Sustainable Price Stability Policies in A Currency Area with Free-Riding Fiscal Policies

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Questions

- Is price stability goal for the EMU compatible with independent fiscal authorities?
- Are there gains from fiscal policy coordination?
- Do independent fiscal authorities imply a government expenditure bias?
- Does the government expenditure bias implies an inflationary bias?
- Can market expectations induce punishment for lax fiscal policies?

The focus of the paper

- A game of strategic interaction among policy makers in a currency area

    a) Single monetary authority and several fiscal authorities
    b) An infinite horizon micro-founded multiple country model

- Nominal government bonds → temptations to monetize debt (inflationary bias)

- Liquidity constraints → welfare costs of inflation (equally shared among area members)

- Sequential policy moves →government expenditure bias

Related Literature

- Dynamic games in non-micro-founded models (Currie and Levin)

- Interaction of fiscal and monetary policy for closed economies (time incosistency) ((Dixit and Lambertini (2003), Diaz-Gimenez, Giovannetti, Marimon and Teles (2002) and Adams and Billi (2004), Uhlig (2000))

- Interaction of fiscal and monetary policy for open economies (Dixit and Lambertini (2003), Chari and Kehoe (1998))

- Sustainable plans →interactions between policy makers (fiscal authorities) and private agents (Chari and Kehoe (1998), Ireland (1998))

- Interactions of fiscal policies in open economy with international spillovers (Chari and Kehoe (1998), Canzoneri and Henderson)

International fiscal policy spillovers

- Coordination failures among fiscal authorities - gains from cooperation - occur when they can

a) influence relative prices through demand effect

b) influence interest rate by competing in attracting capitals

c) influence actions of the monetary authority in their favor (*indirect spillover)*

Equilibrium concept and solution strategy

- Sequential moves between fiscal and monetary authority in dynamic economies

- *Sustainable plans* (history dependence) $\longrightarrow$ applied to the interaction between policy makers/large players (Ireland 1998)

- Markov perfect equilibrium compared to Ramsey outcome (in both cases benevolent planners)

- In dynamic economies multiplicity of equilibria arises (Abreu 1988)

- Trigger strategies span the remaining set equilibria

Results

- Sequential moves and nominal government debt induce inflationary bias (compared to Ramsey outcome)

- Inflationary bias induces debt and government expenditure bias (compared to fiscal policy cooperation)

- Trigger strategies allow to implement the Ramsey outcome

The model economy

- Households problem

$$\sum_{t=0}^{\infty} \beta^t [u(c_t) - \alpha n_t + v(g_t)]$$

$$M_{t+1}^d + Q_{t+1} b_{t+1} = M_t^d - p_t c_t + b_t + p_t n_t$$

$$p_t c_t \leq M_t^d$$

- First order conditions

$$\frac{u'(c_{t+1})}{\alpha} = Q_{t+1}^{-1}$$

$$Q_{t+1} = \beta \frac{p_t}{p_{t+1}}$$

- Fiscal budget constraint:

$$\frac{(M_{t+1} - M_t)}{2} + Q_{t+1} B_{t+1} = B_t + p_t g_t$$

The Ramsey Plan

- *The Ramsey problem*

$$Max \sum_{t=0}^{\infty} \beta^t 2[\ln(c_t) - \alpha(c_t + g_t) + \ln(g_t)]$$

$$\beta\alpha(c_0+g_0)+\sum_{t=0}^{\infty} \beta^t[1-\alpha(c_t+g_t)]+\beta\alpha\frac{B_0}{M_0}c_0 = 0$$

- FOC:

$$\frac{1}{c_0} - \alpha = \lambda\alpha(1 + \frac{B_0}{M_0})$$

$$\frac{1}{c_t} - \alpha = \lambda\alpha$$

$$\frac{1}{g_t} - \alpha = \lambda\alpha$$

- **Solution**→constant consumption and government expenditure for any time t. When B_0 is positive it follows that $c_0 < c$ which implies

$$Q_0^{-1} = \beta \frac{p_0}{p_{-1}} > Q_t^{-1} = \beta \frac{p_t}{p_{t-1}}$$

- **Corollary** → if the monetary authority acts under full commitment the cooperative and the non-cooperative fiscal policy regimes coincide

History of events under sequential moves

- Agents
$$h_{t-1} = (X_s, \pi_s, g_s | s = 0, ..., t-1)$$
- Fiscal authorities
$$h_{F,t} = (X_s, \pi_s, g_s | s = 0, ..., t) \cup M_t^d$$
- The single monetary authority

$$h_{M,t} = (X_s, \pi_s, g_s | s = 0, ..., t) \cup M_t^d \cup g_t$$

- Agents at time t
$$h_t = (h_{t-1}) \cup M_t^d \cup g_t \cup \pi_t$$
- The recursive structure $\rightarrow$ continuation values allow to forecast policies

$$h_{F,t} = (h_{t-1}, M_t^d(h_{t-1}))$$
$$h_{M,t} = (h_{t-1}, \sigma_{F,t}(h_{t-1}))$$

$$h_t = (h_{M,t}, \sigma_{M,t}(h_{M,t}, \sigma_{F,t}))$$

Sustainable plans

- Finding the continuation values that satisfy the following maximization problems for

- The fiscal authorities

$$
\begin{aligned}
& V_t(h_{F,t}, \sigma_F^t, \sigma_M^t, f^t) \\
= \ & \sum_{t=s}^{\infty} \beta^s [\ln(c_s(h_{F,s})) - \alpha(n_s(h_{F,s})) + v(g_s(h_{F,s}))]
\end{aligned}
$$

$$
\begin{aligned}
& \frac{(M_s(h_{F,s}) - M_{s-1}(h_{F,s-1}))}{2} + Q_{s+1}(h_{F,s})B_{s+1}(h_{F,s}) \\
= \ & B_s(h_{F,s-1}) + p_s(h_{F,s})g_s(h_{F,s})
\end{aligned}
$$

- The monetary authority

$$\begin{aligned} & W_t(h_{M,t}, \sigma_F^t, \sigma_M^t, f^t) \\ = & \sum_{t=s}^{\infty} \beta^s 2[\ln(c_s(h_{M,s})) - \alpha(n_s(h_{M,s})) + v(g_{M,s})] \end{aligned}$$

$$\begin{aligned} 0 = & -\beta\alpha(c_s(h_{M,s}) + g_s(h_{M,s})) \\ & + \sum_{t=s}^{\infty} \beta^t [u_{c,s}(h_{M,s})c_s(h_{M,s}) - \alpha(c_s(h_{M,s}) + g_s(h_{M,s}))] \\ & -\beta\alpha \frac{(B_s(h_{M,s}) + B_s^*(h_{M,s}))}{M_s(h_{M,s})} c_s(h_{M,s}) \end{aligned}$$

- The private agents

$$U_t(h_t, \sigma_F^t, \sigma_M^t, f^t)$$
$$= \sum_{t=s}^{\infty} \beta^s [\ln(c_s(h_s)) - \alpha(n_s(h_s)) + v(g_s(h_s))]$$

$$M_{t+1}^d(h_t) + Q_{t+1} b_{t+1}(h_t)$$
$$= M_t^d(h_t) - p_t c_t(h_t) + b_t(h_t) + p_t n_t(h_t)$$

and for all $s \geq t$:

$$M_{s+1}^d(h_s) + Q_{s+1}(h_s) b_{s+1}(h_s)$$
$$= M_s^d(h_s) - p_s(h_s) c_s(h_s) + b_s(h_s) + p_s(h_s) n_s(h_s)$$

The Markov Perfect equilibrium

- At time $t = T - 1$ the monetary authority sets the levels of consumption and government expenditure to

$$Max \sum_{t=T-1}^{T} \beta^s 2[\ln(c_t) - \alpha(c_t + g_t) + \ln(g_t)]$$

$$-\beta\alpha(c_{T-1}+g_{T-1})+\beta^2[1-\alpha(c_T+g_T)]-\beta\alpha\frac{2B_{T-1}}{M_{T-1}}c_{T-1} = 0$$

- FOC

$$\frac{1}{c_{T-1}} - \alpha = \lambda\alpha(1 + \frac{2B_{T-1}}{M_{T-1}})$$

$$\frac{1}{c_T} - \alpha = \lambda\alpha$$

$$\frac{1}{g_T} - \alpha = \lambda\alpha$$

- *Under the policy regime with sequential moves the level of inflation and the nominal interest rate for period $T-1$ are higher than the ones prevailing under the Ramsey equilibrium*

Under Ramsey $\rightarrow c_{T-1} = c_T = c^{Ramsey}$ and $\frac{\beta}{\alpha c^{Ramsey}} = \frac{p_T}{p_{T-1}} = \pi_{T-1}^{Ramsey}$

Under the sustainable equilibrium (and assuming $B_{T-1} > 0$) $\rightarrow \quad c_{T-1} < c_T = c^{Ramsey}$

and $\frac{\beta}{\alpha c_{T-1}} = \frac{p_{T-1}}{p_{T-2}} = \pi_{T-1}^{Sustainable} > \pi_{T-1}^{Ramsey}$

The Fiscal Problem at a generic time t

- *Under the policy regime with sequential moves a positive relation exists between the end of period debt in* $T-1$ *and the level of government expenditure in* $T-2$

$$g_{T-2} = \frac{\beta B_{T-1} c_{T-1}(2B_{T-1})}{M_{T-1}} - \frac{B_{T-2}}{p_{T-2}} + (\frac{M_{T-1} - M_{T-2}}{2})$$

- *Spending and debt levels are higher under the non-cooperative fiscal regime than under the cooperative one*

Non cooperative regime

$$Max \ln(c_{T-2}(g_{T-2}, g^*_{T-2}))$$
$$-\alpha(c_{T-2}(g_{T-2}, g^*_{T-2}) + g_{T-2})$$
$$+ \ln(g_{T-2}) + \beta V(B_{T-1}(g_{T-2}, g^*_{T-2}), B^*_{T-1}(g_{T-2}, g^*_{T-2})]$$

Cooperative regime

$$Max 2 \ln(c_{T-2}(g_{T-2}, g^*_{T-2}))$$
$$-\alpha(c_{T-2}(g_{T-2}, g^*_{T-2}) + g_{T-2}) + \ln(g_{T-2}) + \ln(g^*_{T-2})$$
$$+\beta 2V(B_{T-1}(g_{T-2}, g^*_{T-2}), B^*_{T-1}(g_{T-2}, g^*_{T-2})]$$

Solution of competitive equilibrium and forecast of private agents

- Under the regime with sequential moves the price of government debt is higher and consumption is lower than under the Ramsey plan

Trigger strategies

An arbitrary sequence is the outcome of a sustainable plan under trigger strategies if

(i) The allocation under the plan is be attainable under commitment
(ii) For every t the following constraint holds

$$\sum_{s=t}^{\infty} \beta^s U(c_s, n_s, g_s) \geq U^d(c_t, n_t, g_t) + \frac{\beta}{1-\beta} U^{spf}(c, n, g)$$

Conclusions

- Develop micro-founded models of dynamics interactions among policy makers

- Mechanisms to implement the first best