Finite Sample Evidence of IV Estimators Under Weak Instruments

Appendix not for publication

This document contains the results to be made available at the JAE Data Archive website.

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Tables 1 through 4 present the simulation results described in the paper.

The set of figures correspond to the plots of the empirical density of selected estimators for each of the simulated models.

Appendix Tables

Table 1. Median Point Estimates

Model	(R2f, σ_{ue}, n, T)	TSLS	LIML	B2SLS	JIVE1	JIVE2	FULLER	J2SLS	BCTSLS	BCLIML	BCFULL	REQML
1	(0.001, 0.5, 1, 100)	1.455	1.455	1.489	1.487	1.487	1.495	1.493	1.444	1.444	1.491	1.342
2	(0.01, 0.5, 1, 100)	1.198	1.198	1.376	1.411	1.412	1.446	1.442	1.145	1.145	1.407	1.210
3	(0.1, 0.5, 1, 100)	1.001	1.001	1.052	0.959	0.958	1.146	1.065	1.001	1.001	1.043	1.008
4	(0.001, 0.9, 1, 100)	1.792	1.792	1.871	1.884	1.884	1.888	1.887	1.759	1.759	1.880	1.422
5	(0.01, 0.9, 1, 100)	1.286	1.286	1.592	1.577	1.575	1.759	1.711	1.198	1.198	1.652	1.156
6	(0.1, 0.9, 1, 100)	0.999	0.999	1.078	0.920	0.919	1.256	1.099	0.998	0.998	1.059	1.010
7	(0.001, 0.5, 5, 100)	1.494	1.480	1.474	1.482	1.481	1.494	1.487	1.489	1.479	1.492	1.362
8	(0.01, 0.5, 5, 100)	1.408	1.288	1.366	1.415	1.414	1.427	1.362	1.374	1.278	1.390	1.276
9	(0.1, 0.5, 5, 100)	1.118	0.994	1.031	0.970	0.970	1.125	1.052	1.048	0.993	1.048	1.006
10	(0.001, 0.9, 5, 100)	1.880	1.843	1.881	1.887	1.885	1.885	1.865	1.871	1.841	1.877	1.492
11	(0.01, 0.9, 5, 100)	1.716	1.393	1.655	1.784	1.782	1.745	1.625	1.644	1.380	1.669	1.250
12	(0.1, 0.9, 5, 100)	1.223	1.003	1.073	0.958	0.957	1.228	1.100	1.097	1.003	1.089	1.016
13	(0.001, 0.5, 30, 100)	1.497	1.472	1.498	1.502	1.499	1.486	1.493	1.495	1.470	1.485	1.415
14	(0.01, 0.5, 30, 100)	1.484	1.396	1.488	1.491	1.486	1.444	1.465	1.476	1.395	1.436	1.354
15	(0.1, 0.5, 30, 100)	1.374	1.074	1.189	1.208	1.212	1.187	1.285	1.331	1.074	1.164	1.135
16	(0.001, 0.9, 30, 100)	1.897	1.876	1.907	1.909	1.911	1.890	1.895	1.896	1.876	1.888	1.624
17	(0.01, 0.9, 30, 100)	1.872	1.710	1.869	1.892	1.894	1.804	1.847	1.862	1.712	1.792	1.522
18	(0.1, 0.9, 30, 100)	1.676	1.034	1.302	1.302	1.306	1.306	1.522	1.598	1.032	1.262	1.070
19	(0.001, 0.5, 1, 500)	1.334	1.334	1.456	1.472	1.476	1.480	1.482	1.289	1.289	1.470	1.259
20	(0.01, 0.5, 1, 500)	1.015	1.015	1.117	1.000	0.999	1.265	1.197	0.987	0.987	1.141	1.030
21	(0.1, 0.5, 1, 500)	1.002	1.002	1.011	0.990	0.990	1.036	1.011	0.998	0.998	1.000	1.003
22	(0.001, 0.9, 1, 500)	1.495	1.495	1.734	1.840	1.840	1.836	1.856	1.412	1.412	1.782	1.274
23	(0.01, 0.9, 1, 500)	1.006	1.006	1.201	0.926	0.927	1.454	1.290	0.978	0.978	1.230	1.031
24	(0.1, 0.9, 1, 500)	0.997	0.997	1.015	0.980	0.979	1.062	1.015	0.998	0.998	1.002	1.001
25	(0.001, 0.5, 5, 500)	1.468	1.400	1.463	1.496	1.494	1.473	1.436	1.455	1.402	1.462	1.373
26	(0.01, 0.5, 5, 500)	1.235	1.047	1.164	1.156	1.153	1.260	1.158	1.158	1.047	1.180	1.099
27	(0.1, 0.5, 5, 500)	1.041	1.005	1.015	0.994	0.995	1.040	1.017	1.010	1.007	1.011	1.005
28	(0.001, 0.9, 5, 500)	1.821	1.682	1.800	1.862	1.865	1.836	1.782	1.792	1.671	1.803	1.414
29	(0.01, 0.9, 5, 100)	1.425	1.060	1.232	1.192	1.185	1.447	1.277	1.288	1.050	1.293	1.078
30	(0.1, 0.9, 5, 500)	1.065	1.006	1.022	0.990	0.989	1.067	1.024	1.013	1.006	1.014	1.008
31	(0.001, 0.5, 30, 500)	1.483	1.424	1.461	1.481	1.487	1.463	1.474	1.479	1.426	1.455	1.483
32	(0.01, 0.5, 30, 500)	1.424	1.136	1.315	1.332	1.332	1.274	1.368	1.390	1.138	1.249	1.260
33	(0.1, 0.5, 30, 500)	1.172	1.002	1.004	0.984	0.986	1.036	1.061	1.090	1.004	1.018	1.006
34	(0.001, 0.9, 30, 500)	1.884	1.779	1.852	1.873	1.872	1.842	1.870	1.876	1.779	1.836	1.472
35	(0.01, 0.9, 30, 500)	1.772	1.104	1.488	1.531	1.525	1.468	1.669	1.718	1.103	1.422	1.129
36	(0.1, 0.9, 30, 500)	1.316	1.001	1.010	0.978	0.979	1.062	1.118	1.171	1.002	1.027	1.012
37	(0.001, 0.5, 5, 100) - t12	1.428	1.337	1.412	1.451	1.474	1.451	1.405	1.409	1.327	1.428	1.247
38	(0.01, 0.5, 5, 100) - t12	1.193	1.017	1.087	1.081	1.138	1.209	1.094	1.120	1.009	1.126	1.021
39	(0.1, 0.5, 5, 100) - t12	1.024	0.999	1.004	0.993	0.990	1.025	0.997	1.003	0.999	1.001	0.999
40	(0.001, 0.9, 5, 100) - t12	1.428	1.337	1.412	1.451	1.474	1.451	1.405	1.408	1.331	1.426	1.324
41	(0.01, 0.9, 5, 100) - t12	1.193	1.017	1.087	1.081	1.138	1.209	1.094	1.121	1.011	1.124	1.035
42	(0.1, 0.9, 5, 100) - t12	1.024	0.999	1.004	0.993	0.990	1.025	0.997	1.004	0.999	1.001	1.001
43	(0.001, 0.5, 5, 100) - t1	1.503	1.527	1.501	1.517	1.531	1.506	1.512	1.498	1.520	1.503	-1.155
44	(0.01, 0.5, 5, 100) - t1	1.486	1.489	1.503	1.496	1.523	1.492	1.496	1.481	1.486	1.489	-0.515
45	(0.1, 0.5, 5, 100) - t1	1.360	1.247	1.361	1.277	1.379	1.400	1.325	1.335	1.250	1.372	0.310
46	(0.001, 0.9, 5, 100) - t1	1.899	1.902	1.907	1.894	1.896	1.897	1.906	1.894	1.901	1.898	1.003
47	(0.01, 0.9, 5, 100) - t1	1.865	1.815	1.901	1.832	1.876	1.877	1.876	1.850	1.817	1.871	1.247
48	(0.1, 0.9, 5, 100) - t1	1.675	1.345	1.751	1.544	1.689	1.746	1.620	1.629	1.346	1.686	0.893

Notes: True beta=1. Results are based on 5000 replications for T=100 and 1000 replications for T=500. 500 bootstrap replications are used to compute the bootstrap bias-corrected estimators. Rows 37-48 are based on the design with non-normally generated random variables. t-12 and t-1 correspond to disturbances generated multivariate t with 12 and 1 degrees of freedom, respectively. See text for details.

Table 2. Median Absolute Error

Model	(R2f, σ_{ue}, n, T)	TSLS	LIML	B2SLS	JIVE1	JIVE2	FULLER	J2SLS	BCTSLS	BCLIML	BCFULL	REQML
1	(0.001, 0.5, 1, 100)	0.931	0.931	0.494	0.672	0.671	0.495	1.035	1.268	1.268	0.492	0.751
2	(0.01, 0.5, 1, 100)	0.644	0.644	0.404	0.665	0.664	0.446	0.628	0.800	0.800	0.417	0.586
3	(0.1, 0.5, 1, 100)	0.200	0.200	0.181	0.227	0.227	0.174	0.179	0.202	0.202	0.181	0.202
4	(0.001, 0.9, 1, 100)	0.941	0.941	0.871	0.922	0.922	0.888	1.125	1.079	1.079	0.880	0.827
5	(0.01, 0.9, 1, 100)	0.566	0.566	0.592	0.895	0.895	0.759	0.871	0.654	0.654	0.652	0.571
6	(0.1, 0.9, 1, 100)	0.196	0.196	0.178	0.232	0.231	0.256	0.166	0.199	0.199	0.165	0.200
7	(0.001, 0.5, 5, 100)	0.516	0.978	0.773	0.762	0.759	0.494	0.641	0.584	1.054	0.498	0.734
8	(0.01, 0.5, 5, 100)	0.439	0.757	0.646	0.747	0.743	0.427	0.538	0.491	0.799	0.414	0.644
9	(0.1, 0.5, 5, 100)	0.187	0.216	0.213	0.251	0.252	0.171	0.201	0.200	0.220	0.184	0.219
10	(0.001, 0.9, 5, 100)	0.880	0.967	0.924	0.937	0.935	0.885	0.880	0.873	0.991	0.877	0.871
11	(0.01, 0.9, 5, 100)	0.717	0.643	0.751	0.920	0.916	0.745	0.660	0.656	0.663	0.669	0.643
12	(0.1, 0.9, 5, 100)	0.242	0.194	0.221	0.255	0.252	0.228	0.210	0.205	0.195	0.160	0.199
13	(0.001, 0.5, 30, 100)	0.497	1.007	0.815	0.803	0.803	0.496	0.497	0.495	1.010	0.511	0.771
14	(0.01, 0.5, 30, 100)	0.484	0.919	0.806	0.793	0.801	0.460	0.472	0.476	0.914	0.475	0.733
15	(0.1, 0.5, 30, 100)	0.374	0.422	0.487	0.527	0.537	0.266	0.303	0.332	0.421	0.282	0.450
16	(0.001, 0.9, 30, 100)	0.897	0.971	0.969	0.962	0.964	0.890	0.895	0.896	0.970	0.888	0.909
17	(0.01, 0.9, 30, 100)	0.872	0.869	0.938	0.953	0.957	0.804	0.847	0.862	0.869	0.792	0.832
18	(0.1, 0.9, 30, 100)	0.676	0.284	0.514	0.542	0.547	0.306	0.522	0.598	0.283	0.263	0.298
19	(0.001, 0.5, 1, 500)	0.829	0.829	0.468	0.678	0.677	0.480	0.797	1.190	1.190	0.473	0.738
20	(0.01, 0.5, 1, 500)	0.312	0.312	0.241	0.417	0.418	0.269	0.268	0.330	0.330	0.240	0.315
21	(0.1, 0.5, 1, 500)	0.092	0.092	0.092	0.093	0.093	0.085	0.091	0.092	0.092	0.092	0.093
22	(0.001, 0.9, 1, 500)	0.705	0.705	0.734	0.928	0.929	0.836	1.052	0.882	0.882	0.782	0.741
23	(0.01, 0.9, 1, 500)	0.281	0.281	0.221	0.402	0.402	0.454	0.300	0.299	0.299	0.233	0.299
24	(0.1, 0.9, 1, 500)	0.089	0.089	0.089	0.092	0.092	0.089	0.088	0.090	0.090	0.089	0.093
25	(0.001, 0.5, 5, 500)	0.493	0.954	0.728	0.772	0.772	0.473	0.623	0.563	1.028	0.468	0.731
26	(0.01, 0.5, 5, 500)	0.298	0.418	0.405	0.536	0.535	0.264	0.341	0.331	0.432	0.280	0.433
27	(0.1, 0.5, 5, 500)	0.102	0.106	0.107	0.112	0.112	0.102	0.107	0.109	0.107	0.105	0.106
28	(0.001, 0.9, 5, 500)	0.821	0.850	0.866	0.921	0.921	0.836	0.799	0.793	0.867	0.803	0.761
29	(0.01, 0.9, 5, 500)	0.428	0.298	0.392	0.500	0.502	0.447	0.361	0.344	0.307	0.295	0.333
30	(0.1, 0.9, 5, 500)	0.096	0.087	0.093	0.098	0.098	0.094	0.092	0.090	0.087	0.088	0.090
31	(0.001, 0.5, 30, 500)	0.483	0.946	0.756	0.806	0.802	0.475	0.476	0.479	0.945	0.486	0.748
32	(0.01, 0.5, 30, 500)	0.424	0.554	0.614	0.711	0.705	0.321	0.373	0.392	0.554	0.335	0.604
33	(0.1, 0.5, 30, 500)	0.172	0.109	0.112	0.116	0.116	0.104	0.106	0.108	0.110	0.108	0.110
34	(0.001, 0.9, 30, 500)	0.884	0.926	0.939	0.946	0.943	0.842	0.870	0.876	0.919	0.836	0.864
35	(0.01, 0.9, 30, 500)	0.772	0.397	0.662	0.773	0.778	0.468	0.669	0.718	0.401	0.422	0.467
36	(0.1, 0.9, 30, 500)	0.316	0.091	0.119	0.128	0.126	0.095	0.134	0.173	0.090	0.087	0.094
37	(0.001, 0.5, 5, 100) - t12	0.465	0.847	0.708	0.771	0.780	0.451	0.603	0.518	0.887	0.443	0.696
38	(0.01, 0.5, 5, 100) - t12	0.246	0.324	0.311	0.415	0.524	0.228	0.296	0.268	0.333	0.237	0.330
39	(0.1, 0.5, 5, 100) - t12	0.079	0.081	0.081	0.084	0.100	0.077	0.084	0.080	0.081	0.080	0.081
40	(0.001, 0.9, 5, 100) - t12	0.465	0.847	0.708	0.771	0.780	0.451	0.603	0.516	0.887	0.443	0.759
41	(0.01, 0.9, 5, 100) - t12	0.246	0.324	0.311	0.415	0.524	0.228	0.296	0.266	0.330	0.236	0.271
42	(0.1, 0.9, 5, 100) - t12	0.079	0.081	0.081	0.084	0.100	0.077	0.084	0.081	0.081	0.081	0.078
43	(0.001, 0.5, 5, 100) - t1	0.646	0.995	0.851	0.905	0.890	0.605	1.006	0.727	1.039	0.637	31.45
44	(0.01, 0.5, 5, 100) - t1	0.626	0.954	0.834	0.879	0.880	0.592	0.953	0.697	0.995	0.620	33.18
45	(0.1, 0.5, 5, 100) - t1	0.492	0.686	0.746	0.640	0.763	0.504	0.680	0.523	0.710	0.502	29.36
46	(0.001, 0.9, 5, 100) - t1	0.908	1.001	0.961	0.977	0.961	0.905	0.969	0.913	1.015	0.905	38.18
47	(0.01, 0.9, 5, 100) - t1	0.875	0.967	0.965	0.932	0.954	0.886	0.943	0.872	0.981	0.880	33.62
48	(0.1, 0.9, 5, 100) - t1	0.687	0.632	0.891	0.730	0.838	0.755	0.732	0.661	0.651	0.700	41.28

Notes: True beta=1. Results are based on 5000 replications for T=100 and 1000 replications for T=500. 500 bootstrap replications are used to compute the bootstrap bias-corrected estimators. Rows 37-48 are based on the design with non-normally generated random variables. t-12 and t-1 correspond to disturbances generated multivariate t with 12 and 1 degrees of freedom, respectively. See text for details.
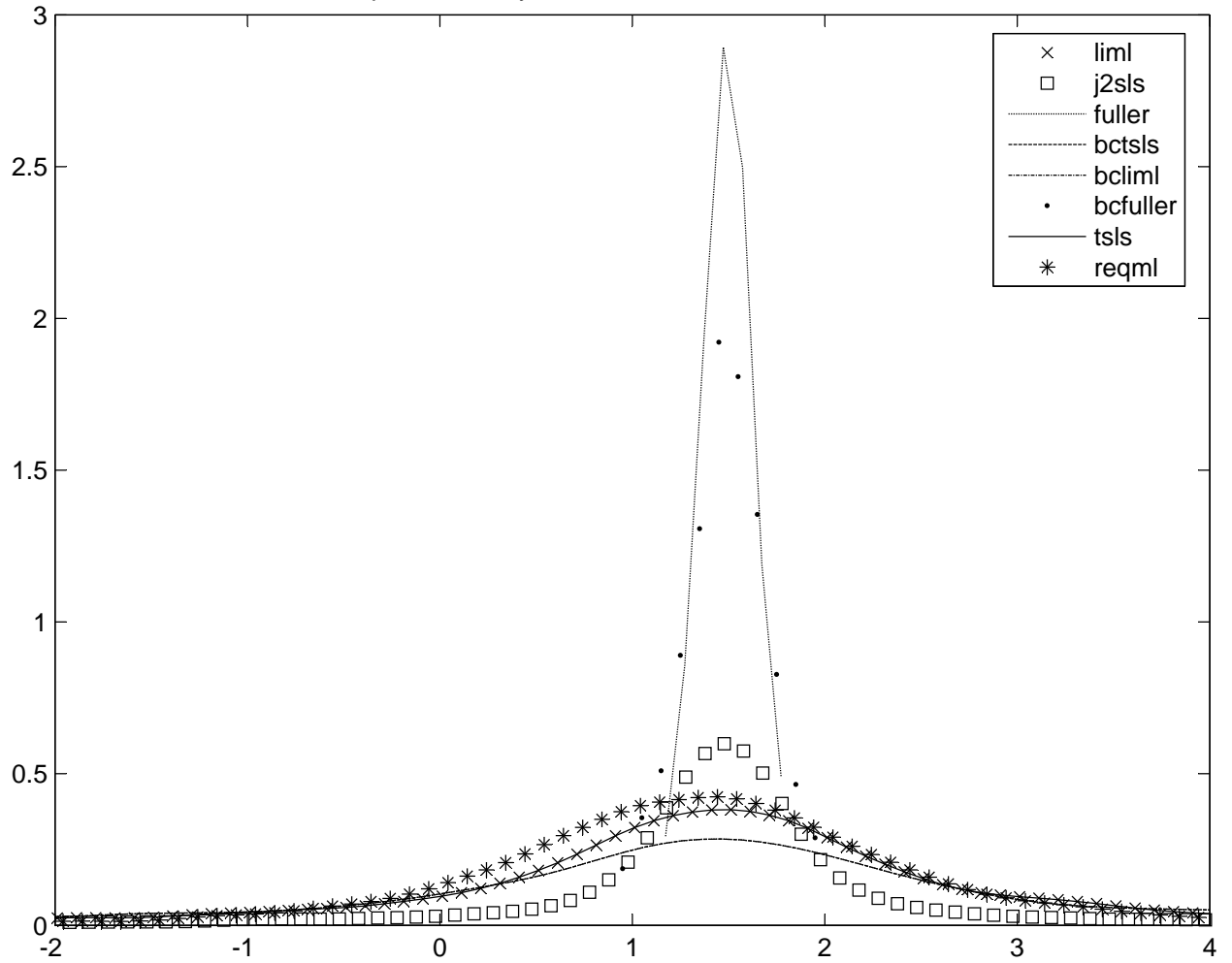
Table 3. Interdecile Range

Model	(R2f, σ_{ue}, n, T)	TSLS	LIML	B2SLS	JIVE1	JIVE2	FULLER	J2SLS	BCTSLS	BCLIML	BCFULL	REQML
1	(0.001, 0.5, 1, 100)	4.970	4.970	0.867	3.386	3.405	0.401	61.456	8.782	8.782	0.658	3.128
2	(0.01, 0.5, 1, 100)	3.742	3.742	0.918	3.489	3.489	0.467	22.520	6.256	6.256	0.752	2.783
3	(0.1, 0.5, 1, 100)	0.862	0.862	0.698	1.064	1.066	0.489	0.667	0.882	0.882	0.692	0.847
4	(0.001, 0.9, 1, 100)	3.074	3.074	0.525	1.907	1.916	0.233	38.690	5.581	5.581	0.394	4.128
5	(0.01, 0.9, 1, 100)	3.782	3.782	0.787	4.028	3.991	0.372	21.039	6.298	6.298	0.623	7.783
6	(0.1, 0.9, 1, 100)	0.881	0.881	0.617	1.210	1.219	0.318	0.535	0.918	0.918	0.576	0.880
7	(0.001, 0.5, 5, 100)	1.129	5.287	3.544	3.679	3.645	0.701	2.238	1.735	5.924	1.071	3.165
8	(0.01, 0.5, 5, 100)	1.058	4.527	3.030	3.846	3.797	0.720	1.939	1.570	5.007	1.076	3.025
9	(0.1, 0.5, 5, 100)	0.620	0.933	0.880	1.220	1.218	0.551	0.788	0.773	0.934	0.700	0.955
10	(0.001, 0.9, 5, 100)	0.589	2.986	1.829	1.847	1.832	0.370	1.157	0.907	3.390	0.565	5.121
11	(0.01, 0.9, 5, 100)	0.668	3.901	2.156	2.818	2.833	0.470	1.250	0.998	4.253	0.693	9.036
12	(0.1, 0.9, 5, 100)	0.500	0.826	0.904	1.415	1.417	0.343	0.753	0.722	0.833	0.521	0.834
13	(0.001, 0.5, 30, 100)	0.410	5.351	3.691	3.833	3.888	1.210	0.856	0.591	5.379	1.363	3.273
14	(0.01, 0.5, 30, 100)	0.406	5.059	3.761	3.674	3.675	1.206	0.835	0.589	5.082	1.350	3.193
15	(0.1, 0.5, 30, 100)	0.371	2.275	2.767	3.199	3.245	0.981	0.696	0.521	2.274	1.081	2.259
16	(0.001, 0.9, 30, 100)	0.212	2.612	1.966	1.955	1.975	0.626	0.447	0.313	2.616	0.708	3.726
17	(0.01, 0.9, 30, 100)	0.219	3.072	2.121	2.143	2.161	0.679	0.454	0.321	3.076	0.762	4.586
18	(0.1, 0.9, 30, 100)	0.234	1.426	3.283	3.962	3.887	0.421	0.454	0.331	1.433	0.465	1.467
19	(0.001, 0.5, 1, 500)	4.517	4.517	0.986	3.926	3.947	0.420	38.050	7.891	7.891	0.737	3.201
20	(0.01, 0.5, 1, 500)	1.554	1.554	0.886	2.227	2.199	0.533	0.927	1.930	1.930	0.813	1.461
21	(0.1, 0.5, 1, 500)	0.364	0.364	0.353	0.376	0.375	0.324	0.352	0.372	0.372	0.366	0.369
22	(0.001, 0.9, 1, 500)	3.783	3.783	0.690	3.057	3.059	0.299	27.334	6.995	6.995	0.521	6.195
23	(0.01, 0.9, 1, 500)	1.566	1.566	0.584	2.882	2.873	0.329	0.777	2.240	2.240	0.510	1.639
24	(0.1, 0.9, 1, 500)	0.343	0.343	0.325	0.367	0.367	0.282	0.323	0.353	0.353	0.341	0.363
25	(0.001, 0.5, 5, 500)	1.157	5.160	3.162	3.757	3.711	0.721	2.178	1.776	5.877	1.085	3.110
26	(0.01, 0.5, 5, 500)	0.880	2.150	1.679	3.078	3.093	0.722	1.288	1.222	2.327	0.990	2.148
27	(0.1, 0.5, 5, 500)	0.355	0.394	0.388	0.412	0.412	0.352	0.388	0.396	0.395	0.389	0.396
28	(0.001, 0.9, 5, 500)	0.636	3.747	2.184	2.215	2.270	0.422	1.245	0.982	4.123	0.631	4.753
29	(0.01, 0.9, 5, 100)	0.565	1.656	1.619	3.997	3.960	0.342	0.982	0.849	1.724	0.506	2.040
30	(0.1, 0.9, 5, 500)	0.311	0.365	0.355	0.388	0.392	0.292	0.352	0.360	0.360	0.344	0.379
31	(0.001, 0.5, 30, 500)	0.429	5.268	3.749	4.086	4.085	1.217	0.832	0.637	5.250	1.398	3.219
32	(0.01, 0.5, 30, 500)	0.386	3.240	2.930	3.467	3.502	1.093	0.733	0.569	3.215	1.239	2.798
33	(0.1, 0.5, 30, 500)	0.254	0.421	0.468	0.494	0.497	0.374	0.366	0.327	0.424	0.401	0.425
34	(0.001, 0.9, 30, 500)	0.209	3.152	2.270	1.912	1.924	0.660	0.435	0.317	3.122	0.752	4.388
35	(0.01, 0.9, 30, 500)	0.234	2.106	2.955	3.750	3.755	0.572	0.439	0.342	2.115	0.635	3.581
36	(0.1, 0.9, 30, 500)	0.193	0.376	0.500	0.540	0.544	0.296	0.325	0.277	0.372	0.329	0.379
37	(0.001, 0.5, 5, 100) - t12	1.142	4.699	3.399	3.976	3.799	0.744	2.261	1.645	5.177	1.107	3.194
38	(0.01, 0.5, 5, 100) - t12	0.772	1.557	1.366	2.233	2.889	0.659	1.213	1.000	1.619	0.878	1.625
39	(0.1, 0.5, 5, 100) - t12	0.285	0.306	0.303	0.321	0.396	0.281	0.326	0.304	0.306	0.302	0.306
40	(0.001, 0.9, 5, 100) - t12	1.142	4.699	3.399	3.976	3.799	0.744	2.261	1.647	5.180	1.106	19.338
41	(0.01, 0.9, 5, 100) - t12	0.772	1.557	1.366	2.233	2.889	0.659	1.213	1.002	1.615	0.881	1.386
42	(0.1, 0.9, 5, 100) - t12	0.285	0.306	0.303	0.321	0.396	0.281	0.326	0.304	0.306	0.302	0.309
43	(0.001, 0.5, 5, 100) - t1	2.092	5.308	3.897	4.368	4.371	1.728	4.323	2.549	5.762	1.942	1663.35
44	(0.01, 0.5, 5, 100) - t1	2.040	5.062	4.001	4.221	4.158	1.720	4.201	2.503	5.494	1.935	1426.27
45	(0.1, 0.5, 5, 100) - t1	1.713	3.846	3.624	3.411	3.922	1.581	3.181	2.020	4.093	1.747	1475.80
46	(0.001, 0.9, 5, 100) - t1	1.041	2.661	1.909	2.349	2.144	0.873	2.191	1.274	2.952	0.972	1578.10
47	(0.01, 0.9, 5, 100) - t1	1.039	3.013	2.026	2.499	2.301	0.872	2.177	1.286	3.282	0.972	1524.80
48	(0.1, 0.9, 5, 100) - t1	1.084	3.066	2.707	2.763	2.827	0.917	2.114	1.332	3.214	1.070	1429.50

Notes: True beta=1. Results are based on 5000 replications for T=100 and 1000 replications for T=500. 500 bootstrap replications are used to compute the bootstrap bias-corrected estimators. Rows 37-48 are based on the design with non-normally generated random variables. t-12 and t-1 correspond to disturbances generated multivariate t with 12 and 1 degrees of freedom, respectively. See text for details.

Table 4. Coverage Rate on a 95% Confidence Interval

Model	(R2f, σ_{ue}, n, T)	TSLS	LIML	B2SLS	JIVE1	JIVE2	FULLER	J2SLS	BCTSLS	BCLIML	BCFULL	REQML
1	(0.001, 0.5, 1, 100)	0.983	0.983	0.975	0.816	0.816	0.926	0.987	0.979	0.979	0.252	0.950
2	(0.01, 0.5, 1, 100)	0.976	0.976	0.966	0.855	0.855	0.920	0.983	0.986	0.986	0.406	0.947
3	(0.1, 0.5, 1, 100)	0.959	0.959	0.952	0.967	0.966	0.925	0.957	0.973	0.973	0.818	0.959
4	(0.001, 0.9, 1, 100)	0.751	0.751	0.263	0.511	0.510	0.000	0.679	0.967	0.967	0.000	0.907
5	(0.01, 0.9, 1, 100)	0.838	0.838	0.572	0.672	0.673	0.016	0.691	0.965	0.965	0.021	0.854
6	(0.1, 0.9, 1, 100)	0.924	0.924	0.892	0.946	0.946	0.739	0.897	0.949	0.949	0.665	0.939
7	(0.001, 0.5, 5, 100)	0.814	0.908	0.626	0.923	0.923	0.751	0.760	0.545	0.993	0.541	0.933
8	(0.01, 0.5, 5, 100)	0.822	0.904	0.688	0.935	0.935	0.784	0.780	0.600	0.993	0.601	0.923
9	(0.1, 0.5, 5, 100)	0.892	0.936	0.922	0.961	0.961	0.896	0.902	0.840	0.967	0.825	0.954
10	(0.001, 0.9, 5, 100)	0.120	0.535	0.255	0.562	0.560	0.001	0.227	0.088	0.951	0.003	0.875
11	(0.01, 0.9, 5, 100)	0.225	0.720	0.386	0.641	0.642	0.032	0.377	0.196	0.941	0.044	0.837
12	(0.1, 0.9, 5, 100)	0.705	0.912	0.848	0.921	0.920	0.747	0.820	0.704	0.923	0.684	0.929
13	(0.001, 0.5, 30, 100)	0.143	0.682	0.351	0.944	0.940	0.555	0.288	0.107	0.480	0.456	0.902
14	(0.01, 0.5, 30, 100)	0.155	0.696	0.376	0.944	0.942	0.577	0.305	0.115	0.492	0.473	0.900
15	(0.1, 0.5, 30, 100)	0.266	0.789	0.638	0.951	0.951	0.728	0.479	0.240	0.614	0.590	0.909
16	(0.001, 0.9, 30, 100)	0.000	0.383	0.146	0.587	0.585	0.021	0.004	0.000	0.318	0.005	0.875
17	(0.01, 0.9, 30, 100)	0.000	0.466	0.178	0.599	0.599	0.050	0.006	0.000	0.323	0.007	0.845
18	(0.1, 0.9, 30, 100)	0.000	0.842	0.539	0.790	0.787	0.619	0.096	0.001	0.563	0.341	0.897
19	(0.001, 0.5, 1, 500)	0.984	0.984	0.971	0.833	0.832	0.933	0.987	0.993	0.993	0.282	0.952
20	(0.01, 0.5, 1, 500)	0.954	0.954	0.949	0.941	0.940	0.910	0.961	0.988	0.988	0.698	0.954
21	(0.1, 0.5, 1, 500)	0.955	0.955	0.952	0.956	0.956	0.941	0.954	0.959	0.959	0.922	0.953
22	(0.001, 0.9, 1, 500)	0.811	0.811	0.423	0.578	0.578	0.000	0.670	0.960	0.960	0.000	0.868
23	(0.01, 0.9, 1, 500)	0.917	0.917	0.856	0.891	0.890	0.395	0.868	0.958	0.958	0.452	0.904
24	(0.1, 0.9, 1, 500)	0.945	0.945	0.943	0.952	0.953	0.909	0.943	0.952	0.952	0.891	0.943
25	(0.001, 0.5, 5, 500)	0.801	0.894	0.638	0.918	0.918	0.743	0.746	0.552	0.997	0.543	0.925
26	(0.01, 0.5, 5, 500)	0.842	0.896	0.818	0.947	0.948	0.831	0.826	0.733	0.978	0.716	0.929
27	(0.1, 0.5, 5, 500)	0.921	0.937	0.922	0.950	0.949	0.923	0.917	0.901	0.942	0.895	0.955
28	(0.001, 0.9, 5, 500)	0.162	0.608	0.301	0.580	0.580	0.004	0.280	0.141	0.965	0.011	0.879
29	(0.01, 0.9, 5, 100)	0.486	0.897	0.685	0.827	0.825	0.415	0.645	0.497	0.933	0.389	0.871
30	(0.1, 0.9, 5, 500)	0.878	0.949	0.937	0.951	0.951	0.894	0.932	0.897	0.950	0.876	0.945
31	(0.001, 0.5, 30, 500)	0.154	0.723	0.404	0.945	0.946	0.571	0.303	0.132	0.446	0.432	0.918
32	(0.01, 0.5, 30, 500)	0.203	0.770	0.577	0.950	0.949	0.677	0.383	0.195	0.532	0.548	0.912
33	(0.1, 0.5, 30, 500)	0.597	0.925	0.881	0.964	0.962	0.911	0.810	0.686	0.881	0.850	0.971
34	(0.001, 0.9, 30, 500)	0.000	0.465	0.182	0.604	0.606	0.035	0.003	0.000	0.273	0.005	0.866
35	(0.01, 0.9, 30, 500)	0.000	0.783	0.422	0.732	0.733	0.370	0.025	0.000	0.493	0.124	0.855
36	(0.1, 0.9, 30, 500)	0.066	0.945	0.858	0.940	0.939	0.885	0.685	0.292	0.894	0.833	0.943
37	(0.001, 0.5, 5, 100) - t12	0.807	0.892	0.650	0.962	0.943	0.755	0.758	0.567	0.990	0.550	0.918
38	(0.01, 0.5, 5, 100) - t12	0.860	0.917	0.866	0.959	0.960	0.855	0.847	0.752	0.979	0.738	0.930
39	(0.1, 0.5, 5, 100) - t12	0.935	0.946	0.942	0.952	0.962	0.938	0.918	0.906	0.944	0.897	0.956
40	(0.001, 0.9, 5, 100) - t12	0.807	0.892	0.650	0.962	0.943	0.755	0.758	0.565	0.991	0.552	0.841
41	(0.01, 0.9, 5, 100) - t12	0.860	0.917	0.866	0.959	0.960	0.855	0.847	0.753	0.978	0.736	0.917
42	(0.1, 0.9, 5, 100) - t12	0.935	0.946	0.942	0.952	0.962	0.938	0.918	0.903	0.940	0.894	0.955
43	(0.001, 0.5, 5, 100) - t1	0.625	0.771	0.274	0.961	0.941	0.465	0.646	0.553	0.996	0.544	0.356
44	(0.01, 0.5, 5, 100) - t1	0.629	0.777	0.290	0.963	0.943	0.470	0.645	0.561	0.995	0.549	0.359
45	(0.1, 0.5, 5, 100) - t1	0.657	0.820	0.426	0.962	0.945	0.513	0.659	0.601	0.987	0.613	0.382
46	(0.001, 0.9, 5, 100) - t1	0.232	0.515	0.161	0.791	0.723	0.093	0.353	0.190	0.971	0.151	0.357
47	(0.01, 0.9, 5, 100) - t1	0.249	0.569	0.179	0.802	0.732	0.098	0.363	0.203	0.974	0.160	0.366
48	(0.1, 0.9, 5, 100) - t1	0.364	0.742	0.334	0.851	0.784	0.177	0.461	0.327	0.974	0.252	0.351

Notes: The confidence intervals are computed using the asymptotic distribution of the estimators, that is, the estimate plus or minus 1.96 times the asymptotic standard error. For the bootstrap bias-corrected estimators (BCTSLS, BCLIML, and BCFULL), the confidence intervals are constructed using the bootstrap estimate of the standard error. For the REQML confidence interval, we follow Chamberlain and Imbens (2004) and find upper and lower values such that the concentrated log-likelihood function differs from its maximum value by G-1(.95)/2 where G is a chi-squared distribution with one degree of freedom. Results are based on 5000 replications for T=100 and 1000 replications for T=500. 500 bootstrap replications are used to compute the bootstrap bias-corrected estimators. Rows 37-48 are based on the design with non-normally generated random variables. t-12 and t-1 correspond to disturbances generated multivariate t with 12 and 1 degrees of freedom, respectively. See text for details.

Appendix Figures

Empirical Density of Selected Estimators for Model 1

Legend:
- × liml
- □ j2sls
- ······ fuller
- - - - bctsls
- -·-·- bcliml
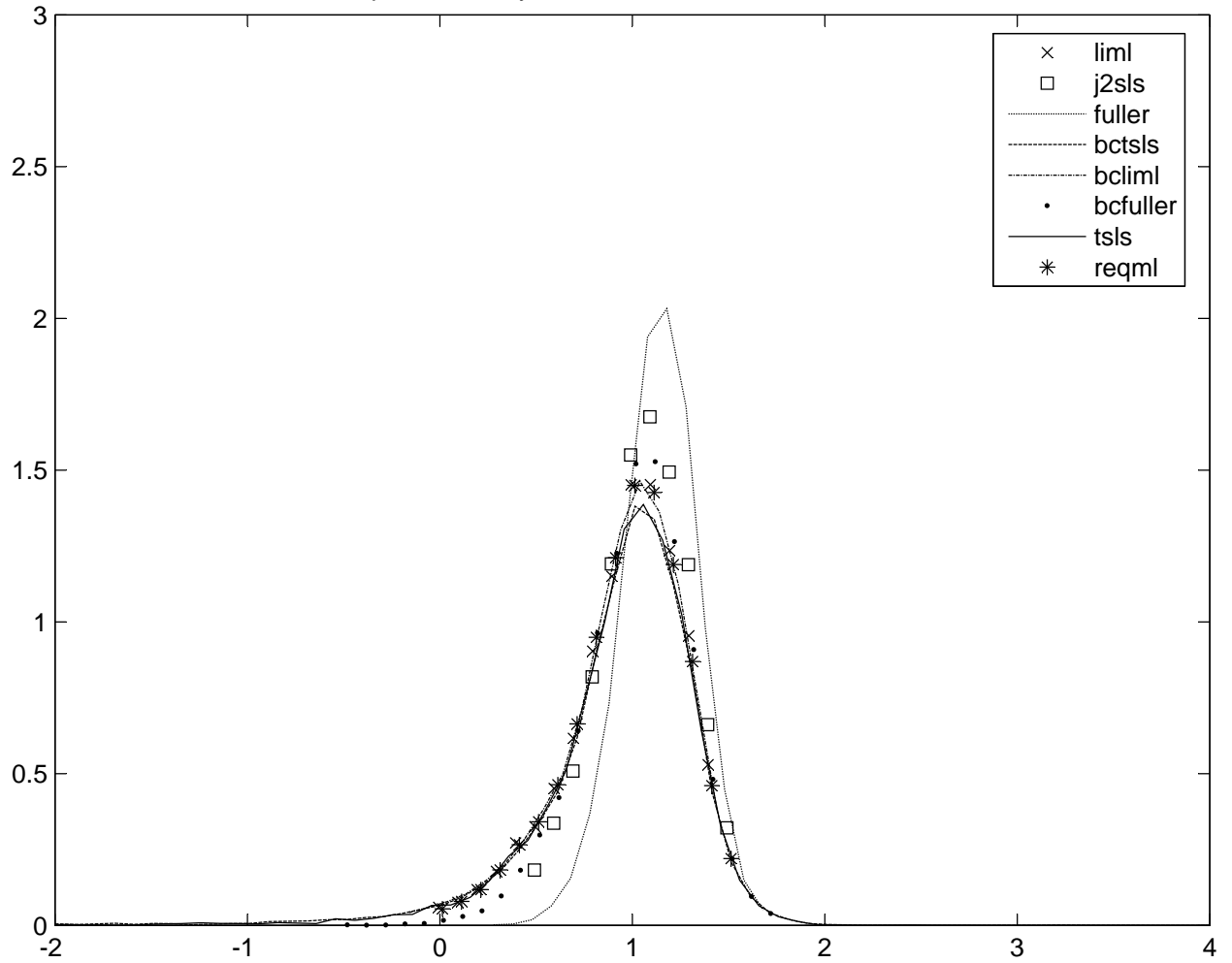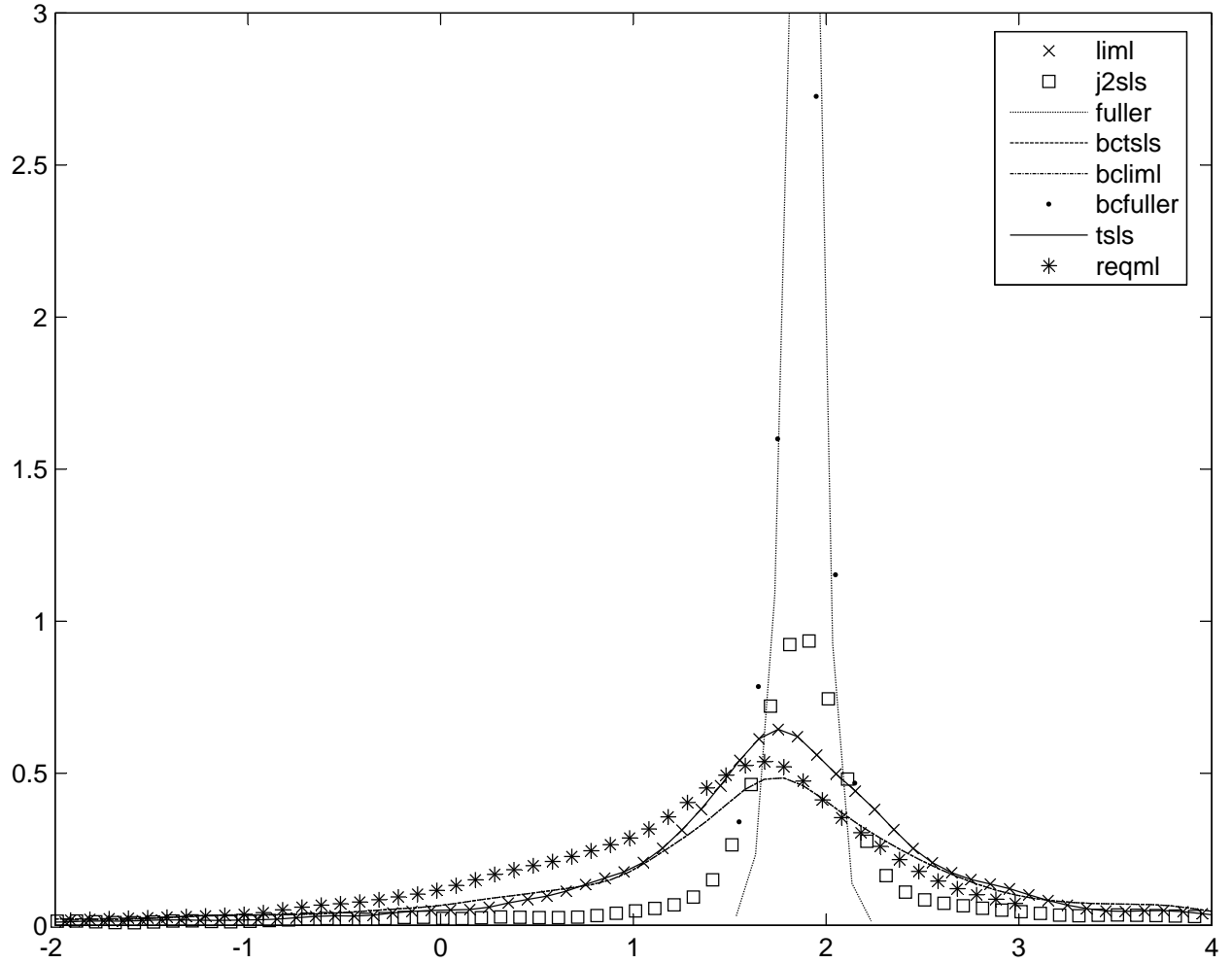- · bcfuller
- —— tsls
- ∗ reqml

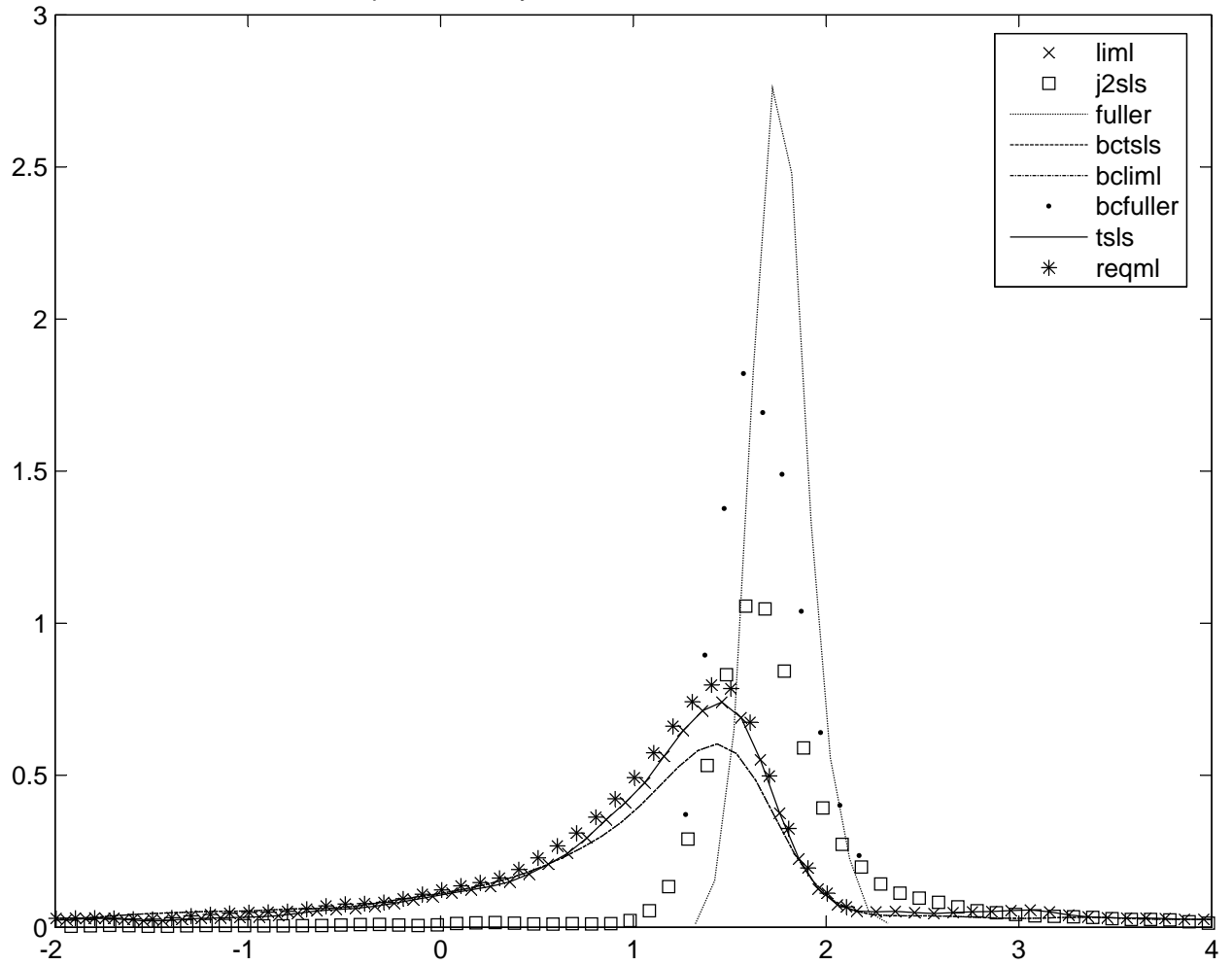Empirical Density of Selected Estimators for Model 2

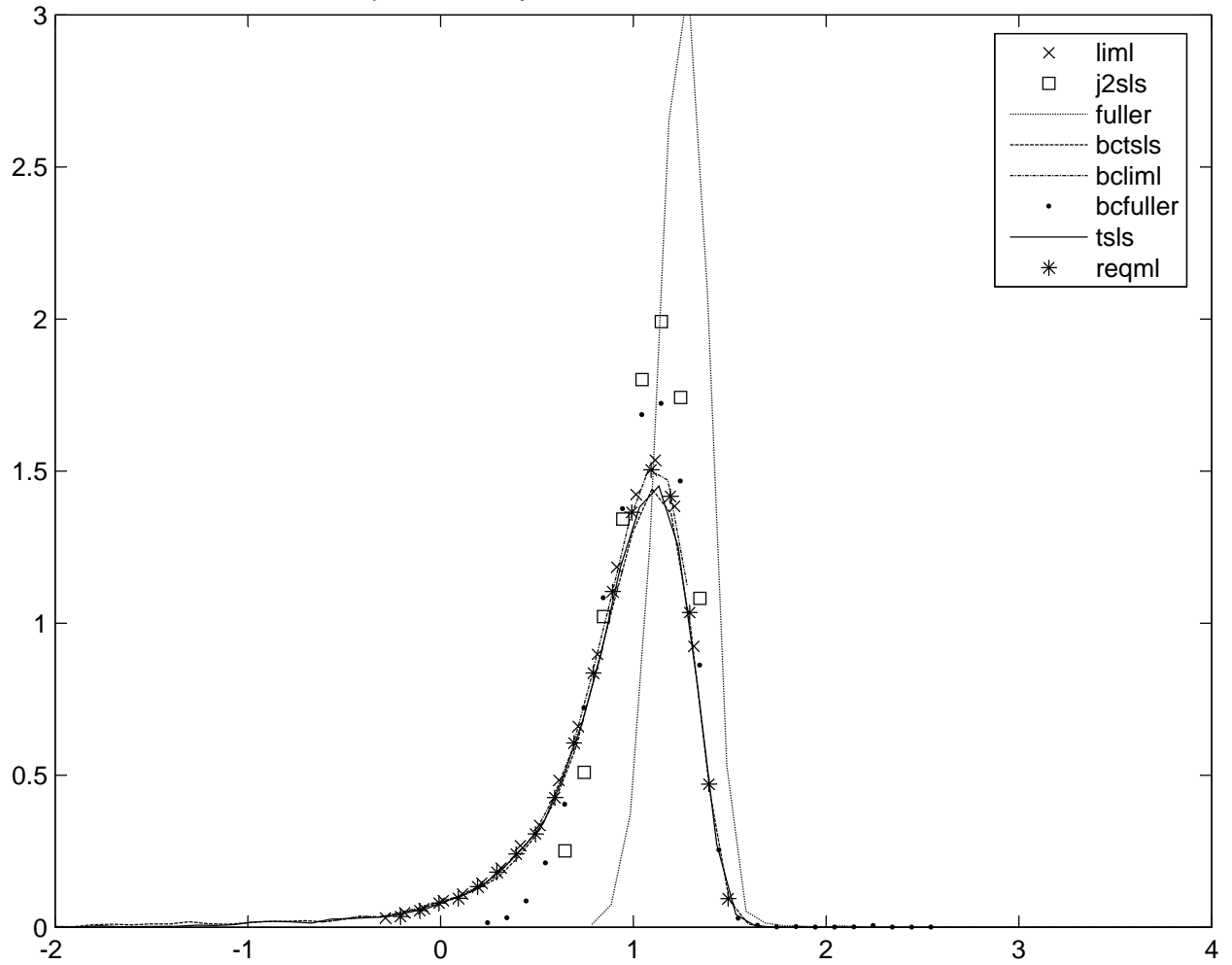Empirical Density of Selected Estimators for Model 3

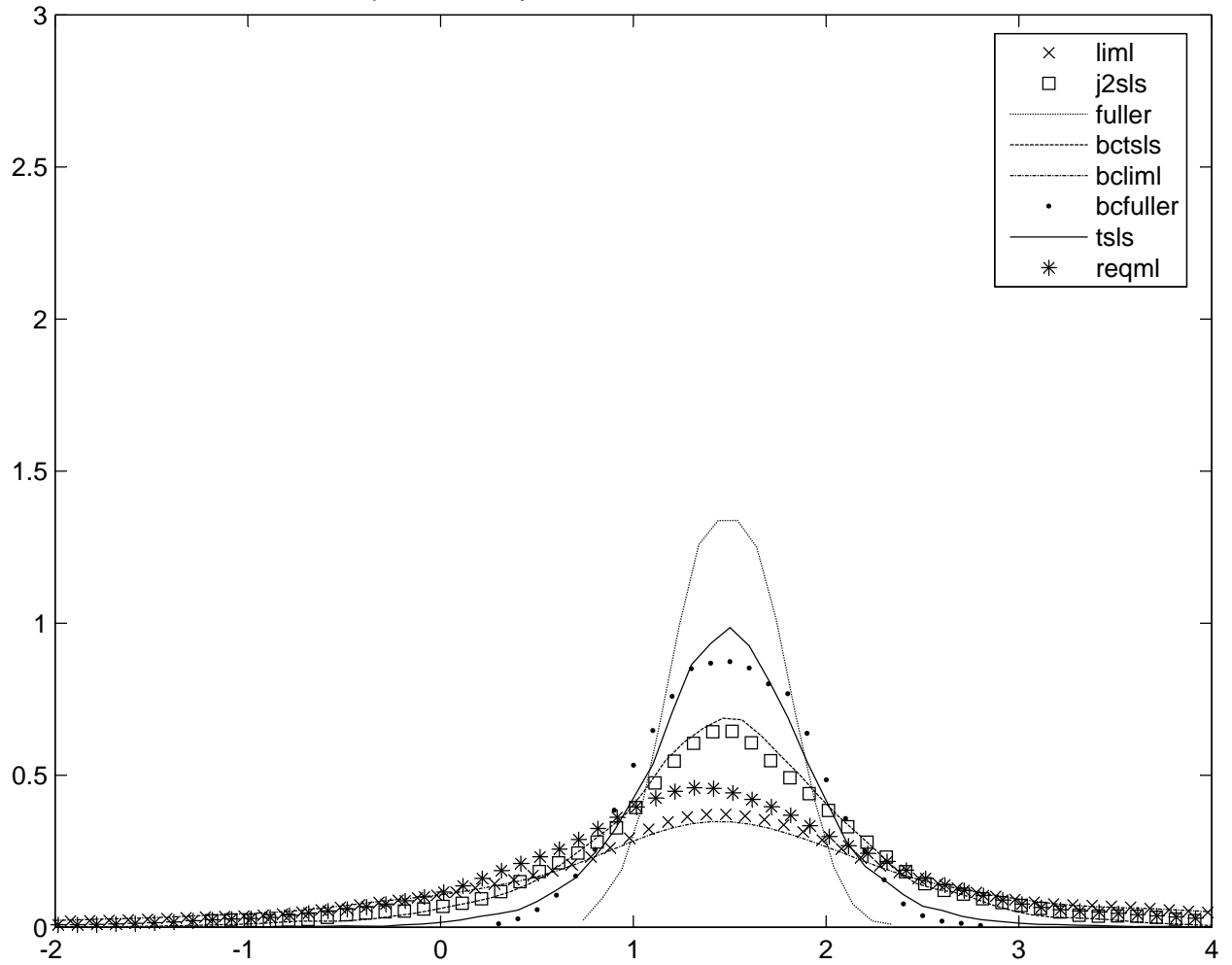Empirical Density of Selected Estimators for Model 4

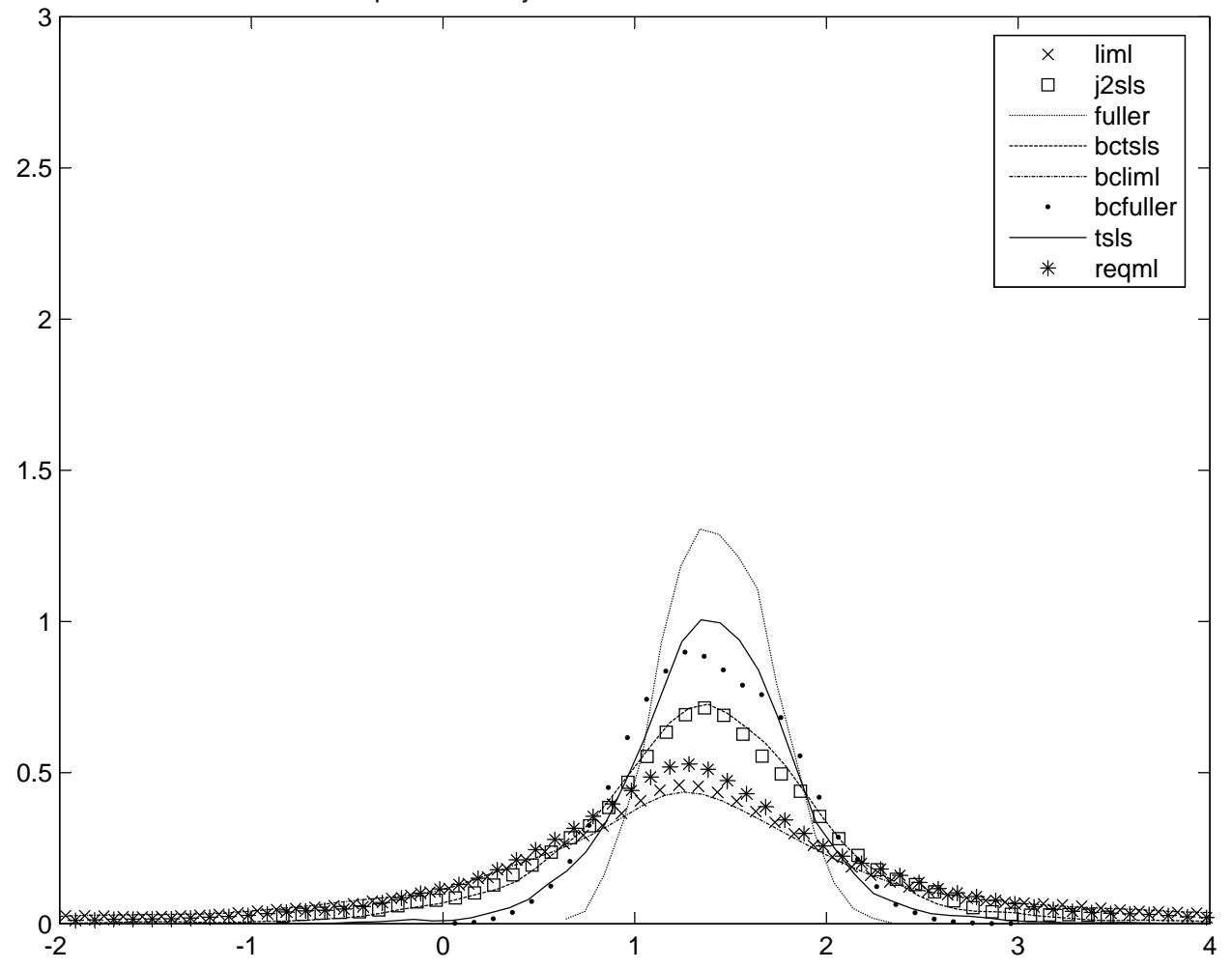Empirical Density of Selected Estimators for Model 5
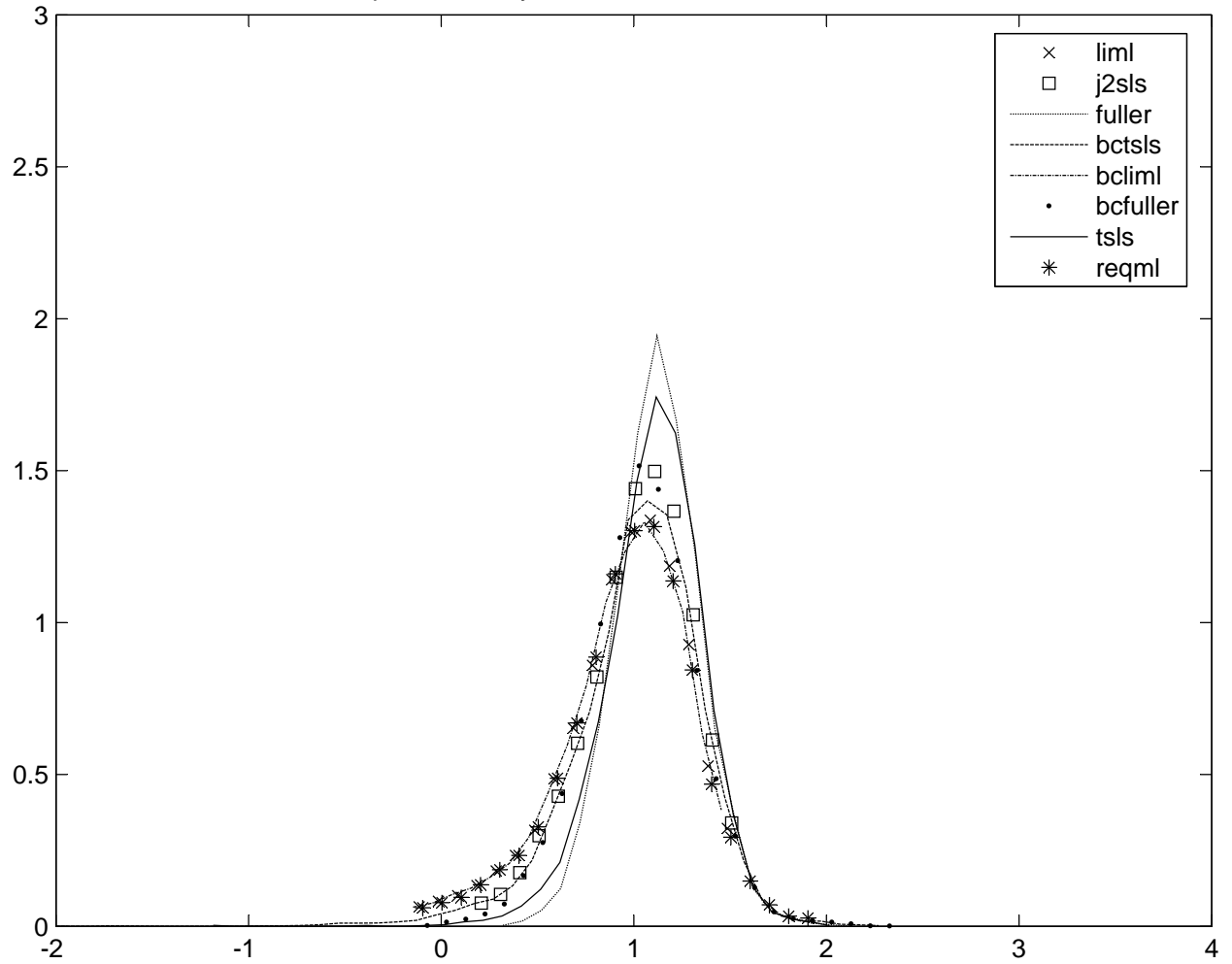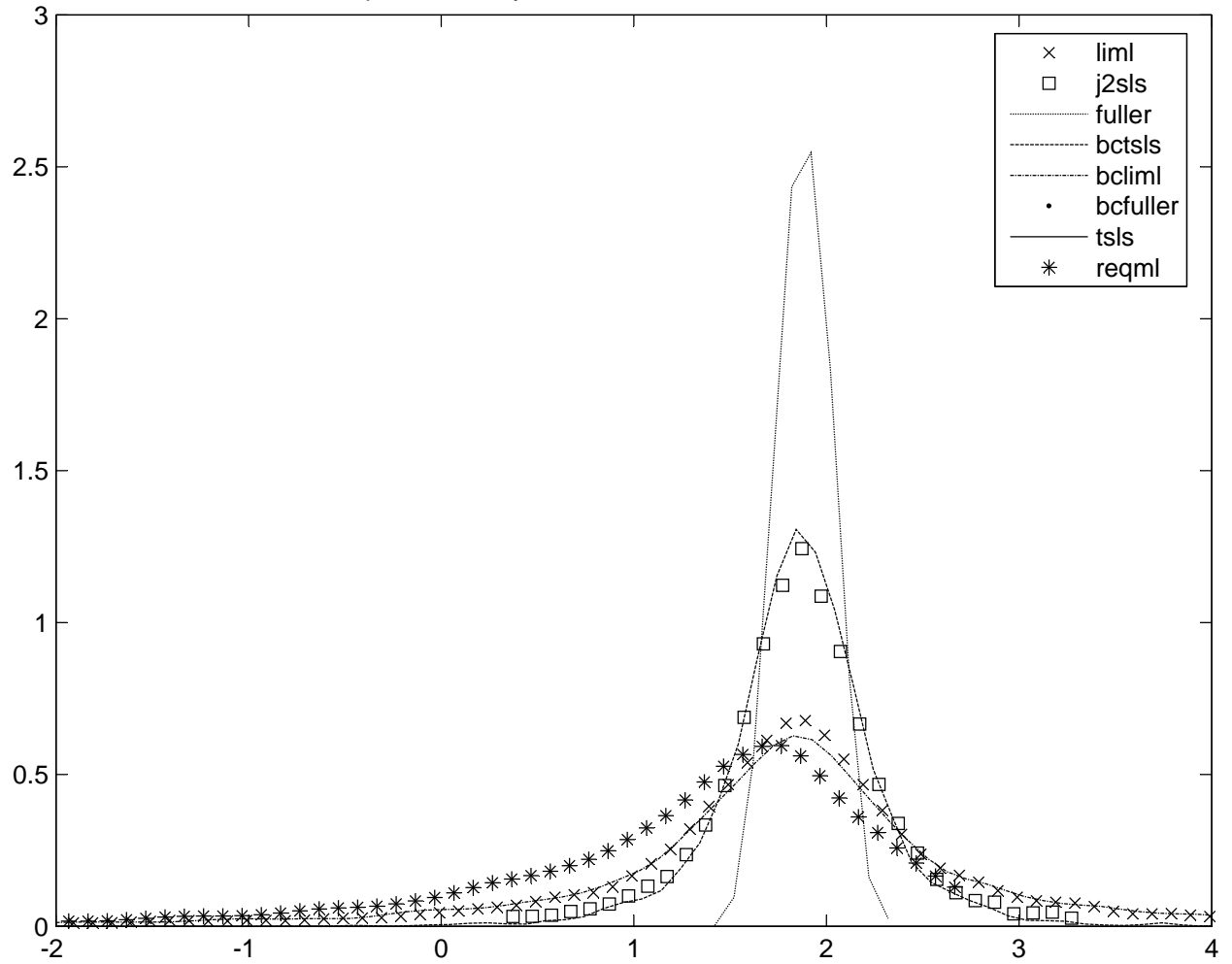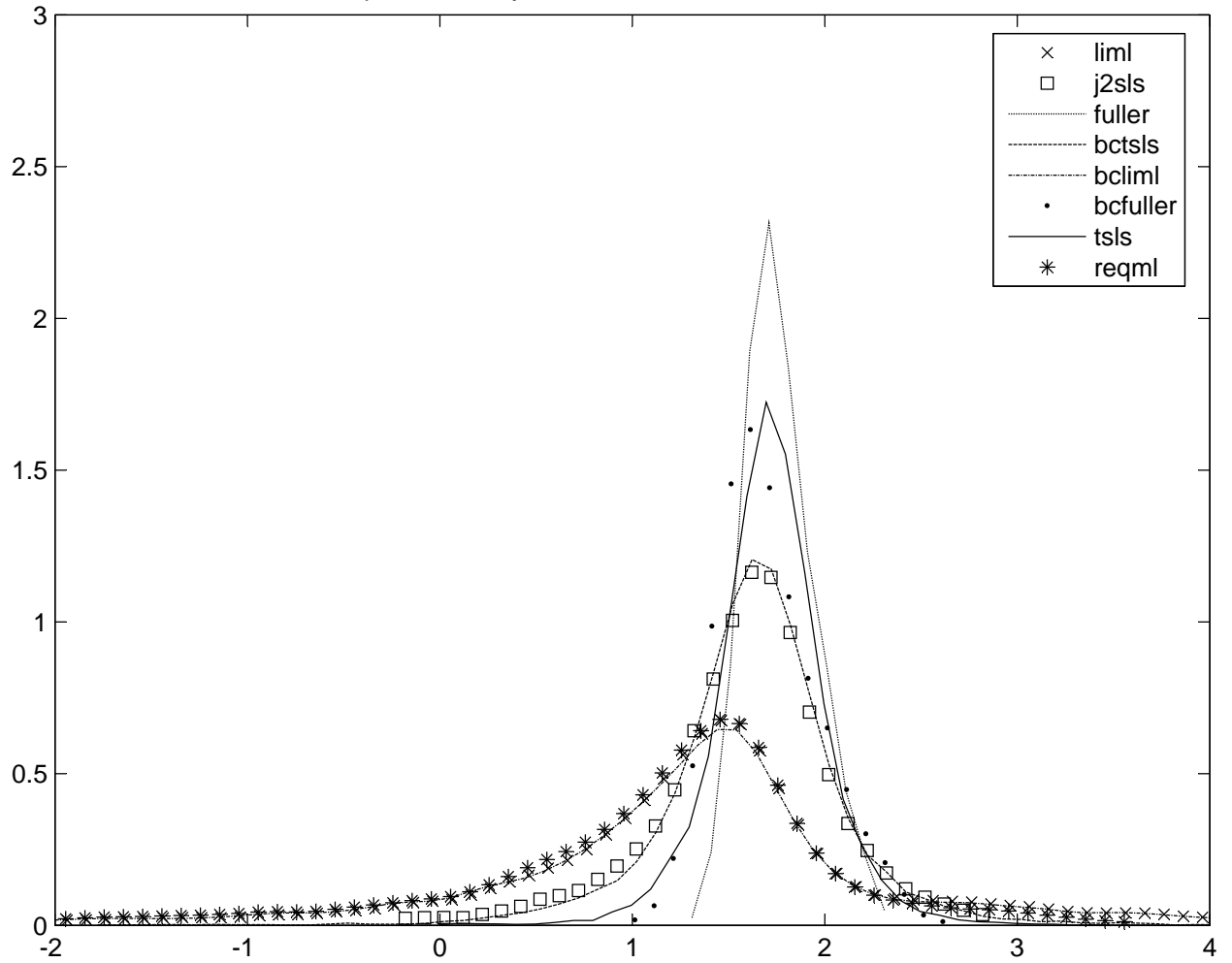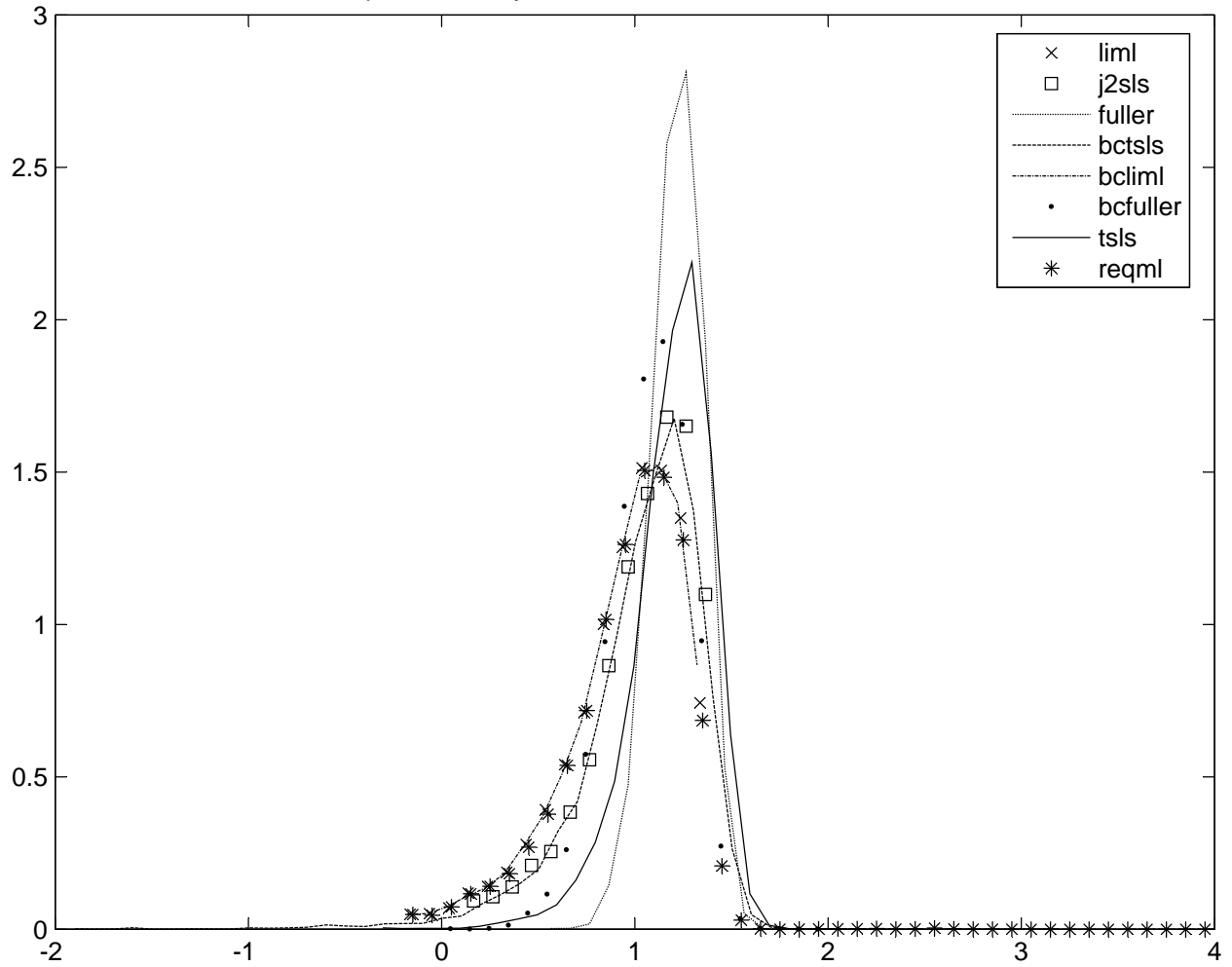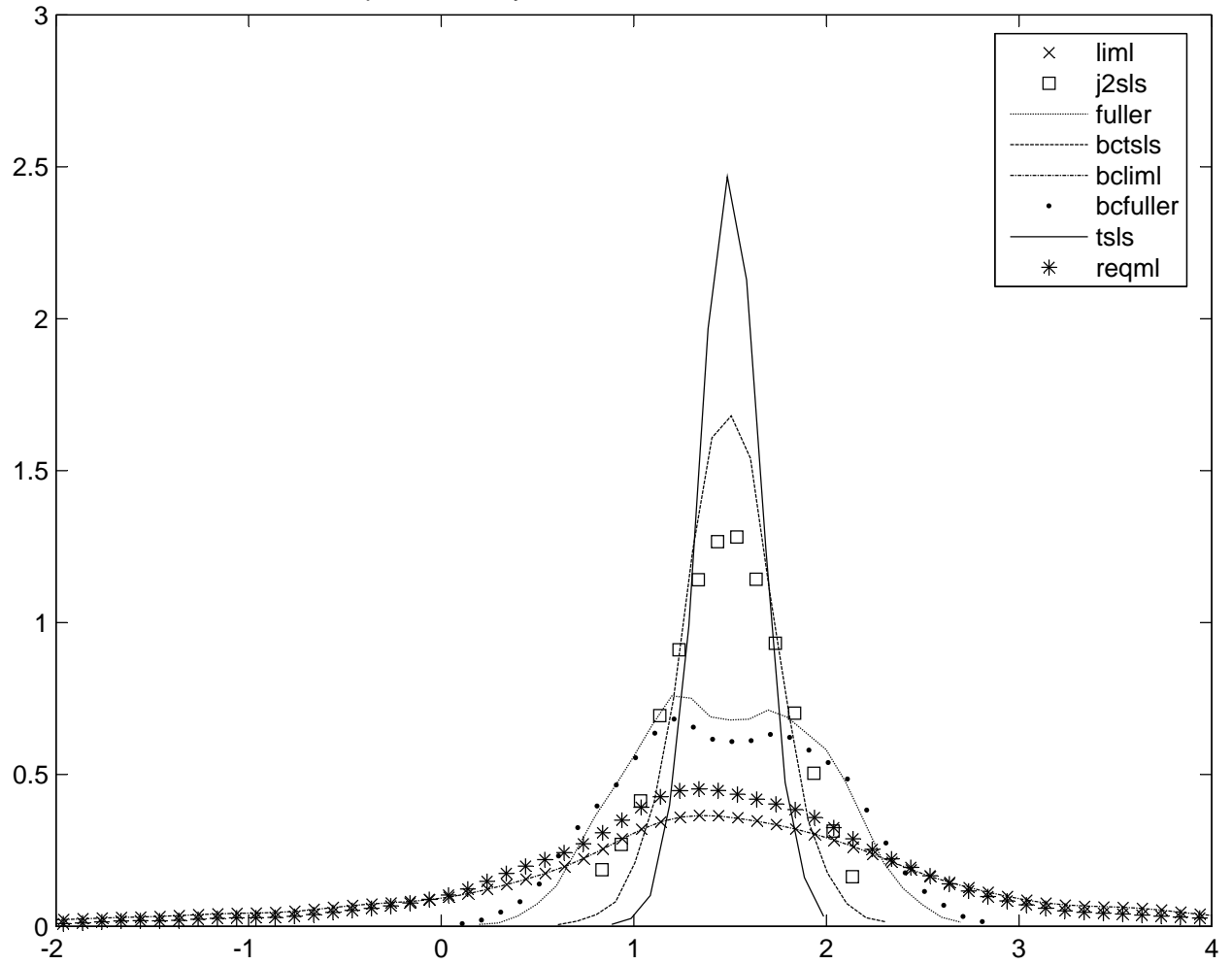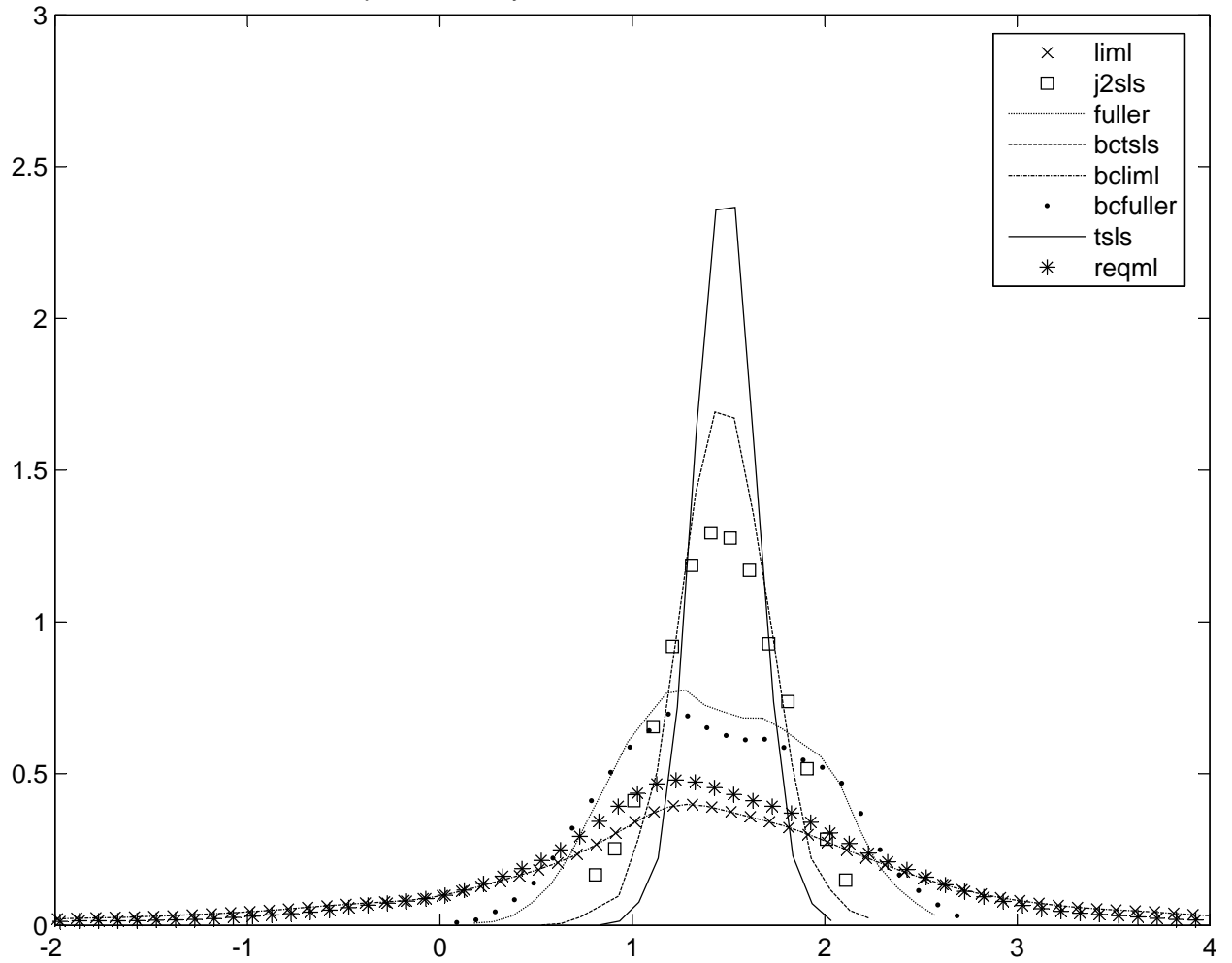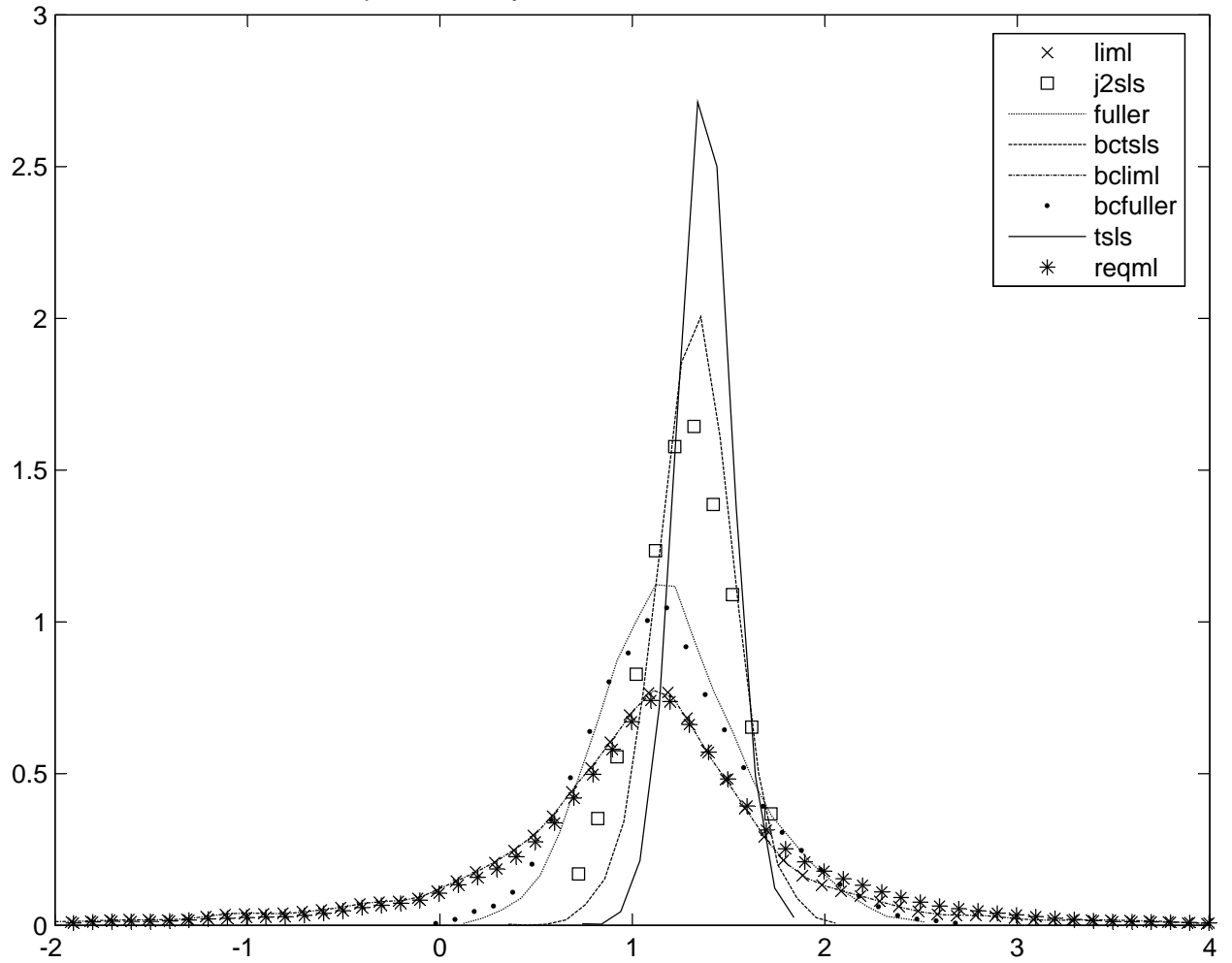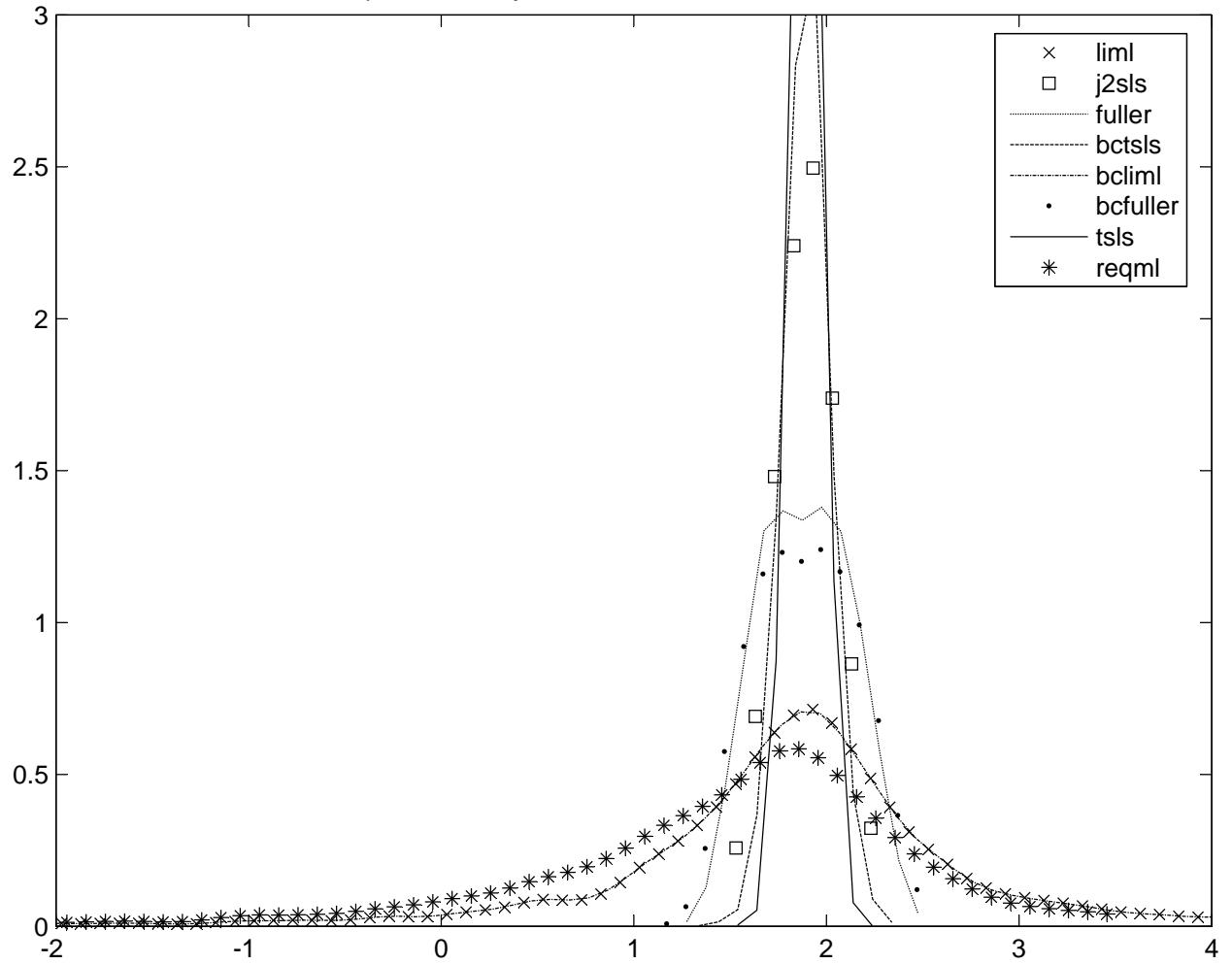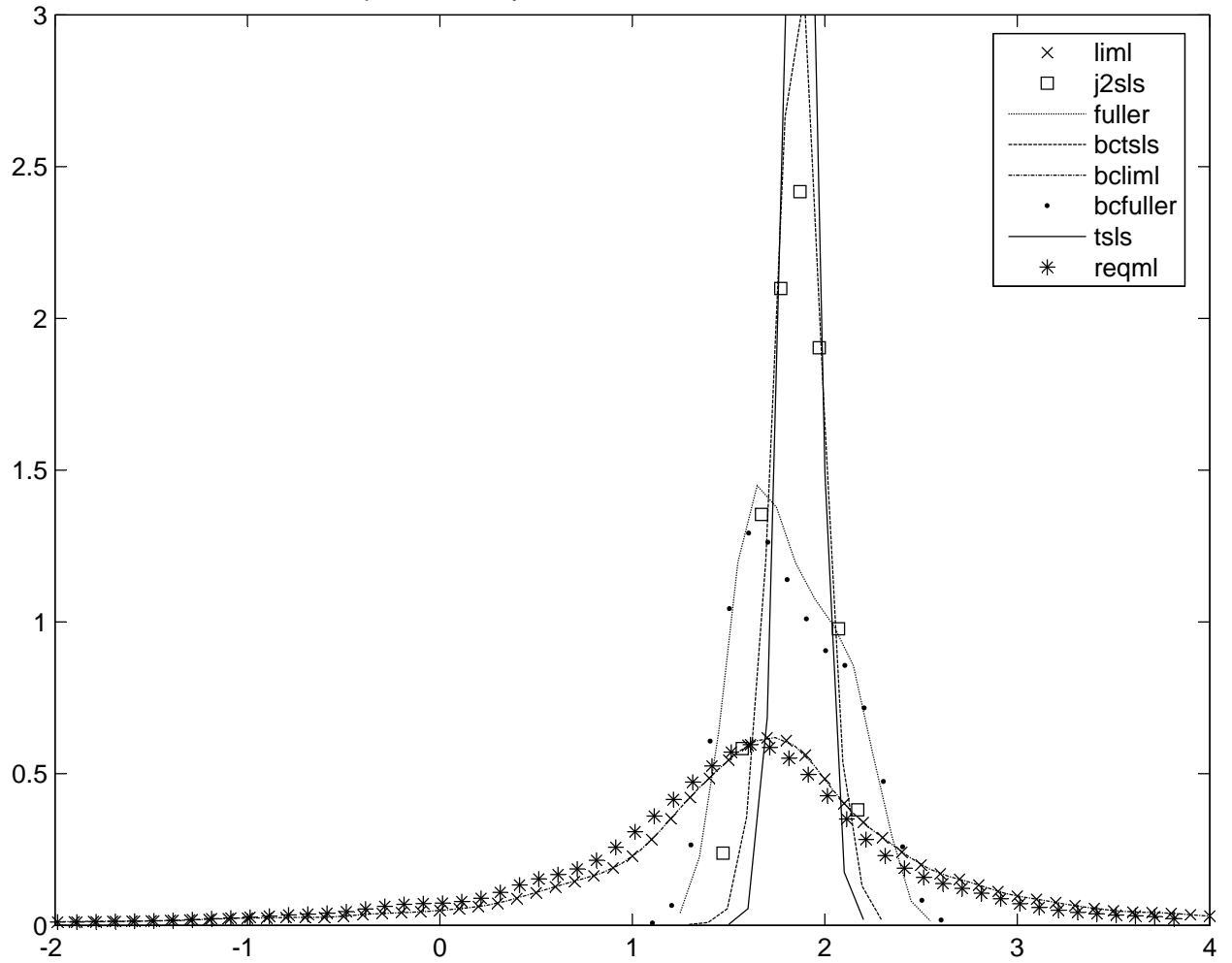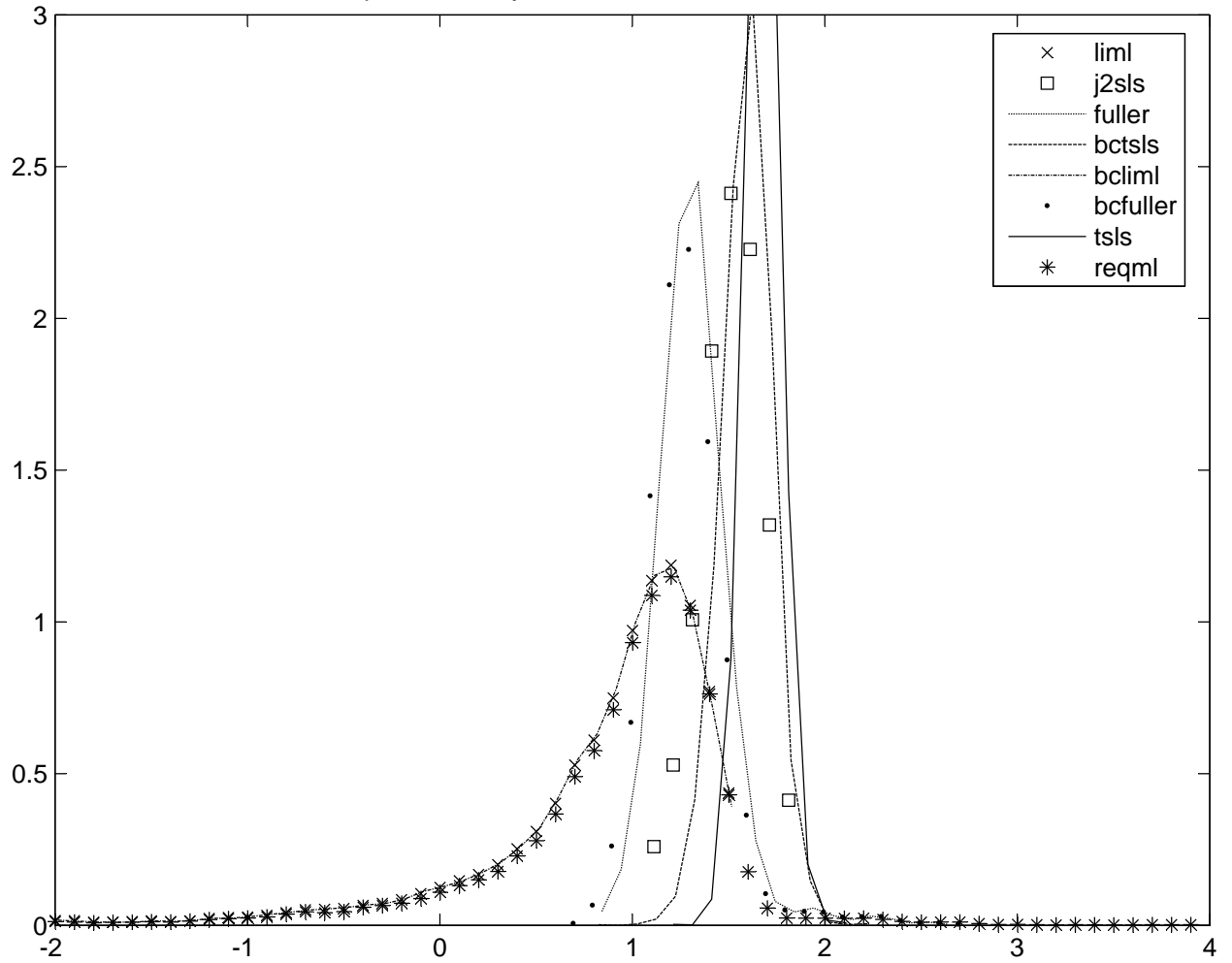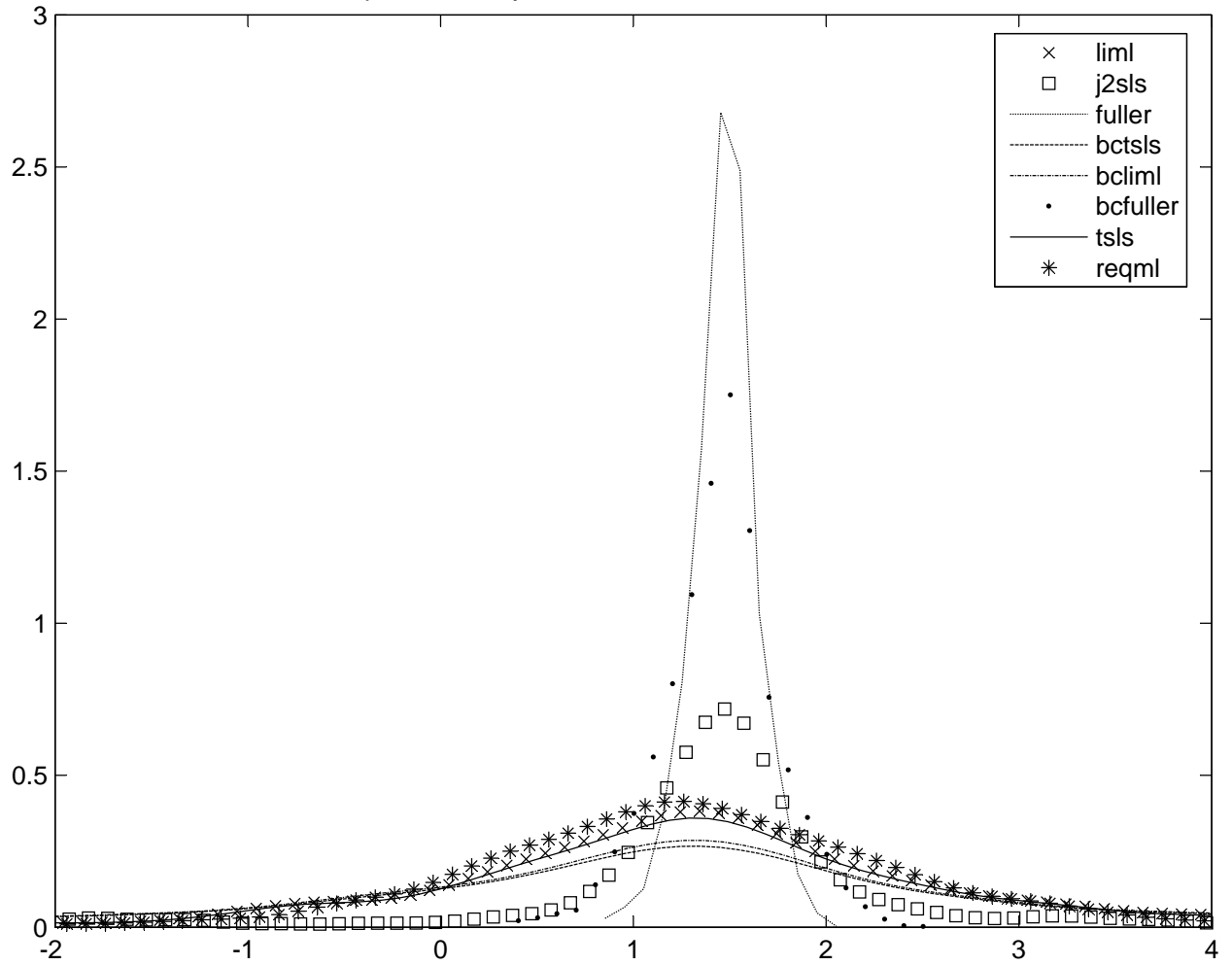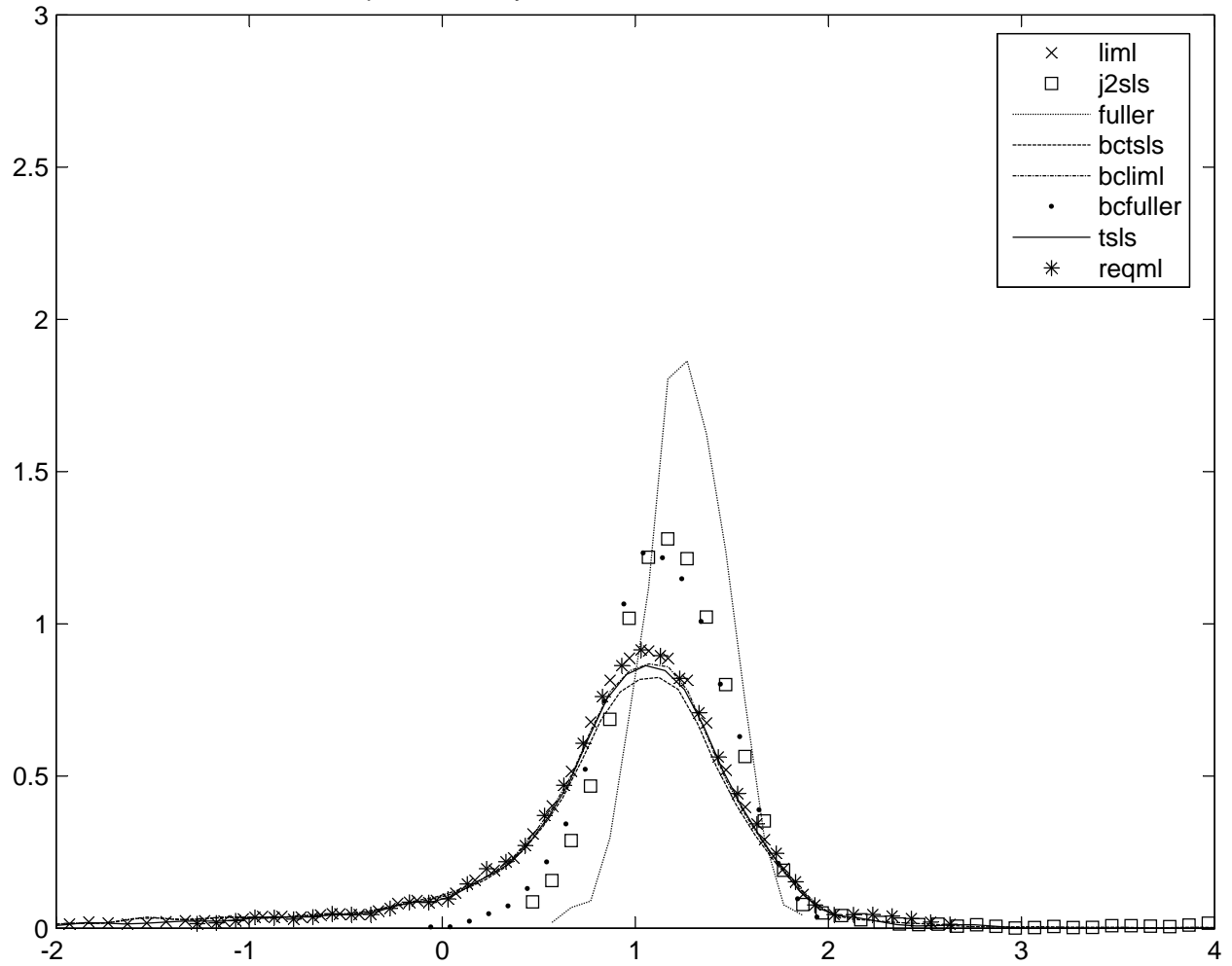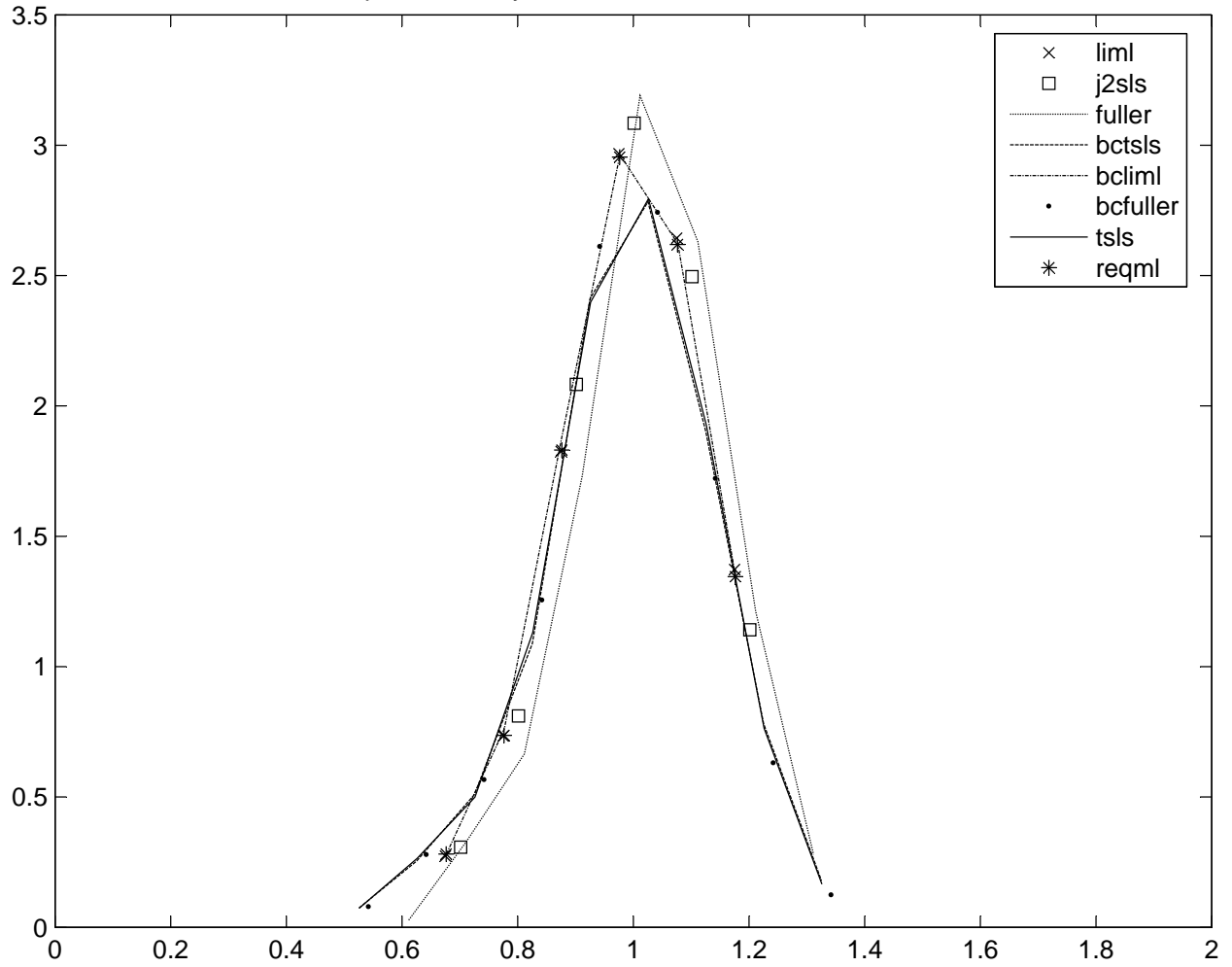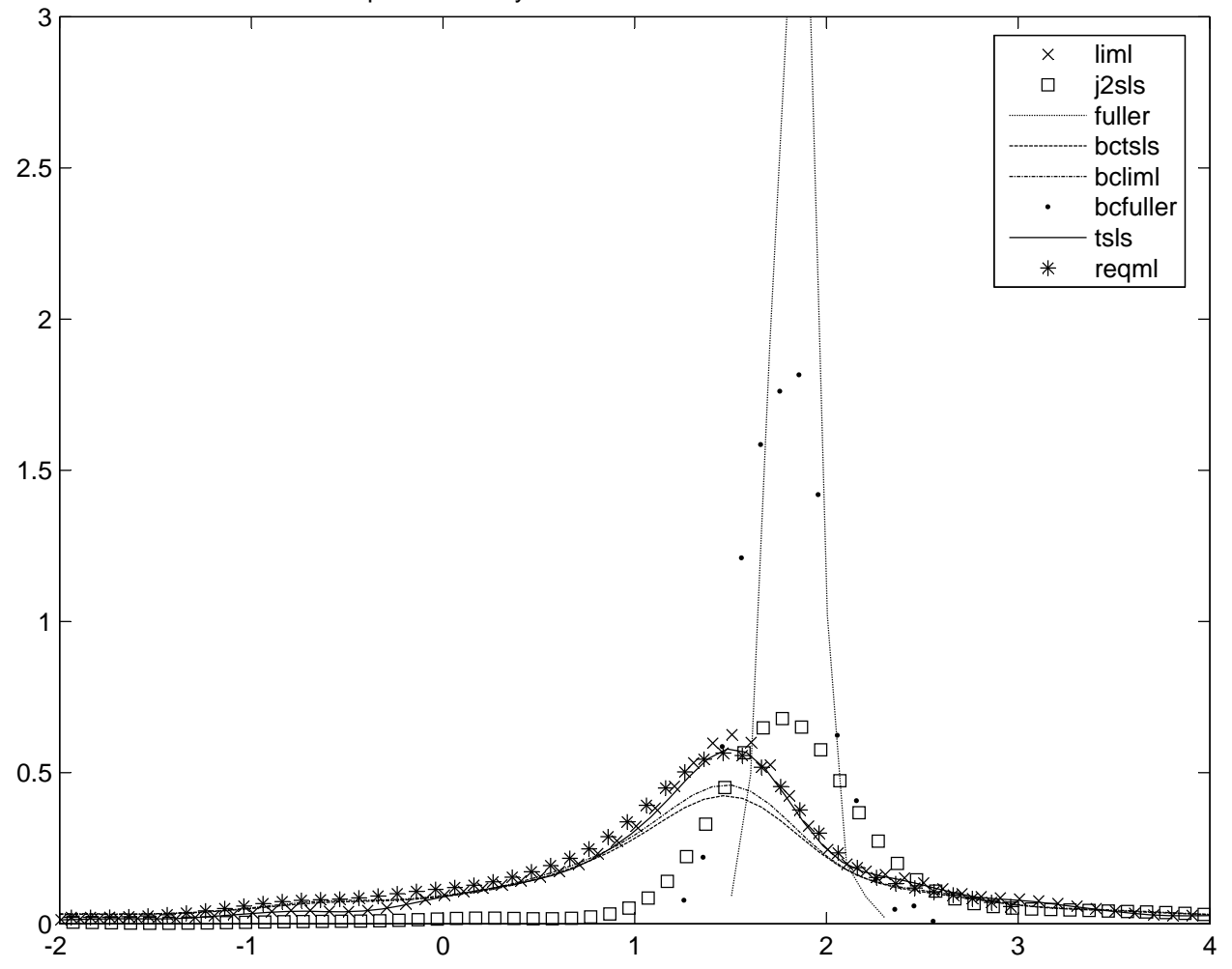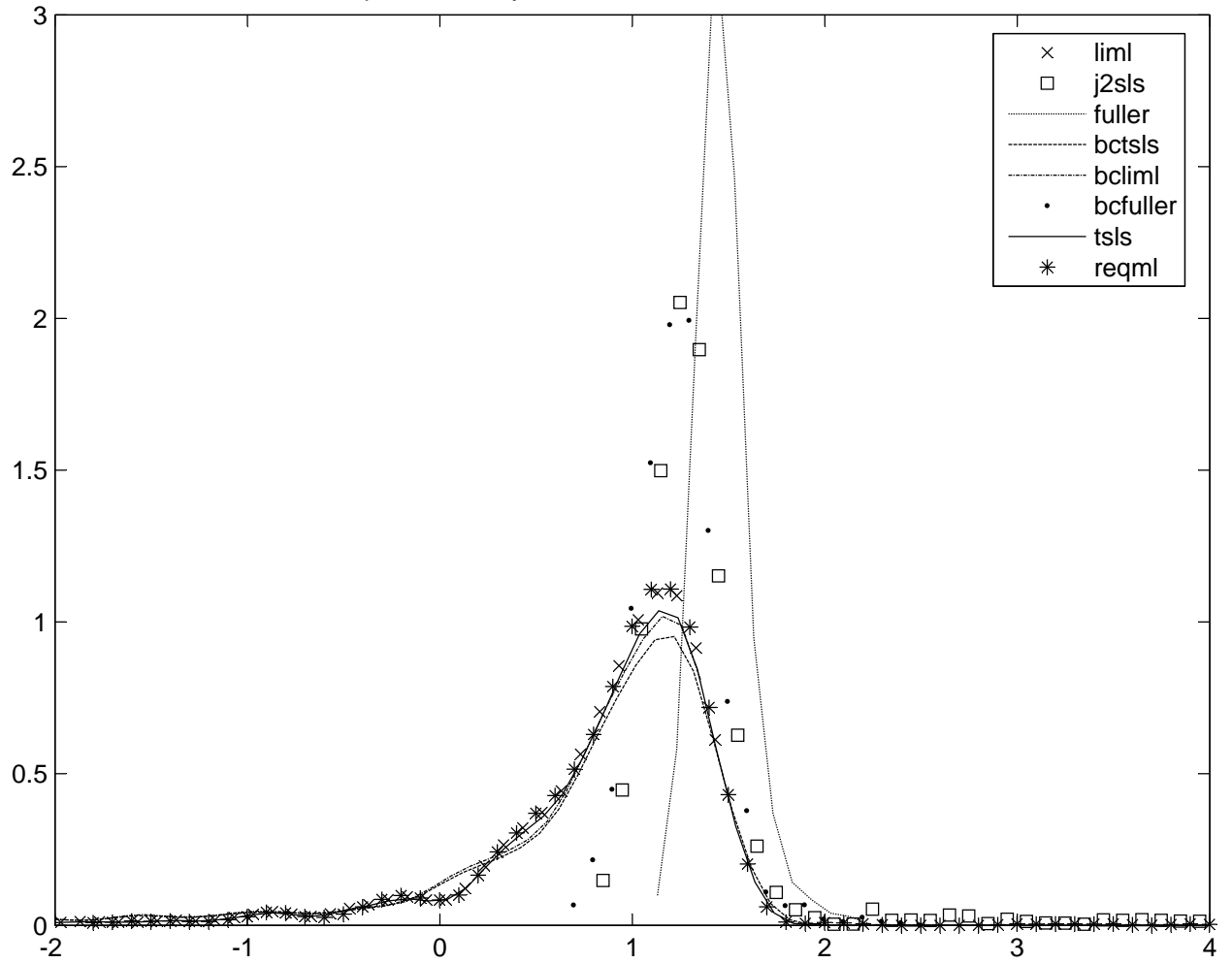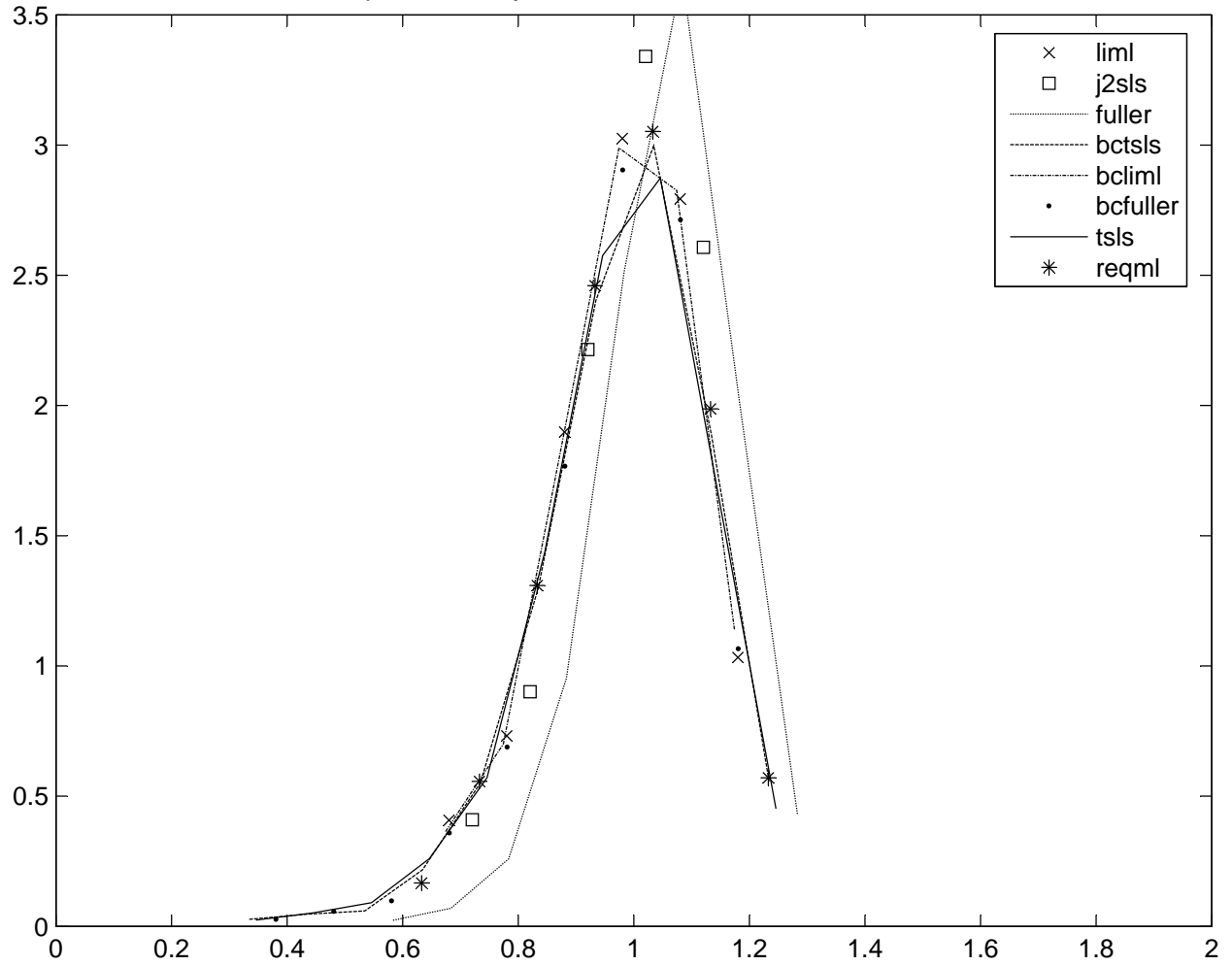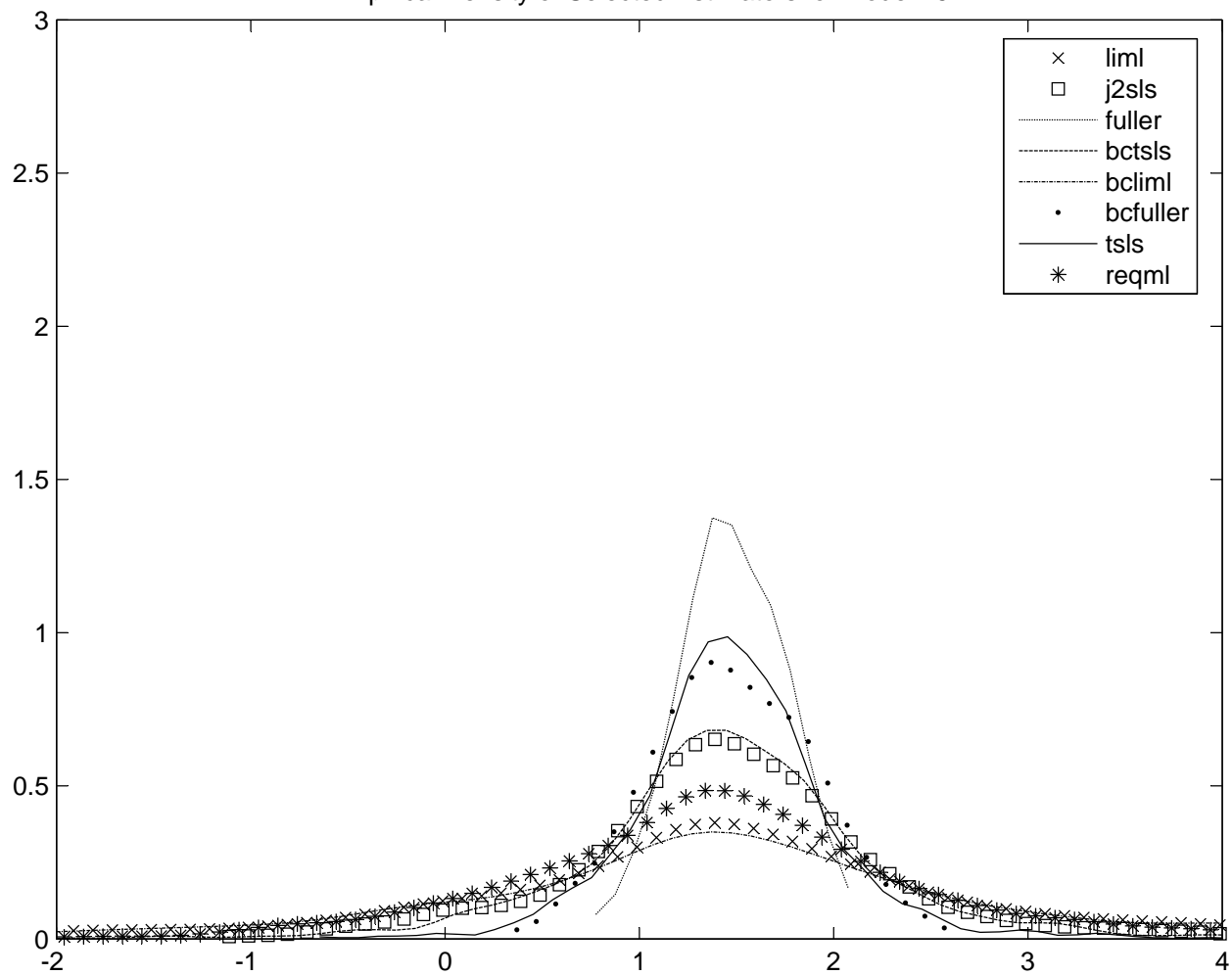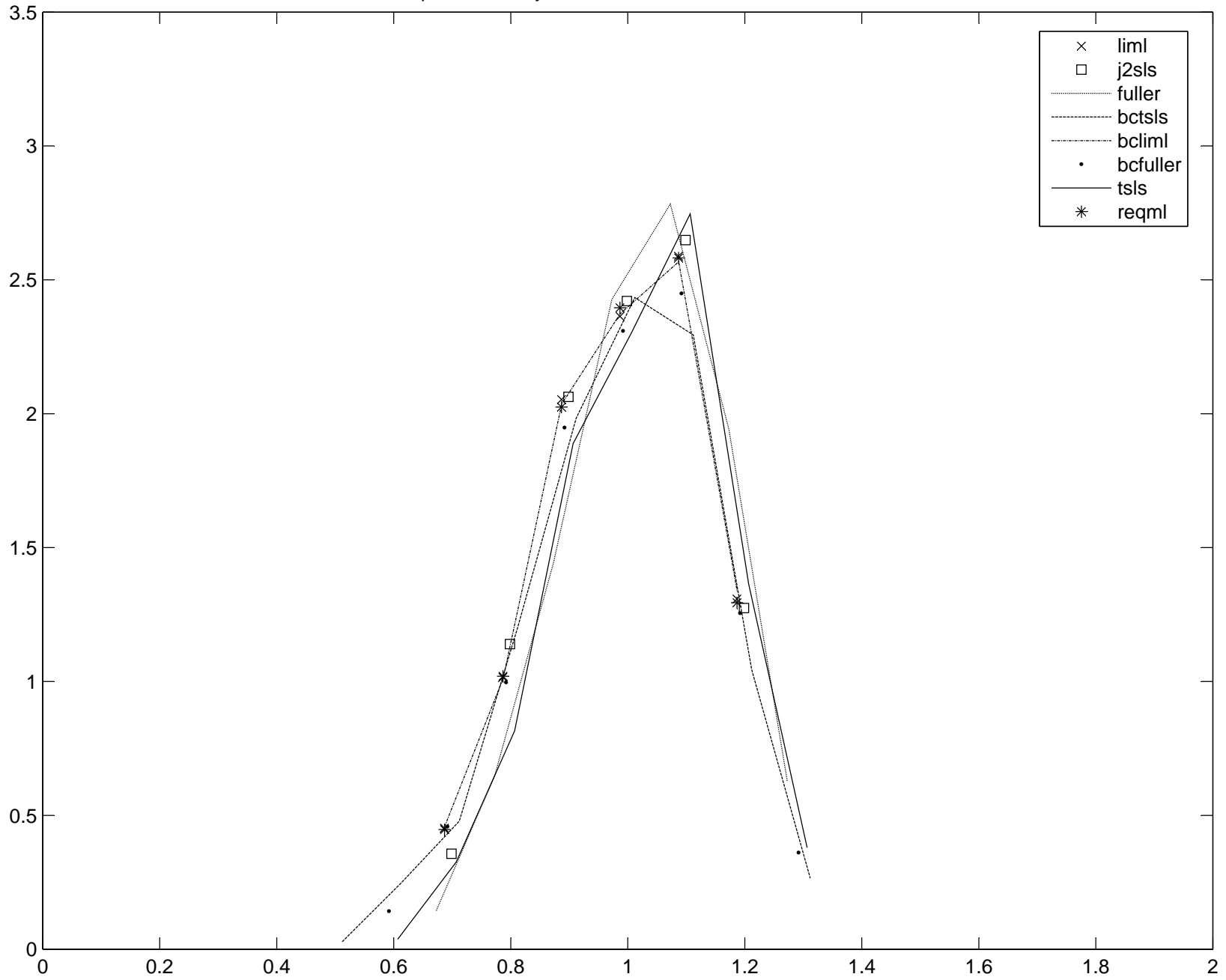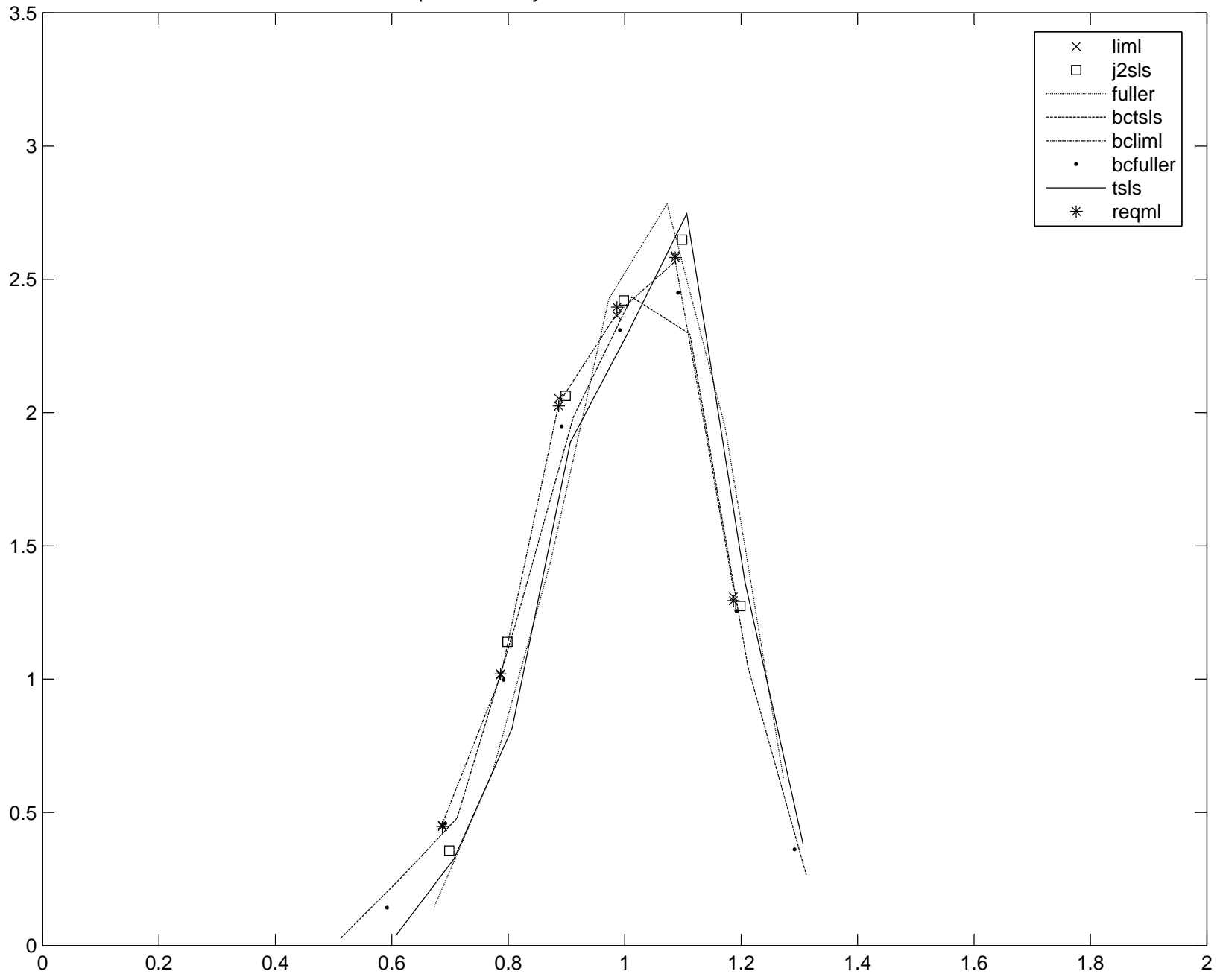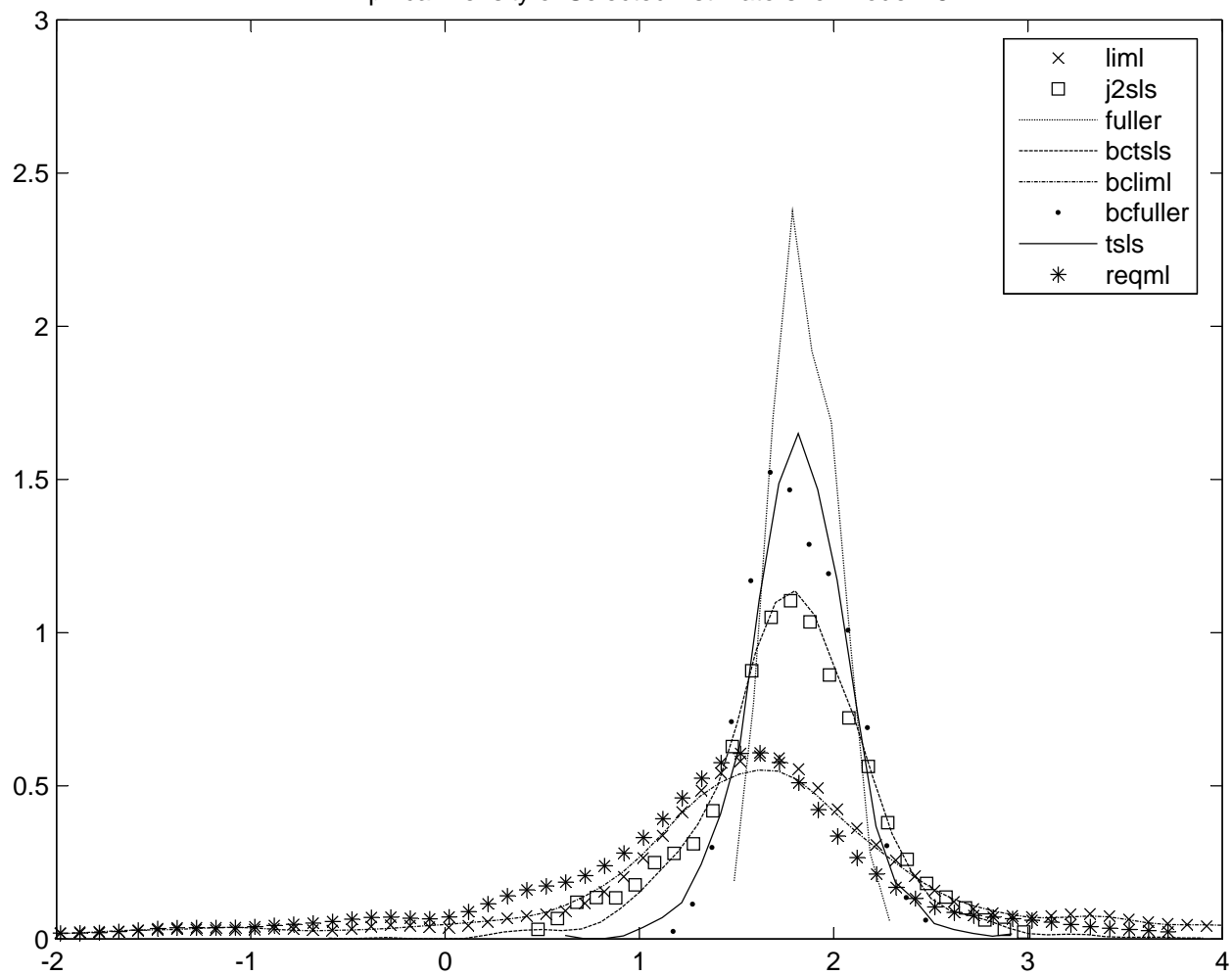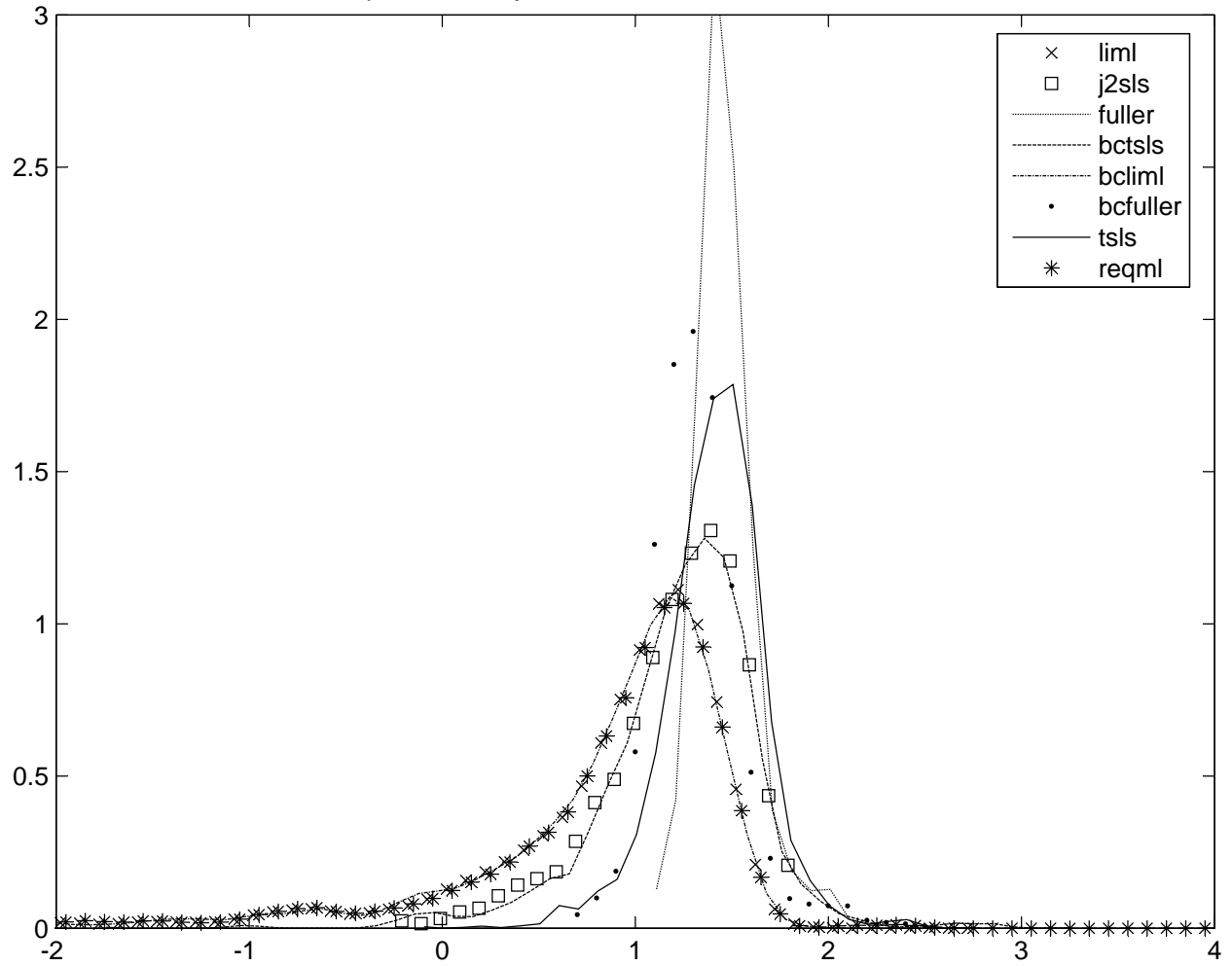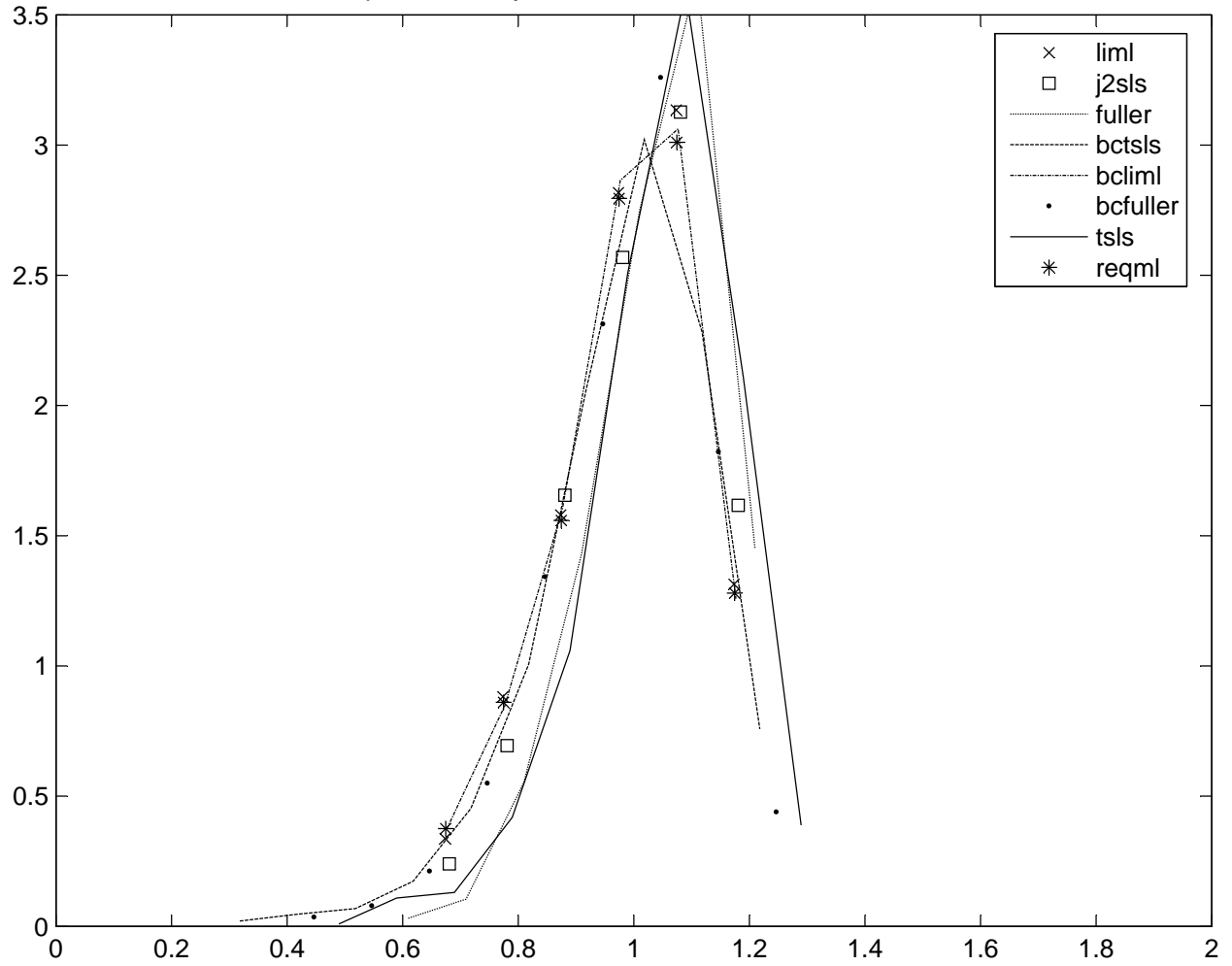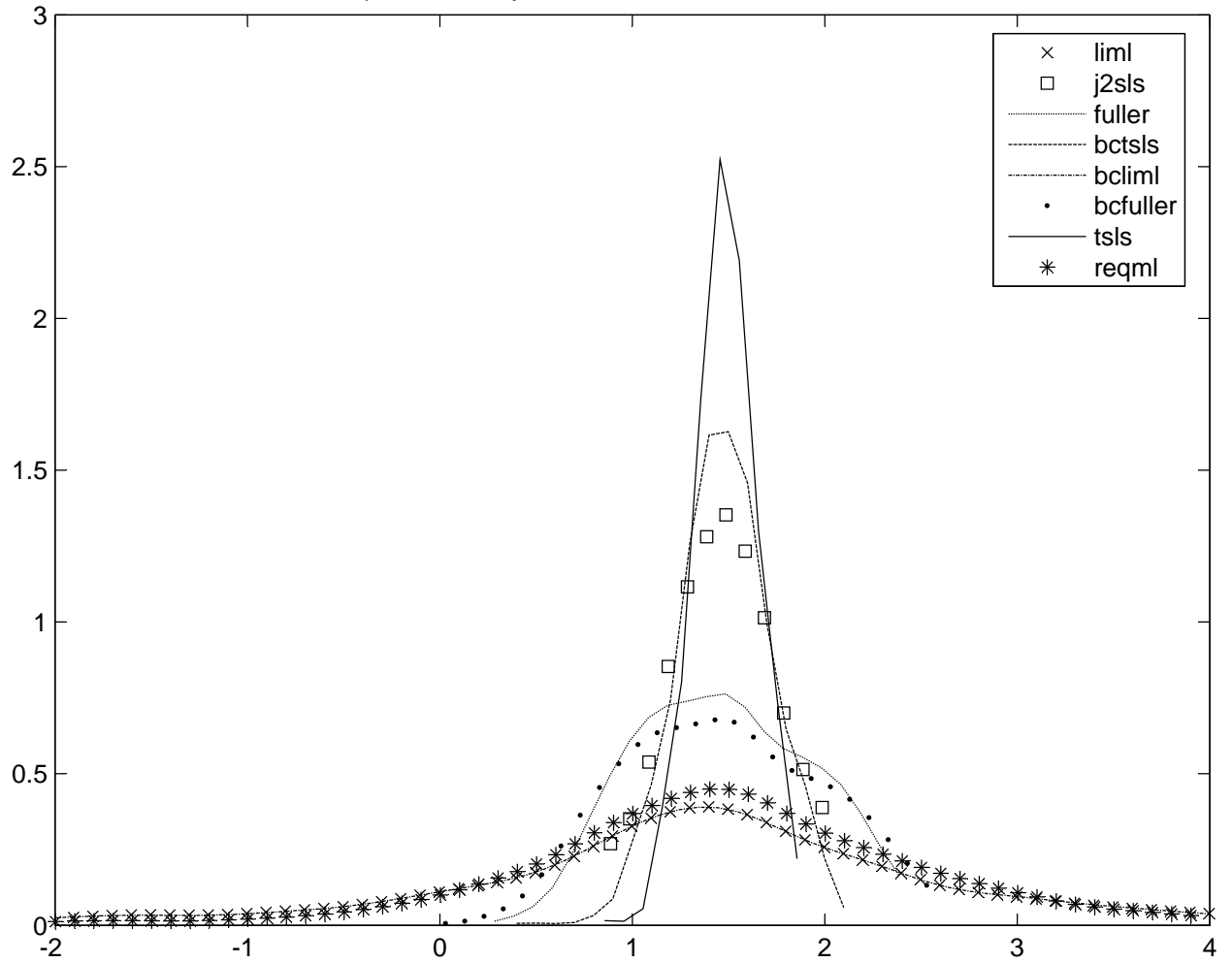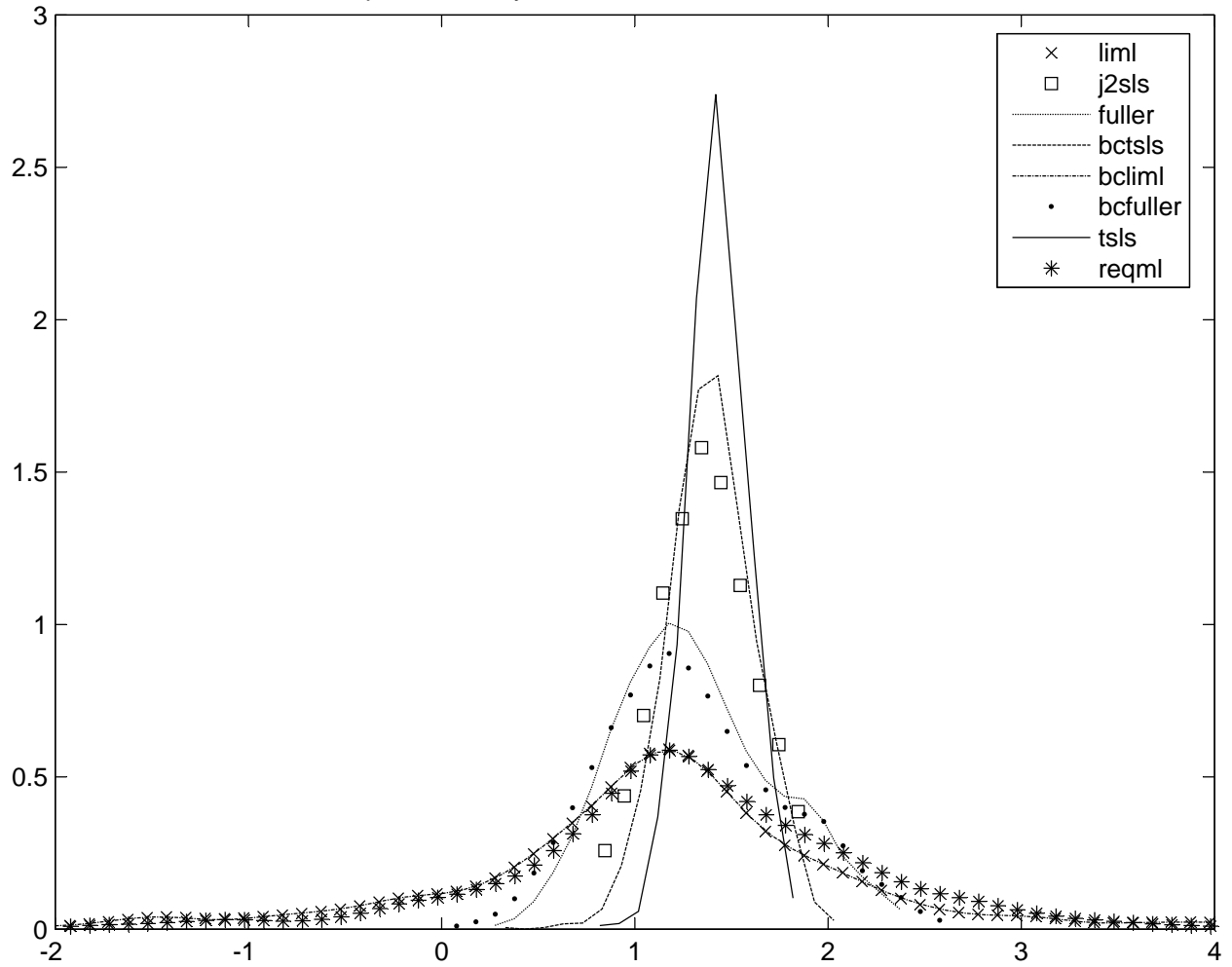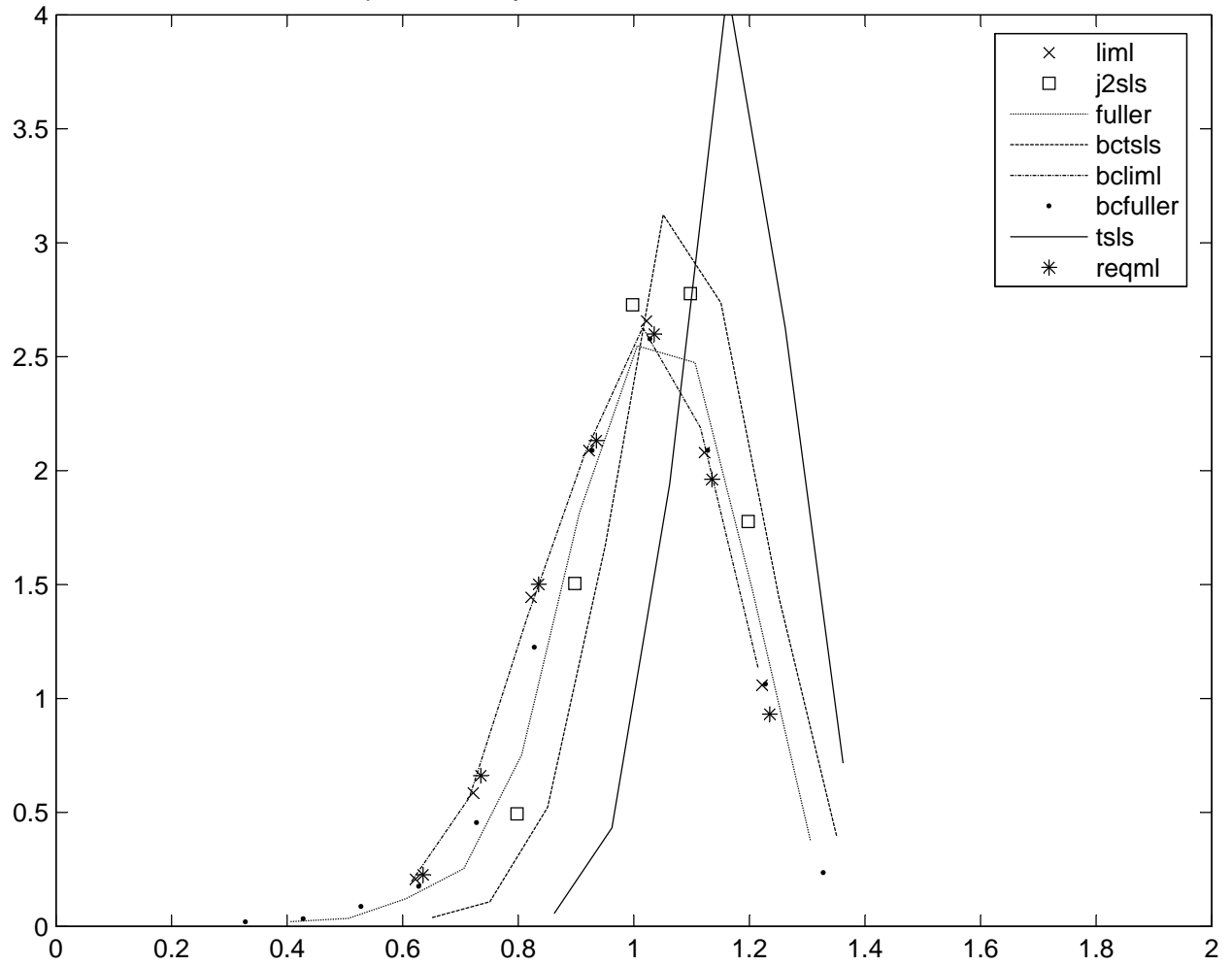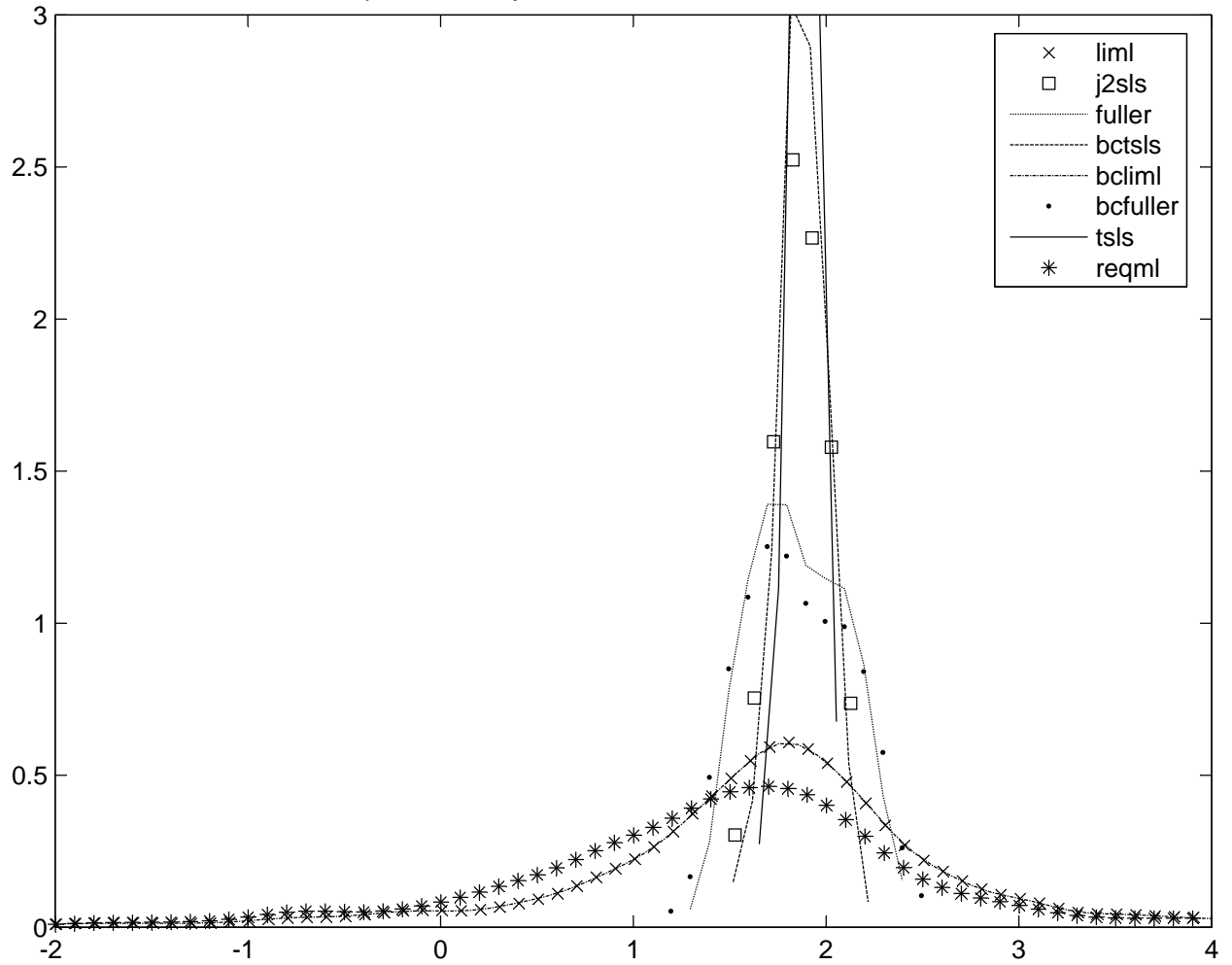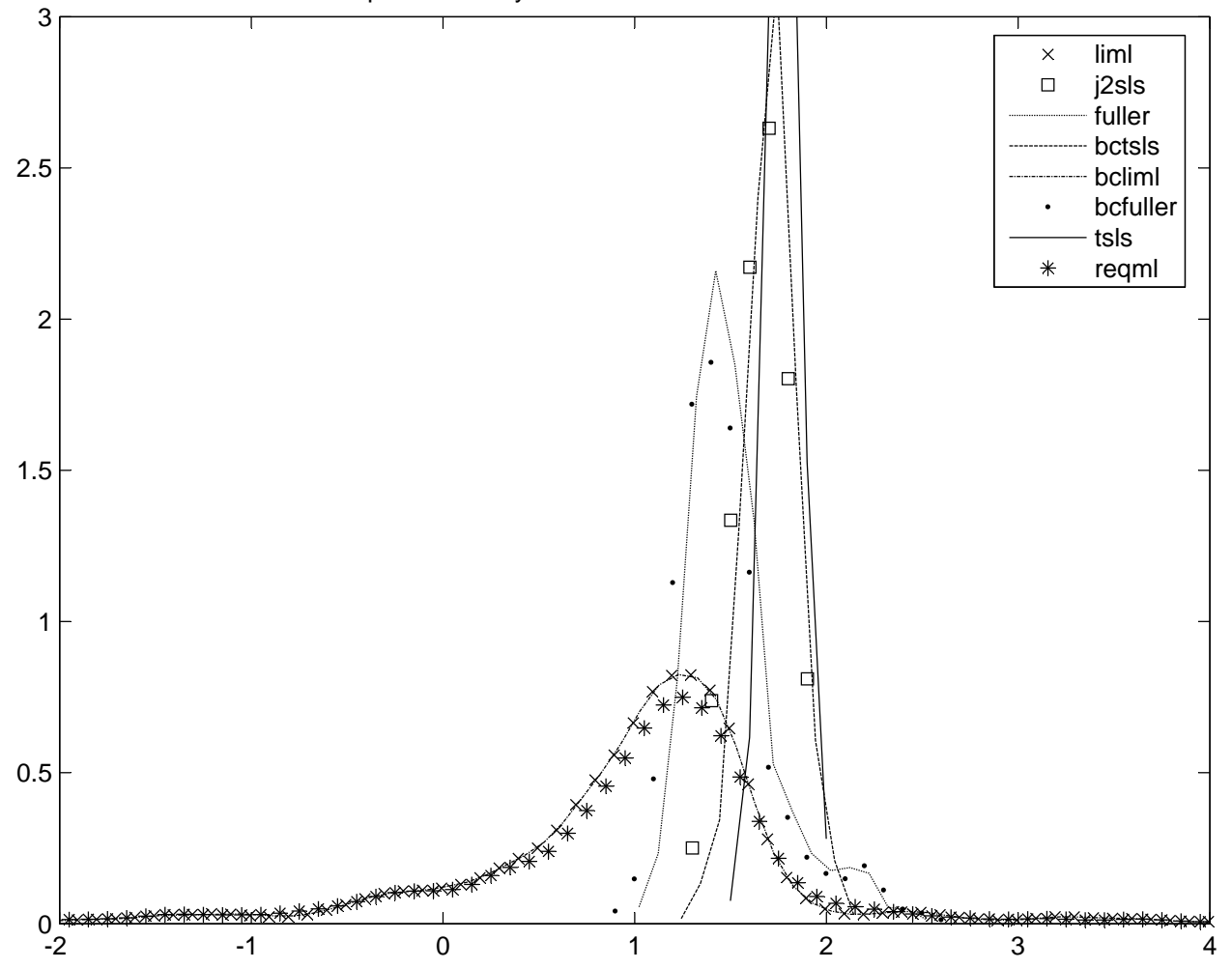
Empirical Density of Selected Estimators for Model 6
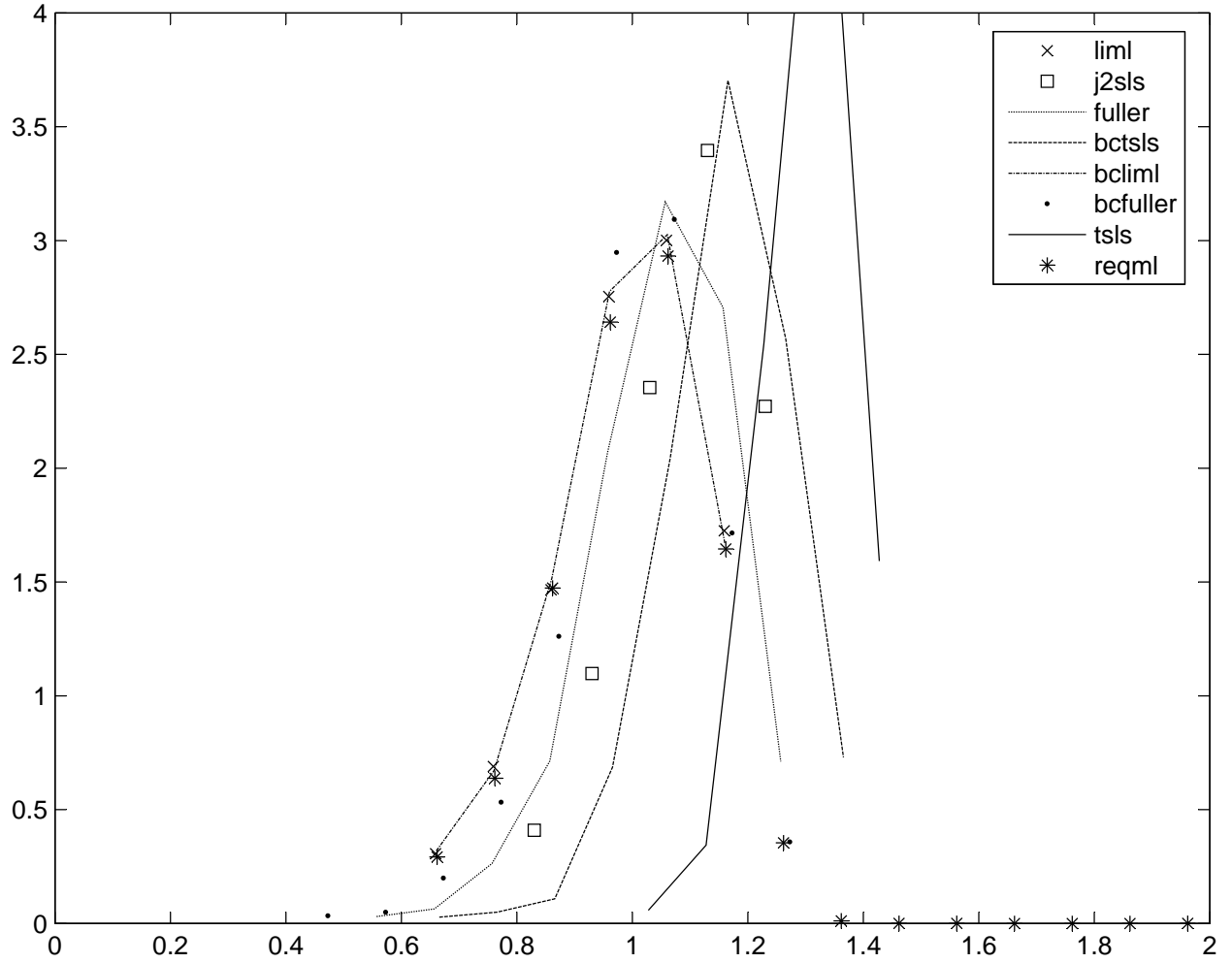
Empirical Density of Selected Estimators for Model 7

Empirical Density of Selected Estimators for Model 8

Empirical Density of Selected Estimators for Model 9

Empirical Density of Selected Estimators for Model 10

Empirical Density of Selected Estimators for Model 11

	liml
□	j2sls
	fuller
	bctsls
	bcliml
·	bcfuller
	tsls
*	reqml

Empirical Density of Selected Estimators for Model 12

Empirical Density of Selected Estimators for Model 13

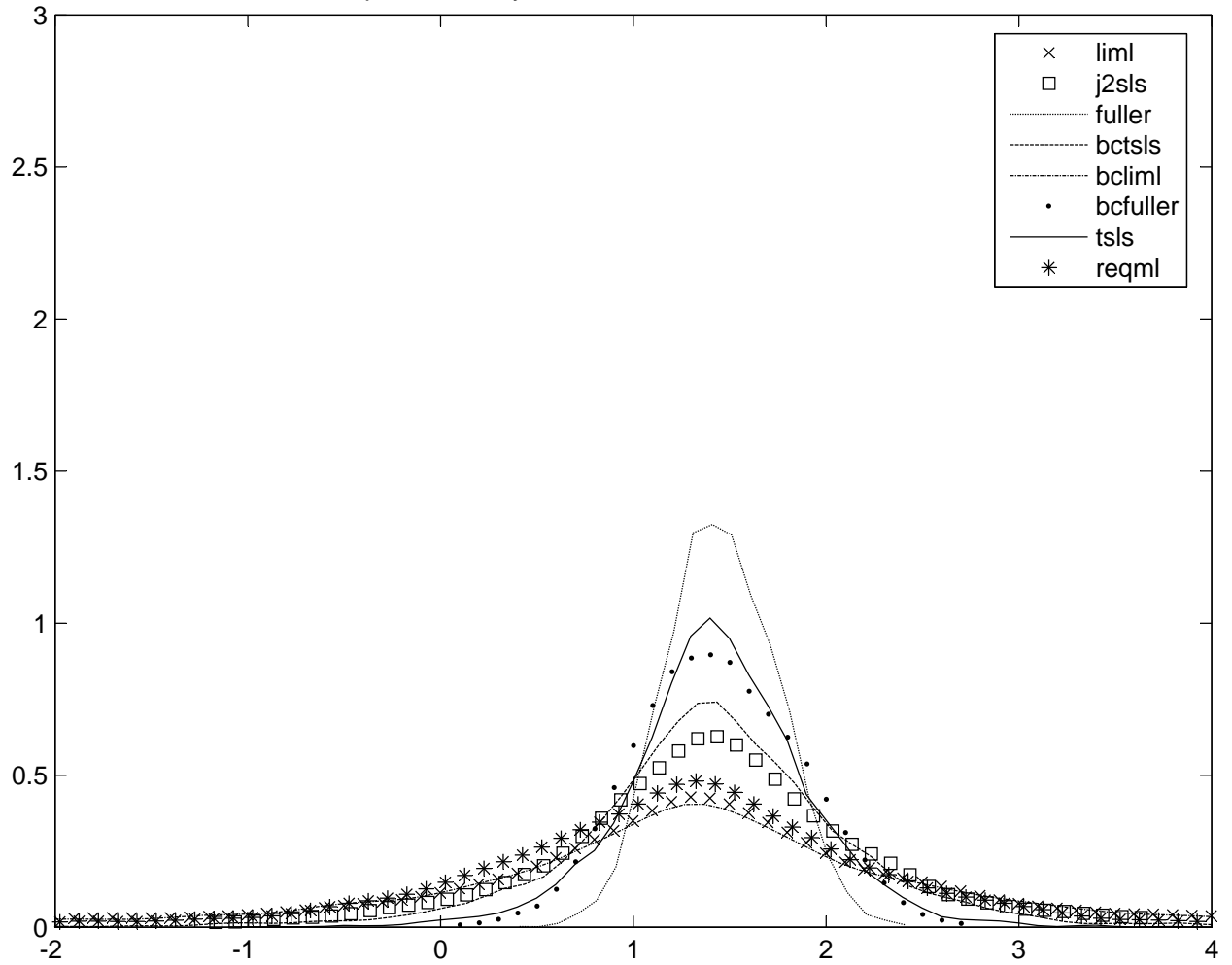Empirical Density of Selected Estimators for Model 14

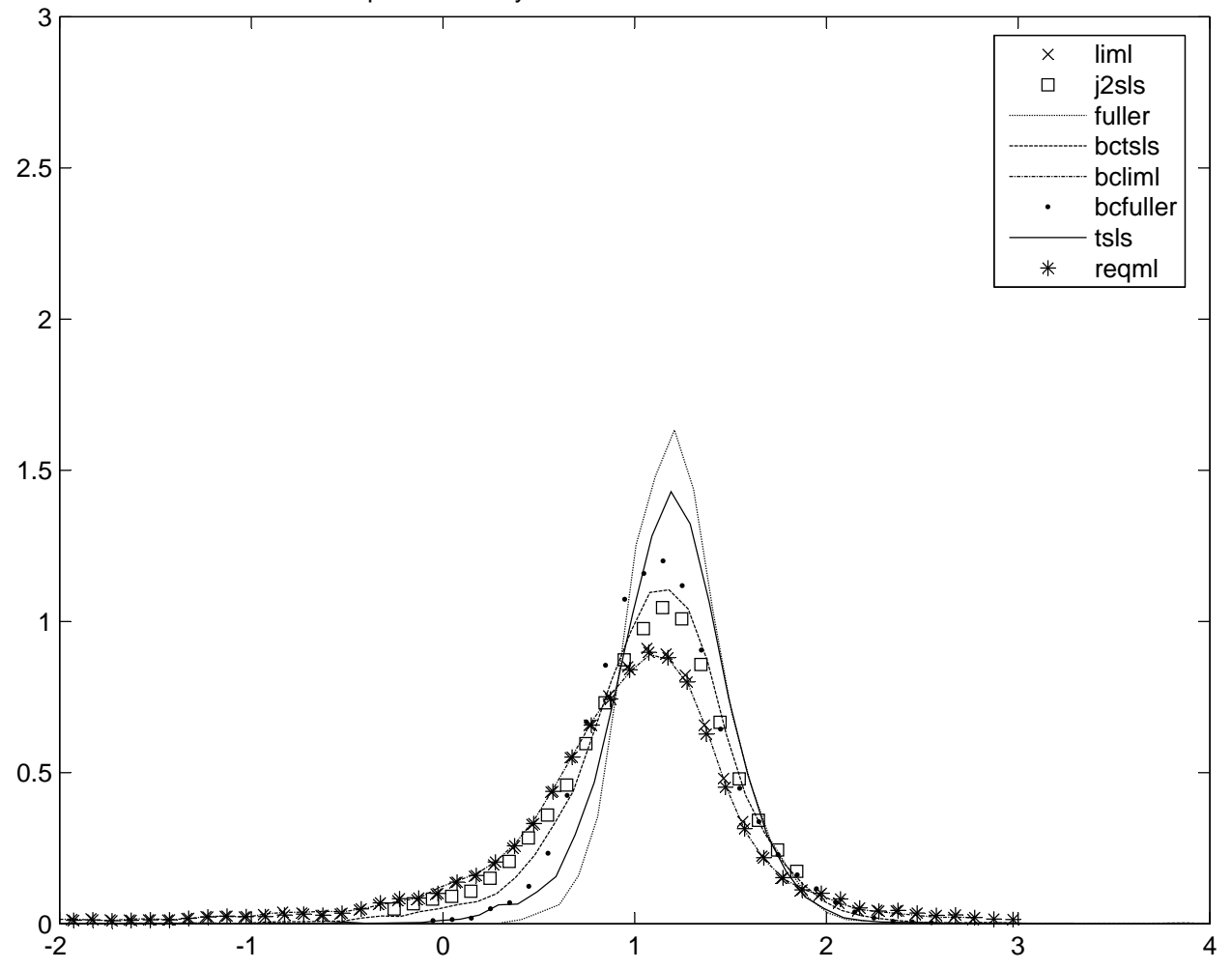Empirical Density of Selected Estimators for Model 15

Empirical Density of Selected Estimators for Model 16

Empirical Density of Selected Estimators for Model 17

×	liml	
□	j2sls	
	fuller	
	bctsls	
	bcliml	
·	bcfuller	
	tsls	
＊	reqml	

Empirical Density of Selected Estimators for Model 18

Empirical Density of Selected Estimators for Model 19

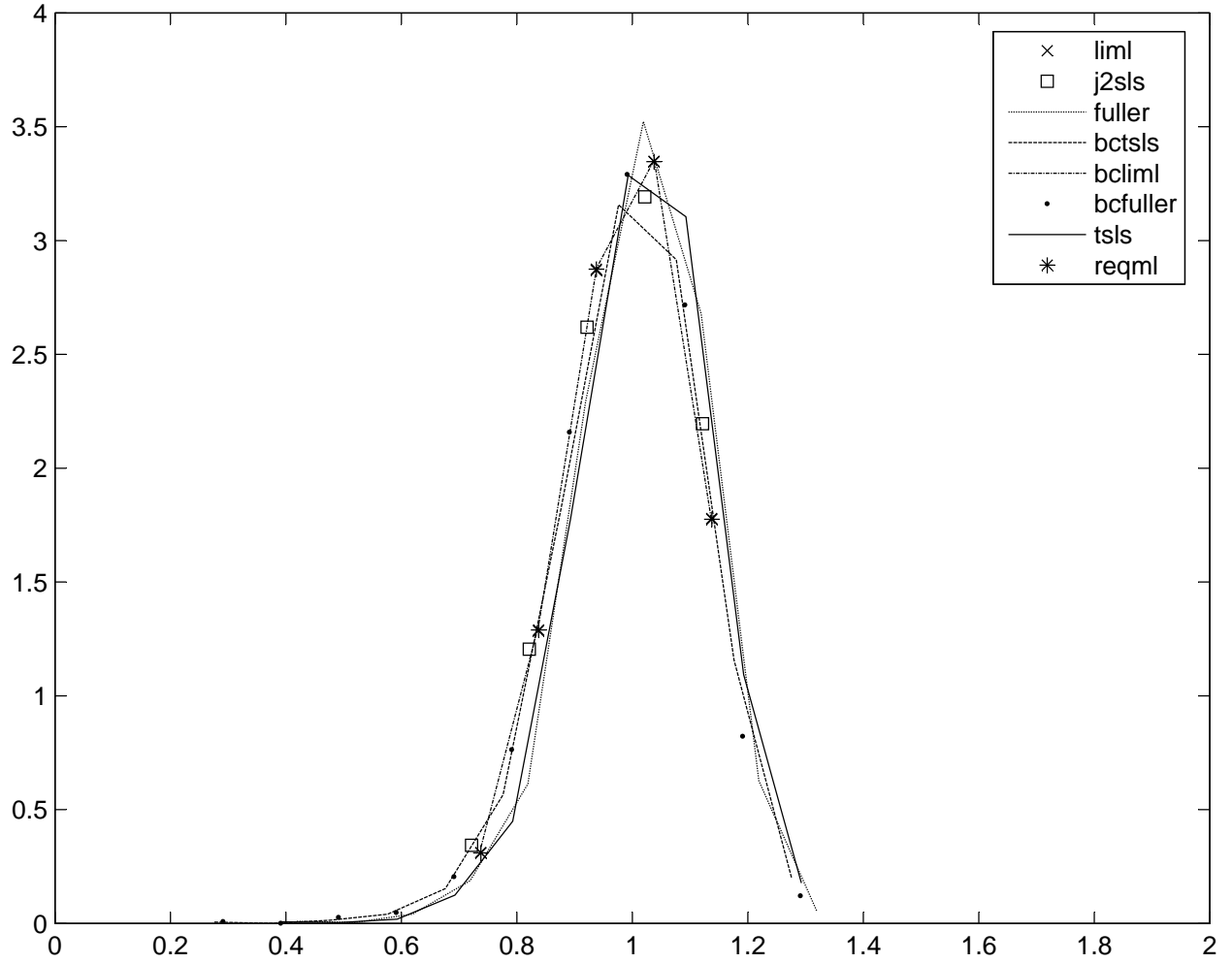|	
×	liml
□	j2sls
⋯	fuller
--	bctsls
-·-	bcliml
·	bcfuller
—	tsls
∗	reqml

Empirical Density of Selected Estimators for Model 20

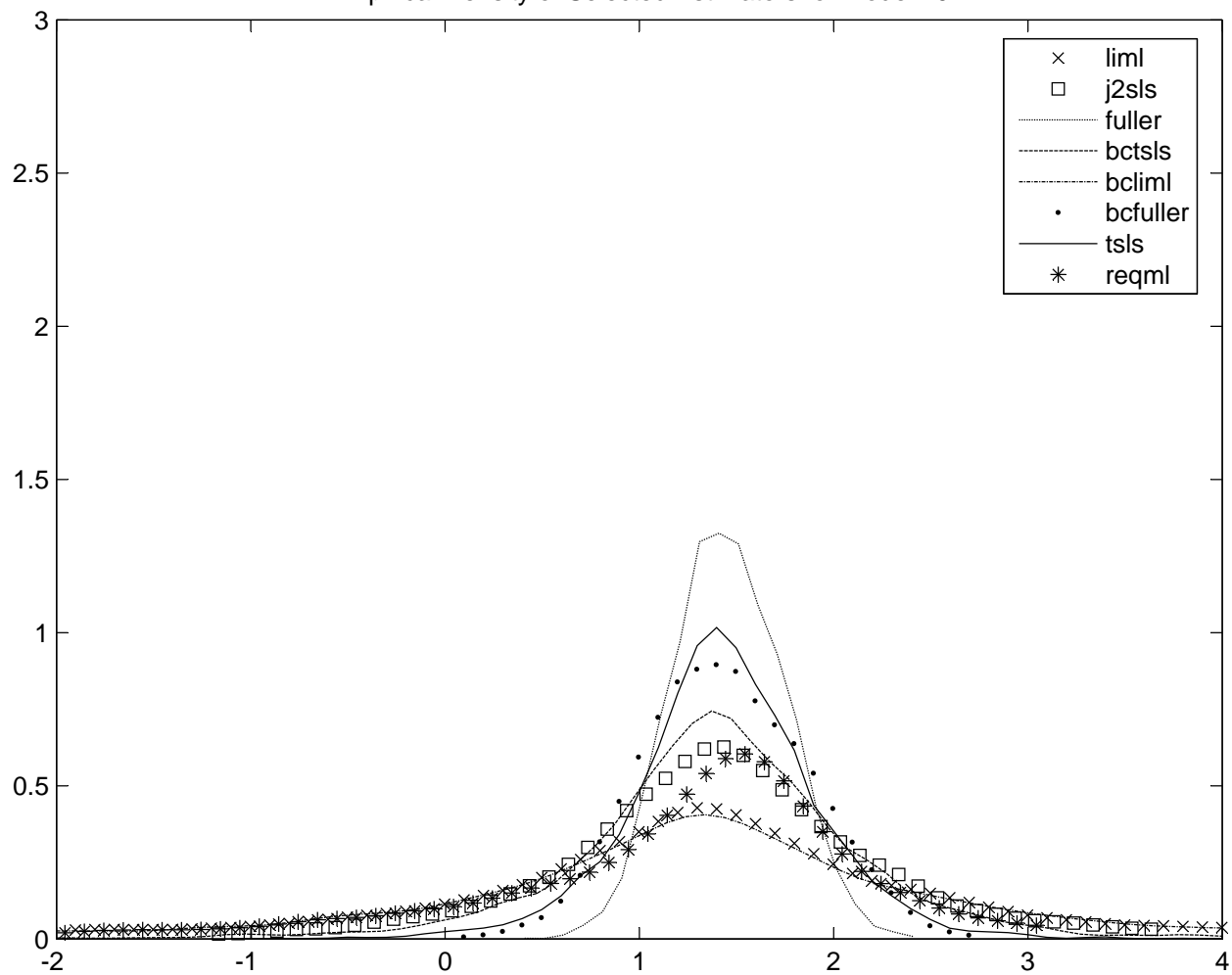Empirical Density of Selected Estimators for Model 21

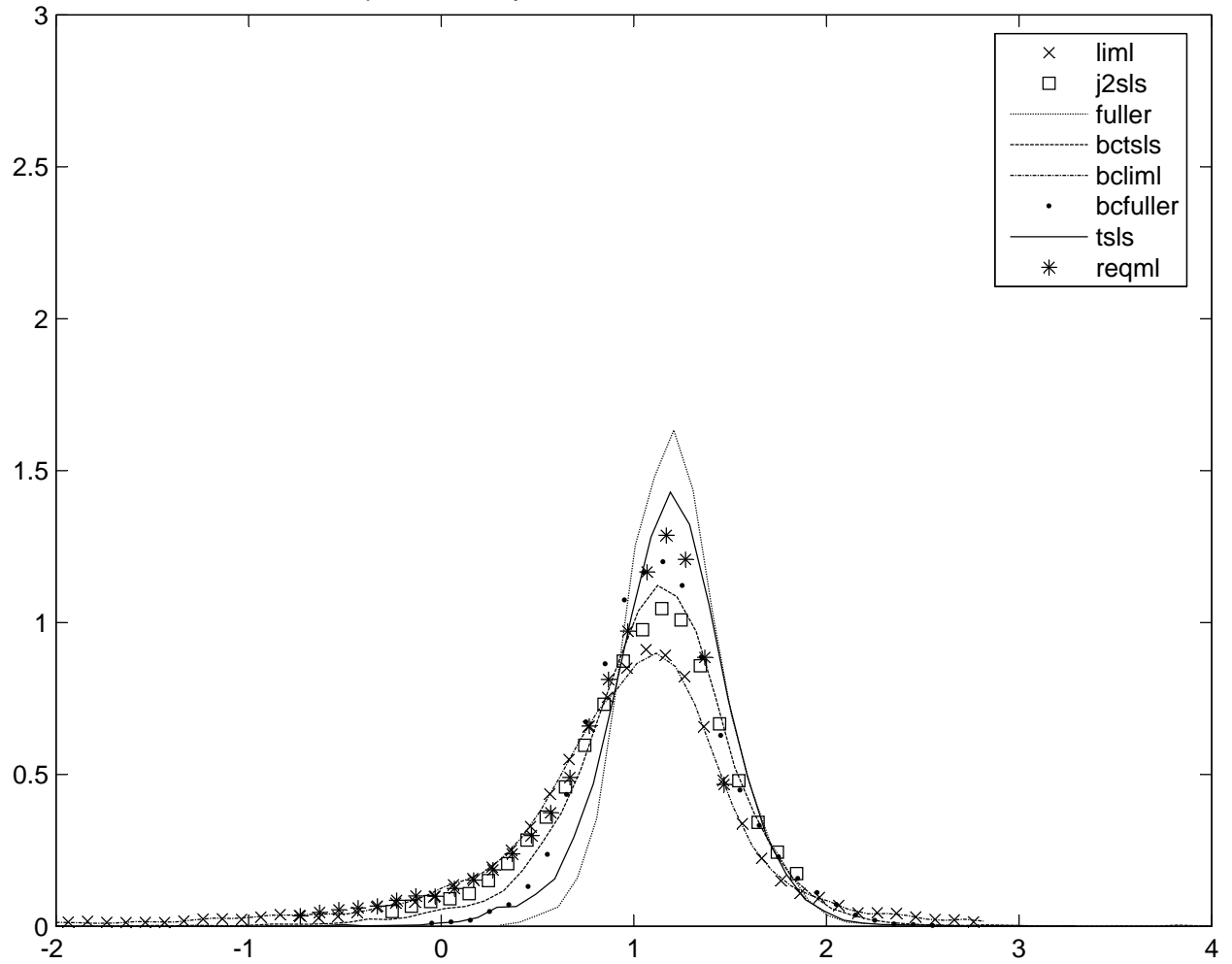Empirical Density of Selected Estimators for Model 22

Empirical Density of Selected Estimators for Model 23

Empirical Density of Selected Estimators for Model 24

Empirical Density of Selected Estimators for Model 25

Empirical Density of Selected Estimators for Model 26

Empirical Density of Selected Estimators for Model 27

Empirical Density of Selected Estimators for Model 28

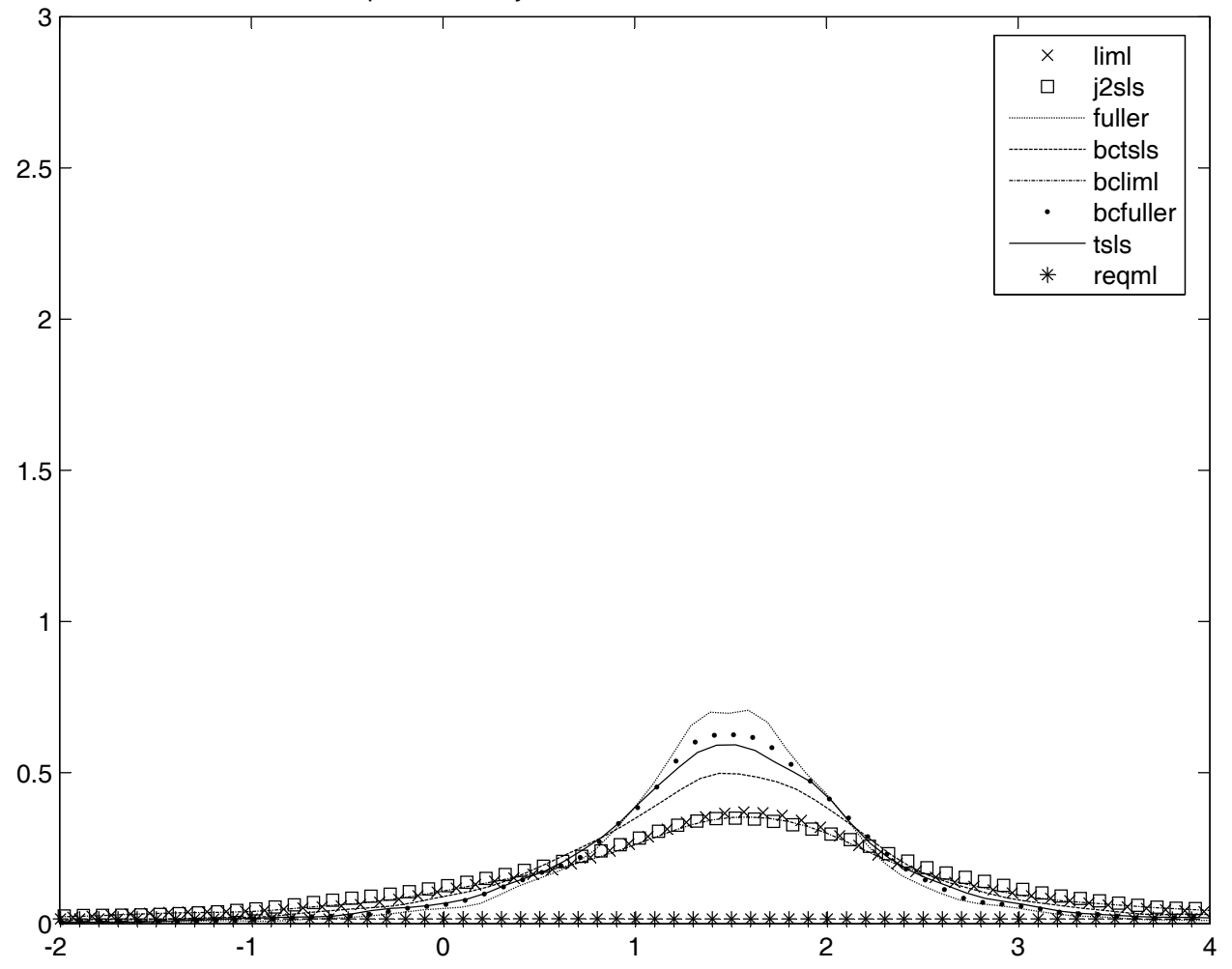Empirical Density of Selected Estimators for Model 29

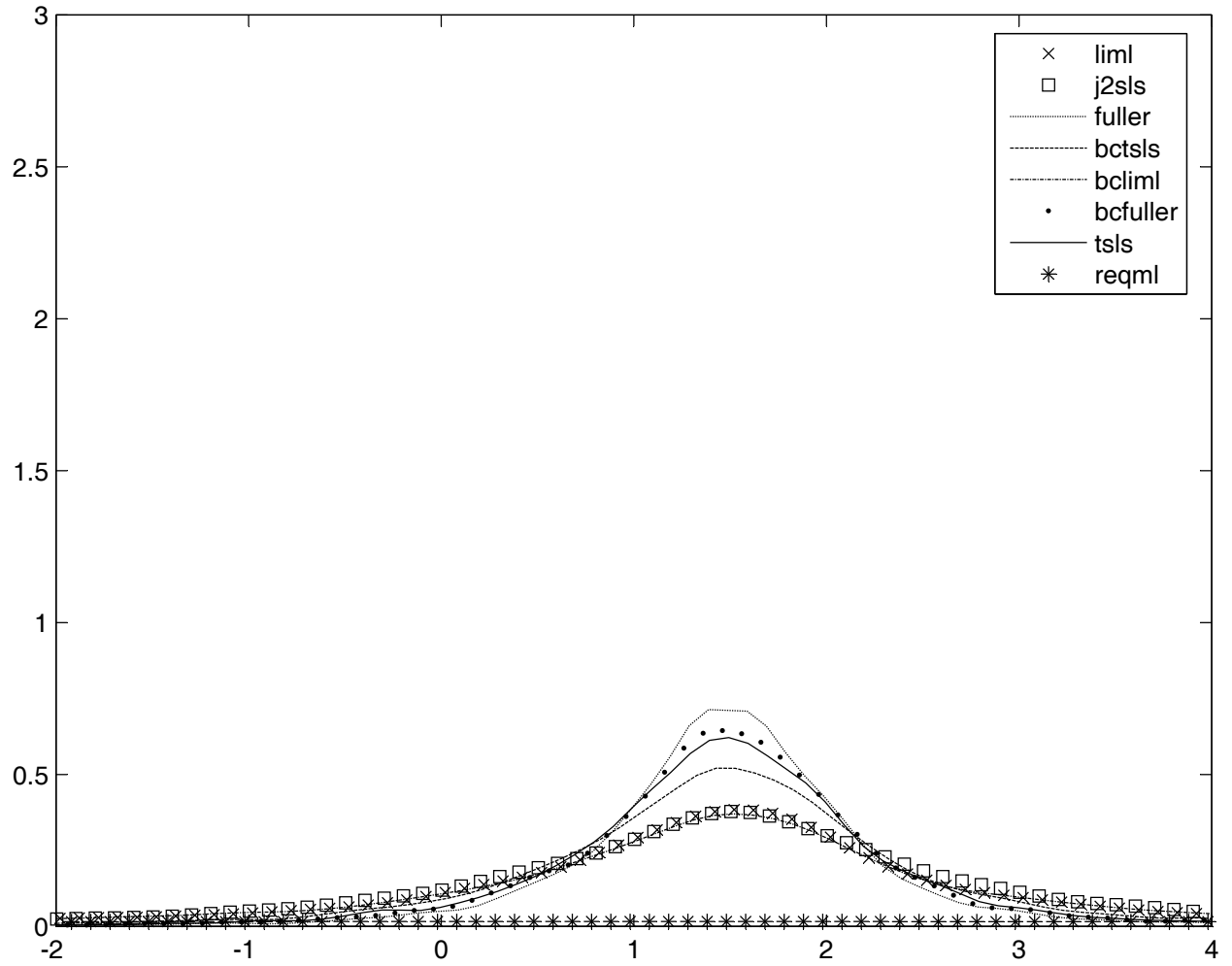Empirical Density of Selected Estimators for Model 30

Empirical Density of Selected Estimators for Model 31

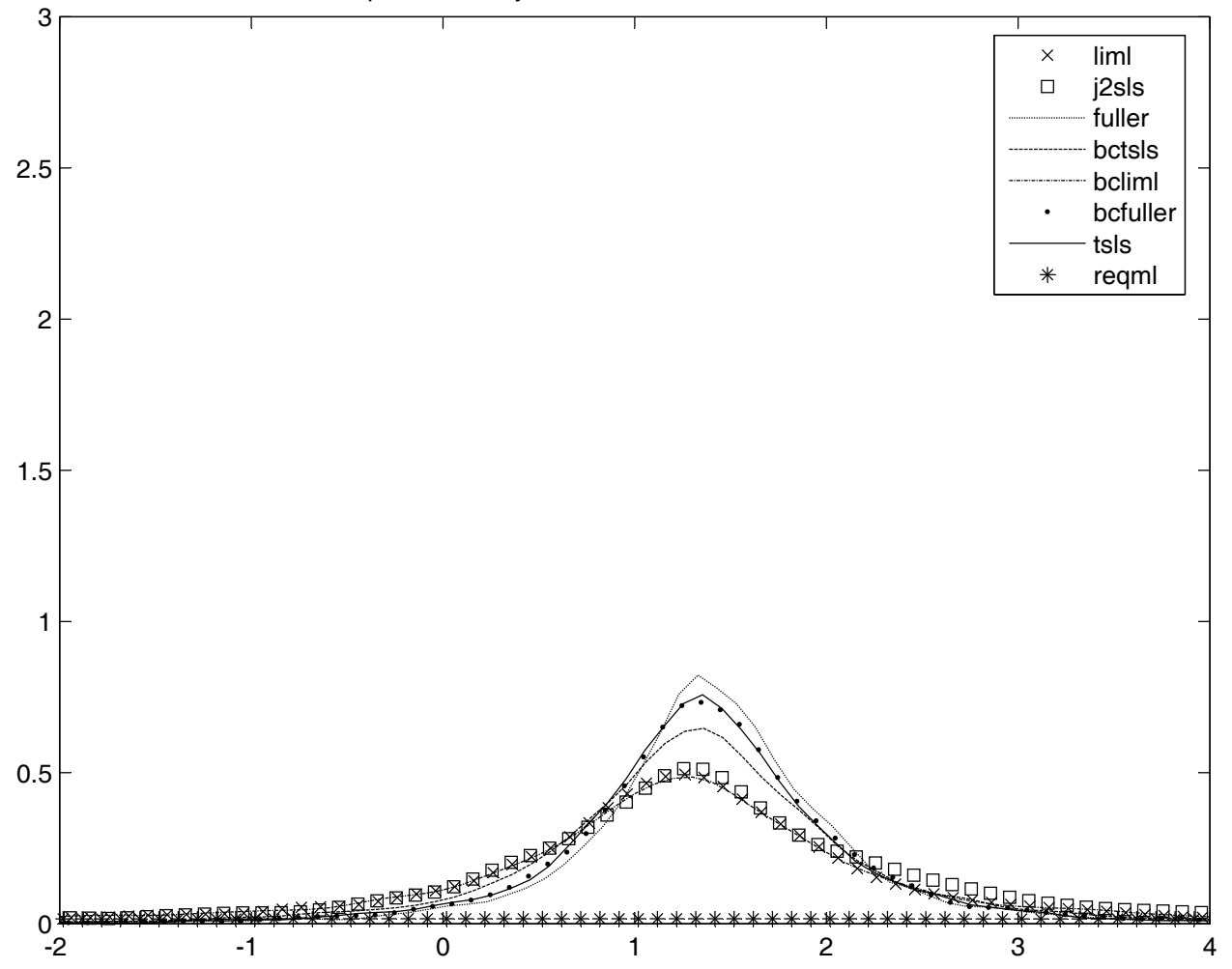Empirical Density of Selected Estimators for Model 32

Empirical Density of Selected Estimators for Model 33

Empirical Density of Selected Estimators for Model 34

Empirical Density of Selected Estimators for Model 35

Empirical Density of Selected Estimators for Model 36

Empirical Density of Selected Estimators for Model 37

Empirical Density of Selected Estimators for Model 38

Empirical Density of Selected Estimators for Model 39

Empirical Density of Selected Estimators for Model 40

Empirical Density of Selected Estimators for Model 41
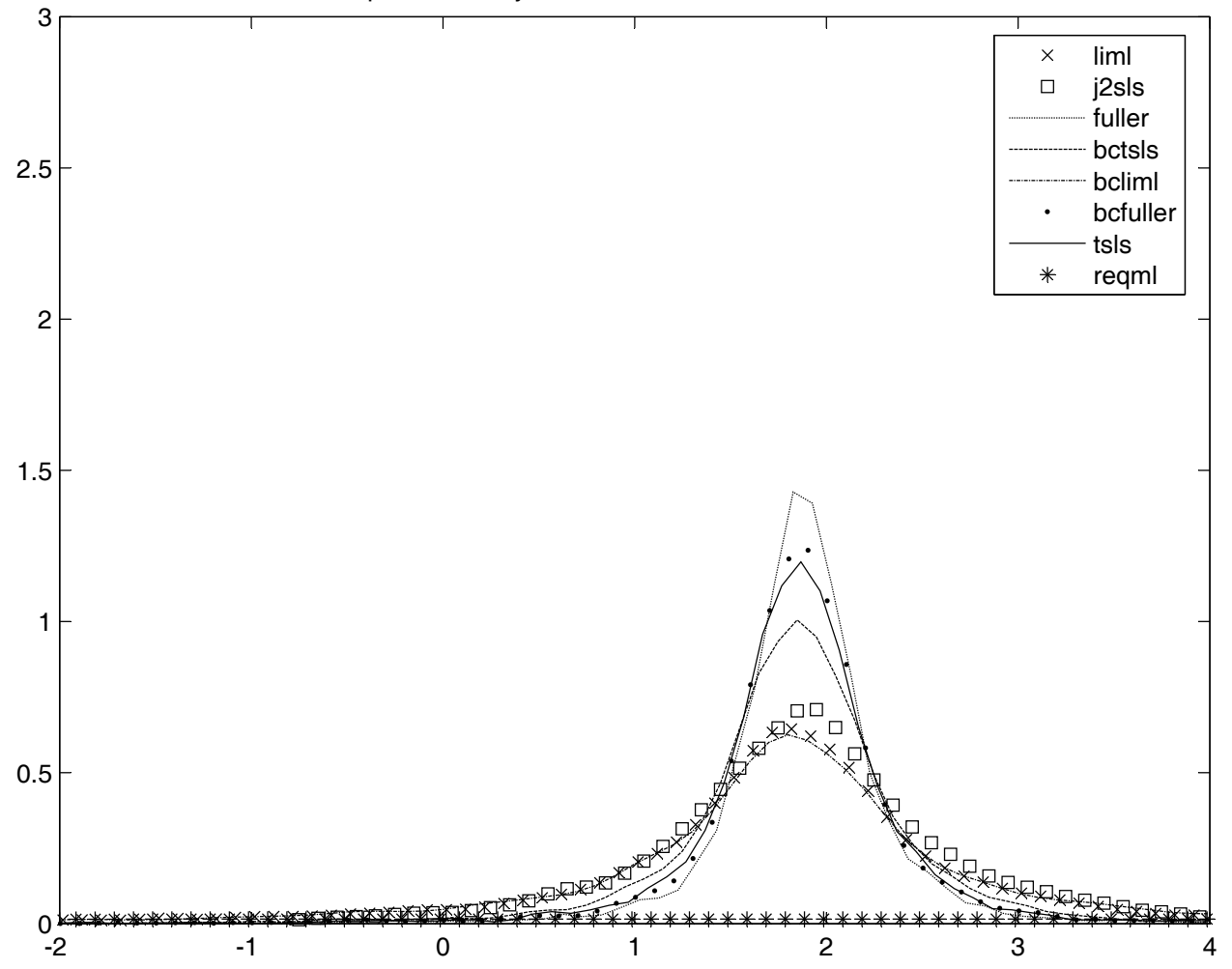
Empirical Density of Selected Estimators for Model 42

Empirical Density of Selected Estimators for Model 43

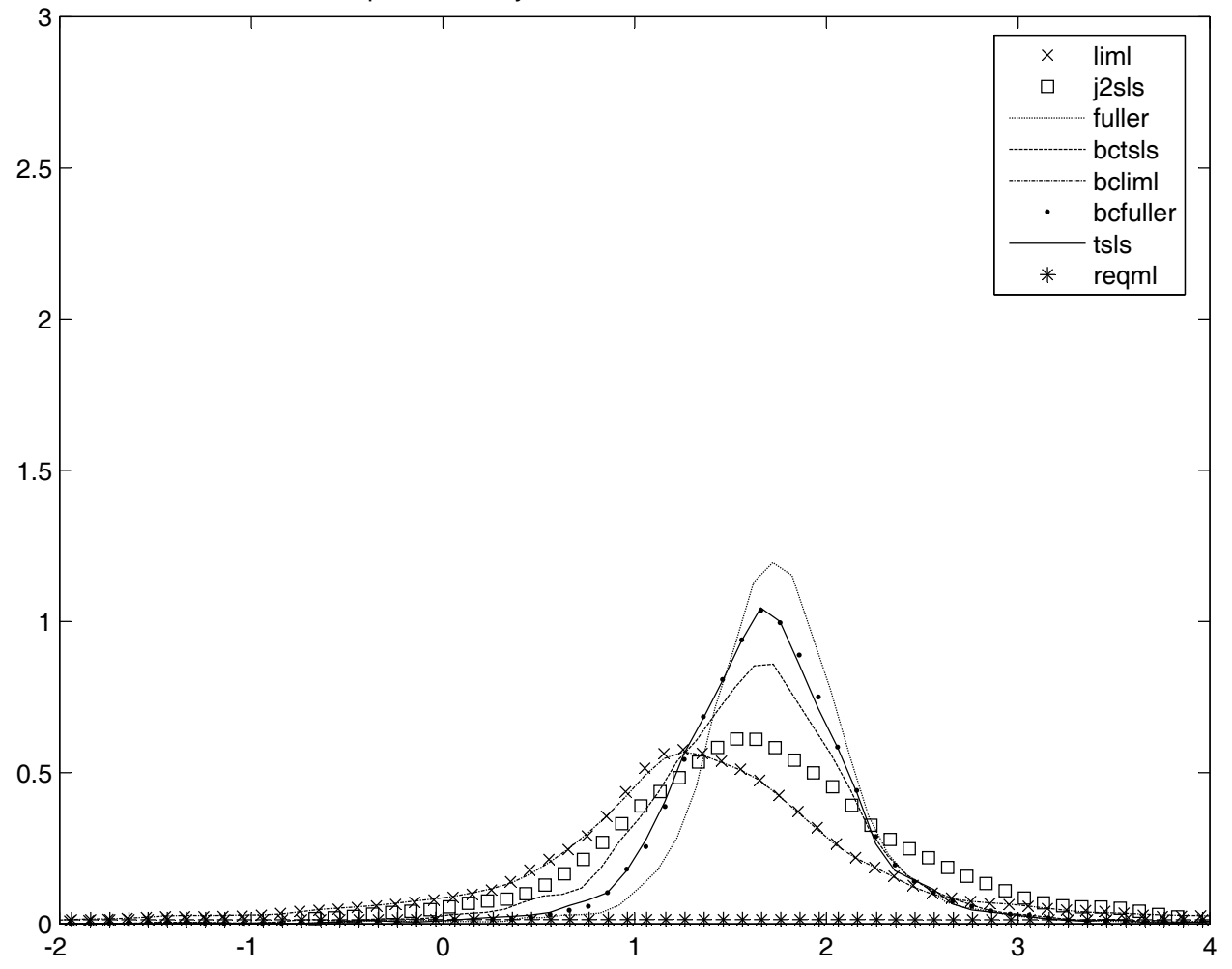Empirical Density of Selected Estimators for Model 44

Empirical Density of Selected Estimators for Model 45

Empirical Density of Selected Estimators for Model 46

Empirical Density of Selected Estimators for Model 47

Empirical Density of Selected Estimators for Model 48