

Problem Set 3

Due *in lecture* on Wednesday, March 16. Be sure to put your name on your problem set. Put “boxes” around your answers to the algebraic questions.

1. Consider the following data from US Treasury <http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield> (accessed 3/7/2016):

Date	1 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
03/01/16	0.29	0.33	0.50	0.68	0.85	0.98	1.31	1.62	1.83	2.28	2.70
03/02/16	0.28	0.36	0.48	0.67	0.85	1.00	1.34	1.65	1.84	2.27	2.69
03/03/16	0.25	0.28	0.46	0.65	0.85	0.99	1.33	1.63	1.83	2.23	2.65
03/04/16	0.25	0.29	0.47	0.67	0.88	1.04	1.38	1.69	1.88	2.29	2.70
03/07/16	0.27	0.32	0.49	0.67	0.91	1.08	1.42	1.72	1.91	2.30	2.71

Suppose the expectations hypothesis of the term structure holds.

- 1.1 Calculate the expected one year interest rate, one year from 3/7/2016.
- 1.2 Calculate the expected five year rate expected five years from 3/7/2016.
- 1.3 Given the interest rates given in the table, do you expect a recession in the next year? Why or why not?

2. 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:

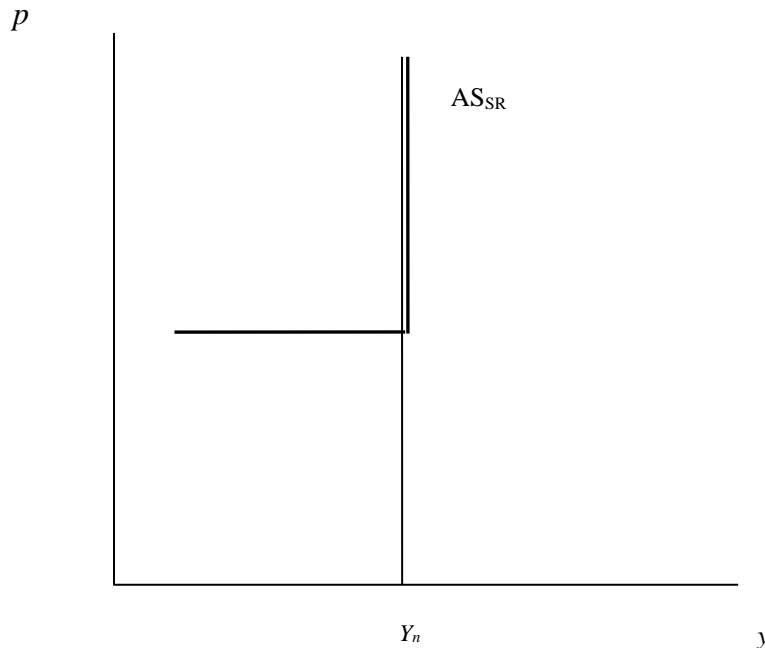
$$NS = I$$

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

- 2.1 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.
- 2.2 Solve for the algebraic solution.
- 2.3 Now suppose all the parameters stay the same, as does z , but the youth dependency rate drops so much that the equilibrium real rate drops below that which is feasible (call that $X\%$). Show the graph.

- 2.4 Suppose the real interest rate cannot drop below $X\%$. What is the level of desired investment? What is the level of desired saving? Do these levels match?
- 2.5 Show what an increase in government spending (resulting in a reduction in national saving) does in this graph.

3. Multipliers. Suppose the short run and long run aggregate supply curves look like the following in the AD-AS diagram:



Aggregate demand is given by:

$$Y = \hat{\gamma} \left[\Lambda_0 - \frac{b_2 \mu_0}{h} + \left(\frac{b_2}{h} \right) \left(\frac{M_0}{P} \right) \right] \quad \text{where} \quad \hat{\gamma} \equiv \frac{1}{1 - c_1(1 - t_1) + b_2 / h}$$

- 3.1 Suppose output is currently at 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 and the central bank targets the money stock (and the interest rates end up above 0%)?
- 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 increase in the money supply.
- 3.4 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?