

EDS241: Assignment 2

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The goal of this assignment is to provide a simple test of whether the effects of air quality regulations are the same across locations with different racial mix. To this end I will test if the NOx Budget Program, a cap-and-trade market for nitrogen oxides (NOx) emissions from power plants lead to similar effects in counties that are predominantly white versus counties that are predominantly African American. The data are a subset of data sample I used in the following paper: <https://olivierdeschenes.weebly.com/uploads/1/3/5/0/135068654/defensive-investmentsand-the-demands-for-air-quality.pdf>. You can also get more information on the NOx Budget Program, here: <https://www.epa.gov/airmarkets/nox-budget-trading-program>

The data included in the file NBP.xls, which is available on Gauchospace, are: fips (fips code identifying each county), NBP (indicator =1 if the county was regulated under the NOx Budget Program), PctBlack (fraction of the county population that is African American), and Dnox_masstons (change in annual NOx emissions from all power plants in a county between 2000 and 2008 (in tons)). Note that the NBP market was in effect in 212 of the 485 counties in the sample from 2003 to 2008, so the 2008-2000 change give us a sense of the program's effect on emissions. If emissions of NOx from power plants declined in a county, then Dnox_masstons should be negative

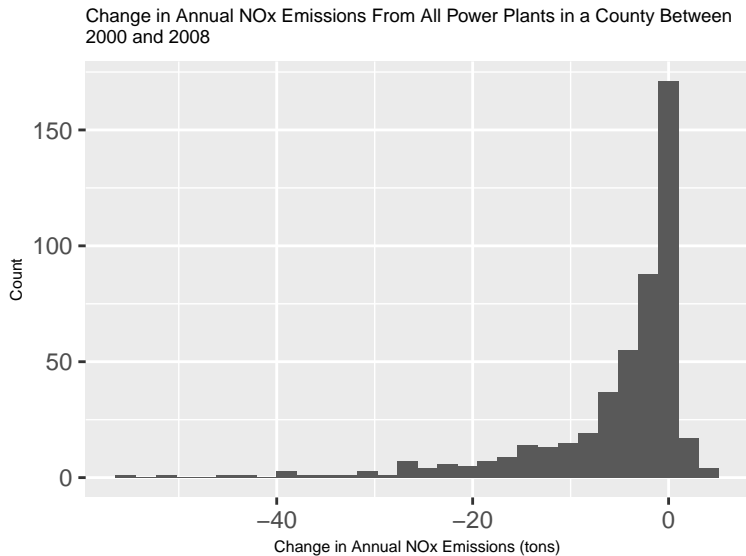
0.0.1 Import and clean the data

```
nox_data <- read_excel(here("data", "NBP.xls")) %>%
  clean_names()
```

Question a: Make a histogram depicting the distribution of Dnox_masstons.

```
dnox_hist <- ggplot(nox_data, aes(x = dnox_masstons)) +
  geom_histogram() +
  labs(x = "Change in Annual NOx Emissions (tons)",
       y = "Count",
       title = "Change in Annual NOx Emissions From All Power Plants in a County Between
2000 and 2008") +
  theme(title = element_text(size = 6))

dnox_hist
```



Question b: Create an indicator =1 if the county has PctBlack above the sample median, and =0 otherwise (in the rest of the assignment, I refer to this variable as ‘D’). What is the average of PctBlack for counties above the median, i.e. counties for which D=1?

```
pct_black_median <- median(nox_data$pct_black)
pct_black_median
```

```
## [1] 4.8
```

```
nox_data <- nox_data %>%
  mutate(pct_black_above_median = ifelse((pct_black > pct_black_median), 1, 0))

counties_above_median <- nox_data %>%
  filter(pct_black_above_median == 1)

avg_above_median <- mean(counties_above_median$pct_black)
avg_above_median
```

```
## [1] 19.31375
```

For counties that have a percentage of African Americans in its population greater than the median for all counties, the average percentage of African Americans is 19.31375%.

Question c: Estimate a regression of Dnox_masstons on NBP. Interpret the estimated intercept and the coefficient on NBP.

```
model_1 <- lm_robust(formula = dnox_masstons ~ nbp, data = nox_data)

model_1_table <- broom::tidy(model_1) %>%
  dplyr::select(term, estimate, std.error, p.value) %>%
  knitr::kable()

model_1_table
```

term	estimate	std.error	p.value
(Intercept)	-3.622031	0.4203230	0.0000000
nbp	-3.920467	0.7959108	0.0000012