

Problem Set 3 (corrected)

Due *in lecture* on Wednesday, March 25. Be sure to put your name on your problem set. Put “boxes” around your answers to the algebraic questions.

1. Secular stagnation? Suppose the national saving (NS) and investment (I) functions (as a share of GDP) for an economy are given by the following equations.

$$NS = [S] + BuS = [\alpha_0 + \alpha_1 r + \alpha_2 d] + F_0$$
$$\alpha_1 > 0, \alpha_2 < 0$$

$$I = \beta_0 + \beta_1 r + \beta_2 z$$
$$\beta_1 < 0, \beta_2 < 0$$

Where S is saving, BuS is the government budget balance (as a share of GDP), r is the real interest rate, d is a dependency rate (share of children in the economy), z is productivity of capital goods.

The equilibrium condition is:

$$NS = I$$

The r that solves this equilibrium condition is the equilibrium real interest rate (you can call it r^*).

- 1.1 Draw a graph of these curves, with the vertical axis as r , and the horizontal axis as NS , and I . Indicate the slopes of these curves, and what shifts each of the curves.
- 1.2 Solve for the algebraic solution.
- 1.3 Suppose $\alpha_0 = 0.10$, $\alpha_1 = 0.10$, $\alpha_2 = -0.20$, $\beta_0 = 0.15$, $\beta_1 = -0.20$, $\beta_2 = -0.30$. The exogenous variables take on the following values: $d = 0.2$, $z = 0.25$, $F_0 = 0$ (there is budget balance). Solve the equilibrium interest rate. (Note: for example, “0.07” is 7%).
- 1.4 Now suppose all the parameters stay the same, as does z , but the youth dependency rate drops to 0.05. Solve for the new equilibrium interest rate.
- 1.5 Suppose the real interest rate cannot drop below zero. What is the level of desired investment? What is the level of desired saving? Do these levels match?
- 1.6 Given the conditions in 1.4, suppose the government budget balance goes into deficit equal to 2% of GDP ($BuS = F_1 = -0.02$).

2. Ricardian equivalence. Suppose the government and household face these two budget intertemporal budget constraints.

$$D_{t+1} = D_t + G_t + R \times D_t - T_t$$

Where D is government debt, G is government purchases, R is the real interest rate, and T is lump sum tax revenues.

$$A_{t+1} = A_t + R \times A_t + E_t - T_t - C_t$$

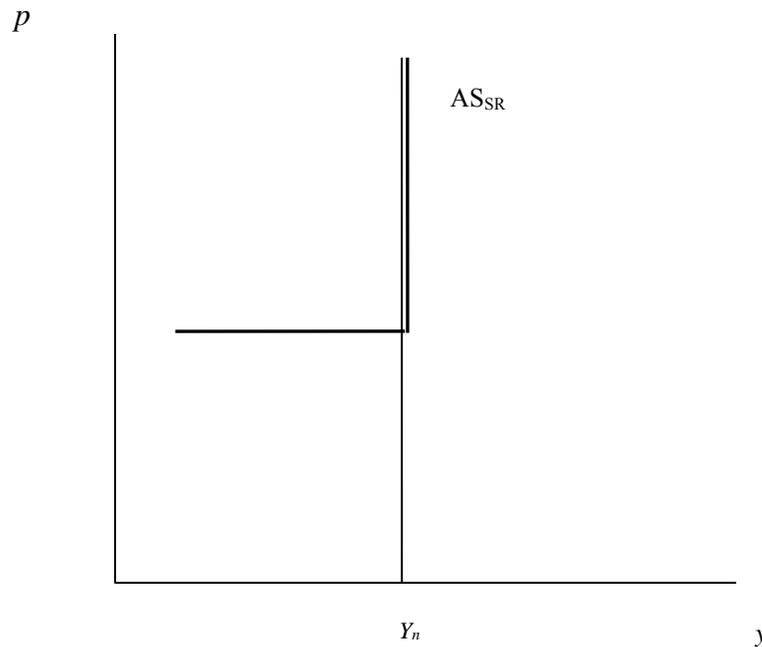
Where A is assets, E is labor earnings, and C is consumption.

Suppose taxes are cut by 1000 in year 1 and the government debt increases.

2.1 If the interest rate is 5%, how much will taxes have to increase next year if the government debt is to come back to normal by the end of the year?

2.2 What is the effect of this decrease and subsequent increase in taxes on the intertemporal budget constraint for consumers? How would you expect this change to affect consumption?

3. Multipliers. Suppose the AD-AS diagram looks like the following:



3.1 Suppose output is currently below Y_n , and interest rates are above 0. What is the size of the multiplier for government spending, assuming the final level of income is below Y_n ?

3.2 Suppose output is at Y_n . What is the size of the government spending multiplier for an increase in government spending?

3.3 Using the same assumptions as in 3.2, state the size of the increase in income arising from a \$1 billion real increase in the money supply.

3.3 Suppose output is currently below Y_n , but interest rates are already at zero. What is the size of the increase in income for a \$1 billion real increase in money supply?