2012 #5b.

From a sample of 200 households, we estimated the following two models of gasoline consumption (t-statistics in parentheses):

$$\begin{gathered} gas = 34.2 + 10.5suv + .25inc - 0.00005inc^2 \\ (2.3) \quad (3.1) \quad (1.7) \quad (1.8) \\ R^2 = 0.356 \end{gathered}$$

$$\begin{gathered} gas = 22.2 + 15.3suv \\ (2.3) \quad (3.1) \\ R^2 = 0.323 \end{gathered}$$

where *gas* gives the number of gallons per month, *suv* is a dummy variable for whether the household owns an SUV, and *inc* is the annual household income in thousands of $. Are the two income variables jointly significant at the 5% level?

2010 #6c.

Using data for the US gasoline market between 1960 and 1999, we estimated the following model:

$$\log(gas) = \beta_0 + \beta_1 \log(inc) + \beta_2 \log(priceg) + \beta_3 \log(prnewcar) + \beta_4 \log(prusedcar) + u$$

where:

```
lng = log(total US gasoline consumption per capita)
lninc = log(income per capita)
lnpriceg = log(gasoline price)
lnprnewcar = log(price of new cars)
lnprusedcar = log(price of old cars)
```

```
. regress lng lninc lnpriceg lnprnewcar lnprusedcar

      Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F(  4,    35) =  440.79
       Model |  2.14671037     4   .30667291           Prob > F      =  0.0000
    Residual |  .019480675    35  .000695738           R-squared     =  0.9910
-------------+------------------------------           Adj R-squared =  0.9888
       Total |  2.16619104    39  .061891173           Root MSE      =  .02638

------------------------------------------------------------------------------
         lng |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lninc |   1.692181   .2154954     7.85   0.000     1.250759    2.133604
    lnpriceg |  -.2325466   .0595617    -3.90   0.001    -.3545532   -.1105399
  lnprnewcar |   -.233414   .1795357    -1.30   0.204    -.6011761    .1343482
 lnprusedcar |  -.0597329   .0693655    -0.86   0.396    -.2018216    .0823558
       _cons |  -3.957868   2.581538    -1.53   0.136     -9.24591    1.330174
------------------------------------------------------------------------------
```

Then we estimated it without the price of new and used cars:

```
. reg lng lninc lnpriceg

      Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F(  2,    37) =  629.99
       Model |  2.13986669     2  .534966673           Prob > F      =  0.0000
    Residual |  .026324354    37  .000849173           R-squared     =  0.9878
-------------+------------------------------           Adj R-squared =  0.9863
       Total |  2.16619104    39  .061891173           Root MSE      =  .02914

------------------------------------------------------------------------------
         lng |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lninc |    2.13019    .148784    14.32   0.000     1.826743    2.433637
    lnpriceg |  -.1528558   .0535811    -2.85   0.008    -.2621352   -.0435763
       _cons |  -5.605895   2.165544    -2.59   0.015    -10.02255    -1.18924
------------------------------------------------------------------------------
```

c. Comparing the two estimated models, would you say that the consumption of gasoline is influenced by the prices of cars, new or used, considered together? (Do a joint test of significance on the two parameters).

Solution

1.

$$H_0 : \beta_{lnpreusedcar} = \beta_{lnprnewcar} = 0$$
$$H_1 : \text{ not } H_0$$

2.

$$F = \frac{(.9910 - .9878)/2}{(1 - .9910)/(40 - 4 - 1)} = 6.22$$

3. We get the critical values from the table for $F_{2,35}$. At the 5% level the critical value is between 3.23 and 3.32; at the 10% level the critical value is between 2.44 and 2.49.

4. We reject the null hypothesis in either case because F ¿ c.

5. We conclude that though they are not individually significantly different from zero, when considered jointly the prices of new and used cars do add explanatory power to our model and help predict gas consumption.