

ECON 5350 Solutions to Problem Set #3

1. Greene 5th edition, Exercise 3.3.

Answer: Begin by considering the regression of Y on Z. The residuals for this regression are given by

$$\begin{aligned}e &= M_Z Y \\ &= [I - Z(Z'Z)^{-1}Z']Y \\ &= [I - XP(P'X'XP)^{-1}P'X']Y \\ &= [I - XPP^{-1}(X'X)^{-1}P'^{-1}P'X']Y \\ &= [I - X(X'X)^{-1}X']Y \\ &= M_X Y.\end{aligned}$$

Since the residuals for a regression of Y on Z are the same as the residuals for a regression of Y on X, the models must have the same fit. Therefore, changing the units of measurement on the independent variables will have no effect on goodness-of-fit measures (although it will affect the coefficients).

2. Greene 5th edition, Exercise 3.7.

Answer: See the attached gauss code.

3. Greene 5th edition, Exercise 3.12.

Answer: See the attached gauss code.

```

@ ***** @
@ Exercise 3.7 @
@ ***** @

@ Data @
y = {3, 2, 5, 4, 3, 2, 0, 9, 1, 2};
n = rows(y);
constant = ones(n, 1);
x = {1, 2, 3, 4, 5, 5, 4, 3, 2, .};

@ create Companion Dummy and Fill with Zero @
x1 = missrv(x, 0);
d = (x1 .== 0);

@ Regression with Zero and Missing Dummy @
xmat1 = constant~x1~d;
b1 = inv(xmat1'*xmat1)*(xmat1'*y);
e1 = y - xmat1*b1;
Rsquare1 = 1 - (e1'*e1)/((y-meanc(y))'*(y-meanc(y)));
print "Fill Missing Observation with Zero and Add Companion Dummy";
print "Intercept = " b1[1];
print "Slope = " b1[2];
print "Dummy Coefficient = " b1[3];
print "R^2 = " Rsquare1;
print;

@ Regression with Sample Mean for Missing Data @
x2 = x[1:n-1]|meanc(x[1:n-1]);
xmat2 = constant~x2;
b2 = inv(xmat2'*xmat2)*(xmat2'*y);
e2 = y - xmat2*b2;
Rsquare2 = 1 - (e2'*e2)/((y-meanc(y))'*(y-meanc(y)));
print "Fill with Missing Observation with Sample Mean";
print "Intercept = " b2[1];
print "Slope = " b2[2];
print "R^2 = " Rsquare2;
print;

@ Regression with Observation Deleted @
xmat3 = ones(n-1, 1)~x1[1:n-1];
y3 = y[1:n-1];
b3 = inv(xmat3'*xmat3)*(xmat3'*y3);
e3 = y3 - xmat3*b3;
Rsquare3 = 1 - (e3'*e3)/((y3-meanc(y3))'*(y3-meanc(y3)));
print "Missing Observation Deleted";
print "Intercept = " b3[1];
print "Slope = " b3[2];
print "R^2 = " Rsquare3;
print;

*****

» run C:\Documents\Classes\Econ5350\ProblemSets\hw3b;
Fill Missing Observation with Zero and Add Companion Dummy
Intercept = 3.5214286
Slope = -0.092857143
Dummy Coefficient = -1.5214286
R^2 = 0.025985438

Fill with Missing Observation with Sample Mean
Intercept = 3.3992063
Slope = -0.092857143
R^2 = 0.0023572405

```

ans3_gauss. txt

Missing Observation Deleted
Intercept = 3.5214286
Slope = -0.092857143
R² = 0.0024142857

```
@ ***** @
@ ECON 5350 PROBLEM SET #3 @
@ ***** @
```

```
@ ***** @
@ Exercise 3.12 @
@ ***** @
```

```
xprimex = {15.000 19.310 111.79, 19.310 25.218 148.98, 111.79 148.98
953.86};
```

```
xprimey = {3.0500, 3.9926, 23.521};
```

```
b = inv(xprimex)*xprimey;
```

```
y = {0.161,0.172,0.158,0.173,0.195,0.217,0.199,0.163,0.195,0.231,
0.257,0.259,0.225,0.241,0.204};
```

```
tss = (y-meanc(y))'*(y-meanc(y));
```

```
ess = y'*y - (b'*xprimey)' - (b'*xprimey) + b'*xprimex*b;
```

```
Rsquare = 1 - ess/tss;
```

```
print "b = " b;
```

```
print;
```

```
print "Rsquare = " Rsquare;
```

```
print;
```

```
b =
```

```
    -0.064881176
```

```
     0.22518527
```

```
    -0.0029082206
```

```
Rsquare =          0.77147639
```