

Problem Set 1 (corrected)

Due *in lecture* on Monday, February 13th. Be sure to put your name on your problem set. Put “boxes” around your answers to the algebraic questions.

(07) 1. The CPI is calculated for a fixed market basket. It measures the change in the cost of the market basket from the base year until the current year. An index with the market basket fixed in the first year, like the CPI, is called a Laspeyres index. An alternative index, the Paasche Index, is based on a market basket in the end year. It measures the change in the cost of a market basket fixed in the end year. Suppose that the base is 2006, and further that the market basket contains only two items, wine and cheese, and the quantities consumed in 2006 and 2007 are

	wine	cheese
2006	50 bottles	100 wheels
2007	45 bottles	150 wheels

Suppose that the price of peanut butter increases from \$1.00 per wheel of cheese in 2006 to \$1.20 per wheel in 2007 and the price of wine increases from \$0.50 per bottle to \$2.00 per bottle.

1.1 Calculate the rate of inflation for the Laspeyres (CPI) index and the Paasche Index.

1.2 Will inflation calculated using the Laspeyres index always exceed inflation calculated with the Paasche index? (Hint: Use standard indifference curve analysis.)

1.3 Workers often receive an adjustment in their wages equal to only a fraction of inflation as calculated using the CPI. In view of the preceding analysis, explain why workers would likely be better off than they were before if they were fully compensated for inflation. Would this also be the case if inflation was calculated using the Paasche index?

(07) 2. 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 2010 and 2011. The base year is 2010

CONSUMPTION

	CHEESE		WINE	
	Quantity	Price	Quantity	Price
2010	100	\$6	150	\$10
2011	100	\$8	400	\$2

INVESTMENT

	BULLDOZERS		TRUCKS	
	Quantity	Price	Quantity	Price
2010	4	\$200	13	\$50
2011	5	\$260	15	\$60

Calculate nominal consumption, investment and GDP for 2010 and 2011.

- 2.1 Using the traditional method, calculate real consumption for 2011.
- 2.2 Using the traditional method, calculate real investment for 2011.
- 2.3 Using the traditional method, calculate real GDP for 2011.
- 2.4 Does 2011 real GDP equal the sum of real consumption and real investment in 2011 when calculated using the traditional method?
- 2.5 Using the chain-weighted method, calculate real consumption in 2011.
- 2.6 Using the chain-weighted method, calculate real investment in 2011.
- 2.7 Using the chain-weighted method, calculate real GDP in 2011 (note: develop weights for *all four* goods and take a weighted average of the growth rates).
- 2.8 Does 2011 real GDP equal the sum of real consumption and real investment in 2011 when using the chain-weighted method? Explain why or why not.

3. 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/2012/pdf/gdp4q11_adv.pdf (January 2012 release). The Consumer Price Index figures can be obtained from the St. Louis Fed website at <http://research.stlouisfed.org/fred2/categories/9> and <http://research.stlouisfed.org/fred2/categories/32424>.

- 3.1. 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!**
- 3.2. Calculate the annual rate of change of the GDP deflator, and the Personal Consumption Expenditure deflator, from the fourth quarter of 2010 to the fourth quarter of 2011. **Show your work!** Are they the same value?
- 3.3 Calculate the annual rate of change in the Consumer Price Index - All, and the Consumer Price Index excluding food and energy, from December 2010 to December 2011 (using seasonally adjusted data). **Show your work!** Are the rates identical?

4. Consider the following economy.

<u>Eq.No.</u>	<u>Equation</u>	<u>Description</u>
(1)	$Y = Z$	Output equals aggregate demand, an equilibrium condition
(2)	$Z \equiv C + I + G$	Definition of aggregate demand
(3)	$C = c_0 + c_1 Y_D$	Consumption function, $c_0 = 2000$, $c_1 = 0.8$
(4)	$Y_D \equiv Y - T$	Definition of disposable income
(5)	$T = t_0 + t_1 Y$	Tax function; $t_0 = -800$, $t_1 = 0.25$
(6)	$I = b_0$	Investment function, $b_0 = 800$
(7)	$G = GO_0$	Government spending, $GO_0 = 1400$

- 4.1 Express, in algebraic symbols, the equilibrium level of income (Y_0) in this economy. Show your work.
- 4.2. 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).
- 4.3. Using the Keynesian Cross diagram, illustrate your answer in part (4.1), with all relevant curves, intercepts and slopes indicated clearly.

4.4. Once again, using algebraic symbols, calculate the government spending multiplier in this economy. What is the multiplier for lump sum taxes (recall that a government transfer is the opposite of taxes)? Why does a reduction in lump sum have a different size impact from an increase in government spending on goods and services?

4.5. Using the answer to part (4.2), what is the level of consumption spending in this economy?

4.6 If the level of investment spending were to rise to 1000, what would be the equilibrium level of income?

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

$$BuS \equiv T - G = t_0 + t_1Y - GO_0$$

Assuming there is no government debt.

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

5.2. What is the budget surplus when I rises to $b_0 = 1200$?

5.3. What accounts for the change in the budget surplus from part (5.1) to (5.2)?

5.4. Suppose potential GDP (or "full-employment GDP") Y_n is 9000. What is the full-employment, or structural, budget surplus, BuS_n , when $I = 800$? 1000?

5.5. 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_n ?

6. National savings identity and the Keynesian Model

Suppose we add equations (8) and (9') to the model in problem (5), and redefine aggregate demand to the open economy (in 2'), as in the *Notes on the Keynesian Model of Income Determination*.

(1)	$Y = Z$	Output equals aggregate demand, an equilibrium condition
(2')	$Z \equiv C + I + G + X - IM$	Definition of aggregate demand
(3)	$C = c_0 + c_1Y_D$	Consumption function, c_1 is the marginal propensity to consume
(4)	$Y_D \equiv Y - T$	Definition of disposable income
(5)	$T = t_0 + t_1Y$	Tax function; t_0 is lump sum taxes, t_1 is marginal tax rate.
(6)	$I = b_0$	Investment function, exogenous
(7)	$G = GO_0$	Government spending on goods and services, exogenous
(8)	$X = x_0$	Exports, exogenous
(9)	$IM = m_0 + m_1Y$	Imports, endogenous

6.1. Solve for the impact of **an increase in** investment on the trade balance or net exports, algebraically.

6.2. Using the definition of the budget surplus in problem 5, solve for the impact of an investment increase on the budget balance, algebraically.

6.3. Will the budget and trade balances move in the same direction in response an investment increase?