Second test in Introductory Econometrics

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1. Gauss-Markov etc. [13 points]

   (a) Please list the assumptions that are required in the *multiple* linear regression model for the BLUE property (linear efficiency) of the OLS estimator (Gauss-Markov conditions).

   (b) Which of these assumptions are needed for the consistency property of the OLS estimator?

   (c) Suppose someone offers you two estimators to choose from. One of them is biased but consistent, the other one is inconsistent but unbiased. Which of the two would you choose? Why?

2. The accompanying software output represents two attempts at explaining prices for single-family homes in San Diego, California, by characteristics of the houses, a so-called hedonic price model. Here, observations on 59 houses are assumed to having been randomly sampled. We generally assume that the Gauss-Markov conditions hold, including normal errors. [12 points]

   (a) Following the first regression, you see an F–test reported (the command "test" following the "reg" regression). The numerator degrees of freedom have been replaced by a question mark. What would they be for this test (a number, please)?

   (b) In the second specification, the numerator degrees of freedom for the F-total test have been replaced by a question mark. What would they be for this test (a number, please)?

   (c) What is the correctly formulated null hypothesis for the first of these two tests, i.e. a restriction test for three regressor variables in the first specification, using our β_j notation? Can this H_0 be rejected at the 5% level? Intuitively, does this result support the second regression specification or the first one?

   (d) You also see values of information criteria printed after each regression (the command "estat ic"). Which of the two specifications would be supported by the AIC criterion?

3. Heteroskedasticity. [10 points]

   (a) Suppose there is heteroskedasticity in a regression model, thus violating one Gauss-Markov condition, while all other such conditions hold. Will OLS be unbiased and consistent?

   (b) Suppose you have a computer program that offers OLS including R^2 and saving of residuals etc., but no further hypothesis tests. Describe how you would run either a Breusch-Pagan or a White test (choose one) for heteroskedasticity.

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. reg price sqft age baths bedrms view floors

      Source |       SS       df       MS              Number of obs =      59
-------------+------------------------------           F(  6,    52) =    9.19
       Model |  377344.735     6  62890.7892           Prob > F      =  0.0000
    Residual |  355880.982    52  6843.86503           R-squared     =  0.5146
-------------+------------------------------           Adj R-squared =  0.4586
       Total |  733225.717    58  12641.8227           Root MSE      =  82.728

------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        sqft |   .1573346    .032365     4.86   0.000     .0923894    .2222797
         age |   2.292286   1.056523     2.17   0.035      .172218    4.412354
       baths |  -5.906598   25.81981    -0.23   0.820    -57.71783    45.90463
      bedrms |  -37.27362   18.81045    -1.98   0.053    -75.01956    .4723152
        view |   42.23403   23.19242     1.82   0.074     -4.30496    88.77301
      floors |  -28.77792   30.41554    -0.95   0.348    -89.81118    32.25533
       _cons |   34.43657   63.29099     0.54   0.589     -92.5661    161.4392
------------------------------------------------------------------------------

. test floors view baths

 ( 1)  floors = 0
 ( 2)  view = 0
 ( 3)  baths = 0

       F(  ?,    52) =    1.91
            Prob > F =    0.1388

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     59   -361.8337   -340.5094      7     695.0188    709.5615
-----------------------------------------------------------------------------

. reg price sqft age bedrms

      Source |       SS       df       MS              Number of obs =      59
-------------+------------------------------           F(  ?,    55) =   15.68
       Model |  338057.919     3  112685.973           Prob > F      =  0.0000
    Residual |  395167.798    55  7184.86905           R-squared     =  0.4611
-------------+------------------------------           Adj R-squared =  0.4317
       Total |  733225.717    58  12641.8227           Root MSE      =  84.764

------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        sqft |   .1596956   .0246409     6.48   0.000     .1103142    .2090771
         age |   2.413136   1.052835     2.29   0.026     .3032072    4.523065
      bedrms |  -45.78228   18.49682    -2.48   0.016    -82.85073    -8.71383
       _cons |   29.82949   56.20004     0.53   0.598     -82.7979    142.4569
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     59   -361.8337   -343.5985      4     695.1969    703.5071
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