

# Package ‘ROI.plugin.osqp’

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**Version** 1.0-2  
**Title** 'osqp' Plugin for the 'R' Optimization Infrastructure  
**Description** Enhances the 'R' Optimization Infrastructure ('ROI') package with the quadratic solver 'OSQP'. More information about 'OSQP' can be found at <<https://osqp.org>>.  
**Imports** methods, slam, ROI (>= 1.0-1), osqp, Matrix  
**License** GPL-3  
**URL** <https://roigrp.gitlab.io>,  
<https://gitlab.com/roigrp/solver/ROI.plugin.osqp>  
**NeedsCompilation** no  
**Author** Florian Schwendinger [aut, cre] (ORCID:  
<<https://orcid.org/0000-0002-3983-9773>>)  
**Maintainer** Florian Schwendinger <FlorianSchwendinger@gmx.at>  
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| <i>osqp</i>             |

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## Description

This package provides an interface to OSQP. The OSQP solver is a numerical optimization package or solving convex quadratic programs written in C and based on the alternating direction method of multipliers.

## Control Arguments

The following description of the control parameters is mostly copied from the **osqp** manual.

- [] rho ADMM step rho
- [] sigma ADMM step sigma
- [] max\_iter maximum iterations
- [] abs\_tol absolute convergence tolerance
- [] rel\_tol relative convergence tolerance
- [] eps\_prim\_inf primal infeasibility tolerance
- [] eps\_dual\_inf dual infeasibility tolerance
- [] alpha relaxation parameter
- [] linsys\_solver which linear systems solver to use, 0=QDLDL, 1=MKL Pardiso
- [] delta regularization parameter for polish
- [] polish boolean, polish ADMM solution
- [] polish\_refine\_iter iterative refinement steps in polish
- [] verbose boolean, write out progress
- [] scaled\_termination boolean, use scaled termination criteria
- [] check\_termination integer, check termination interval. If 0, termination checking is disabled
- [] warm\_start boolean, warm start
- [] scaling heuristic data scaling iterations. If 0, scaling disabled
- [] adaptive\_rho boolean, is rho step size adaptive?
- [] adaptive\_rho\_interval Number of iterations between rho adaptations rho. If 0, it is automatic
- [] adaptive\_rho\_tolerance Tolerance X for adapting rho. The new rho has to be X times larger or 1/X times smaller than the current one to trigger a new factorization
- [] adaptive\_rho\_fraction Interval for adapting rho (fraction of the setup time)

## References

- Bartolomeo Stellato and Goran Banjac and Paul Goulart and Alberto Bemporad and Stephen Boyd. OSQP: An Operator Splitting Solver for Quadratic Programs <https://arxiv.org/abs/1711.08013>, 2017
- Bartolomeo Stellato and Goran Banjac. OSQP “webpage” <https://osqp.org/>, 2019

Example-1

*Quadratic Problem 1***Description**

$$\text{maximize } x_1^2 + x_2^2 + x_3^2 - 5x_2$$

subject to :

$$-4x_1 - 3x_2 + \geq -8$$

$$2x_1 + x_2 + \geq 2$$

$$-2x_2 + x_3 \geq 0$$

$$x_1, x_2, x_3 \geq 0$$

**Examples**

```
require("ROI")
require("ROI.plugin.osqp")

A <- cbind(c(-4, -3, 0),
          c( 2,  1, 0),
          c( 0, -2, 1))
x <- OP(Q_objective(diag(3), L = c(0, -5, 0)),
      L_constraint(L = t(A),
                  dir = rep(">=", 3),
                  rhs = c(-8, 2, 0)))

opt <- ROI_solve(x, solver = "osqp", abs_tol = 1e-8, rel_tol = 1e-8)
opt
## Optimal solution found.
## The objective value is: -2.380952e+00
solution(opt)
## [1] 0.4761905 1.0476191 2.0952381
```

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