Replication Code and Data: "Instrumental Variable Identification of Dynamic Variance Decompositions"

Mikkel Plagborg-Møller Christian K. Wolf

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1 Introduction

This document describes the replication files for the paper "Instrumental Variable Identification of Dynamic Variance Decomposition" and its Online Appendix. The code produces all numbers and figures referred to in the paper, up to simulation noise. The code is extensively commented, and it is hopefully easy to apply our identification procedures to alternative structural models and datasets. The files are organized into four main folders – one folder with auxiliary functions to implement our identification bounds, and three for actual applications. The rest of this note describes the contents of each folder in detail.

All codes have been run and tested on Matlab R2017a and R2017b. For the model-based illustrative analysis, it is also necessary to use *Dynare*; here, the codes have been tested with version 4.5.1. Compared to the vanilla version 4.5.1, we changed the m-file disp_dr.m to save policy functions. The required version of the disp_dr file is included in this folder. To ensure that all codes run, the variable "path" – always located near the top of the various m-files – needs to be changed to reflect the local machine. In addition to code that we have produced, the replication material draws on the following files that have been wholly or partially produced by other authors:

- The data for our empirical application are taken straight from Gertler & Karadi (2015).
- Our *dynare*-based solution of the model in Smets & Wouters (2007) is based on replication code kindly provided by Johannes Pfeifer. The code is available at `https://sites.google.com/site/pfeiferecon/dynare`.

- Our adjustment to the disp_dr file closely follows analogous adjustments proposed by Wouter den Haan.

Further details on these files are given in the relevant application sections.

2 Auxiliary Functions

This folder contains all auxiliary routines needed for our identification procedures. Roughly speaking, the files in this folder fall into three groups. The first set of functions conducts estimation and bootstraps for finite-order VARs. The second set maps model primitives – either an estimated VAR representation, or a structural in the ABCD-form of Fernández-Villaverde et al. (2007) – into variances, covariances and spectral densities of the variables of interest $w_t = (y_t', \tilde{z}_t)'$. The third set then maps these second-moment properties into the identified sets.

3 Applications

3.1 Model Illustration

All files needed to replicate our results in Section 4 as well as the corresponding appendices are located in the sub-folder Model_SW. This folder contains three sub-folders, one for each structural shock – the forward guidance shock (FG), the benchmark monetary policy shock (MP), and the technology shock (Tech). All of these sub-folders are identical in structure, and contain four files: a mod-file for the structural model (SW_model.mod), a file to implement our full LP-IV analysis (SW_*shock*_LPIV.m), a file to implement the (potentially invalid) SVAR-IV analysis (SW_*shock*_SVARIVIV.m), and a policy function file generated by *Dynare* and needed for the mapping into the ABCD-form (polfunction.mat). Throughout, only the two main files – SW_*shock*_LPIV.m and SW_*shock*_SVARIVIV.m – need to be run, and can be run in arbitrary order. They call the mod file, and the mod file produces the policy functions.

The LPIV and SVARIV files are very similar in structure. After some initial housekeeping, the researcher sets the parameters of the experiment – in particular what observables should be considered and what are the ultimate objects of interest (what FVD/FVR, R^2 at different horizons, ...). The rest of the file then solves the Smets-Wouters model, maps the

resulting transition functions into second-moment properties of the data, maps these into our identified sets (or applies the generically biased SVAR-IV analysis), and plots the results.

3.2 Empirical Applications

All files needed to replicate our results in Section 6 as well as the corresponding appendices are located in the sub-folder Empirics_GK. The data file gk2015.csv is taken straight from the publicly available replication files for the original analysis in Gertler & Karadi (2015). Our main analysis is conducted in GK_CI_LPIV.m and GK_CI_SVARIV.m. These two files are the only files that need to be run directly, and they can be run in any order.

The LPIV and SVARIV are set up in parallel to the model illustration files. The researcher first specifies estimation details (now also including information for the bootstrap), and then the file estimates the reduced-form VAR, provides the mapping into our objects of interest, constructs bootstrap-based confidence intervals, and plots the results.

3.3 Simulation Study

All files needed to replicate our results in Appendix B.10 are located in the sub-folder Simulations. The folder contains four m-files, two each for LP-IV and SVAR-IV experiments. The "Main" files conduct our first eight Monte Carlo experiments, while the "Persistent" files conduct the ninth one.

The structure of all files is again identical to those for the model-based and empirical applications, only now with additional outer loops over the Monte Carlo iterations and (for the "Main" files) over the various experiments. Because of computational and time requirements it is not recommended to run these files on private machines; either the number of bootstrap draws and Monte Carlo repetitions should be reduced drastically, or the codes should be run on a cluster.

References

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