A Game-Theoretic View of the Fiscal Theory of the Price Level

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Econometrica

- 2 periods
- continuum of identical households and a government
- endowment one unit of single homogeneous good per period and household
- each household also starts the first period with B_1 units of government bonds which are claims to one unit of account ("Dollar")
- government uses lump sum taxation (T_1 and T_2) to finance G_1 and G_2
- lowercase letters refer to individual household variables, uppercase letters to aggregate ones (restriction to symmetric equilibria)

Household Problem and Government Budget Constraint

$$\max_{c_1, c_2, b_2^d} u(c_1) + u(c_2) \tag{1}$$

subject to:

$$P_1 c_1 \leq P_1(1 - T_1) + B_1 - b_2^d / R_1 \tag{2}$$

and

$$P_2 c_2 \leq P_2(1 - T_2) + b_2^d \tag{3}$$

Government BCs:

$$P_1 G_1 = P_1 T_1 - B_1 + B_2 / R_1 \tag{4}$$

and

$$P_2 G_2 = P_2 T_2 + B_2 \tag{5}$$

Competitive Equilibrium

A CE is an allocation (C_1, C_2, B_2^d), a price system (P_1, P_2, R_1) and government policy (T_1, T_2, B_2) such that

- given prices and government policy the allocation solves the household's problem
- the government budget constraint is satisfied
- the bond market clears

Some more Definitions

- Fiscal policy rule: $T_1(P_1)$, $T_2(P_1, P_2)$
- Monetary policy rule: $R_1(P_1)$
- A policy rule is called *Ricardian* if it satisfies the government budget constraint at any price vector and *Non-Ricardian* otherwise

Fiscal Theory of the Price Level

- if the government adopts a Ricardian rule, P_1 is indeterminate; given any positive value there exists a CE in which P_1 attains that value
- If instead we assume that the policy rule specifies unconditional values for all policy variables then there exists at most one CE that is consistent with such a rule. The equilibrium exist provided taxes are sufficiently large.

Game Theoretic Version of the Economy

- Modified market structure: trading posts (markets) for each possible exchange between goods and bonds
- each household submits the number of items it wants to sell unconditionally
- the same is true for the government, except in the market where maturing bonds are exchanged for new bonds. There the government sets prices (analogy to CE).

Timing

- government levies first installment of period 1 tax T_1^1, sets $P_{B_1B_2}$ and submits bids $C_1^{B_1} \leq T_1^1$ and $B_2^{C_1}$
- trading opens. Households submit bids $c_1^{B_2} \leq 1 - T_1^1$, $b_1^{C_1}$ and $b_1^{B_2}$ such that $b_1^{C_1} + b_1^{B_2} \leq B_1$
- markets clear:

$$P_{C_1B_1} = B_1^{C_1} / C_1^{B_1} \tag{6}$$

$$P_{C_1B_2} = B_2^{C_1} / C_1^{B_2} \tag{7}$$

$$B_2^{B_1} = B_1^{B_2} P_{B_1B_2} \tag{8}$$

Timing II

- the government levies a second installment of first period taxes $T_1^2 \in [-T_1^1 + C_1^{B_1} - C_1^{B_2}, 1 - T_1^1 + C_1^{B_1} - C_1^{B_2}]$
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$$c_1 = 1 - T_1 - c_1^{B_2} + b_1^{C_1}/P_{C_1B_1} \tag{9}$$

$$b_2 = b_1^{B_2} P_{B_1B_2} \tag{10}$$

$$G_1 = T_1 + C_1^{B_2} - C_1^{B_1} \tag{11}$$

- the second period starts. The government sets T_2 and submits $C_2^{B_2} \leq T_2$
- each household submits a bid $b_2^{C_2} \leq b_2$

Timing III and government strategy

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$$P_{C_2B_2} = B_2^{C_2}/C_2^{B_2} \tag{12}$$

$$c_2 = 1 - T_2 + b_3^{C_2}/P_{C_2B_2} \tag{13}$$

$$G_2 = T_2 - C_2^{B_2} \tag{14}$$

- government preferences are not explicitly modeled, instead it is assumed that the government needs to raise $\overline{T}$ every period. The paper concentrates on the subgame after $\overline{T}$ and other government policy are chosen
- the government can commit to a strategy

No Government Spending

If $G_1 = G_2 = 0$ and $B_1 > 0$ there exist government strategies in which taxes are $\overline{T}$ in all contingencies. These strategies all lead to a unique sequential equilibrium outcome. All those strategies lead to the same initial price level, whereas the price level in the second period depends on the particular strategy.
The government budget constraint

$$B_1 = \overline{T} P_{C_1 B_1} + \overline{T} P_{C_2 B_2} / P_{B_1 B_2} \tag{15}$$

holds only at the equilibrium prices.

Variable Government Spending

Now assume $G_1 > \overline{T}$ and $G_2 = 0$. In game in which lending is voluntary, it is impossible for the government to unconditionally adhere to a target level of taxes that falls short of spending. However, assume that there exists a CE in which $T_1 = T_2 - \overline{T}$ and that $B_1 > 0$. Then the government can commit to a strategy such that the unique sequential equilibrium coincides with that CE.