Economics 102: Analysis of Economic Data
Cameron, Department of Economics, U.C.-Davis

EXTRA QUESTION FOR MIDTERM 2 PREPARATION MULTIPLE REGRESSION QUESTION

Based on Question 3 of Fall 2021 Final Exam (A)

Consider data on various characteristics of different models and makes of gasoline-fuelled automobiles sold in the U.S. in 1995.

Dependent Variable

`mpg` = Miles per gallon (a measure of fuel consumption).
`lmpg` = Natural logarithm of `mpg`.

Regressors

`curbwt` = Curb weight (weight of car in pounds with full fuel tank but no passengers or cargo)
`hp` = Horsepower (a measure of engine power)
`torque` = Engine torque (in foot pounds)
`accel` = Acceleration of car (seconds to reach 60 miles per hour)
`lcurbwt` = Natural logarithm of `curbwt`
`lhp` = Natural logarithm of `hp`
`ltorque` = Natural logarithm of `torque`
`dUS` = 1 if U.S. company and = 0 otherwise
`dASIA` = 1 if Asian company and = 0 otherwise
`dEUR` = 1 if European company and = 0 otherwise
Note: `dUS`+`dASIA`+`dEUR` = 1 for all observations.

Use the two pages of output provided at the end of this exam on:

1. Various t critical values.
2. Various descriptive statistics output and correlations for all variables.
3. Three regressions.

Part of the following questions involves deciding which output to use.
You can use the output that gets the correct answer in the quickest possible way.

3. In this question consider the second regression with `mpg` the dependent variable.

(a) Provide an interpretation of the coefficient of variable `hp`.

(b) Which regressors are individually statistically significant at 5 percent?

(c) Are the regressors jointly statistically significant at 5 percent in the multivariate regression? State clearly the null and alternative hypotheses of your test, and your conclusion.

(d) Suppose you wanted to test whether the regressors other than `hp` are jointly statistically significant at 5%. Give the complete Stata command.

(e) Which model explains the data better on the basis of goodness of fit, using a measure that includes a penalty for model size. This model, or the model with just hp as a regressor? Explain.

```
t_v,.05 for  v = 94  v = 93   v = 92   v = 91   v = 90   v = 89   v = 88
             1.661   1.661    1.662    1.662    1.662    1.662    1.662
t_v,.025 for v = 94  v = 93   v = 92   v = 91   v = 90   v = 89   v = 88
             1.986   1.986    1.986    1.986    1.987    1.987    1.987
t_v,.005 for v = 94  v = 93   v = 92   v = 91   v = 90   v = 89   v = 88
             2.629   2.630    2.630    2.631    2.632    2.632    2.633
```

```
. summarize mpg hp curbwt torque accel lhp lmpg lcurbwt dUS dEUR dASIA
```

Variable	Obs	Mean	Std. dev.	Min	Max
mpg	95	28.80105	5.055616	17.3	38.6
hp	95	161.6842	57.68573	70	389
curbwt	95	3035.537	489.6085	2075	4463
torque	95	229.4442	86.67477	100.3	569.5
accel	95	9.877033	1.512222	6.27578	13.65402
lhp	95	5.030046	.3280396	4.248495	5.963579
lmpg	95	3.345303	.1747336	2.850706	3.653252
lcurbwt	95	8.005289	.1615053	7.637716	8.403577
dUS	95	.4736842	.5019559	0	1
dEUR	95	.1052632	.3085203	0	1
dASIA	95	.4210526	.4963472	0	1

```
. summarize mpg, detail
```

Miles per gallon

Percentiles		Smallest		
1%	17.3	17.3		
5%	22.8	20.3		
10%	23	21.2	Obs	95
25%	24.4	21.9	Sum of wgt.	95
50%	28.1		Mean	28.80105
		Largest	Std. dev.	5.055616
75%	32.2	38.2		
90%	37	38.5	Variance	25.55925
95%	37.9	38.6	Skewness	.3684942
99%	38.6	38.6	Kurtosis	2.280529

```
. correlate mpg hp curbwt torque accel
(obs=95)
```

	mpg	hp	curbwt	torque	accel
mpg	1.0000				
hp	-0.8085	1.0000			
curbwt	-0.8960	0.8354	1.0000		
torque	-0.8131	0.9479	0.8795	1.0000	
accel	0.6491	-0.9017	-0.6065	-0.7843	1.0000

```
. * Regressions for exam
. regress mpg hp, vce(robust)

Linear regression                               Number of obs     =         95
                                                F(1, 93)          =     137.02
                                                Prob > F          =     0.0000
                                                R-squared         =     0.6538
                                                Root MSE          =     2.9908

------------------------------------------------------------------------------
             |               Robust
         mpg |  Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
          hp |   -.0708618   .0060537   -11.71   0.000    -.0828833   -.0588404
       _cons |    40.25829   1.075757    37.42   0.000     38.12205    42.39453
------------------------------------------------------------------------------

. regress mpg hp curbwt torque accel dEUR dASIA, vce(robust)

Linear regression                               Number of obs     =         95
                                                F(6, 88)          =      67.99
                                                Prob > F          =     0.0000
                                                R-squared         =     0.8334
                                                Root MSE          =     2.1329

------------------------------------------------------------------------------
             |               Robust
         mpg |  Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
          hp |    .0071719   .0231857     0.31   0.758    -.0389049    .0532487
      curbwt |   -.0090926   .0010608    -8.57   0.000    -.0112007   -.0069845
      torque |    .0083239   .0094324     0.88   0.380    -.0104209    .0270688
       accel |     .986283   .5829988     1.69   0.094    -.1723046    2.144871
        dEUR |   -1.653195     .67888    -2.44   0.017    -3.002326   -.3040634
       dASIA |    .285032   .5395841     0.53   0.599    -.7872781    1.357342
       _cons |    43.64497   7.132522     6.12   0.000     29.47058    57.81936
------------------------------------------------------------------------------

. regress lmpg lhp lcurbwt ltorque accel, vce(robust)

Linear regression                               Number of obs     =         95
                                                F(4, 90)          =     149.31
                                                Prob > F          =     0.0000
                                                R-squared         =     0.8680
                                                Root MSE          =     .06487

------------------------------------------------------------------------------
             |               Robust
        lmpg |  Coefficient  std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         lhp |   -.7777867   .2789421    -2.79   0.006    -1.331954   -.2236196
     lcurbwt |   -.0402201   .2593707    -0.16   0.877    -.5555053     .475065
     ltorque |   -.0264077   .0644809    -0.41   0.683    -.1545102    .1016948
       accel |   -.0842394   .0369613    -2.28   0.025    -.1576694   -.0108094
       _cons |    8.553553   .6638139    12.89   0.000     7.234771    9.872336
------------------------------------------------------------------------------
```