

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: $\text{mpg} \sim \text{cyl} + \text{drat} + \text{vs}$

Data types: mpg: Real data, Miles/(US) gallon
cyl: Integer/Count data, number of cylinders
drat: Real data, Rear axle ratio
vs: Binary data, 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 histograms 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 some plots reflects 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



















