

Beta_p estimations vs rq() coefficients on mtcars

mtcars Dataset

The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).

```
head(mtcars)
```

```
##          mpg cyl disp  hp drat    wt  qsec vs am gear carb
## Mazda RX4     21.0   6 160 110 3.90 2.620 16.46  0  1    4    4
## Mazda RX4 Wag 21.0   6 160 110 3.90 2.875 17.02  0  1    4    4
## Datsun 710    22.8   4 108  93 3.85 2.320 18.61  1  1    4    1
## Hornet 4 Drive 21.4   6 258 110 3.08 3.215 19.44  1  0    3    1
## Hornet Sportabout 18.7   8 360 175 3.15 3.440 17.02  0  0    3    2
## Valiant       18.1   6 225 105 2.76 3.460 20.22  1  0    3    1
```

Model: mpg ~ cyl+drat+vs

Data types:

mpg: Double, Miles/(US) gallon
cyl: Integer/Count data, number of cylinders
drat: Double, Rear axle ratio
vs: Binary/Count , Engine (0 = V-shaped, 1 = straight)

Quantreg

```
rqfit <- rq(mpg ~ cyl+drat+vs, data = mtcars, tau = quantiles)
summary(rqfit)

## Warning in rq.fit.br(x, y, tau = tau, ci = TRUE, ...): Solution may be nonunique

##
## Call: rq(formula = mpg ~ cyl + drat + vs, tau = quantiles, data = mtcars)
##
## tau: [1] 0.1
##
## Coefficients:
##             coefficients lower bd upper bd
## (Intercept) 20.10375   13.58876 85.29796
## cyl        -2.54063   -4.71292 -1.36945
## drat        3.62500   -10.81283  4.40818
```

```

## vs          -1.85375   -3.00296   5.83125
##
## Call: rq(formula = mpg ~ cyl + drat + vs, tau = quantiles, data = mtcars)
##
## tau: [1] 0.5
##
## Coefficients:
##             coefficients lower bd upper bd
## (Intercept) 34.74953    9.74342 42.26316
## cyl         -2.66449   -3.01620 -1.14358
## drat        0.56075   -0.67615  4.67960
## vs          -1.76075   -3.03684  2.16945
##
## Call: rq(formula = mpg ~ cyl + drat + vs, tau = quantiles, data = mtcars)
##
## tau: [1] 0.9
##
## Coefficients:
##             coefficients lower bd upper bd
## (Intercept) -3.53871   -51.55192  89.33789
## cyl         0.23952    -7.75896   2.11267
## drat        6.45161   -2.65866  16.07341
## vs          8.65806   -13.09164  9.45551

```

Beta_p estimations vs rq() coefficients

The plot titles are formatted as (sampling method)(quantile)(error distribution)_(beta_p). The traceplots in black are the beta_p estimations yielded by the paper's model. The red horizontal line reflects rq() beta coefficients. The absence of red lines in certain traceplots reflect big difference in our beta_p estimations and the rq() results.

Notations:

GWS: Gibbs sampler With Scale parameter

GWOS: Gibbs sampler Without Scale parameter

DEP: Double Exponential Prior

TWS: Tobit quantile regression With Scale parameter

TWOS: Tobit quantile regression Without Scale parameter

stdN: Standard Normal distribution

student: Student t distribution

heteroN: Heteroscedastic Normal distribution $(1 + x_{i2})N(0, 1)$

beta_1: Intercept

beta_2: regression coefficient associated with cyl

beta_3: regression coefficient associated with drat

beta_4: regression coefficient associated with vs





















