Third TA Session: Aggregate Demand & Aggregate Supply

Macroeconomics 2

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Highlights

- Aggregate Demand
- Aggregate Supply
- Policy Implications
- Homework discussion

Structural Equations (1)

- Consider the following structural equations:

$$Y = C + I + G \tag{1}$$
$$C = C(Y) \tag{2}$$
$$I = I(Y, r) \tag{3}$$
$$\frac{M}{P} = L(Y, i) \tag{4}$$
$$\frac{\dot{P}}{P} = H\left[\frac{(Y - \bar{Y})}{\bar{Y}}\right] + \pi \tag{5}$$

- Equation (1) to (3) represents the *IS* relationship, equation (4) represents *LM*, while equation (5) represents expectation-augmented Philips curve

Structural Equations (2)

- Our goal is to simplify the equations into more manageable form (instead of 5 equations with 5 unknowns)

$$Y = C(Y) + I(Y, r) + G \tag{6}$$

$$L(Y, i) = \frac{M}{P} \tag{7}$$

$$H\left[\frac{(Y - \bar{Y})}{\bar{Y}}]\right] = \frac{\dot{P}}{P} - \pi \tag{8}$$

Structural Equations (3)

- Since we are more interested in the effect of exogenous variables to our variables of interest (Y, P), we take the total derivative and rearrange the structural equations from before into

$$dY = C_Y dY + I_Y dY + I_r dr + dG \tag{9}$$

$$L_Y dY + L_i dr = \frac{1}{P} dM - \frac{M}{P^2} dP \tag{10}$$

$$\frac{H_Y}{\bar{Y}} dY = \frac{1}{P} d\dot{P} - \frac{\dot{P}}{P^2} dP \tag{11}$$

- To obtain (9)-(11), we impose some restrictions, such as imposing that π and $\bar{Y}$ are constants (such that $d\pi = d\bar{Y} = 0$). The former ensures that in our analysis, $i = r$ and $di = dr$. We also can assume that since price is never far from its equilibrium, the term $\dot{P}/P^2 \sim 0$, such that we can drop the dP

Short Run Analysis

- Only two out of three equations are relevant to our analysis on aggregate demand, that is (9) and (10). Turning those equations into matrices form, we obtain:

$$\begin{bmatrix} (1 - C_Y - I_Y) & -I_r \\ L_Y & L_i \end{bmatrix} \begin{bmatrix} dY \\ dr \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \frac{1}{P} & -\frac{M}{P^2} \end{bmatrix} \begin{bmatrix} dG \\ dM \\ dP \end{bmatrix} \qquad (12)$$

- The math to analyze dY/dG, i.e. effect of fiscal policy to output, is relatively easy, $\frac{dY}{dG} = \frac{L_i}{L_i(1-C_Y-I_Y)+I_rL_Y}$
- However, standard restrictions imposed on this equation cannot sufficiently determine the sign of dY/dG

Slope of IS/LM

- Recall equation (9), which represents the IS curve, and equation (10), which represents the LM curve. We can obtain the slope of each by setting the exogenous variable to zero

$$(1 - C_Y - I_Y)dY = I_r dr \quad (13)$$

$$L_Y dY = -L_i dr \quad (14)$$

- The slope of IS and LM curve (represented by dr/dY) is therefore

$$\frac{dr}{dY} = \frac{(1 - C_Y - I_Y)}{I_r} \quad \text{(IS Slope)} \quad (15)$$

$$\frac{dr}{dY} = \frac{-L_Y}{L_i} \quad \text{(LM Slope)} \quad (16)$$

Convergence/Stability Analysis (1)

- Underlying logic: analysis at equilibrium requires that equilibrium can be reached within finite period of time
- Convergence to equilibrium requires that $d\dot{P}/dP \to 0$, which means price level in the economy will eventually reaches its long-run equilibrium
- From equation (12), we know that

$$\frac{dY}{dP} = \frac{-I_r M/P^2}{L_i(1 - C_Y - I_Y) + I_r L_Y} \tag{17}$$

$$\frac{d\dot{P}}{dY} = \frac{PH_Y}{\bar{Y}} \tag{18}$$

$$\frac{d\dot{P}}{dP} = \frac{-I_r M H_Y}{P\bar{Y}} \frac{1}{L_i(1 - C_Y - I_Y) + I_r L_Y} < 0 \tag{19}$$

Convergence/Stability Analysis (2)

- Notice that since $-I_r MH_Y > 0$ and $P\bar{Y} > 0$, then for the system to achieve convergence, we should impose the following restriction:

$$L_i(1 - C_Y - I_Y) + I_r L_Y < 0 \tag{20}$$

$$L_i(1 - C_Y - I_Y) < -I_r L_Y \tag{21}$$

$$\frac{(1 - C_Y - I_Y)}{I_r} < -\frac{L_Y}{L_i} \tag{22}$$

$$C_Y + I_Y - \frac{I_r L_Y}{L_i} < 1 \tag{23}$$

- The slope for LM therefore should be larger than the slope for IS for the system to converge (22)
- Conceptually, this means that increase in spending as the result of increase in income (marginal propensity to spend) should be $<$ 1

Homework Discussions