UNIVERSITY OF BRISTOL
Department of Economics

Statistics and Introduction to Econometrics
(ECON 12122)

Exercise 7.
Please hand in your solutions to one of the questions 2, 3 and 4 by Monday May 8

Please bring your solutions to questions marked by * to the relevant tutorial, answers to these questions will be circulated later.

1*. Many investigators believe that supply shocks were significant causes of inflation in the 1970's especially the OPEC oil price rises of 1974-75 and 1978-79. To test this proposition an intercept dummy (D) is created which takes the value 1 in 1974, 1975, 1978 and 1979,: 0 otherwise.

An estimated 'Phillips curve type' equation with 75 observations gives:-

$$\hat{P}_t = -10.63 + 0.76\ P_{t-1} + 13.60\ \frac{1}{U_t} + 1.60\ N_t + 2.18\ D_t \qquad R^2 = 0.87$$
$$(5.39) \qquad (2.49) \qquad (1.01) \qquad (3.27)$$

where P is current level of inflation, U is the unemployment rate and N is the estimated natural level of unemployment. Figures in brackets are t values.

(a) Is the estimated coefficient on the dummy variable of the correct sign? What is its interpretation?

(b) If the equation had been estimated without the dummy variable would the value of R^2 have been smaller? Explain.

(c) Interpret the results.

(d) How would you have constructed the equation to allow for separate, differing supply side effects in the two periods 1974-75 and 1978-79 on the intercept?

(e) How would you have constructed the equation to allow for separate, differing supply side effects in the two periods 1974-75 and 1978-79 on the slope coefficients?

2. The following OLS estimates use a sample of UK annual data 1950-1994. The dependent variable is the log of investment at 1990 prices, GDP is the log of GDP at 1990 prices and P is the log of the relative price of investment goods.

	(i)	(ii)	(iii)	(iv)
GDP_t	1.576	2.141	2.351	1.820
	(0.336)	(0.058)	(0.133)	(0.141)
GDP_{t-1}	0.833			
	(0.537)			
GDP_{t-2}	-0.249			
	(0.332)			
P_t	-0.394	-0.285	-0.462	-0.200
	(0.127)	(0.019)	(0.113)	(0.035)
P_{t-1}	0.109			
	(0.122)			
Constant	-16.701	-12.273	-19.458	-12.273
	(0.792)	(1.843)	(1.886)	(1.843)
R^2	0.992	0.991		0.943
s	0.041	0.0409	0.0385	0.034
RSS	0.0656	0.0703	0.0282	0.0231
n	45	45	22	23

standard errors are in brackets, s is the standard error of the residuals, RSS is the sum of squared residuals, n is the number of observations. Columns (i) (ii) were estimated over the whole sample, column (iii) were estimated on data from 1950-71, and column (iv) on data from 1972-94

(a) Test the hypotheses that

(i) that the coefficient of GDP_t is one in equation (i).

(ii) that the coefficient of GDP_t is one in equation (ii).

Comment on your results.

(b) Test the hypothesis that the three lagged explanatory variables have zero coefficients in equation (i).

(c) Using the estimates given, test whether the parameters changed between 1950- 1971 and 1972-1994. State any assumptions which your test requires. Is there any evidence that any of these assumptions are true? Give details.

(d) Comment on all these results. Are there any other explanatory variables which you think should be included in these regressions? Explain.

3. The earnings regression given below were obtained for a sample collected in 1972 of 7,000 British male employees aged 15-64 who worked at least one week in the year preceding the interview. The variables are; Y = annual real earnings, S = years of full-time education, T = years of work experience [(age) - (years of full-time education) - 5], W=weeks worked during the year.

The dependent variable is logY. Standard errors are given in brackets.

	1	2	3
Constant	5.199	4.094	0.444
S	0.097	0.269	0.215
	(0.003)	(0.024)	(0.017)
S^2	-	-0.0064	-0.0049
		(0.0009)	(0.0006)
T	0.091	0.092	0.068
	(0.002)	(0.002)	(0.001)
T^2	-0.0015	-0.0015	-0.0012
	(0.00004)	(0.00004)	(0.00003)
LogW	-	-	1.115
			(0.013)
R^2	0.316	0.321	0.665
S.E.	0.546	0.544	0.382

The average value of S is 10.3 years over the whole sample. Those With a First degree had an average value of S of 17.7.

(a) Test the hypothesis that the coefficient of logW is unity. How do you interpret this result? On what assumptions is this test based?

(b) Explain the role played by the quadratic terms in these equations and interpret their estimated coefficients.

(c) Using standard results on omitted variables bias, account for the difference in the value of the coefficients of S in specifications (1) and (2).

4. Two equations relating annual percentage price changes in Canada $\left(\dot{p}^{c}\right)$ to percentage price changes in the U.S. $\left(\dot{p}^{us}\right)$ were estimated by OLS for 1952 to 1970.

$$\dot{p}^{c}_{t} = \underset{(0.54)}{0.48} + \underset{(0.19)}{0.59}\,\dot{p}^{us}_{t} + e_{1t}$$

$R^2 = 0.365$, RSS = 35.13, s = 1.438.

$$\dot{p}^{c}_{t} = \underset{(0.67)}{0.86} + \underset{(0.21)}{0.53}\,\dot{p}^{us}_{t} - \underset{(0.74)}{0.64}D + e_{2t}$$

$R^2 = 0.393$, RSS = 33.58, s = 1.449.

Standard errors in brackets, RSS is the sum of squared residuals, s is the standard errors of the residuals, e_{1t} and e_{2t} are least squares residuals, D_t is a dummy variable which takes the value 1 up to and including 1958 and 0 afterwards.

(a) What is the relationship between RSS and s?

(b) What is the interpretation of the constant term? Comment on the specification of the model.

(c) Test the hypothesis that the coefficient on D_t is zero.

(d) Interpret the role of D_t. How would you formulate the model if you thought the slope had changed?

5*. In the model

$$y_t = \alpha_1 x_t + \alpha_2 z_t + u_t$$

α_1 is estimated by, $\hat{\alpha}_1 = \dfrac{\Sigma x_t y_t}{\Sigma x_t^{\,2}}$ i.e. z_t is omitted from the regression.

Derive an expression for the bias of $\hat{\alpha}_1$. If z_t and x_t are positively correlated, is it possible to deduce anything about the sign of the bias? Explain.