

Fast and Efficient Bayesian Analysis of Structural Vector Autoregressions Using the R package `bsvars`

version 3.1

Tomasz Woźniak
University of Melbourne

Abstract

The R package `bsvars` provides a wide range of tools for empirical macroeconomic and financial analyses using Bayesian Structural Vector Autoregressions. It uses frontier econometric techniques and compiled code written using `c++` to ensure fast and efficient estimation of these multivariate dynamic structural models, possibly with many variables, complex identification strategies, and non-linear characteristics. The models can be identified using adjustable exclusion restrictions, heteroskedasticity, or non-normal shocks and feature a flexible three-level equation-specific local-global hierarchical prior distribution for the estimated level of shrinkage for autoregressive and structural parameters. Additionally, the package facilitates predictive and structural analyses such as impulse responses, forecast error variance and historical decompositions, forecasting, verification of heteroskedasticity and hypotheses on autoregressive parameters, and analyses of structural shocks, volatilities, and fitted values. These features differentiate `bsvars` from existing R packages that either focus on a specific structural model, do not consider heteroskedastic shocks, or lack the implementation using compiled code.

Keywords: Bayesian inference, Structural VARs, Gibbs sampler, exclusion restrictions, heteroskedasticity, non-normal shocks, forecasting, structural analysis, R.

1. Introduction

[Woźniak \(2024\)](#)

```
R> library(bsvars)
R> data(us_fiscal_lsuv)

R> colMeans(us_fiscal_lsuv)

      ttr      gs      gdp
-9.588408 -9.996170 -7.645419
```

References

Woźniak T (2024). *bsvars: Bayesian Estimation of Structural Vector Autoregressive Models*.
R package version 3.1, URL <http://CRAN.R-project.org/package=bsvars>.

Affiliation:

Tomasz Woźniak

University of Melbourne

Department of Economics

111 Barry Street

Carlton, VIC 3053, Australia

E-mail: tomasz.wozniak@unimelb.edu.au

URL: <https://github.com/donotdespair>