

Problem	ColdIters	WarmIters	$\ x^I - x^P\ $	$\ y^I - y^P\ $
antenna-1	28	59	6.50E-02	2.23E-02
antenna-2	26	25	7.68E-03	7.53E-04
antenna-3	26	45	6.35E-03	9.79E-02
antenna-4	27	23	4.05E-02	3.85E-02
antenna-5	32	18	1.44E-02	2.30E-03
antenna-ave	27.8	34.0	2.68E-02	3.23E-02
blend-1	22	9	2.56E-05	4.67E-02
blend-2	20	12	4.56E-04	4.81E-02
blend-3	21	13	3.54E-04	3.11E-02
blend-4	20	12	4.38E-05	3.31E-02
blend-5	20	10	3.65E-04	2.98E-02
blend-ave	20.6	11.2	2.49E-04	3.78E-02
chemeq-1	292	27	3.89E-04	3.22E-02
chemeq-2	323	44	8.92E-05	2.60E-03
chemeq-3	312	43	3.75E-04	1.45E-03
chemeq-4	248	43	3.89E-04	1.43E-03
chemeq-5	321	44	5.55E-05	2.58E-03
chemeq-ave	299.2	40.2	2.59E-04	8.05E-03
fir_convex-1	33	38	2.33E-03	7.39E-01
fir_convex-2	39	31	7.35E-04	1.01E-03
fir_convex-3	45	43	3.49E-03	7.29E-01
fir_convex-4	53	42	3.62E-03	7.29E-01
fir_convex-5	40	35	4.09E-04	5.64E-04
fir_convex-ave	42.0	37.8	2.12E-03	4.40E-01
hang_midpt-1	43	11	1.39E-05	1.00E-04
hang_midpt-2	47	9	1.39E-05	9.99E-05
hang_midpt-3	40	7	1.39E-05	9.98E-05
hang_midpt-4	45	11	1.39E-05	1.00E-04
hang_midpt-5	54	10	1.39E-05	9.98E-05
hang_midpt-ave	45.8	9.6	1.39E-05	9.99E-05
hydrothermal-1	28	29	2.01E-03	5.24E-04
hydrothermal-2	28	26	6.50E-04	1.63E-04
hydrothermal-3	28	32	1.64E-03	7.93E-04
hydrothermal-4	28	29	4.34E-03	8.23E-04
hydrothermal-5	28	25	1.08E-03	9.10E-05
hydrothermal-ave	28.0	28.2	1.94E-03	4.79E-04
kowalik-1	11	9	3.69E-03	0.00E+00
kowalik-2	11	9	1.14E-03	0.00E+00
kowalik-3	11	7	5.61E-03	0.00E+00
kowalik-4	11	6	5.86E-03	0.00E+00
kowalik-5	11	6	6.37E-04	0.00E+00
kowalik-ave	11.0	7.4	3.39E-03	0.00E+00
markowitz-1	14	3	8.93E-04	1.81E-05
markowitz-2	14	5	3.11E-04	6.86E-06
markowitz-3	14	12	9.73E-04	2.09E-05
markowitz-4	14	11	9.05E-04	2.00E-05
markowitz-5	14	6	1.37E-04	3.62E-06
markowitz-ave	14.0	7.4	6.44E-04	1.39E-05
nb_L2-1	25	3	1.02E-03	4.76E-02
nb_L2-2	20	8	1.11E-02	4.66E-01
nb_L2-3	22	4	2.36E-03	1.09E-01
nb_L2-4	23	5	8.65E-03	3.74E-01
nb_L2-5	25	11	1.16E-02	4.80E-01
nb_L2-ave	23.0	6.2	6.95E-03	2.95E-01
nns-1	13	6	5.04E-04	0.00E+00
nns-2	13	9	9.18E-04	0.00E+00
nns-3	13	9	7.11E-04	0.00E+00
nns-4	13	9	8.08E-04	0.00E+00
nns-5	13	5	4.95E-04	0.00E+00
nns-ave	13.0	7.6	6.87E-04	0.00E+00

TABLE 1. Numerical performance of LOQO on NLPs when warm-starting a problem whose problem data have been modified. The iteration counts for the coldstart and warmstart solution of five perturbed problems are given, and the last 2 columns are the scaled Euclidean norm of the distance between the optimal solutions and the Lagrange multipliers of the initial and the perturbed problem. The problems labeled as “ave” refer to the average performance over the five problems.

Problem	ColdIters	WarmIters	$\ x^I - x^P\ $	$\ y^I - y^P\ $
robotarm-1	22	18	1.05E-04	1.41E-04
robotarm-2	23	20	6.82E-05	3.82E-04
robotarm-3	23	20	1.33E-04	2.10E-04
robotarm-4	23	20	7.77E-05	1.50E-04
robotarm-5	23	20	2.80E-05	1.57E-04
robotarm-ave	22.8	19.6	8.25E-05	2.08E-04
rocket-1	68	29	5.92E-03	1.10E-04
rocket-2	51	37	1.84E-03	3.43E-05
rocket-3	48	27	8.95E-03	1.66E-04
rocket-4	31	31	9.30E-03	1.72E-04
rocket-5	89	40	1.03E-03	1.91E-05
rocket-ave	57.4	32.8	5.41E-03	1.00E-04
sawpath-1	11	3	8.76E-10	6.84E-03
sawpath-2	11	3	2.64E-10	2.24E-03
sawpath-3	11	3	1.21E-09	9.97E-03
sawpath-4	11	3	1.25E-09	1.03E-02
sawpath-5	11	2	1.48E-10	1.26E-03
sawpath-ave	11.0	2.8	7.48E-10	6.12E-03
shekel-1	20	5	1.53E-05	0.00E+00
shekel-2	13	5	3.18E-06	0.00E+00
shekel-3	17	6	2.80E-05	0.00E+00
shekel-4	27	5	9.71E-03	0.00E+00
shekel-5	16	5	2.47E-06	0.00E+00
shekel-ave	18.6	5.2	1.95E-03	0.00E+00
springs-1	37	5	4.36E-04	4.13E-04
springs-2	68	4	1.36E-04	1.29E-04
springs-3	31	6	6.60E-04	6.25E-04
springs-4	98	6	6.85E-04	6.49E-04
springs-5	63	4	7.57E-05	7.17E-05
springs-ave	59.4	5.0	3.99E-04	3.78E-04
steiner-1	27	29	3.72E-04	9.49E-03
steiner-2	22	11	3.28E-04	3.51E-02
steiner-3	22	19	4.20E-04	1.19E-02
steiner-4	21	17	5.03E-03	4.30E-02
steiner-5	23	13	4.35E-04	4.38E-02
steiner-ave	23.0	17.8	1.32E-03	2.87E-02
wbv-1	15	9	3.29E-03	1.08E-02
wbv-2	22	11	4.88E-03	1.00E-02
wbv-3	22	11	5.71E-03	9.61E-03
wbv-4	15	9	2.24E-03	1.29E-02
wbv-5	14	19	2.10E-02	4.55E-01
wbv-ave	17.6	11.8	7.42E-03	9.97E-02

TABLE 2. Numerical performance of LOQO on NLPs when warm-starting a problem whose problem data have been modified. The iteration counts for the coldstart and warmstart solution of five perturbed problems are given, and the last 2 columns are the scaled Euclidean norm of the distance between the optimal solutions and the Lagrange multipliers of the initial and the perturbed problem. The problems labeled as “ave” refer to the average performance over the five problems.