Problem Set #1

ECONOMICS 141
FALL 2008

Due September 18

1. through 8.: Do Problems 2.1, 2.2, 2.3, 2.4, 2.8, 2.9, 2.10, and 2.14 from Pindyck & Rubinfeld's text.

9.   Suppose X and Y are a pair of random variables with means μ_X and μ_Y, variances σ_X^2 and σ_Y^2, and correlation coefficient $\rho_{X,Y}$. Define the random variable U as

$$U \equiv Y - \alpha - \beta \cdot X,$$

where the parameters α and β are defined as

$$\beta \equiv \rho_{X,Y} \cdot \frac{\sigma_Y}{\sigma_X}$$

and

$$\alpha \equiv \mu_Y - \beta \cdot \mu_X.$$

Use the rules for means and variances to show that the new random variable U satisfies

$$E(U) = 0 \qquad and \qquad Cov(U, X) = 0.$$

(That is, if we write

$$Y = \alpha + \beta \cdot X + U,$$

then the "error term" U has zero mean and is uncorrelated with the "explanatory variable" X.)

10. The following data are annual time series observations on the US unemployment rate (r) of civilian workers and the inflation rate ($\Delta p/p$) for US consumer prices from 1971 through 2000:

Year	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
u	5.9	5.6	4.9	5.6	8.5	7.7	7.1	6.1	5.8	7.1
$\Delta p/p$	4.4	3.2	6.2	11.0	9.1	5.8	6.5	7.6	11.3	13.5

Year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
u	7.6	9.7	9.6	7.5	7.2	7.0	6.2	5.5	5.3	5.6
$\Delta p/p$	10.3	6.2	3.2	4.3	3.6	1.9	3.6	4.1	4.8	5.4

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
u	6.8	7.5	6.9	6.1	5.6	5.4	4.9	4.5	4.2	4.0
$\Delta p/p$	4.2	3.0	3.0	2.6	2.8	3.0	2.3	1.6	2.2	3.4

(These data are also available in the file "Phillips.txt" on the course website.) Calculate the sample means, variances, and sample correlation coefficient for these two variables, then, treating the unemployment rate u as the X variable and the inflation rate $\Delta p/p$ as the Y variable, insert these estimates into the formulae for α and β to get estimates for these parameters. (These will turn out to be the coefficients of a least squares fit of a simple linear regression of inflation on unemployment.)