Lecture 5

Chapter 9

- Government budgets – updated from text
- Multiplier model with government and net taxes exogenous
- Multiplier model with government and net taxes endogenous
- Government spending multipliers (G and TR)
- Tax multiplier (t)
- Balanced budget amendment

NOTATION

- Y output or income
- C consumption
- I investment
- G government purchases of goods and services
- TR government spending on transfer payments (a negative tax)
- t tax rate
- TAX taxes
- T net taxes ($TAX - TR$)
- Y_d disposable income ($Y - T$)

MULTIPLIER MODEL, T EXOGENOUS

- $Y_d \equiv Y - T$ Definition
- $C = a + bY_d$ Behavioral
- $Y = C + I + G$ Equilibrium condition

SOLUTION

$$
\begin{aligned}
Y &= C + I + G \\
&= a - bT + bY + I + G \\
&= \tfrac{1}{1-b}(a - bT + I + G) \\
&= \tfrac{a}{1-b} - \tfrac{b}{1-b}T + \tfrac{1}{1-b}(I + G)
\end{aligned}
$$

Reduced form equation

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1-b} = \frac{1}{1-\text{MPC}} = \frac{1}{1-.75} = 4$$

$$\frac{\Delta Y}{\Delta T} = \frac{-b}{1-b} = \frac{-\text{MPC}}{1-\text{MPC}} = \frac{-.75}{1-.75} = -3$$

BALANCED BUDGET MULTIPLIER (ONLY WHEN T IS EXOGENOUS)

If $\Delta G = 10$ and $\Delta T = 10$, then:

$\Delta Y = \frac{10}{1-b} - \frac{10b}{1-b} = 10(\frac{1-b}{1-b}) = 10$

So

$\frac{\Delta Y}{\Delta G} = 1$

MULTIPLIER MODEL, T ENDOGENOUS

- $Y_d \equiv Y - T$ Definition
- $C = a + bY_d$ Behavioral
- $Y = C + I + G$ Equilibrium condition
- $TAX = tY$ Behavioral
- $T \equiv TAX - TR$ Definition

SOLUTION

$$\begin{aligned} Y &= C + I + G \\ &= a + b(Y - tY + TR) + I + G \\ &= \tfrac{a}{1-b+bt} + \tfrac{b}{1-b+bt}TR + \tfrac{1}{1-b+bt}(I+G) \end{aligned}$$

Reduced form equation

If $b = .75$ and $t = \frac{1}{3}$, then $\frac{1}{1-.75+.25} = 2$ and $\frac{.75}{1-.75+.25} = 1.5$

MULTIPLIER MODEL, T ENDOGENOUS, BALANCED BUDGET AMENDMENT

- $Y_d \equiv Y - T$ Definition
- $C = a + bY_d$ Behavioral
- $Y = C + I + G$ Equilibrium condition
- $TAX = tY$ Behavioral
- $T \equiv TAX - TR$ Definition
- $G = T$ Behavioral

SOLUTION

$Y = C + I + G$
$= a + b(Y - tY + TR) + I + tY - TR$
$= \frac{a}{1-b+bt-t} + \frac{b}{1-b+bt-t}TR + \frac{1}{1-b+bt-t}(I - TR)$ Reduced form equation

If $b = .75$ and $t = \frac{1}{3}$, then $\frac{1}{1-.75+.25-.33} = 5.9$

billions $

GDP in 2016 = 18,625

	Federal 2016	State & Local 2016
Expenditures		
G	965	1,694
TR	2,093	693
GIA	556	—
Interest	475	197
Other	60	0
	4,149	2,584
Receipts		
Personal tax	1,541	420
Corporate tax	401	58
Sales & property & other tax	370	1,363
Social Security tax	1,230	20
GIA	—	556
	3,452	2,417
Deficit (−)	−697	−167

$$\text{aggregate tax rate} = t = \frac{3{,}452 + 2{,}417 - 556}{18{,}625} = 0.29$$

CHANGE IN G

- Government increases its purchases of goods and services, G.
- Output (income), Y, increases to meet the added sales.
- Taxes, tY, increase. So does disposable income, Y_d, because t is less than 1.0.
- Because of the increase in disposable income, consumption, C, increases. This further increases Y, etc. Reduced form equation is needed to see the final solution.

CHANGE IN TR

- Government increases its transfer payments to households, TR.
- Disposable income, Y_d, increases because transfer payments are part of disposable income.
- Because of the increase in disposable income, consumption, C, increases. Consumption increases by b times the change in TR, where b is the marginal propensity to consume. The initial increase in demand is thus b times the change in TR, not the entire change in TR.
- Output (income), Y, increases to meet the added sales.
- Taxes, tY, increase. Disposable income increases further because t is less than 1.0.
- Because of the further increase in disposable income, consumption increases further. This further increases Y, etc. Reduced form equation is needed to see the final solution.
- Note: the initial injection of demand is not the entire change in TR, unlike when G is changed, where the entire change in demand is the change in G.