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**A significance test for covariates in nonparametric regression.** (English) Zbl 1309.62076  
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Summary: We consider testing the significance of a subset of covariates in a nonparametric regression. These covariates can be continuous and/or discrete. We propose a new kernel-based test that smoothes only over the covariates appearing under the null hypothesis, so that the curse of dimensionality is mitigated. The test statistic is asymptotically pivotal and the rate of which the test detects local alternatives depends only on the dimension of the covariates under the null hypothesis. We show the validity of wild bootstrap for the test. In small samples, our test is competitive compared to existing procedures.

**MSC:**

**62G08** Nonparametric regression and quantile regression  
**62G10** Nonparametric hypothesis testing  
**62G20** Asymptotic properties of nonparametric inference

Cited in 7 Documents

**Keywords:**

asymptotic pivotal test statistic; bootstrap; kernel smoothing;  $U$ -statistic

**Full Text:** [DOI](#) [Euclid](#) [arXiv](#)

**References:**

- [1] Ait-Sahalia, Y., Bickel, P. J. and Stoker, T. M. (2001). Goodness-of-fit tests for kernel regression with an application to option implied volatilities., *Journal of Econometrics* 105 363-412. · [Zbl 1004.62042](#) · [doi:10.1016/S0304-4076\(01\)00091-4](#)
- [2] Bochner, S. (1955)., *Harmonic Analysis and the Theory of Probability* . University of California Press, Berkeley and Los Angeles. · [Zbl 0068.11702](#)
- [3] Chen, X. and Fan, Y. (1999). Consistent hypothesis testing in semiparametric and nonparametric models for econometric time series., *Journal of Econometrics* 91 373-401. · [Zbl 1274.62190](#) · [doi:10.1214/11-EJS631](#) · [euclid:ejms/1316092865](#) · [arxiv:0811.3628](#)
- [4] Delgado, M. A. (1993). Testing the equality of nonparametric regression curves., *Statist. Probab. Lett.* 17 199-204. · [Zbl 0771.62034](#) · [doi:10.1016/0167-7152\(93\)90167-H](#)
- [5] Delgado, M. A. and González Manteiga, W. (2001). Significance testing in nonparametric regression based on the bootstrap., *Ann. Statist.* 29 1469-1507. · [Zbl 1043.62032](#) · [doi:10.1214/aos/1013203462](#) ·
- [6] Dette, H. and Neumeyer, N. (2001). Nonparametric analysis of covariance., *Annals of Statistics* 29 1361-1400. · [Zbl 1043.62033](#) · [doi:10.1214/aos/1013203458](#) ·
- [7] Fan, J. (1996). Test of significance based on wavelet thresholding and Neyman's truncation., *J. Amer. Statist. Assoc.* 91 674-688. · [Zbl 0869.62032](#) · [doi:10.2307/2291663](#)
- [8] Fan, Y. and Li, Q. (1996). Consistent model specification tests: Omitted variables and semiparametric functional forms., *Econometrica* 64 865-890. · [Zbl 0854.62038](#) · [doi:10.2307/2171848](#)
- [9] Hall, P. and Heyde, C. C. (1980)., *Martingale Limit Theory and Its Application* . Academic Press Inc. [Harcourt Brace Jovanovich Publishers], New York. Probability and Mathematical Statistics. · [Zbl 0462.60045](#)
- [10] Härdle, W. and Mammen, E. (1993). Comparing nonparametric versus parametric regression fits., *Ann. Statist.* 21 1926-1947. · [Zbl 0795.62036](#) · [doi:10.1214/aos/1176349403](#) ·
- [11] Hurst, S. (1995). The characteristic function of the Student t distribution. Technical Report, Center for Financial Mathematics, Canberra.
- [12] Johnson, N. L., Kotz, S. and Balakrishnan, N. (1995)., *Continuous Univariate Distributions* . Wiley, New-York. · [Zbl 0821.62001](#)
- [13] Lavergne, P. (2001). An equality test across nonparametric regressions., *J. Econometrics* 103 307-344. Studies in estimation and testing. · [Zbl 0969.62029](#) · [doi:10.1016/S0304-4076\(01\)00046-X](#)
- [14] Lavergne, P. and Vuong, Q. (2000). Nonparametric significance testing., *Econometric Theory* 16 576-601. · [Zbl 0968.62047](#) · [doi:10.1017/S0266466600164059](#)
- [15] Mammen, E. (1993). Bootstrap and wild bootstrap for high-dimensional linear models., *Ann. Statist.* 21 255-285. · [Zbl 0771.62032](#) · [doi:10.1214/aos/1176349025](#) ·
- [16] Neumeyer, N. and Dette, H. (2003). Nonparametric comparison of regression curves: An empirical process approach., *Ann. Statist.* 31 880-920. · [Zbl 1041.62506](#) · [doi:10.1016/S0304-4076\(98\)00081-5](#) ·

- [17] Neumeyer, N. and Dette, H. (2003). Nonparametric comparison of regression curves: An empirical process approach., *Annals of Statistics* 31 880-920. · [Zbl 1032.62037](#) · [doi:10.1214/aos/1056562466](#) ·
- [18] Racine, J. (1997). Consistent significance testing for nonparametric regression., *Journal of Business & Economic Statistics* 15 369-378.
- [19] Racine, J. S., Hart, J. and Li, Q. (2006). Testing the significance of categorical predictor variables in nonparametric regression models., *Econometric Rev.* 25 523-544. · [Zbl 1106.62046](#) · [doi:10.1080/07474930600972590](#)
- [20] Racine, J. and Li, Q. (2004). Nonparametric estimation of regression functions with both categorical and continuous data., *Journal of Econometrics* 119 99-130. · [Zbl 1337.62062](#) · [doi:10.1016/S0304-4076\(03\)00157-X](#)
- [21] Stute, W. (1997). Nonparametric model checks for regression., *Ann. Statist.* 25 613-641. · [Zbl 0926.62035](#) · [doi:10.1214/aos/1031833666](#) ·
- [22] van der Vaart, A. W. and Wellner, J. A. (1996)., *Weak Convergence and Empirical Processes* . Springer Series in Statistics . Springer-Verlag, New York. With applications to statistics. · [Zbl 0862.60002](#)
- [23] van der Vaart, A. and Wellner, J. A. (2011). A local maximal inequality under uniform entropy., *Electron. J. Stat.* 5 192-203. · [Zbl 1268.60027](#) · [doi:10.1214/11-EJS605](#) · [euclid:ejs/1302784853](#) · [arxiv:1012.5533](#)
- [24] Volgushev, S., Birke, M., Dette, H. and Neumeyer, N. (2013). Significance testing in quantile regression., *Electronic Journal of Statistics* 7 105-145. · [Zbl 1337.62084](#) · [doi:10.1214/12-EJS765](#) · [euclid:ejs/1359041587](#) · [arxiv:1206.3125](#)

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