Final, Econ 513, USC, Fall 2010

Problem 1. In a study the effect of participation in the Vietnam war on income is studied. Income is measured as the average income over ten years after return from the war. We consider males who were born in 1949. They turned 18 in 1967. The US army during the Vietnam war was mainly an army of conscripts. Not all members of the 1949 cohort served in Vietnam. Let y denote average income and d an indicator variable for participation in the war.

a.(10) Formulate a linear regression model that relates y to participation in the war.

b.(20) Under what assumption does the model in a. estimate the causal effect of participation in the war? Is this assumption likely to hold in this case? Argue why (not). What is the likely direction of the bias (argue!). Hint: Not all members of the 1949 cohort were conscripted, not all conscripts served, and some who served were not conscripted.

c. (10) If the assumption in a. were to hold, would the model in a. require that the effect of participation is the same for all participants in the war? If the effect is not the same what causal effect is estimated?

The conscripts were selected in the 1949 birth cohort by a lottery. In December 1966 all birthdays in 1967 were randomly assigned a number 1 to 365. For instance, January 1 was assigned 22, January 2 was assigned 311, etc. All men of the 1949 cohort with a birthday with a number less than 121 were conscripted. These conscripts had to undergo a medical check. Denote the conscription indicator by z.

d.(20) How can you use z to estimate the causal effect of participation in the Vietnam war on income? Does z satisfy the requirements for this method?

e.(10) What causal effect can be estimated using z by the method in c. Hint: Do not assume the all participants have the same effect of the war.

Men knew their conscription status in December 1966.

f.(10) If deferred service was granted to those men who enrolled in college, would z still satisfy the assumptions in c.? Hint: Deferred service meant in many cases that the individual did not serve in Vietnam.

Problem 2. Let d_{it} be an indicator of whether a particular drug is taken by i in period t with $t = 1, \ldots, T$. Let y_{it} be the result of a medical test (e.g. a blood test). When prescribing the drug the physician takes into account (i) characteristics of the patient, (ii) previous test results.

a.(10) Does a simple linear regression of y_{it} on d_{it} estimate the causal effect of the drug? Why (not)?

b.(10) If $T = 2$, the drug was not available in period 1 and became available in period 2, how would you check for selective prescription in period 2?

c.(20) Under what assumption can you estimate the causal effect of the drug? What causal effect, if not everyone has the same response to treatment?

d.(10) For $T \geq 3$ and no restriction on d_{it}, formulate a panel data model for the relation between y_{it} and d_{it}. Assume that everyone has the same response to treatment.

e.(20) Does the FE estimator give a consistent estimator of the effect of the drug? Why (not)? Does the FD estimator give a consistent estimator of the effect of the drug? Why (not)? Hint: Consider both (i) and (ii).