

## 1. Instructions

**1 point**

For this assignment we will use data from Lalonde (1986), that aimed to evaluate the impact of National Supported Work (NSW) Demonstration, which is a labor training program, on post-intervention income levels. Interest is in estimating the causal effect of this training program on income.

First load the packages `tableone` and `Matching`:

```
>install.packages("tableone")
```

```
>install.packages("Matching")
```

```
>install.packages("MatchIt")
```

```
> library(tableone)
```

```
> library(Matching)
```

Now load the `lalonde` data (which is in the `MatchIt` package):

```
>library(MatchIt)
```

```
> data(lalonde)
```

The data have  $n=614$  subjects and 10 variables

**age** age in years.

**educ** years of schooling.

**black** indicator variable for blacks.

**hispan** indicator variable for Hispanics.

**married** indicator variable for marital status.

**nodegree** indicator variable for high school diploma.

**re74** real earnings in 1974.

**re75** real earnings in 1975.

**re78** real earnings in 1978.

**treat** an indicator variable for treatment status.

The *outcome* is  
re78 – post-intervention income.

The *treatment* is  
treat – which is equal to 1 if the subject received the labor training and equal to 0 otherwise.

The potential *confounding variables* are: age, educ, black, hispan, married, nodegree, re74, re75.

## Question 1

Find the standardized differences for all of the confounding variables (pre-matching). What is the standardized difference for married (to nearest hundredth)?

- ☐ 0.39
- ☐ 0.51
- ☒ 0.72
- ☐ 0.02

2. What is the raw (unadjusted) mean of real earnings in 1978 for treated subjects minus the mean of real earnings in 1978 for untreated subjects?

1 point

- ☒ -\$635
- ☐ \$1067
- ☐ \$219
- ☐ \$1229

### 3. Instructions

**1 point**

Fit a propensity score model. Use a logistic regression model, where the outcome is treatment. Include the 8 confounding variables in the model as predictors, with no interaction terms or non-linear terms (such as squared terms). Obtain the propensity score for each subject.

### Question 3

What are the minimum and maximum values of the estimated propensity score?

- ☐ minimum=0.390, maximum=0.67
- ☐ minimum=0.188, maximum=0.92
- ☒ minimum=0.009, maximum=0.85
- ☐ minimum=0.027, maximum=0.81

### 4. Instructions

**1 point**

Now carry out propensity score matching using the Match function.

Before using the Match function, first do:

```
>set.seed(931139)
```

Setting the seed will ensure that you end up with a matched data set that is the same as the one used to create the solutions.

Use options to specify pair matching, without replacement, no caliper.

Match on the propensity score itself, not logit of the propensity score. Obtain the standardized differences for the matched data.

## Question 4

What is the standardized difference for married?

- ☐ 0.007
- ☒ 0.027
- ☐ 0.721
- ☐ 0.235

5. For the propensity score matched data:

1 point

Which variable has the largest standardized difference?

- ☐ age
- ☐ nodegree
- ☐ re74
- ☒ black

## 6. Instructions

1 point

Re-do the matching, but use a caliper this time. Set the caliper=0.1 in the options in the Match function.

Again, before running the Match function, set the seed:

```
>set.seed(931139)
```

## Question 6

How many matched pairs are there?

- ☐ 429
- ☐ 614
- ☐ 185
- ☒ 111

## 7. Instructions

1 point

Use the matched data set (from propensity score matching with caliper=0.1) to carry out the outcome analysis.

## Question 7

For the matched data, what is the mean of real earnings in 1978 for treated subjects minus the mean of real earnings in 1978 for untreated subjects?

- ☒ \$1246.81

- ☐ \$499.58
- ☐ \$903.33
- ☐ -\$629.12

8. Use the matched data set (from propensity score matching with caliper=0.1) to carry out the outcome analysis.

1 point

Carry out a paired t-test for the effect of treatment on earnings. What are the values of the 95% confidence interval?

- ☐ (\$108.73, \$656.21)
- ☐ (-\$107.47, \$1091.53)
- ☒ (-420.03, 2913.64)
- ☐ (\$858.68, \$1747.89)

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