Homework Assignment 6: Due at the beginning of class 10/9/02

The specific learning goals of this assignment are for you to:

- Use graphical and numerical tests to determine whether a given set of data is perfectly linear or not.
- Create linear functions to approximate the trend in a set of data points.
- Use your linear functions to make predictions about the future performance of an economy.
- To examine the appropriateness of continuing with a linear model when circumstances change.

Note: To expedite your work in Questions 3 and 4, preformatted tables are available as a separate file if you would like to use them. If you need it, the data used to construct Figure 1 is also available as a separately file.

On Thursday March 17, 1988, at 10:45am in the Bronx Vernia Brown was killed by a stray bullet[1]. The bullet was fired by a man who was involved in a dispute over illegal drugs. Vernia Brown, 19, was not involved in the dispute; she was simply walking down a public street, on her way home from a convenience store where she had just purchased milk, bread and baby formula.

The circumstances of Vernia Brown's death were both tragic and tragically common. A few days after Vernia Brown was killed, New York City Deputy Chief of Police Raymond W. Kelly announced in a press conference that during 1987, 38% of murders in the city had been drug-related[2].

Advocates of drug decriminalization often argue that obviating criminal penalties for illicit drug possession and distribution will significantly reduce the amount of drug-related violent crime[3]. However, these arguments rest on an unstated assumption: That legal prohibition of a substance produces violent crime in the first place. In this homework assignment you will investigate the link between prohibition and violence.

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[1] *New York Times*, March 19, 1988, p. 29.

[2] *New York Times*, March 23, 1988, p. B1.

[3] For examples, see:

- Ostrowski, J. 1989. Thinking about drug legalization. *Cato Institute Policy Analysis Report #121*. Washington DC: Cato Institute.
- Eldredge, D. C. 1998. *Ending the War on Drugs. A Solution for America.* Bridgehampton NY: Bridge Works Publishing Company.
- Gray, M. 2000. *Drug Crazy. How We Got Into this Mess and How We Can Get Out.* New York: Routledge.

1. The United States' first large scale experiment with prohibition was the Volstead Act of 1919. The Volstead Act introduced the Eighteenth Amendment to the Constitution of the United States, specifically prohibiting the importation, manufacture, sale, consumption and possession of alcoholic beverages. Figure 1[4] gives a graph of murder and firearms assault **rate**. The quantity graphed on the vertical axis is the **rate** at which a group of 100,000 people experienced either murder or assault involving a firearm. The units of this rate are:

$$\text{Units} = \frac{\text{Number of murders and firearm assaults experienced by group of 100,000 people}}{\text{Years}}$$

The Volstead Act took effect on January 1, 1920, and it was repealed on December 5, 1933, with the ratification of the Twenty-first Amendment to the Constitution. In a few sentences, describe any features of Figure 1 that seem to suggest that there might be a link between prohibition and violent crime.

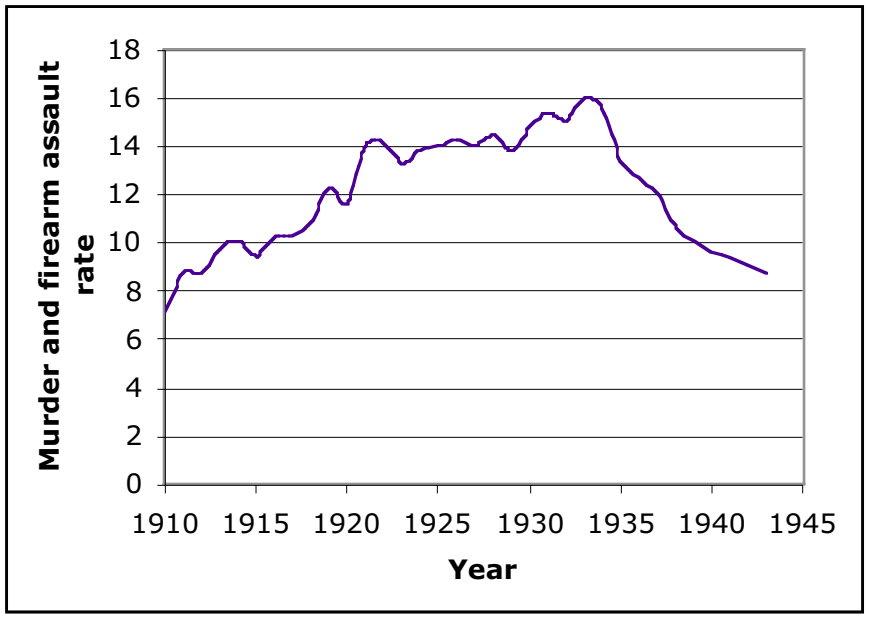

Figure 1: Murder and firearm assault rate for the United States, 1910-1943.

2. One way to understand exactly what information Figure 1 is displaying is to relate Figure 1 to some mathematics that you are already very familiar with. Assigning:

- **Independent variable (x):** The amount of time (in years) since January 1, 1910.
- **Dependent variable (y):** The total number of murders and firearm assaults experienced by a group of 100,000 people since January 1, 1910.

[4] The data used to create Figure 1 was obtained from: U.S. Bureau of the Census. 1975. *Historical Statistics of the United States. Colonial Times to 1970.* Washington DC: Unites States Department of Commerce.

Figure 1 can be understood as the graph of the rate of change,

$$\text{Rate of change} = \frac{\text{Change in } y}{\text{Change in } x}.$$

Given this way of thinking about Figure 1, briefly explain why y will be an *increasing* function of x and why it is reasonable to use the value $y = 0$ when $x = 0$.

3. Using a "run" of one year, approximate the value of the function y at the beginning of the Prohibition Era (January 1, 1920). Use your approximation to calculate the number of murders or firearm assaults that the average American would have experienced between January 1, 1910 and January 2, 1920.

4. Again using a "run" of one year, approximate the value of the function y at the end of the Prohibition Era. (Use January 1, 1934 as the end of the Prohibition Era for this calculation.) How many murders or firearm assaults would the average American have experienced during the Prohibition Era?

5. Based on your answers to Questions 3 and 4, how did your chances of being murdered or assaulted with a firearm during the Prohibition Era compare with your chances in the decade before Prohibition? Do you think that Prohibition Era violent crime made life noticeably different for the average American? If you were a politician during the Prohibition Era, how could you have capitalized on these figures to advance your career?