A dataset from the Hill, Griffiths, and Lim text, which provided the *x* variable for your Project #2 Monte Carlo study, contains weekly observations on two variables, sales and advertising by a large department store. The Daily Problems this week will explore the dynamic relationship between these variables.

The simplest regression, which we would not really expect to be adequate, would regress this week's sales on this week's advertising expenditures.

```
. reg sales adv

      Source |       SS           df       MS      Number of obs   =       157
-------------+----------------------------------   F(1, 155)       =     94.32
       Model | 161.334577          1  161.334577   Prob > F        =    0.0000
    Residual |  265.12239        155  1.71046703   R-squared       =    0.3783
-------------+----------------------------------   Adj R-squared   =    0.3743
       Total | 426.456966        156   2.7336985   Root MSE        =    1.3078


------------------------------------------------------------------------------
       sales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         adv |   5.982779   .6160225     9.71   0.000     4.765896    7.199662
       _cons |   21.92519   .6440184    34.04   0.000     20.65301    23.19738
------------------------------------------------------------------------------
```

1. Give a brief assessment of this regression. Are the results consistent with your expectations?

2. Would you expect the error in this regression to be autocorrelated? Why?

```
. predict uhat , resid

. reg uhat adv l.uhat

      Source |       SS           df       MS      Number of obs   =       156
-------------+----------------------------------   F(2, 153)       =      1.77
       Model | 5.95769769          2  2.97884885   Prob > F        =    0.1734
    Residual | 257.129967        153  1.68058802   R-squared       =    0.0226
-------------+----------------------------------   Adj R-squared   =    0.0099
       Total | 263.087665        155  1.69733977   Root MSE        =    1.2964


------------------------------------------------------------------------------
        uhat |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         adv |   .0469047   .6112425     0.08   0.939     -1.16066    1.254469
             |
        uhat |
         L1. |   .1498829   .0796299     1.88   0.062    -.0074331     .307199
             |
       _cons |  -.0391273   .6387111    -0.06   0.951    -1.300959    1.222704
------------------------------------------------------------------------------
```

3. The equation above regresses the residual on the regressor (*adv*) and the lagged residual. Explain the logic of the regression and interpret the results using the χ^2 (Lagrange multiplier) version of the Breusch-Godfrey test at the 5% and 10% level of significance. Are you surprised at the results?