Homework will be graded for both content and neatness. Sloppy or illegible work will not receive full credit. This homework requires the use of Microsoft Excel.

1) The following question is concerned with the effect of personal income taxes and minimum wage laws on labor market outcomes for workers. You are provided with an aggregate production function of the form $Y = AK^{\alpha}L^{1-\alpha}$, where $A = 9$, $\alpha = 0.5$, and $K = 25$ are fixed throughout the problem. The equation $L_S = 100[(1-t)w]^2$ describes labor supply, where t is level of taxes and w is the real wage. Therefore, we can write (1-t)w as the after-tax real wage. Firms are assumed to hire labor until the marginal product of labor equals the real wage: MPL = w. This defines equilibrium in the labor market.

A) Compute the marginal product of labor (MPL). Recall that $MPL = \frac{\partial Y}{\partial L}$. It should only depend on L.

B) Set MPL = w and solve for L. Call this labor demand, L_D. It should only depend on w.

C) Let t = 0; find the equilibrium levels of w, L, and Y (the full employment level of output). What is the total factor payment received by labor, i.e. labor income?

D) Repeat part (C) under the assumption that t = 0.6. Is labor better or worse off in terms of the after-tax real wage and after-tax labor income?

E) Repeat part (C) with t = 0 and a minimum wage of $\underline{w} = 2$. Draw a rough graph showing the intersection of the labor demand and labor supply curves, the minimum wage (price floor), the equilibrium level of employment, and the equilibrium real wage. Is labor better or worse off in terms of the after-tax real wage and after-tax labor income?

F) Taking into account your answers to parts (C) through (E), should the government intervene in the labor market? Why or why not?

2) Let $Y = AK^{0.3} L^{0.5} N^{0.2}$ be a Cobb-Douglas production function that uses the level of technology (A), capital (K), labor (L), and land (N) to produce output (Y). Technological progress makes all other factors more productive, and land is used in combination with labor and capital. Time is represented by t and takes on values t = 0, 1, 2, …, 20. The next four equations describe how technology and the factors of production change over time; *e* is the exponential function. Excel is <u>required</u> for this problem.

$A(t) = 2e^{0.03t}$ (technology)

$K(t) = 10e^{0.05t}$ (capital)

$L(t) = 5e^{0.02t}$ (labor)

$N(t) = \{10, \text{if } 0 \leq t \leq 9; 20, \text{if } t > 9$ (land; land reclamation project completed at time t=10)

A) Compute Y, ΔY, and %ΔY for t = 0, 1, 2, …, 20. *[HINT: for this question, see Excel file: Q2 tab. EXP(x) returns* e *to the power x in Excel.]*

B) Graph Y and %ΔY for t = 0, 1, 2, …, 20. Talk about the graphs qualitatively.

C) What is the marginal product of capital (MPK) for this production function?
Graph it for t = 0, 1, 2, …, 20. Is it smooth (continuous)? Why or why not?

D) What is the marginal product of labor (MPL) for this production function?
Graph it for t = 0, 1, 2, …, 20. Is it smooth (continuous)? Why or why not?

E) Is the level of output Y accelerating or decelerating during this time period? Why is this happening?

3) The following question refers to the model of the loanable funds market in Mankiw 7e chapter 3. You are provided with the following information about the structure of the economy:

$C = 160 + 0.6Y_D$ (consumption function)

$Y_D = Y - T$ (definition of disposable income)

$Y = C + I(r) + G$ (equilibrium in the loanable funds market)

where Y_D stands for disposable income and I(r) gives the level of investment as a function of the real interest rate. The economy is closed. Therefore, no international trade takes place and there are no international flows of savings or capital.

A) With I(r) = 150 a constant function that does not depend on the real interest rate, solve for the equilibrium levels of Y, Y_D, and C if T = 100 and G = 150 (we haven't fixed the level of output Y yet).

B) Repeat part (A) provided that the government lowers taxes to T = 75. Did output increase or decrease relative to the old tax rate of T = 100? Intuitively, why did this happen?

C) Now let's hold the level of output fixed, as in the long-run of the classical model. If Y = 1200 is held constant and I(r) = 400 – 25r, where a real interest rate of 2% is expressed as r = 2, solve for the equilibrium real interest rate. Assume that T = 100 and G = 150.

D) Repeat part (C) provided that the government lowers taxes to T = 50. Did the real interest rate increase or decrease relative to the old tax rate of T = 100? Intuitively, why did this happen?

E) Let T = 100. What level of government expenditure G is consistent with the equilibrium real interest rate you found in part (D)?

F) You are an economist on the Council of Economic Advisors (CEA), which advises President of the United States on economic policy. In the latest CEA report, President Obama wants to know which type of expansionary fiscal policy (T↓ or G↑) has the largest effect on the real interest rate in the long-run. Assuming that both T and G are changed by the same amount, what is your answer?

4) "Okun's law" is an empirical relationship between the change in the unemployment rate and GDP growth. This question asks you to estimate and discuss the relationship using US data, which is provided in the Excel file (homework2fall2009tables.xls, tab Q4). Excel is required for this problem.

A) Compute %ΔGDP (GDP growth) and ΔUR (change in the unemployment rate) for the data provided, from 1948 Q1 (first quarter) to 2009 Q2 (second quarter).

B) Graph %ΔGDP versus ΔUR. In other words, graph %ΔGDP on the vertical axis (y-axis) and ΔUR on the horizontal axis (x-axis). This should be a scatterplot. Label the graph and its axes.

C) Visually inspect the graph. Do you notice any relationship between %ΔGDP and ΔUR? Is this relationship positive or negative? Describe this qualitatively. If we expect quarterly GDP growth above 3%, what is your prediction about the sign of ΔUR?

D) Add the best-fit linear trend line to the graph. To do this, right-click on your data points and select "add trendline" from the drop-down menu. Select the option "linear" and check the boxes for "display equation on chart" and "display R-squared value on chart". R^2 is a measure of goodness-of-fit for the linear model, as in how closely your fitted line matches the data. A high value for R^2 is associated with a model that fits the data well. However, if the data points are far away from the trend line, fit will be poor; therefore, we'd expect that R^2 is low. R^2 is between zero and one.

E) What is the slope of your linear trend line? Interpret.

F) Provided that the unemployment rate increased by 0.75% this quarter, what is your prediction for GDP growth using the fitted linear model?

G) Let's split the sample at 1980 Q1. Repeat parts (B) through (D) for two periods: 1948 Q1 – 1979 Q4 and 1980 Q1 – 2009 Q2. For the two periods, is there a difference in the slope of the best-fit trend line?

H) "The Great Moderation" is a phrase that refers to the increased macroeconomic stability in the last two decades of the 20th century and the first decade of the 21th century (until the financial crisis). This change is attributed to better central bank policy and productivity growth. Using your results from part (G), did the Great Moderation have an effect on the Okun's law relationship between %ΔGDP and ΔUR? If there was an effect, did the relationship become weaker or stronger? Why do you think this happened?

5) Refer to the article "How Did Economists Get It So Wrong?" by Paul Krugman in *The New York Times Magazine* when responding to this question (link on TA website).

A) In what sense did economists "get it so wrong" according to Krugman? What were the consequences of this perceived error in judgment?

B) Briefly compare and contrast what Krugman refers to as the "freshwater" and "saltwater" schools of macroeconomics in the United States. What advice would each school give in terms of fiscal and monetary policy? What do the two schools of thought agree on? Respond in a few paragraphs.

C) What does Krugman propose as an alternative to the two conventional schools of thought? Describe this third group. Were they more successful in terms of predicting the financial crisis? If so, did these predictions have an effect on economic policy-making? Why or why not?