Economics 102
Fall 2007
Answers to Homework #5

1. Complete the following table, and answer the questions that follow.

Taxes are proportional to income, so T = tY. Assume that there are NO TRANSFERS.
Hint: You should consider using the slope formula to calculate MPC.

Y	T	Y-T	C	S
60	15	45	56	**-11**
100	**25**	75	80	**-5**
175	**43.75**	131.25	125	**6.25**
400	**100**	300	**260**	**40**

a) Determine the progressive tax rate t.
   15 = t(60)   t = .25

b) Determine the consumption and saving functions with respect to disposable income, and with respect to aggregate income.

$$MPC = \frac{\Delta C}{\Delta(Y-T)} = \frac{C_1 - C_2}{(Y-T)_1 - (Y-T)_2} = \frac{80-56}{75-45} = .8$$
$$MPS = 1 - MPC = 1 - .8 = .2$$

   C = 20 + .8(Y-T)   **C = 20 + .6Y**
   S = -20 + .2(Y-T)   **S = -20 + .15Y**

c) Given the consumption function you determined in part (b), the tax rate you found in part (a), and the following information about the economy, determine the equilibrium output:

   I = 130
   G = 100 + .16T
   X = 250
   M = 200

   Y = [20 + .8(Y-T)] + 130 + [100 + .16T] + [250-200]
   Y = 300 + .8(.75Y) + .16(.25Y)
   Y = 300 + .64Y
   .36Y = 300
   Y = 833.33

d) Given equilibrium output, determine the equilibrium levels of consumption, savings, taxes, and government spending.

C = 20 + .6(833.33)   C = 20 + 499.99   C = 519.99
S = -20 + .15(833.33)   S = -20 + 124.99   S = 104.99
T = .25*(833.33)   T = 208.33
G = 100 + .16(208.33)   G = 133.33

Notice, adding the values for C + S + T, you get 833.33 (approximately because of rounding errors). This is the value determined for Y in part C. This is consistent with the identity from class, Y = C + S + (T-TR).

e) Is the government running a deficit or a surplus? Are there capital inflows or outflows?

    The government is running a surplus. T-G = 75
    There are capital outflows M – X = -50.

f) In terms of variables, determine the GDP multiplier. Hint: you should model the equations as follows:

    $C = a + b(Y\text{-}T)$
    $I = I$
    $G = g + dT$
    $X = X$
    $M = M$
    $T = tY$

    Y = [a + b(Y-T)] + I + [g + dT] + [X-M]
    Y = [a + b(Y-tY)] + I + [g + dtY] + X – M
    Y = a + bY –btY + I + g + dtY + X – M
    Y – bY + btY – dtY = a + I + g + X – M
    Y(1 – b + bt – dt) = a + I + g + X – M

    $$Y = \frac{1}{(1-b+bt-dt)} * [a + I + g + X - M] \quad \textbf{So the multiplier is} \quad \frac{1}{(1-b+bt-dt)}$$

g) Determine the numerical value for the multiplier. Using the multiplier, how much does GDP increase if autonomous consumption increases by 100?

    1/(1 - .8 + .8(0.25) - (.16(0.25)))   = 1/(1 - .8 + .2 – .04)   =   1/0.36 = 2.778
    2.778 * 100 = 277.78

h) Looking at your multiplier equation, what is the difference between the variables in the denominator of the multiplier and those which aren't (the variables that the multiplier is multiplying)? Is there any intuition which may explain this?

The variables captured in the multiplier are all dependent on GDP. These are all proportional to GDP (b = MPC, t is proportional to GDP and d is proportional to t which is proportional to GDP). The values that the multiplier is multiplying are all autonomous values (a + I + g + X – M). So, based on any autonomous change, the multiplier gives you the change in GDP. So the multiplier captures all of the changes proportional to GDP without you having to recalculate the entire GDP equation.

2. What are the three uses of money that were described in class? Describe each of these uses (you can use a real world example for each if you'd like).

Medium of exchange. If you and I wanted to exchange goods and services between each other, instead of trading the goods for each other, we exchange money. Instead of going to a restaurant and offering to work for them for a meal, you offer them money instead.

Store of value. If I have money that was given to me ten years ago, it still has value today. Money holds value over time, and can be used tomorrow just as easily as it can be used today.

Unit of account. When we purchase goods, all of the prices are quoted in terms of money. This helps us make comparisons between the prices of goods. We know the value of money, so with a given price of a good we know the value of the good and can make decisions about whether to purchase it or not.

3. Suppose Jack Bauer deposits $250,000 in his account at Bank of America, and James Bond borrows $125,000 from Bank of America to buy an Aston Martin from the dealership. The required reserve ratio, set by the Federal Reserve, is 20%. The Aston Martin dealership deposits Mr. Bond's $125,000 into an account at the UW Credit Union. Assume that there are no currency drains.

a) What is a required reserve ratio (the definition, not the particular numerical value for this problem)? How is the required reserve ratio directly linked to the money multiplier? If the required reserve ratio increases, what happens to the money multiplier? Does this make sense?

The required reserve ratio is the percentage of reserves a bank holds that they must hold in the bank as cash reserves on hand. Specifically, a required reserve ratio of 20%, means that the bank must hold 20% of all deposits in cash reserves at the bank. This means that the bank can loan out all of their deposits, except for 20% which they must keep on hand. So, since the bank cannot lend out all of their money, and must withhold the required reserve ratio, this will change the money multiplier. The formula for the money multiplier is 1/(required reserve ratio). So, as the required reserve ratio goes up, it decreases the size of the money multiplier. This makes senses because

when the required reserve ratio goes up, the bank is able to loan out less money.

b) Determine the money multiplier. How much does Mr. Bauer's deposit increase the money supply (ignore the later effects of Mr. Bond's borrowing)?

The money multipler is 1/.2 = 5. So, Mr. Bauer's deposit increases the money supply by 5 * 250,000 = $1.25 million dollars.

c) Draw T-accounts for Bank of America, and UW Credit Union depicting the changes in assets and liabilities for these two institutions.

Bank of America's Balance Sheet	
Changes in Assets	Changes in Liabilities
Reserves: **$125,000**	Demand Deposits: **$250,000**
Loans: **$125,000**	

UW Credit Union's Balance Sheet	
Changes in Assets	Changes in Liabilities
Reserves: **$125,000**	Demand Deposits: **$125,000**
Loans: **0**	

d) What is the amount of required reserves held by Bank of America due to Mr. Bauer's deposit? What is the amount of required reserves held by UW Credit Union after the deposit from the Aston Martin dealership? If you went to the UW Credit Union, and the only money they had was from the $125,000 deposit from the Aston Martin dealership, what is the MOST you could borrow from them?

Bank of America's required reserves = $250,000*.20 = $50,000
UW Credit Union's required reserves = $125,000*.20 = $25,000

The most you could borrow is the amount of the deposit minus the required reserves. $125,000 - $25,000 = $100,000. Or, you could calculate this as $125,000*.80 = $100,000 since the bank is allowed to loan out 80% of the deposit, as long as they hold the other 20% as cash reserves on hand.

e) If the Federal Reserve was to increase the required reserve ratio to 25%, what would the new money multiplier be? Explain how a Federal Reserve policy like this can change the money supply. What is your intuition about what will happen to interest rates in this scenario?

The new money multiplier would be 1/.25 = 4. This could drastically change the money supply because the banks would not be allowed to lend out as

much money as they were able to before. Specifically, since the banks have to hold a larger percentage of their deposits as cash reserves, the banks have less money that is available for loans. Since the banks have less money to loan out, it is likely that interest rates will increase. The intuition behind this is if there are lots of people who want to borrow money from the bank, and the bank is allowed to lend out less money than they were before, the bank has bargaining power, and can charge higher interest rates on loans. This provides some intuition for how the Federal Reserve can influence interest rates in the economy, and conduct monetary policy.