Comparative cost and preferred method

Computing the two linear solves with one dense factorization costs $O(p^3)$ setup and $O(p^2)$ per right-hand side. A whole risk-budget curve then uses $O(p)$ vector arithmetic per point. A general quadratic-programming solve at every risk level repeats setup. The attained Cauchy–Schwarz bound certifies the optimum for this model; no investment-performance or universal solver-speed claim follows.