

# Full experimental results

January 31, 2025

We put here the full results aggregated by instances of same parameters (cybersecurity cost, number of players, number of markets, method) for all tolerance values  $\delta_f \in \{10^{-2}, 10^{-3}, 10^{-4}\}$ . The column *cost* gives the cybersecurity cost used and the column *#solved* gives the number of instances solved with respect to the total number of instances with the corresponding parameters. The mean computation time in column *time (s)* and mean number of iterations in the SGM in column *#iter* are computed among solved instances. The iteration for the method *2-level approx.* are the sum of iterations of the two calls to the SGM.

Table 1: Results by size parameters for tolerance  $\delta_f = 10^{-2}$

cost	#players	#markets	method	#solved	time (s)	#iter.
log	2	2	SGM-ExpCone	10/10	0.45	3.6
log	2	2	direct approx.	10/10	0.23	3.6
log	2	2	2-level approx.	10/10	0.22	4.8
log	2	6	SGM-ExpCone	10/10	1.23	6.9
log	2	6	direct approx.	10/10	0.56	7.4
log	2	6	2-level approx.	10/10	0.46	8.5
log	2	10	SGM-ExpCone	10/10	3.92	7.7
log	2	10	direct approx.	10/10	0.74	8.0
log	2	10	2-level approx.	10/10	0.72	9.0
log	3	2	SGM-ExpCone	10/10	1.1	10.3
log	3	2	direct approx.	10/10	0.38	10.5
log	3	2	2-level approx.	10/10	0.34	11.6
log	3	6	SGM-ExpCone	10/10	2.35	13.3
log	3	6	direct approx.	10/10	0.85	13.5
log	3	6	2-level approx.	10/10	0.81	14.7
log	3	10	SGM-ExpCone	10/10	7.37	13.8
log	3	10	direct approx.	10/10	1.53	14.3
log	3	10	2-level approx.	10/10	1.48	15.5
log	4	2	SGM-ExpCone	10/10	1.72	13.2
log	4	2	direct approx.	10/10	0.55	13.5
log	4	2	2-level approx.	10/10	0.5	14.8

Continued on next page

**Table 1 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
log	4	6	SGM-ExpCone	10/10	3.03	17.1
log	4	6	direct approx.	10/10	1.1	18.1
log	4	6	2-level approx.	10/10	1.07	19.2
log	4	10	SGM-ExpCone	10/10	10.54	21.8
log	4	10	direct approx.	10/10	2.65	22.7
log	4	10	2-level approx.	10/10	2.31	24.1
log	5	2	SGM-ExpCone	10/10	1.64	13.8
log	5	2	direct approx.	10/10	0.61	14.3
log	5	2	2-level approx.	10/10	0.57	15.9
log	5	6	SGM-ExpCone	10/10	5.33	28.9
log	5	6	direct approx.	10/10	2.92	28.9
log	5	6	2-level approx.	10/10	2.11	29.6
log	5	10	SGM-ExpCone	10/10	12.63	29.8
log	5	10	direct approx.	10/10	3.39	30.3
log	5	10	2-level approx.	10/10	3.37	32.0
log	6	2	SGM-ExpCone	10/10	3.22	20.5
log	6	2	direct approx.	10/10	1.05	20.0
log	6	2	2-level approx.	10/10	0.96	21.6
log	6	6	SGM-ExpCone	10/10	20.11	32.3
log	6	6	direct approx.	10/10	8.85	33.1
log	6	6	2-level approx.	10/10	9.81	36.5
log	6	10	SGM-ExpCone	10/10	20.67	36.8
log	6	10	direct approx.	10/10	17.69	40.3
log	6	10	2-level approx.	10/10	6.24	38.5
log	7	2	SGM-ExpCone	10/10	4.7	22.9
log	7	2	direct approx.	10/10	1.51	22.7
log	7	2	2-level approx.	10/10	1.26	22.7
log	7	6	SGM-ExpCone	10/10	36.11	42.7
log	7	6	direct approx.	10/10	73.62	52.6
log	7	6	2-level approx.	10/10	14.85	45.6
log	7	10	SGM-ExpCone	7/10	23.73	40.29
log	7	10	direct approx.	8/10	105.6	55.5
log	7	10	2-level approx.	8/10	9.51	47.75
log	8	2	SGM-ExpCone	2/2	6.66	26.0
log	8	2	direct approx.	2/2	3.67	33.0
log	8	2	2-level approx.	2/2	2.89	33.5
log	8	8	SGM-ExpCone	1/2	12.5	37.0
log	8	8	direct approx.	1/2	4.78	37.0
log	8	8	2-level approx.	1/2	4.02	38.0
log	8	15	SGM-ExpCone	2/2	249.56	59.5
log	8	15	direct approx.	1/2	138.05	73.0
log	8	15	2-level approx.	2/2	124.96	70.5
log	10	2	SGM-ExpCone	2/2	7.88	31.0
log	10	2	direct approx.	2/2	3.15	30.0
log	10	2	2-level approx.	2/2	2.5	32.0
log	10	8	SGM-ExpCone	1/2	60.98	50.0

Continued on next page

**Table 1 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
log	10	8	direct approx.	1/2	28.91	50.0
log	10	8	2-level approx.	1/2	28.81	51.0
log	10	15	SGM-ExpCone	2/2	230.8	63.5
log	10	15	direct approx.	2/2	52.98	65.5
log	10	15	2-level approx.	2/2	59.93	67.0
log	12	2	SGM-ExpCone	2/2	162.59	50.0
log	12	2	direct approx.	2/2	3.08	35.5
log	12	2	2-level approx.	2/2	2.63	36.5
log	12	8	SGM-ExpCone	1/2	139.66	54.0
log	12	8	direct approx.	1/2	70.1	59.0
log	12	8	2-level approx.	1/2	43.98	59.0
log	12	15	SGM-ExpCone	0/2	NaN	NaN
log	12	15	direct approx.	0/2	NaN	NaN
log	12	15	2-level approx.	0/2	NaN	NaN
log	15	2	SGM-ExpCone	2/2	34.4	41.0
log	15	2	direct approx.	2/2	150.14	56.5
log	15	2	2-level approx.	1/2	1.55	24.0
log	15	8	SGM-ExpCone	1/2	794.26	83.0
log	15	8	direct approx.	0/2	NaN	NaN
log	15	8	2-level approx.	0/2	NaN	NaN
log	15	15	SGM-ExpCone	0/2	NaN	NaN
log	15	15	direct approx.	0/2	NaN	NaN
log	15	15	2-level approx.	0/2	NaN	NaN
root	2	2	SGM-MIQCQP	10/10	0.09	3.6
root	2	2	direct approx.	10/10	0.28	3.7
root	2	2	2-level approx.	10/10	0.3	5.0
root	2	6	SGM-MIQCQP	10/10	0.27	6.9
root	2	6	direct approx.	10/10	0.47	7.4
root	2	6	2-level approx.	10/10	0.43	8.5
root	2	10	SGM-MIQCQP	10/10	0.48	7.7
root	2	10	direct approx.	10/10	0.91	8.0
root	2	10	2-level approx.	10/10	0.81	9.0
root	3	2	SGM-MIQCQP	10/10	0.19	10.3
root	3	2	direct approx.	10/10	0.38	10.6
root	3	2	2-level approx.	10/10	0.41	12.7
root	3	6	SGM-MIQCQP	10/10	0.52	13.3
root	3	6	direct approx.	10/10	1.02	13.5
root	3	6	2-level approx.	10/10	0.88	14.7
root	3	10	SGM-MIQCQP	10/10	0.88	13.9
root	3	10	direct approx.	10/10	1.52	14.3
root	3	10	2-level approx.	10/10	1.54	15.6
root	4	2	SGM-MIQCQP	10/10	0.3	13.2
root	4	2	direct approx.	10/10	0.5	13.5
root	4	2	2-level approx.	10/10	0.55	14.9
root	4	6	SGM-MIQCQP	10/10	0.91	17.1
root	4	6	direct approx.	10/10	1.38	18.1

Continued on next page

**Table 1 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
root	4	6	2-level approx.	10/10	1.06	19.6
root	4	10	SGM-MIQCQP	10/10	1.6	21.8
root	4	10	direct approx.	10/10	2.57	22.7
root	4	10	2-level approx.	10/10	2.37	24.4
root	5	2	SGM-MIQCQP	10/10	0.3	13.9
root	5	2	direct approx.	10/10	0.71	14.5
root	5	2	2-level approx.	10/10	0.74	16.3
root	5	6	SGM-MIQCQP	10/10	1.68	26.9
root	5	6	direct approx.	10/10	2.52	28.4
root	5	6	2-level approx.	10/10	1.96	31.0
root	5	10	SGM-MIQCQP	10/10	2.21	29.9
root	5	10	direct approx.	10/10	3.86	30.5
root	5	10	2-level approx.	10/10	2.91	32.1
root	6	2	SGM-MIQCQP	10/10	0.54	19.4
root	6	2	direct approx.	10/10	1.06	19.8
root	6	2	2-level approx.	10/10	1.04	21.7
root	6	6	SGM-MIQCQP	9/10	1.92	27.78
root	6	6	direct approx.	10/10	22.15	35.5
root	6	6	2-level approx.	9/10	2.35	31.0
root	6	10	SGM-MIQCQP	10/10	8.7	37.5
root	6	10	direct approx.	10/10	11.27	39.4
root	6	10	2-level approx.	10/10	15.44	42.5
root	7	2	SGM-MIQCQP	10/10	0.98	22.0
root	7	2	direct approx.	10/10	1.33	23.1
root	7	2	2-level approx.	10/10	0.89	22.7
root	7	6	SGM-MIQCQP	10/10	22.23	39.7
root	7	6	direct approx.	10/10	32.36	43.8
root	7	6	2-level approx.	10/10	9.37	41.8
root	7	10	SGM-MIQCQP	7/10	9.08	41.57
root	7	10	direct approx.	8/10	9.02	43.38
root	7	10	2-level approx.	8/10	6.38	44.38
root	8	2	SGM-MIQCQP	2/2	0.84	23.5
root	8	2	direct approx.	2/2	2.56	27.5
root	8	2	2-level approx.	2/2	2.69	34.0
root	8	8	SGM-MIQCQP	1/2	3.12	37.0
root	8	8	direct approx.	1/2	4.83	37.0
root	8	8	2-level approx.	1/2	4.95	38.0
root	8	15	SGM-MIQCQP	0/2	NaN	NaN
root	8	15	direct approx.	2/2	117.54	64.5
root	8	15	2-level approx.	1/2	254.59	86.0
root	10	2	SGM-MIQCQP	2/2	2.81	34.0
root	10	2	direct approx.	2/2	4.67	36.0
root	10	2	2-level approx.	2/2	3.86	35.5
root	10	8	SGM-MIQCQP	1/2	34.05	50.0
root	10	8	direct approx.	1/2	25.28	50.0
root	10	8	2-level approx.	1/2	29.84	52.0

Continued on next page

**Table 1 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
root	10	15	SGM-MIQCQP	2/2	56.7	63.5
root	10	15	direct approx.	2/2	102.79	65.5
root	10	15	2-level approx.	2/2	69.7	67.5
root	12	2	SGM-MIQCQP	1/2	0.96	23.0
root	12	2	direct approx.	2/2	248.56	59.0
root	12	2	2-level approx.	2/2	179.11	61.0
root	12	8	SGM-MIQCQP	1/2	123.03	58.0
root	12	8	direct approx.	1/2	59.25	56.0
root	12	8	2-level approx.	1/2	64.34	60.0
root	12	15	SGM-MIQCQP	0/2	NaN	NaN
root	12	15	direct approx.	0/2	NaN	NaN
root	12	15	2-level approx.	0/2	NaN	NaN
root	15	2	SGM-MIQCQP	2/2	190.77	54.0
root	15	2	direct approx.	2/2	78.33	51.5
root	15	2	2-level approx.	2/2	431.27	76.0
root	15	8	SGM-MIQCQP	0/2	NaN	NaN
root	15	8	direct approx.	0/2	NaN	NaN
root	15	8	2-level approx.	1/2	761.35	111.0
root	15	15	SGM-MIQCQP	0/2	NaN	NaN
root	15	15	direct approx.	0/2	NaN	NaN
root	15	15	2-level approx.	0/2	NaN	NaN
nonconvex	2	2	SGM-MINLP	10/10	2.95	3.4
nonconvex	2	2	direct approx.	10/10	0.26	3.4
nonconvex	2	2	2-level approx.	10/10	0.39	4.6
nonconvex	2	6	SGM-MINLP	10/10	16.18	6.9
nonconvex	2	6	direct approx.	10/10	0.39	7.4
nonconvex	2	6	2-level approx.	10/10	0.46	8.4
nonconvex	2	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	2	10	direct approx.	10/10	0.61	8.0
nonconvex	2	10	2-level approx.	10/10	0.63	9.0
nonconvex	3	2	SGM-MINLP	10/10	5.47	10.2
nonconvex	3	2	direct approx.	10/10	0.27	10.4
nonconvex	3	2	2-level approx.	10/10	0.37	11.4
nonconvex	3	6	SGM-MINLP	10/10	21.08	13.3
nonconvex	3	6	direct approx.	10/10	0.79	13.5
nonconvex	3	6	2-level approx.	10/10	0.76	14.5
nonconvex	3	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	3	10	direct approx.	10/10	1.32	14.3
nonconvex	3	10	2-level approx.	10/10	1.49	15.4
nonconvex	4	2	SGM-MINLP	10/10	11.43	13.2
nonconvex	4	2	direct approx.	10/10	0.57	13.5
nonconvex	4	2	2-level approx.	10/10	0.72	14.6
nonconvex	4	6	SGM-MINLP	10/10	29.71	17.1
nonconvex	4	6	direct approx.	10/10	1.04	18.1
nonconvex	4	6	2-level approx.	10/10	1.04	19.1
nonconvex	4	10	SGM-MINLP	3/10	85.66	21.67

Continued on next page

**Table 1 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
nonconvex	4	10	direct approx.	10/10	2.3	23.0
nonconvex	4	10	2-level approx.	10/10	2.21	24.0
nonconvex	5	2	SGM-MINLP	10/10	7.07	13.8
nonconvex	5	2	direct approx.	10/10	0.32	14.1
nonconvex	5	2	2-level approx.	10/10	0.47	15.3
nonconvex	5	6	SGM-MINLP	10/10	26.65	26.3
nonconvex	5	6	direct approx.	10/10	1.37	29.0
nonconvex	5	6	2-level approx.	10/10	1.1	28.9
nonconvex	5	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	5	10	direct approx.	10/10	1.63	30.3
nonconvex	5	10	2-level approx.	10/10	1.65	31.7
nonconvex	6	2	SGM-MINLP	10/10	11.05	20.9
nonconvex	6	2	direct approx.	10/10	0.53	20.4
nonconvex	6	2	2-level approx.	10/10	0.76	22.2
nonconvex	6	6	SGM-MINLP	10/10	39.03	31.0
nonconvex	6	6	direct approx.	10/10	3.3	32.4
nonconvex	6	6	2-level approx.	10/10	2.0	33.5
nonconvex	6	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	6	10	direct approx.	10/10	4.61	39.3
nonconvex	6	10	2-level approx.	10/10	4.8	40.6
nonconvex	7	2	SGM-MINLP	10/10	10.95	21.1
nonconvex	7	2	direct approx.	10/10	1.03	22.5
nonconvex	7	2	2-level approx.	10/10	1.09	23.3
nonconvex	7	6	SGM-MINLP	10/10	63.15	40.3
nonconvex	7	6	direct approx.	10/10	13.18	45.7
nonconvex	7	6	2-level approx.	10/10	18.66	47.8
nonconvex	7	10	SGM-MINLP	1/10	255.13	39.0
nonconvex	7	10	direct approx.	7/10	6.43	46.29
nonconvex	7	10	2-level approx.	9/10	24.19	54.33
nonconvex	8	2	SGM-MINLP	2/2	23.41	24.5
nonconvex	8	2	direct approx.	2/2	2.37	26.0
nonconvex	8	2	2-level approx.	2/2	1.89	25.0
nonconvex	8	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	8	8	direct approx.	1/2	3.77	37.0
nonconvex	8	8	2-level approx.	1/2	3.77	38.0
nonconvex	8	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	8	15	direct approx.	1/2	6.99	51.0
nonconvex	8	15	2-level approx.	1/2	10.95	52.0
nonconvex	10	2	SGM-MINLP	2/2	36.39	30.0
nonconvex	10	2	direct approx.	2/2	6.36	36.0
nonconvex	10	2	2-level approx.	2/2	4.89	35.5
nonconvex	10	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	10	8	direct approx.	1/2	32.58	50.0
nonconvex	10	8	2-level approx.	1/2	27.35	52.0
nonconvex	10	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	10	15	direct approx.	2/2	15.93	62.0

Continued on next page

**Table 1 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
nonconvex	10	15	2-level approx.	1/2	17.76	59.0
nonconvex	12	2	SGM-MINLP	2/2	182.89	50.5
nonconvex	12	2	direct approx.	2/2	3.1	35.5
nonconvex	12	2	2-level approx.	2/2	3.59	37.0
nonconvex	12	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	12	8	direct approx.	1/2	45.43	57.0
nonconvex	12	8	2-level approx.	1/2	28.44	57.0
nonconvex	12	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	12	15	direct approx.	0/2	NaN	NaN
nonconvex	12	15	2-level approx.	1/2	897.24	88.0
nonconvex	15	2	SGM-MINLP	2/2	143.08	54.5
nonconvex	15	2	direct approx.	1/2	1.58	23.0
nonconvex	15	2	2-level approx.	2/2	169.36	61.5
nonconvex	15	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	15	8	direct approx.	0/2	NaN	NaN
nonconvex	15	8	2-level approx.	0/2	NaN	NaN
nonconvex	15	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	15	15	direct approx.	0/2	NaN	NaN
nonconvex	15	15	2-level approx.	0/2	NaN	NaN

Table 2: Results by size parameters for tolerance  $\delta_f = 10^{-3}$

cost	#players	#markets	method	#solved	time (s)	#iter.
log	2	2	SGM-ExpCone	10/10	0.5	4.1
log	2	2	direct approx.	10/10	0.34	4.4
log	2	2	2-level approx.	10/10	0.22	5.7
log	2	6	SGM-ExpCone	10/10	1.23	7.8
log	2	6	direct approx.	10/10	0.69	8.5
log	2	6	2-level approx.	10/10	0.46	9.6
log	2	10	SGM-ExpCone	10/10	3.58	8.7
log	2	10	direct approx.	10/10	1.19	9.1
log	2	10	2-level approx.	10/10	0.77	10.1
log	3	2	SGM-ExpCone	10/10	1.11	12.1
log	3	2	direct approx.	10/10	0.56	12.3
log	3	2	2-level approx.	10/10	0.37	13.6
log	3	6	SGM-ExpCone	10/10	2.21	15.0
log	3	6	direct approx.	10/10	1.59	15.4
log	3	6	2-level approx.	10/10	0.81	16.6
log	3	10	SGM-ExpCone	10/10	7.72	15.6
log	3	10	direct approx.	10/10	2.34	16.2
log	3	10	2-level approx.	10/10	1.77	17.5
log	4	2	SGM-ExpCone	10/10	1.62	15.0

Continued on next page

**Table 2 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
log	4	2	direct approx.	10/10	0.78	15.2
log	4	2	2-level approx.	10/10	0.59	16.5
log	4	6	SGM-ExpCone	10/10	3.3	19.4
log	4	6	direct approx.	10/10	1.95	20.0
log	4	6	2-level approx.	10/10	1.19	21.2
log	4	10	SGM-ExpCone	10/10	10.76	24.2
log	4	10	direct approx.	10/10	3.73	25.1
log	4	10	2-level approx.	10/10	2.46	26.5
log	5	2	SGM-ExpCone	10/10	1.89	15.4
log	5	2	direct approx.	10/10	0.87	15.7
log	5	2	2-level approx.	10/10	0.69	17.5
log	5	6	SGM-ExpCone	10/10	5.59	32.0
log	5	6	direct approx.	10/10	4.62	32.3
log	5	6	2-level approx.	10/10	2.3	33.2
log	5	10	SGM-ExpCone	10/10	14.12	33.1
log	5	10	direct approx.	10/10	6.03	35.6
log	5	10	2-level approx.	10/10	3.36	35.6
log	6	2	SGM-ExpCone	10/10	3.5	22.0
log	6	2	direct approx.	10/10	1.96	23.4
log	6	2	2-level approx.	10/10	1.01	23.6
log	6	6	SGM-ExpCone	9/10	6.1	31.89
log	6	6	direct approx.	10/10	8.05	36.1
log	6	6	2-level approx.	10/10	19.05	41.0
log	6	10	SGM-ExpCone	10/10	34.97	42.7
log	6	10	direct approx.	10/10	12.5	43.8
log	6	10	2-level approx.	10/10	9.71	44.7
log	7	2	SGM-ExpCone	10/10	4.19	24.0
log	7	2	direct approx.	10/10	2.47	25.2
log	7	2	2-level approx.	10/10	2.45	28.7
log	7	6	SGM-ExpCone	10/10	58.28	47.4
log	7	6	direct approx.	10/10	58.21	52.5
log	7	6	2-level approx.	10/10	39.08	53.5
log	7	10	SGM-ExpCone	7/10	27.04	45.14
log	7	10	direct approx.	9/10	52.96	57.78
log	7	10	2-level approx.	8/10	13.79	52.75
log	8	2	SGM-ExpCone	2/2	8.25	33.5
log	8	2	direct approx.	2/2	3.81	31.5
log	8	2	2-level approx.	2/2	2.79	34.5
log	8	8	SGM-ExpCone	1/2	14.88	40.0
log	8	8	direct approx.	1/2	5.45	42.0
log	8	8	2-level approx.	1/2	2.96	43.0
log	8	15	SGM-ExpCone	2/2	282.36	65.0
log	8	15	direct approx.	1/2	9.2	58.0
log	8	15	2-level approx.	2/2	176.75	74.5
log	10	2	SGM-ExpCone	2/2	16.11	42.0
log	10	2	direct approx.	2/2	3.66	32.0

Continued on next page



**Table 2 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
log	10	2	2-level approx.	2/2	2.32	34.0
log	10	8	SGM-ExpCone	1/2	105.66	55.0
log	10	8	direct approx.	1/2	52.01	56.0
log	10	8	2-level approx.	1/2	40.45	57.0
log	10	15	SGM-ExpCone	2/2	244.37	69.5
log	10	15	direct approx.	2/2	64.86	71.0
log	10	15	2-level approx.	2/2	56.53	72.5
log	12	2	SGM-ExpCone	1/2	5.93	24.0
log	12	2	direct approx.	2/2	6.5	39.5
log	12	2	2-level approx.	2/2	4.5	40.5
log	12	8	SGM-ExpCone	1/2	184.62	60.0
log	12	8	direct approx.	1/2	93.46	65.0
log	12	8	2-level approx.	1/2	86.72	68.0
log	12	15	SGM-ExpCone	0/2	NaN	NaN
log	12	15	direct approx.	0/2	NaN	NaN
log	12	15	2-level approx.	0/2	NaN	NaN
log	15	2	SGM-ExpCone	1/2	5.84	24.0
log	15	2	direct approx.	1/2	2.26	24.0
log	15	2	2-level approx.	1/2	1.86	25.0
log	15	8	SGM-ExpCone	0/2	NaN	NaN
log	15	8	direct approx.	0/2	NaN	NaN
log	15	8	2-level approx.	0/2	NaN	NaN
log	15	15	SGM-ExpCone	0/2	NaN	NaN
log	15	15	direct approx.	0/2	NaN	NaN
log	15	15	2-level approx.	0/2	NaN	NaN
root	2	2	SGM-MIQCQP	10/10	0.08	4.2
root	2	2	direct approx.	10/10	0.36	4.4
root	2	2	2-level approx.	10/10	0.25	5.8
root	2	6	SGM-MIQCQP	10/10	0.25	7.9
root	2	6	direct approx.	10/10	0.97	8.5
root	2	6	2-level approx.	10/10	0.53	9.6
root	2	10	SGM-MIQCQP	10/10	0.51	8.7
root	2	10	direct approx.	10/10	1.45	9.1
root	2	10	2-level approx.	10/10	0.9	10.1
root	3	2	SGM-MIQCQP	10/10	0.21	12.6
root	3	2	direct approx.	10/10	0.57	12.1
root	3	2	2-level approx.	10/10	0.45	14.6
root	3	6	SGM-MIQCQP	10/10	0.69	15.0
root	3	6	direct approx.	10/10	2.25	15.4
root	3	6	2-level approx.	10/10	1.24	16.6
root	3	10	SGM-MIQCQP	10/10	1.14	15.7
root	3	10	direct approx.	10/10	2.59	16.4
root	3	10	2-level approx.	10/10	1.74	17.6
root	4	2	SGM-MIQCQP	10/10	0.36	14.9
root	4	2	direct approx.	10/10	0.68	15.2
root	4	2	2-level approx.	10/10	0.58	16.6

Continued on next page

**Table 2 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
root	4	6	SGM-MIQCQP	10/10	0.85	19.4
root	4	6	direct approx.	10/10	2.37	20.0
root	4	6	2-level approx.	10/10	1.33	21.6
root	4	10	SGM-MIQCQP	10/10	1.68	24.2
root	4	10	direct approx.	10/10	3.83	25.0
root	4	10	2-level approx.	10/10	2.61	26.9
root	5	2	SGM-MIQCQP	10/10	0.37	15.3
root	5	2	direct approx.	10/10	0.96	15.8
root	5	2	2-level approx.	10/10	0.72	17.7
root	5	6	SGM-MIQCQP	10/10	2.19	30.2
root	5	6	direct approx.	10/10	5.14	33.7
root	5	6	2-level approx.	10/10	2.58	33.5
root	5	10	SGM-MIQCQP	10/10	3.2	34.2
root	5	10	direct approx.	10/10	6.15	35.7
root	5	10	2-level approx.	10/10	3.75	36.0
root	6	2	SGM-MIQCQP	10/10	0.8	22.6
root	6	2	direct approx.	10/10	1.38	22.3
root	6	2	2-level approx.	10/10	0.97	23.7
root	6	6	SGM-MIQCQP	9/10	3.0	32.67
root	6	6	direct approx.	9/10	9.83	37.89
root	6	6	2-level approx.	9/10	3.42	34.89
root	6	10	SGM-MIQCQP	10/10	17.1	43.2
root	6	10	direct approx.	10/10	24.5	44.0
root	6	10	2-level approx.	10/10	38.93	49.7
root	7	2	SGM-MIQCQP	10/10	1.44	24.7
root	7	2	direct approx.	10/10	4.09	28.4
root	7	2	2-level approx.	10/10	1.62	25.9
root	7	6	SGM-MIQCQP	10/10	27.4	45.5
root	7	6	direct approx.	10/10	63.37	47.4
root	7	6	2-level approx.	10/10	30.27	48.6
root	7	10	SGM-MIQCQP	8/10	16.79	50.0
root	7	10	direct approx.	7/10	11.58	47.0
root	7	10	2-level approx.	6/10	8.77	48.83
root	8	2	SGM-MIQCQP	2/2	1.11	28.0
root	8	2	direct approx.	2/2	2.91	31.0
root	8	2	2-level approx.	2/2	2.69	36.5
root	8	8	SGM-MIQCQP	1/2	3.35	40.0
root	8	8	direct approx.	1/2	9.05	42.0
root	8	8	2-level approx.	1/2	5.54	43.0
root	8	15	SGM-MIQCQP	0/2	NaN	NaN
root	8	15	direct approx.	1/2	14.36	57.0
root	8	15	2-level approx.	1/2	183.32	85.0
root	10	2	SGM-MIQCQP	2/2	2.57	32.0
root	10	2	direct approx.	2/2	4.31	32.0
root	10	2	2-level approx.	2/2	2.65	34.5
root	10	8	SGM-MIQCQP	1/2	51.15	55.0

Continued on next page

**Table 2 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
root	10	8	direct approx.	1/2	71.98	56.0
root	10	8	2-level approx.	1/2	50.85	58.0
root	10	15	SGM-MIQCQP	2/2	75.95	69.0
root	10	15	direct approx.	2/2	70.07	71.0
root	10	15	2-level approx.	2/2	57.69	73.0
root	12	2	SGM-MIQCQP	1/2	1.79	24.0
root	12	2	direct approx.	1/2	5.45	24.0
root	12	2	2-level approx.	1/2	2.56	25.0
root	12	8	SGM-MIQCQP	1/2	152.02	62.0
root	12	8	direct approx.	1/2	174.0	65.0
root	12	8	2-level approx.	1/2	81.54	69.0
root	12	15	SGM-MIQCQP	0/2	NaN	NaN
root	12	15	direct approx.	0/2	NaN	NaN
root	12	15	2-level approx.	0/2	NaN	NaN
root	15	2	SGM-MIQCQP	1/2	0.94	24.0
root	15	2	direct approx.	1/2	4.52	24.0
root	15	2	2-level approx.	1/2	2.71	25.0
root	15	8	SGM-MIQCQP	0/2	NaN	NaN
root	15	8	direct approx.	0/2	NaN	NaN
root	15	8	2-level approx.	0/2	NaN	NaN
root	15	15	SGM-MIQCQP	0/2	NaN	NaN
root	15	15	direct approx.	0/2	NaN	NaN
root	15	15	2-level approx.	0/2	NaN	NaN
nonconvex	2	2	SGM-MINLP	10/10	3.0	3.7
nonconvex	2	2	direct approx.	10/10	0.62	4.0
nonconvex	2	2	2-level approx.	10/10	0.59	5.3
nonconvex	2	6	SGM-MINLP	10/10	13.53	7.8
nonconvex	2	6	direct approx.	10/10	0.82	8.4
nonconvex	2	6	2-level approx.	10/10	0.57	9.4
nonconvex	2	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	2	10	direct approx.	10/10	1.47	9.2
nonconvex	2	10	2-level approx.	10/10	1.16	10.1
nonconvex	3	2	SGM-MINLP	10/10	7.12	11.7
nonconvex	3	2	direct approx.	10/10	0.87	12.0
nonconvex	3	2	2-level approx.	10/10	0.89	12.9
nonconvex	3	6	SGM-MINLP	10/10	23.88	15.0
nonconvex	3	6	direct approx.	10/10	1.85	15.4
nonconvex	3	6	2-level approx.	10/10	1.36	16.4
nonconvex	3	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	3	10	direct approx.	10/10	2.3	16.2
nonconvex	3	10	2-level approx.	10/10	1.93	17.3
nonconvex	4	2	SGM-MINLP	10/10	10.08	14.9
nonconvex	4	2	direct approx.	10/10	1.15	15.1
nonconvex	4	2	2-level approx.	10/10	1.14	16.2
nonconvex	4	6	SGM-MINLP	10/10	37.52	19.4
nonconvex	4	6	direct approx.	10/10	2.47	20.0

Continued on next page

**Table 2 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
nonconvex	4	6	2-level approx.	10/10	1.89	21.0
nonconvex	4	10	SGM-MINLP	3/10	88.42	24.33
nonconvex	4	10	direct approx.	10/10	4.53	25.6
nonconvex	4	10	2-level approx.	10/10	2.81	26.6
nonconvex	5	2	SGM-MINLP	10/10	8.04	15.3
nonconvex	5	2	direct approx.	10/10	0.75	15.4
nonconvex	5	2	2-level approx.	10/10	0.88	16.6
nonconvex	5	6	SGM-MINLP	10/10	29.37	29.1
nonconvex	5	6	direct approx.	10/10	2.21	30.9
nonconvex	5	6	2-level approx.	10/10	1.6	32.4
nonconvex	5	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	5	10	direct approx.	10/10	2.82	33.7
nonconvex	5	10	2-level approx.	10/10	2.37	36.0
nonconvex	6	2	SGM-MINLP	10/10	12.02	21.9
nonconvex	6	2	direct approx.	10/10	0.81	21.7
nonconvex	6	2	2-level approx.	10/10	1.0	23.9
nonconvex	6	6	SGM-MINLP	10/10	47.39	35.9
nonconvex	6	6	direct approx.	10/10	2.9	34.9
nonconvex	6	6	2-level approx.	10/10	2.64	36.9
nonconvex	6	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	6	10	direct approx.	10/10	9.38	45.1
nonconvex	6	10	2-level approx.	10/10	5.75	44.5
nonconvex	7	2	SGM-MINLP	10/10	13.87	24.9
nonconvex	7	2	direct approx.	10/10	1.34	24.6
nonconvex	7	2	2-level approx.	10/10	1.7	26.3
nonconvex	7	6	SGM-MINLP	10/10	114.1	52.6
nonconvex	7	6	direct approx.	10/10	33.48	52.8
nonconvex	7	6	2-level approx.	10/10	12.83	50.6
nonconvex	7	10	SGM-MINLP	1/10	709.96	98.0
nonconvex	7	10	direct approx.	8/10	4.9	48.38
nonconvex	7	10	2-level approx.	9/10	76.78	64.33
nonconvex	8	2	SGM-MINLP	2/2	23.19	26.0
nonconvex	8	2	direct approx.	2/2	5.88	33.0
nonconvex	8	2	2-level approx.	2/2	5.51	29.5
nonconvex	8	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	8	8	direct approx.	1/2	7.35	42.0
nonconvex	8	8	2-level approx.	1/2	6.79	43.0
nonconvex	8	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	8	15	direct approx.	0/2	NaN	NaN
nonconvex	8	15	2-level approx.	1/2	8.2	58.0
nonconvex	10	2	SGM-MINLP	2/2	32.42	32.0
nonconvex	10	2	direct approx.	2/2	7.27	39.5
nonconvex	10	2	2-level approx.	2/2	3.67	33.0
nonconvex	10	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	10	8	direct approx.	1/2	62.79	55.0
nonconvex	10	8	2-level approx.	1/2	46.82	58.0

Continued on next page

**Table 2 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
nonconvex	10	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	10	15	direct approx.	2/2	119.88	74.0
nonconvex	10	15	2-level approx.	1/2	41.13	64.0
nonconvex	12	2	SGM-MINLP	2/2	370.04	58.5
nonconvex	12	2	direct approx.	2/2	8.24	39.5
nonconvex	12	2	2-level approx.	2/2	7.09	41.0
nonconvex	12	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	12	8	direct approx.	1/2	94.89	61.0
nonconvex	12	8	2-level approx.	1/2	73.14	65.0
nonconvex	12	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	12	15	direct approx.	1/2	390.09	84.0
nonconvex	12	15	2-level approx.	0/2	NaN	NaN
nonconvex	15	2	SGM-MINLP	1/2	53.23	24.0
nonconvex	15	2	direct approx.	2/2	217.25	61.0
nonconvex	15	2	2-level approx.	1/2	3.7	25.0
nonconvex	15	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	15	8	direct approx.	0/2	NaN	NaN
nonconvex	15	8	2-level approx.	0/2	NaN	NaN
nonconvex	15	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	15	15	direct approx.	0/2	NaN	NaN
nonconvex	15	15	2-level approx.	0/2	NaN	NaN

Table 3: Results by size parameters for tolerance  $\delta_f = 10^{-4}$

cost	#players	#markets	method	#solved	time (s)	#iter.
log	2	2	SGM-ExpCone	10/10	0.52	4.7
log	2	2	direct approx.	10/10	0.42	4.7
log	2	2	2-level approx.	10/10	0.24	6.2
log	2	6	SGM-ExpCone	10/10	1.38	9.1
log	2	6	direct approx.	10/10	1.16	9.4
log	2	6	2-level approx.	10/10	0.59	10.5
log	2	10	SGM-ExpCone	10/10	4.02	10.2
log	2	10	direct approx.	10/10	1.85	10.2
log	2	10	2-level approx.	10/10	0.83	11.2
log	3	2	SGM-ExpCone	10/10	1.19	13.0
log	3	2	direct approx.	10/10	0.87	13.5
log	3	2	2-level approx.	10/10	0.42	14.8
log	3	6	SGM-ExpCone	10/10	2.45	16.6
log	3	6	direct approx.	10/10	2.15	16.8
log	3	6	2-level approx.	10/10	0.93	18.0
log	3	10	SGM-ExpCone	10/10	8.3	17.6
log	3	10	direct approx.	10/10	3.62	18.0

Continued on next page

**Table 3 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
log	3	10	2-level approx.	10/10	1.8	19.4
log	4	2	SGM-ExpCone	10/10	1.94	17.5
log	4	2	direct approx.	10/10	0.93	17.1
log	4	2	2-level approx.	10/10	0.68	18.4
log	4	6	SGM-ExpCone	10/10	3.28	22.1
log	4	6	direct approx.	10/10	4.02	22.4
log	4	6	2-level approx.	10/10	1.39	23.6
log	4	10	SGM-ExpCone	10/10	10.96	27.0
log	4	10	direct approx.	10/10	6.27	28.6
log	4	10	2-level approx.	9/10	2.92	28.56
log	5	2	SGM-ExpCone	10/10	2.05	17.4
log	5	2	direct approx.	10/10	1.43	17.2
log	5	2	2-level approx.	10/10	0.81	19.0
log	5	6	SGM-ExpCone	10/10	6.0	35.1
log	5	6	direct approx.	10/10	8.08	37.0
log	5	6	2-level approx.	10/10	3.63	37.1
log	5	10	SGM-ExpCone	10/10	16.73	37.8
log	5	10	direct approx.	10/10	11.36	38.2
log	5	10	2-level approx.	10/10	4.9	38.7
log	6	2	SGM-ExpCone	10/10	4.25	26.3
log	6	2	direct approx.	10/10	2.39	24.7
log	6	2	2-level approx.	10/10	1.94	27.3
log	6	6	SGM-ExpCone	9/10	7.36	35.56
log	6	6	direct approx.	10/10	26.8	42.7
log	6	6	2-level approx.	10/10	18.69	44.2
log	6	10	SGM-ExpCone	10/10	76.49	48.7
log	6	10	direct approx.	10/10	20.75	45.6
log	6	10	2-level approx.	10/10	12.54	49.2
log	7	2	SGM-ExpCone	10/10	8.09	31.1
log	7	2	direct approx.	10/10	3.84	28.8
log	7	2	2-level approx.	10/10	4.73	33.3
log	7	6	SGM-ExpCone	10/10	23.44	49.5
log	7	6	direct approx.	10/10	69.53	55.5
log	7	6	2-level approx.	10/10	67.02	58.8
log	7	10	SGM-ExpCone	7/10	31.23	50.43
log	7	10	direct approx.	7/10	66.83	58.0
log	7	10	2-level approx.	7/10	28.74	58.71
log	8	2	SGM-ExpCone	2/2	22.64	37.5
log	8	2	direct approx.	2/2	4.78	33.5
log	8	2	2-level approx.	2/2	3.06	36.5
log	8	8	SGM-ExpCone	1/2	15.59	45.0
log	8	8	direct approx.	1/2	8.09	47.0
log	8	8	2-level approx.	1/2	5.25	48.0
log	8	15	SGM-ExpCone	2/2	237.31	71.5
log	8	15	direct approx.	1/2	14.13	65.0
log	8	15	2-level approx.	1/2	6.26	66.0

Continued on next page

**Table 3 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
log	10	2	SGM-ExpCone	2/2	8.69	38.0
log	10	2	direct approx.	2/2	5.8	36.5
log	10	2	2-level approx.	2/2	2.47	36.5
log	10	8	SGM-ExpCone	1/2	132.7	60.0
log	10	8	direct approx.	1/2	81.17	60.0
log	10	8	2-level approx.	1/2	58.13	61.0
log	10	15	SGM-ExpCone	1/2	176.16	67.0
log	10	15	direct approx.	2/2	67.92	79.0
log	10	15	2-level approx.	2/2	124.83	81.0
log	12	2	SGM-ExpCone	1/2	6.32	32.0
log	12	2	direct approx.	2/2	7.74	44.5
log	12	2	2-level approx.	2/2	4.37	45.5
log	12	8	SGM-ExpCone	1/2	282.82	65.0
log	12	8	direct approx.	1/2	198.45	69.0
log	12	8	2-level approx.	1/2	112.78	72.0
log	12	15	SGM-ExpCone	0/2	NaN	NaN
log	12	15	direct approx.	0/2	NaN	NaN
log	12	15	2-level approx.	0/2	NaN	NaN
log	15	2	SGM-ExpCone	1/2	6.59	36.0
log	15	2	direct approx.	1/2	3.59	26.0
log	15	2	2-level approx.	1/2	2.15	27.0
log	15	8	SGM-ExpCone	0/2	NaN	NaN
log	15	8	direct approx.	0/2	NaN	NaN
log	15	8	2-level approx.	0/2	NaN	NaN
log	15	15	SGM-ExpCone	0/2	NaN	NaN
log	15	15	direct approx.	0/2	NaN	NaN
log	15	15	2-level approx.	0/2	NaN	NaN
root	2	2	SGM-MIQCQP	10/10	0.08	4.6
root	2	2	direct approx.	10/10	0.44	4.7
root	2	2	2-level approx.	10/10	0.27	6.2
root	2	6	SGM-MIQCQP	10/10	0.29	9.1
root	2	6	direct approx.	10/10	1.36	9.4
root	2	6	2-level approx.	10/10	0.63	10.6
root	2	10	SGM-MIQCQP	10/10	0.6	9.8
root	2	10	direct approx.	10/10	7.17	10.2
root	2	10	2-level approx.	10/10	1.01	11.2
root	3	2	SGM-MIQCQP	10/10	0.28	13.7
root	3	2	direct approx.	10/10	0.89	13.3
root	3	2	2-level approx.	10/10	0.54	16.0
root	3	6	SGM-MIQCQP	10/10	0.55	16.4
root	3	6	direct approx.	10/10	2.52	17.0
root	3	6	2-level approx.	10/10	1.04	18.0
root	3	10	SGM-MIQCQP	10/10	1.0	17.4
root	3	10	direct approx.	10/10	3.57	18.1
root	3	10	2-level approx.	10/10	1.93	19.4
root	4	2	SGM-MIQCQP	10/10	0.36	16.7

Continued on next page

**Table 3 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
root	4	2	direct approx.	10/10	1.22	17.1
root	4	2	2-level approx.	10/10	0.7	18.6
root	4	6	SGM-MIQCQP	10/10	0.99	22.1
root	4	6	direct approx.	10/10	4.11	22.4
root	4	6	2-level approx.	10/10	1.56	24.0
root	4	10	SGM-MIQCQP	10/10	2.08	28.0
root	4	10	direct approx.	10/10	6.31	27.4
root	4	10	2-level approx.	10/10	3.57	29.8
root	5	2	SGM-MIQCQP	10/10	0.43	17.5
root	5	2	direct approx.	10/10	1.4	17.5
root	5	2	2-level approx.	10/10	0.81	19.2
root	5	6	SGM-MIQCQP	10/10	2.78	34.8
root	5	6	direct approx.	10/10	6.93	34.4
root	5	6	2-level approx.	10/10	2.72	37.8
root	5	10	SGM-MIQCQP	10/10	4.91	38.0
root	5	10	direct approx.	10/10	9.7	38.6
root	5	10	2-level approx.	10/10	5.87	40.2
root	6	2	SGM-MIQCQP	10/10	2.69	26.7
root	6	2	direct approx.	10/10	2.57	23.8
root	6	2	2-level approx.	10/10	1.46	25.7
root	6	6	SGM-MIQCQP	10/10	87.34	43.9
root	6	6	direct approx.	9/10	12.74	36.67
root	6	6	2-level approx.	9/10	3.37	38.44
root	6	10	SGM-MIQCQP	10/10	17.54	46.8
root	6	10	direct approx.	10/10	23.93	46.7
root	6	10	2-level approx.	10/10	93.42	54.0
root	7	2	SGM-MIQCQP	10/10	3.86	31.1
root	7	2	direct approx.	10/10	7.85	30.6
root	7	2	2-level approx.	10/10	8.43	33.7
root	7	6	SGM-MIQCQP	10/10	84.52	51.4
root	7	6	direct approx.	10/10	92.58	54.4
root	7	6	2-level approx.	10/10	91.08	55.5
root	7	10	SGM-MIQCQP	6/10	13.7	50.33
root	7	10	direct approx.	6/10	14.33	51.67
root	7	10	2-level approx.	7/10	13.57	56.43
root	8	2	SGM-MIQCQP	2/2	1.35	29.0
root	8	2	direct approx.	2/2	5.2	32.0
root	8	2	2-level approx.	2/2	5.06	40.5
root	8	8	SGM-MIQCQP	1/2	3.79	45.0
root	8	8	direct approx.	1/2	15.46	47.0
root	8	8	2-level approx.	1/2	6.41	48.0
root	8	15	SGM-MIQCQP	0/2	NaN	NaN
root	8	15	direct approx.	0/2	NaN	NaN
root	8	15	2-level approx.	1/2	222.17	89.0
root	10	2	SGM-MIQCQP	2/2	2.64	36.0
root	10	2	direct approx.	2/2	6.39	34.0

Continued on next page



**Table 3 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
root	10	2	2-level approx.	2/2	3.02	37.0
root	10	8	SGM-MIQCQP	1/2	74.93	59.0
root	10	8	direct approx.	1/2	75.6	60.0
root	10	8	2-level approx.	1/2	56.73	62.0
root	10	15	SGM-MIQCQP	2/2	102.4	79.0
root	10	15	direct approx.	1/2	214.98	88.0
root	10	15	2-level approx.	2/2	86.74	81.5
root	12	2	SGM-MIQCQP	1/2	1.47	27.0
root	12	2	direct approx.	1/2	4.64	29.0
root	12	2	2-level approx.	1/2	2.75	30.0
root	12	8	SGM-MIQCQP	1/2	370.07	69.0
root	12	8	direct approx.	1/2	235.97	66.0
root	12	8	2-level approx.	1/2	95.56	74.0
root	12	15	SGM-MIQCQP	0/2	NaN	NaN
root	12	15	direct approx.	0/2	NaN	NaN
root	12	15	2-level approx.	0/2	NaN	NaN
root	15	2	SGM-MIQCQP	1/2	1.1	26.0
root	15	2	direct approx.	1/2	3.99	26.0
root	15	2	2-level approx.	1/2	1.9	27.0
root	15	8	SGM-MIQCQP	0/2	NaN	NaN
root	15	8	direct approx.	0/2	NaN	NaN
root	15	8	2-level approx.	0/2	NaN	NaN
root	15	15	SGM-MIQCQP	0/2	NaN	NaN
root	15	15	direct approx.	0/2	NaN	NaN
root	15	15	2-level approx.	0/2	NaN	NaN
nonconvex	2	2	SGM-MINLP	10/10	3.28	4.1
nonconvex	2	2	direct approx.	10/10	3.34	4.2
nonconvex	2	2	2-level approx.	10/10	2.38	5.5
nonconvex	2	6	SGM-MINLP	10/10	15.75	8.9
nonconvex	2	6	direct approx.	10/10	2.58	9.3
nonconvex	2	6	2-level approx.	10/10	1.54	10.3
nonconvex	2	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	2	10	direct approx.	10/10	4.17	10.2
nonconvex	2	10	2-level approx.	10/10	2.54	11.2
nonconvex	3	2	SGM-MINLP	10/10	7.64	12.8
nonconvex	3	2	direct approx.	10/10	3.75	13.2
nonconvex	3	2	2-level approx.	10/10	2.96	14.1
nonconvex	3	6	SGM-MINLP	10/10	24.13	16.4
nonconvex	3	6	direct approx.	10/10	5.15	16.8
nonconvex	3	6	2-level approx.	10/10	3.52	17.8
nonconvex	3	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	3	10	direct approx.	10/10	4.8	18.1
nonconvex	3	10	2-level approx.	10/10	3.31	19.2
nonconvex	4	2	SGM-MINLP	10/10	8.33	16.7
nonconvex	4	2	direct approx.	10/10	2.71	17.1
nonconvex	4	2	2-level approx.	10/10	2.62	18.4

Continued on next page

**Table 3 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
nonconvex	4	6	SGM-MINLP	10/10	28.57	22.0
nonconvex	4	6	direct approx.	10/10	4.85	22.4
nonconvex	4	6	2-level approx.	10/10	3.31	23.4
nonconvex	4	10	SGM-MINLP	3/10	52.61	27.33
nonconvex	4	10	direct approx.	10/10	6.54	30.5
nonconvex	4	10	2-level approx.	10/10	4.29	29.5
nonconvex	5	2	SGM-MINLP	10/10	9.32	17.8
nonconvex	5	2	direct approx.	10/10	3.53	17.3
nonconvex	5	2	2-level approx.	10/10	3.36	18.4
nonconvex	5	6	SGM-MINLP	10/10	34.11	33.6
nonconvex	5	6	direct approx.	10/10	6.14	35.7
nonconvex	5	6	2-level approx.	10/10	3.68	35.7
nonconvex	5	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	5	10	direct approx.	10/10	8.43	38.8
nonconvex	5	10	2-level approx.	10/10	5.36	39.1
nonconvex	6	2	SGM-MINLP	10/10	16.15	27.5
nonconvex	6	2	direct approx.	10/10	2.65	23.8
nonconvex	6	2	2-level approx.	10/10	2.52	26.1
nonconvex	6	6	SGM-MINLP	10/10	62.61	40.8
nonconvex	6	6	direct approx.	10/10	9.19	39.7
nonconvex	6	6	2-level approx.	10/10	10.28	41.9
nonconvex	6	10	SGM-MINLP	0/10	NaN	NaN
nonconvex	6	10	direct approx.	10/10	20.02	50.4
nonconvex	6	10	2-level approx.	10/10	24.09	53.0
nonconvex	7	2	SGM-MINLP	10/10	14.58	27.1
nonconvex	7	2	direct approx.	10/10	6.09	31.9
nonconvex	7	2	2-level approx.	10/10	4.61	29.4
nonconvex	7	6	SGM-MINLP	10/10	174.28	59.5
nonconvex	7	6	direct approx.	10/10	37.27	54.9
nonconvex	7	6	2-level approx.	10/10	22.62	56.3
nonconvex	7	10	SGM-MINLP	1/10	676.16	98.0
nonconvex	7	10	direct approx.	8/10	92.33	61.88
nonconvex	7	10	2-level approx.	8/10	117.29	64.5
nonconvex	8	2	SGM-MINLP	2/2	27.57	30.5
nonconvex	8	2	direct approx.	2/2	22.72	34.0
nonconvex	8	2	2-level approx.	2/2	13.51	31.0
nonconvex	8	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	8	8	direct approx.	1/2	17.1	47.0
nonconvex	8	8	2-level approx.	1/2	9.63	48.0
nonconvex	8	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	8	15	direct approx.	1/2	630.94	88.0
nonconvex	8	15	2-level approx.	1/2	18.09	66.0
nonconvex	10	2	SGM-MINLP	2/2	43.79	34.0
nonconvex	10	2	direct approx.	2/2	14.0	32.0
nonconvex	10	2	2-level approx.	2/2	10.45	35.0
nonconvex	10	8	SGM-MINLP	0/2	NaN	NaN

Continued on next page

**Table 3 – continued from previous page**

cost	#players	#markets	method	#solved	time (s)	#iter.
nonconvex	10	8	direct approx.	1/2	58.34	58.0
nonconvex	10	8	2-level approx.	1/2	52.37	59.0
nonconvex	10	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	10	15	direct approx.	0/2	NaN	NaN
nonconvex	10	15	2-level approx.	2/2	115.68	80.0
nonconvex	12	2	SGM-MINLP	1/2	28.21	28.0
nonconvex	12	2	direct approx.	2/2	24.19	44.5
nonconvex	12	2	2-level approx.	2/2	14.28	46.0
nonconvex	12	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	12	8	direct approx.	1/2	84.0	65.0
nonconvex	12	8	2-level approx.	1/2	69.92	68.0
nonconvex	12	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	12	15	direct approx.	0/2	NaN	NaN
nonconvex	12	15	2-level approx.	0/2	NaN	NaN
nonconvex	15	2	SGM-MINLP	1/2	51.23	26.0
nonconvex	15	2	direct approx.	1/2	15.06	26.0
nonconvex	15	2	2-level approx.	1/2	8.63	27.0
nonconvex	15	8	SGM-MINLP	0/2	NaN	NaN
nonconvex	15	8	direct approx.	0/2	NaN	NaN
nonconvex	15	8	2-level approx.	0/2	NaN	NaN
nonconvex	15	15	SGM-MINLP	0/2	NaN	NaN
nonconvex	15	15	direct approx.	0/2	NaN	NaN
nonconvex	15	15	2-level approx.	0/2	NaN	NaN