

AEB 6571 - Econometric Methods II

Test Questions

Charles B. Moss

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1. Prove that ordinary least squares estimates are best linear unbiased.
2. Develop the normal distribution ordinary least squares estimates in small sample.
3. Intuitively develop the asymptotic distribution of the ordinary least squares estimator.
4. A researcher has hypothesized that farm programs have increased the inequality of farmer wealth. As a part of this research effort he computes an entropy measure to measure farm concentration

$$J_{st} = - \sum_{i \in \{s,t\}} w_{i,st} \ln(w_{i,st}) \gg 0 \quad (1)$$

where J_{st} is the entropy measure for state s at time t and $w_{i,st}$ is the share of agricultural assets held by individual i who farms in state s at time t . The researcher hypothesizes that this value is explained by share of farm revenue from government payments $z_{1,st}$ and the percent of farmland planted in grain crops $z_{2,st}$. He then estimates a linear relationship using ordinary least squares

$$J_{st} = \alpha_0 + \alpha_1 z_{1,st} + \alpha_2 z_{2,st} + \xi_{st} \quad (2)$$

and tests his hypothesis using a t-Test. A colleague objects to the results arguing that J_{st} is probably distributed Gamma. Was the researcher wrong? Why?

5. What is a Wald test and what is the most frequently used Wald Test in econometrics?
6. Demonstrate that the ordinary least squares estimates are the same as the maximum likelihood estimates for the simple linear regression model.
7. Using the data from Moss, Erickson, Ball, and Mishra (2003) construct a variance matrix for the variables of the Translog cost specification (i.e., Share of Purchased Inputs, Share of Labor, Logarithm of Purchased Input Prices, Logarithm of Labor Price, Logarithm of Capital Price, Logarithm of Livestock Output, and Logarithm of Crop Output)[Note that the Share of Capital has been dropped]. Construct the conditional covariance and correlation matrix for the Share of Purchased Inputs, Share of Labor, Logarithm of Livestock Output, and Logarithm of Output removing the correlation with the logarithm of input prices. Using this conditional variance matrix estimate the regression

$$s_{1t} = \beta_0 + \beta_1 y_{1t} + \beta_2 y_{2t} + \epsilon_t \quad (3)$$

where s_{1t} is the Share of Purchased Inputs, y_{1t} is the Logarithm of Livestock Output, and y_{2t} is the Logarithm of Crop Output.

8. Using the data from Moss, Erickson, Ball, and Mishra (2003) estimate the share equation for farm labor

$$s_{2t} = \alpha_0 + \alpha_1 \ln[w_{1t}] + \alpha_2 \ln[w_{2t}] + \alpha_3 \ln[w_{3t}] + \alpha_4 \ln[y_{1t}] + \alpha_5 \ln[y_{2t}] + \epsilon_t \quad (4)$$

where s_{2t} is the share of cost spent on labor, w_{1t} is the price of purchased inputs, w_{2t} is the price of labor, w_{3t} is the price of capital, y_{1t} is the level of livestock output, and y_{2t} is the level of crop output. Estimate the variance matrix and construct a t-Test for each parameter. Present these results along with the p-Values in a table of results.

9. Using the specifications from Problem 8, estimate the restricted least squares specification imposing homogeneity

$$\alpha_1 + \alpha_2 + \alpha_3 = 0. \quad (5)$$

Present these results in a table including the standard errors of the estimates.

10. Using the specifications from Problem 8, test the homogeneity restriction $\alpha_1 + \alpha_2 + \alpha_3 = 0$.
11. The effect of ethanol on the demand for corn and, hence, on other crops has been an frequently cited policy issue over the past three years. An important consideration in this problem is the relationship between corn prices and livestock prices. Using the data from AgPrices.xls estimate

$$d_t = \beta_0 + \beta_1 p_{1t} + \beta_2 p_{2t} + \beta_3 p_{3t} + \beta_4 p_{1,t-1} + \beta_5 p_{2,t-1} + \beta_6 p_{3,t-1} + \epsilon_t \quad (6)$$

where d_t is the logarithmic difference between feed grain prices and food grain prices, p_{1t} is the logarithm of meat animal prices, p_{2t} is the logarithm of dairy prices, and p_{3t} is the logarithm of poultry prices. Test the assumption that the lagged prices are not important

$$\beta_4 = \beta_5 = \beta_6 = 0. \quad (7)$$