Punishment and Deterrence: Replication of Drunk Driving Study Using Cross-Validation

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Abstract

The article uses a regression discontinuity design to assess the impact of stricter punishments on reducing the recurrence of driving under the influence (DUI). Specifically, it evaluates how the heightened penalties associated with surpassing legal blood alcohol content (BAC) thresholds affect the likelihood of recidivism.

Introduction

The Machine Learning Cross-Validation approach our group employed for the study to estimate the effect of legal BAC thresholds on DUI recidivism, ensuring the selection of an optimal bandwidth that balances bias and variance, thereby enhancing the precision and reliability of the findings.

Methodology

The original study utilized a regression discontinuity design to estimate the impact of BAC thresholds on the probability of recidivism. Our empirical analysis attempts to recreate and/or improve the findings of the paper using a Cross-Validation approach.

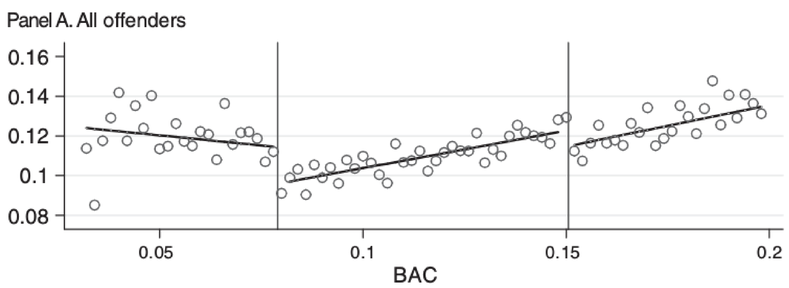

Figure: Figure 3. BAC and Recidivism

Findings

Table: RDD Estimates for the Effect of DUI Penalties on Recidivism

Ind. Variable	Coefficient	Std Error	P-value	[0.025	0.975]
Constant	5.4709	0.826	0.000	3.851	7.091
DUI	-0.0236	0.004	0.000	-0.032	-0.015
Agg. DUI	-0.0065	0.003	0.050	-0.013	-2.6e-06
Observations	90074				
R-squared	0.004				
bandwidth	0.05				

Table: Replicated RDD Estimates for the Effect of DUI Penalties on Recidivism

Ind. Variable	Coefficient	Std Error	P-value	[0.025	0.975]
Constant	6.0302	1.093	0.000	3.775	7.990
DUI	-0.0158	0.006	0.005	-0.027	-0.005
Agg. Dui	-0.0037	0.004	0.388	-0.012	0.005
Observations	90074				
R-squared	0.005				
bandwidth	0.028				

Discussion

Optimizing bandwidth to 0.028 for the regression discontinuity design yielded a reduced DUI effect on recidivism from -0.0236 to -0.0158 with a slight increase in model accuracy. For the 0.15 BAC threshold, also decreased the estimation of being booked on recidivism from -0.0065 to -0.0037, reflecting a more conservative estimate.

Conclusions

Our contribution demonstrates the effectiveness of using machine learning cross-validation to refine bandwidth selection in regression discontinuity designs, providing precise estimates of the deterrent effects of legal BAC thresholds on DUI recidivism.

Literature Review, References, and Appendix

- *Hansen, Benjamin. 2015. "Punishment and Deterrence: Evidence from Drunk Driving." American Economic Review 105 (4): 1581–1617. https://doi.org/10.1257/aer.20130189*
- *Tougui, Ilias, et al. 2021. "Impact of the Choice of Cross-Validation Techniques on the Results of Machine Learning-Based Diagnostic Applications." Healthcare Informatics Research 27 (3): 189–199. https://doi.org/10.4258/hir.2021.27.3.189*

Figure: Visit Doc