

COMPLETE CONSISTENCY AND ASYMPTOTIC NORMALITY FOR THE WEIGHTED ESTIMATOR IN A NONPARAMETRIC REGRESSION MODEL UNDER DEPENDENT ERRORS

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Abstract. In this paper, we investigate the effect of dependent errors in the fixed design nonparametric regression models. Under some mild conditions, we obtain the complete consistency and asymptotic normality for the weighted estimator in the fixed design nonparametric regression models. In addition, a simulation study is undertaken to investigate finite sample behavior of the estimator.

Mathematics subject classification (2020): 62F12, 62G20.

Keywords and phrases: Nonparametric regression model, asymptotic normality, complete consistency, weighted estimator, (α, β) -mixing sequence.

REFERENCES

- [1] A. ADLER, A. ROSALSKY, *Some general strong laws for weighted sums of stochastically dominated random variables*, Stochastic Analysis and Applications, **5**, 1–16, 1987.
- [2] A. ADLER, A. ROSALSKY, R. L. TAYLOR, *Strong laws of large numbers for weighted sums of random elements in normal linear spaces*, International Journal of Mathematics and Mathematical Sciences, **12**, 507–529, 1989.
- [3] R. C. BRADLEY, W. BRYC, *Multilinear forms and measures of dependence between random variables*, Journal of Multivariate Analysis, **16**, 335–367, 1985.
- [4] Z. W. CAI, *Strong consistency and rates for recursive nonparametric conditional probability density estimates under (α, β) -mixing conditions*, Stochastic Processes and Their Applications, **38**, 323–333, 1991.
- [5] J. FAN, I. GIBBELS, *Local Polynomial Modelling and Its Applications*, Chapman and Hall, London, 1996.
- [6] A. A. GEORGIEV, *Local properties of function fitting estimates with applications to system identification*, In: W. Grossmann et al., eds. Mathematical Statistics and Applications, Proceedings 4th Panonian Sump. Math. Statist., 4–10, September, 1983, Bad Tatzmannsdorf, Austria, Reidel, Dordrecht, 141–151, 1985.
- [7] P. GAO, *Strong stability of (α, β) -mixing sequences*, Applied Mathematics-A Journal of Chinese Universities, Series B, **31** (4), 405–412, 2016.
- [8] W. HÄRDLE, *Applied Nonparametric Regression*, Cambridge University Press, Cambridge, 1990.
- [9] S. H. HU, G. M. PAN, Q. B. GAO, *Estimation problems for a regression model with linear process errors*, Applied Mathematics-A Journal of Chinese Universities, Series A, **18** (1), 81–90, 2003.
- [10] H. Y. LIANG, B. Y. JING, *Asymptotic properties for estimates of nonparametric regression models based on negatively associated sequences*, Journal of Multivariate Analysis, **95** (2), 227–245, 2005.
- [11] C. R. LU, Z. Y. LIN, *Limit Theory for Mixed Dependent Variables*, Science Press of China, Beijing, 1997.
- [12] H. G. MÜLLER, *Nonparametric Regression Analysis of Longitudinal Data*, Lectures Notes in Statistics **46**, Springer-Verlag, Berlin, 1988.

- [13] Q. M. SHAO, *Limit theorems for the partial sums of dependent and independent random variable*, Hefei, University of Science and Technology of China, 1–309, Hefei, 1989.
- [14] A. T. SHEN, *Bernstein-type inequality for widely dependent sequence and its application to nonparametric regression models*, Abstract and Applied Analysis, vol. 2013, Article ID 862602, 9 pages, 2013.
- [15] A. T. SHEN, *Complete convergence for weighted sums of END random variables and its application to nonparametric regression models*, Journal of Nonparametric Statistics, **28**, 702–715, 2016.
- [16] A. T. SHEN, M. YAO, W. J. WANG, A. VOLODIN, *Exponential probability inequalities for WNOD random variables and their applications*, RACSAM, **110**, 251–268, 2016.
- [17] A. T. SHEN, Y. ZHANG, A. VOLODIN, *Applications of the Rosenthal-type inequality for negatively superadditive dependent random variables*, Metrika, **78**, 295–311, 2015.
- [18] S. K. SAMURA, X. J. WANG, Y. WU, *Consistency properties for the estimators of partially linear regression model under dependent errors*, Journal of Statistical Computation and Simulation, **89** (13), 2410–2433, 2019.
- [19] Y. SHEN, Y. J. ZHANG, *Strong limit theorems for (α, β) -mixing random variable sequences*, Journal of University of Science and Technology of China, **41** (9), 778–795, 2011.
- [20] X. J. WANG, Z. Y. SI, *Complete consistency of the estimator of nonparametric regression model under ND sequence*, Statistical Papers, **56**, 585–596, 2015.
- [21] X. J. WANG, C. XU, T. C. HU, A. VOLODIN, S. H. HU, *On complete convergence for widely orthant dependent random variables and its applications in nonparametric regression models*, TEST, **23** (3), 607–629, 2014.
- [22] Y. WU, X. J. WANG, S. H. SUNG, *Asymptotic normality and mean consistency for the weighted estimator in nonparametric regression models*, Journal of the Korean Statistical Society, **48**, 463–479, 2019.
- [23] S. C. YANG, *Maximal moment inequality for partial sum of strong mixing sequences and application*, Acta Mathematica Sinica, English Series, **23** (6), 1013–1024, 2007.
- [24] C. Q. YU, *Convergence theorems of weighted sum for (α, β) -mixing sequences*, Journal of Hubei University (Natural Science), **38** (6), 477–487, 2016.