Due in lecture on Tuesday, September 22nd. Be sure to put your name on your problem set, as well as the (i) name of your officially designated teaching assistant and (ii) discussion section number. Put “boxes” around your answers to the algebraic questions.

1. From Hall & Papell – Chapter 2, Numerical problem #5 (pp. 57-58)
   Note: There is an error in the statement of the problem. The sixth line should read “Suppose the base year is 2006.” (the problem incorrectly gives the base year as 2003).
   Answer parts (a) – (c); also (d) Calculate the rate of inflation between 2006 and 2007 using a Fisher price index.


2.1. Calculate the annualized quarterly growth rate of real GDP in each of the last four quarters. Is the economy expanding or contracting? Show your work!
2.2. Calculate the annual rate of change of the GDP deflator, and the PCE deflator, from the second quarter of 2008 to the second quarter of 2009. Show your work! Are they the same value?
2.3 Calculate the annual rate of change in the Consumer Price Index - All, and the Consumer Price Index excluding food and energy, from August 2008 to August 2009 (using seasonally adjusted data). Show your work! Are the rates identical?

3. Consider the following economy.

<table>
<thead>
<tr>
<th>Eq.No.</th>
<th>Equation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>$Y = AD$</td>
<td>Output equals aggregate demand, an equilibrium condition</td>
</tr>
<tr>
<td>(2)</td>
<td>$AD = C + I + G + X$</td>
<td>Definition of aggregate demand</td>
</tr>
<tr>
<td>(3)</td>
<td>$C = a_o + bY_d$</td>
<td>Consumption function, $a_o = 1200$, $b = 0.7$</td>
</tr>
<tr>
<td>(4)</td>
<td>$Y_d \equiv Y - T + F$</td>
<td>Definition of disposable income</td>
</tr>
<tr>
<td>(5)</td>
<td>$T = TA_0 + tY$</td>
<td>Tax function; $TA_0 = 200$, $t = 0.10$</td>
</tr>
<tr>
<td>(6)</td>
<td>$F = FT_0$</td>
<td>Tax function; $FT_0 = 1000$</td>
</tr>
<tr>
<td>(7)</td>
<td>$I = IN_0$</td>
<td>Investment function, $IN_0 = 800$</td>
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<tr>
<td>(8)</td>
<td>$G = GO_0$</td>
<td>Government spending, $GO_0 = 1000$</td>
</tr>
<tr>
<td>(9)</td>
<td>$X = g_0$</td>
<td>Net Exports, $g_0 = 200$</td>
</tr>
</tbody>
</table>

3.1 Express, in algebraic symbols, the equilibrium level of income ($Y_0$) in this economy. Show your work.
3.2. Substituting in the numerical values given above, indicate the numerical value of equilibrium income (in this and future subsequent numerical answers, round off your answer at two decimal places).

3.3. Using the Keynesian Cross diagram, illustrate your answer in part (3.1), with all relevant curves, intercepts and slopes indicated clearly.

3.4. Once again, using algebraic symbols, calculate the government spending multiplier in this economy? What is the government transfers multiplier (recall that a government transfer is the opposite of taxes)? Why are they different?

3.5. Using the answer to part (3.2), what is the level of consumption spending in this economy?

3.6 If the level of investment spending were to fall to 600, what would be the equilibrium level of consumption?

4. Using the same economy described in question 3, answer the following, noting the budget surplus is:

\[ BuS = T - G - F = TA_0 + tY - FT_0 - GO_0 \]

Assume there is no government debt, in answering the following questions.

4.1. What is the value of the budget surplus when investment spending is 800?

4.2. What is the budget surplus when \( I \) falls to \( IN_1 = 600 \)?

4.3. What accounts for the change in the budget surplus from part (4.1) to (4.2)?

4.4. Suppose potential GDP (or "full-employment GDP") \( Y^* \) is 12000. What is the full-employment, or structural, budget surplus, \( BuS^* \), when \( I = 800 \) or 600?

4.5. Write out what the \( BuS \) depends upon, algebraically (i.e., using the symbols rather than the numbers). What variables affect \( BuS \)? What variables affect the full-employment budget surplus, \( Bus^* \)?

5. Suppose the government spending function is different: \( G = GO_0 - \theta Y \) where \( \theta \) is a parameter. This means that as the economy grows, government spending on goods and services (such building roads and buying tanks) decline. (For purposes of answering the below questions, assume the rest of the economy is the same as in question 3.)

5.1. Solve out for equilibrium income using algebraic symbols.

5.2. What is the new investment spending multiplier, \( \Delta Y/\Delta IN \) (algebraically)?

5.3. Why is the new multiplier less than the standard one, intuitively?

5.4. Substituting in the parameter values, what is the numerical value of the multiplier for \( \theta = 0.15 \)?

5.5. In this new economy, what are (i) the parameters; (ii) the exogenous variables; (iii) the endogenous variables?

6. Suppose equation (9) in the model in problem 3 looks like:

\( (9') \quad X = g_0 - mY \)

6.1. Solve for the impact of a (lump sum) tax increase on the trade balance or net exports, algebraically.

6.2. Using the definition of the budget surplus in problem 4, solve for the impact of a tax increase on the budget balance, algebraically.

6.3. Will the budget and trade balances move in the same direction in response to a tax increase?