(M-)SSA-package: tutorials on novel (Multivariate) Smooth Sign Accuracy Forecast Approach

Formal/technical background:
- Wildi (2024) introduces the univariate SSA, applied to US business-cycle analysis.
- Wildi (2026a) provides theory.
- M-SSA is a multivariate extension (Wildi, 2026b).
- Heinisch et al. (2026) construct a multi-quarter ahead M-SSA predictor for German GDP (multiple quarters ahead).

M-SSA Package description: There are four folders and a R-project file called M-SSA_package

- Folder "Data": macro data (in particular for German GDP predictor in tutorial 7: this replicates Heinisch et al. (2026))
- Folder "R": collection of R-functions used in tutorials
- Folder "M-SSA Tutorials": all tutorials. Proceed in ascending order.
- Folder "Papers": working paper versions of cited literature.

Working through the tutorials:

- Load the R-project file "M-SSA_package" in R studio.
- In R-studio: select a tutorial from the "M-SSA Tutorial" folder.
- Go through the numbered tutorials: follow the sequence (from simplest to most complex).
    - Number 0: introduction to topic: trilemma, optimization criterion, classic mean-square error (MSE) approach
    - Number 1: application of SSA (univariate approach) to forecasting
    - Number 2: application to real-time signal extraction and Hodrick-Prescott filter
    - Number 3: application to Hamilton regression filter
    - Number 4: application to Baxter and King filter
    - Number 5: application to (refined) Beveridge Nelson filter
    - Number 6: extension of SSA to non-stationary series (maximal monotone predictor). Under construction.
    - Number 7: extension of SSA to multivariate prediction problem M-SSA
        - Application: forecasting German GDP several quarters ahead

Literature:

\bibitem{} Heinisch, K. and Van Norden, S. and Wildi, M. (2026) Smooth and Persistent Forecasts of German GDP: Balancing Accuracy and Stability. {IWH Discussion Papers} {\bf 1/2026}, Halle Institute for Economic Research,

https://doi.org/10.18717/dp99kr-7336.

\bibitem{} Wildi, M. (2024). Business-Cycle Analysis and Zero-Crossings of Time Series: a Generalized Forecast Approach.{\it Journal of Business Cycle Research}. https://doi.org/10.1007/s41549-024-00097-5

\bibitem{} Wildi, M. (2026a). Sign Accuracy, Mean-Squared Error and the Rate of Zero Crossings: a Generalized Forecast Approach. {   arXiv:2601.06547 [econ.EM]}.

https://doi.org/10.48550/arXiv.2601.06547

\bibitem{} Wildi, M. (2026b). The Accuracy Smoothness Dilemma in Prediction: a Novel Multivariate M-SSA Forecast Approach .{\it Journal of Time Series Analysis} (accepted for publication).