ECON 442

Limits on Gov't Spending

Winter 2015

Gov't Budget Constraint

Gov't Spending must equal revenue.

$$G(t) + B(t-1) = \frac{B(t)}{1+r(t)} + N_t \tau_1(t) + N_{t-1}\tau_2(t)$$

The current deficit in per-capita terms $\Delta(t)$ is given by

$$\begin{aligned} g(t) - \tau_1(t) - \frac{1}{n}\tau_2(t) &= \frac{b(t)}{1+r(t)} - \frac{b(t-1)}{n} \\ g(t) - \tau_1(t) - \frac{1}{n}\tau_2(t) &= [b(t) - b(t-1)] + \frac{n-1}{n} b(t-1) - \frac{r(t)}{1+r(t)} b(t) \end{aligned}$$

Sustainability of debt depends on interest rates vs. the growth rate of the economy.

A First Pass ...

We have seen that constant per-capita debt is only an equilibrium whenever the equilibirum interest rate satisfies $1 + r = n$.

Hence, the government needs to have no primary deficit

$$g(t) - \tau_1(t) - \frac{1}{n}\tau_2(t) - [b(t) - b(t-1)] = \Delta(t) = 0$$

for all periods.

More generally, a primary deficit is possibly whenever $1 + r < n$, otherwise the gov't needs to run primary surpluses to keep per-capita debt constant.

Gov't Intertemporal Budget Constaint

Consider the budget constraint every period and substitute out debt.

$$g_0 + \frac{b_{-1}}{n} = \tau_0 + \frac{b_0}{1+r_0}$$

$$g_0 + \frac{b_{-1}}{n} = \tau_0 + \frac{n}{1+r_0}\left(\tau_1 - g_1 + \frac{b_1}{1+r_1}\right)$$

$$(g-\tau)\left(1+\left(\frac{n}{1+r}\right)\right) + \frac{b_{-1}}{n} = \left(\frac{n}{1+r}\right)^2\left(\tau - g + \frac{b_2}{1+r}\right)$$

$$(g-\tau)\left(1+\left(\frac{n}{1+r}\right)+\left(\frac{n}{1+r}\right)^2+\dots\right) + \frac{b_{-1}}{n} = \lim_{t\to\infty}\left(\frac{n}{1+r}\right)^t \frac{b_t}{1+r}$$

Note that we have assumed that all variables (except debt) stay constant.

Gov't Intertemporal Budget Constraint

Note that as $b_t \to y_1 - \tau_1$, interest rates need to go to infinity.

Hence, assume that $n < (1+r)$, so that $\lim_{t\to\infty} \left(\frac{n}{1+r}\right)^t \frac{b_t}{1+r} = 0$, since b_t is bounded.

Intertemporal Budget Constraint for the Gov't becomes simply

$$g = \tau + b_{-1}\left(\frac{1}{1+r} - \frac{1}{n}\right)$$

Note that the last term is negative:

- if $b_{-1} < 0$, the government has initial assets
- if $b_{-1} > 0$, the government has initial debt

Some Unpleasant Arithmetic

Scenario 1: Permanent Budget Deficit

- $\Delta = g - \tau > 0$
- Need to finance it from initial assets.
- Issuing ever increasing debt (in per-capita terms) cannot do it.

Scenario 2: g increases permanently.

- Government will be forced – eventually – to increase taxes.

Scenario 3: Temporary Spending Increase

- Assume $b_{-1} = 0$ or $g = \tau$
- At $t = 0$, increase in spending for one time, i.e. $g_1 = (1 + \Delta)g$.
- Issue bond instead and roll it over indefinitely.

Sequence of debt levels:

$$
\begin{aligned}
\frac{b_0}{1+r} &= \Delta g \\
\frac{b_1}{1+r} &= \left(\frac{1+r}{n}\right)\Delta g \\
\frac{b_t}{1+r} &= \left(\frac{1+r}{n}\right)^t \Delta g
\end{aligned}
$$

Hence: $\frac{b_t}{1+r} \to \infty$, whenever $1 + r > n$.

Conclusion: need to raise τ eventually.

Ricardian Equivalence

Consider a feasible gov't policy $(\tau_1(t), \tau_2(t), b(t))$.

Thus:

$$\begin{aligned}
\frac{1}{n}b(t-1) &= \frac{b(t)}{1+r(t)} + \tau_1(t) + \frac{1}{n}\tau_2(t) \\
\frac{1}{n}b(t) &= \frac{b(t+1)}{1+r(t+1)} + \tau_1(t+1) + \frac{1}{n}\tau_2(t+1)
\end{aligned}$$

where $r(t)$ and $r(t+1)$ are equilibrium interest rates.

Now change the debt level and alter taxes for generation t as follows:

- $\hat{b}(t) \neq b(t)$
- $\hat{\tau}_1(t) = \tau_1(t) + \frac{b(t)-\hat{b}(t)}{1+r(t)}$
- $\hat{\tau}_2(t+1) = \tau_2(t+1) - \Big(b(t) - \hat{b}(t)\Big)$

Fix interest rates at $r(t)$.

The new policy is feasible in both periods.

$$
\begin{aligned}
\frac{1}{n}b(t-1) &= \frac{\hat{b}(t)}{1+r(t)} + \tau_1(t) + \frac{b(t)-\hat{b}(t)}{1+r(t)} + \frac{1}{n}\tau_2(t) \\
\frac{1}{n}\hat{b}(t) &= \frac{b(t+1)}{1+r(t+1)} + \tau_1(t+1) + \frac{1}{n}\left(\tau_2(t+1) - b(t) + \hat{b}(t)\right)
\end{aligned}
$$

Neither the FONC, nor the NPV of taxes changes for generation t.

Conclusion: The timing of taxes does not matter, unless the time path of debt is altered so that there is redistribution between different generations.