Package: rlppinv (via r-universe)

June 11, 2026

Type Package

Title Linear Programming via Regularized Least Squares

Version 2.0.0

Description The Linear Programming via Regularized Least Squares (LPPinv) is a two-stage estimation method that reformulates linear programs as structured least-squares problems. Based on the Convex Least Squares Programming (CLSP) framework, LPPinv solves linear inequality, equality, and bound constraints by (1) constructing a canonical constraint system and computing a pseudoinverse projection, followed by (2) a convex-programming correction stage to refine the solution under additional regularization (e.g., Lasso, Ridge, or Elastic Net). LPPinv is intended for underdetermined and ill-posed linear problems, for which standard solvers fail.

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Encoding UTF-8

Language en-US

Depends R (>= 4.3)

Imports rclsp (>= 2.0.0)

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

URL https://github.com/econcz/rlppinv

BugReports https://github.com/econcz/rlppinv/issues

Config/roxygen2/version 8.0.0

NeedsCompilation no

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Repository https://cran.r-universe.dev

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Contents

`lppinv` *Solve a linear program via Convex Least Squares Programming (CLSP).*

Description

Solve a linear program via Convex Least Squares Programming (CLSP).

Usage

```
lppinv(
  c = NULL,
  A_ub = NULL,
  b_ub = NULL,
  A_eq = NULL,
  b_eq = NULL,
  non_negative = TRUE,
  bounds = NULL,
  replace_value = NA_real_,
  tolerance = sqrt(.Machine$double.eps),
  final = TRUE,
  alpha = NULL,
  cond_tolerance = NULL,
  ...
)
```

Arguments

`c`	numeric vector of length p, optional. Objective-function coefficients. Included for API parity with Python's `pylppinv`; not used by CLSP.
`A_ub`	numeric matrix of size $i \times p$, optional. Matrix of inequality constraints $\mathbf{A}_{ub}\mathbf{x} \leq \mathbf{b}_{ub}$.
`b_ub`	numeric vector of length i, optional. Right-hand side for the inequality constraints.

A_eq	numeric matrix of size $j \times p$, optional. Matrix of equality constraints $\mathbf{A}_{eq}\mathbf{x} = \mathbf{b}_{eq}$.
b_eq	numeric vector of length j, optional. Right-hand side for the equality constraints.
non_negative	logical scalar, default = TRUE. If FALSE, no default nonnegativity bound is applied.
bounds	NULL, numeric(2), or list of numeric(2). Bounds on variables. If a single pair c(low, high) is given, it is applied to all variables. If NULL, defaults to c(0, NA) for each variable (non-negativity).
replace_value	numeric scalar or NA, default = NA. Final replacement value for any variable that violates the bounds by more than the given tolerance.
tolerance	numeric scalar, default = sqrt(.Machine$double.eps). Convergence tolerance for bounds.
final	logical scalar, default = TRUE If FALSE, only the first step of the CLSP estimator is performed.
alpha	numeric scalar, numeric vector, or NULL, Regularization parameter for the second step of the CLSP estimator.
cond_tolerance	numeric scalar or NULL, default = NULL Singular-value cutoff for the custom condition number function. If NULL, the implementation uses an internal relative cutoff of 1e-14.
...	Additional arguments passed to the **rclsp** solver.

Value

An object of class "clsp" containing the fitted CLSP model.

See Also

clsp

CVXR-package

Examples

```
## Linear Programming via Regularized Least Squares (LPPinv)
## Underdetermined and potentially infeasible LP system

RNGkind("L'Ecuyer-CMRG")
set.seed(123456789)

# sample (dataset)
A_ub <- matrix(rnorm(50 * 500), nrow = 50L, ncol = 500L)
A_eq <- matrix(rnorm(25 * 500), nrow = 25L, ncol = 500L)
b_ub <- matrix(rnorm(50),       ncol = 1L)
b_eq <- matrix(rnorm(25),       ncol = 1L)

# model (no default non-negativity, unique MNBLUE solution)
model <- lppinv(
```

```
    A_ub = A_ub,
    A_eq = A_eq,
    b_ub = b_ub,
    b_eq = b_eq,
    non_negative = FALSE,
    final = TRUE,
    alpha = 1.0                                   # unique MNBLUE estimator
)

# coefficients
print("x hat (x_M hat):")
print(round(model$x, 4))

# numerical stability (if available)
if (!is.null(model$kappaC)) {
    cat("\nNumerical stability:\n")
    cat("  kappaC :", round(model$kappaC, 4), "\n")
}
if (!is.null(model$kappaB)) {
    cat("  kappaB :", round(model$kappaB, 4), "\n")
}
if (!is.null(model$kappaA)) {
    cat("  kappaA :", round(model$kappaA, 4), "\n")
}

# goodness-of-fit diagnostics (if available)
if (!is.null(model$nrmse)) {
    cat("\nGoodness-of-fit:\n")
    cat("  NRMSE :", round(model$nrmse, 6), "\n")
}
if (!is.null(model$x_lower)) {
    cat("  Diagnostic band (min):", round(min(model$x_lower), 4), "\n")
}
if (!is.null(model$x_upper)) {
    cat("  Diagnostic band (max):", round(max(model$x_upper), 4), "\n")
}

# bootstrap NRMSE t-test (if supported by rclsp)
if ("ttest" %in% names(model)) {
    cat("\nBootstrap t-test:\n")
    tt <- model$ttest(sample_size = 30L,
                      seed = 123456789,
                      distribution = "normal")
    for (nm in names(tt)) {
        cat("   ", nm, ": ", round(tt[[nm]], 6), "\n", sep = "")
    }
}
```

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