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Three-step censored quantile regression and extramarital affairs. (English summary)

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This paper suggests very simple three-step estimators for censored quantile regression models with a separation restriction on the censoring probability. The estimators are theoretically attractive (i.e., asymptotically as efficient as the celebrated Powell's censored least absolute deviation estimator). At the same time, they are conceptually simple and have trivial computational expenses. They are especially useful in samples of small size or models with many regressors, with desirable finite-sample properties and small bias. The separation restriction costs a small reduction of generality relative to the canonical censored regression quantile model, yet its main plausible features remain intact. The estimator can also be used to estimate a large class of traditional models, including the normal Amemiya-Tobin model and many accelerated failure and proportional hazard models. The approach is illustrated with an extramarital affairs example.

Reviewed by *P. Rochus* (Liège)

References

1. Abadie, A., Angrist, J., and Imbens, G. (2002), "Instrumental Variables Estimates of the Effect of Subsidized Training on the Quantiles of Trainee Earnings," *Econometrica*, 70, 91–117. [MR1926256 \(2003g:62176\)](#)
2. Amemiya, T. (1981), "Two-Stage Least Absolute Deviations Estimators," *Econometrica*, 50, 689–711. [MR0662726 \(83h:62117\)](#)
3. Amemiya, T. (1985), *Advanced Econometrics*, Cambridge, MA: Harvard University Press.
4. Amemiya, T., and Powell, J. L. (1983), "A Comparison of the Logit Model and Normal Discriminant Analysis When the Independent Variables are Binary," in *Studies in Econometrics, Time Series, and Multivariate Statistics*, New York: Academic Press, pp. 3–30. [MR0738645 \(85g:62101\)](#)
5. Andrews, D. (1994), "Empirical Process Methods in Econometrics," in *Handbook of Econometrics, Vol. 4*, eds. R. Engle and D. McFadden, Amsterdam: North-Holland. [MR1315972](#)
6. Becker, G. S. (1968), "Crime and Punishment: An Economic Approach," *The Journal of Political Economy*, 76, 169–217.
7. Biliyas, Y., Chen, S., and Ying, Z. (2000), "Simple Resampling Methods for Censored Regression Quantiles," *Journal of Econometrics*, 99, 373–386. [MR1792254 \(2001i:62053\)](#)
8. Breiman, L., Friedman, J. H., Olshen, R. A., and Stone, C. J. (1984), *Classification and Regression Trees*, Belmont, CA: Wadsworth. [MR0726392 \(86b:62101\)](#)
9. Buchinsky, M. (1994), "Changes in U.S. Wage Structure 1963–87: An Application of Quantile Regression," *Econometrica*, 62, 405–458.
10. Buchinsky, M., and Hahn, J. (1998), "An Alternative Estimator for the Censored Regression

- Model," *Econometrica*, 66, 653–671. [MR1627038 \(99e:62039\)](#)
11. Chaudhuri, P. (1991), "Nonparametric Estimates of Regression Quantiles and Their Local Bahadur Representation," *The Annals of Statistics*, 19, 760–777. [MR1105843 \(93d:62055\)](#)
 12. Chaudhuri, P., Doksum, K., and Samarov, A. (1997), "On Average Derivative Quantile Regression," *The Annals of Statistics*, 25, 715–744. [MR1439320 \(98d:62054\)](#)
 13. Cronk, L. (1991), "Human Behavioral Ecology," *Annual Review of Anthropology*, 20, 25–53.
 14. Davis, R. A., Knight, K., and Liu, J. (1992), "M-Estimation for Autoregressions With Infinite Variance," *Stochastic Processes and Their Applications*, 40, 145–180. [MR1145464 \(93c:62145\)](#)
 15. Doksum, K. (1974), "Empirical Probability Plots and Statistical Inference for Nonlinear Models in the Two-sample case," *Annals of Statistics*, 2, 267–277. [MR0356350 \(50 #8820\)](#)
 16. Efron, B. (1975), "The Efficiency of Logistic Regression Compared to Normal Discriminant Analysis," *Journal of the American Statistical Association*, 70, 892–898. [MR0391403 \(52 #12224\)](#)
 17. Fair, R. C. (1978), "Theory of Extramarital Affairs," *Journal of Political Economy*, 86, 45–61.
 18. Fitzenberger, B. (1997a), "Computational Aspects of Censored Quantile Regression," in *Proceedings of the 3rd International Conference on Statistical Data Analysis Based on the L1-Norm and Related Methods*, ed. Y. Dodge, Hayward, CA: IMS, pp. 171–186.
 19. Fitzenberger, B. (1997b), "A Guide to Censored Quantile Regressions," in *Handbook of Statistics, Vol. 14, Robust Inference*, Amsterdam: North-Holland, pp. 405–437. [MR1492720](#)
 20. Fitzenberger, B., and Winker, P. (2001), "Improving the Computation of Censored Quantile Regression," preprint. cf. [MR2409966](#)
 21. Goldberger, A. (1983), "Abnormal Selection Bias," in *Studies in Econometrics, Time Series, and Multivariate Statistics*, eds. T. A. S. Karlin and L. Goodman, New York: Academic Press. [MR0738642 \(85f:62004\)](#)
 22. Hogg, R. V. (1975), "Estimates of Percentile Regression Lines Using Salary Data," *Journal of the American Statistical Association*, 70, 56–59.
 23. Honoré, B., Khan, S., and Powell, J. (2002), "Quantile Regression Under Random Censoring," *Journal of Econometrics*, 109, 67–105. [MR1899693 \(2003c:62174\)](#)
 24. Horowitz, J., and Neumann, G. (1987), "Semiparametric Estimation of Employment Duration Models," *Econometric Reviews*, 6, 5–40. [MR0926589](#)
 25. Hurd, M. (1979), "Estimation in Truncated Samples When There is Heteroscedasticity," *Journal of Econometrics*, 11, 247–258. [MR0555630 \(81g:62178\)](#)
 26. Jureckova, J., and Prochazka, B. (1994), "Regression Quantiles and Trimmed Least Squares in Nonlinear Regression Model," *Journal of Nonparametric Statistics*, 3, 201–222. [MR1291545 \(95j:62042\)](#)
 27. Khan, S., and Powell, J. L. (2001), "Two-Step Estimation of Semiparametric Censored Regression Models," *Journal of Econometrics*, 100, 319–355. [MR1820409](#)
 28. Knight, K. (1998), "Limiting Distributions for L_1 Regression Estimators Under General Conditions," *The Annals of Statistics*, 26, 755–770. [MR1626024 \(99f:62037\)](#)
 29. Koenker, R., and Bassett, G. S. (1978), "Regression Quantiles," *Econometrica*, 46, 33–50. [MR0474644 \(57 #14279\)](#)

30. Koenker, R., and Geling, O. (2001), "Reappraising Medfly Longevity: A Quantile Regression Survival Analysis," *Journal of the American Statistical Association*, 96, 458–468. [MR1939348](#)
31. Koenker, R., and Machado, J. A. F. (1999), "Goodness of Fit and Related Inference Processes for Quantile Regression," *Journal of the American Statistical Association*, 94, 1296–1310. [MR1731491 \(2000h:62050\)](#)
32. Koenker, R., and Portnoy, S. (1987), "L-Estimation for Linear Models," *Journal of the American Statistical Association*, 82, 851–857. [MR0909992 \(89b:62142\)](#)
33. LeBlanc, M., and Tibshirani, R. (1996), "Combining Estimates in Regression and Classification," *Journal of the American Statistical Association*, 91, 1641–1650. [MR1439105 \(97k:62147\)](#)
34. Lehmann, E. L. (1974), *Nonparametrics: Statistical Methods Based on Ranks*, San Francisco: Holden-Day. [MR0395032 \(52 #15830\)](#)
35. Michie, Spiegelhalter, and Taylor (1994), *Machine Learning, Neural, and Statistical Classification*, Ellis Horwood, Gregory Piatetsky-Shapiro.
36. Miller, B. C., and Klein, D. M. (1981), "A Survey of Recent Marriage and Family Texts (in Survey Essays)," *Contemporary Sociology*, 10, 8–21.
37. Pollard, D. (1991), "Asymptotics for Least Absolute Deviation Regression Estimator," *Econometric Theory*, 7, 186–199. [MR1128411 \(93d:62176\)](#)
38. Portnoy, S. (1991), "Asymptotic Behavior of Regression Quantiles in Nonstationary, Dependent Cases," *Journal of Multivariate Analysis*, 38, 100–113. [MR1128939 \(92k:62121\)](#)
39. Portnoy, S. (2001), "Censored Regression Quantiles," preprint. cf. [MR 2004k:62225](#)
40. Portnoy, S., and Jureckova, J. (2000), "On Extreme Regression Quantiles," *Extremes*, 227–243. [MR1781938 \(2001j:62065\)](#)
41. Portnoy, S., and Koenker, R. (1997), "The Gaussian Hare and the Laplacian Tortoise," *Statistical Science*, 12, 279–300. [MR1619189 \(98m:62195\)](#)
42. Powell, J. L. (1986), "Censored Regression Quantiles," *Journal of Econometrics*, 32, 143–155. [MR0853049 \(88e:62246\)](#)
43. Powell, J. L. (1991), "Estimation of Monotonic Regression Models Under Quantile Restrictions," in *Nonparametric and Semiparametric Methods in Econometrics and Statistics (Durham, NC, 1988)*, Cambridge, U.K.: Cambridge University Press, pp. 357–384. [MR1174980 \(93j:62165\)](#)
44. Press, S. J., and Wilson, S. (1978), "Choosing Between Logistic Regression and Discriminant Analysis," *Journal of the American Statistical Association*, 73, 699–705.
45. Reiss, I. (1980), *Family Systems in America*, New York: Holt, Reinhart and Winston.
46. Reiss, I., Anderson, R., and Sponaugle, G. (1980), "A Multivariate Model of the Determinants of Extramarital Permissiveness," *Journal of Marriage and Family*, 42, 395–410.
47. Ripley, B. D. (1996), *Pattern Recognition and Neural Networks*, Cambridge, U.K.: Cambridge University Press. [MR1438788 \(98a:68161\)](#)
48. South, S. J., and Lloyd, K. M. (1995), "Spousal Alternatives and Marital Dissolution," *American Sociological Review*, 60, 21–35.
49. van der Vaart, A. W. (1998), *Asymptotic Statistics*, Cambridge, U.K.: Cambridge University Press. [MR1652247 \(2000c:62003\)](#)

50. van der Vaart, A. W., and Wellner, J. A. (1996), *Weak Convergence and Empirical Processes*, New York: Springer-Verlag. [MR1385671 \(97g:60035\)](#)
51. Vapnik, V. N. (2000), *The Nature of Statistical Learning Theory*, (2nd ed.), New York: Springer-Verlag. [MR1719582 \(2001c:68110\)](#)
52. Yang, S. (1997), "Extended Weighted Log-Rank Estimating Functions in Censored Regression," *Journal of the American Statistical Association*, 92, 977–984. [MR1482128 \(98k:62075\)](#)
53. Zhou, M. (1992), "M-Estimation in Censored Linear Models," *Biometrika*, 79, 837–841. [MR1209482 \(94f:62049\)](#)

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