

**Question 1:** Obama's "cycle of crime" theory implicitly assumes that the value of the dependent variables' error terms are independent of predictor variables. But, this may not be the case, and there may be an endogeneity issue. This is because people who commit crimes may actually be likely to reoffend anyway, regardless of how harsh their sentence is. We have to have more evidence to conclude that "harsh sentencing is creating more criminals" because it could be that criminals are the ones who receive the harshest sentences. Moreover, other factors that are not being controlled for, such as income, poverty, personal circumstances, that are highly connected with the outcome and explanatory variables could be contributing to some of this problem.

**Question 2:** My friend's research design suffers from the endogeneity problem because the regressor, the length of the prison sentence, and the outcome variable, recidivism are probably jointly dependent on another factor that's not been controlled for (an error term). For instance, one variable that's not included in the dataset that could be related to both the main explanatory variable and outcome variable is personal circumstances, such as poverty. There is much evidence that impoverished circumstances can drive people to repeated (recidivism), violent (which obviously relates to the length of sentence) crime. We'd need instrumental variables to correct for this endogeneity problem.

It's also worth noting that there may be a reverse causality problem. We don't know if the explanatory variable, length of prison sentence, explains recidivism, or it's the other way around. In fact, we could argue that it is the other way around, since people who continuously offend will probably receive longer prison sentences.

Table 1: Descriptive Statistics and Balance Table

	Control			Treatment			Diff
	N	Mean	SD	N	Mean	SD	
Severity of Crime	2426	1.98	0.81	2574	1.97	0.82	-0.014
Months in Jail	2426	16.45	19.39	2574	19.43	19.87	2.975***
Recidivates	2426	0.26	0.44	2574	0.40	0.49	0.140***

**Description:** From the balance table, we can see that there is a statistically insignificant difference between the severity of crime and whether the judge was a Republican or not. However, we can also see there there is a statistically significant difference between Republican vs. non-Republican judges when it comes to the months in jail and recidivates. Thus, it seems that judges, by political party, are randomly assigned on the basis of how severe the crime is. However, there's clearly a statistically significant difference in whether a criminal reoffends and how long of a sentence the criminal gets, depending on what judge s/he gets.

**Question 5:** The first stage is to estimate predicted treatment. We would like to regress the nudge, in this case judge partisanship, on treatment, in this

case, the number of months in jail. X in this case would be the length of the prison sentence, "monthsinjail". The outcome variable is recidivism. The instrumental variable, z, is republicanjudge, since this variable is correlated with the main explanatory variable of interest, length of prison sentence (republican judges give longer jail sentences, it seems). However, whether a judge is republican or not is also NOT correlated with other factors in the error term, such as poverty, etc. There's no logical way to connect the instrumental variable to the outcome variable, other than through months in jail.

Table 2: First Stage of IV Design

	Stage 1
republicanjudge	3.221876*** (8.767467)
severityofcrime	18.14888*** (80.20931)
_cons	-19.47041*** (-37.46343)
R-squared	0.5653
Number of observations	5000

**Description:** This table shows us the first stage of the IV design. We regress the judge, the judges' partisanship, on treatment, the number of months in jail. In this regression, we control for severity of crime, since it's not correlated with whether the judge is republican or not, as we saw from the balance test from before. However, it should be controlled because the length of time someone spends in jail is related to how severe the crime is.

Table 3: Recidivism and Jail Sentence (IV Design)

	Stage 2
monthsinjail	.0442798*** (7.682411)
severityofcrime	-.6150693*** (-5.850316)
_cons	.7481873*** (7.102812)
R-squared	0.9436
Number of observations	5000

**Description:** In this table, we perform the 2nd stage of the IV regression. We can see from the table that for compliers, the longer the length of the prison sentence, the more likely that someone will reoffend, statistically significant to the 1 percent level.

**Question 10:** F-stat is 164.34, which is greater than 10. So yes, it is above the conventional threshold.

**Question 11:** Compare the ratio from 8 (.0442798) to coefficient on 9 (.0442798). The numbers are the same. They're both 0.0442798

**Question 12:** In the research design above, using randomized judges, the always-takers are the people who will get long jail sentences, regardless of the judges' partisanship. The never-takers are the people who will get short jail sentences, no matter the judges' partisanship. The compliers are the people who will get long jail sentences if the judge is republican. The defiers are the people who get will long jail sentences if the judge isn't republican.

**Question 13:** Monotonicity assumption is that there are no defiers. In the case of judges' partisanship and reoffenders, defiers would be the individuals who will get long jail sentences if the judge is not republican. If there are defiers in this case, that would be a problem, since the IV (in this case, the judges' partisanship) is only able to measure the causal effect of the treatment (jail time) for the compliers.

**Question 14:** Compliers are people who will get long jail sentences if the judge is republican, but will get shorter jail sentences if the judge isn't.

**Question 15:** Yes, the cycle of crime hypothesis seems to be true for compliers (the only people that our IV is able to measure the causal effect of the treatment effect). As we can see, having a republican judge will make it about 4.4 percent more likely that the person will reoffend. Since the IV nudges compliers to the treatment (longer jail sentences), it seems that longer jail sentences will lead to an increased likelihood of recidivism, which is exactly what Obama was talking about.