HOMEWORK #2

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Since the oil shock of 1973 there has been a continuing controversy about tax policy for gasoline and other petroleum distillates. Of course, a reliable model for demand is needed for any such debate. In this Problem Set we will analyse U.S. postwar demand for gasoline and some aspects of tax policy. Suppose you have been asked to help the U.S. government to devise an optimal gas tax strategy - you are supposed to infer what consequences should be expected after gas tax increase. In your data file **p** denotes "1982 dollar" price of gas per gallon, **z** is annual income in thousands of 1982 dollars and finally **q** is the consumption of gas in thousands of gallons.

A general dynamic model for the demand for gasoline could be written as:

$$y_t = \alpha_0 + \left(\alpha_1 \cdot y_{t-1} + \sum_{j=1}^{r-1} \delta_j \cdot \Delta y_{t-j} \right) + \beta x_t + \sum_{j=0}^{s-1} \gamma_j \cdot \Delta x_{t-j} + u_t \qquad \textbf{(1)}$$

where all variables are in logarithms. In our specification the vector **x** contains real prices **p** and personal income **z**. The dependent variable is per capita personal consumption of gasoline **q**.

1) Estimate model (1) with r=2, s=2 and use Schwarz-Bayes Information Criterion to simplify model. How does your simplification procedure result change in case of the Akaike Information Criterion and Amemiya's (prediction) criterion? What is the best model if you use the adjusted R^2?

Take the best model using SB crit. and do the following tasks:

2) Compute the long-run income and price elasticities corresponding to your final model. Compare with results you would get from the simple static model. Try to interpret the differences. What revenue implication do these long run elasticities have for contemplated increases in the gasoline tax? Hint: The simple static model has a form:

$$q_t = \alpha_0 + \beta_p \cdot p_t + \beta_y \cdot y_t + u_t \qquad \textbf{(2)}$$

3) Are there any seasonal shifts in the dynamic model? I.e., test whether the intercept term α_0 depends upon seasonality of the quarterly observations.

4) Are the error terms u_t serially correlated?

5) What price would yield maximum revenue? And how many? Note: Rev.=Price*Quantity