

# Composite change point estimation for bent line quantile regression

Liwen Zhang<sup>1</sup> · Huixia Judy Wang<sup>3</sup> · Zhongyi Zhu<sup>2</sup>

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**Abstract** The bent line quantile regression describes the situation where the conditional quantile function of the response is piecewise linear but still continuous in covariates. In some applications, the change points at which the quantile functions are bent tend to be the same across quantile levels or for quantile levels lying in a certain region. To capture such commonality, we propose a composite estimation procedure to estimate model parameters and the common change point by combining information across quantiles. We establish the asymptotic properties of the proposed estimator, and demonstrate the efficiency gain of the composite change point estimator over that obtained at a single quantile level through numerical studies. In addition, three different inference procedures are proposed and compared for hypothesis testing and the construction of confidence intervals. The finite sample performance of the proposed procedures is assessed through a simulation study and the analysis of a real data.

**Keywords** Change point · Composite quantile regression · Bent line · Bootstrap · Rank score

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✉ Zhongyi Zhu  
zhuzy@fudan.edu.cn

<sup>1</sup> School of Economics, Shanghai University, Shanghai 200444, China

<sup>2</sup> Department of Statistics, Fudan University, Shanghai 200433, China

<sup>3</sup> Department of Statistics, George Washington University, Washington, DC 20052, USA