

## Supplementary Material

# Demystifying the stability and the performance aspects of CoCoSo ranking method under uncertain preferences

**Table 1:** Results of the experiment on the CoCoSo method using the scalar approach and unbiased weights.

Number of matrices	Matrix size	Total adequacy test on rows		Partial adequacy test on rows			Total adequacy test on columns		Partial adequacy test on columns		
		Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)	Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)
300	5 × 6	84.33	15.67	84.33	11	4.67	3.67	96.33	3.67	40	56.33
	7 × 8	76	24	76	21.67	2.33	0	100	0	41	59
	8 × 9	78.33	21.67	78.33	19.33	2.34	0	100	0	36	64
	9 × 12	64	36	64	34	2	0	100	0	36	64
600	5 × 6	85.5	14.5	85.5	12	2.5	1	99	1	46.17	52.83
	7 × 8	76.33	23.67	76.33	20	3.67	0	100	0	38.67	61.33
	8 × 9	73.83	26.17	73.83	23.83	2.34	0	100	0	34.67	65.33
	9 × 12	68.5	31.5	68.5	29.83	1.67	0	100	0	34.33	65.67
900	5 × 6	85.44	14.56	85.44	11.44	3.12	1.78	98.22	1.78	43	55.22
	7 × 8	75.56	24.44	75.56	21.11	3.33	0.11	99.89	0.11	39.78	60.11
	8 × 9	76.44	23.56	76.44	22.22	1.34	0	100	0	35.11	64.89
	9 × 12	68.11	31.89	68.11	28.67	3.22	0	100	0	34.11	65.89
1200	5 × 6	86.33	13.67	86.33	11.25	2.42	2.17	97.83	2.17	41.42	56.41
	7 × 8	77.08	22.92	77.08	20.42	2.5	0	100	0	37.67	62.33
	8 × 9	75.25	24.75	75.25	22.17	2.58	0	100	0	37.83	62.17
	9 × 12	69.25	30.75	69.25	28.25	2.5	0	100	0	36.92	63.08
1500	5 × 6	87	13	87	10.33	2.67	1.67	98.33	1.67	43.93	54.4
	7 × 8	78.73	21.27	78.73	18.53	2.54	0	100	0	39.93	60.07
	8 × 9	75.53	24.47	75.53	22	2.47	0	100	0	36.93	63.07
	9 × 12	67.87	32.93	67.87	30.33	2.6	0	100	0	34.2	65.8
1800	5 × 6	85.94	14.06	85.94	11.17	2.89	2.72	97.28	2.72	42.89	54.39
	7 × 8	77.67	22.33	77.67	19.28	3.05	0	100	0	38.5	61.5
	8 × 9	73.5	26.5	73.5	24.17	2.33	0	100	0	34.94	65.06
	9 × 12	68.61	31.39	68.61	28.61	2.78	0	100	0	35.28	64.72
2100	5 × 6	85.1	14.9	85.1	11.29	3.61	2.62	97.38	2.62	43.05	54.33
	7 × 8	78.24	21.76	78.24	19.19	2.57	0	100	0	37.62	62.38
	8 × 9	73.05	26.95	73.05	24.24	2.71	0	100	0	36.95	63.05
	9 × 12	67.1	32.9	67.1	29.81	3.09	0	100	0	34.9	65.1
2400	5 × 6	86.88	13.12	86.88	10.21	2.91	2.54	97.46	2.54	45.5	51.96

	7 × 8	77.25	22.75	77.25	19.71	3.04	0.04	99.96	0.04	38.08	61.88
	8 × 9	72.79	27.21	72.79	24.83	2.38	0	100	0	37.75	62.25
	9 × 12	70.12	29.88	70.12	27.12	2.76	0	100	0	37.25	62.75
2700	5 × 6	85	15	85	11.59	3.41	2.22	97.78	2.22	42.3	55.48
	7 × 8	78	22	78	19.07	2.93	0.04	99.96	0.04	36.85	63.11
	8 × 9	74.52	25.48	74.52	23.26	2.22	0	100	0	35.37	64.63
	9 × 12	68.65	31.15	68.65	28.3	2.85	0	100	0	35.48	64.52
3000	5 × 6	86.8	13.2	86.8	10.17	3.03	1.97	98.03	1.97	42.97	55.06
	7 × 8	77.63	22.37	77.63	19.7	2.67	0	100	0	39.63	60.37
	8 × 9	73.93	26.07	73.93	22.9	3.17	0	100	0	35.53	64.47
	9 × 12	67.23	32.77	67.23	29.6	3.17	0	100	0	35.37	64.63

**Table 2:** Results of the experiment on the CoCoSo method using the power approach and unbiased weights.

Number of matrices	Matrix size	Total adequacy test on rows		Partial adequacy test on rows			Total adequacy test on columns		Partial adequacy test on columns		
		Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)	Pass (%)	Pass (%)	Fail (%)	Pass (%)	Fail (%)
300	5 × 6	96	4	96	3	1	2.67	97.33	2.67	44.33	53
	7 × 8	92.33	7.67	92.33	7	0.67	0.33	99.67	0.33	42.33	57.34
	8 × 9	94.33	5.67	94.33	5.33	0.34	0	100	0	41	59
	9 × 12	93.67	6.33	93.67	6	0.33	0	100	0	37	63
600	5 × 6	94.5	5.5	94.5	4.83	0.67	0.67	99.33	0.67	44.17	55.16
	7 × 8	95.67	4.33	95.67	4.33	0	0	100	0	42.5	57.5
	8 × 9	95	5	95	4.5	0.5	0	100	0	38	62
	9 × 12	94.33	5.67	94.33	5.5	0.17	0	100	0	37.67	62.33
900	5 × 6	96	4	96	3.11	0.89	1.22	98.78	1.22	43.56	55.22
	7 × 8	94.56	5.44	94.56	4.67	0.77	0	100	0	43	57
	8 × 9	94.89	5.11	94.89	4.78	0.33	0	100	0	36.89	63.11
	9 × 12	95	5	95	4.56	0.44	0	100	0	34.67	65.33
1200	5 × 6	95.25	4.75	95.25	4.08	0.67	1.83	98.17	1.83	44.25	53.92
	7 × 8	95.25	4.75	95.25	4.25	0.5	0	100	0	39.25	60.75
	8 × 9	94.92	5.08	94.92	4.83	0.25	0	100	0	40	60
	9 × 12	93.33	6.67	93.33	6.08	0.59	0	100	0	36.42	63.58
1500	5 × 6	96.33	3.67	96.33	3.13	0.54	1.6	98.4	1.6	46.6	51.8
	7 × 8	95.07	4.93	95.07	4.4	0.53	0	100	0	42.73	57.27
	8 × 9	93.73	6.27	93.73	5.47	0.8	0	100	0	41.33	58.67
	9 × 12	94.6	5.4	94.6	5	0.4	0	100	0	38.07	61.93
1800	5 × 6	95.72	4.28	95.72	3.33	0.95	1.83	98.17	1.83	46.5	51.67
	7 × 8	94.61	5.39	94.61	4.78	0.61	0.06	99.94	0.06	42.67	57.27
	8 × 9	94.11	5.89	94.11	5.61	0.28	0	100	0	40	60

	$9 \times 12$	94.33	5.67	94.33	5.28	0.39	0	100	0	38	62
2100	$5 \times 6$	96.14	3.86	96.14	3.29	0.57	1.62	98.38	1.62	46.74	51.62
	$7 \times 8$	93.9	6.1	93.9	5.24	0.86	0.05	99.95	0.05	40.05	59.9
	$8 \times 9$	95.05	4.95	95.05	4.48	0.47	0	100	0	40.33	59.67
	$9 \times 12$	93.14	6.86	93.14	6.52	0.34	0	100	0	37.43	62.57
2400	$5 \times 6$	96.29	3.71	96.29	3	0.71	1.75	98.25	1.75	47.79	50.46
	$7 \times 8$	95.38	4.61	95.38	4.21	0.41	0.04	99.96	0.04	42.12	57.84
	$8 \times 9$	93.88	6.12	93.88	5.71	0.41	0	100	0	41.67	58.33
	$9 \times 12$	94.75	5.25	94.75	4.92	0.33	0	100	0	39.04	60.96
2700	$5 \times 6$	95.44	4.56	95.44	3.74	0.82	2.81	97.19	2.81	43.85	54.04
	$7 \times 8$	95.07	4.93	95.03	4.37	0.56	0	100	0	41.89	58.11
	$8 \times 9$	94.15	5.85	94.15	5.33	0.52	0	100	0	39.3	60.7
	$9 \times 12$	94.26	5.74	94.26	5.52	0.22	0	100	0	38.41	61.59
3000	$5 \times 6$	96.17	3.83	96.17	3.27	0.56	1.73	98.27	1.73	45.9	52.37
	$7 \times 8$	94.77	5.23	94.77	4.77	0.46	0	100	0	42.57	57.43
	$8 \times 9$	94.53	5.47	94.53	5.03	0.44	0	100	0	38.6	61.4
	$9 \times 12$	93.4	6.6	93.4	6.13	0.47	0	100	0	39.03	60.97

**Table 3:** Results of the experiment on the CoCoSo method using the scalar approach and biased weights.

Number of matrices	Matrix size	Total adequacy test on rows		Partial adequacy test on rows			Total adequacy test on columns		Partial adequacy test on columns		
		Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)	Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)
300	$5 \times 6$	84.33	15.67	84.33	11	4.67	3.67	96.33	3.67	40	56.33
	$7 \times 8$	79	21	79	19	2	0	100	0	45.67	54.33
	$8 \times 9$	83	17	83	15.33	1.67	0	100	0	41.67	58.33
	$9 \times 12$	71.67	28.33	71.67	26.67	1.66	0	100	0	45.67	54.33
600	$5 \times 6$	85.5	14.5	85.5	12	2.5	1	99	1	46.17	52.83
	$7 \times 8$	76.33	23.67	76.33	20	3.67	0	100	0	38.67	61.33
	$8 \times 9$	73.83	26.17	73.83	23.83	2.34	0	100	0	34.67	65.33
	$9 \times 12$	68.5	31.5	68.5	29.83	1.67	0	100	0	34.33	65.67
900	$5 \times 6$	85.44	14.56	85.44	11.44	3.12	1.78	98.22	1.78	43	55.22
	$7 \times 8$	75.56	24.44	75.56	21.11	3.33	0.11	99.89	0.11	39.78	60.11
	$8 \times 9$	76.44	23.56	76.44	22.22	1.34	0	100	0	35.11	64.89
	$9 \times 12$	68.11	31.89	68.11	28.67	3.22	0	100	0	35.11	64.89
1200	$5 \times 6$	86.33	13.67	86.33	11.25	2.42	2.17	97.83	2.17	41.42	56.41
	$7 \times 8$	77.08	22.92	77.08	20.42	2.5	0	100	0	37.67	62.33
	$8 \times 9$	75.25	24.75	75.25	22.17	2.58	0	100	0	37.83	62.17
	$9 \times 12$	69.25	30.75	69.25	28.25	2.5	0	100	0	36.92	63.08
1500	$5 \times 6$	87	13	87	10.33	2.67	1.67	98.33	1.67	43.93	54.4
	$7 \times 8$	78.73	21.27	78.73	18.53	2.74	0	100	0	39.93	60.07

	<b>8 × 9</b>	75.53	24.47	75.53	22	2.47	0	100	0	36.93	63.07
	<b>9 × 12</b>	67.87	32.93	67.87	30.33	2.6	0	100	0	34.2	65.8
<b>1800</b>	<b>5 × 6</b>	85.94	14.06	85.94	11.17	2.89	2.72	97.28	2.72	42.89	54.39
	<b>7 × 8</b>	77.67	22.33	77.67	19.28	3.05	0	100	0	38.5	61.5
	<b>8 × 9</b>	73.5	26.5	73.5	24.17	2.33	0	100	0	34.94	65.06
	<b>9 × 12</b>	68.61	31.39	68.61	28.61	2.78	0	100	0	35.28	64.72
<b>2100</b>	<b>5 × 6</b>	85.1	14.9	85.1	11.29	3.61	2.62	97.38	2.62	43.05	54.33
	<b>7 × 8</b>	78.24	21.76	78.24	19.19	2.57	0	100	0	37.62	62.38
	<b>8 × 9</b>	73.05	26.95	73.05	24.24	2.71	0	100	0	36.95	63.05
	<b>9 × 12</b>	67.1	32.9	67.1	29.81	3.09	0	100	0	34.9	65.1
<b>2400</b>	<b>5 × 6</b>	86.88	13.12	86.88	10.21	2.91	2.54	97.46	2.54	45.5	51.96
	<b>7 × 8</b>	77.25	22.75	77.25	19.71	3.04	0.04	99.96	0.04	38.08	61.88
	<b>8 × 9</b>	72.79	27.21	72.79	24.83	2.38	0	100	0	37.75	62.25
	<b>9 × 12</b>	70.12	29.88	70.12	27.12	2.76	0	100	0	37.25	62.75
<b>2700</b>	<b>5 × 6</b>	85	15	85	11.59	3.41	2.22	97.78	2.22	42.3	55.48
	<b>7 × 8</b>	78	22	78	19.07	2.93	0.04	99.96	0.04	36.85	63.11
	<b>8 × 9</b>	74.52	25.48	74.52	23.26	2.22	0	100	0	35.37	64.63
	<b>9 × 12</b>	68.65	31.15	68.65	28.3	2.85	0	100	0	35.48	64.52
<b>3000</b>	<b>5 × 6</b>	86.8	13.2	86.8	10.17	3.03	1.97	98.03	1.97	42.97	55.06
	<b>7 × 8</b>	77.63	22.37	77.63	19.7	2.67	0	100	0	39.63	60.37
	<b>8 × 9</b>	73.93	26.07	73.93	22.9	3.17	0	100	0	35.53	64.47
	<b>9 × 12</b>	67.23	32.77	67.23	29.6	3.17	0	100	0	35.37	64.63

**Table 4:** Results of the experiment on the CoCoSo method using the power approach and biased weights.

Number of matrices	Matrix size	Total adequacy test on rows		Partial adequacy test on rows			Total adequacy test on columns		Partial adequacy test on columns		
		Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)	Pass (%)	Fail (%)	Pass (%)	Partial pass (%)	Fail (%)
<b>300</b>	<b>5 × 6</b>	95.33	4.67	95.33	4.33	0.34	3	97	3	52	45
	<b>7 × 8</b>	97.33	2.67	97.33	2.67	0	0	100	0	50.67	49.33
	<b>8 × 9</b>	94	6	94	5	1	0	100	0	43.33	56.67
	<b>9 × 12</b>	94.67	5.33	94.67	5	0.33	0	100	0	56.67	43.33
<b>600</b>	<b>5 × 6</b>	94.33	5.67	94.33	4.5	1.17	2	98	2	48.67	49.33
	<b>7 × 8</b>	95	5	95	4.67	0.33	0	100	0	47.33	52.67
	<b>8 × 9</b>	93.17	6.83	93.17	6	0.83	0	100	0	42.67	57.33
	<b>9 × 12</b>	94.83	5.17	94.83	4.67	0.5	0	100	0	37.83	62.17
<b>900</b>	<b>5 × 6</b>	95.89	4.11	95.89	3.33	0.78	2.56	97.44	2.56	45.78	51.66
	<b>7 × 8</b>	94.89	5.11	94.89	5.11	0	0	100	0	43.67	56.33
	<b>8 × 9</b>	93.78	6.22	93.78	6	0.22	0	100	0	48.56	51.44
	<b>9 × 12</b>	94.33	5.67	94.33	5.56	0.11	0	100	0	39.22	60.38
<b>1200</b>	<b>5 × 6</b>	96.08	3.92	96.08	3.42	0.5	3.25	96.75	3.25	46.25	49.5

	<b>7 × 8</b>	94.58	5.42	94.58	4.83	0.57	0	100	0	42.92	57.08
	<b>8 × 9</b>	94.33	5.67	94.33	5.17	0.5	0	100	0	44.08	55.92
	<b>9 × 12</b>	93.42	6.58	93.42	5.92	0.66	0	100	0	40.25	59.75
<b>1500</b>	<b>5 × 6</b>	96.53	3.47	96.53	3.13	0.34	2.8	97.2	2.8	49.53	47.67
	<b>7 × 8</b>	94.07	5.93	94.07	5.47	0.46	0	100	0	47	53
	<b>8 × 9</b>	93.93	6.07	93.93	5.47	0.6	0	100	0	42.47	57.53
	<b>9 × 12</b>	93.4	6.6	93.4	6.07	0.53	0	100	0	37.6	62.4
<b>1800</b>	<b>5 × 6</b>	95.06	4.94	95.06	4.17	0.77	2.89	97.11	2.89	47.06	50.05
	<b>7 × 8</b>	94.61	5.39	94.61	4.67	0.72	0.11	99.89	0.11	46.11	53.78
	<b>8 × 9</b>	92.94	7.06	92.94	6.61	0.45	0	100	0	42.89	57.11
	<b>9 × 12</b>	93.56	6.44	93.56	6	0.44	0	100	0	39.94	60.06
<b>2100</b>	<b>5 × 6</b>	96.43	3.57	96.43	3.1	0.47	2.76	97.24	2.76	49.81	47.43
	<b>7 × 8</b>	94.29	5.71	94.29	5.14	0.57	0.1	99.1	0.1	44.57	55.33
	<b>8 × 9</b>	93.62	6.28	93.62	5.81	0.57	0	100	0	42.86	57.14
	<b>9 × 12</b>	94.67	5.33	94.67	5.05	0.28	0	100	0	41.76	58.24
<b>2400</b>	<b>5 × 6</b>	96	4	96	3.46	0.54	2.88	97.12	2.88	49.92	47.2
	<b>7 × 8</b>	94.79	5.21	94.79	4.75	0.46	0	100	0	45.42	54.58
	<b>8 × 9</b>	93.54	6.46	93.54	5.83	0.63	0	100	0	45.38	54.62
	<b>9 × 12</b>	94.79	5.21	94.79	5	0.21	0	100	0	41.83	58.17
<b>2700</b>	<b>5 × 6</b>	95.96	4.04	95.96	3.11	0.93	3.11	96.89	3.11	48.15	48.74
	<b>7 × 8</b>	93.81	6.19	93.81	5.41	0.78	0.07	99.93	0.07	44.39	55.34
	<b>8 × 9</b>	93.19	6.81	93.19	6.44	0.37	0	100	0	41.78	58.22
	<b>9 × 12</b>	93.67	6.33	93.67	6	0.33	0	100	0	40.15	59.85
<b>3000</b>	<b>5 × 6</b>	95.83	4.17	95.83	3.5	0.67	2.57	97.43	2.57	47.8	49.63
	<b>7 × 8</b>	94.77	5.23	94.77	4.73	0.5	0.03	99.97	0.03	44.6	55.37
	<b>8 × 9</b>	93.47	6.53	93.47	6.03	0.5	0	100	0	43.33	56.67
	<b>9 × 12</b>	94.1	5.9	94.1	5.57	0.33	0	100	0	40.43	59.57