

Economics 302
Prof. Kelly
Problem Set 1
Due: Wednesday, February 2

Exercise 1 *Income = Expenditure*

In 2.1 of Mankiw, he gives an example of how GDP can be calculated as the total expenditure in an economy or the total income. Regardless of the method of calculation, the answer must be identical, whatever one consumer spends, another individual must put in the cash register. In any macroeconomic model, income equaling expenditure is a fundamental property of an equilibrium. The purpose of this question is three-fold. First, it hopes to demonstrate how macroeconomists use this equilibrium condition in other settings. Second, it provides some early practice using notation. Third, it offers the opportunity to test the conclusions of a model using macroeconomic data.

Suppose there are two countries in the world, "Home" and "Foreign". They produce n goods which are just given numbers: $\{1, 2, 3, \dots, n\}$. Home will produce all goods with a number k and below while foreign will produce all goods with a number greater than k . Suppose that every individual in both Home and Foreign will consume some of every good regardless of where it is produced and that regardless of how much income any individual in Home or Foreign possesses, they always spend a fixed percentage of their income on each good (later in the semester, you will see a common utility function that produces just this result, but for now, take it as given). For example, they might always spend 10% on good 1 and 7% on good 2 and so forth. Call the percentage spent on good x , p_x .

Next define the following variables:

$h(k)$ is the percentage of Home income spent on Home goods (the folks in Home are identical to the folks in Foreign and so if Home residents spend 50% of their income on Home goods, 50% of Foreign income is spent on Home goods).

w is the wage per worker in Home (for analogy, if you mow your neighbors lawn, you get \$20 regardless of how much time it takes you).

w^* is the wage per worker in Foreign

L is the size of the work force in Home

L^* is the size of the work force in Foreign

- a** Find, I_H , the total income in Home by considering the income of workers.
- b** Give an expression for $h(k)$ in terms of the p_x 's.
- c** Find the expenditure in Foreign on Home goods (denote this $E_{H,F}$) in terms of $h(k), w^*, L^*$. This is the value of Home's exports.
- d** Find the expenditure in Home on Foreign goods (denote this $E_{F,H}$) in terms of $h(k), w, L$. This is the value of Home's imports.
- e** Find the total expenditure on Home goods (denote this E_H) in terms of $h(k), w, w^*, L, L^*$.
- f** Since total expenditure on Home goods must equal total income in Home, equate your expression from (a) to the expression from (e) and solve for $\frac{w}{w^*}$, the ratio of Home wage to Foreign wage.
- g** Assume that the value of imports must equal the value of exports, ie no trade deficits. Find an expression for $\frac{w}{w^*}$ in terms of $h(k), L, L^*$.

- h** Compare your answer from (f) with the answer from (g).
- i** Let Home be Canada and let Foreign be the United States. The US labor force in 2000 was 145 million, while Canada had a labor force of 16.5 million. GDP per capita for 2002 in the US was \$35,000 and \$29,000 in Canada. Use the ratio of GDP per capita to proxy for the wage ratio (that is, let $\frac{GDP_C}{GDP_{US}} = \frac{w_C}{w_{US}}$). Assume, naively, that the only two countries in the world are the US and Canada and use the equation in (g) to solve for the percent of Canadian income spent on US goods.

Exercise 2 *Finding Macroeconomic Data*

The data in Mankiw's text generally goes up to 2000. Using various government webpages (addresses below), find the following information:

- a** Monthly unemployment from 2000-2005 (www.bls.gov) (plot this using Excel or some similar type of program). What was the average unemployment rate over the period, and did unemployment increase or decrease in general?
- b** Annual real GDP from 2000-2005 (www.bea.gov).
- c** The monthly CPI from 2000-2005 (www.bea.gov). What was the average inflation rate over the period?
- d** Once you have the unemployment and GDP figures, calculate the average annual unemployment for 2000, 2001, 2002, 2003, and 2004. Calculate the change in average annual unemployment and annual real GDP for each year. Use Okun's law (page 36) to calculate the predicted change in real GDP and then compare the predicted changes with the actual changes. Does Okun's law seem to apply during this time period?

Exercise 3 *Calculating CPI*

What monthly CPI does a UW-Madison student face? Below are 10 items I found myself purchasing at Woodman's on Sunday:

24oz box of Honey Bunches of Oats
 3 16oz boxes of Barilla Pipette Pasta
 1 gallon of skim milk
 1 lb of vine-ripe tomatoes
 1 tube of AIM toothpaste
 2 cans of refried beans
 1 package of cream cheese
 16oz of blueberry yogurt
 12 pack of Coke
 1 dozen extra-large eggs

The assignment is for you to report a similar basket of at least 10 items (include a fruit or vegetable, milk, dairy products, personal products, grains, beverages) with the respective prices of each good. Also, you must specify how many of each product you bought, what brand you purchased (Crest, Colgate, AIM or Wheaties, Cheerios, Frosted Mini-Wheats etc) and in what size (16ozs, gallon, 2 liter, dozen). So, writing

"cereal \$2.49" won't cut it, write "20oz box of Lucky Charms from Copps \$3.69. Also, include where you purchased these goods or if you did not purchase them, what store you went to to find prices. Do not lose this information because you will have to report it every time you hand in a problem set. At the end of the semester, we will have a pretty good data set of prices and can see what inflation looks like to a student.