

University of Western Ontario
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Fall 2011

Midterm 1
Econ 2220A-001/002
October 6, 2011

Instructions

This is a 2-hour exam. This is a closed book, closed notes exam.

All the answers need to be written in the separate exam booklet(s) provided.

You must show all your derivations to obtain full credit.

Write your name and student number on the front of all booklets.

Please write your name in the format: LAST NAME, FIRST NAME.

1. GDP Measurement (25 pts)

In the year 2007, there were 500 people living in the country of Krakozhia. There were two firms, the Bubba Gump Company and a restaurant called the Shrimp Kitchen, and they were both owned by consumers.

The Bubba Gump Company caught 200 tons of shrimp in 2007. It sold 50 tons directly to the consumers at \$20 per ton, it sold 100 tons to the Shrimp Kitchen at \$20 per ton, while the remaining 50 tons were exported to the U.S. at \$25 per ton. Bubba Gump Company paid gross wages to its workers in the amount of \$1,500 and paid taxes to the government in the amount of \$500.

In addition to purchasing local shrimp, the restaurant Shrimp Kitchen purchased 20 tons of jumbo shrimp from abroad at \$20 per ton. The restaurant used the local and imported shrimp to produce meals (barbeque shrimp, shrimp kabobs, shrimp gumbo, shrimp soup and shrimp sandwiches) which were sold to consumers at a total value of \$5,000. The Shrimp Kitchen paid gross wages to restaurant workers in the amount of \$1,000 and paid \$800 in sales taxes.

The consumers in this economy earned gross wage income from working, out of which they paid income taxes in the amount of \$200. They also earned profits from owning the firms.

The government hired workers to provide national defence services for Krakozhia and paid them wages in the amount of \$1,500.

(a) **(6 pts)** In words, give a formula for calculating the after-tax profits of the two firms in this economy. Then, calculate the after-tax profits of the Bubba Gump Shrimp Company. Also, calculate the after-tax profits of the Shrimp Kitchen.

(b) **(6 pts)** Compute GDP in Krakozhia according to the product approach. What is the value added by Bubba Gump Shrimp Company? What is the value added by the Shrimp Kitchen? What is the value added by the government?

(c) **(6 pts)** Compute GDP in Krakozhia according to the expenditure approach.

(d) **(6 pts)** Compute GDP in Krakozhia according to the income approach.

(e) **(1 pt)** Compute GDP in Krakozhia per capita.

2. Nominal GDP, Real GDP and Prices (30 points)

Consider the following data for years 1, 2 and 3. There are two goods produced and sold in Krakozhia. The prices and quantities sold in each year are provided in the table below.

	Year 1	Year 2	Year 3
Prices of good 1	6	7	8
Prices of good 2	5	4	3
Quantities of good 1	42	43	44
Quantities of good 2	30	35	40

For **each of the three years**, compute the following:

- (a) **(3 pts)** Compute nominal GDP.
- (b) **(6 pts)** Compute fixed-weight real GDP in base year 2.
- (c) **(9 pts)** Compute chained-weight real GDP in the prices of year 2.
- (d) **(3 pts)** Compute the implicit GDP price deflator using the chained-weight real GDP as the measure of real GDP.

Next, examine the changes in GDP and the price index.

(e) **(2 pts)** Compute the growth rate in real GDP from year 2 to year 3 using both the fixed-weight real GDP (that you derived in point (b) above) and the chained-weight real GDP (that you derived in point (c) above). Which method of computing GDP gives the higher growth rate in real GDP from year 2 to year 3?

(f) **(5 pts)** *Explain in words* why the fixed-weight method of computing real GDP overstates or understates growth between years 2 and 3.

(g) **(2 pts)** Using the implicit price deflator you computed in point (d) above, calculate the inflation rate in year 2 and the inflation rate in year 3.

3. Business Cycle Facts (20 pts)

Table 1 below reports business cycle statistics for Krakozhia. For each series (GDP, consumption, total investment, residential investment, nonresidential investment and employment), the natural logarithm was applied to the original data and then the cyclical component was obtained using the Hodrick-Prescott filter.

Table 1 reports the standard deviations of the cyclical component of each series. It also reports correlations of the cyclical component of GDP with the cyclical components of the other five variables (consumption, total investment, residential investment, nonresidential investment and employment). The table gives the contemporaneous correlations of GDP with each variable, as well as the correlations of GDP with past and future values of these variables.

Table 1. Business Cycle Statistics for Krakozhia				
	Standard Deviation (in %)	Correlations of GDP with		
		$x(-1)$	x	$x(+1)$
GDP	1.72			
Consumption	1.27	0.80	0.83	0.67
Total Investment	8.24	0.79	0.91	0.76
Residential Investment	10.70	0.74	0.63	0.39
Nonresidential Investment	5.11	0.57	0.79	0.88
Employment	1.41	0.72	0.89	0.92

(a) **(5 pts)** Give a definition of a leading variable. Give a definition of a lagging variable.

(b) **(3 pts)** Characterize the relationship between consumption and GDP at business cycle frequencies. That is, answer the following:

(i) Is consumption more or less volatile relative to GDP?

(ii) Is consumption procyclical or countercyclical?

(iii) Does consumption lead GDP, lag GDP or is consumption a coincident variable?

Provide a brief explanation for each of your answers. This means, use statistics from the table to justify your answers for (b) (i), (b) (ii) and (b) (iii).

(c) **(12 pts)** *Briefly characterize* the relationship between *total investment* and GDP: write one sentence that indicates whether (i) total investment is more or less volatile relative to GDP, whether (ii) it is procyclical or countercyclical and whether (iii) it leads GDP, lags GDP or it is a coincident variable. You do not need to provide explanations here. Next, write a similar sentence to characterize the relationship between *residential investment* and GDP; *nonresidential investment* and GDP and, lastly, *employment* and GDP. You should have a total of 4 sentence here.

4. Consumer Behaviour (25 pts)

Consider a consumer whose preferences over consumption, C , and leisure, l , are represented by the utility function: $U(C, l) = C^{1/2}l^{1/4}$.

(a) (5 pts) For the specific utility function that you were given, write down the expression for the indifference curve that gives the representative consumer a level of utility equal to 12. Draw this indifference curve on a graph which has the leisure good on the x-axis and the consumption good on the y-axis.

Consider the following bundles:

Bundle E gives the consumer $l_E = 1$ hour of leisure and C_E units of consumption.

Bundle F gives the consumer $l_F = 4$ hours of leisure and C_F units of consumption.

Bundle G gives the consumer $l_G = 9$ hours of leisure and C_G units of consumption.

Compute C_E , C_F and C_G and mark the three consumption bundles (E , F and G) on the indifference curve.

(b) (5 pts) Write a mathematical expression for the slope of the indifference curve you drew in point (a). It will be useful to start with the equation that defines the indifference curve and then differentiate both sides of this equation with respect to l .

(c) (5 pts) What is the mathematical expression for the marginal rate of substitution of leisure for consumption, $MRS_{l,C}$? Compute the marginal rate of substitution of leisure for consumption at consumption bundle E . Compute the marginal rate of substitution at consumption bundle G ?

(d) (5 pts) Next, assume that the consumer has a total of $h = 14$ hours a day which are split between playing golf and working at Angelo's Bakery for an hourly wage rate $w = 7$. The consumer also earns a dividend income $\pi = 49$, and pays lump-sum taxes $T = 21$. Write down the budget constraint of the consumer. Draw the budget constraint of the consumer on a NEW graph that has leisure on the x-axis and consumption on the y-axis (Note: do not draw the budget set on the same graph as the indifference curve in point (a)). Shade the set of all feasible consumption bundles. Make sure you mark on your graph the following: (i) the level of consumption the consumer may consume if she takes no leisure and (ii) the level of leisure that the consumer may take if she consumes zero consumption. Is the budget constraint kinked?

(e) (5 pts) Solve for the optimal bundle (C^*, l^*) . To do this, start by writing down the optimization problem of the consumer. Then, solve for C^* and l^* .