**Homework 1: Competition in homogenous products markets (20 points)**

To hand in by 28 August

You are provided with data which was used for estimation in the paper by Porter (1983). The data includes the following information:

* Consecutive weeks between years 1880 and 1886 (week)
* Grain rate in dollars per 100 lbs (GR)
* Total quantity of grain shipped in tons (TQG).
* A dummy variable equal to one if the Great Lakes were open to navigation (Lakes).
* Cheating dummy variable equal to one if colluding was reported by Railway Review and zero otherwise (PO).
* Dummy variable equal to 1 from week 28 in 1880 to week 10 in 1883; and 0 otherwise reflecting entry by the Grand Trunk Railway (DM1).
* Dummy variable equal to 1 from week 11 in 1883 to week 1 in 1886; and 0 otherwise reflecting an addition to New York Central (DM2).
* Dummy variable equal to 1 from week 26 in 1883 to week 11 in 1886; and 0 otherwise reflecting entry by the Chicago and Atlantic (DM3).
* Dummy variable equal to 1 from week 12 to week 16 in 1886; and 0 otherwise reflecting departure of the Chicago and Atlantic from the JEC (DM4).
* Month dummies, where there are 13 months per year because a month is defined by 4 weeks periods (seas).

Your task is as follows:

1. (2 points) Compute the sample statistics and compare to those given in the paper (Table 2). They may not match exactly. Plot price and quantities against time.
2. (4 points) Write down demand function which you will estimate. Analyze graphically dependence between prices and quantities. Suggest alternative specifications of demand. Comment on what basis would you choose between different specifications of demand?
3. (4 points) Estimate demand equation using ordinary least squares (OLS) and instrumental variables (2SLS) and conclude on price elasticity and other estimates. Include month dummies in the regression. Comment on what is the appropriate demand estimation method and why. STATA command is ivregress and instruments to be used DM dummies and PO dummy. Argue why these are good instruments.
4. (4 points) Write down first order condition and resulting supply equations which you will estimate. Explain the interpretation of particular parameters.
5. (3 points) Estimate supply equation following the first approach in the paper, where conduct shifts from cartel to collusion are known based on the price war dummy variable (PO). In addition, include month dummies and entry dummies. Comment on what is the appropriate estimation method.
6. (3 points) Discuss estimation results and calculate conduct parameter. What is the interpretation of estimated conduct parameter?