Economics 3950
Spring 2008
Dr. Richard Mueller

Assignment #3

Instructions: These questions should be answered using a text editor or a word processor where you can cut and paste output from your statistical program (where necessary). Please mark question numbers clearly. This assignment is **due on Thursday, March 20 in class.**

1. (20 points total) Exercise 5.8, p. 228.
2. (45 points total) Exercise 6.10, pp. 276-7.
3. (35 points total) Exercise 6.22, pp. 282-3.

Grand Total: 100 points

Answer Key

1. This statement is erroneous, just the opposite is true. MC increases the standard errors and lowers the t-statistics. A lower t-stat is likely to make a variable insignificant rather that significant.

2.

a. $$F_c = \frac{(ESS_B - ESS_A)/2}{ESS_A/(40-6)} = \frac{(0.311974 - .030293)/2}{0.309293/34} = 0.147$$

b. Under the null hypothesis, this has an F-distribution with 2 (34) d.f. for the numerator (denominator).

c. $F^*_{2,34}$ is in the range (2.44,2.49) at the 10 per cent level.

d. Since Fc < F*, we cannot reject the null hyptothesis.

e. Not rejecting the null implies that the coefficients for ln(UNEMP) and ln(POP) are jointly insignificant.

f. The t-statistic for ln(PRICE) is given by (1.557 – 1)/0.230 = 2.42, for ln(INCOME) it is (4.807 – 1)/0.708 = 5.38, for ln(INTRATE) it is (0.208 – 1)/0.058 = -13.66.

g. Under the null hypothesis, these statistics will be distributed as a t-distribution with 40 – 4 = 36 d.f. for Model B.

h. t* for 36 d.f. and 5 per cent level of significance is in the range 2.021 to 2.042.

i. We reject the null in all three cases and conclude that the elasticities all differ from 1.

3. The GRETL commands for this problem are given below:

```
open C:\Data\gretl\data\data6-5
logs HARVEST EXPORTS HOUSTART INDPROD TIMBPRIC PRODPRIC
ols l_HARVES const l_EXPORT l_HOUSTA l_INDPRO l_TIMBPR l_PRODPR
omit l_EXPORT l_TIMBPR
ols l_HARVES const l_EXPORT l_HOUSTA l_INDPRO l_TIMBPR l_PRODPR
omit l_TIMBPR
omit l_EXPORT
genr HSTAR2 = 1000*HOUSTART
logs HSTAR2
ols l_HARVES const l_EXPORT l_HSTAR2 l_INDPRO l_TIMBPR l_PRODPR
```

```
MODEL 1: OLS estimates using the 31 observations 1959-1989
Dependent variable: l_HARVES

      VARIABLE      COEFFICIENT      STDERROR       T STAT    2Prob(t > |T|)

   0)    const           0.9716        0.1917        5.067       0.000031 ***
   8) l_EXPORT           0.0642        0.0643        0.998       0.327994
   9) l_HOUSTA           0.1567        0.0774        2.024       0.053770 *
  10) l_INDPRO           0.7000        0.1716        4.079       0.000404 ***
  11) l_TIMBPR          -0.0268        0.0300       -0.893       0.380541
  12) l_PRODPR          -0.3766        0.0766       -4.914       0.000047 ***

Mean of dep. var.              1.990  S.D. of dep. variable           0.149
Error Sum of Sq (ESS)         0.1228  Std Err of Resid. (sgmahat)    0.0701
Unadjusted R-squared           0.816  Adjusted R-squared              0.779
F-statistic (5, 25)          22.2041  p-value for F()              0.000000
Durbin-Watson stat.            0.823  First-order autocorr. coeff     0.571
```

The adjusted R-squared for the general model with all explanatory variables is 0.779 and the F-statistic for overall goodness of fit with d.f. 5 and 25 is 22.204 with p=0.0000. Therefore, we can reject the null hypothesis of the coefficients being jointly insignificant.

We now omit l_EXPORT and l_TIMBPR since both of the variables have coefficient estimates insignificantly different than zero at the 10 per cent level. This results in:

```
MODEL 2: OLS estimates using the 31 observations 1959-1989
Dependent variable: l_HARVES

      VARIABLE      COEFFICIENT      STDERROR       T STAT    2Prob(t > |T|)

   0)    const           0.8563        0.1185        7.228       0.000000 ***
   9) l_HOUSTA           0.1568        0.0756        2.073       0.047828 **
  10) l_INDPRO           0.8070        0.1045        7.721       0.000000 ***
  12) l_PRODPR          -0.4150        0.0680       -6.105       0.000002 ***

Mean of dep. var.              1.990  S.D. of dep. variable           0.149
Error Sum of Sq (ESS)         0.1293  Std Err of Resid. (sgmahat)    0.0692
Unadjusted R-squared           0.807  Adjusted R-squared              0.785
F-statistic (3, 27)          37.5384  p-value for F()              0.000000
Durbin-Watson stat.            0.784  First-order autocorr. coeff     0.589

MODEL SELECTION STATISTICS
```

SGMASQ	0.0047871	AIC	0.00539698	FPE	0.00540479
HQ	0.00573252	SCHWARZ	0.00649394	SHIBATA	0.00524539
GCV	0.0054963	RICE	0.00561964		

```
Comparison of Model 1 and Model 2:

  Null hypothesis: the regression parameters are zero for the variables

    l_EXPORT
    l_TIMBPR

  Test statistic: F(2, 25) = 0.652380, with p-value = 0.529445
  Of the 8 model selection statistics, 8 have improved.
```

This shows the results of the Wald test which indicates that the null hypothesis that the coefficients are zero cannot be rejected. If we omit the variables one at a time, we end up with the same results.

The elasticities and the standard errors are given above (i.e., the coefficient estimates). To test these are significantly different than one, we do the following:

l_HOUSTA	tc = (.1568- 1)/0.0756 = -11.5	Reject Ho at 5 per cent.
l_INDPRO	tc = (.8070 - 1)/0.1045 = -1.85	Do not reject Ho at 5 per cent (but can at 10 per cent).
l_PRODPR	tc = (-.4150 - 1)/0.0680 = -20.80	Reject Ho at 5 per cent.

In each case, the critical t-value will 27 d.f. at 5 (10) per cent is t* = 2.052 (1.703).

Finally, if we change the units of measurement from millions to thousands, we end up with:

MODEL 3: OLS estimates using the 31 observations 1959-1989
Dependent variable: l_HARVES

	VARIABLE	COEFFICIENT	STDERROR	T STAT	2Prob(t > |T|)	
0)	const	-0.1109	0.5268	-0.211	0.834927	
8)	l_EXPORT	0.0642	0.0643	0.998	0.327994	
14)	l_HSTAR2	0.1567	0.0774	2.024	0.053770	*
10)	l_INDPRO	0.7000	0.1716	4.079	0.000404	***
11)	l_TIMBPR	-0.0268	0.0300	-0.893	0.380541	
12)	l_PRODPR	-0.3766	0.0766	-4.914	0.000047	***

Mean of dep. var.	1.990	S.D. of dep. variable	0.149
Error Sum of Sq (ESS)	0.1228	Std Err of Resid. (sgmahat)	0.0701
Unadjusted R-squared	0.816	Adjusted R-squared	0.779
F-statistic (5, 25)	22.2041	p-value for F()	0.000000
Durbin-Watson stat.	0.823	First-order autocorr. coeff	0.571

Notice that the only change is in the constant term compared to Model 1 above.