ECNS 309, Fall 2014

Practice Problems #3

1. Suppose you want to estimate the demand function for retail-level gasoline. The following table that describes the purchases of gasoline (in thousands of gallons per day) across Rocky Mountain states, the price per gallon, and the population (in millions) in each state.

State	**Consumption**	**Price**	**Population**
Arizona	628	$2.35	6.39
Colorado	858	$2.25	5.03
Idaho	57	$2.43	1.57
Montana	32	$2.39	0.99
Nevada	71	$2.41	2.70
New Mexico	470	$2.36	2.06
Utah	104	$2.42	2.76
Wyoming	24	$2.34	0.56

Sources: Consumption and price data are from the U.S. Energy Information Administration for 2010. Population data are from the U.S. Census Bureau.

The following have to be completed by hand. You can use Excel to check your answers, but it is important that you understand how to solve these statistics without the aid of a computer.

(a) In estimating the demand function for retail-level gasoline, set up a theoretical model. That is, identify the dependent variable and the independent regressor variables that may be factors in affecting changes in the value of the dependent variable. At least five regressor variables must be identified and included in the model. Provide the model in both a linear and exponential forms.

(b) Consider the model $Q_{\text{gas}} = \alpha + \beta P_{\text{gas}} + e$.

i. Estimate the parameters of the model.

ii. Determine the standard error of the parameter associated with the price of gasoline. Test the hypothesis that the estimated parameter is not equal to zero.

iii. Determine the adjusted R^2 for the regression model.

iv. Within the context of your findings in (i)–(iii), discuss the economic interpretation and implications of these findings.

(c) Consider the model $Q_{\text{gas}} = \alpha + \beta_1 P_{\text{gas}} + \beta_2 \text{Pop} + e$.

i. Estimate the parameters of the model.

ii. Determine the standard error of the parameter associated with the price of gasoline. Test the hypothesis that the estimated parameter is not equal to zero.

iii. Determine the adjusted R^2 for the regression model.

iv. Within the context of your findings in (i)–(iii), discuss the economic interpretation and implications of these findings.

2. Suppose that you are estimating an exponential demand function, $Q_i = \alpha P_i^{\beta_1} P_j^{\beta_2} e$, where I represents income. You determine the following covariance matrix:

	log Q_i	log P_i	log P_j
log Q_i	1.43	-1.98	0.99
log P_i	-1.98	3.72	1.11
log P_j	0.99	1.11	2.15

Furthermore, $\overline{\ln Q} = 1.33$, $\overline{\ln P_i} = 0.29$, and $\overline{\ln P_j} = 0.16$.

(a) Determine the parameter estimates for log-transformed form of demand function.

(b) Discuss the economic interpretation of the estimated parameters.

(c) Given the estimated parameter values, present the demand function in its original exponential form.

3. You are considering the market for beer. You need to empirically estimate the demand function for this product.

(a) Download the data set **ps3_data.xls** from the course website (`http://www.montana.edu/bekkerman/classes/ecns309/ps3_data.xls`). There two datasets. The first contains information about state-level aggregate beer consumption (in gallons), state population, and the average price for six packaged 12-ounce units. The second contains the state-level tax rate per gallon of produced beer.

(b) Merge the two datasets by the state name. Hint: In Excel, use the VLOOKUP function. (It is your responsibility to learn how to use this function. Google is an excellent resource for guides and examples.)

(c) Consider the per-capita beer demand model, $\frac{\text{Consumption}}{\text{Person}} = \alpha + \beta_1 \text{Price} + \beta_2 \text{Tax} + e$.

i. Put together a table of standard summary statistics about the central tendency and dispersion of each variable in the model.

ii. Use scatter plots to graphically represent the relationship between each of the variable pairs. You should present three scatter plots. Interpret the relationship and provide economic insights/reasoning for why a certain relationship is observed.

iii. Estimate the model parameters. Interpret these parameters in terms of the statistical significance and the economic significance.

iv. Determine and interpret the model fit statistic, R^2.

(d) Now consider the per-capita exponential beer demand model, $\frac{\text{Consumption}}{\text{Person}} = \alpha \text{Price}^{\beta_1} \text{Tax}^{\beta_2} e$.

i. Convert each variable in the model to transform the exponential model into its log-log counterpart.

ii. Estimate the model parameters. Interpret these parameters in terms of the statistical significance and the economic significance.

iii. Determine and interpret the model fit statistic, R^2.

iv. Use the parameter estimates to represent the estimated beer demand in the original exponential form.