README

Replication Package for “Financial Frictions: Micro vs Macro Volatility”: Model Results

Note on this version

This version corrects numerical implementation issues, notably an unintended overwriting of household-dependent Jacobian entries by `update_model`. Derivatives computed in the full equilibrium system (`Fsys`) were replaced by aggregate-block derivatives (`Fsys_agg`), including for aggregates such as the MPC. This affected model dynamics. Investment adjustment costs and aggregate shock sizes were recalibrated to match the original targets for consumption volatility relative to output and output volatility. The quantitative results have been updated, while the paper’s main conclusions remain unchanged.

Authors:
Renato Faccini, Seungcheol Lee, Ralph Luetticke, Morten O. Ravn, and Tobias Renkin

Publication:
American Economic Review

Overview

This replication package contains all the code and instructions necessary to reproduce the model results (tables and figures) in our paper “Financial Frictions: Micro vs Macro Volatility.” There is another README for the replication of the empirical results.

The package employs Julia and Stata scripts to solve various model variants, run second-order approximations, simulate policy functions, and generate the final outputs. Detailed instructions for running the replication are provided below.

Folder Structure

- **models/**
  Contains all model solution and results scripts. Subfolders include:
  - `src_rankbank` and `src_rankbank_lowleverage` (RANK model variants)
  - `src_hank1bank`, `src_hank1bank_lowleverage`, and their second-order variants
  - `src_hank2bank`, `src_hank2bank_lowleverage`, and their second-order variants
  - `src_hank1bank_stata` and `src_hank2bank_stata` (for policy function estimation and Monte Carlo simulation)

- **models/terminaloutput/**
  Contains log files for each model solution.
- **tempfigures/**
  Temporary figures are saved here during replication and copied to the final figures folder; temporary files are retained.
- **temptables/**
  Temporary tables are saved here during replication and copied to the final tables folder; temporary files are retained.
- **tables/**
  Final folder containing tables for both the main text and the appendix.
- **figures/**
  Final folder containing all figures for both the main text and the appendix.

Software Requirements

- **Software:**
  - **Julia (v1.9.3):** Used for the updated server runs. The original package used Julia 1.9.2. Ensure the intended Julia executable is on your PATH. Project.toml and Manifest.toml specify the package environment; they do not install Julia itself.
  - **Stata:** The original package used Stata 18; the updated server runs used Stata 19.5. Stata is required for the regressions on simulated household data.
  - **Bash Shell:** The batch file is written for a Unix-like environment (macOS or Linux).

Computational Requirements

The original replication was run on an Ubuntu (Release 22.04.5 LTS, MATE 1.26.0) workstation with an Intel Xeon Gold 6240 CPU @ 2.60 GHz, 72 logical processors and 376.5 GB RAM.

- **Memory:**
  Some model solutions (e.g. second-order solutions) are very memory-intensive (requires up to 300GB RAM).
- **Runtime:**
  The full replication may take several days on a high-end workstation. The batch file runs model jobs sequentially; individual Julia jobs use multiple threads.
- **Log Files:**
  Model-solution, welfare, simulation and Stata logs are stored in models/terminaloutput/. Other postprocessing output is printed to the terminal.

Instructions for Replicators

1. **Set Your Working Directory:**
   Ensure you are in the folder containing the file "replication_model.sh".
2. **Install dependencies once:**
   From the package root, run:
   `julia --project=. -e 'using Pkg; Pkg.instantiate()'`
   In Stata, install gtools, ftools, require, reghdfe and coefplot using ssc install followed by each package name. The spartan graph scheme is included in the model folders. The launcher checks the Stata dependencies before running the regressions.
3. **Run the Batch File:**
   Execute: bash replication_model.sh
   If Stata is not on your PATH, set its executable explicitly:
   STATA_BIN=/absolute/path/to/stata bash replication_model.sh

   This runs first-order and second-order solutions, the welfare calculations, Monte Carlo simulations and Stata regressions, then copies the results to their publication folders. Use a machine with sufficient RAM for the second-order models.

4. **Review Log Files:**
   Check the log files in `models/terminaloutput/` to monitor progress or troubleshoot any issues.
5. **Final Outputs:**
   The final tables and figures will be organized into the `tables/` and `figures/` folders.

Walkthrough of replication_model.sh

The following sections and line numbers refer to the supplied replication_model.sh. Line numbers may change if the script is edited.

Lines 26–31: Create temporary folders

Lines 37–92: Solve all model variants

- Lines 38–44: RANK model variants
- Lines 46–56: HANK1BANK model variants
- Lines 58–66: HANK2BANK model variants
- Lines 68–75: Second-order solutions for HANK1BANK
- Lines 77–83: Second-order solutions for HANK2BANK
- Lines 85–92: Policy functions for Monte Carlo simulations

Lines 94–188: Results

- Lines 97–123: Steady-state results
- Lines 125–165: First-order results
- Lines 167–175: Second-order welfare results
- Lines 177–188: Monte Carlo simulations and Stata regressions

Lines 190–326: Copy figures and tables; retain temporary outputs

Additional Notes

- **Memory and Runtime:**
  The full replication is computationally intensive. HANK2 second-order jobs use a 300 GB heap-size hint. A heap-size hint is not a hard memory limit; sufficient physical RAM is required.
- **Thread Settings:**
  Model jobs run sequentially. Adjust Julia's -t thread counts and --heap-size-hint values in the batch file to suit the machine.
- **Software Installation:**
  Ensure Julia and Stata are installed and the dependencies above are available. The Stata executable can be selected with STATA_BIN.

Directory of all Model Results (chronologically from paper)

Figure/Table #	Program	Launcher line(s)
Figure 1	See replication of empirics	--
Figure 2	See replication of empirics	--
Figure 3	See replication of empirics	--
Table 1	See replication of empirics	--
Figure 4	See replication of empirics	--
Table 2	See replication of empirics	--
Table 3	replication_model.sh	103
Table 4	replication_model.sh	103
Table 5	replication_model.sh	140
Figure 5	replication_model.sh	130
Figure 6	replication_model.sh	130
Figure 7	replication_model.sh	133
Figure 8	replication_model.sh	133
Table 6	replication_model.sh	103, 107, 112, 116
Table 7	replication_model.sh	140, 146, 157, 160
Figure 9	replication_model.sh	136–137
Table 8	replication_model.sh	172, 175
Figure 10	replication_model.sh	165
Table A.1	See replication of empirics	--
Figure A.1	See replication of empirics	--
Table A.2	See replication of empirics	--
Table A.3	See replication of empirics	--
Figure D.1	replication_model.sh	143
Figure D.2	replication_model.sh	130
Figure D.3	replication_model.sh	130
Figure D.4	replication_model.sh	130
Figure D.5	replication_model.sh	187
Figure D.6	replication_model.sh	187
Figure D.7	replication_model.sh	180–181

Figure/Table #	Program	Launcher line(s)
Figure D.8	replication_model.sh	140
Table D.1	replication_model.sh	140, 149, 152
Figure D.9	replication_model.sh	103, 137
Table E.1	No computation	--
Figure E.1	replication_model.sh	187
Figure E.2	replication_model.sh	187
Table E.2	replication_model.sh	103, 107, 121, 123

References

Faccini, Renato, Seungcheol Lee, Ralph Luetticke, Morten O. Ravn, and Tobias Renkin. “Financial Frictions: Micro vs Macro Volatility.” American Economic Review.