**HOMEWORK #3**

*This homework assignment is due at the beginning of lecture on Monday, February 7.*

1. Consider an economy in which full-employment output $\bar{Y}$, as determined in the labor market, is equal to 6000. Let government purchases $G$ be equal to 1200. Let desired consumption $C^d = 3600 - 2000r + 0.1\bar{Y}$ and let desired investment $I^d = 1200 - 4000r$, where $r$ is the real interest rate.

(a) Derive an equation for desired national saving $S^d$ as a function of $r$.

(b) Graph the desired saving curve and the desired investment curve in a graph with $r$ on the $y$-axis and desired saving and investment on the $x$-axis. Find the equilibrium interest rate. Verify that the goods market clears (i.e., verify that the demand for goods $C^d + I^d + G$ is equal to the supply of goods $\bar{Y}$).

(c) Suppose now that $G$ increases from 1200 to 1440. How (if at all) do the curves in part (b) shift? Determine the new equilibrium interest rate and verify that the goods market clears.

(d) Suppose instead that desired consumption depends on private disposable income rather than on total income:

$$C^d = 3600 - 2000r + 0.1(\bar{Y} - T),$$

where $T$ is government taxation. Suppose too that the government balances its budget, so that $T = G$. In this case, how does an increase in $G$ from 1200 to 1440 affect the equilibrium interest rate?

2. Suppose that the economywide expected future marginal product of capital is given by: $MPK^f = 20 - 0.02K^f$, where $K^f$ is the future capital stock. The depreciation rate of capital, $d$, is equal to 20% per period. The current capital stock is 900 units of capital. Firms pay taxes equal to 50% of their revenues. Let the price of a unit of capital and the price a unit of output both be equal to 1. Desired consumption in the economy is given by: $C^d = 100 + 0.5\bar{Y} - 200r$, where $r$ is the real interest rate and full-employment output $\bar{Y}$ is equal 1000. Finally, let government purchases $G$ equal 200.
Suppose that the real interest rate is equal to 10% per period (i.e., set $r = 0.1$).

(a) What is the tax-adjusted user cost of capital? Calculate the desired future capital stock. Calculate the desired level of investment (i.e., calculate $K^* - K + dK$, where $K$ is the current capital stock and $K^*$ is the desired future capital stock).

(b) Derive an expression for the desired capital stock as a function of $r$. Use this expression to derive an expression for the desired level of investment as a function of $r$.

(c) Derive an expression for the desired level of national savings as a function of $r$.

(d) Use your answers from parts (b) and (c) to determine the equilibrium interest rate. Verify that the goods market clears.

(e) Suppose that the tax rate decreases from 50% to 40%. How (if at all) do the desired savings curve and the desired investment curve shift? Determine the effect of the tax decrease on the equilibrium interest rate and on equilibrium consumption and investment.

3. Do problem 8 from Chapter 4 on p. 153 of the textbook.

4. Do problem 7 from Chapter 4 on p. 154 of the textbook.