

Gretl Workshop 4B

Model Specification
Review of gretl procedures

Data for Gasoline Demand Fct

- Start gretl
- Click on File/Open data/sample file and choose **greene tab** double click on **Greene7_8** data file.
- Look at variable definitions and consider which variables go into a demand function.

Theoretical Specification

- What are the usual variables in a demand function?
- What role might the price of cars and the price of public transportation play in the demand model?
- How might the aggregate price indexes P_d , P_n , P_s enter into a model for the demand for gasoline?

Empirical Specification

- How should population enter into the model?
- Would you prefer a model that is linear or nonlinear in the variables? Why?

Variable Transformations

- Define real (relative) price variables.
- Use Add/define new variable and enter the formulas (pay attention to upper case/lower case letters)
- $P_{ncr} = P_{nc} / P_d$
- $P_{ucr} = P_{uc} / P_d$
- $P_{gr} = P_{gr} / P_n$
- $P_{ptr} = P_{pt} / P_s$

Variable Transformations

- Define per capita variables for gasoline consumption and income.
- Use Add/define new variable and enter the formulas,
- $G_{pc}=G/Pop$
- $Y_{pc}=Y/Pop$
- Use Add/time trend to create “time”

Variable Transformations

- Take logs of all variables you have created (Gpc, Ypc, Pgr, Pncr, Pucr, Pptr).
 - Hold down the ctrl key and click on all six of these variables to highlight them.
 - Choose Add/logs of selected variables.
 - This creates l_Gpc, etc. to indicate the log of Gpc.

Save your data

- Choose File/Save data/save
- This will save all new and original variables in a file named greene7-8, but in the user subdirectory.

Regressions

- Estimate the double-log demand model
- Choose Model/ordinary least squares and
 - I_Gpc is dependent variable (double click on this variable to set it as the default dependent variable)
 - I_Pgr, I_Pncr, I_Pucr, I_Pptr, I_Ypc are explanatory variables
 - You can use ctrl-click to select all five explanatory variables at once.

Interpretation

- What is own price elasticity of demand?
- What is income elasticity of demand?
- What are cross price elasticities with respect to new cars, used cars, and public transportation? What signs do you expect for these cross price elasticities and why?
- Test the significance of each elasticity using 5% one-tailed tests.

Model 1: OLS estimates using the 36 observations 1960-1995
Dependent variable: I_Gpc

VARIABLE	COEFFICIENT	STDERROR	T STAT	P-VALUE
const	-5.62858	0.511035	-11.014	<0.00001 ***
I_Ypc	1.66562	0.117736	14.147	<0.00001 ***
I_Pgr	-0.209770	0.0352978	-5.943	<0.00001 ***
I_Pptr	-0.0317361	0.0746973	-0.425	0.67397
I_Pncr	-0.301922	0.146579	-2.060	0.04819 **
I_Pucr	-0.0864846	0.0509702	-1.697	0.10009

Unadjusted R-squared = 0.9779

Adjusted R-squared = 0.974217

F-statistic (5, 30) = 265.494 (p-value < 0.00001)

Diagnostics

- From the output window choose
Graphs/fitted, actual plot/against time
 - Notice how the model tracks the period of oil price shocks (1974 and 1979-1981)
- From the output window choose
Tests/normality of residual.
 - Do the residuals pass the Jarque-Bera test reported in the upper left corner? (What is the null hypothesis; what is the p-value?)

Another Model

- From the main gretl window choose Model/ordinary least squares and add “time” as another explanatory variable (dependent variable is still I_Gpc).
- What is the theoretical reason for including time? What could time be approximating?
- How do you interpret the coefficient estimate on this variable (.003)?

Back to original model

- In main window go to Model/Ordinary least squares, and remove time from the regression. Then ok.
- Minimize, but do not close, this output window.

Importance of theory in model specification

- Based on theory of the consumer, all prices and income were put in real terms.
- Theory of individual consumer suggests per capita form.
- Suppose we had ignored theory and just used nominal variables and not per capita forms?

Model with raw data (logs)

- In main gretl window, use ctrl-click to highlight G, Y, Pg, Pnc, Puc, Ppt, Pop
- Choose Add/logs of selected variables.
- Go to Model/ordinary least squares and choose I_G as dependent, and I_Y, I_Pg, I_Pnc, I_Puc, I_Ppt, I_Pop as independent variables (should be last 6 variables in list)

Model 2: OLS estimates using the 36 observations 1960-1995

Dependent variable: I_G

VARIABLE	COEFFICIENT	STDERROR	T STAT	P-VALUE
const	-9.14555	1.84637	-4.953	0.00003 ***
I_Pg	-0.0926626	0.0301961	-3.069	0.00463 ***
I_Y	1.98770	0.202518	9.815	<0.00001 ***
I_Pnc	0.105085	0.138465	0.759	0.45402
I_Puc	-0.0997882	0.0743772	-1.342	0.19012
I_Ppt	-0.0333806	0.0832224	-0.401	0.69129
I_Pop	-0.641761	0.614642	-1.044	0.30506

Unadjusted R-squared = 0.988756

Compare the two models

- Which model has more statistically significant elasticities?
- Are there any important differences in the point estimates of particular elasticities?
- What do these comparisons say about the use of economic theory in model specification?

Lessons

- Use economic theory to choose exact definitions of variables
- Demand theory is in real terms, so that prices and incomes should be deflated appropriately