

Econometrics II

Spring 1999

Assignment 5

Due Date: March 2 (in class).

The first part of this assignment is computational in nature (questions 1-4). Attached you will find a codebook for a data set which comes from *Consumer Demand and Labor Supply* by William Barnett (North-Holland, 1981). You will be investigating demand relations for the FOUR goods: 1 (perishables), 2 (semi-durables), 3 (durables), and 4 (services). You will ignore the demand for leisure in this assignment. You are to use only data from the years 1890-1941 in carrying out the empirical analysis [so as not to have to deal with the missing data problems which occur during the WWII years].

Begin by creating per capita consumption measures by dividing total expenditures on the four items in each year by the population size in that year. After that, form the quantities you will need to estimate the estimable form of the Rotterdam model which we derived in class. In particular, we have

$$w_{it}^* Dq_{it} = \mu_i Dq_t + \sum_{j=1}^3 \pi_{ij} (Dp_{jt} - Dp_{4t}) + \varepsilon_{it}, \quad i = 1, 2, 3$$

where

$$\begin{aligned} w_{it}^* &= \frac{w_{i,t-1} + w_{it}}{2} \\ w_{it} &= \frac{p_{it} q_{it}}{\sum_{j=1}^4 p_{jt} q_{jt}} \\ Dx_t &= \ln\left(\frac{x_t}{x_{t-1}}\right) \text{ [defines the } D \text{ operator]} \\ Dq_t &= \sum_{j=1}^4 w_{jt}^* Dq_{jt} \end{aligned}$$

The random vector $(\varepsilon_{1t} \varepsilon_{2t} \varepsilon_{3t})$ is i.i.d., with mean vector 0 and contemporaneous covariance matrix Σ .

1. Estimate the parameters μ and π using OLS. Is the OLS estimator consistent in this model? Is it efficient [i.e., BLUE] when no restrictions are placed on the behavioral parameters?

2. Obtain consistent estimates of the covariance matrix Σ . Define the estimated covariance matrix as $\hat{\Sigma}$.
3. Reestimate the demand model under the restriction

$$\pi_{12} = \pi_{21}$$

$$\pi_{13} = \pi_{31}$$

$$\pi_{23} = \pi_{32}$$

using a Feasible GLS estimator. Assuming that the errors are normally distributed [and ignoring the fact that Σ is not known but is estimated], perform a test of the restrictions. Defend the reasonableness of your test in the light of demand theory and conventional statistical practice. Given that Σ is in fact not known, do you think your test is too “liberal” or too “conservative”?

4. Derive a consistent estimate of μ_4 , including its asymptotic standard error. [For this you should employ the “delta-method” technique.]
5. Consider a system of two seemingly unrelated regressions in which the regressors in the second equation are a proper subset of the regressors in the first equation. Show that the OLS estimator of β_2 is the same as the SUR estimator of β_2 . You may assume that the contemporaneous covariance matrix of the disturbances is known.

Codebook for AGGDEM

Column	Variable
1	Year
2	Population Size (1000s)
	Quantities
3	Perishables
4	Semi-Durables
5	Durables
6	Services
7	Leisure
	Prices
8	Perishables
9	Semi-Durables
10	Durables
11	Services
12	Leisure
	Other Information
13	Leisure Consumption
14	Wage Rate
15	Unemployment Rate