Economics 312 **Spring 2013**
Daily Problem #22 **March 25**

1. Suppose that we run an OLS regression of the model $y_i = \beta_1 + \beta_2 x_{i,2} + \beta_3 x_{i,3} + e_i$. We are concerned that $x_{i,3}$ might be correlated with the error term e_i. To test for this, we calculate the OLS residuals $\hat{e}_i$ and perform a test of the hypothesis that $\text{cov}\left(x_{i,3}\hat{e}_i\right) = 0$ based on $\widehat{\text{cov}}\left(x_{i,3}\hat{e}_i\right) = \frac{1}{N}\sum_{i=1}^{N} x_{i,3}\hat{e}_i$. Is this test valid? Explain the logic of your answer. (Do not worry about whether we should divide by N or $N-3$; that is not the point of the question.)

2. Suppose that you are working with the following supply-demand model, which is Model V from our class discussion of identification (and a variation of Model IV, which you analyzed for Daily Problem #21):

$$\text{Demand: } Q = \alpha_0 + \alpha_P P + \alpha_M M + u$$
$$\text{Supply: } Q = \beta_0 + \beta_P P + \beta_R R + \beta_W W + v.$$

M, R, and W are, respectively, consumer incomes, rainfall, and wages, all of which are assumed to be exogenous.

a. Are the coefficients of the demand curve not identified, just identified, or overidentified? Explain exactly what this means in terms of our ability to obtain estimates of the α parameters from the estimated reduced-form coefficients.
b. Are the coefficients of the supply curve not identified, just identified, or overidentified? Explain exactly what this means in terms of our ability to obtain estimates of the β parameters from the estimated reduced-form coefficients.
c. For each equation, explain exactly how you would follow the procedure of HGL's Section 10.4.2 to test instrument validity, or, if appropriate, explain why the test cannot be performed for that equation. Be explicit about what expressions like "all available instruments," "the G variables …," and "the L instruments …" are in the context of this problem. In other words, don't just repeat the steps on pp. 421–422, apply them to this particular model.