Tutorial 3
Instrumental Variabls - Due on 18.05.2020 24:00

Empirical Banking and Finance
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This exercise[1] follows [Levine et al., 2000] using an instrumental variable based on [Porta et al., 1998] to study the relationship between fiancne and growth. We use the same original data as in the previous tutorial. The data can be found on Rafael La Porta's Webpage.

1. Motivating the use of Instrumental Variables (IV)
   a) [Levine, 2005] writes that "While [King and Levine, 1993] and Levine and Zervos (1998) show that financial development predicts economic growth, these results do not settle the issue of causality. It may simply be the case that financial markets develop in anticipation of future economic activity. Thus, finance may be a leading indicator rather than a fundamental cause."
   b) (4-5 sentences) Please sketch out the mechanism of how the indicators for financial development used (credit to GDP, size of the stock market) might simply be a leading indicator and not a cause of economic growth.
   c) (2 sentences) How could an instrumental variable approach solve the issue of causality?
2. Regression 1: OLS
   a) Create a scatterplot of *gdpgrowth* and *private_credit_1960* and fit a simple regression line between the two variables.
   b) Run a regression of *gdpgrowth* on *private_credit_1960* using *loggdp_1960* as a control.
   c) Why do we include *loggdp_1960*?
   d) Very briefly comment on the coefficient of *private_credit_1960*: Whether it is significant, its size and sign. Provide a 95% confidence interval for the coefficient.
3. The Instrument
   a) We now use the national legal origin ([Porta et al., 1998]) of a country as an instrument for its financial development

[1] Thanks to Ulrich Schüwer

b) (4-5 sentences) Without using the data yet, discuss the arguments why a coutry's legal origin might satisfy or not the requirments to be a valid instrument.

c) (2-3 sentences) Briefly sketch the theoretical mechanism from the origin of a country's legal system to our measure of financial development.

d) Briefly comment on the summary statistics of the legal origin variables.

e) (2 sentences) Create a plot with the average *private_credit_1960* for each group of legal origin. There are several ways to do this. The variable *legor* might be useful. Does the graph make you more confident about this IV strategy or not?

4. Regression 2: IV with one instrument

a) Run an IV version of Regression 1 using German legal origin *legor_ge* as an instrument for *private_credit_1960*

b) Compare the coefficient on *private_credit_1960* to the one in the OLS regression: Size, sign and significance

c) Provide a 95% confidence interval for the coefficient.

d) Is the model underidentified, exactly identified or overidentified?

e) Formally test whether *legor_ge* is a valid (two main assumptions) instrument. Provide H_0, H_A, the test statistic, its distribution and the result of the test.

5. Regression 2: IV with several instruments

a) Run an IV version of Regression 1 using four out of five legal origin dummies as instruments for *private_credit_1960*

b) Why cannot all legal origin dummies be included?

c) Compare the coefficient on *private_credit_1960* to the one in the OLS regression: Size, sign and significance

d) Provide a 95% confidence interval for the coefficient.

e) Is the model underidentified, exactly identified or overidentified?

f) Formally test whether the instruments are valid (two main assumptions). Provide H_0, H_A, the test statistic, its distribution and the result of the test.

g) (3 sentences) Why is the formal test for the exogeneity of instruments useful or not in this setting?

h) Formally test whether *private_credit_1960* is endogenous. Provide H_0, H_A, the test statistic, its distribution and the result of the test.

6. Regression 3: IV with several instruments and several endogenous variables

a) Run an IV version of Regression 1 using four out of five legal origin dummies as instruments for *private_credit_1960*, but now, add *public_banks_1970* as an additional endogenous dependent variable.

b) Briefly discuss size, sign and significance of the coefficients of the two endogenous variables.

7. Regression 4: Back to OLS

    a) Run Regression 1 and add the legal origin dummies as control variables

    b) Briefly comment on the size, sign and significance of the coefficients

References

[King and Levine, 1993] King, R. G. and Levine, R. (1993). Finance and Growth: Schumpeter Might Be Right. *The Quarterly Journal of Economics*, 108(3):717–737.

[Levine, 2005] Levine, R. (2005). Finance and Growth: Theory and Evidence. In Aghion, P. and Durlauf, S., editors, *Handbook of Economic Growth*, volume 1 of *Handbook of Economic Growth*, chapter 12, pages 865–934. Elsevier.

[Levine et al., 2000] Levine, R., Loayza, N., and Beck, T. (2000). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics*, 46(1):31–77.

[Porta et al., 1998] Porta, R. L., de Silanes, F. L., Shleifer, A., and Vishny, R. W. (1998). Law and Finance. *Journal of Political Economy*, 106(6):1113–1155.