

Replication Exercise 4 - Instrumental Variables

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1. What is the treatment? What is the control? What is the outcome? What is the instrument for treatment?

The treatment is to watch the TV program about the Proposition 209, and the control, to don't watch it. The outcome is a change on viewer's political knowledge and attitudes, measured as voting in the election; voting, supporting and having information on the proposition and the salience of the issue. The instrument is whether the respondents were asked to watch the program or not.

2. If we did not know about instrumental variables, the basic observational regression we might run is to examine directly how the treatment variable is related to the outcome variable. Run this basic observational regression and interpret the results.

Running an OLS only with treatment and outcome, we would say that watching the program significantly (at 99% confidence level) increases the information on the proposition, adding 0.296 at the information level.

Table 1:

	<i>Dependent variable:</i>
	Info_Proposition
Watched_Program	0.296*** (0.084)
Constant	3.157*** (0.043)
Observations	498
R ²	0.024
Adjusted R ²	0.022
Residual Std. Error	0.821 (df = 496)
F Statistic	12.381*** (df = 1; 496)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

3. Do you trust the treatment effect estimates from Q2? What are the major threats to causal inference here? Provide concrete examples if why the estimate in Q2 might be wrong.

The results above can overestimated by those respondents who always watches TV shows on politics, and these people are usually more educated and already well informed. This means that we're estimating the effect on different people given the treatment (watching the program) wasn't completely randomized or controlled.

4. To conduct an Instrumental Variables analysis, we first need to make sure we have a strong ‘first stage’, i.e. that our instrument (encouragement to watch the program in the phone call) predicts our treatment variable (watching the program). Using a simple regression, what is the evidence about the strength of our first stage?

The encouragement to watch received by the treatment group seems to be a good predictor of watching TV, increasing it by 0.407 and significant at 1% level.

Also, our F-Statistics is above 10, which is rule of thumb for considering the first stage IV estimation significant (Staiger and Stock, 1997)

Table 2:

	<i>Dependent variable:</i>
	Watched_Program
Encouraged_to_Watch	0.407*** (0.034)
Constant	0.044* (0.024)
Observations	507
R ²	0.220
Adjusted R ²	0.218
Residual Std. Error	0.384 (df = 505)
F Statistic	142.219*** (df = 1; 505)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

5. Now let’s perform the 2-Stage Least Squares instrumental variables methodology. First, save the fitted values of the first stage regression from Q4 as another column in your data.

```
## Observations: 507
## Variables: 13
## $ partyid      <dbl> 1.000000, 2.000000, 7.000000, 1.000000, 2....
## $ pntst       <dbl> 4, 4, 4, 4, 3, 2, 4, 3, 3, 3, 2, 4, 4, 4, ...
## $ watchnat    <dbl> 4, 6, 7, 6, 6, 6, 7, 1, 6, 6, 6, 7, 7, 7, ...
## $ educad      <dbl> 11, 9, 11, 11, 11, 6, 12, 12, 11, 11, 12, ...
## $ readnews    <dbl> 2, 7, 7, 7, 7, 7, 7, 6, 1, 6, 7, 7, 1, 6, ...
## $ gender      <dbl> 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 0, 1, 1, ...
## $ income      <dbl> 5.000000, 2.000000, 3.000000, 7.000000, 9....
## $ white       <dbl> 1.00000, 1.00000, 1.00000, 1.00000, 1.0000...
## $ Info_Proposition <int> 4, 3, 3, 3, 4, 4, 3, 2, 3, 2, 4, 4, 3, 4, ...
## $ support      <int> 1, 1, NA, 1, 1, 1, 0, 0, 1, 1, 1, 1, NA, 1...
## $ Watched_Program <int> 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ...
## $ Encouraged_to_Watch <int> 1, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 0, ...
## $ watched_fitted <dbl> 0.45173745, 0.45173745, 0.45173745, 0.4517...
```

6. Next, run the second-stage regression of the outcome variable on those fitted values from Q5. Carefully interpret the Instrumental Variables regression result.

There's no significant effect on the respondent information level about the proposition between those who watched the program only because of the encouragement. In other words, assuming that there were no defiers, the average treatment effect among compliers isn't statistically different from zero, so we can't say there's a positive effect on proposition information due to watching the TV program about it.

Table 3:

<i>Dependent variable:</i>	
Info_Proposition	
watched_fitted	0.238 (0.183)
Constant	3.173*** (0.059)
Observations	498
R ²	0.003
Adjusted R ²	0.001
Residual Std. Error	0.830 (df = 496)
F Statistic	1.698 (df = 1; 496)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

7. The only disadvantage of the 2-Stage Least Squares approach is that it doesn't correctly estimate the standard errors for our estimated treatment effect. Conduct the equivalent all-in-one IV approach to the previous analysis using ivreg in the AER library in R or ivreg2 in Stata.

Even with smaller standard errors, the interpretation remains the same from Q6.

Table 4:

<i>Dependent variable:</i>	
Info_Proposition	
Watched_Program	0.232 (0.176)
Constant	3.173*** (0.058)
Observations	498
R ²	0.023
Adjusted R ²	0.021
Residual Std. Error	0.822 (df = 496)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

8. A crucial assumption for the instrumental variables regression is the exclusion restriction: that the instrument ONLY affects the outcome through the treatment, and not through any other mechanism. We have to support this assumption by theory and supportive qualitative evidence as it cannot be empirically verified. Make the argument that the encouragement to watch the program through the phone call ONLY affects participants' information about the proposition through its affect on watching the program.

The phone call didn't mention the proposition, so people only had (extra) contact with the issue during the TV program. There's no obvious hint that people should get to look into the proposition matter besides their current level of information/attitude about it.

9. Now pretend you are a reviewer/critic and make the argument that the exclusion restriction assumption is likely to be false.

The authors don't explicitly tell us the content of the phone call received by the respondents. How did they tell people about the second interview? Was it mentioned it would be after the elections, or a general "we'll contact you later"? People might have been induced to get (more) informed on the elections if they were said they would be contacted after it, including the control group. This could have induced a social desirability bias to be able to answer about the elections.

Given the program the treated group should watch was on Fox News, the viewers attitude towards it carries their different opinion around this channel. This can induce them to watch something else instead or in addition to. This could also have increased their curiosity about other TV programs about the elections and the proposition, getting even more informed - specially if the call was made with sufficient time ahead of the elections.

10. The authors' analysis in Table 4 is more complicated than ours only because it includes control variables in an attempt to make sure the instrument satisfies the exclusion restriction. Add the control variables to both the first and second stage 2SLS methodology regressions and interpret the results (it will be slightly different from the values in Table 4).

Adding the control variables in both stages of the estimation, the treatment effect increases and gets significant at 10% level (Table 5 at page 5 of this document). When the covariates were added, we accounted for some of the uncertainty on the treatment effect that were making our estimation less precise. However, it's worthy to mention that the interest on politics has a similar effect size and it's more significant, so further analysis should explore how the treatment interact between people with different levels of political interest.

11. To what group of people ('population') does our estimate of the causal effect of treatment apply? How generalizable would our results be?

The applicability of the effects we found are highly contextual. People were asked to view a TV program on a state political issue in the evening before a presidential election, so we need to be skeptical about the generalizations for how TV media can affect political behavior. People are more opened to or aware of the political debate during elections, so we might not see this effect on non-political season - they can either forget about what they saw or don't take it into account to form their own opinion. Nonetheless, these results are from 23 years ago when the Internet were in its early years and people watched more TV. Today, the average effect of a debate on the TV is probably different.

Table 5:

	<i>Dependent variable:</i>	
	Info_Proposition	
	(1)	(2)
watched_fitted	0.238 (0.183)	0.277* (0.162)
partyid		−0.017 (0.016)
pnintst		0.251*** (0.048)
watchnat		0.0003 (0.024)
readnews		0.107*** (0.019)
educad		0.003 (0.013)
income		−0.008 (0.013)
gender		−0.053 (0.069)
white		0.069 (0.086)
Constant	3.173*** (0.059)	1.797*** (0.236)
Observations	498	498
R ²	0.003	0.197
Adjusted R ²	0.001	0.183
Residual Std. Error	0.830 (df = 496)	0.751 (df = 488)
F Statistic	1.698 (df = 1; 496)	13.339*** (df = 9; 488)

Note:

*p<0.1; **p<0.05; ***p<0.01