

Economics 6352: Applied Econometrics

Southern Methodist University

Department of Economics

Practice Midterm I

1. Consider the linear regression model $y_i = \beta_0 + \beta_1 x_{i1} + u_i$. However, suppose the true DGP is $y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \varepsilon_i$.

- What is the OLS estimator of β_1 ?
- Is it biased? If so, what is the bias?
- In practice, how can one check for functional form in this model?

2. If measurement error exists and one runs OLS, what is the effect on the OLS estimates when:

- The measurement error is in the independent variable.
- The measurement error is in the dependent variable.

3. The general fertility rate (gfr) is the number of children born to every 1,000 women of childbearing age. For the years 1913 through 1984, the equation:

$$gfr = \beta_0 + \beta_1 pe + \beta_2 ww2 + \beta_3 pill + u,$$

explains gfr in terms of the average real dollar value of the personal tax exemption (pe) and two binary variables. The variable $ww2$ takes on the value of unity during the years 1941 through 1945, when the United States was involved in World War II. The variable $pill$ is unity from 1963 on, when the birth control pill was made available for contraception. The OLS estimates are:

$$\widehat{gfr} = 95.87 + 0.083pe - 24.24ww2 - 31.59pill$$

- What is the interpretation of the intercept?
- What is the interpretation of the remaining coefficients?

4. Suppose we add two lags to the variable pe in the model in question 3

$$gfr_t = \beta_0 + \beta_1 pe_t + \beta_2 pe_{t-1} + \beta_3 pe_{t-2} + \beta_4 ww2_t + \beta_5 pill_t + v_t.$$

Further, suppose the OLS estimates from this specification are:

$$\widehat{gfr}_t = 95.87 + 0.073pe_t - 0.0058pe_{t-1} + 0.034pe_{t-2} - 22.13ww2_t - 31.30pill_t$$

- What is the short run impact of pe ?
- What is the long run impact of pe ?
- What is the cost to the degrees of freedom in this model?

5. Consider again the same problem from questions 3 and 4. It has been argued that both grf and pe exhibit unit root behavior. Suppose we take the first difference of both variables, drop the dummies and run OLS. Here we obtain the following estimates:

$$\widehat{\Delta grf} = -0.785 - 0.043\Delta pe$$

- (a) What is a possible problem of running OLS on two nonstationary processes?
(b) Interpret the coefficients.