Homework 1

INSTRUCTIONS: For the empirical exercises, please submit the SAS log files and computer output. The deadline for the assignment is Wednesday, April 19 at 4:30 pm. Late assignments will be penalized at a rate of 50% per calendar day late. Only ECON 524 students are required to do the Project Exercises at the end of the assignment.

Empirical Exercises

Download Data for Homework 1 from my website. The data set includes the variables year (YEAR), real advertising expenditures (AD), and real net profits (PROFIT) for the brewing industry from 1950-2004. Advertising expenditures is expressed in millions of dollars and net profits in thousands of dollars. Both are in real terms (1982 = 100).

1. Consider the economic model, \( PROFIT = \alpha_1 + \alpha_2 AD \). Do you expect that \( \alpha_2 < 0 \), \( \alpha_2 = 0 \), \( \alpha_2 > 0 \), or that \( \alpha_2 \) may be positive or negative. Explain your answer.

2. a. Using SAS, plot a scatter diagram with AD on the horizontal axis and PROFIT on the vertical axis.

b. Does it look like advertising increases, decreases, or has no effect on profit?

3. a. How much did the brewing industry spend on advertising in 2004? (Be sure to state the units of measurement.)

b. Use SAS to find out the average level of real advertising expenditures, and the average level of real net profits, in the brewing industry between 1950-2004.

c. What was the minimum value of advertising over the period? What was the maximum value of profits over the period?

4. a. Estimate the following equation using regression analysis and plot it on a scatter diagram.

\[ PROFIT_t = \beta_1 + \beta_2 AD_t + e_t \]

b. What is the estimated value of \( \beta_2 \) (i.e., \( b_2 \)) from (a)? Interpret the value verbally. Be sure to consider the units of measurement for the two variables as described above.

c. Does the estimated value \( b_2 \) have the sign that you expected in question (1)?

Analytical Exercises

1. Exercises from the textbook: 2.2, 2.8, 2.20, 3.1, and 3.13.

2. Find the expected value of the variable to the left of the = sign in each of the following equations and simplify the equation as much as possible. The terms a, b, and m are constants, while y, x and e are random variables.
i. \[ y = mx + b \]

ii. \[ e = y - a - bx \]

iii. \[ y = a + bx + e \] and the expected value of e is zero, i.e., \( E(e) = 0; \)

3. Let \( X_1, X_2, \ldots, X_n \) be independent random variables that all have the same probability distribution, with mean \( \beta \) and variance \( \sigma^2 \). Consider the following estimator,

\[
\hat{\beta} = \left[ \frac{1}{n-1} \sum_{i=1}^{n} X_i \right].
\]

Is \( \hat{\beta} \) an unbiased estimator of \( \beta \)? Prove your answer.

ECON 524 Project Exercises

1. Provide 3 possible topics for your project. Hone your topics from a general area to a specific area to a question of the form, how do \( X_1 \) and \( X_2 \) affect \( Y \), or how does \( X_1 \) affect \( Y \) holding \( X_2 \) constant? See examples of general and specific topics on the next page.

2. Find data that could be used to support at least 1 of the 3 topics. Write down the reference for the data and define the variables which would be used. Because of the limited time for the paper, you may want to find the data first and then propose a topic or topics.

Tips for Project Exercises

As a general resource on how to conduct research, including how to find a topic, you might be interested in a book called *The Craft of Research* by Booth, Colomb and Williams. It is available under ECON 428 in the textbook section of the Bookstore and may be available in the general section.

For everything you ever wanted to know about economics, including links to data sources, see American Economic Association’s webpage, *Resources for Economics on the Internet (RFE)*, edited by Bill Goffe, [http://www.aeaweb.org/RFE/](http://www.aeaweb.org/RFE/)

Here are some website sources of economic data:

- President’s Economic Report— [http://w3.access.gpo.gov/eop](http://w3.access.gpo.gov/eop)

Here are some tips on finding a topic:

Your coursework will often pique your interest in specific topic areas. You might pursue a question that came to you in your studies or an extension or twist on the material studied.
Economic questions of interest are often raised in the newspaper, Wall Street Journal, Business Week and other outlets.

Another approach is to go to the library and browse through recent issues of economics journals to find articles of interest.

You can also look at the major topic areas classified by ECONLIT (the electronic data base for economics journals) on http://www.econlit.org/subject_descriptors.html:

A - General Economics and Teaching
B - Schools of Economic Thought and Methodology
C - Mathematical and Quantitative Methods
D - Microeconomics
E - Macroeconomics and Monetary Economics
F - International Economics
G - Financial Economics
H - Public Economics
I - Health, Education, and Welfare
J - Labor and Demographic Economics
K - Law and Economics
L - Industrial Organization
M - Business Administration and Business Economics • Marketing • Accounting
N - Economic History
O - Economic Development, Technological Change, and Growth
P - Economic Systems
Q - Agricultural and Natural Resource Economics
R - Urban, Rural, and Regional Economics
Z - Other Special Topics

If you click on a topic from the list above, a more detailed list of topics will appear. For example, the list below will appear if you click on

I - Health, Education, and Welfare

I000 - Health, Education, and Welfare: General
I100 - Health: General
I110 - Analysis of Health Care Markets
I120 - Health Production: Nutrition, Mortality, Morbidity, Substance Abuse and Addiction, Disability, and Economic Behavior
I180 - Health: Government Policy; Regulation; Public Health
I190 - Health: Other

I200 - Education: General
I210 - Analysis of Education
I220 - Educational Finance
I230 - Higher Education Research Institutions
I280 - Education: Government Policy
I290 - Education: Other

I300 - Welfare and Poverty: General
I310 - General Welfare; Basic Needs; Living Standards; Quality of Life; Happiness
I320 - Measurement and Analysis of Poverty
I380 - Welfare and Poverty: Government Programs; Provision and Effects of Welfare Programs
I390 - Welfare and Poverty: Other