Replication files for "Reserve Accumulation, Macroeconomic Stabilization, and Sovereign Risk"

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1 Quantitative Model

All the files to compute and simulate the (different versions of our) quantitative model are in the folder "Quantitative_Model." We also provide a second folder, "outputs_model," which contains the output files from the computation and simulation of various versions of our model.

1.1 Sub-Folders

Under the "Quantitative Model" folder we have the following sub-folders:

1. code_folder: this contains all the files necessary to run from scratch any arbitrary version of our model.
2. fixed_economy_clean: has the solution to the economy under fixed exchange rates. Its contents are also used to create some of the figures (discussed below).
3. flex_economy_clean: has the solution to the economy under flexible exchange rates. Its contents are also used to create some of the figures (discussed below).
4. Figures: has Matlab files to create all the model-related figures in our paper.
5. welfare_files: has solutions to the different versions of the model needed to create the welfare plots.
6. adjustment_cost_files: a very large folder. It has many versions of the model and its purpose is to store the data needed to produce panels B and D in Figure 10.

1.2 Main code

a. Main files

- **code_BSP_Restud.f90**: Fortran file that solves and simulates the model.
- **get_moments_replication.m**: Matlab file that generates business cycle statistics from the simulations.

b. Other files that are needed to run the Fortran codes.

- **param_xxx.txt**: where 'xxx' stands for various model parameters. All these files are in the replication folder. They need to be changed to solve and simulate the model under different parametrizations.

- **toolbox.f90**: this contains a toolbox of numerical routines provided by Hans Fehr and Fabian Kindermann. This toolbox can be obtained in their Github repository:
  https://github.com/fabiankindermann/ce-fortran/blob/main/installation/toolbox/toolbox.f90
  We are **not** providing this toolbox file in our replication package but this is freely available at the above website. Please see their installation instructions.

- **solve_and_sim.sh**: (Optional) Bash script to run all files from the command line.

c. How to run the codes

Regarding the cost of exchange rate fluctuations, we assume a quadratic function $\frac{\Phi}{2}(e-\bar{e})^2$, where $\bar{e}$ is normalized to one. The codes are written to solve the general case, $\Phi \in [0, \infty)$, therefore, depending on the exercise we want to perform, we need change the value in 'param_phi.txt' accordingly.[1]

The parameters governing the grid configuration are specified in the "module param" at the beginning of each Fortran code. The files with the calibration parameter values as well as the "toolbox.f90" file must be saved in the same directory that .f90 files are saved.

The sequence for successfully running the codes is:

1. First, run **code_BSP_Restud.f90**,

2. Second, run **get_moments_replication.m**.

File **solve_and_sim.sh** runs steps 1 to 2 all from one call (Recommended). Also, **solve_cluster.sh** shows how to run this on a typical cluster (like the one at the University of Notre Dame).

Note. All the results reported in the paper were obtained compiling and running the Fortran codes using GNU Fortran (GCC.9.0).

[1] To solve the extreme cases, fully fixed or fully flexible, we can change slightly the code to speed-up the computation and obtain the same results. For the case of a fixed exchange rate regime ($\Phi \to \infty$), we can (i) set Φ to a very large number (e.g. 10,000), and (ii) set the number of grid points for the possible values of the exchange rate, `e_num`, to 1. For the case of a fully flexible exchange rate regime ($\Phi = 0$), we can set $\overline{W} = 0$ and `e_num` $= 1$.

1.3 Reproducing Table 2 and Model-related Figures

Table 2. This table (containing the model simulations) can be reproduced by running **get_moments.m** for the fixed and fully flexible exchange rate regimes.

Figures. Inside subfloder 'Figures' we have the following files:

1. produce_figures_ab_candidates.m: This file reproduces figures 1, 2 (for which it calls file ur_tomorrow_plots.m, also located in the same subfolder), 5 and 6. All these plots are made for candidate portfolios that keep current consumption constant, at some level $\overline{c}$.
2. produce_other_figures.m: This file reproduces figures 3, 4, D1 and D2.
3. produce_welfare_figures.m: reproduces the welfare cost plots (Figure 12). It uses data from the subfolder "welfare_files". The data in that subfolder is not used anywhere else in the replication.
4. produce_depreciation_figures.m: reproduces the model-data panels from Figure 10 (i.e. panels B and D). It uses data from the subfolder "adjustment_cost_files". The data in that subfolder is not used anywhere else in the replication.

2 Empirical Results

The folder "Empirics" has the following contents:

- Subfolder 'Data' with raw and intermediate data.
- Subfolder 'Outputs' where all the empirical results (tables, figures, etc.) are stored.
- Files: 'Empirical_script_1.R', 'Empirical_script_2.R', and 'Empirical_script_3.m'

How to run the codes. Empirical scripts 1 and 2 are coded in R. All the necessary packages are mentioned at the beginning of each script. One needs to first run 'Empirical_script_1.R', and only then run 'Empirical_script_2.R.' 'Empirical_script_3.m' is coded in Matlab and it only reproduces panels A and C from Figure 10.

3 Software Requirements

- GCC Fortran Compiler, version 9.0. (code runs in newer versions, but results are reported using GCC 9.0)
- Matlab (codes were run last with version R2022b).
- R 4.2.2
  - tidyverse 1.3.2
  - stargazer 5.2.3
  - broom 1.0.2
  - R.matlab 3.7.0
  - readxl 1.4.1
  - haven 2.5.1
  - ggrepel 0.9.3
  - plm 2.6.2
  - lmtest 0.9.40
  - fixest 0.11.1
  - modelsummary 1.3.0
  - thematic 0.1.2.1
  - showtext 0.9.5
  - wbstats 1.0.4

4 Data Availability Statement

Our panel data comes mostly from online appendix of Catão and Mano (2017). Researchers can access these files on https://sites.google.com/site/ruimano/data/cataomano2017?authuser=0. We use the file 'CataoManoJIE_Data_PostWW2_simplified.dta' We also follow them in terms of variable definitions for debt, reserves, spreads, world interest rate, crisis years, and exchange rate regime classification. The original sources of the data are:

- The World Bank
  - World Development Indicators. This is the source for debt, nominal exchange rate, and GDP.

  - Global Economic Monitor. This is the source for the EMBI Spreads.
  - International Debt Statistics. This is a source for government debt.
  - All databases are available at: https://databank.worldbank.org/home

- International Monetary Fund.
  - International Financial Statistics. This is the source for international reserves, world interest rate, and the exchange rate regime. https://data.imf.org/ifs.
  - World Economic Outlook. This is a source for government debt. https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases

We also use cross-country measures of wage rigidity from Matschke and Nie (2022), who kindly shared their data with us. We provide this raw data in our replication package (see file './Empirics/Data/ data_wage_rigidity.xlsx' – columns 'gamma_hat' and gamma_tilde' are the wage rigiditiy measures).

References

Catão, L. A. and R. C. Mano (2017). Default premium. *Journal of International Economics 107*, 91–110.

International Monetary Fund (2022a). International financial statistics. Washington DC.

International Monetary Fund (2022b). World economic outlook databases. Washington DC.

Matschke, J. and J. Nie (2022). Downward wage rigidities and recession dynamics. Mimeo, Kansas Fed.

The World Bank (2022a). Global economic monitor. Washington DC.

The World Bank (2022b). International debt statistics. Washington DC.

The World Bank (2022c). World development indicators. Washington DC.