FIN 550: Problem Set 2
EXECUTIVE SUMMARY

☐ Individual Submission
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Case Overview

In the United States, Motor vehicle accidents killed over 40,000 Americans in 2020 and are the leading cause of death for adults under the age of 25 (CDC 2020). Adolescent drivers who lack driving experience face, especially high crash risk. All state governments heavily regulate teenage driving to protect the safety of young drivers and those around them. These regulations include a minimum legal driving age, zero-tolerance drunk driving laws, and driver's education requirements. Teenagers cannot apply for a driver's license until they meet their state's minimum legal driving age. These laws thus create a large difference in the number of teenage drivers on either side of the minimum legal driving age threshold. We will analyze research work from Huh and Reif (2021), the authors were able to obtain death certificate records for every US death that occurred between 1983 and 2014, during which time there were 501,193 teenage deaths. Our objective is to investigate what happens to mortality rates after changes to driving regulations. calculate how many months away from the minimum legal driving age each decedent was at the time of death.

Methodology

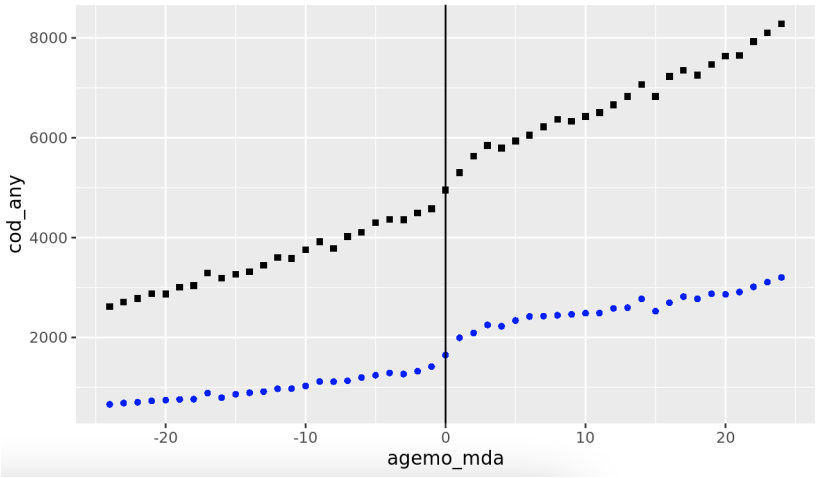
The mortality rate due to any cause for individuals in the sample who are 1-24 months above and below the MLDA was calculated to identify if there was any difference

between these two groups. The results for this are displayed in Table 1.1 below. Every value in the summary above MLDA is higher than that below. The average of the mortality rates supports this as well, with 'Above MLDA' being 64.34 and 'Below MLDA' being 34.07. There is a difference of 30.27, plausibly describing the causal effect of reaching the MLDA on mortality.

	Above MLDA	Below MLDA
Minimum	50.55	25.24
1st Quarter	58.86	29.15
Median	64.00	33.71
Mean	64.34	34.07
3rd Quarter	69.98	38.68
Maximum	78.29	43.75

Table 1.1

In the image below, a scatter plot with mortality rates is shown with a vertical line at the age driving eligibility begins. It is limited to people within 2 years of the MLDA. The black squares depict mortality rate due to any cause, and the blue circles depict the mortality rate due to motor vehicle accidents.



We Calculated a non-parametric RD estimated effect of driving on mortality rates due to (a) any cause and (b) motor vehicle accidents and Calculated these estimates using four different bandwidths: 48, 24, 12, and 6 months.

In the code, We Omitted the partially-treated observation using `agemo_mda==0` from the estimation to generate what is called a “donut” RD. Used linear regression to calculate all these values, and below we have the results for different bandwidths using non-parametric results.

bandwidth <dbl>	rd_all <dbl>	rd_MVA <dbl>
48	48.83893	21.445071
24	30.27784	15.290869
12	19.06807	11.178446
6	13.16966	8.835371

From the above results we say that the RD estimates are going down by reducing the bandwidth, we can say that if the bandwidth is large then the difference in groups is maximised due to the other factors which make them two different types of population. Vice versa if you think about the low bandwidth it tells that the two groups are similar approximately except that one is treated and not treated.

In the 4th problem, We calculated a parametric RD estimated effect of driving on mortality rates due to (a) any cause and (b) motor vehicle accidents. Allow for linear

trends on either side of the cutoff. Calculate these estimates using four different bandwidths: 48, 24, 12, and 6 months:

bandwidth <dbl>	rd_all <dbl>	rd_MVA <dbl>
48	11.834794	9.516126
24	6.831030	6.504842
12	6.611472	5.968510
6	6.012612	4.867183

After looking at the results for both parametric and non-parametric, the non-parametric values are larger than parametric. So, the parametric estimates can be considered to be a better estimate since they allowed the fitting of different curves above and below the cut off which makes that different fits for treatment and control groups.

Conclusion

From the overall results, we conclude that the mortality rate is increasing with the current minimum legal driving age. So policymakers have to reconsider the minimum legal driving age limits to reduce the risks associated (that is death). In the USA, different states have different minimum legal age numbers for driving so the state which has a high mortality rate because of motor vehicle accidents should try increasing the age limit to reduce the deaths that are caused in this subcategory and observe the results by analyzing them again. This way we can think of implementing it in other states or not.