogeneity, int'l coordination, securitization, interconnectedness