SIMON FRASER UNIVERSITY
Department of Economics

Econ 305
Intermediate Macroeconomic Theory

Prof. Kasa
Spring 2012

MIDTERM EXAM
(Solutions)

Answer the following questions True, False, or Uncertain. Briefly explain your answers. No credit without explanation. (10 points each).

1. According to Ricardian Equivalence, fiscal policy cannot influence the level of real GDP.

   FALSE. *Ricardian Equivalence relates to the financing of a given level of government spending. It says that under certain conditions, the timing of taxes doesn't matter. It certainly doesn't imply that fiscal policy in general (e.g., the level of government spending) is irrelevant.*

2. When a country has a current account deficit, it is borrowing from abroad (or reducing its foreign assets).

   TRUE. *The National Income Accounting Identity says*

   $$Y = C + I + G + NX$$

   If we add Net Factor Payments to both sides we get

   $$GNP = C + I + G + CA$$

   where CA denotes the current account surplus. From this we can conclude that if a country has a current account deficit, it must be spending more than its income. As for individuals, the only way to do this is to either borrow the money or sell off some of your assets. (Actually, sometimes countries receive unrequited transfers, or gifts, from other countries. Government accountants make up an account for this sort of thing, which makes it equivalent to selling off an asset).

3. The Solow model predicts that poor countries should grow faster than rich countries.

   FALSE/UNCERTAIN. *This is only true if the two countries have the same underlying characteristics that determine their steady state capital/labor ratios (ie., productivity, saving, population growth, depreciation rates, etc). If they don't, then poor countries may actually grow slower than a rich countries, if poor countries are closer to their own long-run steady states. (Remember, in the Solow model, growth only occurs during the transition to the steady state).*

4. According to the Solow model, if the interest rate is below the economy's growth rate, then the economy is saving too much.

   TRUE/UNCERTAIN. *This is true if the economy is at its long-run steady state. The Golden Rule occurs when $r = n$. If saving is higher than this, r falls below n, due to diminishing returns to capital. This is inefficient, since everyone could enjoy more consumption by permanently reducing the saving rate. On the other hand, if the economy has not yet converged to its steady state, it is quite possible for $r < n$, even if the economy adheres to the Golden Rule. This could occur if the economy begins with a k that exceeds the steady state level of k.*

5. Government policy should aim for a zero unemployment rate.

   FALSE. *The only way this could be true is if there were no frictions, or heterogeneity, in the labor market. When there is heterogeneity, it takes time and effort to match diverse workers to diverse jobs. (Trust me, I've been spending many hours this term doing exactly that!). The time it takes to find new jobs/workers is,*

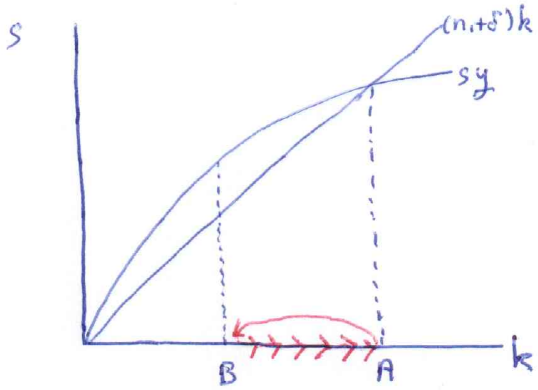
by definition, recorded as unemployment. Trying to achieve a zero unemployment rate would likely produce inefficient matches.

The following questions are short answer. Briefly explain your answer. Clarity will be rewarded.

6. (25 points). This question asks you to use the Solow model to analyze the effects of immigration. As usual, suppose that output is produced with the production function $Y = AK^{\alpha}L^{1-\alpha}$. Capital depreciates at rate δ, and productivity, A, is assumed constant. The saving rate, s, is also constant.

   (a) Suppose that initially the economy is in a steady state, with a constant population growth rate, n_1. Depict the steady state equilibrium in a graph. Now, suppose that there is a one-time increase in immigration, perhaps due to an influx of refugees from a troubled foreign country. Its temporary nature means that there is no change to the economy's underlying population growth rate. Use your previous graph to illustrate the effects of this on the economy. How does output change? How do wages change? (Hint: Be sure to distinguish between the short-run and long-run effects).

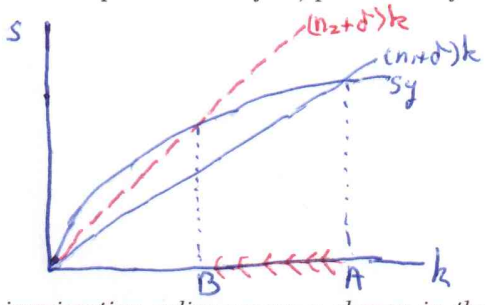
   The initial steady state is depicted in the following diagram, as point A.



   A sudden increase in population, with no change in the growth rate, causes a sudden drop in the capital/labor ratio, k. The new short-run equilibrium occurs at point B. At this new equilibium, the fall in K/L causes per capita income to fall. Of course, total GDP increases, assuming the refugees have a positive marginal produce of labor, and can find jobs. Because wages equal the marginal product of labor, and the marginal product of labor depends positively on k, the drop in k causes wages to fall. Wages have to fall so that firms have the incentive to hire the new workers. However, point B is only a temporary equilibrium. Because the underlying determinants of the steady state have not changed, beginning at point B the economy begins to accumulate more capital (in order to equip the new workers with the same long-run capital/labor ratio). Over time, per capita income and wages rise back to where they were before, and the economy goes back to point A.

   (b) Now consider the effects of a changed immigration law, which makes it easier for immigrants to move to Canada. As a result, the growth rate of population increases to $n_2 > n_1$. Once again, use your graph to illustrate the effects on output and wages. Be sure to distinguish short-run and long-run effects, as well as aggregate effects from per capita effects.

   The economy begins in the same position as before, pt A in the following diagram.



   Now, however, the new immigration policy causes a change in the steady state. In particular, the break

even line rotates counter-clockwise, and the new long-run steady state moves to point B. In contrast to part (a), now there is no sudden change in wages or per capita income. The new policy does not produce a sudden increase in the number of immigrants. It just changes the long-run population growth rate. Because the saving rate does not change, gradually, over time, the capital/labor ratio falls as the economy converges to point B. As a result, so do wages and per capita income. On the other hand, the growth in the level of aggregate GDP increases due to the increased population/labor force growth.

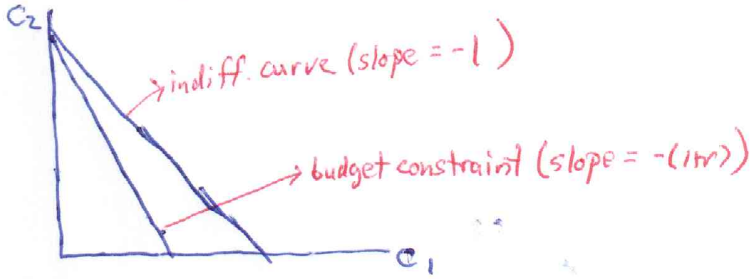
7. (25 points). Consider a simple 2-period endowment economy. A representative household receives an exogenous income of Y_1 in period-1, and Y_2 in period-2. Suppose the interest rate, r, is exogenous.

(a) Suppose the household's preferences are described by the utility function

$$U(C_1, C_2) = C_1 + C_2$$

Depict the household's optimal consumption/savings plan in a graph with C_1 on the horizontal axis, and C_2 on the vertical axis. Without doing any math, what is the optimal decision if $r > 0$? What is the optimal plan if $r = 0$? Illustrate your answers with a graph, and explain the intuition.

The thing to note here is that this person does not care about the timing of consumption. Consumption in period-1 is a perfect substitute for consumption in period-2. Indifference curves are just straight lines, with a slope of one. Since the slope of the budget constraint is $-(1+r)$, if $r > 0$, the budget constraint is steeper than the indifference curves, and the highest indifference curve is reached by setting $C_1 = 0$, and waiting until tomorrow to consume all your income. If you don't care when you consume, and you can earn interest, why not wait? (On the other hand, if $r = 0$, then the budget constraint and indifference curves have the same slope, and any point on the budget constraint would be an equally attractive solution.



(b) Now suppose that preferences are described by the following utility function

$$U(C_1, C_2) = \ln(C_1) + \ln(C_2)$$

Write down the household's first-order optimality condition. Substitute into the budget constraint to find the household's optimal choices of C_1 and C_2. What happens to saving when the interest rate rises?

In contrast to the guy in part (a), this guy's preferences feature a diminishing marginal rate of substitution. In other words, this guy wants to even out his consumption over time. The first-order optimality condition is

$$\frac{MU_1}{MU_2} = \frac{C_2}{C_1} = 1 + r \qquad \Rightarrow \qquad C_2 = (1+r)C_1$$

The budget constraint is just $C_1 + \frac{1}{1+r}C_2 = Y_1 + \frac{1}{1+r}Y_2$. Using the above result to eliminate C_2, we get the following solution for first-period consumption

$$C_1 = \frac{1}{2}\left[Y_1 + \frac{1}{1+r}Y_2\right]$$

Since saving is just $S = Y_1 - C_1$, we have

$$S = \frac{1}{2}\left[Y_1 - \frac{1}{1+r}Y_2\right]$$

That is, the household saves when current income is high relative to the present value of future income. Notice that savings increase when r increases, indicating that in this case the substitution effect dominates the income effect.