Worksheet week # 6

1. In 1986 Frederick Schut and Peter VanBergeijk published an article in which they attempted to see if the pharmaceutical industry practiced international price discrimination by estimation by estimating a model of the prices of pharmaceuticals in a cross section of 32 countries. The authors felt that if price discrimination existed, then the coefficient of per capita income in a properly specified price equation would be strongly positive. The reason they felt that the coefficient of per capita income would measure price discrimination went as follows: the higher the ability to pay, the lower (in absolute value) the price elasticity of demand for pharmaceuticals and the higher the price a price discriminator could charge. In addition, the authors expected that prices would be higher if pharmaceutical patents were allowed and that prices would be lower if price controls existed, if competition was encouraged, or if the pharmaceutical market in a country was relatively large. Their estimates were:

$$\widehat{P}_i = \underset{}{38.22} + \underset{(0.21)}{1.43}\, GDPN_i - \underset{(0.22)}{0.6}\, CVN_i + \underset{(6.12)}{7.31}\, PP_i - \underset{(6.93)}{15.63}\, DPC_i - \underset{(7.16)}{11.38}\, IPC_i \ ,$$

where:

P_i	...	the pharmaceutical price level in the i-th country divided by that of the United States
$GDPN_i$	...	per capita domestic product in the i-th country divided by that of the United States
CVN_i	...	per capita volume of consumption of pharmaceuticals in the i-th country divided by that of the United States
PP_i	...	a variable equal to 1 if patents for pharmaceutical products are recognized in the i-th country and equal to 0 otherwise
DPC_i	...	a variable equal to 1 if the i-th country applied strict price controls and 0 otherwise
IPC_i	...	a variable equal to 1 if the i-th country encouraged price competition and 0 otherwise

   (a) Develop and test appropriate hypotheses concerning the regression coefficients using the t-test at the 5 percent level. Do you think Schut and VanBergeijk concluded that international price discrimination exists? Why or why not?

   (b) Set up 90 percent confidence intervals for each of the estimated slope coefficients.

2. Using data *wage.csv* estimate the model describing the impact of education and experience on wage:

$$wage = \beta_0 + \beta_1 educ + \beta_2 exper + \beta_3 exper^2 + \varepsilon$$

   (a) Import data into Gretl from the csv file.

   (b) Generate variable $exper^2$.

   (c) Why we include this variable into the model?

   (d) Estimate model with and without $exper^2$, compare R^2 and R^2_{adj}.

   (e) Comment on the signs and significance of β_1, β_2, and β_3 in the model with $exper^2$.

   (f) Test the following hypotheses in the model with $exper^2$:
   - test for the overall significance of the regression;
   - education has a significant impact on wage;
   - experience has a significant impact on wage.

3. Answer the following questions about a data on the sales prices of houses in the UK. The variables in this study are:

$HPRICE_i$	Sales price for house i
$ASSESS_i$	Assessed price of house i
$LOTSIZE_i$	Size of lot (in m^2) for house i
$BDRMS_i$	Number of bedrooms for house i
$BATH_i$	Number of bathrooms for house i
$OCEAN_i$	Dummy variable indicating that house i is located within 1 mile of the ocean
$LAKE_i$	Dummy variable indicating that house i is located within 1 mile of the lake
$URBAN_i$	Dummy variable indicating that house i is located in an area classified as urban
$INTERCEPT$	Intercept in the model
SSE	Sum of squared residuals

Table 3 lists coefficients with standard errors in parentheses below the coefficients.

Table 1: Results of regressions

Dependent variable $HPRICE_i$, $n = 238$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$ASSESS_i$		0.90	0.90	0.91	0.90	0.89	0.90
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
$LOTSIZE_i$	0.0035	0.00059	0.00059	0.00057	0.00058	0.00059	0.00060
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
$BDRMS_i$		11.5	9.74	7.65	8.74	10.43	
		(2.32)	(3.11)	(3.29)	(3.54)	(3.77)	
$BATH_i$			3.57	3.78			
			(2.24)	(1.11)			
$OCEAN_i$			15.6	14.32	16.76	15.32	14.56
			(11.43)	(5.21)	(4.32)	(4.98)	(7.01)
$URBAN_i$				9.54	10.29		12.32
				(8.99)	(5.43)		(5.22)
$LAKE_i$				11.36		12.87	11.98
				(4.28)		(8.32)	(6.43)
$INTERCEPT$	261.9	-38.91	-40.30	-43.21	- 36.54	-42.37	-38.44
	(11.98)	(6.78)	(7.32)	(6.99)	(5.87)	(7.22)	(9.43)
SSE	145.69	142.99	136.66	134.54	135.38	135.22	136.54
R^2	0.143	0.158882	0.196118	0.208588	0.203647	0.204588	0.196824

(a) Using the reported regressions, could you test whether the value of the house near water was different from the value of the house away from the water at the 5% level, controlling for assessed value, lot size and the number of bedrooms? If so, perform the test. If not, explain what results you would need to do the test.

(b) Could you test whether the number of bathrooms changes the value of the house controlling for the assessed value, lot size and the number of bedrooms at the 5% level? If so, perform the test. If not, explain what results you would need to do the test.

(c) Can you test whether the assessed value and the number of bedrooms are jointly significant, controlling for the lot size? If so, perform the test at 5% level. If not, explain what you would need to perform this test.

(d) Could you test whether all of the 7 listed variables (excluding the intercept) are jointly significant at the 5% level? Be sure to state any assumptions you make.