Computer codes and data for "Policy Regimes, Policy Shifts, and U.S. Business Cycles"

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1. Introduction

This README file provides a brief description of the codes and data necessary for replicating results presented in the paper and a short instruction to execute the codes.

Download `trunk2.zip` from the repository and unzip it. There are three folders: `data`, `library` and `run3`.

2. Data

In folder `data`, there are two files: `dataset3_2.txt` and `dataset3_2.xlsx`. The ASCII file `dataset3_2.txt` is the data file for all the estimations. The Excel file `dataset3_2.xlsx` contains the original data we obtained from their sources. Worksheet "raw" explains how we transformed the original data to get the final input for estimation, which is saved in `dataset3_2.txt`.

We use the following definitions for our observables: per capita output = (personal consumption of nondurable+personal consumption of services+government consumption) / civil- ian noninstitutional population; annualized inflation = $400\times\Delta\log$(GDP deflator); annualized interest rates = the quarterly average of daily effective federal funds rates; tax revenues = current tax receipts + contributions for government social insurance; government debt = market value of privately held gross federal debt; and government purchases = government consumption.

Note that we use a single price level, GDP deflator, for all the model variables (e.g. output, government debt, tax revenues, and government purchases). The effective federal funds rate and civilian noninstitutional population data were obtained from the FRED database of Federal Reserve Bank of St. Louis. The market value of privately held gross federal debt series was obtained from Federal Reserve Bank of Dallas. All the other data were taken from National Income and Product Accounts (NIPA) tables.

3. Software details

We used Matlab to estimate models and produce tables and figures. We tested that the codes are running fine with version R2015a on OS X 10.10 and version R2012a on Scientific Linux 6.6.

4. Folder structure and codes

Folder `library` contains codes for optimization (csminwel by Chris Sims), rational expectations model solver (gensys by Chris Sims), Kalman filtering and smoothing (by Chris Sims), and several utility functions. Folder `run3` has all the codes that actually estimate models and produce results. Also `run3` has subfolders that contain specification files and estimation results for each of the models or specifications like `m21_1-1`, …, `m21_f-2`.

In general, there are two types of codes. Codes whose name starts with `run_` are to be executed for each operation. Before you execute any `run_` file, make necessary changes following instructions in the file. These `run_` codes call functions whose name start with `call_`.

5. How to produce results

First of all, start Matlab and change your working folder to `run3`. Check the file `run_Libraries.m` and make changes if necessary following instructions therein. Because we use MCMC simulations to characterize the posterior distribution of our models, the result is not fixed and you need to change some codes according to intermediate results. Also, there will be small differences due to simulations in a new execution.

a. Tables 1 and 2

In order to produce results for the AMPF regime pre-Volcker period, take the following steps. Line `folder=`, located usually at the beginning of a code, should be changed to `{'m21_1-1','m21_1-1_1'}` at each of the following steps. Output is saved in subfolder `run3/m21_1-1/m21_1-1_1`.

1) Run `run_SimulPriorDnsty.m`. This simulates 40K draws from the prior distribution and chooses 40 draws with the highest posterior density and 10 randomly chosen draws, which is saved in `param0.mat`.
2) After doing step 1) for AMPF post-Volcker and PMAF post-Volcker, run `run_PolicyParam_m21_AMPF.m` and `run_PolicyParam_m21_PMAF.m` to compute the prior mean, standard deviation and the 5th and 95th percentiles of the policy parameters based on the simulated draws in step 1). The output for Table 1 is displayed on screen.

From now on, do the following for each regime.

3) Run `run_MaxPstDnstyDSGE_Batch.m`. This numerically finds a posterior mode starting at each of the 50 draws found previously. The optimization result is saved in `mode_x_yy.mat` and `mode_x_yy.txt` for `x` = 0 and 1 and `yy` = 01, 02, …, 50.
4) Run `run_Check.m`. This finds the highest among the 50 (local) modes found by starting at 50 different starting points previously. Find which one achieves the highest posterior density. For example, if the mode (Rank 1) is `x=0` and `yy=18`, then `mode_0_18.mat` and `mode_0_18.txt` have the output for the mode.

5) Run run_ComputeHess.m. This numerically computes the Hessian at the posterior, whose inverse will be used in the proposal distribution in the next step. The result is saved in the same file name as the posterior model with _Hess attached at the end of the file name. For example, mode_0_18_Hess.mat.
6) Run run_SimulPstDnsty.m. This simulates from the posterior distribution of each regime using an MCMC algorithm described in the paper and appendix. The output is saved in, for example, SimulPst_0_18_n_01.mat and SimulPst_0_18_n_01.txt.

folder in run_ files should take on one of the following
{'m21_2-1','m21_2-1_1'} for the PMAF regime pre-Volcker;
{'m21_6-1','m21_6-1_1'} for the PMPF regime pre-Volcker;
{'m21_a-2','m21_a-2_1'} for the AMPF regime post-Volcker;
{'m21_b-2','m21_b-2_1'} for the PMAF regime post-Volcker; and
{'m21_f-2','m21_f-2_1'} for the PMPF regime post-Volcker.

You can find the marginal likelihood estimates with different weighting probabilities under the heading "Modified harmonic mean" near the bottom of a simulation output (For example, SimulPst_0_18_n_01.txt). We chose the estimate with weighting probability 0.5. Put this number in a corresponding cell of column "MHM output" in an Excel file marginal_likelihoods_m21.xlsx to get the marginal likelihood after adjusting the prior probabilities.

b. Tables 3 and 4

1) Run run_SimulIRFs.m for all 6 regimes.
2) In the output file whose name starts with SimulIRF_ (for example, SimulIRF_0_18_n.txt), you can find the variance decomposition results in decimal (means and 5 and 95 percentiles). Multiply 100 to get decompositions in percentage.

c. Figures 1-4

1) Run run_SimulIRFs_Plot_m21_Fig_1_3.m for Figures 1 and 3 and run_SimulIRFs_Plot_m21_Fig_2_4.m for Figures 2 and 4. The output files are IRFs_Monetary_PMAF_PMPF_Pre.eps for Figure 1, IRFs_Fiscal_PMAF_PMPF_Pre.eps for Figure 3, IRFs_Monetary_AMPF_PMPF_Post.eps for Figure 2, and IRFs_Fiscal_AMPF_PMPF_Post.eps for Figure 4.

d. Figure 5

1) Copy the posterior mode file (for example, mode_0_42.mat) of m21_6-1_1 to three subfolders m21_6-1: m21_6-1_d1, m21_6-1_d2, and m21_6-1_d3. Also copy the

posterior mode file of `m21_f-2_1` to three subfolders in `m21_f-2`: `m21_f-2_d1`, `m21_f-2_d2`, and `m21_f-2_d3`.

2) Run `run_ComputeIRFs_Decomp.m`.
3) Run `run_ComputeIRFs_Decomp_Plot_Figure_5.m`. The output file is `IRFs_Decomp.eps`.

e. Figure 6

1) Run `run_PstEstmCheck.m` for all 6 regimes.
2) Run `run_InflationTarget.m`. The output file is `Inflation_Target_Smoothed_All.eps`.

f. Figure 7

1) Copy the posterior mode file, the posterior simulation result file, and the Kalman filtering/smoothing file for PMPF pre-Volcker to `run3/m21c_6_a-2/m21c_6_a-2_1` (for example, `mode_0_42.mat`, `SimulPst_0_42_n_01.mat`, and `PstCheck_0_42_n.mat`)
2) Run `run_SimulCounterFactuals.m`. The output file is `Counterfactuals_PMPF_AMPF_output.eps` in subfolder `m21c_6_a-2/m21c_6_a-2_1`.
3) The variance of inflation is (2,2) element under the heading "Data covariance" and the variance of counterfactual inflation is (2,2) element under the heading "Posterior means" in file `SimulCF_3.txt`. Take the square root of the variances to get the standard deviation discussed in Section 3.6.3.