EC402 Winter 2018
Homework 1: Markets and Data

University of Michigan
Department of Economics
PLEASE WORK NEATLY
DUE 5:00 PM FRIDAY Jan 19.

1. **Mankiw Chapter 2**: Problems 2, 7 and 9 (pp. 44-45).

2. Consider a world in which people live for only *two* periods (periods 1 and 2).

   (a) Consider an agent who receives income of $y_2 = 110$ units of goods in the second period of life. **He receives no income in youth. (i.e. he receives nothing in period-1).**

      1. Suppose that the real rate of return (r) is 25%, so that $(1 + r) = 1.25$. What is the maximum amount of period-1 consumption that he could afford? What is the maximum amount of period-2 consumption that he could afford? Draw the consumer's budget constraint on a graph with period-1 consumption (c_1) on the horizontal axis and with period-2 consumption (c_2) on the vertical axis.
      2. Using the same diagram, draw the consumers budget constraint when the real rate of return is 4% (i.e. when $(1 + r) = 1.04$). Under which real rate of return is the consumer better off?

   (b) Consider a young person who has a *real* current income of $y_1 = 100$ units of goods. He receives no additional wealth in old age (i.e. he receives nothing in period-2).

      1. Suppose that the real rate of return (r) is 25%, so that $(1 + r) = 1.25$. What is the maximum amount of period-1 consumption that he could afford? What is the maximum amount of period-2 consumption that he could afford? Draw the consumer's budget constraint on a graph with period-1 consumption on the horizontal axis and with period-2 consumption on the vertical axis.
      2. On the same diagram draw the consumers budget constraint when the real rate of return is 4% (i.e. $(1 + r) = 1.04$). Under which real rate of return is the consumer better off?

   (c) Parts (a) and (b) suggest that changes in interest rates affect different consumers differently (some are better off with high interest rates while others are worse off).

      1. Draw an indifference curve diagram for an arbitrary consumer with endowments (y_1, y_2). Put c_1 on the horizontal axis and c_2 on the vertical axis. Include a line for the intertemporal budget constraint. Draw in their optimal consumption choices (c_1^*, c_2^*) *under the assumption that the consumer is borrowing* (i.e. that $c_1^* > y_1$).
      2. Prove that if the consumer is borrowing when the interest rate is $1 + r$ then they *must* be better of when the interest rate is lower. Are they necessarily worse off when the interest rate is higher?

3. Consider someone who gets utility from consumption in two periods 1 and 2. Her utility function is

$$U = c_1^{\frac{1}{2}} + \phi\,(c_2)^{\frac{1}{2}} = \sqrt{c_1} + \phi\sqrt{c_2}$$

   (a) Suppose $\phi = 4$. What is the marginal rate of substitution when $c_1 = 16$ and $c_2 = 4$? What is the *level* of utility?

   (b) What is the MRS when $c_1 = 4$ and $c_2 = 16$?

   (c) Solve for c_2 as a function of c_1 and utility U. This gives the level of c_2 which generates utility U for a given c_1.

   (d) Keep $\phi = 4$. Plot out two indifference curves. Put c_1 on the horizontal axis and put c_2 on the vertical axis. Consider the indifference curve for $U = 10$ and $U = 12$. Find the levels of c_2 which give this utility when $c_1 = 0, 1, 4, 9$, and 16. Plot the two indifference curves.

4. Real interest rates.

   The Excel spreadsheet PS1-data_2018.xls on Canvas provides data on the monthly Federal Funds rate and the CPI for all urban consumers from January 1960 to November 2017.

   (a) Compute the monthly inflation rate for each month from 1960:1 to 2015:11. For each month, express the inflation rate as a percent change at an annual rate. (See the notes packet for computing annual rates). Note that this inflation rate (quoted at an annual rate) is in the same units as the Federal Funds rate, i.e., percent per year.

   (b) Compute the *ex post* real interest rate for each month, i.e., the nominal interest rate each month minus the inflation rate (annual rate) for that month. Plot this data series (i.e., plot the real interest rate).

   (c) What is the current real interest rate? What is the average real interest rate for the entire sample? Is the real interest rate lower or higher during recessions? The troughs (i.e., the "low points") of the last recessions were Nov 1979, Mar 1975, July 1980, Nov 1982, Mar 1991, Nov 2001 and June 2009.

   For #4, you should hand in the data plot (part b) and your answer to part c.