

R Packages

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References

Cheung et al.: semlbci: An R package for forming likelihood-based confidence intervals for parameter estimates, correlations, indirect effects, and other derived parameters

Cheung-Pesigan-2023

Shu Fai Cheung and Ivan Jacob Agaloos Pesigan. “semlbci: An R package for forming likelihood-based confidence intervals for parameter estimates, correlations, indirect effects, and other derived parameters”. In: *Structural Equation Modeling: A Multidisciplinary Journal* (May 2023), pp. 1–15. DOI: [10.1080/10705511.2023.2183860](https://doi.org/10.1080/10705511.2023.2183860).

Abstract: There are three common types of confidence interval (CI) in structural equation modeling (SEM): Wald-type CI, bootstrapping CI, and likelihood-based CI (LBCI). LBCI has the following advantages: (1) it has better coverage probabilities and Type I error rate compared to Wald-type CI when the sample size is finite; (2) it correctly tests the null hypothesis of a parameter based on likelihood ratio chi-square difference test; (3) it is less computationally intensive than bootstrapping CI; and (4) it is invariant to transformations. However, LBCI is not available in many popular SEM software packages. We developed an R package, semlbci, for forming LBCI for parameters in models fitted by lavaan, a popular open-source SEM package, such that researchers have more options in forming CIs for parameters in SEM. The package supports both unstandardized and standardized

estimates, derived parameters such as indirect effect, multisample models, and the robust LBCI proposed by Falk.

Neale et al.: OpenMx 2.0: Extended Structural Equation and Statistical Modeling
Neale-Hunter-Pritikin-et-al-2015

Michael C. Neale et al. “OpenMx 2.0: Extended Structural Equation and Statistical Modeling”. In: *Psychometrika* 81.2 (Jan. 2015), pp. 535–549. DOI: [10.1007/s11336-014-9435-8](https://doi.org/10.1007/s11336-014-9435-8).

Abstract: The new software package OpenMx 2.0 for structural equation and other statistical modeling is introduced and its features are described. OpenMx is evolving in a modular direction and now allows a mix-and-match computational approach that separates model expectations from fit functions and optimizers. Major backend architectural improvements include a move to swappable open-source optimizers such as the newly written CSOLNP. Entire new methodologies such as item factor analysis and state space modeling have been implemented. New model expectation functions including support for the expression of models in LISREL syntax and a simplified multigroup expectation function are available. Ease-of-use improvements include helper functions to standardize model parameters and compute their Jacobian-based standard errors, access to model components through standard R \$ mechanisms, and improved tab completion from within the R Graphical User Interface.

Ou et al.: What’s for dynr: A package for linear and nonlinear dynamic modeling in R
Ou-Hunter-Chow-2019

Lu Ou, Michael D. Hunter, and Sy-Miin Chow. “What’s for dynr: A package for linear and nonlinear dynamic modeling in R”. In: *The R Journal* 11.1 (2019), p. 91. DOI: [10.32614/rj-2019-012](https://doi.org/10.32614/rj-2019-012).

Abstract: Intensive longitudinal data in the behavioral sciences are often noisy, multivariate in nature, and may involve multiple units undergoing regime switches by showing discontinuities interspersed with continuous dynamics. Despite increasing interest in using linear and nonlinear

differential/difference equation models with regime switches, there has been a scarcity of software packages that are fast and freely accessible. We have created an R package called `dynr` that can handle a broad class of linear and nonlinear discrete and continuous-time models, with regime-switching properties and linear Gaussian measurement functions, in C, while maintaining simple and easy-to-learn model specification functions in R. We present the mathematical and computational bases used by the `dynr` R package, and present two illustrative examples to demonstrate the unique features of `dynr`.

Pesigan et al.: betaDelta and betaSandwich: Confidence intervals for standardized regression coefficients in R **Pesigan-Sun-Cheung-2023**

Ivan Jacob Agaloos Pesigan, Rong Wei Sun, and Shu Fai Cheung. “betaDelta and betaSandwich: Confidence intervals for standardized regression coefficients in R”. In: *Multivariate Behavioral Research* (Apr. 2023), pp. 1–4. DOI: [10.1080/00273171.2023.2201277](https://doi.org/10.1080/00273171.2023.2201277).

Abstract: The multivariate delta method was used by Yuan and Chan to estimate standard errors and confidence intervals for standardized regression coefficients. Jones and Waller extended the earlier work to situations where data are nonnormal by utilizing Browne’s asymptotic distribution-free (ADF) theory. Furthermore, Dudgeon developed standard errors and confidence intervals, employing heteroskedasticity-consistent (HC) estimators, that are robust to nonnormality with better performance in smaller sample sizes compared to Jones and Waller’s ADF technique. Despite these advancements, empirical research has been slow to adopt these methodologies. This can be a result of the dearth of user-friendly software programs to put these techniques to use. We present the `betaDelta` and the `betaSandwich` packages in the R statistical software environment in this manuscript. Both the normal-theory approach and the ADF approach put forth by Yuan and Chan and Jones and Waller are implemented by the `betaDelta` package. The HC approach proposed by Dudgeon is implemented by the `betaSandwich` package. The use of the packages is demonstrated with an empirical example. We think the packages will enable applied researchers to accurately assess the sampling variability of standardized regression coefficients.