

## Appendix: Individual Level Revealed Preference Tests for Rationality and Homotheticity

This appendix is supplementary to the non-parametric revealed preference tests for individual rationality and homotheticity. We report the efficiency indexes, CCEI and HEI for Risk and VoI problems separately. In addition, we report the Houtman-Maks index (HMI) due to Houtman and Maks (1985). This index is another commonly used measure for individual rationality, describing the largest subset of choices which still satisfies GARP. In our experiment setting, it is calculated as forty minus the smallest number of choices that has to be removed in order to achieve consistency with GARP.

Table 1: Individual test for rationality and homotheticity

ID	CCEI.Risk	CCEI.VoI	HEI.Risk	HEI.VoI	HMI.Risk	HMI.VoI
1	0.952	1.000	0.816	0.842	35	40
2	0.862	0.781	0.734	0.750	37	34
3	0.997	0.886	0.874	0.753	39	36
4	0.973	0.984	0.690	0.932	38	37
5	0.983	0.945	0.889	0.929	38	38
6	0.994	0.994	0.769	0.663	39	39
7	0.982	0.935	0.927	0.901	38	38
8	0.971	0.980	0.894	0.869	35	37
9	0.991	0.996	0.951	0.988	38	39
10	0.949	0.973	0.849	0.905	36	36
11	0.790	0.974	0.693	0.910	33	38
12	0.870	1.000	0.776	1.000	38	40
13	1.000	1.000	0.970	0.993	40	39
14	0.960	0.991	0.800	0.908	35	39
15	1.000	0.998	0.910	0.850	39	39
16	0.948	0.980	0.761	0.823	35	39
17	1.000	0.991	0.930	0.906	40	39
18	0.997	0.797	0.811	0.723	39	36
19	0.960	0.991	0.870	0.663	36	39
20	0.991	0.824	0.797	0.791	39	36
21	0.910	0.955	0.860	0.889	33	34
22	1.000	1.000	1.000	0.995	40	39
23	0.977	0.977	0.822	0.777	37	39
24	0.993	0.952	0.956	0.885	39	37
25	0.986	0.902	0.907	0.816	36	34
26	0.830	0.873	0.713	0.657	33	31
27	0.973	0.894	0.812	0.792	35	37
28	0.986	0.829	0.931	0.739	39	37
29	0.990	0.985	0.884	0.913	39	39
30	0.990	0.981	0.924	0.924	38	39
31	1.000	0.989	0.938	0.901	40	38
32	0.986	0.997	0.859	0.926	39	39
33	0.996	0.995	0.832	0.872	37	39
34	1.000	1.000	0.811	0.781	40	38
35	0.930	0.727	0.786	0.674	38	36
36	0.962	0.830	0.866	0.632	36	32
37	1.000	1.000	0.820	0.714	38	39
38	0.980	0.990	0.951	0.877	39	38
39	1.000	0.998	0.931	0.971	40	39
40	0.862	1.000	0.810	0.989	37	40

Table 2: Individual test for rationality and homotheticity (cnt)

ID	CCEI.Risk	CCEI.VoI	HEI.Risk	HEI.VoI	HMI.Risk	HMI.VoI
41	0.821	0.975	0.674	0.791	38	33
42	0.982	0.969	0.890	0.940	38	37
43	1.000	1.000	0.757	0.781	40	40
44	0.989	0.997	0.943	0.974	38	37
45	0.883	0.986	0.838	0.917	36	39
46	0.998	0.952	0.917	0.903	39	34
47	0.996	0.965	0.747	0.762	38	38
48	0.994	0.977	0.956	0.859	38	36
49	0.992	0.954	0.900	0.808	37	36
50	0.982	0.966	0.934	0.896	38	34
51	0.989	0.972	0.961	0.871	39	39
52	0.991	0.922	0.807	0.776	37	37
53	0.997	0.974	0.892	0.842	39	38
54	0.993	0.994	0.905	0.940	39	38
55	0.929	1.000	0.841	0.918	35	40
56	0.999	1.000	0.948	0.944	39	39
57	0.959	0.998	0.946	0.976	39	39
58	0.877	0.999	0.848	0.886	36	39
59	1.000	1.000	0.943	0.962	40	40
60	0.904	1.000	0.782	1.000	37	40
61	0.864	1.000	0.753	0.764	37	40
62	0.921	0.996	0.798	0.851	37	38
63	0.985	0.920	0.759	0.841	39	36
64	1.000	0.976	0.840	0.937	40	37
65	0.933	0.967	0.926	0.769	37	37
66	0.911	0.958	0.768	0.866	35	37
67	0.962	0.914	0.881	0.791	35	36
68	0.963	0.890	0.735	0.707	35	35
69	1.000	1.000	0.877	0.871	39	39
70	0.999	0.998	0.928	0.932	38	39
71	0.997	0.773	0.884	0.753	39	37
72	0.909	0.875	0.713	0.800	36	36
73	0.975	1.000	0.866	0.869	38	39
74	1.000	1.000	1.000	1.000	40	40
75	0.946	0.968	0.632	0.683	38	35
76	0.841	0.987	0.734	0.806	36	38
77	0.966	0.956	0.857	0.895	37	36
78	0.846	0.824	0.668	0.721	34	36
79	0.917	0.964	0.754	0.668	39	36
80	0.954	1.000	0.723	0.899	38	39
81	0.997	0.998	0.928	0.820	39	39
82	0.968	0.960	0.884	0.837	37	36
83	0.984	1.000	0.781	0.921	39	40
84	0.978	0.949	0.843	0.830	35	36
85	0.982	0.925	0.856	0.837	38	35
86	0.883	0.911	0.799	0.832	39	36
87	1.000	0.860	1.000	0.750	40	39
88	0.969	0.966	0.808	0.917	36	35
89	1.000	1.000	1.000	0.990	40	40
90	0.971	0.994	0.863	0.892	37	39
91	0.984	0.948	0.868	0.895	37	37
92	0.923	0.727	0.820	0.577	38	37

## Appendix: Individual Level Parametric Estimation with CRRA Specification

This appendix is supplementary to the structural estimations of individual belief and curvature parameters ( $\alpha$  and  $\rho$ ) in section 6. In Table 1 and 2, we report the starting values of  $\alpha$  and  $\rho$  for NLLS estimations of both expected utility and subjective expected utility model. These values are calculated from OLS estimates based on the interior optimal conditions solved for a DM's constrained maximization problem. Table 3 and 4 are the expected utility estimations of curvature parameter  $\rho_{\text{Risk}}$ ,  $\rho_{\text{diff}}$ , their P values, and the calculated  $\rho_{\text{VoI}}$ . We additionally report estimates of belief parameter  $\alpha$  and its P value for the subjective utility model in Table 5 and 6.

The OLS regression based on the interior optimal condition for a typical DM is:

$$\ln(x_i/y_i) = \beta_0^i + \beta_1^i \ln(q) + \epsilon_i,$$

where  $\epsilon_i$  is assumed to follow a normal distribution with zero mean and variance of  $\sigma_i^2$ . Based on the regressed parameters  $\hat{\beta}_0^i$  and  $\hat{\beta}_1^i$ , we can calculate the curvature parameter  $\rho^i = 1/\hat{\beta}_1^i$  and the belief parameter  $\alpha^i = \exp(-\hat{\beta}_0^i/\hat{\beta}_1^i)$ . We ran the OLS regression separately for  $i \in \{\text{Risk}, \text{VoI}\}$ .

We use  $\rho_{\text{Risk}}$  and  $\rho_{\text{diff}}$  in Table 1 and 2 as  $\rho_{\text{Risk}}$  and  $\rho_{\text{diff}}$ 's starting values for the estimation of curvature parameters in EU and SEU with NLLS method.

For this version of NLLS estimation with subjective expected utility model, the DM has the same belief parameter  $\alpha$  for Risk and VoI problems. We use  $\alpha_{\text{Risk}}$  in Table 1 and 2 as  $\alpha$ 's starting values for the estimation algorithm. These estimation results are robust to alternative sets of starting values of  $\alpha$  including  $\alpha_{\text{VoI}}$  and various combinations of  $\alpha_{\text{Risk}}$  and  $\alpha_{\text{VoI}}$ .

Table 1: OLS estimation based on interior optimal condition

ID	$\alpha_{\text{Risk}}$	$\rho_{\text{Risk}}$	$\alpha_{\text{VoI}}$	$\rho_{\text{VoI}}$	$\rho_{\text{diff}}$
1	0.009	3.732	0.026	2.250	-1.481
4	0.000	5.186	0.274	4.286	-0.900
5	0.870	0.955	0.841	1.393	0.438
7	0.573	1.970	0.718	1.354	-0.616
8	0.955	1.418	0.854	1.698	0.280
9	1.038	3.532	0.924	6.641	3.109
10	0.294	3.368	0.835	3.354	-0.014
14	0	69.470	0.020	7.239	-62.231
15	0.887	1.151	0.843	0.739	-0.412
16	0.109	2.683	0.838	0.612	-2.071
17	1.060	0.697	0.670	2.200	1.503
19	1.115	0.698	0.084	3.829	3.131
20	0.117	1.762	0.129	0.938	-0.824
21	0.006	4.488	0.165	2.515	-1.973
23	0.776	0.481	0.857	0.409	-0.071
24	0.646	2.039	0.000	5.791	3.752
25	0.705	1.217	0.127	3.924	2.707
27	0.022	4.762	0.109	4.757	-0.005
28	0.597	2.358	0.026	4.471	2.113
29	0.035	4.489	0.015	5.463	0.973
30	0.805	1.354	0.228	2.301	0.947
31	1.074	0.597	1.024	0.432	-0.165
32	0.000	33.747	0.009	12.808	-20.939
33	0.462	1.729	0	52.122	50.393
34	1.100	0.292	1.032	0.414	0.122
37	0.919	0.332	1.093	0.426	0.094
38	0.571	2.544	0.949	1.054	-1.490
39	0.300	2.994	0.732	1.891	-1.103
40	0.148	5.410	1.165	14.328	8.919
42	0.207	3.905	0.756	2.912	-0.992
43	0.681	0.796	0.610	0.905	0.109
44	0.050	8.129	0.129	6.815	-1.315

Table 2: OLS estimation based on interior optimal condition (cnt)

ID	$\alpha_{\text{Risk}}$	$\rho_{\text{Risk}}$	$\alpha_{\text{VoI}}$	$\rho_{\text{VoI}}$	$\rho_{\text{diff}}$
45	0.637	0.742	1.023	0.946	0.204
47	0.613	0.878	0.494	1.011	0.134
50	0.712	1.871	0.190	3.789	1.918
51	0.501	0.924	0.398	1.190	0.266
52	0.427	1.706	0.607	1.323	-0.382
53	0.256	2.253	0.136	3.129	0.876
54	0.617	1.164	0.707	0.873	-0.291
55	0.576	0.630	0	14.516	13.886
56	0.521	1.654	0.638	1.556	-0.098
57	0.466	2.219	0.796	1.190	-1.029
58	0.036	3.677	0.002	14.523	10.846
59	1.021	0.707	0.851	1.009	0.302
62	0.511	1.479	0.211	3.508	2.029
63	0.530	1.306	0.938	0.868	-0.438
64	1.323	0.649	0.114	13.296	12.647
65	0.697	2.145	0	56.730	54.585
66	0.627	0.945	0.629	1.890	0.945
67	0.180	2.388	0.448	1.810	-0.578
70	0.282	3.126	0.497	3.489	0.363
72	0.377	1.549	0.771	0.972	-0.577
73	0.512	1.114	0.090	2.160	1.046
77	0.043	4.635	0.005	6.990	2.355
79	0.534	0.939	0.018	2.287	1.348
80	0.001	6.752	0.545	2.122	-4.630
81	0.745	1.660	0.849	1.548	-0.112
82	0.088	4.480	0.000	9.302	4.821
83	1.094	0.414	1.282	0.586	0.172
84	0.166	3.334	0.275	1.852	-1.482
86	0.807	1.571	0.984	0.638	-0.933
88	0.000	9.888	0.101	2.596	-7.292
90	0.000	11.006	0.147	3.905	-7.101
91	0.022	6.153	0.252	3.538	-2.616

Table 3: NLLS estimation with Expected Utility ( $\alpha = 1$ )

ID	$\rho_{\text{Risk}}$	$P(\rho_{\text{Risk}})$	$\rho_{\text{diff}}$	$P(\rho_{\text{diff}})$	$\rho_{\text{VoI}}$
1	0.801	0	-0.209	0.028	0.591
4	0.664	0	1.479	0.005	2.143
5	0.862	0	0.366	0.001	1.228
7	1.378	0	-0.299	0.045	1.078
8	1.370	0	0.144	0.666	1.514
9	3.638	0	2.620	0.007	6.258
10	1.730	0	1.213	0.033	2.943
14	1.981	0	-0.181	0.540	1.801
15	1.053	0.000	-0.400	0.092	0.653
16	0.990	0.000	-0.451	0.049	0.539
17	0.730	0	0.950	0.037	1.680
19	0.762	0	0.551	0.051	1.313
20	0.663	0.000	-0.299	0.012	0.363
21	0.915	0	0.137	0.361	1.053
23	0.402	0	-0.036	0.598	0.366
24	1.525	0	-0.819	0.000	0.706
25	0.959	0	0.553	0.005	1.512
27	1.202	0	0.550	0.058	1.753
28	1.687	0	-0.520	0.039	1.167
29	1.254	0	0.029	0.849	1.283
30	1.160	0	-0.085	0.455	1.075
31	0.632	0	-0.192	0.020	0.441
32	2.418	0	0.342	0.440	2.761
33	1.083	0.000	0.781	0.161	1.864
34	0.315	0	0.109	0.098	0.425
37	0.312	0	0.146	0.057	0.458
38	1.776	0	-0.763	0.006	1.013
39	1.551	0	-0.027	0.846	1.524
40	2.187	0	14.057	0.200	16.244
42	1.761	0	0.635	0.027	2.396
43	0.613	0.000	0.042	0.784	0.655
44	2.452	0	0.186	0.543	2.637

Table 4: NLLS estimation with Expected Utility ( $\alpha = 1$ ) (cnt)

ID	$\rho_{\text{Risk}}$	$P(\rho_{\text{Risk}})$	$\rho_{\text{diff}}$	$P(\rho_{\text{diff}})$	$\rho_{\text{VoI}}$
45	0.550	0	0.413	0.028	0.963
47	0.637	0	0.018	0.823	0.655
50	1.482	0.000	0.179	0.639	1.660
51	0.603	0	0.093	0.079	0.695
52	1.029	0.000	-0.074	0.744	0.955
53	1.097	0	0.134	0.336	1.232
54	0.847	0	-0.159	0.089	0.689
55	0.442	0	-0.003	0.965	0.439
56	1.100	0	0.054	0.493	1.155
57	1.396	0	-0.385	0.000	1.012
58	1.029	0	1.470	0.002	2.499
59	0.718	0	0.179	0.049	0.897
62	0.974	0	0.620	0.008	1.594
63	0.877	0	-0.049	0.737	0.827
64	0.828	0	4.136	0.371	4.965
65	1.677	0	1.066	0.035	2.743
66	0.695	0	0.697	0.033	1.391
67	1.028	0	0.089	0.529	1.117
70	1.581	0	0.686	0.045	2.267
72	0.883	0	-0.074	0.675	0.810
73	0.734	0	0.022	0.852	0.757
77	1.355	0	0.011	0.956	1.365
79	0.632	0.000	-0.076	0.654	0.556
80	1.010	0	0.434	0.035	1.444
81	1.352	0	0.022	0.877	1.374
82	1.559	0	-0.226	0.321	1.333
83	0.445	0	0.280	0.044	0.725
84	1.396	0	-0.468	0.020	0.928
86	1.347	0.000	-0.718	0.061	0.630
88	1.131	0	-0.193	0.191	0.938
90	1.566	0	0.010	0.965	1.576
91	1.562	0	0.153	0.498	1.715

Table 5: NLLS estimation with Subjective Expected Utility ( $\alpha > 1$ )

ID	$\alpha$	$P(\alpha)$	$\rho_{\text{Risk}}$	$P(\rho_{\text{Risk}})$	$\rho_{\text{diff}}$	$P(\rho_{\text{diff}})$	$\rho_{\text{VoI}}$
1	0.019	0.461	3.238	0.000	-0.821	0.007	2.416
4	0.001	0.810	4.173	0.061	10.592	0.077	14.765
5	0.860	0	0.963	0	0.408	0.001	1.370
7	0.663	0.000	1.805	0	-0.381	0.048	1.425
8	0.910	0.001	1.470	0.000	0.152	0.674	1.622
9	1.615	0	2.270	0.000	1.784	0.008	4.054
10	0.428	0.068	2.832	0.001	2.226	0.048	5.057
14	0.001	0.866	13.176	0.152	-0.554	0.658	12.622
15	0.855	0.001	1.181	0.001	-0.449	0.113	0.732
16	0.664	0.014	1.263	0.003	-0.546	0.080	0.717
17	1.532	0.000	0.488	0.000	0.663	0.057	1.151
19	1.146	0.008	0.680	0.004	0.504	0.095	1.184
20	0.126	0.366	1.719	0.010	-0.775	0.037	0.945
21	0.045	0.528	3.056	0.012	0.623	0.162	3.678
23	0.821	0.000	0.462	0.000	-0.040	0.609	0.422
24	0.010	0.504	7.891	0.000	-4.744	0.001	3.147
25	0.526	0.001	1.454	0.000	0.737	0.010	2.191
27	0.041	0.610	4.129	0.036	2.041	0.098	6.170
28	0.143	0.288	4.487	0.003	-1.640	0.031	2.846
29	0.024	0.417	4.893	0.000	0.066	0.832	4.958
30	0.486	0.000	1.853	0	-0.215	0.177	1.638
31	1.375	0.000	0.476	0.000	-0.143	0.029	0.333
32	0.000	0.905	17.931	0.265	3.266	0.370	21.197
33	0.227	0.492	2.390	0.091	1.336	0.282	3.726
34	1.373	0.000	0.237	0.000	0.085	0.108	0.322
37	0.976	0.000	0.318	0.000	0.149	0.068	0.467
38	0.860	0.000	1.968	0.000	-0.835	0.011	1.134
39	0.517	0.000	2.305	0	0.036	0.844	2.340
40	0.162	0.357	5.252	0.010	39.779	0.234	45.031
42	0.387	0.009	2.999	0.000	1.302	0.011	4.302
43	0.648	0.035	0.821	0.003	0.052	0.794	0.873
44	0.082	0.215	7.137	0.000	0.674	0.247	7.811



Table 6: NLLS estimation with Subjective Expected Utility ( $\alpha > 1$ )(cnt)

ID	$\alpha$	$P(\alpha)$	$\rho_{\text{Risk}}$	$P(\rho_{\text{Risk}})$	$\rho_{\text{diff}}$	$P(\rho_{\text{diff}})$	$\rho_{\text{Vol}}$
45	0.736	0.001	0.677	0.000	0.530	0.040	1.208
47	0.555	0.001	0.930	0.000	0.018	0.866	0.949
50	0.470	0.132	2.395	0.010	0.174	0.763	2.568
51	0.457	0.000	0.971	0	0.140	0.031	1.111
52	0.523	0.077	1.533	0.005	-0.091	0.783	1.442
53	0.199	0.062	2.482	0.000	0.258	0.274	2.741
54	0.671	0.000	1.105	0	-0.203	0.091	0.902
55	0.082	0.431	1.397	0.008	-0.186	0.275	1.211
56	0.577	0	1.562	0	0.090	0.329	1.652
57	0.684	0	1.785	0	-0.469	0.000	1.316
58	0.027	0.553	3.912	0.008	5.369	0.018	9.282
59	1.033	0.000	0.700	0.000	0.175	0.065	0.875
62	0.425	0.015	1.631	0.000	0.966	0.014	2.597
63	0.751	0.001	1.061	0.000	-0.042	0.814	1.019
64	2.586	0	0.250	0.002	1.492	0.394	1.742
65	0.372	0.096	3.051	0.001	1.453	0.084	4.503
66	0.628	0.016	0.945	0.000	0.947	0.055	1.892
67	0.295	0.044	1.971	0.000	0.235	0.324	2.206
70	0.350	0.060	2.844	0.000	1.321	0.043	4.165
72	0.591	0.027	1.225	0.001	-0.073	0.762	1.152
73	0.282	0.129	1.490	0.001	-0.029	0.890	1.461
77	0.018	0.632	5.620	0.019	-0.076	0.886	5.544
79	0.171	0.567	1.567	0.125	-0.293	0.488	1.275
80	0.057	0.467	3.142	0.006	1.889	0.029	5.031
81	0.797	0	1.587	0	0.032	0.845	1.618
82	0.012	0.701	7.044	0.043	-1.291	0.165	5.752
83	1.554	0.000	0.296	0.000	0.172	0.065	0.468
84	0.240	0.119	2.908	0.000	-0.949	0.026	1.959
86	0.953	0.000	1.395	0.005	-0.742	0.083	0.653
88	0.024	0.552	4.259	0.006	-0.531	0.182	3.728
90	0.029	0.568	5.679	0.012	0.370	0.531	6.049
91	0.096	0.307	4.301	0.001	0.643	0.203	4.944































