RD Robustness Project

Exercise: Drop outside OBW

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Introduction

The goal of this project is to test the robustness of the Regression-Discontinuity analysis to different extreme cases, via simulations, using the 'rdrobust' package.

This Document: Excercise #1

Replacing observations outside Optimal Bandwitdh (OBW) with zeros, or dropping them.

Select exercise type:

```
exercise="bwo"      # Type of exercise - "zero" or "bwo" ('bandwidth only')
```

Set Parameters

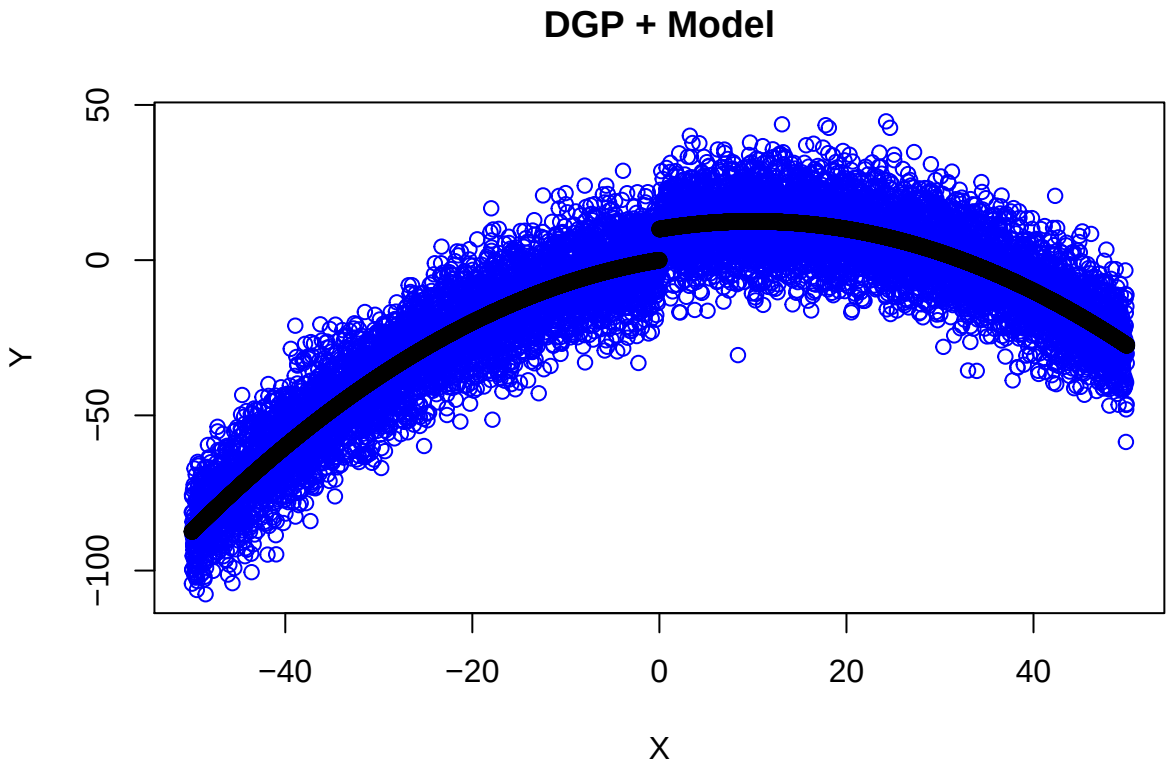
Here we set the main parameters for the excercise:

```
jump=10           # Size of jump at cutoff
loop=1000
figs.iter.save=5
quadratic=T       # T - quadratic DGP, F - linear
symm_obw="mserd"  # mserd - symmetric OBW, msetwo - asymmetric OBW
normal.x=T        # T - normal draws of x around cutoff, F - uniform draws
dgp.sd=10         # sd of normal noise added to DGP
bc=F              # bias-corrected estimates or conventional
```

Simulate DGP + Plot

```
## dataframe for dgp
df <- as.data.frame(matrix(0, ncol = 0, nrow = length(seq(-100,100,0.01))))
df$x=round(seq(-100,100,0.01), digits=2)
df=subset(df,df$x!=0)
df$treated <- ifelse(df$x>0, 1, 0)
df$y.model<- 0.5*df$x  - 0.025*df$x^2*quadratic + jump*df$treated
df$y=df$y.model+rnorm(length(df$x),0,dgp.sd)

## dataframe for draws (samples)
sample.x <- as.data.frame(matrix(0, ncol = 0, nrow = nrow(df)/10))
```

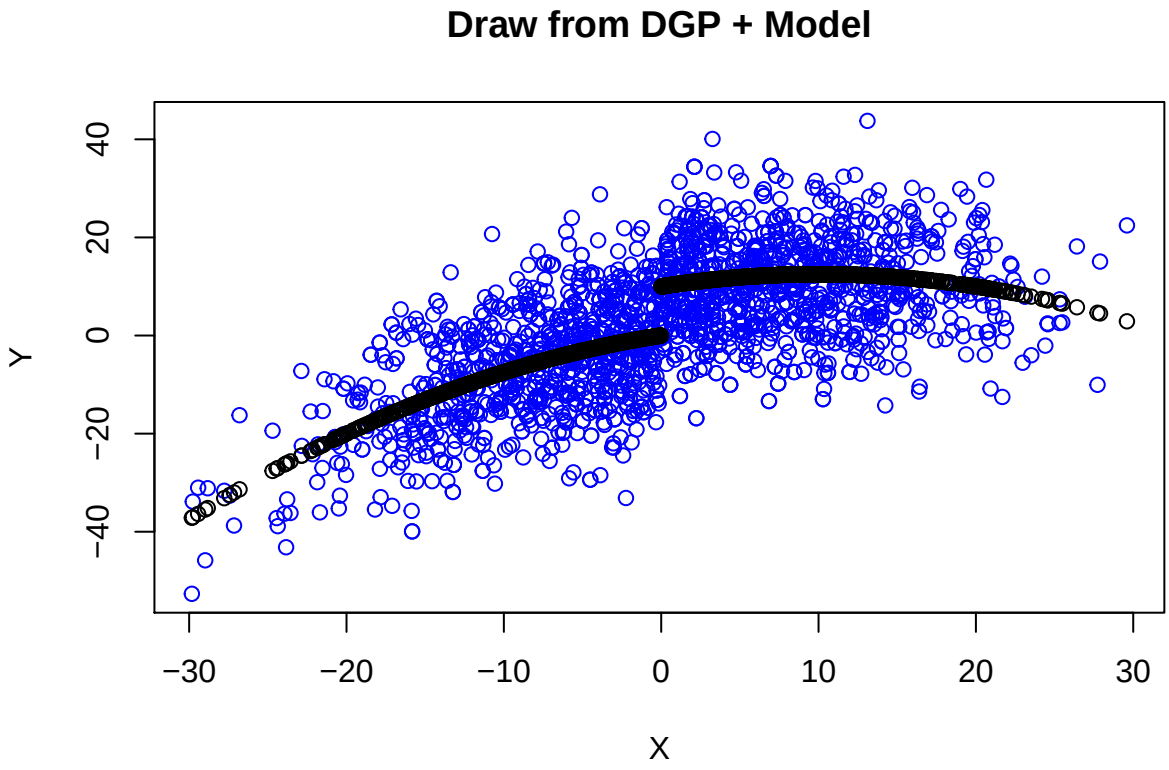


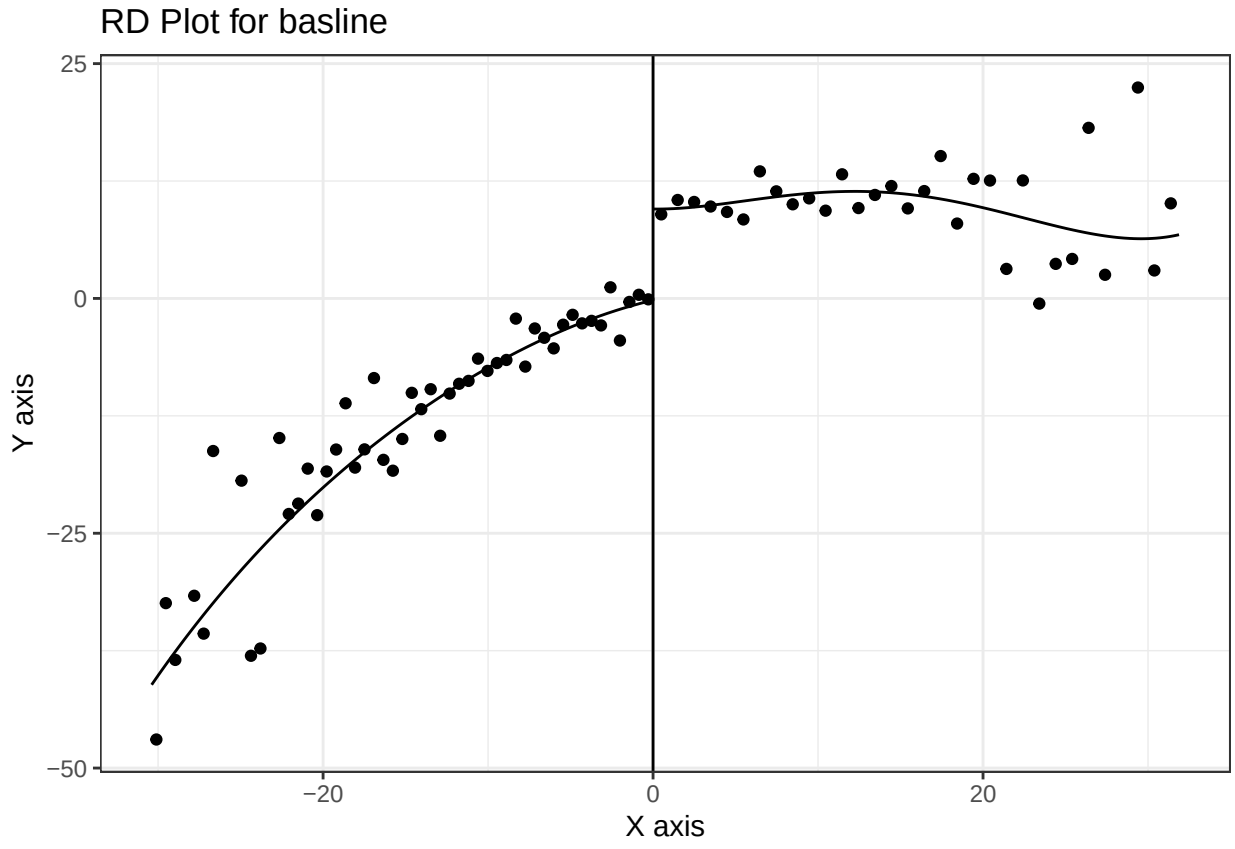
Iterations

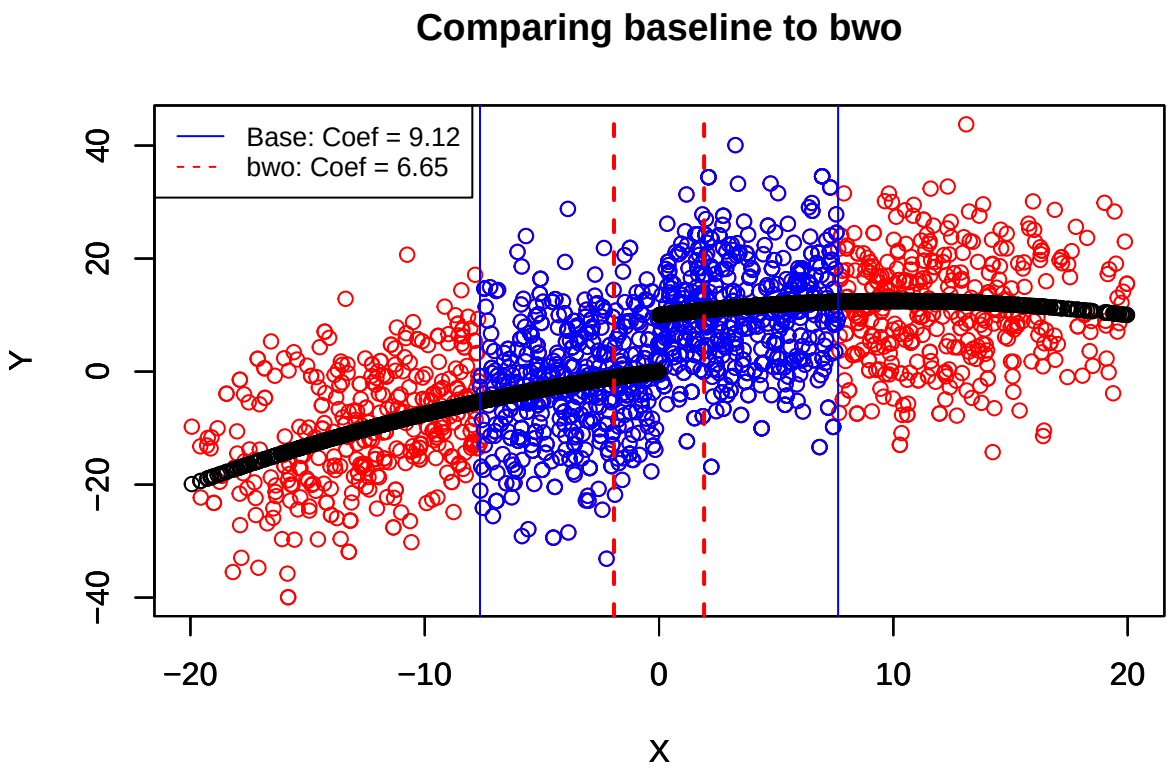
Running 1000 iterations, and saving figures from 5 last iterations to file. In each iteration, we:

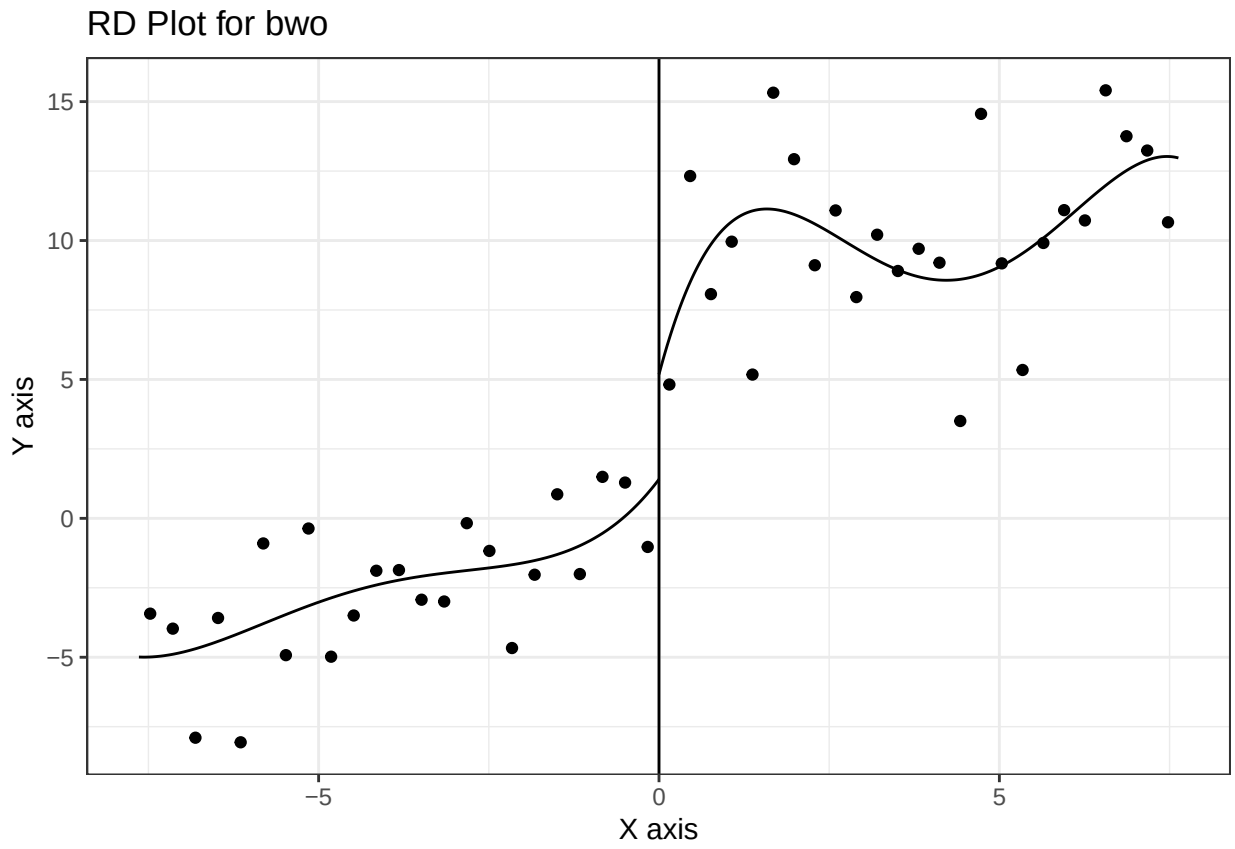
1. draw randomly 2000 observations around the cutoff.
2. compute the OBW and RD coefficient.
3. drop observations outside OBW/replace them with zero
4. compute again the OBW and RD coefficient.

Presenting figures from last iteration for illustration



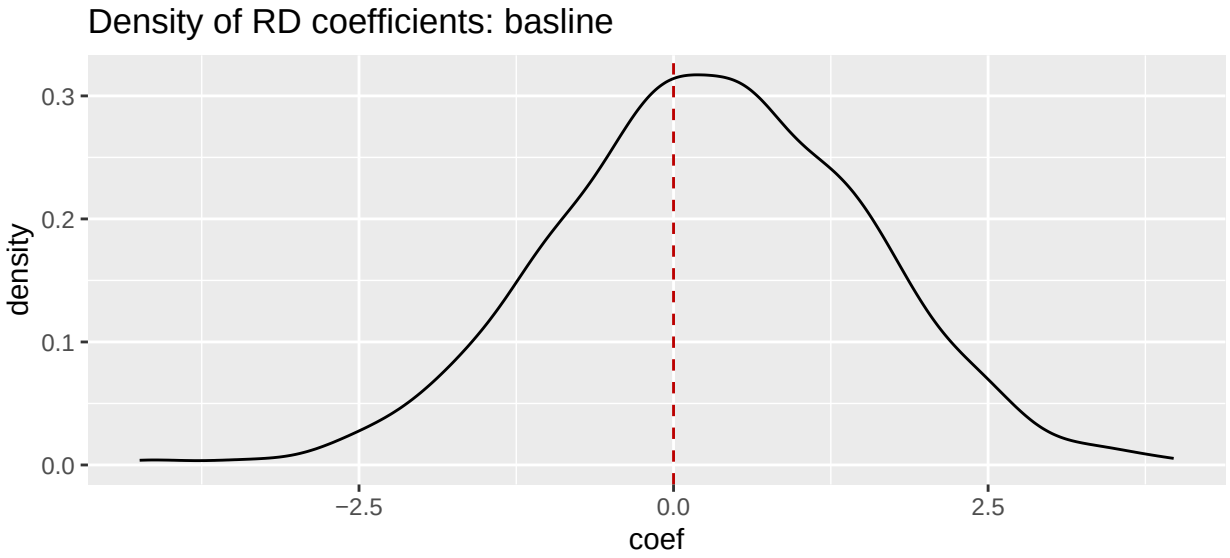


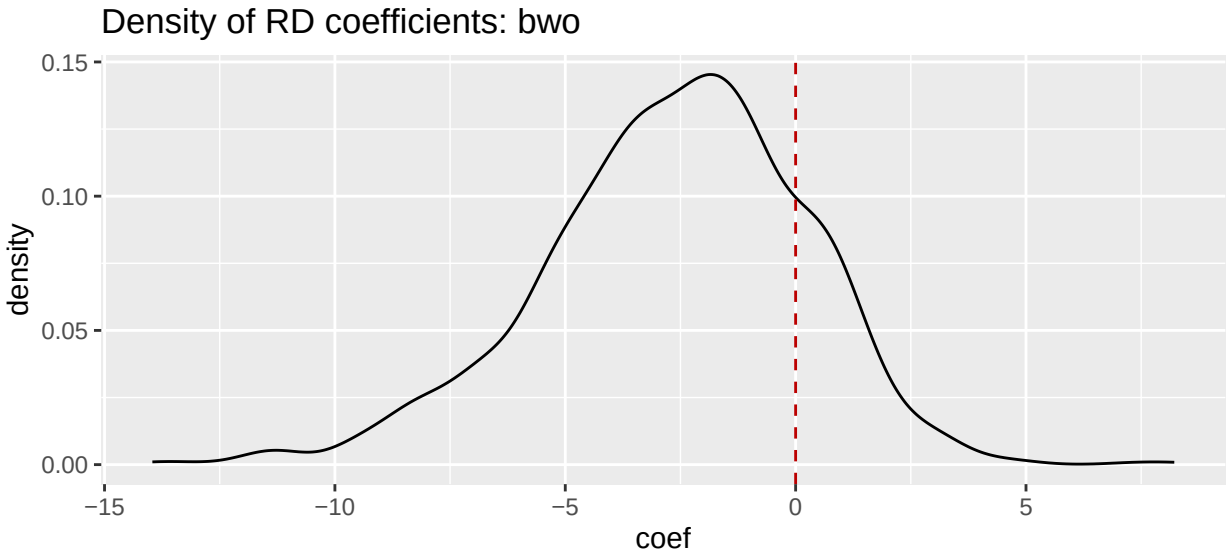

Comparing baseline to bwo
Base: Coef = 9.12
bwo: Coef = 6.65
Y
X
40
20
0
−20
−40
−20
−10
0
10
20

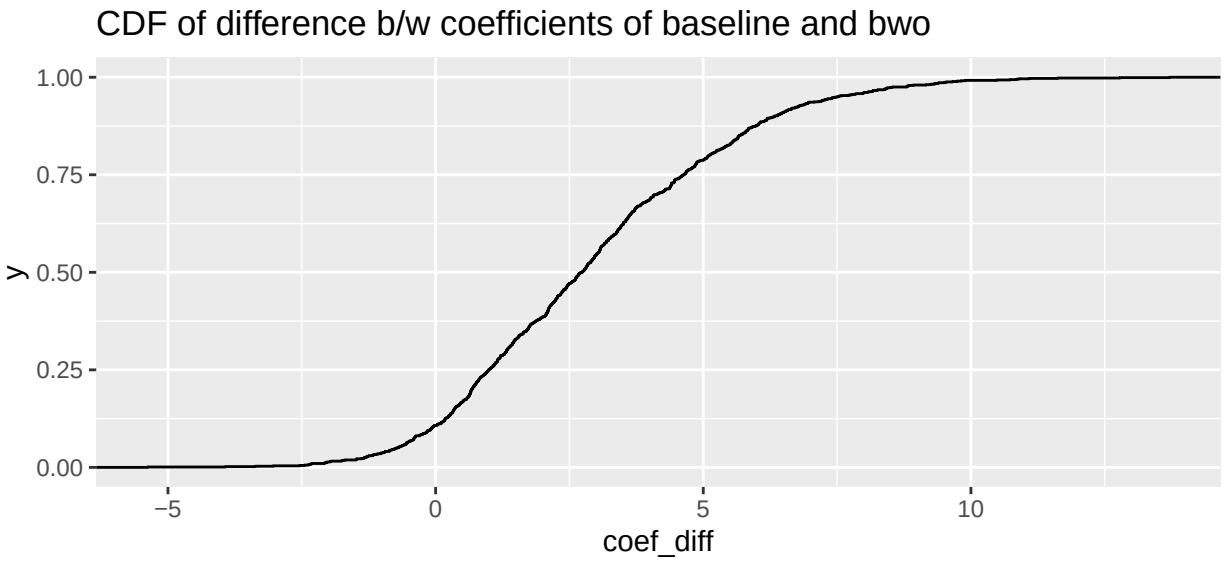

RD Plot for bwo
15
10
5
0
−5
Y axis
−5
0
5
X axis

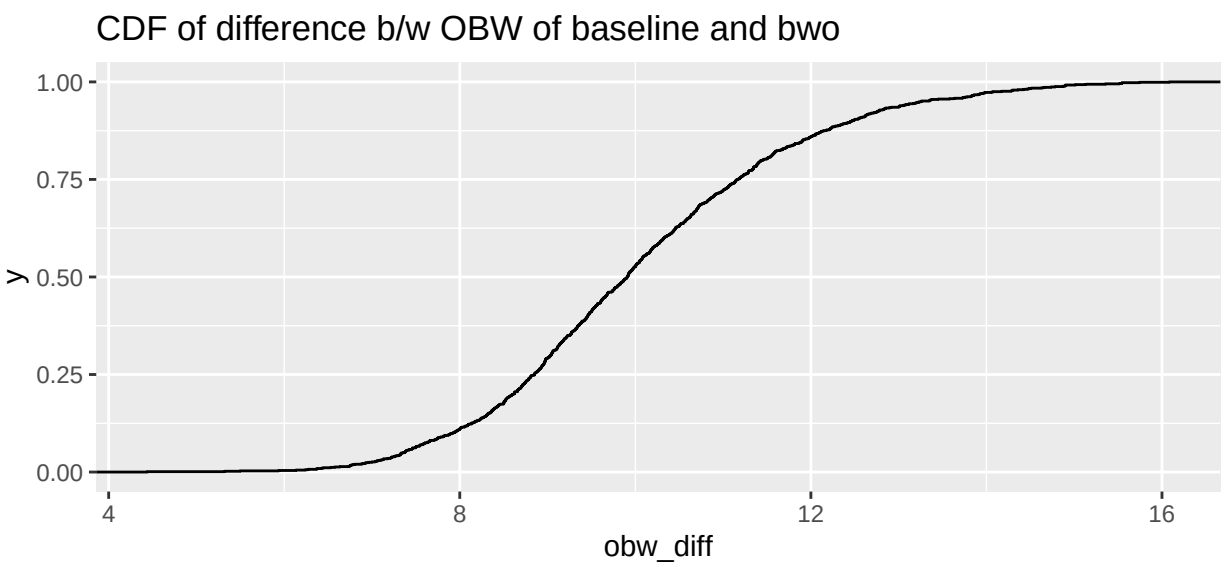
Results

Figures summarizing iterations









Correlation between baseline OBW and change in OBW

```
cor(results$obw,results.exercise$obw_diff)
```

```
## [1] 0.9064301
```

Correlation between baseline coefficients and change in coefficients

```
cor(results$coef,results.exercise$coef_diff)
```

```
## [1] 0.008748068
```

Summary results - table:

Note: coefficient (treatment effects) are normalized to zero, by subtracting from each estimate the size of the jump at the cutoff.

Table 1: Summary Table

	base	bwo	diff_base
coef	0.2886	-2.6531	2.9417
obw	13.1101	3.0498	10.0603

Interpreting results

When dropping values outside OBW, the new OBW are smaller, and the estimated coefficients are biased downwards