Why it is hard to keep monetary and fiscal policy in separate boxes

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What determines the price level?

- $MV = PT$? But then what determines M? What is M when treasury bills pay zero interest?

- Reserve requirements and a money multiplier? Not any more.

- A Fed-determined short interest rate and "demand for money"?

- The policy rate has been at essentially zero for several years. The usual "demand for money" equation is derived assuming that money pays no interest, while bonds pay interest. It is a money-bonds relative price equation. Bonds now pay neqr-zero interest; most of M1 pays interest.

What is a "bubble"?

- A situation where an asset's price is at a level higher than anyone would be willing to pay, were it not that they think they can resell the asset at a similar price, and there is another equilibrium with the price lower — i.e. the bubble could "pop".

- This description is very precisely matched by "money" in many theoretical models that try to derive the value of pure fiat money from first principles.

- Even if fiat money has a "transactions value", the price level is generally bubble-like unless, unrealistically, the economy cannot exist without money, i.e. with barter trading, or, realistically, there is a government with the power to tax as well as to issue money and/or fiat debt.

Current events

Tax backing

- We are going to consider a very specific, simple model of price level determination.
- It can generate both the usual case of unbacked, “bubble” money with multiple equilibria and no uniquely determined price level, and that of “backed” money, in which even a small capacity to tax (more precisely, to tax in excess of current expenditures) implies a uniquely determined price level.
- Though the model is simple and abstract, the basic pattern of results applies in a wide variety of models with money.

- Though in this perfect-foresight model each equilibrium is distinct and permanent, if we introduced randomness, there would be indeterminacy in prices every period.

Reference with similar results in a dissimilar model

Sims, C. A. "A Simple Model for Study of the Determination of the Price Level and the Interaction of Monetary and Fiscal Policy", *Economic Theory*, 1994, 4, 381-99

Model here is OG, with dynamic inefficiency, no coexistence of bonds and money, no randomness. The 1994 article model has randomness, no dynamic inefficiency, coexistence of non-interest-bearing money and bonds, infinitely lived representative agent. Same qualitative results.

People in the model

- Infinite sequence of two-period-lived agents, no population growth.

- Young endowed at birth with one unit of the single good.

- They can store it, in which case a fraction $\theta < 1$ of it survives to their second period of life, when they can eat it.

- They can also purchase from the current old generation nominal bonds, trading goods for bonds.

- At the initial date $t = 1$, there are old from generation 0 who have B_1 units of new one-period debt to sell to the young at $t = 1$.

Government

- The bonds pay interest at a gross rate R (which could be 1) and are one-period bonds. The government exchanges each unit of mature bonds for R units of newly issued one-period nominal bonds.

- The government may also impose lump sum taxes on the young, in which case they must use some of their resources to pay the tax.

Variables

(All are per capita.)

C_{1t} : consumption while young (i.e. at time t) of the generation born at t

$C_{2,t+1}$: consumption while old (i.e. at time $t+1$) of the generation born at t

S_t : amount put into storage at t by the young at t

B_t : nominal bonds purchased by the young at t

P_t : price level at t. The rate at which new bonds trade for goods.

R : the gross nominal interest rate

τ : lump sum tax on the young

Optimization problem of a typical agent

$$\max_{C_{1t}, C_{2,t+1}, S_t, B_t} \{\log C_{1t} + \log C_{2,t+1}\}, \text{ subject to}$$

$$C_{1t} + S_t + \frac{B_t}{P_t} = 1 - \tau$$

$$C_{2,t+1} = \frac{R_t B_t}{P_{t+1}} + \theta S_t$$

$$S_t \geq 0\,, \qquad B_t \geq 0\,.$$

Government budget constraint, market clearing

$$B_t = RB_{t-1} - P_t\tau$$

Market clearing imposed implicitly by using the same symbol, B_t, for the bonds purchased by the young and the bonds returned (net of taxes) to old in exchange for maturing bonds.

Equilibrium conditions

$$\theta = \frac{C_{2,t+1}}{C_1 t} \qquad \text{if } S_t > 0$$

$$\frac{P_t R}{P_{t+1}} = \frac{C_{2,t+1}}{C_1 t} \qquad \text{if } B_t > 0$$

$$C_{1t} + C_{2t} + S_t = 1 + \theta S_{t-1}$$ SRC, from private and government constraints

Equilibrium with no storage, $B_t > 0$

Define

$$\rho_t = \frac{C_{2,t+1}}{C_1 t} = \frac{RP_t}{P_{t+1}} \, .$$

$$C_{2,t+1} = \rho_t C_{1t} = \rho_t (1 - C_{1t} - \tau)$$
$$\therefore C_{1t} = \tfrac{1}{2}(1 - \tau) \, .$$

No storage and $\tau = 0$

$$C_{1t} = \tfrac{1}{2} = C_{2t}\,,\ \text{all } t \tag{1}$$

$$\therefore \rho_t = \frac{RP_t}{P_{t+1}} = 1 \tag{2}$$

$$\frac{B_t}{P_t} = \tfrac{1}{2} \tag{3}$$

$$\therefore P_1 = 2B_1 \tag{4}$$

$S_t > 0$, $B_t > 0$, $\tau = 0$

$$\rho_t \equiv \theta = \frac{RP_t}{P_{t+1}}$$

$$\therefore \frac{B_t}{P_t} = \theta \frac{B_{t-1}}{P_{t-1}} \text{ from GBC}$$

$$\therefore, \because S_t + \frac{B_t}{P_t} = \tfrac{1}{2}, \quad S_t \xrightarrow[t\to\infty]{} \tfrac{1}{2}$$

$$P_1 = \text{ anything in } (2B_1, \infty]$$

No storage and $\tau > 0$

$$C_{1t} = \frac{1-\tau}{2}$$

$$C_{2,t} = \frac{1+\tau}{2}$$

$$\rho = \frac{1+\tau}{1-\tau} = \frac{R_t P_t}{P_{t+1}}$$

$$P_1 = \frac{2B_1}{1+\tau}$$

$\tau > 0$ **and** $S_t > 0$?

Because $\tau > 0$, $C_{1t} < .5$. Suppose we had $S_t > 0$ but it were known that $S_{t+1} = 0$. Since $\tau > 0$, $C_{1,t+1} < .5$, but at $t+1$,

$$C_{2,t+1} > 1 + \theta S_t - C_{1,t+1} > .5 \,.$$

But this is impossible if $\rho_t < 1$. So if $S_t > 0$, it must be positive at all subsequent dates also. But then the GBC is

$$\frac{B_t}{P_t} = \theta \frac{B_{t-1}}{P_{t-1}} - \tau$$

which is a stable difference equation that converges to a negative value, which is impossible.