

Appendices

Appendix 1. Validation of GFIT – Comparing Exact and Simulated p -values

This appendix contains tabulated p -values of the GOF test statistics for a selection of observed and expected frequencies. The methods are described in Chapter 2 and form part of the validation of GFIT in Chapter 3.

Appendix 2. Validation of GFIT – Comparing the Number of Simulations and p -values

This appendix contains tabulated and graphical representations to display the effect the number of Monte Carlo simulations has on p -values for various observed and expected data. The methods are described in Chapter 2.

Appendix 3. Output from GFIT

This appendix contains an example of the output from the 'GFIT' software developed by Holly and Steele (1998).

Appendix 4. Graphical Results of Power Studies

This appendix displays graphical representations of the power studies in Chapter 4.

Appendix 1: Validation of GFIT – Comparing Exact and Simulated p -values

Table A1.1. Exact and simulated p -values for uniform null distributions.

$O_{1...O_k}$	E_i	T_{OrdKS}		T_{NomKS}		T_{CombKS}	T_{χ^2}			$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
		Exact ¹	Sim	Exact ²	Sim		Sim	Exact ²	Sim			
5,1,0	2	0.03567	0.044	0.053	0.058	0.044	0.053	0.058	0.03	0.021	0.058	0.021
6,0,0	2	0.00274	0.004	0.004	0.006	0.004	0.004	0.006	0.002	0.004	0.006	0.004
6,3,0	3	0.12361	0.123	0.166	0.159	0.123	0.050	0.054	0.05	0.024	0.054	0.024
7,2,0	3	0.01656	0.022	0.025	0.028	0.022	0.014	0.010	0.013	0.004	0.015	0.004
8,1,0	3	0.00193	0.001	0.003	0.001	0.001	0.003	0.001	0.002	0.001	0.001	0.001
8,4,0	4	0.04994	0.049	0.070	0.063	0.049	0.017	0.018	0.018	0.006	0.018	0.006
9,3,0	4	0.00771	0.009	0.012	0.015	0.009	0.004	0.005	0.005	0.002	0.005	0.002
10,2,0	4	0.00109	0.001	0.002	0.002	0.001	0.001	0.002	0.001	0.001	0.002	0.001
9,5,1	5	0.09181	0.090	0.125	0.116	0.090	0.043	0.035	0.041	0.011	0.035	0.011
10,5,0	5	0.02089	0.020	0.030	0.027	0.020	0.001	0.005	0.007	0.001	0.004	0.001
11,4,0	5	0.00361	0.004	0.005	0.004	0.004	0.001	0.001	0.002	0.001	0.001	0.001
10,6,2	6	0.13579	0.145	0.180	0.180	0.145	0.076	0.076	0.071	0.032	0.076	0.032
11,6,1	6	0.04005	0.038	0.057	0.056	0.038	0.017	0.017	0.016	0.002	0.016	0.002
12,6,0	6	0.00902	0.008	0.013	0.015	0.008	0.003	0.001	0.002	0.001	0.001	0.001
12,7,2	7	0.06308	0.062	0.087	0.085	0.062	0.032	0.031	0.028	0.015	0.031	0.015
13,7,1	7	0.01760	0.021	0.025	0.027	0.021	0.007	0.009	0.006	0.004	0.009	0.004
14,7,0	7	0.00402	0.007	0.006	0.009	0.007	0.001	0.001	0.001	0.001	0.001	0.001
13,8,3	8	0.08824	0.085	0.120	0.114	0.085	0.050	0.051	0.044	0.017	0.051	0.017
14,8,2	8	0.02897	0.027	0.041	0.040	0.027	0.013	0.008	0.011	0.003	0.008	0.003
15,8,1	8	0.00792	0.006	0.016	0.008	0.006	0.002	0.003	0.002	0.002	0.003	0.002
14,9,4	9	0.11433	0.120	0.153	0.154	0.120	0.071	0.069	0.062	0.028	0.069	0.028
15,9,3	9	0.04245	0.046	0.060	0.059	0.046	0.022	0.022	0.018	0.009	0.022	0.009

¹ Exact p -values from Pettitt and Stephens (1977) and verified by determining all possible permutations and calculating the multinomial probability for each permutation.

² Calculated by determining all possible permutations and calculating the multinomial probability for each permutation.

Table A1.1 (Continued). Exact and simulated p -values for uniform null distributions.

$O_1 \dots O_k$	E_i	T_{OrdKS}		T_{NomKS}		T_{CombKS}	T_{χ^2}			$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
		Exact	Sim	Exact	Sim	Sim	Exact	Sim	Asym	Sim	Sim	Sim
16,9,2	9	0.01325	0.018	0.019	0.021	0.018	0.005	0.004	0.004	0.002	0.006	0.002
16,10,4	10	0.05757	0.057	0.080	0.082	0.057	0.033	0.035	0.027	0.014	0.035	0.014
17,10,3	10	0.02015	0.021	0.029	0.029	0.021	0.009	0.004	0.007	0.003	0.005	0.003
18,10,2	10	0.00609	0.007	0.009	0.008	0.007	0.001	0.001	0.002	0.001	0.001	0.001
5,2,1,0	2	0.10791	0.106	0.218	0.212	0.106	0.095	0.090	0.072	0.022	0.065	0.018
6,2,0,0	2	0.01514	0.022	0.034	0.040	0.022	0.007	0.006	0.007	0.002	0.004	0.002
7,3,2,0	3	0.05974	0.059	0.129	0.119	0.059	0.037	0.027	0.034	0.005	0.028	0.005
8,3,1,0	3	0.01115	0.009	0.026	0.023	0.009	0.005	0.005	0.005	0.001	0.005	0.001
8,4,4,0	4	0.12611	0.124	0.240	0.244	0.124	0.043	0.051	0.046	0.012	0.071	0.013
9,4,3,0	4	0.03299	0.039	0.074	0.075	0.039	0.013	0.013	0.015	0.003	0.022	0.003
10,4,2,0	4	0.00706	0.010	0.017	0.019	0.010	0.002	0.002	0.003	0	0.003	0
10,5,5,0	5	0.06598	0.069	0.138	0.133	0.069	0.021	0.027	0.019	0.005	0.043	0.007
11,5,4,0	5	0.01826	0.024	0.043	0.052	0.024	0.006	0.006	0.006	0.001	0.014	0.001
12,5,3,0	5	0.00424	0.005	0.010	0.011	0.005	0.001	0.001	0.001	0.001	0.001	0.001
11,6,6,1	6	0.10519	0.106	0.205	0.196	0.106	0.045	0.050	0.04	0.006	0.070	0.008
12,6,6,0	6	0.03526	0.042	0.079	0.090	0.042	0.007	0.006	0.007	0.002	0.011	0.002
13,6,5,0	6	0.01014	0.011	0.024	0.027	0.011	0.003	0.001	0.002	0.001	0.004	0.001
13,7,7,1	7	0.05689	0.046	0.120	0.103	0.046	0.015	0.012	0.016	0.001	0.018	0.001
14,7,7,0	7	0.01914	0.021	0.045	0.042	0.021	0.003	0.003	0.003	0.001	0.006	0.001
15,7,6,0	7	0.00566	0.003	0.014	0.007	0.003	0.001	0.001	0.001	0.001	0.004	0.001
6,2,2,0,0	2	0.04162	0.039	0.128	0.130	0.039	0.014	0.019	0.017	0	0.016	0
7,2,1,0,0	2	0.00477	0.004	0.018	0.020	0.004	0.003	0.003	0.002	0	0.001	0
7,3,3,2,0	3	0.12322	0.133	0.317	0.317	0.133	0.074	0.065	0.070	0.007	0.087	0.006
8,3,3,1,0	3	0.03202	0.023	0.103	0.099	0.023	0.012	0.012	0.013	0.001	0.015	0.001
9,3,3,0,0	3	0.00584	0.006	0.022	0.022	0.006	0.001	0	0.001	0	0.001	0
9,4,4,3,0	4	0.07617	0.077	0.218	0.220	0.077	0.031	0.025	0.033	0.002	0.066	0.003
10,4,4,2,0	4	0.02203	0.021	0.075	0.074	0.021	0.007	0.003	0.007	0.001	0.010	0.001
11,4,4,1,0	4	0.00496	0.005	0.019	0.014	0.005	0.001	0	0.001	0	0	0
10,5,5,5,0	5	0.13083	0.130	0.330	0.332	0.130	0.042	0.039	0.040	0.006	0.094	0.010
11,5,5,4,0	5	0.04717	0.049	0.147	0.140	0.049	0.015	0.014	0.015	0.002	0.031	0.002
13,5,5,2,0	5	0.00368	0.005	0.015	0.013	0.005	0.001	0	<0.001	0	0.002	0
12,6,6,6,0	6	0.07924	0.078	0.224	0.217	0.078	0.017	0.013	0.017	0.003	0.056	0.003

Table A1.1 (Continued). Exact and simulated p -values for uniform null distributions.

$O_1 \dots O_k$	E_i	T_{OrdKS}		T_{NomKS}		T_{CombKS}	T_{χ^2}			$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
		Exact	Sim	Exact	Sim	Sim	Exact	Sim	Asym	Sim	Sim	Sim
13,6,6,5,0	6	0.02930	0.031	0.097	0.098	0.031	0.007	0.005	0.006	0.001	0.019	0.001
14,6,6,4,0	6	0.00946	0.008	0.035	0.031	0.008	0.002	0.001	0.002	0.001	0.005	0.001
6,2,2,2,0,0	2	0.08064	0.079	0.293	0.285	0.079	0.083	0.032	0.035	0.004	0.047	0.003
7,2,2,1,0,0	2	0.01422	0.014	0.074	0.070	0.014	0.012	0.004	0.004	0.001	0.006	0.001
8,2,2,0,0,0	2	0.00173	0.001	0.010	0.009	0.001	0.001	0	<0.001	0	0	0
8,3,3,3,1,0	3	0.06435	0.053	0.250	0.264	0.053	0.077	0.027	0.027	0	0.048	0.002
9,3,3,3,0,0	3	0.01599	0.014	0.082	0.078	0.014	0.010	0.002	0.003	0	0.004	0
10,3,3,2,0,0	3	0.00308	0.002	0.019	0.017	0.002	0.002	0	<0.001	0	0.001	0
9,4,4,4,3,0	4	0.13203	0.130	0.419	0.421	0.130	0.077	0.065	0.062	0.005	0.147	0.007
10,4,4,4,2,0	4	0.04695	0.051	0.198	0.209	0.051	0.021	0.015	0.016	0.001	0.047	0.002
11,4,4,4,1,0	4	0.01375	0.012	0.073	0.070	0.012	0.003	0.004	0.002	0	0.008	0.001
11,5,5,5,4,0	5	0.08836	0.084	NA	0.305	0.084	NA	0.023	0.030	0.002	0.103	0.002
12,5,5,5,3,0	5	0.03317	0.032	NA	0.146	0.032	NA	0.006	0.008	0.001	0.026	0.001
13,5,5,5,2,0	5	0.01071	0.009	NA	0.046	0.009	NA	0.002	0.001	0.001	0.008	0.001
6,2,2,2,2,0,0	2	0.12856	0.124	0.487	0.462	0.124	0.068	0.064	0.062	0.004	0.112	0.009
7,2,2,2,1,0,0	2	0.02996	0.032	0.186	0.164	0.032	0.011	0.015	0.009	0.001	0.021	0.001
8,2,2,2,0,0,0	2	0.00511	0.006	0.043	0.038	0.006	0.001	0.001	<0.001	0	0.003	0
8,3,3,3,3,1,0	3	0.10550	0.096	NA	0.443	0.096	NA	0.051	0.049	0.002	0.107	0.007
9,3,3,3,3,0,0	3	0.03242	0.034	NA	0.193	0.034	NA	0.010	0.006	0	0.026	0.001
10,3,3,3,2,0,0	3	0.00807	0.012	NA	0.063	0.012	NA	0.001	0.001	0	0.005	0
10,4,4,4,4,2,0	4	0.08047	0.079	NA	0.360	0.079	NA	0.034	0.03	0.002	0.106	0.004
11,4,4,4,4,1,0	4	0.02828	0.028	NA	0.170	0.028	NA	0.010	0.005	0	0.023	0.001
12,4,4,4,4,0,0	4	0.00853	0.010	NA	0.068	0.010	NA	0	<0.001	0	0.008	0
7,2,2,2,2,1,0,0	2	0.05166	0.053	NA	0.334	0.053	NA	0.023	0.017	0	0.047	0.001
8,2,2,2,2,0,0,0	2	0.01122	0.013	NA	0.110	0.013	NA	0.002	0.001	0	0.008	0
9,3,3,3,3,3,0,0	3	0.05477	0.055	NA	0.337	0.055	NA	0.017	0.012	0.001	0.058	0.002
10,3,3,3,3,2,0,0	3	0.01641	0.015	NA	0.153	0.015	NA	0.004	0.002	0	0.017	0.001
11,3,3,3,3,1,0,0	3	0.00410	0.002	NA	0.060	0.002	NA	0.001	<0.001	0	0.005	0
7,2,2,2,2,2,1,0,0	2	0.07840	0.076	NA	0.499	0.076	NA	0.037	0.03	0	0.082	0.001
8,2,2,2,2,2,0,0,0	2	0.02043	0.017	NA	0.234	0.017	NA	0.001	0.002	0	0.016	0
9,2,2,2,2,1,0,0,0	2	0.00406	0.003	NA	0.067	0.003	NA	0	<0.001	0	0.002	0

Table A1.1 (Continued). Exact and simulated p -values for uniform null distributions.

$O_1 \dots O_k$	E_i	T_{OrdKS}		T_{NomKS}		T_{CombKS}	T_{χ^2}			$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
		Exact	Sim	Exact	Sim	Sim	Exact	Sim	Asym	Sim	Sim	Sim
9,3,3,3,3,3,3,0,0	3	0.08210	0.077	NA	0.530	0.077	NA	0.022	0.021	0.002	0.103	0.003
10,3,3,3,3,3,2,0,0	3	0.02831	0.029	NA	0.286	0.029	NA	0.006	0.004	0.001	0.039	0.001
11,3,3,3,3,3,1,0,0	3	0.00833	0.012	NA	0.111	0.012	NA	0	<0.001	0	0.009	0.001
7,2,2,2,2,2,1,0,0	2	0.10909	0.104	NA	0.644	0.104	NA	0.053	0.049	0.001	0.145	0.003
8,2,2,2,2,2,0,0,0	2	0.03276	0.034	NA	0.384	0.034	NA	0.005	0.004	0	0.037	0.001
9,2,2,2,2,1,0,0,0	2	0.00781	0.011	NA	0.171	0.011	NA	0.001	<0.001	0	0.005	0
9,3,3,3,3,3,3,0,0	3	0.11333	0.114	NA	0.663	0.114	NA	0.029	0.035	0.001	0.189	0.002
10,3,3,3,3,3,2,0,0	3	0.04365	0.042	NA	0.441	0.042	NA	0.010	0.007	0.001	0.058	0.001
12,3,3,3,3,3,0,0,0	3	0.00421	0.003	NA	0.075	0.003	NA	0.001	<0.001	0	0.003	0

Table A1.2. Exact and simulated p -values for non-uniform null distributions.

O_1, \dots, O_k	E_1, \dots, E_k	T_{OrdKS}		T_{NomKS}		T_{χ^2}			$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
		Exact	Sim	Exact	Sim	Exact	Sim	Asym	Sim	Sim	Sim
9,4,4,3,0	4,4,4,4,4	0.07167	0.077	0.218	0.220	0.031	0.025	0.033	0.002	0.066	0.003
10,4,4,2,0	4,4,4,4,4	0.02203	0.021	0.075	0.074	0.007	0.006	0.007	0.001	0.010	0.001
11,4,4,1,0	4,4,4,4,4	0.00496	0.005	0.019	0.014	0.001	0	0.001	0	0	0
13,4,3,0,0	8,4,4,2,2	0.07099	0.071	0.174	0.175	0.115	0.103	0.117	0.006	0.155	0.005
14,4,2,0,0	8,4,4,2,2	0.02033	0.020	0.057	0.052	0.048	0.037	0.05	0.002	0.040	0.001
15,4,1,0,0	8,4,4,2,2	0.00444	0.005	0.014	0.010	0.016	0.009	0.015	0.001	0.009	0.001
15,2.5,2.5,0,0	10,2.5,2.5,2.5,2.5	0.07424	0.061	0.119	0.124	0.111	0.125	0.112	0.018	0.075	0.018
16,2.5,1.5,0,0	10,2.5,2.5,2.5,2.5	0.02110	0.018	0.034	0.033	0.057	0.052	0.061	0.004	0.022	0.005
17,2.5,0.5,0,0	10,2.5,2.5,2.5,2.5	0.00446	0.006	0.008	0.008	0.023	0.019	0.021	0.001	0.005	0
17,2,1,0,0	12,2,2,2,2	0.05458	0.051	0.100	0.100	0.151	0.131	0.16	0.016	0.071	0.016
18,2,0,0,0	12,2,2,2,2	0.01489	0.018	0.028	0.026	0.067	0.058	0.061	0.006	0.015	0.004
19,1,0,0,0	12,2,2,2,2	0.00332	0.006	0.007	0.006	0.036	0.029	0.032	0.001	0.004	0.002
9,3,3,3,3,3,3,0,0	3,3,3,3,3,3,3,3,3	0.11333	0.114	NA	0.663	NA	0.029	0.035	0.001	0.189	0.002
10,3,3,3,3,3,3,2,0,0	3,3,3,3,3,3,3,3,3	0.04365	0.042	NA	0.441	NA	0.010	0.007	0.001	0.058	0.001
12,3,3,3,3,3,3,0,0,0	3,3,3,3,3,3,3,3,3	0.00421	0.003	NA	0.075	NA	0.001	<0.001	0	0.003	0
8,2,3,2,5,5,5,0,0,0	2,2,3,2,5,5,5,3,2,1	0.14992	0.097	NA	0.623	NA	0.005	0.004	0.001	0.258	0.002
9,2,3,2,5,5,4,0,0,0	2,2,3,2,5,5,5,3,2,1	0.06105	0.033	NA	0.382	NA	0.002	<0.001	0.001	0.116	0.001
11,2,3,2,5,5,2,0,0,0	2,2,3,2,5,5,5,3,2,1	0.00639	0.005	NA	0.078	NA	0.001	<0.001	0	0.009	0
7,2,3,5,6,5,2,0,0,0	1,2,3,5,6,5,4,2,1,1	0.14306	0.076	NA	0.561	NA	0.001	<0.001	0.001	0.294	0.002
8,2,3,5,6,5,1,0,0,0	1,2,3,5,6,5,4,2,1,1	0.05652	0.033	NA	0.325	NA	0	<0.001	0	0.114	0.002
10,2,3,5,6,4,0,0,0,0	1,2,3,5,6,5,4,2,1,1	0.00567	0.002	NA	0.057	NA	0	<0.001	0	0.010	0

Appendix 2: Validation of GFIT – Comparing the Number of Simulations and p -values

Table A2.1. Number of simulations and p -values of GOF test statistics for 6 categories with uniform expected frequencies of 2 and common OrdKS value.

n	OrdKS Value	T_{χ^2}	T_{OrdKS}	T_{NomKS}	$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
100	4	0.02	0.08	0.27	0	0.06	0
	5	0	0	0.03	0	0	0
	6	0	0	0.01	0	0	0
200	4	0.035	0.07	0.27	0	0.05	0
	5	0.005	0.02	0.055	0	0	0
	6	0	0	0.01	0	0	0
300	4	0.027	0.073	0.29	0	0.037	0
	5	0.007	0.02	0.107	0	0.007	0
	6	0	0	0.007	0	0	0
400	4	0.038	0.088	0.33	0.005	0.05	0.005
	5	0.005	0.018	0.075	0	0.01	0
	6	0	0.003	0.008	0	0	0
500	4	0.022	0.094	0.284	0.004	0.044	0.004
	5	0.004	0.002	0.046	0	0	0
	6	0	0.002	0.008	0	0.002	0
600	4	0.037	0.09	0.32	0	0.05	0
	5	0.007	0.022	0.075	0.002	0.01	0.002
	6	0	0	0.005	0	0	0
700	4	0.044	0.099	0.294	0.003	0.049	0.003
	5	0.003	0.007	0.061	0	0.004	0
	6	0.001	0.003	0.014	0	0.001	0
800	4	0.036	0.073	0.276	0.005	0.041	0.005
	5	0.006	0.018	0.076	0	0.005	0
	6	0	0.004	0.015	0	0	0
900	4	0.044	0.106	0.338	0.003	0.061	0.003
	5	0.004	0.018	0.084	0	0.009	0
	6	0	0.001	0.013	0	0	0
1000	4	0.042	0.078	0.298	0.003	0.047	0.004
	5	0.007	0.014	0.073	0	0.005	0
	6	0	0.004	0.012	0	0	0
1500	4	0.029	0.08	0.305	0.002	0.047	0.004
	5	0.006	0.019	0.087	0	0.007	0
	6	0.001	0.003	0.01	0	0	0
2000	4	0.035	0.087	0.305	0.003	0.058	0.003
	5	0.004	0.017	0.079	0.001	0.005	0.005
	6	0.001	0.001	0.01	0	0.001	0
2500	4	0.033	0.086	0.288	0.002	0.053	0.002
	5	0.007	0.014	0.078	0	0.007	0
	6	0	0.001	0.01	0	0	0
3000	4	0.025	0.084	0.291	0.004	0.041	0.004
	5	0.005	0.012	0.076	0	0.006	0
	6	0	0.003	0.008	0	0	0
3500	4	0.031	0.077	0.295	0.002	0.049	0.003
	5	0.005	0.018	0.079	0	0.007	0
	6	0	0.001	0.007	0	0	0

Table A2.1 (Continued). Number of simulations and p -values of GOF test statistics for 6 categories with uniform expected frequencies of 2 and common OrdKS value.

n	OrdKS Value	T_{χ^2}	T_{OrdKS}	T_{NomKS}	$T_{A^2(Cat)}$	$T_{U^2(Cat)}$	$T_{W^2(Cat)}$
4000	4	0.034	0.040	0.299	0.002	0.052	0.003
	5	0.005	0.017	0.077	0	0.008	0
	6	0	0.001	0.011	0	0	0
4500	4	0.034	0.075	0.295	0.003	0.046	0.004
	5	0.006	0.016	0.075	0	0.006	0
	6	0	0.002	0.012	0	0	0
5000	4	0.030	0.075	0.28	0.002	0.047	0.003
	5	0.005	0.013	0.072	0	0.005	0.006
	6	0.001	0.002	0.01	0	0	0
7500	4	0.032	0.079	0.287	0.003	0.044	0.003
	5	0.005	0.015	0.073	0	0.007	0
	6	0.001	0.002	0.011	0	0.001	0
10000	4	0.034	0.081	0.300	0.002	0.048	0.002
	5	0.005	0.015	0.072	0	0.006	0.004
	6	0	0.001	0.001	0	0	0

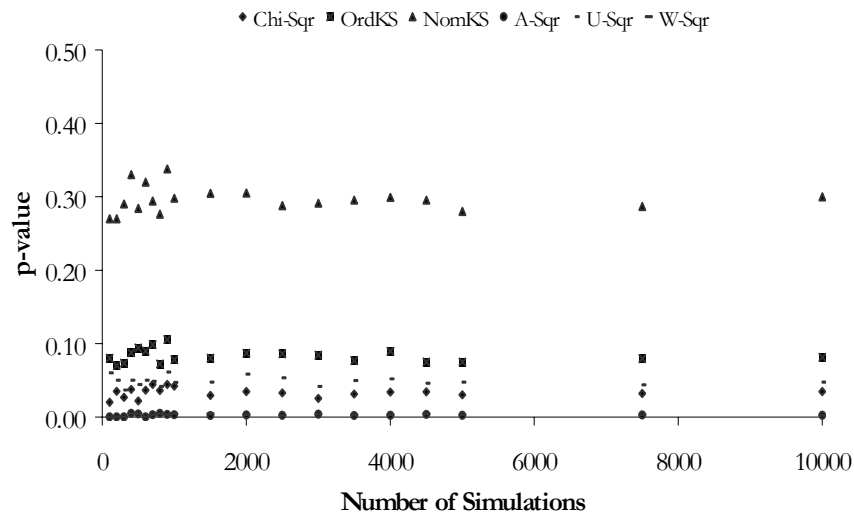


Figure A2.1. Number of simulations and p -values of GOF test statistics for 6 categories with uniform expected frequencies of 2 and $T_{OrdKS} = 4$.

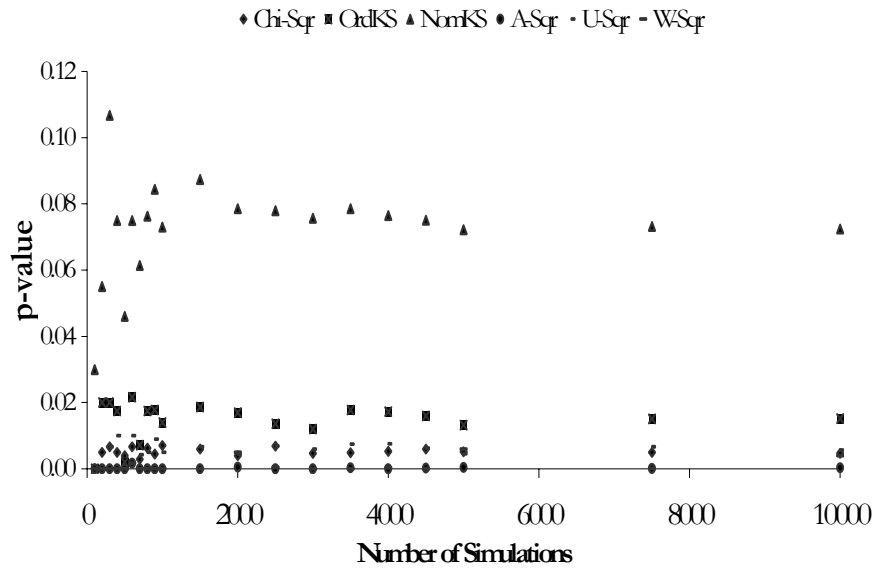


Figure A2.2. Number of simulations and p -values of GOF test statistics for 6 categories with uniform expected frequencies of 2 and $T_{OrdKS} = 5$.

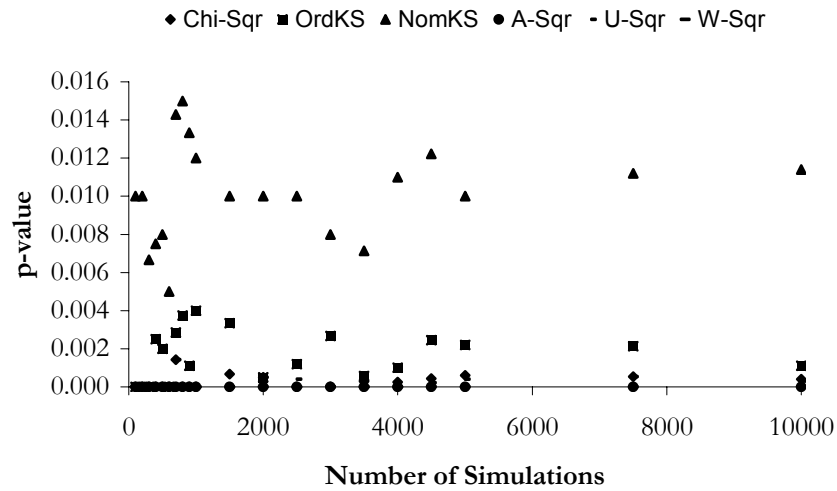


Figure A2.3. Number of simulations and p -values of GOF test statistics for 6 categories with uniform expected frequencies of 2 and $T_{OrdKS} = 6$.

Table A2.2. Number of simulations and p -values for Kolmogorov-Smirnov test statistics for 7 categories ranked 1223334 with uniform expected frequencies of 2 and common OrdKS value.

n	OrdKS Value	T_{OrdKS}	T_{CombKS}	T_{NomKS}	n	OrdKS Value	T_{OrdKS}	T_{CombKS}	T_{NomKS}
100	4	0.04	0.18	0.47	1500	4	0.125	0.203	0.463
	5	0.02	0.02	0.11		5	0.025	0.044	0.173
	6	0	0	0.03		6	0.003	0.007	0.043
200	4	0.14	0.235	0.475	2000	4	0.132	0.213	0.482
	5	0.01	0.035	0.225		5	0.028	0.054	0.189
	6	0.005	0.005	0.055		6	0.007	0.012	0.046
300	4	0.197	0.24	0.527	2500	4	0.123	0.206	0.481
	5	0.037	0.047	0.18		5	0.027	0.054	0.198
	6	0.01	0.013	0.08		6	0.004	0.006	0.043
400	4	0.11	0.205	0.478	3000	4	0.129	0.215	0.501
	5	0.023	0.048	0.185		5	0.028	0.048	0.179
	6	0.008	0.01	0.05		6	0.007	0.014	0.051
500	4	0.12	0.202	0.434	3500	4	0.123	0.202	0.479
	5	0.03	0.054	0.192		5	0.032	0.052	0.191
	6	0.004	0.014	0.06		6	0.007	0.010	0.044
600	4	0.142	0.21	0.475	4000	4	0.128	0.213	0.492
	5	0.03	0.05	0.177		5	0.029	0.052	0.184
	6	0.002	0.002	0.035		6	0.003	0.007	0.040
700	4	0.127	0.233	0.514	4500	4	0.134	0.213	0.491
	5	0.033	0.04	0.163		5	0.032	0.056	0.183
	6	0.007	0.013	0.0364		6	0.004	0.009	0.043
800	4	0.145	0.224	0.483	5000	4	0.125	0.204	0.472
	5	0.03	0.053	0.185		5	0.027	0.048	0.181
	6	0.006	0.011	0.056		6	0.004	0.008	0.042
900	4	0.129	0.219	0.51	7500	4	0.123	0.203	0.483
	5	0.032	0.052	0.194		5	0.030	0.051	0.185
	6	0.008	0.011	0.047		6	0.004	0.008	0.042
1000	4	0.124	0.198	0.462	10000	4	0.132	0.206	0.484
	5	0.03	0.049	0.195		5	0.030	0.050	0.183
	6	0.003	0.009	0.046		6	0.006	0.009	0.043

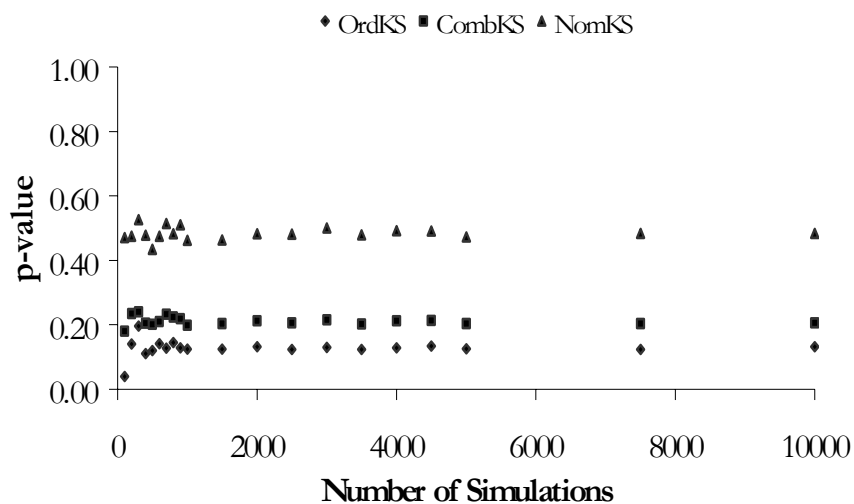


Figure A2.4. Number of simulations and p -values - Kolmogorov-Smirnov test statistics for 7 categories ranked 1223334 with uniform expected frequencies of 2 and $T_{OrdKS} = 4$.

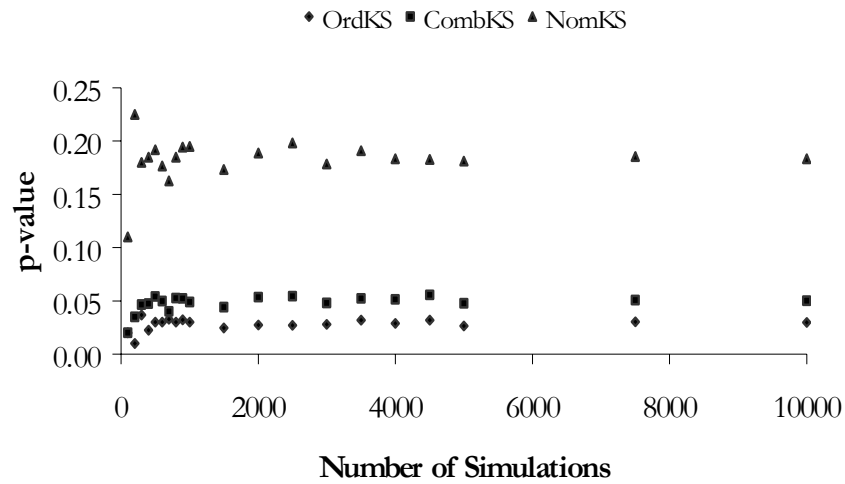


Figure A2.5.Number of simulations and p -values - Kolmogorov-Smirnov test statistics for 7 categories ranked 1223334 with uniform expected frequencies of 2 and $T_{OrdKS} = 5$.

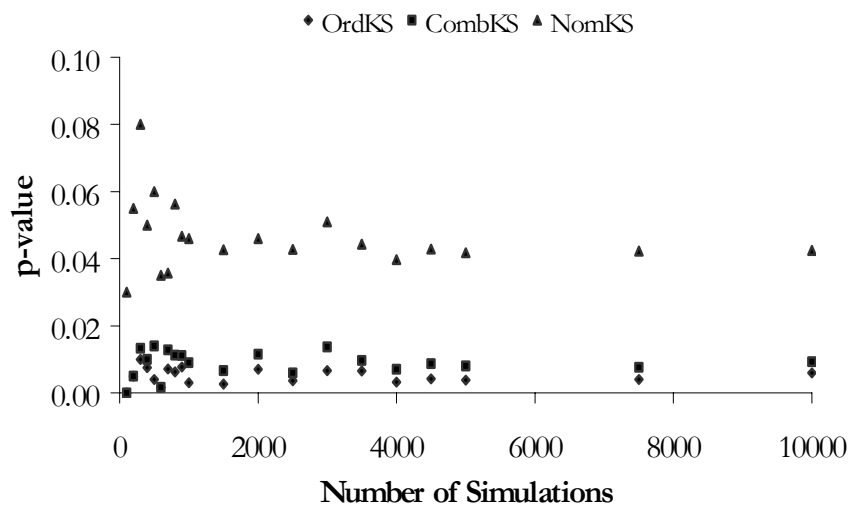


Figure A2.6.Number of simulations and p -values - Kolmogorov-Smirnov test statistics for 7 categories ranked 1223334 with uniform expected frequencies of 2 and $T_{OrdKS} = 6$.

Appendix 3: Example of Output from GFIT

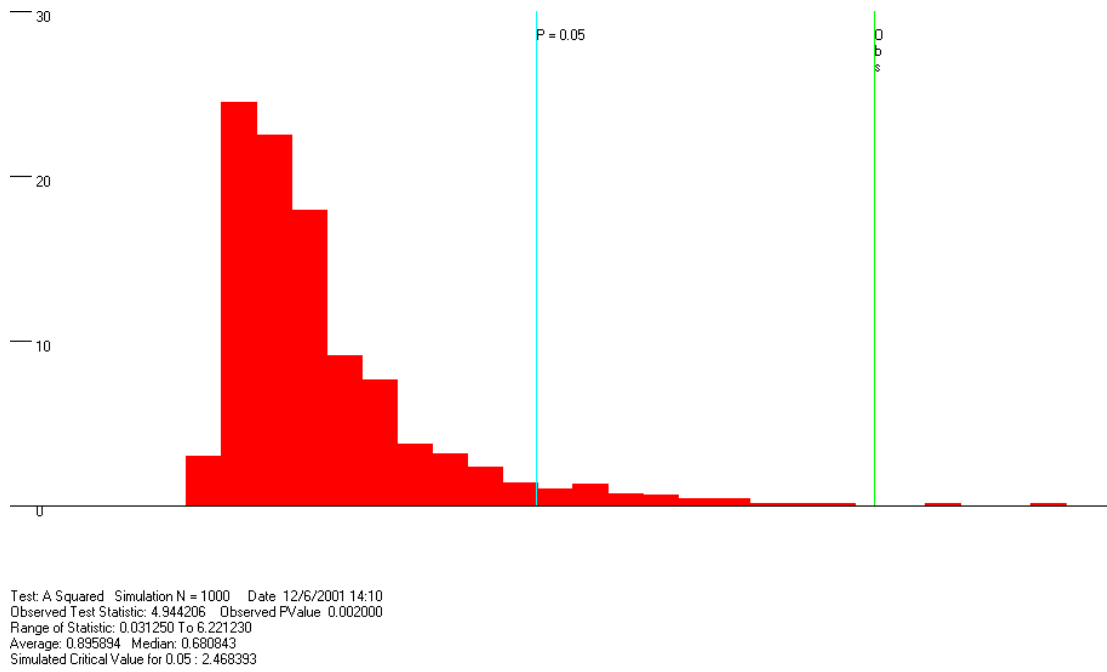


Figure A3.1 Example of output from GFIT.

Appendix 4: Graphical Results from Power Studies

Note: For all figures in Appendix 4, k represents the number of categories and E_i represents the uniform expected frequencies.

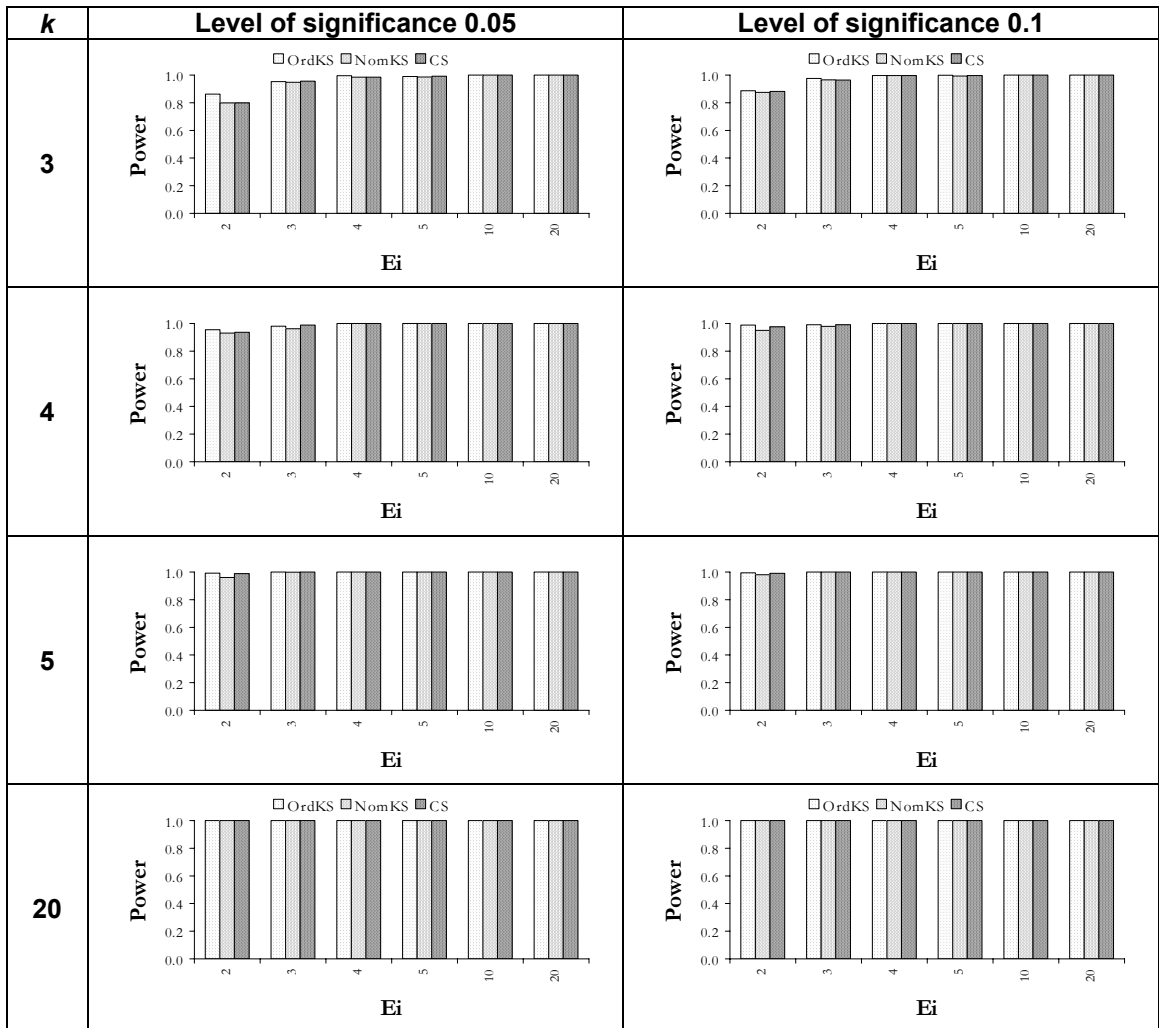


Figure A4.1. Power - uniform null against $A_1(0.1)$ alternative distribution.

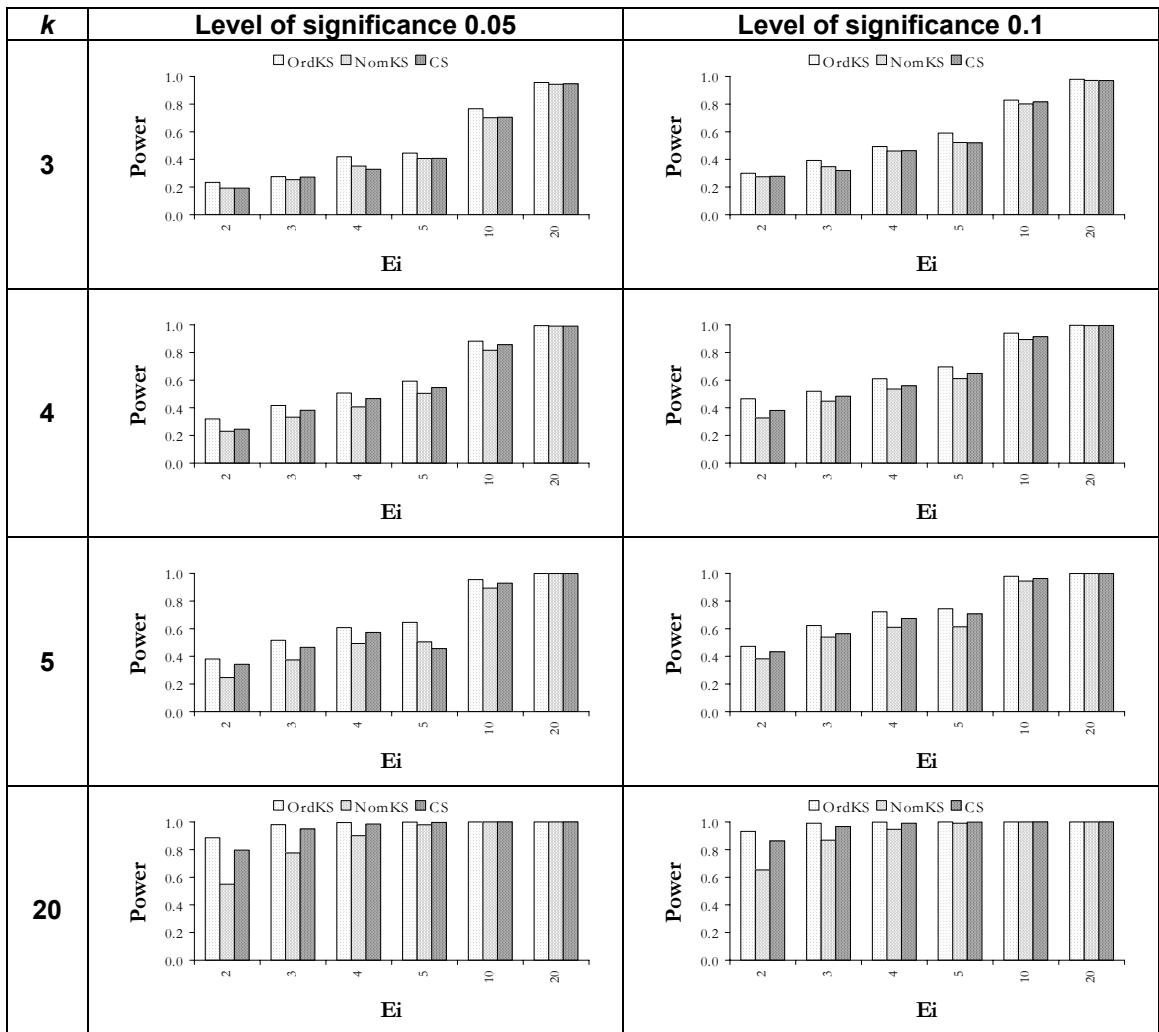


Figure A4.2. Power - uniform null against $A_1(0.5)$ alternative distribution.

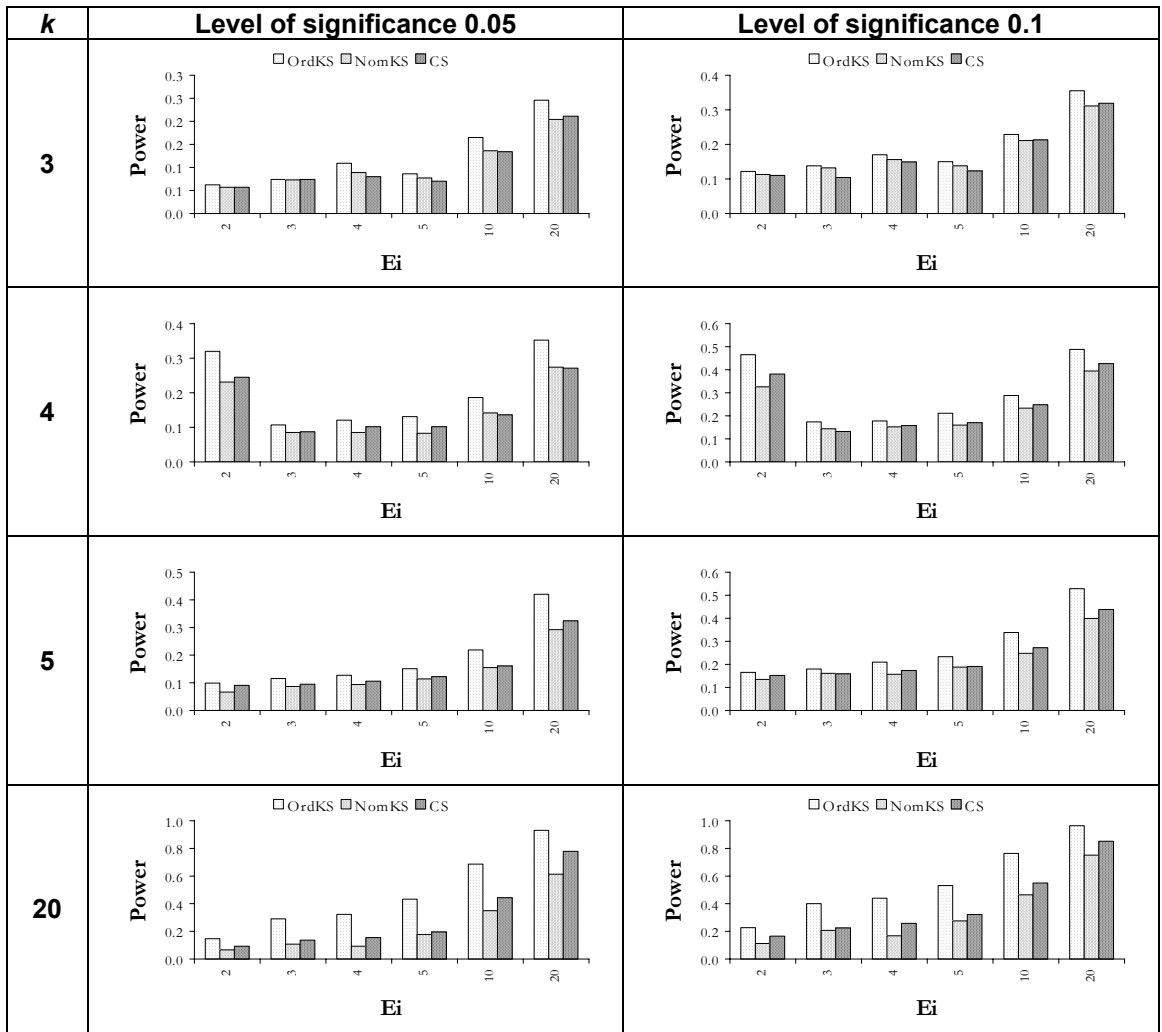


Figure A4.3. Power - uniform null against $A_1(0.8)$ alternative distribution.

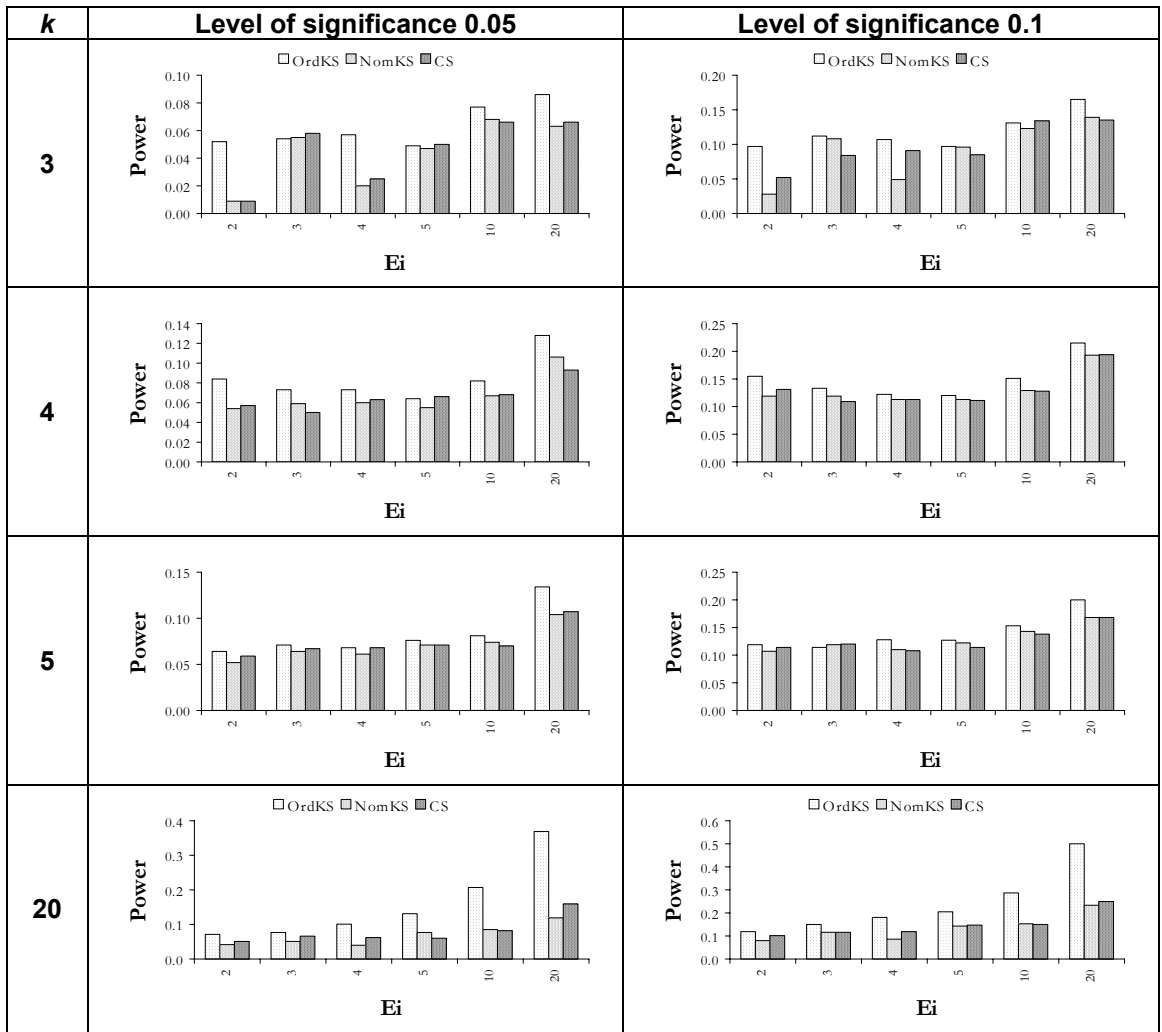


Figure A4.4. Power - uniform null against $A_1(0.9)$ alternative distribution.

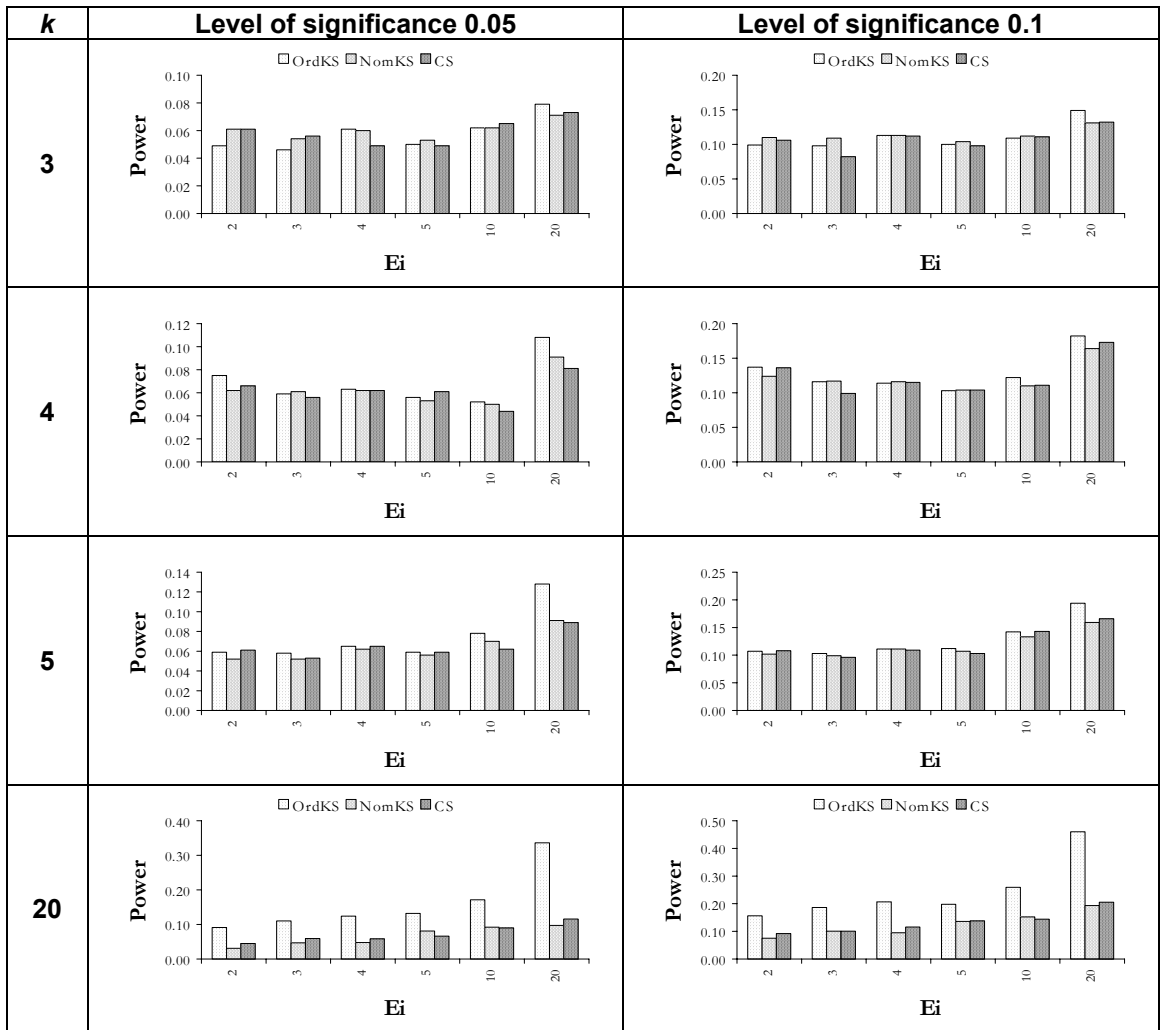


Figure A4.5. Power - uniform null against $A_1(1.1)$ alternative distribution.

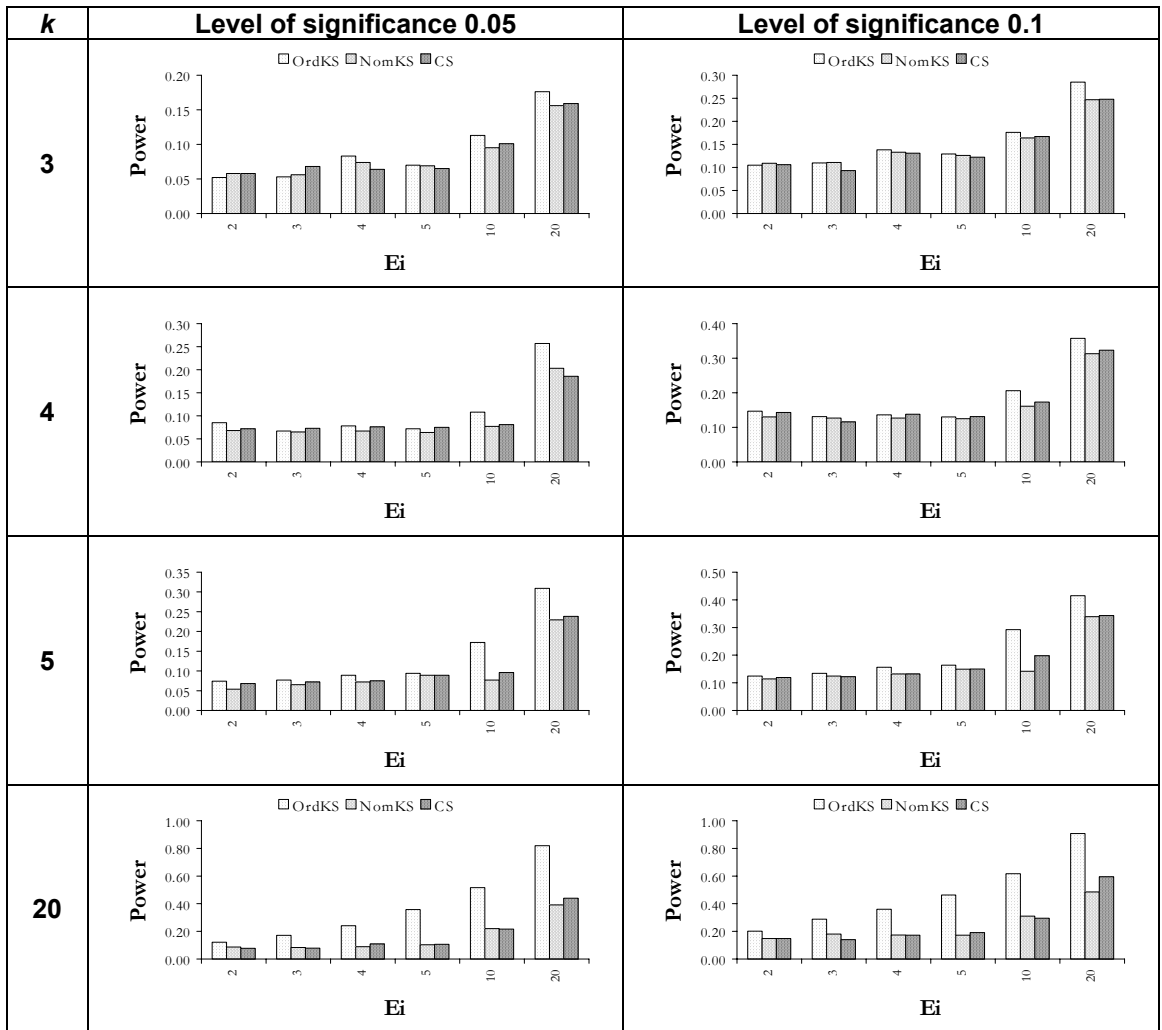


Figure A4.6. Power - uniform null against $A_1(1.2)$ alternative distribution.

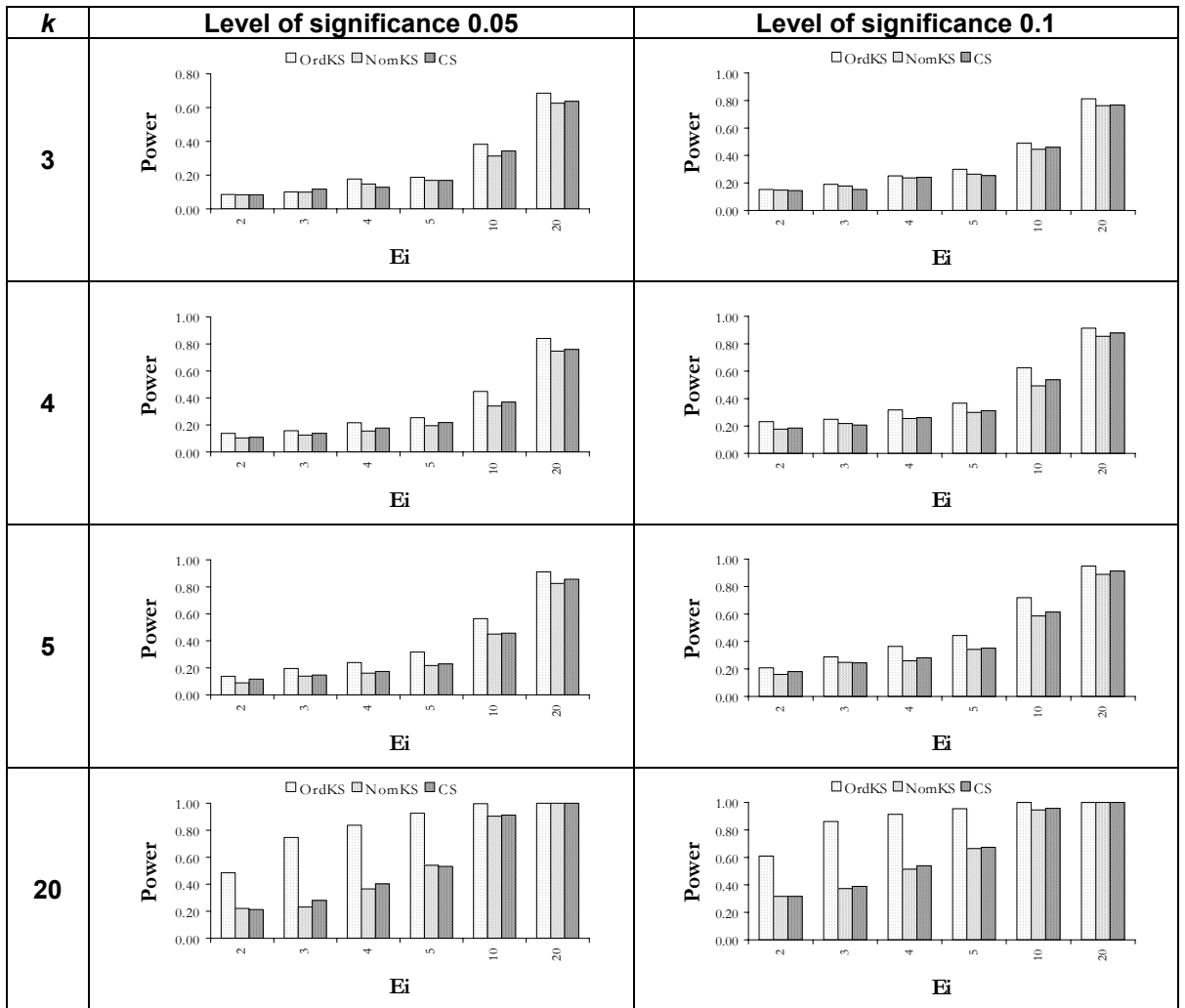


Figure A4.7. Power - uniform null against $A_1(1.5)$ alternative distribution.

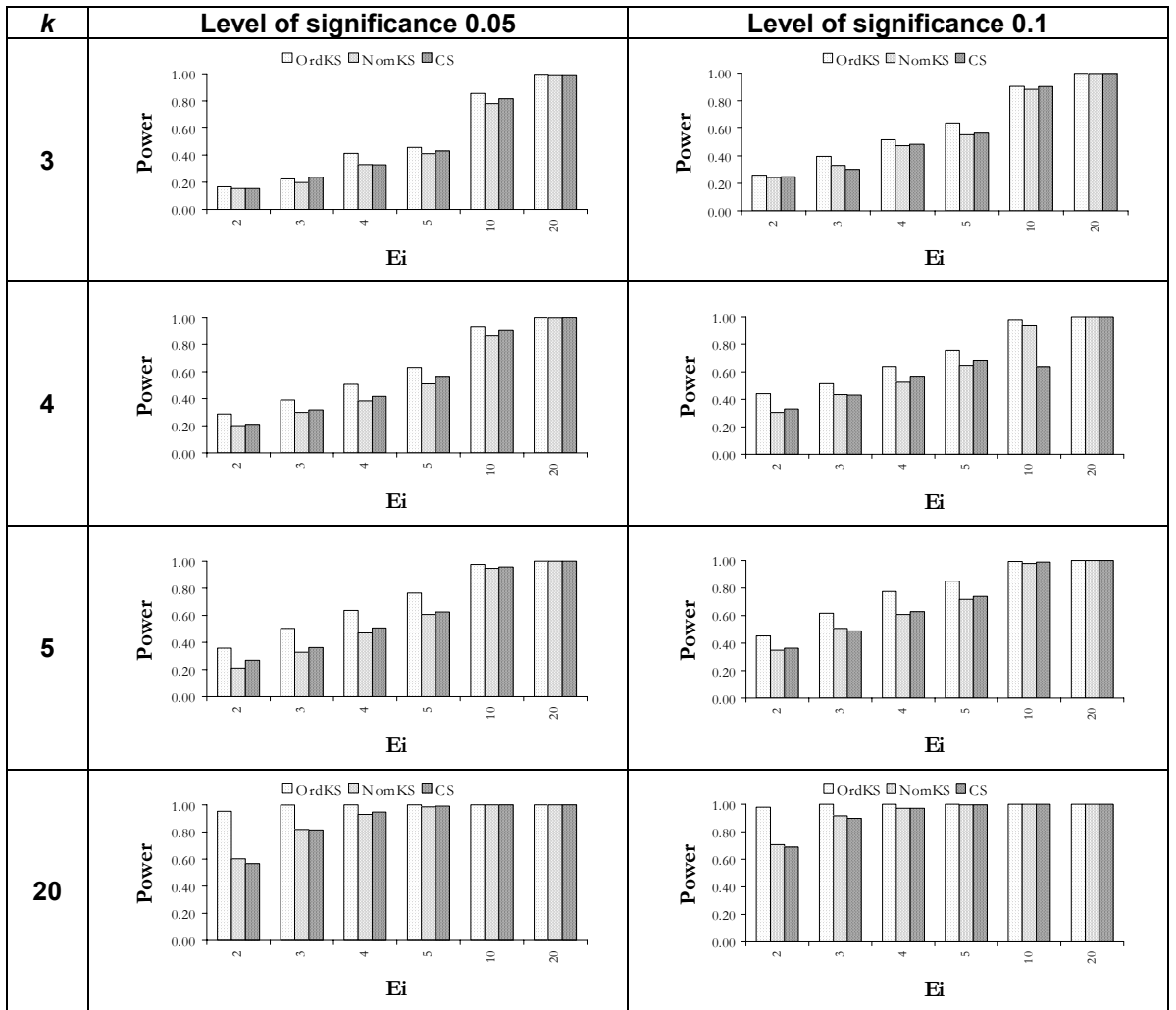


Figure A4.8. Power - uniform null against $A_1(2)$ alternative distribution.

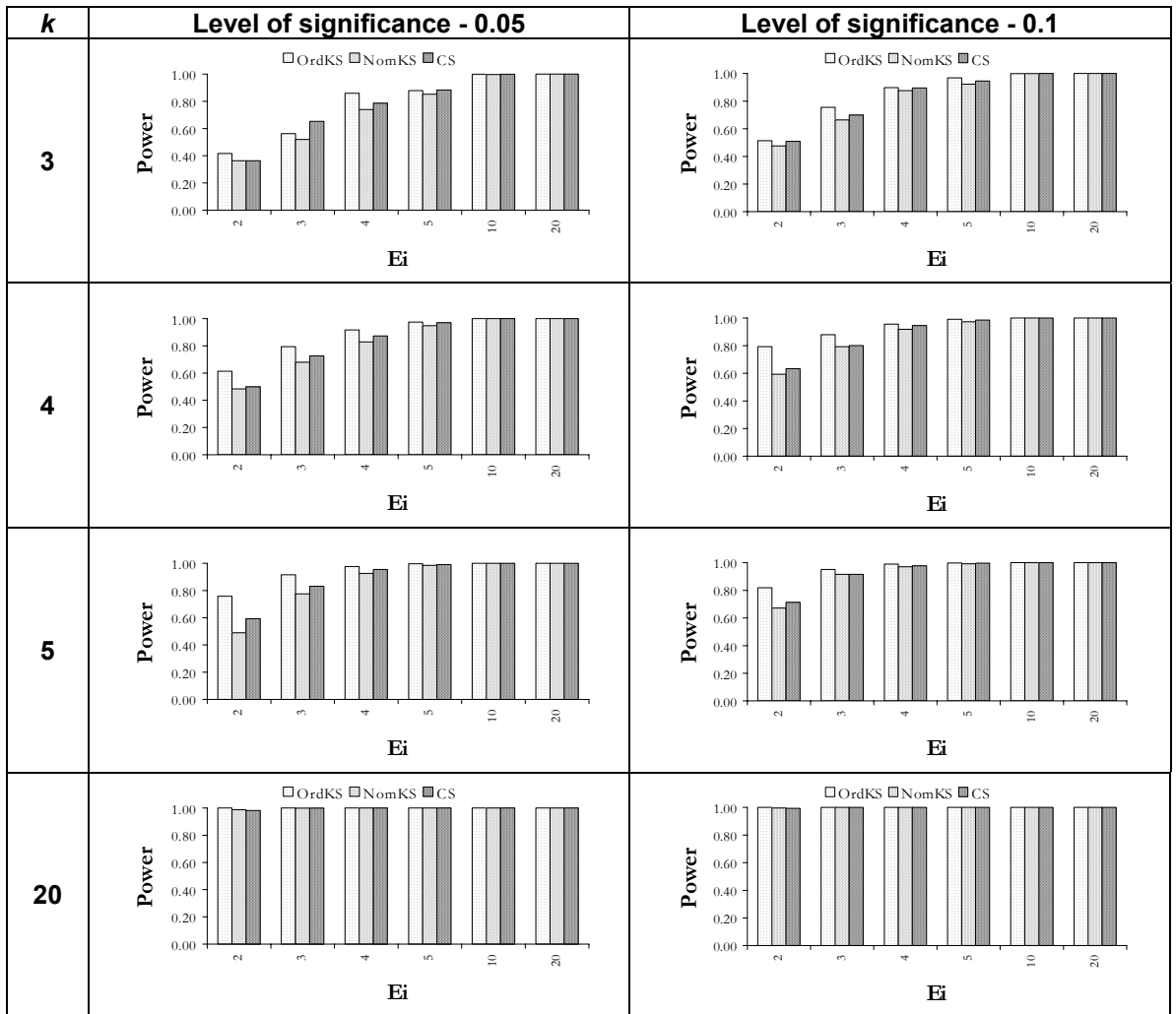


Figure A4.9. Power - uniform null against $A_1(3)$ alternative distribution.

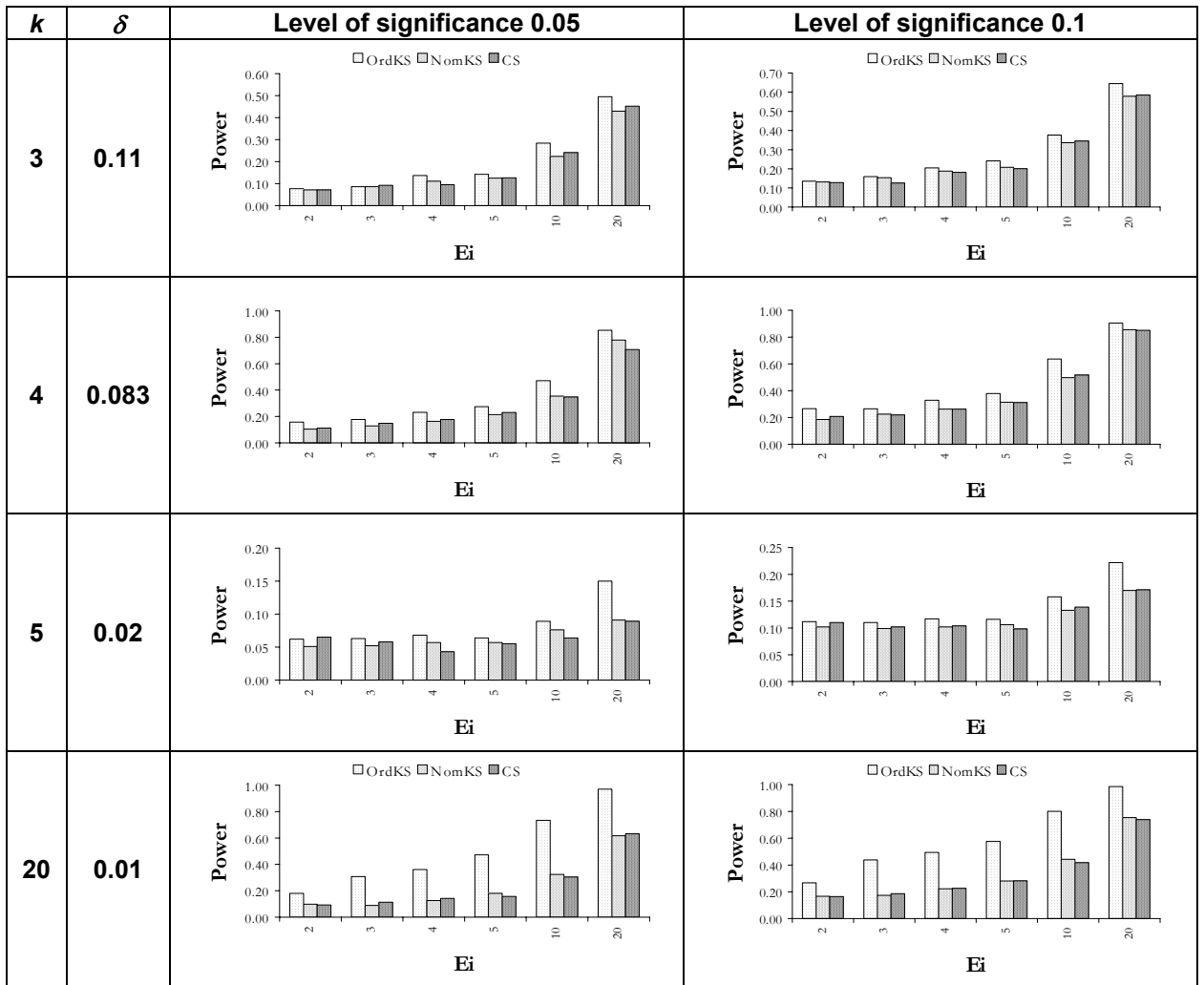


Figure A4.10. Power - uniform null against $A_2(\delta)$ alternative distribution with $\delta < 1/2k$.

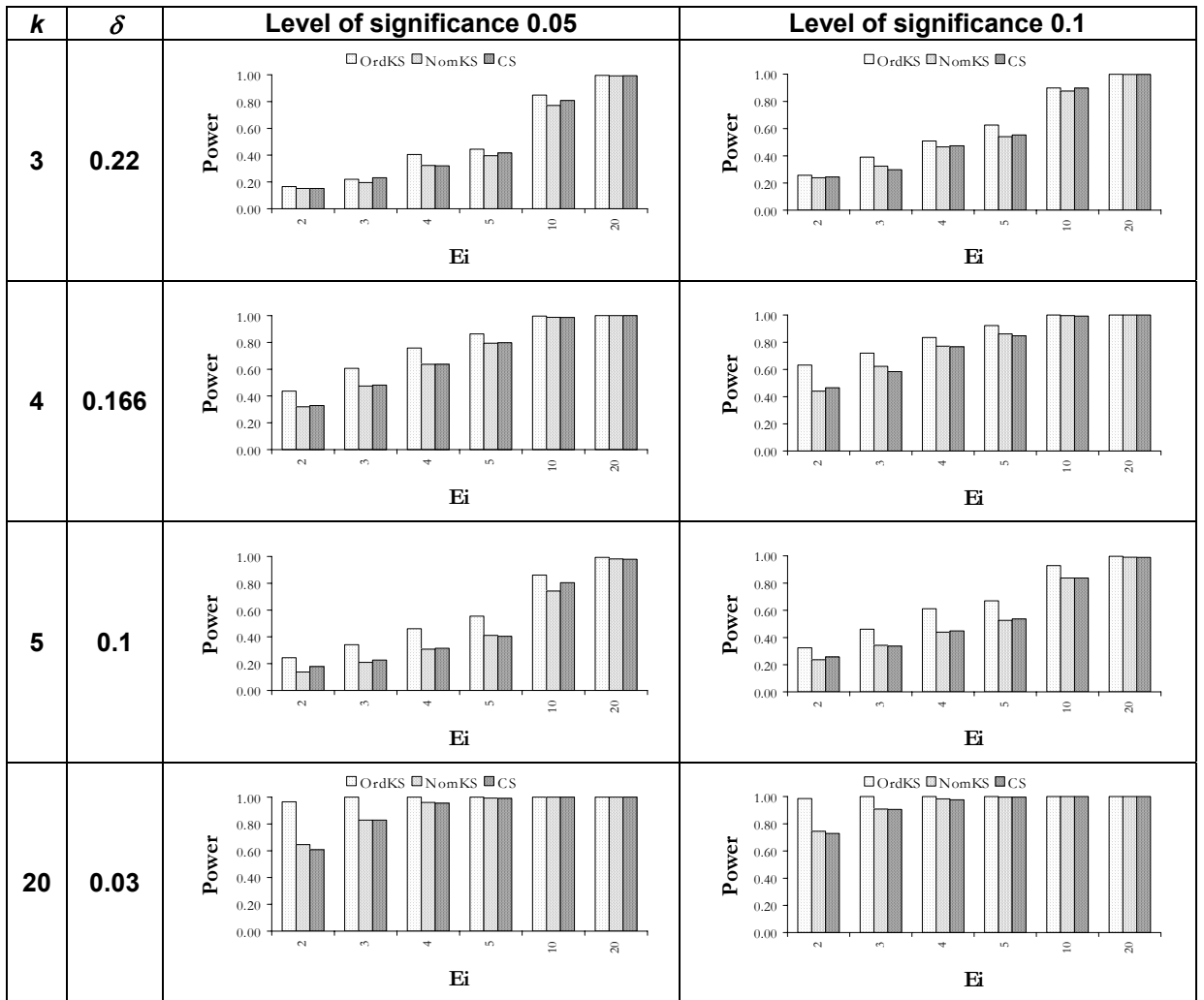


Figure A4.11. Power - uniform null against $A_2(\delta)$ alternative distribution with $\delta \approx 1/2k$.

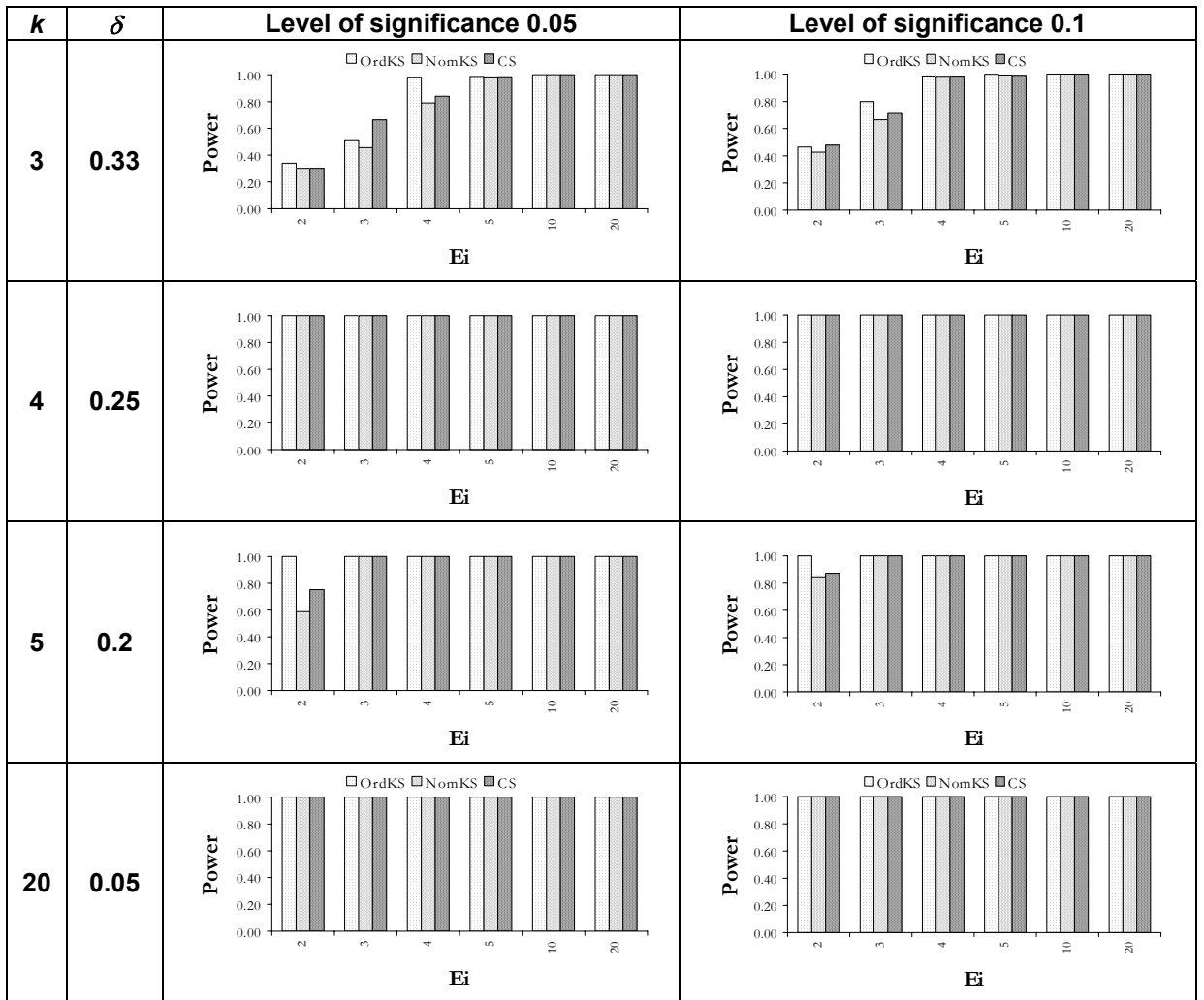


Figure A4.12. Power - uniform null against $A_2(\delta)$ alternative distribution with $\delta = 1/k$.

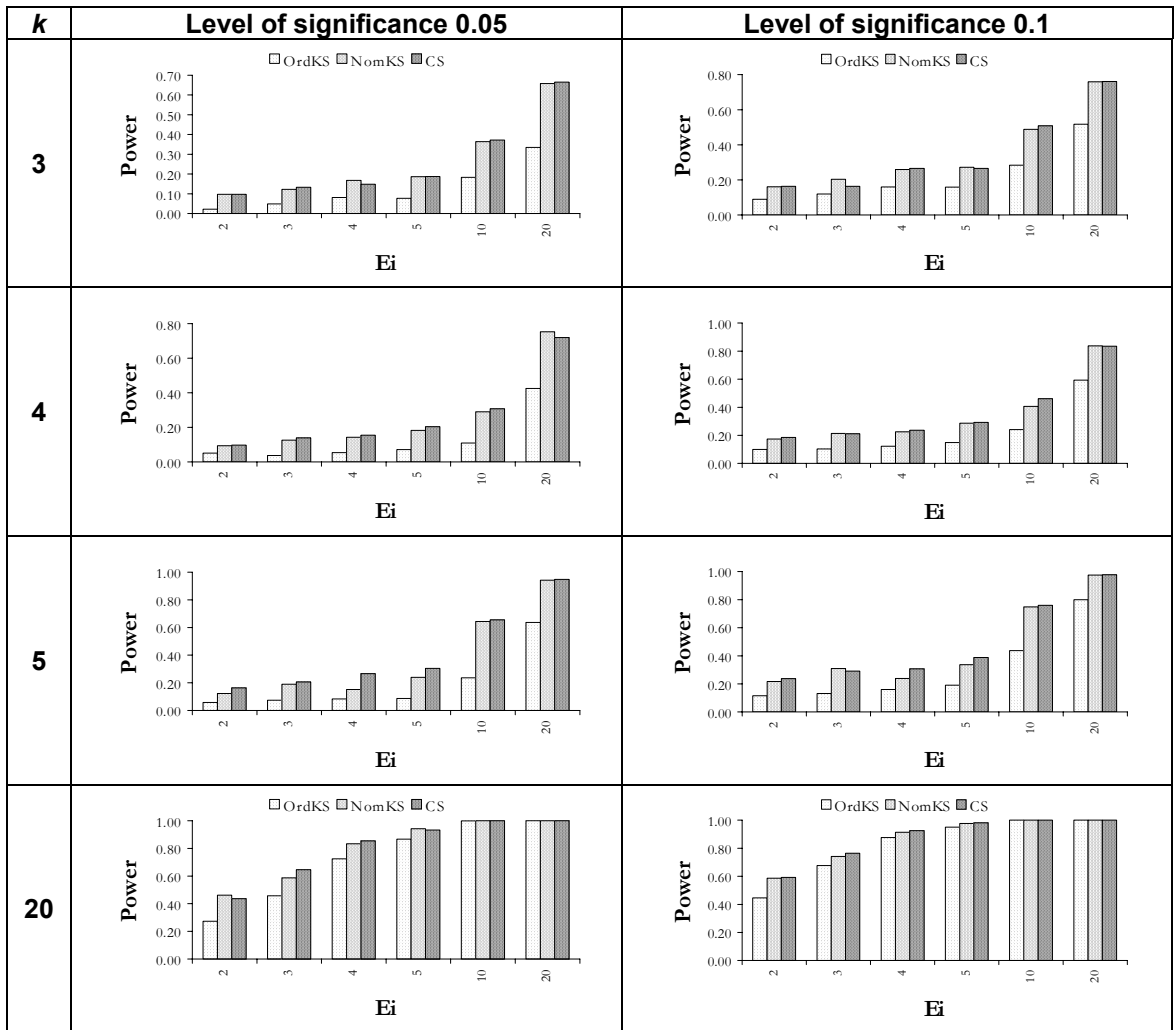


Figure A4.13. Power - uniform null against A_3 alternative distribution.

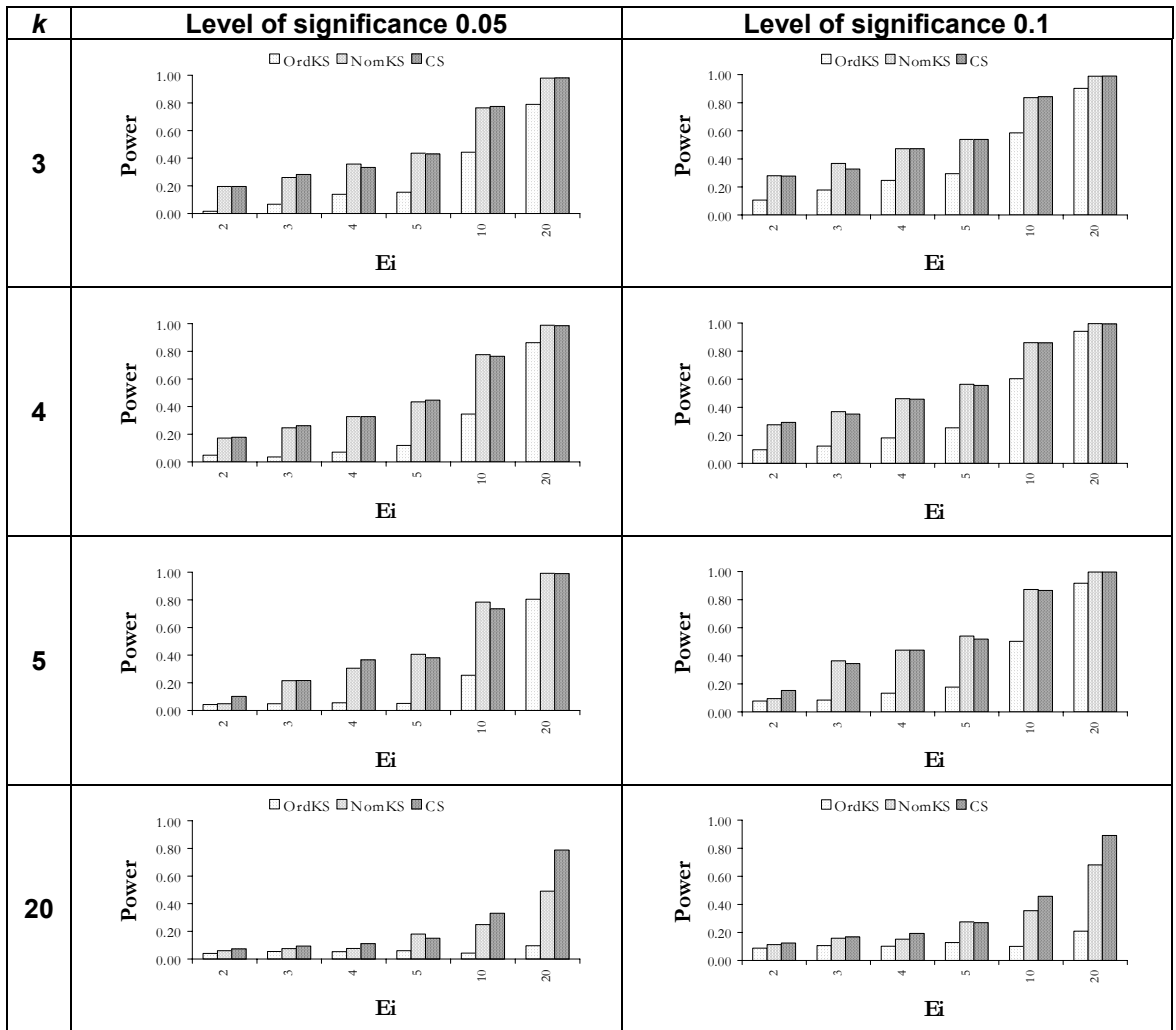


Figure A4.14. Power - uniform null against A_4 alternative distribution.

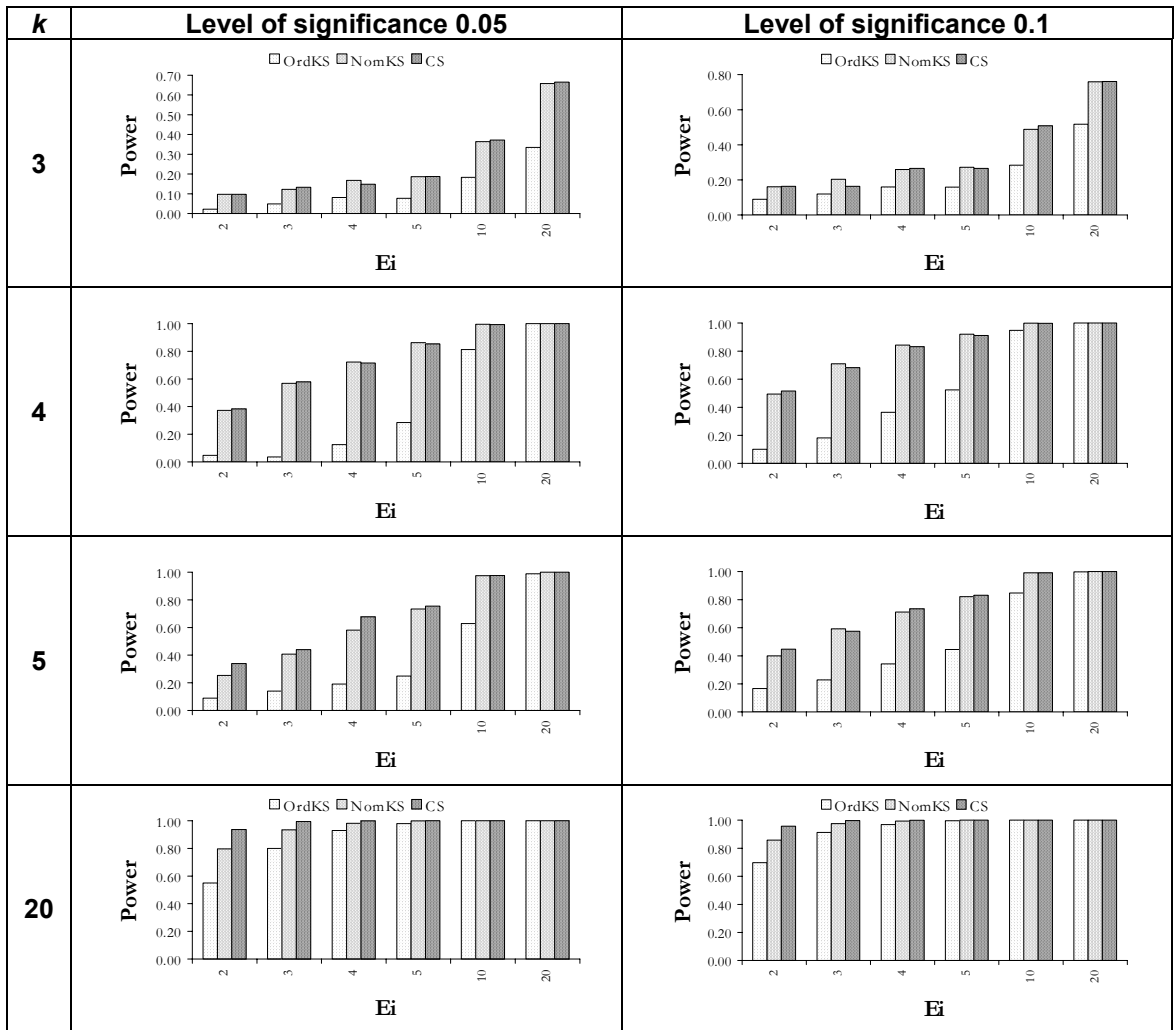


Figure A4.15. Power - uniform null against A_5 alternative distribution.