

**Problem Set 1**

Due *in lecture* on Monday, September 27th. Be sure to put your name on your problem set. Put “boxes” around your answers to the algebraic questions.

1. Chain-Weighting

Suppose that the agrarian economy of Simpsonia consists only of two sectors: private consumption and private investment. The following figures give total production and prices for both sectors in 2050 and 2051. The base year is 2050

**CONSUMPTION**

	<b>POTATOES</b>		<b>RICE</b>	
	<b>Quantity</b>	<b>Price</b>	<b>Quantity</b>	<b>Price</b>
<b>2050</b>	100	\$3	150	\$5
<b>2051</b>	100	\$4	400	\$1

**INVESTMENT**

	<b>TRACTORS</b>		<b>SHOVELS</b>	
	<b>Quantity</b>	<b>Price</b>	<b>Quantity</b>	<b>Price</b>
<b>2050</b>	4	\$100	13	\$25
<b>2051</b>	5	\$130	15	\$30

- 1.1 Calculate nominal consumption, investment and GDP for 2050 and 2051.
  - 1.2 Using the traditional method, calculate real consumption for 2051.
  - 1.3 Using the traditional method, calculate real investment for 2051.
  - 1.4 Using the traditional method, calculate real GDP for 2051.
  - 1.5 Does 2051 real GDP equal the sum of real consumption and real investment in 2051 when calculated using the traditional method?
  - 1.6 Using the chain-weighted method, calculate real consumption in 2051.
  - 1.7 Using the chain-weighted method, calculate real investment in 2051.
  - 1.8 Using the chain-weighted method, calculate real GDP in 2051 (note: develop weights for *all four* goods and take a weighted average of the growth rates).
  - 1.9 Does 2051 real GDP equal the sum of real consumption and real investment in 2051 when using the chain-weighted method? Explain why or why not.
2. This problem requires obtaining data from various sources. You can access the latest GDP data from the BEA at [http://www.bea.gov/newsreleases/national/gdp/2010/pdf/gdp2q10\\_2nd.pdf](http://www.bea.gov/newsreleases/national/gdp/2010/pdf/gdp2q10_2nd.pdf) (August 2010 release). The Consumer Price Index figures can be obtained from the St. Louis Fed website at

<http://research.stlouisfed.org/fred2/series/CPIAUCSL?cid=9> and  
<http://research.stlouisfed.org/fred2/series/CPILFESL?cid=9> .

- 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 Personal Consumption Expenditure deflator, from the second quarter of 2010 to the second quarter of 2010. **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 July 2009 to July 2010 (using seasonally adjusted data). **Show your work!** Are the rates identical?

3. Consider the following economy.

<u>Eq.No.</u>	<u>Equation</u>	<u>Description</u>
(1)	$Y = AD$	Output equals aggregate demand, an equilibrium condition
(2)	$AD = C + I + G + X$	Definition of aggregate demand
(3)	$C = a_0 + bY_d$	Consumption function, $a_0 = 1200$ , $b = 0.8$
(4)	$Y_d \equiv Y - T$	Definition of disposable income
(5)	$T = TA_0 + tY$	Tax function; $TA_0 = -800$ , $t = 0.15$
(6)	$I = IN_0$	Investment function, $IN_0 = 1000$
(7)	$G = GO_0$	Government spending, $GO_0 = 1000$
(8)	$X = g_0$	Net Exports, $g_0 = 200$

- 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 800, what would be the equilibrium level of income?

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

$$BuS \equiv T - G = TA_0 + tY - GO_0$$

Assuming there is no government debt.

- 4.1. What is the value of the budget surplus when investment spending is 1000?
- 4.2. What is the budget surplus when  $I$  falls to  $IN_I = 800$ ?
- 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 13000. What is the full-employment, or structural, budget surplus,  $BuS^*$ , when  $I = 1000$ ? 800?
- 4.5. Can you 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:  $G = GO_\theta - \theta Y$  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 4.)

- 5.1. Solve out for equilibrium income using algebraic symbols.
- 5.2. What is the new government spending multiplier,  $\Delta Y/\Delta GO$  (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  $\theta = 0.10$ ?
- 5.5. In this new economy, what are (i) the parameters; (ii) the exogenous variables; (iii) the endogenous variables?

## 6. National savings identity and the Keynesian Model

Suppose equation 8 in the model in problem (3) looks like:

$$(8') \quad X = g_0 - mY \qquad \text{Net Exports}$$

- 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?