nse: Computation of Numerical Standard Errors in R

David Ardia
Institute of Financial Analysis, University of Neuchâtel, Switzerland
Département de Finance, Assurance et Immobilier, Université Laval, Québec, Canada

Keven Bluteau
Institute of Financial Analysis, University of Neuchâtel, Switzerland

January 11, 2017

Summary

nse is an R package (R Core Team, 2016) for computing the numerical standard error (NSE), an estimate of the standard deviation of a simulation result, if the simulation experiment were to be repeated many times. The package provides a set of wrappers around several R packages, which give access to more than thirty estimators, including batch means estimators (Geyer, 1992, Section 3.2), initial sequence estimators Geyer (1992, Equation 3.3), spectrum at zero estimators (Heidelberger and Welch, 1981; Flegal and Jones, 2010), heteroskedasticity and autocorrelation consistent (HAC) kernel estimators (Newey and West, 1987; Andrews, 1991; Andrews and Monahan, 1992; Newey and West, 1994; Hirukawa, 2010), and bootstrap estimators Politis and Romano (1992, 1994); Politis and White (2004). The full set of methods available is presented in Ardia et al. (2016) together with several examples of applications of NSE in econometrics and finance. The latest version of the package is available at `https://github.com/keblu/nse`.

References

D. W. K. Andrews. Heteroskedasticity and autocorrelation consistent covariance matrix estimation. *Econometrica*, 59(3):817–858, 1991. doi: 10.2307/2938229.

D. W. K. Andrews and J Christopher Monahan. An improved heteroskedasticity and autocorrelation consistent covariance matrix estimator. *Econometrica*, 60(4):953–966, 1992. doi: 10.2307/2951574.

D. Ardia, K. Bluteau, and Lennart F. Hoogerheide. Comparison of multiple methods for computing numerical standard errors: An extensive Monte Carlo study, 2016. URL `https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2741587`. Working paper.

J. M. Flegal and G. L. Jones. Batch means and spectral variance estimators in Markov chain Monte Carlo. *Annals of Statistics*, 38(2):1034–1070, 2010. doi: 10.1214/09-aos735.

C. J. Geyer. Practical Markov chain Monte Carlo. *Statistical Science*, 7(4):473–483, 1992. doi: 10.1214/ss/1177011137.

Philip Heidelberger and Peter D. Welch. A spectral method for confidence interval generation and run length control in simulations. *Communications of the ACM*, 24(4):233–245, 1981. doi: 10.1145/358598.358630.

Masayuki Hirukawa. A two-stage plug-in bandwidth selection and its implementation for covariance estimation. *Econometric Theory*, 26(3):710–743, 2010. doi: 10.1017/s0266466609990089.

Whitney K Newey and Kenneth D West. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(3):703–708, 1987. doi: 10.2307/1913610.

Whitney K Newey and Kenneth D West. Automatic lag selection in covariance matrix estimation. *Review of Economic Studies*, 61(4):631–653, 1994. doi: 10.3386/t0144.

Dimitris N Politis and Joseph P Romano. A circular block-resampling procedure for stationary data. In *Exploring the Limits of Bootstrap*, pages 263–270. John Wiley & Sons, 1992.

Dimitris N Politis and Joseph P Romano. The stationary bootstrap. *Journal of the American Statistical association*, 89(428):1303–1313, 1994. doi: 10.2307/2290993.

Dimitris N Politis and Halbert White. Automatic block-length selection for the dependent bootstrap. *Econometric Reviews*, 23(1):53–70, 2004. doi: 10.1081/etc-120028836.

R Core Team. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria, 2016. URL `http://www.R-project.org/`.