Business Cycles
Prof. Dr. M. Wolters Summer 2022

Problem Set
The Neoclassical Model

1. This exercise will ask you to work through the derivation of the IS curve under various different scenarios.

a) Graphically derive the IS curve for a generic specification of the consumption function and the investment demand function.

b) Suppose that investment demand is relatively more sensitive to the real interest rate than in (a). Relative to (a), how will this impact the shape of the IS curve?

c) Suppose that the MPC is larger than in (a) but still smaller than one. How will this affect the shape of the IS curve?

2. In this question, you are asked to derive the Y^s curve again.

a) Graphically derive the Y^s curve for a generic specification of the aggregated production function, the labor supply curve, and the labor demand curve.

b) Show graphically and explain how an increase in the current productivity A_t affects the Y^s curve.

c) Show graphically and explain how an increase in the money supply M_t^s affects the Y^s curve.

3. The neoclassical model is characterized by eight equations all simultaneously holding. In class you derived a graphical apparatus to characterize the equilibrium. Re-derive the equilibrium determined by the "real block" and by the "nominal block" graphically and explain the decision rules of each actor!

4. Suppose that we assume specific functional forms for the consumption function and the investment demand function. These are:

$$C_t = c_1(Y_t - G_t) + c_2(Y_{t+1} - G_{t+1}) - c_3 r_t$$
$$I_t = -d_1 r_t + d_2 A_{t+1} + d_3 K_t$$

Here, c_1 through c_3 and d_1 through d_3 are fixed parameters governing the sensitivity of consumption and investment to different factors relevant for those decisions.

a) We must have $Y_t = C_t + I_t + G_t$. Use the given function forms for the consumption and investment with the resource constraint to derive an algebraic expression for the IS curve.

b) Use this to derive an expression for the slope of the IS curve (i.e. $\frac{\partial Y_t}{\partial r_t}$).

5. Further (voluntary) homework:
Suppose the economy described in question 4 and assuming that the parameters are as follows: $c_1 = 0.6$, $c_2 = 0.5$, $c_3 = 10$, $d_1 = 20$, $d_2 = 1$, and $d_3 = 0.5$. Suppose that $Y_{t+1} = 15$, $G_t = 10$, $G_{t+1} = 10$, $A_{t+1} = 5$, and $K_t = 15$. Suppose that $r_t = 0.1$.

a) Create an Excel file to numerically solve for Y_t.

b) Suppose instead that $r_t = 0.15$. Solve for Y_t in your Excel file.

c) Create a range of values of r_t, ranging from 0.01 to 0.2, with a gap of 0.001 between values. Solve for Y_t for each value of r_t. Create a plot with r_t on the vertical axis and Y_t on the horizontal axis (i.e. create a plot of the IS curve). Is it downward-sloping, as you would expect?

d) Create another version of your IS curve when $A_{t+1} = 7$ instead of 5. Plot this along with the IS curve with $A_{t+1} = 5$. Explain how the higher value of A_{t+1} impacts the position of the IS curve.