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PII: S0304-4076(18)30116-7
DOI: https://doi.org/10.1016/j.jeconom.2018.06.020
Reference: ECONOM 4531

To appear in: *Journal of Econometrics*

Received date : 10 April 2016
Revised date : 29 December 2017
Accepted date : 28 June 2018

Please cite this article as: Chen S., Sequential estimation of censored quantile regression models. *Journal of Econometrics* (2018), https://doi.org/10.1016/j.jeconom.2018.06.020

Sequential Estimation of Censored Quantile Regression Models

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Abstract

In this paper we propose sequential censored quantile regression (SCQR) and sequential instrumental variables censored quantile regression estimators (SIVCQR). We effectively transform the difficult censored quantile regression and censored instrumental variables quantile regression problems into more standard QR and IVQR procedures, consequently, our approaches make the quantile regression techniques for censored data easily accessible to applied reseachers. Simulation results show that both estimators perform well.
JEL Classification: C14, C21, C24, C26
Key Words: Quantile Regression, Instrumental Variable, Censoring

1 Introduction

The quantile regression framework developed by Koenker and Bassett (1978) allows parsimonious model specification that characterizes the entire conditional distribution through a family of quantile regression coefficients. By allowing varying quantile regression coefficients across different points of conditional distribution, the quantile regression model is able to accommodate heterogeneous effects and unobserved heterogeneity. This simple and versatile nature has led to widespread use of the quantile regression techniques in empirical research.

Censoring is common in practice.[1] Quantile regression (QR) techniques are particularly well suited to the analysis of censored data due to the equivariance nature of the quantile function with respect to monotone transformation such as censoring. With this insight, Powell (1984, 1986) developed censored quantile regression (CQR) techniques. Powell's estimator, however, is difficult to implement due to the nonlinear and non-convex nature of the optimization problem involved. A great deal of effort has been devoted to dealing with this important practical issue; see, for example, Buchinsky (1994), Fitzenberger (1996), Fitzenberger and Winker (2007), and Koenker (2008a), among others. Buchinsky (1994) proposed an iterative linear programing algorithm (ILPA), which, however, is not guaranteed to converge. Fitzenberger (1996) developed the algorithm BRCENS, an adaptation of the Barrodale-Roberts-Algorithm (BRA), but is only guaranteed to converge to a local minimum. Based on extensive simulation studies, Fitzenberger

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[1] In this paper we take censoring from below as the basis for discussion and that the analysis for censoring from above is essentially symmetric.