Fiscal Policy and Ricardian Equivalence

ECON 30020: Intermediate Macroeconomics

Prof. Eric Sims

University of Notre Dame

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Readings

- GLS Ch. 12.1-12.2

Fiscal Policy

- The term *fiscal policy* refers to government spending and tax collection
- We will study fiscal policy in a particularly simple environment – endowment economy with no production
- Basic conclusions will carry over to a model with production
- Key result: *Ricardian Equivalence*. Ricardian Equivalence states that the manner in which a government finances its spending (debt or taxes) is irrelevant for understanding the equilibrium effects of changes in spending
- We will also discuss the "government spending multiplier"

Environment

- Time lasts for two periods, t and $t+1$
- Government does an exogenous amount of expenditure, G_t and G_{t+1}. We do not model the usefulness of this expenditure (i.e. public good provision)
- Like the household, the government faces two flow budget constraints:

$$G_t \leq T_t + B_t$$
$$G_{t+1} + r_t B_t \leq T_{t+1} + B_{t+1} - B_t$$

- B_t: stock of debt government debt issued in t and carried into $t+1$
- Government can finance its period t spending by raising taxes (T_t) or issuing debt (B_t, with initial level $B_{t-1} = 0$)
- Same in period $t+1$, except government also has interest expense on debt, $r_t B_t$

Intertemporal Budget Constraint

- Note that $B_t > 0$ means debt (opposite for household savings) and $B_t < 0$ means government saving
- Terminal condition: $B_{t+1} = 0$
- Intertemporal budget constraint is then:

$$G_t + \frac{G_{t+1}}{1 + r_t} = T_t + \frac{T_{t+1}}{1 + r_t}$$

- Conceptually the same as the household
- Government's budget must balance in an intertemporal present value sense, not period-by-period

Household Preferences

- Representative household. Everyone the same
- Household problem the same as before. Lifetime utility:

$$U = u(C_t) + \beta u(C_{t+1}) + \underbrace{h(G_t) + \beta h(G_{t+1})}_{\text{Can Ignore}}$$

- Cheap way to model usefulness of government spending: household gets utility from it via $h(\cdot)$
- As long as "additively separable" manner in which household receives utility is irrelevant for understanding equilibrium dynamics
- Hence we will ignore this

Household Budget Constraints

- Faces two within period flow budget constraints:

$$C_t + S_t \leq Y_t - T_t$$
$$C_{t+1} + S_{t+1} - S_t \leq Y_{t+1} - T_{t+1} + r_t S_t$$

- Household takes T_t and T_{t+1} as given
- Imposing terminal condition that $S_{t+1} = 0$ yields household's intertemporal budget constraint:

$$C_t + \frac{C_{t+1}}{1 + r_t} = Y_t - T_t + \frac{Y_{t+1} - T_{t+1}}{1 + r_t}$$

Household Optimization

- Standard Euler equation:

$$u'(C_t) = \beta(1 + r_t)u'(C_{t+1})$$

- Can write household's IBC as:

$$C_t + \frac{C_{t+1}}{1 + r_t} = Y_t + \frac{Y_{t+1}}{1 + r_t} - \left[T_t + \frac{T_{t+1}}{1 + r_t}\right]$$

- But since present value of stream of taxes must equal present value of stream of government spending, this is:

$$C_t + \frac{C_{t+1}}{1 + r_t} = Y_t + \frac{Y_{t+1}}{1 + r_t} - \left[G_t + \frac{G_{t+1}}{1 + r_t}\right]$$

Taxes Drop Out

- From the household's perspective, knowing that the government's IBC must hold, we can get:

$$C_t + \frac{C_{t+1}}{1+r_t} = Y_t - G_t + \frac{Y_{t+1} - G_{t+1}}{1+r_t}$$

- In other words, T_t and T_{t+1} drop out
- From household's perspective, it is as though $T_t = G_t$ and $T_{t+1} = G_{t+1}$
- This means that the consumption function (which can be derived qualitatively via indifference curves and budget lines) does not depend on T_t or T_{t+1}:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

Intuition

- All the household cares about when making its consumption/saving decision is the present discounted value of the stream of income
- A cut in taxes, not met by a change in spending, means that future taxes must go up by an amount equal in present value
- Example:
  - Cut T_t by 1
  - Holding G_t and G_{t+1} fixed, the government's IBC holding requires that T_{t+1} go up by $(1 + r_t)$
  - Present value of this is $\frac{1+r_t}{1+r_t} = 1$, the same as the present value of the period t cut in taxes – i.e. it's a wash from the household's perspective

Ricardian Equivalence

- Ricardian Equivalence due to Barro (1979), named after David Ricardo
- Basic gist: the manner of government finance is irrelevant for how a change in government spending impacts the economy
- Increasing G_t by increasing T_t ("tax finance") will have equivalent effects to increasing G_t by increasing B_t ("deficit finance")
- Why? Current debt is equivalent to future taxes, and household is forward-looking
- Debt must equal present value of government's "primary surplus" (taxes less spending, excluding interest payments):

$$B_t = \frac{1}{1 + r_t} \left[T_{t+1} - G_{t+1} \right]$$

- Issuing debt equivalent to raising future taxes

Ricardian Equivalence in the Real World

- Ricardian Equivalence rests on several dubious assumptions:
  1. Taxes must be lump sum (i.e. additive)
  2. No borrowing constraints
  3. Households forward-looking
  4. No overlapping generations (i.e. government does not "outlive" households)
- Nevertheless, the basic intuition of Ricardian Equivalence is potentially powerful when thinking about the real world

Fiscal Policy in an Endowment Equilibrium Model

- Market-clearing requires that $B_t = S_t$ – government borrowing equals household saving
- Equivalently, "aggregate saving" equals zero:

$$S_t - B_t = 0$$

- But this is:

$$Y_t - T_t - C_t - (G_t - T_t) = 0$$

- Which implies:

$$Y_t = C_t + G_t$$

Equilibrium Conditions

- Household optimization:

$$C_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t)$$

- Market-clearing:

$$Y_t = C_t + G_t$$

- Exogenous variables: Y_t, Y_{t+1}, G_t, G_{t+1}.
- Taxes irrelevant for equilibrium!
- IS and Y^s curves are conceptually the same as before, but now G_t and G_{t+1} will shift the IS curve

The Government Spending Multiplier

- Total desired expenditure is:

$$Y_t^d = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t) + G_t$$

- Impose that income equals expenditure:

$$Y_t = C^d(Y_t - G_t, Y_{t+1} - G_{t+1}, r_t) + G_t$$

- Totally differentiate, holding r_t, Y_{t+1}, and G_{t+1} fixed:

$$dY_t = \frac{\partial C^d}{\partial Y_t}(dY_t - dG_t) + dG_t$$

- Or: $dY_t = dG_t$
- This tells you that, *holding r_t fixed*, output would change one-for-one with government spending – i.e. the "multiplier" would be 1. This gives horizontal shift of the IS curve to a change in G_t

The Multiplier without Ricardian Equivalence

- Suppose that the household is not forward-looking, so desired expenditure, equal to total income, is:

$$Y_t = C^d(Y_t - T_t, r_t) + G_t$$

- Suppose that there is a deficit-financed increase in expenditure, so that T_t does not change. Totally differentiating:

$$dY_t = \frac{\partial C^d}{\partial Y_t} dY_t + dG_t$$

- Simplifying one gets a "multiplier" of:

$$\frac{dY_t}{dG_t} = \frac{1}{1 - MPC} > 1$$

- Note: this assumes (i) no Ricardian Equivalence and (ii) fixed real interest rate

"Rounds of Spending" Intuition

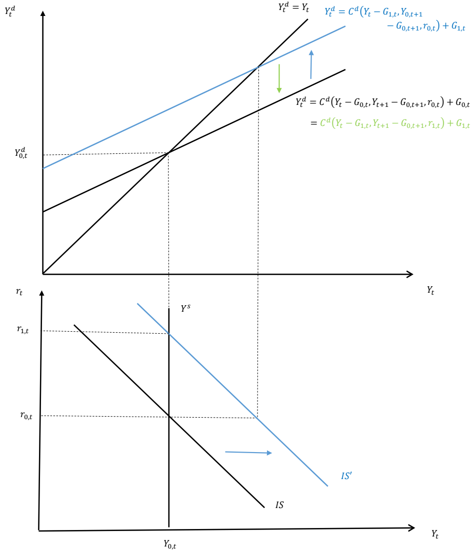
- One can think of several "rounds" of spending happening within a period
- In round 1, government spending goes up by 1
- With no Ricardian equivalence, this generates 1 of income, which generates MPC of extra consumption in round 2. This extra MPC of consumption in round 2 generates MPC extra income, which generates MPC^2 of extra consumption in round 3, and so on:

$$\frac{dY_t}{dG_t} = 1 + MPC + MPC^2 + MPC^3 + \cdots = \frac{1}{1 - MPC}$$

- With Ricardian Equivalence, process is similar, but initially only a $1 - MPC$ infusion of spending (because household reacts to increase in G_t as though taxes have increased):

$$\frac{dY_t}{dG_t} = (1 - MPC) + MPC(1 - MPC) + MPC^2(1 - MPC) + \cdots = \frac{1 - MPC}{1 - MPC} = 1$$

Graphical Effects: Increase in G_t



Crowding Out

- An increase in G_t has no effect on Y_t in equilibrium
- Hence, private consumption is completely "crowded out": $dC_t = -dG_t$
- To make this compatible with market-clearing, r_t must rise
- Increase in G_{t+1} has opposite effect: r_t falls to keep current C_t from declining
- Again, r_t adjusts so as to undo any desired smoothing behavior by household
- Multiplier is *zero* in equilibrium. *Not* a consequence of Ricardian Equivalence, but rather assumption of endowment economy where output cannot react

Graphical Effects: Increase in G_{t+1}