

ECON 5350 Solutions to Problem Set #5

1. Greene 5th edition, Exercise 5.2.

Answer: Begin by writing

$$\begin{aligned} e_i &= y_i - b'x_i \\ &= (\beta'x_i + \epsilon_i) - b'x_i \\ &= \epsilon_i + (\beta - b)'x_i. \end{aligned}$$

Since the $\text{plim}(b) = \beta$ and $\text{plim}(x_i) = x_i$, it follows that $\text{plim}(e_i - \epsilon_i) = 0$.

2. Greene 5th edition, Exercise 6.1.

Answer: We are to test the null hypothesis $H_0: R\beta = q$ where $R = (0 \ 1 \ 1)$ and $q = 1$. The F statistic is

$$F = \frac{(Rb - q)'[R(X'X)^{-1}R']^{-1}(Rb - q)/J}{s^2} \sim F(J, n - k).$$

We also know the following: $s^2 = e'e/(n - k) = 20$; $J = 1$; $(Rb - q) = 0.3$; and $[R(X'X)^{-1}R']^{-1} = 35.455$. Substituting the pieces into the F statistic above, we get $F = 0.160$. The critical F value is $F(1, 26) = 4.23$. Therefore, we fail to reject the null hypothesis that the two slopes are equal.

3. Greene 5th edition, Exercise 6.2.

Answer: The appropriate F statistic is

$$F = \frac{(e'_*e_* - e'e)/J}{e'e/(n - k)} \sim F(J, n - k).$$

We know that $e'e = 520$; $n - k = 26$; $J = 1$ and the critical value is $F(1, 26) = 4.23$. We now need to calculate $e'_*e_* = y'M^0y - b_2^2x_2'x_2$. From the unrestricted R^2 , we get that $y'M^0y = 600$. Using the fact that $\bar{x}_2 = 0$, we know that $x_2'x_2 = 80$. The formula for the restricted estimator is $b_2 = (x_2'y)/(x_2'x_2)$. We can get $x_2'y$ by noting that

$$X'y = X'Xb = \begin{bmatrix} 29 & 0 & 0 \\ 0 & 50 & 10 \\ 0 & 10 & 80 \end{bmatrix} \begin{bmatrix} 4 \\ 0.4 \\ 0.9 \end{bmatrix} = \begin{bmatrix} 116 \\ 29 \\ 76 \end{bmatrix}.$$

This implies that $x_2'y = 76$ and $b_2 = 76/80$. Finally, we get that $e'_*e_* = 527.8$ and $F = 0.39$. Therefore, we fail to reject the null hypothesis that the coefficient on x_1 is zero.

4. Greene 5th edition, Exercise 6.9.

Answer: See the attached gauss code. The F statistic equals 38.19. The 5% critical value is $F(3, 31) = 2.91$. Therefore, we conclude that the three price indices are jointly significant determinants of the demand for gasoline.

hw5b. txt

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@ ***** @
@ ECON 5350 PROBLEM SET #5 @
@ ***** @

@ ***** @
@ Exercise 6.9 @
@ ***** @

@ Load Data and Create Data Matrices @
load data[37, 11] = c:\gauss35\classes\econ5340\data\F2. 2;
gas = data[2: 37, 2];
popul = data[2: 37, 11];
y = ln(gas./popul);
income = ln(data[2: 37, 4]);
pg = ln(data[2: 37, 3]);
pnc = ln(data[2: 37, 5]);
puc = ln(data[2: 37, 6]);
nobs = rows(gas);
constant = ones(nobs, 1);
xmat = constant~income~pg~pnc~puc;
k = cols(xmat);

@ OLS @
b = inv(xmat' xmat)*xmat' y;
resid = y - xmat*b;
s2 = (resid' resid)/(nobs-k);

R = {0 0 1 0 0, 0 0 0 1 0, 0 0 0 0 1};
q = {0, 0, 0};
J = 3;
F = (R*b - q)' * inv(R*inv(xmat' *xmat)*R') *(R*b - q)/(J*s2);
print "F statistic = " F;
print;

F statistic =          38.187155
```