Quantile Regression: An Introduction

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Abstract

There is more to econometric life than is dreamt of in the philosophies of Gaussian regression and least squares estimation.

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Regression is Demeaning

‘De mean is ’de meaning.

Regression is demeaning.

Regression is de-meaning
Quantile Regression

Just Enough to be Dangerous

Econometric Analysis
Fourth Edition
William H. Greene
Quantile Regression

Univariate $\tau$th Quantile

$$\hat{\alpha}(\tau) = \arg\min_{a \in \mathbb{R}} \sum_{i=1}^{n} \rho_{\tau}(y_i - a)$$

where

$$\rho_{\tau}(u) = (\tau - I(u < 0))u$$

Regression $\tau$th Quantile

$$\hat{\beta}(\tau) = \arg\min_{b \in \mathbb{R}^p} \sum_{i=1}^{n} \rho_{\tau}(y_i - x_i^\top b)$$
Engel’s Food Expenditure Data
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A Model of Infant Birthweight

- Reference: Abreveya (2001)

- Data: June, 1997, Detailed Natality Data of the US. Live, singleton births, with mother’s recorded as either black or white, between 18-45, and residing in the U.S. Sample size: 198,377.

- Response: Infant Birthweight (in grams)

- Covariates:
  - Mother’s Education
  - Mother’s Prenatal Care
  - Mother’s Smoking
  - Mother’s Age
  - Mother’s Weight Gain
Conclusions

- Quantile regression methods complement established mean regression (least-squares) methods.

- By focusing on local slices of the conditional distribution, they offer a useful deconstruction of conditional mean models.

- They provide a more flexible role for covariate effects allowing them to influence location, scale and shape of the response distribution.

- In applications a variety of unobserved heterogeneity phenomena are rendered observable.