Replication Package for:
Time-Varying Shock Transmission in Non-Gaussian Structural Vector Autoregressions

Helmut Lütkepohl and Till Strohsal

12 December 2025

This replication package accompanies the article: Helmut Lütkepohl and Till Strohsal, *Time-Varying Shock Transmission in Non-Gaussian Structural Vector Autoregressions. The Econometrics Journal.*

Data Availability and Provenance Statements

Statement about Rights

The authors have legitimate access to and permission to use all data employed in this manuscript.

Summary of Availability

All data used in the study are publicly available.

Details on Each Data Source

The data used in the empirical analysis (Figure 1, Table 1, Table 2, and Figure 2) are from Lutz Kilian (2009) and publicly available from https://www.aeaweb.org/articles?id=10.1257/aer.99.3.1053.

These data include:

- Monthly data on crude oil production growth
- Index of global real economic activity
- Real price of oil

These data are included in the replication package as `Data_Kilian_2009.txt`.

Dataset List

Data file	Source	Notes	Provided
Data_Kilian_2009.txt	Kilian (2009)	oil prod., global activity, real oil price	Yes

Description of Programs and Code

The main replication script is MAIN.m. It runs the entire empirical application in the main paper in sequential order. The subcomponents are organized as follows:

- estimate_recursive_B_full.m: Estimates the recursive (Cholesky-identified) structural B-matrix using the full sample (Kilian 2009 baseline).
- estimate_nonnormal_B_full.m: Estimates the structural B-matrix identified by non-Gaussianity for the full sample.
- create_figure1.m: Creates Figure 1, which displays reduced-form residuals from the VAR(24).
- estimate_recursive_B_subsamples.m: Estimates recursive B-matrices for two subsamples split at 1990M9.
- estimate_nonnormal_B_subsamples.m: Estimates non-Gaussian B-matrices for the same two subsamples.
- compute_tests_tables_1_and_2.m: Implements Wald tests for time-varying shock transmission and generates results for Table 1 and Table 2 (main break date).
- compute_tests_tables_1_and_2_robustness.m: Provides robustness checks using alternative break dates (± 1 and ± 2 months).
- create_figure2.m: Plots impulse response functions for both identification strategies and subsamples (Figure 2).
- non_normality_tests.m: Performs tests for non-normality and independence (results reported in Footnote 4).

Each script prints relevant outputs (test results, matrices, etc.) directly to the MATLAB command window or saves generated PDF/PNG plots in the output directory of the replication package.

Computational Requirements

Software Requirements

- MATLAB: All code was developed and tested in MATLAB R2023b.
- Required MATLAB Toolboxes:
  - Statistics and Machine Learning Toolbox
  - Optimization Toolbox (used for constrained maximization)
- Operating System: Microsoft Windows 11 Enterprise LTSC, Version 24H2, Build 26100.6899

All scripts should run without error using a standard MATLAB installation with the above toolboxes.

Memory and Runtime Requirements

Summary: Approximate time needed to reproduce the analyses on a standard (2025) desktop machine: about 2 hours.

Details:

- Machine specifications: Intel Core i7 (12th Gen), 16 GB RAM, SSD
- Most individual scripts (e.g., B-matrix estimation or non-normality tests) run in under 1 minute.
- The most time-consuming parts are the Wald test computations in `compute_tests_tables_1_and_2.m` and `compute_tests_tables_1_and_2_robustness.m`, which may take up to 120 minutes depending on processor speed.

All numerical outputs (test statistics, B-matrix estimates, etc.) are printed to the MATLAB console.

Instructions to Replicators

1. Open MATLAB (version R2023b).
2. Set the working directory to the folder containing this replication package.
3. Run `MAIN.m`. This script sequentially executes the full empirical replication:
   - Estimation of recursive and non-Gaussian B-matrices
   - Generation of Figures 1 and 2
   - Wald tests for time-varying transmission (Tables 1 and 2)
   - Non-normality and independence tests

4. Note that the exact numerical results in Tables 1 and 2, as well as in $\hat{B}_{nG}$, $\hat{B}_{nG}^{(1)}$ and $\hat{B}_{nG}^{(2)}$ may differ slightly across computing environments. Numerical optimization algorithms can converge to different local maxima of the likelihood function, which may result in the selection of different B-matrices of structural impact coefficients. These differences can translate into small discrepancies at the second, and occasionally the first, decimal place.

List of Tables, Figures, and In-Text Numbers

Figure/Table/ In-text numbers	**Notes**	**Program**
In-text numbers	Triangular B-matrix (full sample)	`estimate_recursive_B_full`
In-text numbers	B-matrix non-Gaussian (full sample)	`estimate_nonnormal_B_full`
Figure 1	Reduced-form LS residuals from VAR(24)	`create_figure1`
In-text numbers	Triangular B-matrix (subsamples)	`estimate_recursive_B_subsamples`
In-text numbers	B-matrix non-Gaussian (subsamples)	`estimate_nonnormal_B_subsamples`
Tables 1 and 2	Results break date 1990M9	`compute_tests_tables_1_and_2`
Tables 1 and 2	Results alternative break dates	`compute_tests_tables_1_and_2_robustness`
Figure 2	Impulse response functions	`create_figure2`
In-text numbers (Footnote 4)	Non-normality and independence tests	`non_normality_tests`

This list follows the chronological order of the empirical results in the paper. All outputs appear in the MATLAB command window. The provided code reproduces all numbers, tables, and figures reported in the main paper.

References

- Kilian, L. (2009). "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market." *American Economic Review*, 99(3): 1053–69. https://doi.org/10.1257/aer.99.3.1053