Econ 717 Problem Set 2

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March 9, 2022

Question 0

I dropped 2,490 observations in the PSID comparison group.

Question 1

I regressed 1978 earnings on age, age squared, education, and indicators for black, Hispanic, married, no degree, and earnings in 1974 and 1975. As we can see, there is a large treatment effect of $818, which is also significant at a 90% confidence level. Note, it is important to include covariates beyond just the treatment indicator to control for effects that may be due to heterogeneity between treated and untreated populations.

*I have worked on this problem set with Emily Case and Alex von Hafften.

VARIABLES	(1) re78
treated	818.7*
	(468.2)
age	-145.9
	(214.1)
age2	2.799
	(3.585)
educ	206.8
	(181.8)
black	-1,461*
	(801.6)
hisp	100.5
	(1,047)
married	133.9
	(655.5)
nodegree	-405.9
	(747.6)
re74	0.0871
	(0.0710)
re75	0.0840
	(0.0880)
Constant	5,649
	(3,677)
Observations	722
R-squared	0.045

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Question 2

I drop observations that are both in the experiment and that receive the treatment. For the remainder of this problem set, I have defined a new variable, treated2, which is equal to 0 for individuals in the CPS comparison group and equal to 1 for individuals in the experimental control group. Note, no one remaining in the sample actually received the treatment - this definition allows us to identify differences in the individuals that chose to be included in the experiment (despite not being treated) compared to individuals in the CPS data.

Question 3

The probit estimation for propensity scores are as follows. The probit assigns an estimated probability of being in the experimental group to each individual, based on the characteristics included as regressors. The first column shows the probit coefficients for the coarse propensity scores, and the second column shows the probit coefficients for the rich propensity scores.

	(1)	(2)
VARIABLES	treated2	treated2
age	0.253***	0.322***
	(0.0293)	(0.0316)
age2	-0.00453***	-0.00548***
	(0.000493)	(0.000530)
educ	0.0169	0.0178
	(0.0181)	(0.0183)
black	1.990***	1.950***
	(0.0778)	(0.0796)
hisp	0.973***	0.978***
	(0.103)	(0.106)
married	-1.101***	-0.909***
	(0.0826)	(0.0869)
nodegree	1.133***	1.071***
	(0.100)	(0.104)
re74		-1.07e-06
		(8.60e-06)
re75		-5.76e-05***
		(9.56e-06)
Constant	-6.358***	-7.108***
	(0.483)	(0.509)
Observations	16,417	16,417

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Question 4

The descriptive statistics suggest that the average propensity scores for the experimental control group are higher than the propensity scores for the CPS comparison group. However, the minimum propensity score is 0 for each group and each specification. Further, the maximum propensity score for both groups under the coarse specification is 0.69, and the maximum propensity score for both groups under the rich specification is about 0.8. This implies that although the mean propensity scores are very different across groups, the supports of each group are roughly the same. This implies that the density of propensity scores in the CPS comparison group is heavily weighted around a score of 0.

Descriptive Statistics: Coarse Propensity Scores

	Mean	SD	Min	Median	Max	N
0	0.02	0.07	0.00	0.00	0.69	15,992
1	0.39	0.23	0.00	0.47	0.69	425
Total	0.03	0.09	0.00	0.00	0.69	16,417

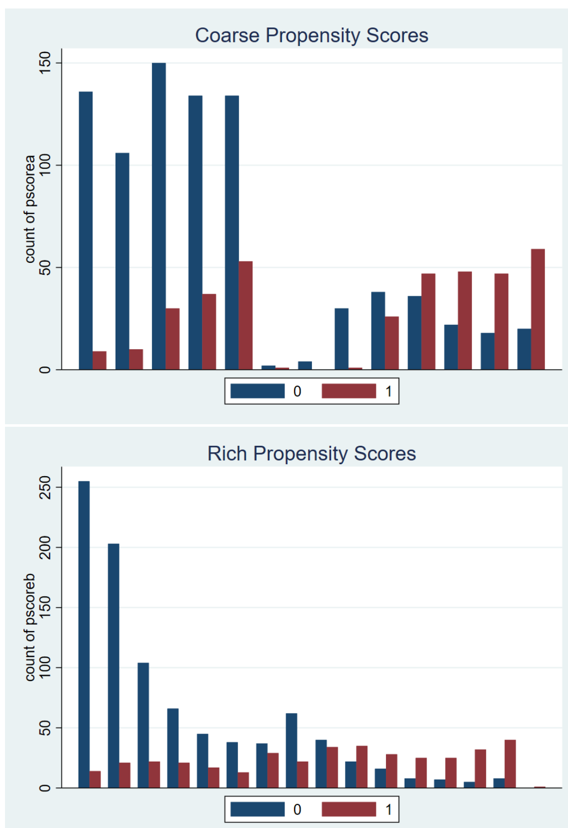
Descriptive Statistics: Rich Propensity Scores

	Mean	SD	Min	Median	Max	N
0	0.02	0.06	0.00	0.00	0.79	15,992
1	0.42	0.25	0.00	0.46	0.80	425
Total	0.03	0.10	0.00	0.00	0.80	16,417

Question 5

In the histograms below, I show the distributions of the propensity scores for each specification. As discussed in question 4, the CPS comparison group has a large density mass at a score of 0. Because these scores do not match well with the scores in the experimental control group, I do not include them in the histograms. This also makes the histograms much easier to read.

As we can see, even after removing propensity scores equal to 0 from the sample,the propensity scores in the CPS comparison group still appear to be more heavily weighted towards a low score, while the propensity scores in the experimental control group appear more evenly distributed across the full support of the distribution.



Question 6

I matched observations using the single nearest neighbor matching without replacement, with the common support condition. As we can see in the table below, the non-experimental bias is significant and negative. This means that even after matching, the observations in the control group had lower earnings in 1978. The bias is lower when matching based on rich propensity scores. No observations are dropped due to the common support condition under the coarse scores, but 7 observations are dropped due to the common support condition under the rich scores.

	Unmatched	ATT for `pscorea`	ATT for `pscoreb`
Difference	-9756.61	-4439.07	-2340.78
SE	470.16	486.48	449.37

Question 7

I matched observations using the single nearest neighbor matching with replacement, with the common support condition. As we can see in the table below, the non-experimental bias is significant and negative, but lower than in question 6.

	Unmatched	ATT for `pscorea`	ATT for `pscoreb`
Difference	-9756.61	-3677.03	-1515.99
SE	470.16	934.5	707.62

Question 8

The standardized differences are in the table below. The standardized difference is smaller using the single nearest neighbor matching

	re74	re75
Raw Data	1.26	1.41
Matched using pscoreb	1.16	0.98

Question 9

Matching with a Gaussian kernel results in larger estimates of the experimental bias. The experimental bias is larger as the bandwidth gets bigger, but the standard error falls.

	Bandwidth = 0.02	Bandwidth = 0.2	Bandwidth = 2.0
Difference	-2349.09	-7043.43	-9772.13
SE	658.53	337.06	289.25

Question 10

Local linear matching results in experimental bias for the two smaller bandwidths that are negative, consistent with the Guassian kernel matches. However, now the sign of the difference for the largest bandwidth is negative and smaller in magnitude.

	Bandwidth = 0.02	Bandwidth = 0.2	Bandwidth = 2.0
Difference	-1980.88	-2421.42	993.88
SE	707.62	707.62	707.62

Question 11

I regressed real earnings in 1978, controlling for the new treatment definition, as well as age, age squared, education, and indicators for black, Hispanic, married, no degree, and earnings in 1974 and 1975. The coefficient on the treated2 variable is consistent with the bias estimates from matching - large in magnitude and negative.

VARIABLES	(1) re78
treated2	-1,853***
	(383.1)
age	-235.5***
	(40.54)
age2	1.858***
	(0.553)
educ	163.3***
	(28.42)
black	-832.4***
	(208.7)
hisp	-114.2
	(215.3)
married	199.4
	(148.0)
nodegree	296.6*
	(176.6)
re74	0.291***
	(0.0121)
re75	0.471***
	(0.0121)
Constant	7,757***
	(726.9)
Observations	16,417
R-squared	0.483

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Question 12

I regressed real earnings in 1978, using only the comparison group sample, controlling for age, age squared, education, and indicators for black, Hispanic, married, no degree, and earnings in 1974 and 1975. The coefficient on the treated2 variable is consistent with the bias estimates from matching - large in magnitude and negative. The first column of the table repeats the results from question 11 for comparison. As we can see, the coefficient estimates between the two regressions are within one standard deviation of each other (and usually less), which indicates that the much of the unobserved heterogeneity in the sample can be captured by the treated2 variable.

VARIABLES	(1) re78	(2) re78
treated2	-1,853***	
	(383.1)	
age	-235.5***	-252.0***
	(40.54)	(41.43)
age2	1.858***	2.041***
	(0.553)	(0.564)
educ	163.3***	166.6***
	(28.42)	(28.71)
black	-832.4***	-773.9***
	(208.7)	(215.0)
hisp	-114.2	-168.2
	(215.3)	(219.5)
married	199.4	244.1
	(148.0)	(150.5)
nodegree	296.6*	330.7*
	(176.6)	(179.4)
re74	0.291***	0.299***
	(0.0121)	(0.0122)
re75	0.471***	0.470***
	(0.0121)	(0.0122)
Constant	7,757***	7,908***
	(726.9)	(740.5)
Observations	16,417	15,992
R-squared	0.483	0.476

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Question 13

The inverse probability weighting estimate for the treatment effect on the treated is -1420.38 without rescaling and -9756.61 with rescaling.