Seminar 5. Problems with multipliers

Solution to Problem 1

We write the general model for the case of a closed economy:

$$\begin{cases} Y = C + I + G \\ C = C_0 + c \cdot Y_{disp}, \quad c \in (0,1) \\ Y_{disp} = Y - T + TR \\ T = T_0 + t \cdot Y, \quad t \in (0,1) \end{cases}$$

We then bring the model to its final form, replacing step by step the dependent variables T, Y_{disp} and C in the output equation.

$$\begin{cases} Y = C_0 + c \cdot (1-t)Y - cT_0 + cTR + G + I \\ C = C_0 + c \cdot (1-t)Y - cT_0 + cTR \\ Y_{disp} = (1-t)Y - T_0 + TR \\ T = T_0 + tY \end{cases}$$

The following final form of the equation is obtained: $Y = \frac{1}{1-c(1-t)} \cdot [C_0 - cT_0 + cTR + G + I]$

a) The case when t=0

From the last equation we get:

$$Y = \frac{1}{1-c}(C_a + I + G) - \frac{c}{1-c} \cdot (T - TR) = \frac{1}{1-0{,}9}(100+200+500) - \frac{0{,}9}{1-0{,}9} \cdot 400 = 4400 \text{ bil.lei}$$

C= 100+ 0,9(4400-400)=3700 bil.lei

T= T_0= 400 bil. lei

BD= G- T +TR= 500- 400 = 100 bil. lei (budgetary deficit)

b) The case when t=1/3

$Y = \frac{1}{1-c(1-t)} 440 = 1100$ bil.lei

BD= G- T_0 -tY +TR= 500- 400 -1/3*1100= -266,7 bil. lei (budgetary surplus)

How do you justify the decrease of the GDP and the budget deficit in case b) when a tax rate of 33.3% was introduced?

Solution to Problem 2

The general model is:

$$\begin{cases} Y = C + I + G + NX \\ C = C_0 + c \cdot Y_{disp} \\ Y_{disp} = Y - T + TR \\ T = T_0 + t \cdot Y \end{cases}$$

Since the variation of the budget deficit is defined by the relation:

$\Delta BD = \Delta G - \Delta T$,

It results:

$\Delta BD = \Delta G - \Delta T = -100$ mil. lei

If we make the replacement $\Delta T = t \cdot \Delta Y$ in the previous equation, we obtain:

$\Delta BD = \Delta G – t\ \Delta Y = -100$ mil. lei

According to the multipliers theory, the relation by which we determine the variation of GDP ($\Delta Y = Y_1 – Y_0$) caused by the variation in government spending ($\Delta G = G_1 – G_0$) is:

$$\Delta Y = \frac{1}{1-c(1-t)} \cdot \Delta G$$

where $\frac{\Delta Y}{\Delta G} = \frac{1}{1-c(1-t)}$ is the multiplier of government spending (or the multiplier of budgetary policy)

After making the necessary replacements we get:

$$\Delta Y = \frac{1}{1-0{,}9(1-1/3)} \cdot \Delta G = 2{,}5 \cdot \Delta G$$

$\Delta BD = \Delta G – t\ (2{,}5 \cdot \Delta G) = (1 – 2{,}5/3) \cdot \Delta G = 1/6 \cdot \Delta G$

Since $\Delta BD = –100$, government spending should drop by 600 mil. lei.

Solution to Problem 3

The null hypothesis: ΔT_0=50 mil. €.

$$\alpha_G = \frac{1}{1-c(1-t)} = 3{,}125$$

$\Delta Y = -c\ \alpha_G\ \Delta T_0 = -0{,}9 \cdot 3{,}125 \cdot 50 = -125$ mil. €

$\Delta BD = -\Delta T_0 - t \cdot \Delta Y = -50 + 0{,}15 \cdot 125 = -31{,}25$ mil. €

$\Delta C = -c\ \Delta T_0 + c(1-t)\Delta Y = -0{,}8 \cdot 50 + 0{,}8 \cdot (1-0{,}15) \cdot (-125) = -125$ mil. €

Alternatively, the variation in private consumption could also be determined by using the following relationship:

$\Delta Y = \Delta C + \Delta I + \Delta G + \Delta NX$.

Since investments, government spending and net exports do not change, $\Delta I = \Delta G = \Delta NX = 0$, then:

$\Delta Y = \Delta C = -125$ mil. €

Solution to Problem 4

$\Delta TR = -1$ mil € and $\Delta G = 1$ mil. €

$\Delta Y = \alpha_G [\Delta G + c\ \Delta TR] = \alpha_G\ [1 - c]$ mil. € >0 => GDP will increase

$\Delta BD = \Delta G + \Delta TR - t \cdot \Delta Y = 1-1 –t\ \Delta Y = –t\ \Delta Y < 0$ => the budgetary deficit will drop