Problem Set #1

MACS 40200, Dr. Evans

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Problem 1 Git and GitHub.com (1 point).

If you can download and copy my homework, then this problem is correctly solved.

Problem 2 Persuasive short paper for structural estimation or reduced form estimation or both (9 points).

Reduced form estimation and structural estimation are two methods used in empirical studies. The former commonly introduces instrument variables or design experiments to eliminate endogeneity, while the latter derives the estimates directly from the theories and assumptions. Since the cores of these methods are extremely different, they excel and dominate in different situations. The following gives two cases in which one of them performs better than the other.

When we are interested in the policy effects or shock responses, reduced form estimation is usually a handy tool. To be more concrete, the DD estimator could reveal the effects or responses directly if we could find the treatment group and control group to construct a natural experiment, or a "low-grade quasi-experiment". On the other hand, structural estimation could be tricky because it involves lots of equations and there is a possibility that the model cannot be estimated. As suggested in Keane (2010), the DD strategy relies on strong assumptions, one of which requires "other factors" have the same impact on both treatment and control group. Keane further argues that the assumption could only be satisfied when the two groups are almost the same. In other words, the DD estimator cannot give a reliable estimation if the two groups are dramatically different. Indeed, we are confident in the DD estimator if the treatment and control group only differ in the policy or shock; however, the DD estimator is still valid under certain circumstances, even if the two groups do not resemble each other at all. For instance, most empirical studies employing DD strategy would test the parallel trend assumption in order to eliminate the impact of "other factors". The parallel trend assumption captures the fact that "other factors" have the same impact on both groups in that both groups move similarly when only "other factors" matters before the policy or shock. In addition, the parallel trend assumption is testable even if we do not have any information of "other factors". Therefore, Keane's attitude towards the DD estimator might be too pessimistic, since the DD estimator can be reliable if the parallel trend assumption is correctly tested and satisfied.

When the variables of interest are intercorrelated with each other so that one or more of them might simultaneously be the cause and consequence, structural estimation is always the best choice. Given that we need to start from the theories to derive the equations step by step, the relationships between the variables gradually become clear so that the causal relationship will emerge naturally. For instance, Keane (2010) gives an example where it is impossible to find an instrument variable.

This is because the causal relationship given by the theories indicates that the independent variable, the change in wages from t–1 to t, will correlate with the error term. A vivid example employing structural estimation to reveal complicated causal relationship is given by Morten (2019). She builds a dynamic model of risk-sharing to investigate the relationship between the demand for informal risk-sharing and migration. Structural estimation is required because migration may decrease the need for informal risk-sharing while informal insurance may also decay the incentive to migrate. By estimating the model, Morten is able to give both the effect of migration on informal insurance, as well as the effect of informal insurance on migration. When reduced form estimation were used, only one direction would be estimated if no proper instrument variables could be found.

From the two cases above, it is clear that reduced form estimation and structural estimation should be used in different scenarios. In fact, we should make use of the advantages of each estimation and try our best to avoid their disadvantages. As a result, when using reduced form estimation, we need to be careful when interpret the results in order to be in accordance with existing theories; when using structural estimation, necessary assumptions should be introduced to obtain an estimate, even if the assumptions are dubious to some extent.

References

Keane, Michael P, "Structural vs. atheoretic approaches to econometrics," *Journal of Econometrics*, 2010, *156* (1), 3–20.

Morten, Melanie, "Temporary migration and endogenous risk sharing in village india," *Journal of Political Economy*, 2019, *127* (1), 1–46.