STATA®
Statistics/Data Analysis

Title

svarih —— Structural vector autoregressive models, identified through heteroskedasticity

Syntax

svarih *method* _depvarlist_ [_if_] [_in_] [**,** *options*]

method	Description
bacchiocchi	Bacchiocchi (2011) method and model
bfanelli	Bacchiocchi/Fanelli (2012) method and model
llutkepohl	Lanne/Lütkepohl (2008) method and model

For the detailed syntax and description of these estimation methods, see svarih bac, svarih bfa and svarih llu.

Description

svarih implements several identification methods and models for structural vector autoregressions that are based on identification through heteroskedasticity. For a detailed exposition of these estimation methods, see their respective help files.

Abbreviations, definitions, notation

The following list contains abbreviations, definitions, and notation that are used throughout this help file, the help files for **svarih** methods, and for **dsimih** and **dsimih** subcommands.

Definitions:
volatility regime/state	period of time within which the structural / reduced-form covariance matrix does not change.
regime variable	categorical numeric variable that identifies volatility regimes
regime matrix	matrix that pins down the volatile shocks for each volatility state

Abbreviations:
IH	identification through heteroskedasticity
IH-BAC	IH, Bacchiocchi (2011) method
IH-BFA	IH, Bacchiocchi/Fanelli (2012) method
IH-LLU	IH, Lanne/Lütkepohl (2008) method
(S)VAR	(structural) vector autoregression
SIRF	structural impulse response function
SFEVD	structural forecast-error variance decomposition

Remarks

Remarks are presented under the following headings:

Structural VAR IH models
Variants of IH models
Notation
Help file access

Structural VAR IH models

Structural VAR estimation has a long tradition in economics. Various methods
have been proposed to identify the parameters of a structural VAR simultaneous
equations model, the most prominent ones being short-run (exclusion/equality)
restrictions, long-run restrictions, and sign restrictions. Kilian (2011)
provides an excellent overview of the identification methods that have been
advanced. Identification through short-run and long-run restrictions have been
implemented in official Stata through the svar command.

svarih, by contrast, uses identification methods that are based on
heteroskedasticity in the data. It posits the existence of different "regimes".
This means that the covariance matrix of the structural (as well as the
reduced-form) shocks varies over time but remains constant within a certain time
span ("regime"). In practice, this often translates into defining a "baseline"
regime and one or several "volatility" regimes that deviate from the baseline.
Each regime can occur multiple times. The sequence of regimes is unrestricted.
There can be gaps in the data.

Apart from the existence of different error covariance matrices, the model
employed fully corresponds to the standard structural VAR model. In particular,
this means that the A-matrix and/or the B-matrix (in AB-model notation; see [TS]
svar (manual) and svar (online)), if they are present in the respective SVAR-IH
model, contain constant coefficients.

IH models achieve identification through positing a priori knowledge about the
changing nature of structural shocks, i.e. different volatility regimes. The
applicability of IH models thus depends on the plausibility of such assumptions.
The advantage of these identification methods is that apart from normalization
restrictions no or fewer constraints on the parameters to be estimated are
necessary, or that constraints can be imposed in a more flexible way.

Since IH models assume different states of volatility, you have to supply the
estimation command with information regarding the different volatility periods.
All **svarih** methods take a variable as input that identifies the regimes. svarih
bacchiocchi additionally needs a matrix that tells the estimation routine which
shocks have modified volatility during each volatility regime.

After estimation, you can use dsimih to create SIRFs and SFEVDs. **predict**
generates prediced values, residuals, shocks, and historical decompositions.
For these and other postestimation tools, see svarih postestimation.

Variants of IH models

The seminal contribution in the IH SVAR literature is Rigobon (2003). It
consists of an A-model where shock volatility regimes are defined exogenously.
To account for correlatedness of the structural shocks, common shocks can be
added to the model. There is no asymptotic framework. Standard errors are
obtained through a bootstrap. Lanne and Lütkepohl (2008) converted the model to
a B-model and added an asymptotic ML framework. Lanne and Lütkepohl (2010) set
up a similar B-model that models the residuals as following a mixture normal
distribution. Lanne et al. (2010) add Markov-switching properties to a B-model
so that regimes are determined endogenously. Bacchiocchi (2011) provides an
AB-model ML framework that also allows for different shock propagation in
different regimes. Finally, Bacchiocchi and Fanelli (2012) tackle the issue of
simultaneous changes in volatility and B-matrix elements. For a survey of these
and similar methods, see Lütkepohl (2012).

Notation

The usage of conflicting notation for VAR and SVAR related model parameters in
different publications is an obstacle in understanding and comparing the
different methods. To facilitate the understanding of the differenet IH methods
and how they compare to the standard **svar** methods, the notation of **svarih** leans
heavily on the Stata time-series manual entries of var and svar. Notation
matters in some instances for command options and for returned **e()**-values but
mostly for the accompanying PDF document on methods and formulas.

Help file access

The help files for the subcommands of **svarih** are available under their minimum abbreviated form. For example, type "help svarih bac" instead of "help svarih bacchiocchi". Likewise, the other estimation subcommand help files are accessible under "svarih bfa" and "svarih llu". Help for the postestimation option "**svarih, cmat**" is available under "help svarih cmat". Help for the utility **svarih examples** which generate example estimates can be accessed by "help svarih examples".

A PDF document called **svarihMethodsAndFormulas.pdf** that details methods and formulas used in **svarih** and **dsimih** is part of the **svarih** package. During package installation the PDF file is copied into the same directory as **svarih.ado**. To find the directory where both files are located, you can type

   . findfile svarih.ado , all

Author

Daniel C. Schneider, Goethe University Frankfurt, dan_schneider@outlook.com

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DISCLAIMER

THE SVARIH STATA PACKAGE (THE "SOFTWARE") COMES AS-IS. NO WARRANTIES, EXPRESS OR IMPLIED, ARE GIVEN. ANY CONSEQUENTIAL DAMAGE DUE TO THE USE OF THE SOFTWARE IS THE SOLE RESPONSIBILITY OF THE USER.

References

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<u>Also see</u>

Help: **<u>[TS] svar</u>**, **<u>svarih bac</u>**, **<u>svarih bfa</u>**, **<u>svarih llu</u>**, **<u>svarih postestimation</u>**, **<u>svarih cmat</u>**, **<u>dsimih</u>**