Package 'lzrq'

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Type Package

Title Quantile Regression for Logarithmic Relationships with Non-Positive Outcome Values

Version 0.1.0

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Description Provides the lzrq() function for estimating logarithmic regression slopes in quantile regression models, permitting the outcome variable to take on non-positive values. lzrq() conducts regression after replacing non-positive values with a sufficiently negative value. If the fitted values of a quantile regression on this transformed outcome are all greater than the negative value, then results are displayed. The resulting coefficients can be meaningfully interpreted as logarithmic intensive-margin relationships between the outcome variable and the independent variables, even with non-positive values in the outcome variable. If the condition does not hold for the specified quantile, then the command iteratively makes the value larger and checks again. After ten iterations where the condition does not hold, the functions return an error and suppress results. This is an automated adaptation of the algorithm described by Liu & Kaplan (2025) <https://drive.google.com/file/d/1F3dnhm8MrlO5aRrGt48rBWAEaBqdCBH-/view> and implemented in the companion 'Stata' command 'lzqreg', described in Fitzgerald et al. (2026) <doi:10.31222/osf.io/juda7_v1>.

Encoding UTF-8

URL https://github.com/jack-fitzgerald/lzrq

BugReports https://github.com/jack-fitzgerald/lzrq/issues

Imports MASS, quantreg, stats

NeedsCompilation no

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Repository CRAN

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Contents

`lzrq` *Quantile regression for logarithmic relationships with non-positive outcome values*

Description

`lzrq` fits a quantile regression model where the raw dependent variable is transformed with a calibrated extensive margin (CEM) transformation of the form

$$y^* = \ln(y) \quad \text{if } y > 0$$
$$y^* = -\psi \quad \text{if } y \leq 0$$

`lzrq` is a wrapper for `rq`. If all fitted values from a quantile regression on the CEM-transformed outcome are greater than $-\psi$, results are returned. The resulting coefficients can be interpreted as logarithmic intensive-margin relationships between the outcome and the independent variables, even when the outcome contains non-positive values. If the condition does not hold, `lzrq` iteratively increases ψ and re-checks. After ten failed iterations, `lzrq` returns an error and suppresses results. This is an automated adaptation of the algorithm described by Liu & Kaplan (2025).

All methods supported by `rq` are available, including `coef()`, `residuals()`, `fitted()`, `predict()`, `summary()`, `AIC()`, and `logLik()`.

Usage

```
lzrq(formula, data, tau = 0.5, psi_init = -1e35, ...)
```

Arguments

`formula`	A formula with the raw (untransformed) outcome on the left-hand side.
`data`	Optional data frame containing the variables in the model.
`tau`	Quantile level. Numeric scalar strictly between 0 and 1. Defaults to 0.5.
`psi_init`	Initial lower bound constant used in the bisection algorithm. Defaults to `-1e35` to mirror Stata's `lzqreg` convention.
`...`	Additional arguments passed to `rq`, such as `weights` or `method`.

Value

An object of class `c("lzrq", "rq")`. This is the fitted `rq` object with two additional fields:

`lb_constant`	The lower bound constant $-\psi$ used to replace non-positive outcomes in the final iteration.
`n_nonpos`	Number of non-positive outcome values in the estimation sample.

All `rq` fields are preserved, so the full suite of `rq` postestimation methods works automatically.

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References

Fitzgerald, J., Adema, J., Fiala, L., Kujansuu, E., & Valenta, D. (2026). Non-Robustness in Log-Like Specifications. MetaArXiv. doi:10.31222/osf.io/juda7_v1

Liu, X., & Kaplan, D. M. (2025). Quantile Regression with Log(0) Outcomes. https://drive.google.com/file/d/1F3dnhm8MrlO5aRrGt48rBWAEaBqdCBH-/view

See Also

rq, summary.rq

Examples

```
library(MASS)

# The 'epil' dataset records epileptic seizure counts.
# The outcome 'y' is zero for about 10% of observations.
table(epil$y == 0)

# Because the median of 'y', conditional on 'trt', is above zero for
# both treatment groups, lzrq returns results at quantile 0.5.
result <- lzrq(y ~ trt + age, data = epil, tau = 0.5)
print(result)
summary(result)

# However, the tenth percentile of 'y' is zero for some treatment groups,
# so lzrq suppresses results and returns an error at quantile 0.1.
tryCatch(
  lzrq(y ~ trt + age, data = epil, tau = 0.1),
  error = function(e) message(e$message)
)
```

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