Exercise on FTPL*

1. BIBLIOGRAPHIC NOTES

The model of interaction of fiscal and monetary policy that we discussed in class is exactly that of my paper "A Simple Model for Study of the Determination of the Price Level and the Interaction of Monetary and Fiscal Policy," which is a starred item on the reading list and available on my web site, as well as in published form in *Economic Theory*. There are some minor differences in notation from the lectures and one possibly confusing one: in the paper τ is the level of government *transfers*, while in the lectures the same Greek letter denotes the level of lump-sum *taxes*. In other words, the two τ's have the same absolute value but are opposite in sign.

The Woodford paper on the reading list under this topic heading and my "Fiscal Foundations of Price Stability in Open Economies" should both be treated as unstarred now, because we have not had time to discuss them in lectures, and they involve technical problems you shouldn't be required to master on your own. The Leeper paper on active and passive monetary policies is still starred, even though we haven't discussed it explicitly. It uses methods that should be familiar too you by now, and it may make the general pattern of interconnections between monetary and fiscal policy clearer than the detailed examination of a specific nonlinear model in "A Simple Model..."

A recent publication that you may find interesting — it would have been an unstarred entry on the reading list had it appeared before the course started — is the paper by John Cochrane in the most recent *NBER Macroeconomics Annual*, together with the very detailed discussion of it by Michael Woodford. They are attempting to interpret the US postwar history of inflation and fiscal policy in the light of FTPL.

2. NEW EXERCISE

We consider a model which is just that of the lectures and the "Simple Model" paper, except that one-period government bonds are replaced by consols. (A consol is a bond that promises to pay one dollar per period forever. For such a bond the current market value is $1/r_t$ and r_t is an (infinitely) long term interest rate.) You are asked to verify that a monetary policy of fixing the consol rate $r_t \equiv \bar{r}$ and the primary surplus $\tau_t \equiv \bar{\tau}$ produces a unique equilibrium price level under the same conditions that a policy of $R_t = \bar{R}$, $\tau_t \equiv \bar{\tau}$ does so in the model of the lectures, where R is the gross nominal interest rate on one period bonds (i.e., the same as ρ_t in the "Simple Model" paper). Then you are asked to check that an unanticipated, permanent change in the level of

$\bar{r}$ has a different effect on the time path of prices than an unanticipated, permanent change in the level of $\bar{R}$.

The representative individual maximizes with respect to C, B and M the objective function

$$E\left[\sum_{t=0}^{\infty} \beta^t \log C_t\right] \tag{1}$$

subject to the constraints, for $t = 0, \ldots, \infty$,

$$C_t \cdot \left(1 + \frac{\gamma v_t}{1 + v_t}\right) + \frac{B_t - B_{t-1}}{P_t r_t} + \frac{M_t - M_{t-1}}{P_t} = Y_t + \frac{B_{t-1}}{P_t} - \tau_t \tag{2}$$

$$B_t \geq 0 \tag{3}$$

$$v_t = \frac{P_t C_t}{M_t}. \tag{4}$$

a. Find the FOC's for an optimum in the agent's problem.
b. Verify that, when initial $B > 0$, the conditions under which there is a unique equilibrium price level under a policy combination of $r_t \equiv \bar{r}$, $\tau_t \equiv \bar{\tau}$ are the same as those under which there is a unique equilibrium price level under $R_t = \bar{R}$, $\tau_t = \bar{\tau}$ in the one-period bond model of the lectures and the "Simple Model" paper.
c. Show that if we start in an equilibrium with constant r and τ, chosen so that there is no trend in prices (the real rate matches the nominal rate), an unanticipated change to a new policy with τ still constant at the old level, but the nominal interest rate reduced to a new constant level, produces different time paths of prices according to whether the debt is consols or one-period bonds, even if the new interest rate is chosen so that the long run inflation rate is the same for both the consol and one-period bond economies.

This last question is not technically difficult, but it is different from anything we have already done in class. The economy will simply move instantly from one equilibrium of a type worked out in the "Simple Model" paper to another equilibrium of the same type. But the behavior of the price level at the time of the policy change will differ according to whether debt is consols or one-period bonds.