Economics 304 Fall 2014
Suggested Problems #1

These problems are drawn from last year's problem sets and midterm exam. They are intended to give you a focus for study, to make sure that you understand the key analytical concepts we have covered in the course. They are not required and you are not to hand in solutions. But I strongly recommend that you work through them (ideally in groups) to make sure that you understand the solutions. Come and talk with me if you have difficulties; that's often how students learn!

(From problem set)

1. This is an algebraic problem pertaining to the economy of Reedistan, which behaves according to the Solow growth model. Suppose that the production function in Reedistan is

$$Y = F(K, AL) = K^{1/3}(AL)^{2/3}.$$

a. Show that the intensive form of this production function is $y = k^{1/3}$.

b. Solve for the steady-state values $\bar{k}$ and $\bar{y}$ as functions of *s*, δ, *n*, and *a*.

c. Suppose that δ = 0.06, *n* = 0.02, and *a* = 0.01. Calculate the values of $\bar{k}$, $\bar{y}$, and $\bar{c}$ for *s* = 0.04, 0.09, 0.16, 0.25, 0.36, and 0.49. Which of these values of *s* is the "best"?

d. The laws of calculus tell us that the marginal product of capital for this production function depends on *k* according to $MPK = \frac{1}{3}k^{-2/3}$. Using this formula, calculate the Golden Rule values of *s*, $\bar{k}$, and $\bar{c}$ for the parameters given in part c. Is this consistent with the evidence from part c?

e. Suppose that (with the other parameters as in part c) the saving rate is initially 0.09 and Reedistan is in a steady-state equilibrium. Shortly after a revolution brings him to power in Year 1, Grand Ayatollah Mohammed Al-Kroger decrees convincingly that excessive consumption is sinful and as a result the saving rate increases to 0.36. Assume that the capital stock in any year is determined by the *previous* year's saving, so that the change in saving in year one does not affect the capital stock until year 2:

$$k_2 - k_1 = \Delta k_2 = s_1 f(k_1) - (\delta + n + a)k_1.$$

How much will *k* and *y* increase in year 2 as a result of the increase in the saving rate that occurred in year 1? What percentage of the gap between the old and new steady state values of *y* has been made up in year 2? (This percentage is called the "rate of convergence.") About how many years will it take for *y* to travel halfway to the new steady state? [You might find a spreadsheet helpful in doing the calculations for this problem.]

(From problem set)

2. Endogenous growth models incorporate an expanded concept of capital that has non-diminishing marginal returns, often justified as knowledge capital or human capital. Consider a simple production function $Y = AK$, in which K is the stock of this expanded capital, A is a constant, and Y is output. We assume that the labor force is constant, so we don't need to include it in and production function and we can do the familiar Solow diagram in terms of capital letters rather than the intensive form. There is no "exogenous" growth in this model. Suppose that the accumulation of capital is as in the Solow model: $\Delta K = sY - \delta K$. You should assume that $sA > \delta$.

a. Find an expression for ΔK in terms of K and the parameters of the model.

b. Show a graph analogous to the one we used for the Solow model and use it to describe the dynamic behavior of K.

c. What is the growth rate of K in this model?

d. Is there a process of "convergence" to a steady-state path or is the economy always growing at the same rate regardless of the initial level of K?

e. How, if at all, is the growth rate affected by a change in the saving rate?

f. Contrast these conclusions with those of the version of the Solow model in which the labor force and exogenous technology do not grow.

(From problem set)

3. Box 5.4 discusses the effect of minimum-wage laws on the natural unemployment rate. In this problem we explore this relationship in more detail.

a. The minimum wage in Oregon is $8.95 per hour; the distribution of average hourly earnings for Oregon workers (as of 2012) has the following properties:

Mean	$21.75
10th percentile	$9.30
25th percentile	$11.49
Median (50th percentile)	$17.14
75th percentile	$26.59
90th percentile	$39.66

Given the actual wage distribution, is the minimum wage irrelevant for the Oregon labor market?

b. Consider a model of a segmented labor market, in which there are two distinct markets for, respectively, skilled and unskilled labor. Suppose that the market-clearing wage lower than the minimum wage in the unskilled market is but higher in the skilled market. Draw diagrams of the two markets noting the market-clearing wage and the minimum wage in both.

c. In the short run, there is no spillover in labor supply between markets because it takes time to acquire skills and skilled workers would not choose to work at unskilled jobs. However, there may be spillovers in labor demand. How would the presence of the minimum wage affect the skilled labor market if skilled and unskilled workers are substitutes in production? What if they are complements?

d. In the long run, workers choose whether or not to acquire skills. Why might the presence of the minimum wage discourage skill acquisition? Why might the presence of the minimum wage encourage skill acquisition? Show the effects on the skilled and unskilled labor markets in each case: where the discouraging effect dominates and where the encouraging effect dominates.

e. Based on your answers to the previous parts of this question, why do labor unions (whose members are usually skilled workers) lobby in favor of increases in the minimum wage?

(From problem set)

4. The long-run analysis in Chapter 6 puts the Cambridge "*k*" in a central role in money demand.

a. In what units is *k* measured?

b. Explain (as in footnote 4) how *k* is related to "money velocity."

c. What are the units of velocity?

d. The derivation of equation (6.5) is based on the assumption that *k* (and velocity) is constant. Given the pace of financial innovation in recent decades—introduction, spread, and interconnection of ATMs, development of phone-based and later online banking, etc.—would you expect that *k* would generally increase or decrease over time?

e. Given your answer to the previous question, how would this affect the steady-state rate of inflation, given the rates of money growth and real GDP growth?

(From midterm exam)

5. The following questions relate to long-run steady-state paths of Alopecia and Baldova, whose economies operate according to (1) the Solow model, (2) the quantity theory of money, and (3) relative purchasing power parity.

a. If money growth is the same in the two countries, but real growth is larger in Alopecia than in Baldova, what can we say about the steady-state inflation rates in the two countries? Why?

b. If the two countries have the same rate of technological progress, production function, and saving rate, but Alopecia has lower population growth than Baldova, what can we say about the steady-state growth rates of per-capita GDP in Alopecia and Baldova? Why?

c. If Alopecia has a higher money growth rate than Baldova but real growth is the same in the two countries, then what can we say about the steady-state behavior of Alopecia's nominal exchange rate? Why?

(From midterm exam)
6. The drop in housing prices in the United States in 2008–2011 reduced the ability of home-owners to sell their houses and move from one location to another. How might this reduced mobility affect the equilibrium (natural) rate of unemployment in the United States and why? (Hint: Think about how mobility affects the efficiency of job search and matching.)

(From midterm exam)
7. Suppose that per-capita income in the Czech Republic is now 20% higher than in Slovakia because the Czech Republic has more capital per worker, but that both countries have identical parameters (*i.e.*, saving rates, production function, etc.).

a. If the two countries behave according to the Solow model, will per-capita income in Slovakia eventually catch up to the Czech Republic? Explain, using a diagram or equation if appropriate.

b. If the two countries behave according to the simple endogenous growth model of the textbook chapter and the second problem above, will per-capita income in Slovakia eventually catch up to the Czech Republic? Explain, using a diagram or equation if appropriate.