

# Replication Package for: Large Structural VARs with Multiple Sign and Ranking Restrictions

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## 1 Overview of the Replication Package

This replication package contains eight **MATLAB** files and four auxiliary folders. Five of the **MATLAB** files serve as main programs to generate the two tables (Tables 2 and 3) and fourteen figures (Figures 1–14) reported in the paper. These main files rely on the auxiliary folders, which contain either datasets or additional functions. Table 1 details the correspondence between the output tables/figures and the five main **MATLAB** files.

Table 1: **MATLAB** program details

| Output                       | Program                        | Files/Folders Used      |
|------------------------------|--------------------------------|-------------------------|
| Figure 1                     | main_15VAR_Fig1.m              | RWZ_15var.m             |
|                              |                                | proposed_15var.m        |
|                              |                                | data<br>utility         |
| Table 2,<br>Figures 11–13    | main_6VAR_Tab2Figs11to13.m     | Application.Uhlig2005.m |
|                              |                                | data<br>utility         |
|                              |                                | auxFunctions            |
| Table 3                      | main_MonteCarlo_Tab3.m         | Restr<br>utility        |
| Figures 2–4,<br>Figures 6–10 | main_35VAR_Figs2to10_except5.m | data<br>utility         |
|                              |                                | data<br>utility         |

In addition to the five main programs, the package includes the following three **MATLAB** scripts and four folders:

- **RWZ\_15var.m**: This script implements the empirical application in Chan (2022), which estimates a 15-variable VAR identified via sign restrictions using the algorithm of Rubio-Ramirez, Waggoner, and Zha (2010).
- **proposed\_15var.m**: This script implements the same 15-variable VAR application using the proposed algorithm described in Chan, Matthes, and Yu (2025).
- **Application\_Uhlig2005.m**: This script replicates the application in Uhlig (2005) using three different algorithms: the RWZ algorithm (Rubio-Ramirez, Waggoner, and Zha, 2010), the proposed algorithm (Chan, Matthes, and Yu, 2025), and the algorithm of Read (2022).
- **data**: Contains three datasets:
  1. **data35\_1975.csv**: Fifteen U.S. quarterly variables (1985:Q1–2019:Q4). The raw time series were obtained from the FRED database maintained by the Federal Reserve Bank of St. Louis<sup>1</sup>. Construction details are provided in Chan (2022).
  2. **database\_2019Q4.csv**: Thirty-five U.S. quarterly variables (1983:Q1–2019:Q4). The raw series were obtained from FRED; see Crump, Eusepi, Giannone, Qian, and Sbordon (2021) for details.
  3. **Uhlig\_monthly.csv**: Six monthly variables (industrial production, CPI, S&P GSCI commodity index, total reserves, nonborrowed reserves, and the effective federal funds rate) from December 1969 to December 2007, as used in Uhlig (2005).
- **utility**: Contains 17 **MATLAB** functions that perform various tasks such as prior construction, auxiliary calculations, sampling steps, and plotting.
- **Restr**: Contains 18 simulated **MATLAB** data files used in the Monte Carlo experiments, together with a subfolder that holds four **MATLAB** scripts for generating those artificial datasets.

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<sup>1</sup><https://fred.stlouisfed.org/>

- **auxFunctions**: Contains 25 MATLAB functions required for implementing the algorithm of Read (2022). These files are copied from the original code provided by Read (2022).

While Table 1 details the programs and their dependencies, Table 2 lists the specific files saved to disk upon completing each main program.

| Table 2: Files saved after running the main MATLAB programs |                                |
|-------------------------------------------------------------|--------------------------------|
| Program                                                     | Saved files                    |
| main_15VAR_Fig1.m                                           | results_15var_RWZ.mat          |
|                                                             | results_15var.mat              |
|                                                             | Fig1_Panela.eps                |
|                                                             | Fig1_Panelb.eps                |
| main_6VAR_Tab2Figs11to13.m                                  | Fig11.eps                      |
|                                                             | Fig12.eps                      |
|                                                             | Fig13.eps                      |
|                                                             | Table2.csv                     |
| main_MonteCarlo_Tab3.m                                      | Table3.csv                     |
| main_35VAR_Figs2to10_except5.m                              | results_35var.mat              |
|                                                             | Fig2.eps                       |
|                                                             | Fig3.eps                       |
|                                                             | Fig4.eps                       |
|                                                             | Fig6.eps                       |
|                                                             | Fig7.eps                       |
|                                                             | Fig8.eps                       |
|                                                             | Fig9.eps                       |
| main_15VARvs35VAR_Figs5and14.m                              | Fig10.eps                      |
|                                                             | results_35var_compare15var.mat |
|                                                             | Fig5.eps                       |
|                                                             | Fig14.eps                      |

## 2 Data Availability Statement

The three datasets in the **data** folder were downloaded from the U.S. Federal Reserve Economic Data (FRED) database, except for one series that has been perturbed with noise (specifically, the commodity-price series in **Uhlig\_monthly.csv**). All data files in the **Restr** folder are generated by the accompanying code and are not based on external sources.

### 3 Instructions for Code Execution

All tables and figures can be reproduced directly by running the corresponding main programs. The following execution order is recommended (note there is no need for a specific order, each file can generate its own files without running the others before, EXCEPT that Task 1 needs to be run before Task 5 as Task 5 has a specific prerequisite, indicated in bold below):

1. Run `main_15VAR_Fig1.m` to produce Figure 1.
2. Run `main_6VAR_Tab2Figs11to13.m` to produce Table 2 and Figures 11–13.
3. Run `main_MonteCarlo_Tab3.m` to produce Table 3.
4. Run `main_35VAR_Figs2to10_except5.m` to produce Figures 2–4 and 6–10.
5. Run `main_15VARvs35VAR_Figs5and14.m` to produce Figures 5 and 14. **Note: This requires the file `results_15var.mat`, which is generated by `main_15VAR_Fig1.m` and serves as an input for comparison with the 35-VAR.**

### 4 Computational Requirements and Running Time

The computations were performed in the following environment:

- CPU: 12th Gen Intel(R) Core(TM) i9-12900KF (3.20 GHz)
- RAM: 64.0 GB
- Operating System: Windows 11 Home 64-bit
- Software: MATLAB R2022b

Approximate running times for the main programs are:

- `main_15VAR_Fig1.m`: Approximately 140 hours + 16 seconds. The script consists of two parts:
  1. Execution of `RWZ_15var.m` (about 140 hours). This step can be skipped because its results are already reported in Chan (2022).

2. Execution of `proposed_15var.m` (about 16 seconds). Users may start the script from line 25 to run only this part.

- `main_6VAR_Tab2Figs11to13.m`: Approximately 20 minutes.
- `main_MonteCarlo_Tab3.m`: Approximately 100 hours<sup>2</sup>.
- `main_35VAR_Figs2to10_except5.m`: Approximately 140 minutes.
- `main_15VARvs35VAR_Figs5and14.m`: Approximately 140 minutes.

## 5 List of Tables and Figures

### 5.1 Tables

The paper contains four tables. Tables 2 and 3 are generated directly by the code in this replication package. Tables 1 and 4 reproduce and extend analyses from Chan (2022) and Crump, Eusepi, Giannone, Qian, and Sbordone (2021), respectively; the complete code for replicating those tables is available in the original sources and is therefore not included here.

- Table 2: Produced by `main_6VAR_Tab2Figs11to13.m`. The table is displayed in the MATLAB command window.
- Table 3: Produced by `main_MonteCarlo_Tab3.m`. The table is displayed in the MATLAB command window.

### 5.2 Figures

All 14 figures are generated by the provided code.

- Figures 1–14 are produced by the corresponding main programs listed in Table 1. Each figure opens in a separate MATLAB graphics window upon completion of the respective script.

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<sup>2</sup>The running time can be reduced by lowering the number of Monte Carlo draws from 10,000 (used in the paper) to a smaller number (e.g., 300), though this introduces approximation error.

## References

- CHAN, J., C. MATTHES, AND X. YU (2025): “Large structural vars with multiple sign and ranking restrictions,” *arXiv preprint arXiv:2503.20668*.
- CHAN, J. C. C. (2022): “Asymmetric conjugate priors for large Bayesian VARs,” *Quantitative Economics*, 13(3), 1145–1169.
- CRUMP, R. K., S. EUSEPI, D. GIANNONE, E. QIAN, AND A. M. SBORDONE (2021): “A large Bayesian VAR of the United States economy,” *FRB of New York Staff Report No. 976*.
- READ, M. (2022): “Algorithms for inference in SVARs identified with sign and zero restrictions,” *The Econometrics Journal*, 25(3), 699–718.
- RUBIO-RAMIREZ, J. F., D. F. WAGGONER, AND T. ZHA (2010): “Structural vector autoregressions: Theory of identification and algorithms for inference,” *The Review of Economic Studies*, 77(2), 665–696.
- UHLIG, H. (2005): “What are the effects of monetary policy on output? Results from an agnostic identification procedure,” *Journal of Monetary Economics*, 52(2), 381–419.