LIST OF TABLES

TABLES

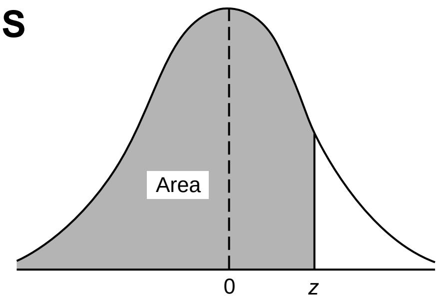

Table 1 The normal curve

(a) Area under the normal curve

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
−3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
−3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
−3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
−3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
−3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
−2.9	0.0019	0.0018	0.0017	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0124	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0352	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0722	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table 1(a) continued

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9278	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Source: Walpole and Myers, 1989

(b) critical values for a standard normal distribution

The normal distribution is symmetrical with respect to $\mu = 0$.

Level of significance α		z
Two-sided	One-sided	
0.001	0.0005	3.29
0.002	0.001	3.09
0.0026	0.0013	3.00
0.01	0.05	2.58
0.02	0.01	2.33
0.0456	0.0228	2.00
0.05	0.025	1.96
0.10	0.05	1.64
0.20	0.10	1.28
0.318	0.159	1.00

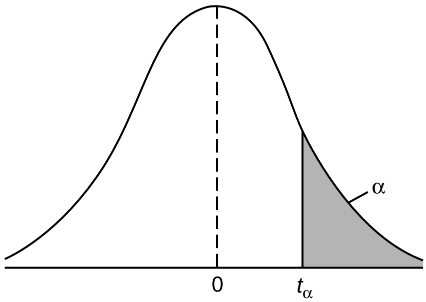

Table 2 Critical values of the *t*-distribution

ν	Level of significance α				
	0.10	0.05	0.025	0.01	0.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
∞	1.282	1.645	1.960	2.326	2.576

Source: Fisher and Yates, 1974

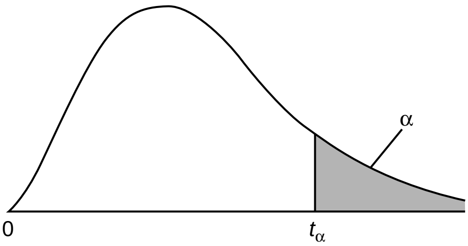

Table 3 Critical values of the *F*-distribution

Level of significance $\alpha = 0.05$

ν_2 \ ν_1	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

Table 3 continued

Level of significance $\alpha = 0.05$

ν_2 \ ν_1	10	12	15	20	24	30	40	60	120	∞
1	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

Table 3 continued

Level of significance $\alpha = 0.01$

ν_2 \ ν_1	1	2	3	4	5	6	7	8	9
1	4052	4999	5403	5625	5764	5859	5928	5981	6022
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56
∞	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41

Table 3 continued

Level of significance $\alpha = 0.01$

ν_2 \ ν_1	10	12	15	20	24	30	40	60	120	∞
1	6056	6106	6157	6209	6235	6261	6287	6313	6339	6366
2	99.40	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50
3	27.23	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13
4	14.55	14.37	14.20	14.02	13.39	13.84	13.75	13.65	13.56	13.46
5	10.05	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
6	7.87	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88
7	6.62	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65
8	5.81	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86
9	5.26	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31
10	4.85	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91
11	4.54	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60
12	4.30	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36
13	4.10	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17
14	3.94	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00
15	3.80	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87
16	3.69	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75
17	3.59	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65
18	3.51	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57
19	3.43	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49
20	3.37	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42
21	3.31	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36
22	3.26	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31
23	3.21	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26
24	3.17	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21
25	3.13	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17
26	3.09	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13
27	3.06	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10
28	3.03	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06
29	3.00	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03
30	2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
40	2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
60	2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
120	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
∞	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00

Source: Pearson and Hartley, 1970

Table 4 Fisher z-transformation

$$z(r) = \tfrac{1}{2}\log_e\left(\frac{1+r}{1-r}\right) = \tanh^{-1} r = 1.1513\log_{10}\left(\frac{1+r}{1-r}\right)$$

z	0	1	2	3	4	5	6	7	8	9
0.0	0.0000	0.0100	0.0200	0.0300	0.0400	0.0500	0.0601	0.0701	0.0802	0.0902
0.1	0.1003	0.1104	0.1206	0.1307	0.1409	0.1511	0.1614	0.1717	0.1820	0.1923
0.2	0.2027	0.2132	0.2237	0.2341	0.2448	0.2554	0.2661	0.2769	0.2877	0.2986
0.3	0.3095	0.3205	0.3316	0.3428	0.3541	0.3654	0.3769	0.3884	0.4001	0.4118
0.4	0.4236	0.4356	0.4477	0.4599	0.4722	0.4847	0.4973	0.5101	0.5230	0.5361
0.5	0.5493	0.5627	0.5763	0.5901	0.6042	0.6184	0.6328	0.6475	0.6625	0.6777
0.6	0.6931	0.7089	0.7250	0.7414	0.7582	0.7753	0.7928	0.8107	0.8291	0.8480
0.7	0.8673	0.8872	0.9076	0.9287	0.9505	0.9730	0.9962	1.0203	1.0454	1.0714
0.8	1.0986	1.1270	1.1568	1.1881	1.2212	1.2562	1.2933	1.3331	1.3758	1.4219
0.90	1.4722	1.4775	1.4828	1.4882	1.4937	1.4992	1.5047	1.5103	1.5160	1.5217
0.91	1.5275	1.5334	1.5393	1.5453	1.5513	1.5574	1.5636	1.5698	1.5762	1.5826
0.92	1.5890	1.5956	1.6022	1.6089	1.6157	1.6226	1.6296	1.6366	1.6438	1.6510
0.93	1.6584	1.6658	1.6734	1.6811	1.6888	1.6967	1.7047	1.7129	1.7211	1.7295
0.94	1.7380	1.7467	1.7555	1.7645	1.7736	1.7828	1.7923	1.8019	1.8117	1.8216
0.95	1.8318	1.8421	1.8527	1.8635	1.8745	1.8857	1.8972	1.9090	1.9210	1.9333
0.96	1.9459	1.9588	1.9721	1.9857	1.9996	2.0139	2.0287	2.0439	2.0595	2.0756
0.97	2.0923	2.1095	2.1273	2.1457	2.1649	2.1847	2.2054	2.2269	2.2494	2.2729
0.98	2.2976	2.3235	2.3507	2.3796	2.4101	2.4427	2.4774	2.5147	2.5550	2.5987
0.99	2.6467	2.6995	2.7587	2.8257	2.9031	2.9945	3.1063	3.2504	3.4534	3.8002

Source: Neave, 1978

Table 5 Critical values for the χ^2-distribution

Columns *a* denote the lower boundaries or the left-sided critical values.
Columns *b* denote the upper boundaries or the right-sided critical values.

	Level of significance α							
Two-sided One-sided	0.20 0.10		0.10 0.05		0.05 0.025		0.01 0.005	
ν	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*
1	0.016	2.71	39.10^{-4}	3.84	98.10^{-5}	5.02	16.10^{-5}	6.63
2	0.21	4.61	0.10	5.99	0.05	7.38	0.02	9.21
3	0.58	6.25	0.35	7.81	0.22	9.35	0.11	11.34
4	1.06	7.78	0.71	9.49	0.48	11.14	0.30	13.28
5	1.61	9.24	1.15	11.07	0.83	12.83	0.55	15.09
6	2.20	10.64	1.64	12.59	1.24	14.45	0.87	16.81
7	2.83	12.02	2.17	14.07	1.69	16.01	1.24	18.48
8	3.49	13.36	2.73	15.51	2.18	17.53	1.65	20.09
9	4.17	14.68	3.33	16.92	2.70	19.02	2.09	21.67
10	4.87	15.99	3.94	18.31	3.25	20.48	2.56	23.21
11	5.58	17.28	4.57	19.68	3.82	21.92	3.05	24.73
12	6.30	18.55	5.23	21.03	4.40	23.34	3.57	26.22
13	7.04	19.81	5.89	22.36	5.01	24.74	4.11	27.69
14	7.79	21.06	6.57	23.68	5.63	26.12	4.66	29.14
15	8.55	22.31	7.26	25.00	6.26	27.49	5.23	30.58
16	9.31	23.54	7.96	26.30	6.91	28.85	5.81	32.00
17	10.09	24.77	8.67	27.59	7.56	30.19	6.41	33.41
18	10.86	25.99	9.39	28.87	8.23	31.53	7.01	34.81
19	11.65	27.20	10.12	30.14	8.91	32.85	7.63	36.19
20	12.44	28.41	10.85	31.41	9.59	34.17	8.26	37.57
21	13.24	29.62	11.59	32.67	10.28	35.48	8.90	38.93
22	14.04	30.81	12.34	33.92	10.98	36.78	9.54	40.29
23	14.85	32.01	13.09	35.17	11.69	38.08	10.20	41.64
24	15.66	33.20	13.85	36.42	12.40	39.36	10.86	42.98
25	16.47	34.38	14.61	37.65	13.12	40.65	11.52	44.31
26	17.29	35.56	15.38	38.89	13.84	41.92	12.20	45.64
27	18.11	36.74	16.15	40.11	14.57	43.19	12.88	46.96
28	18.94	37.92	16.93	41.34	15.31	44.46	13.56	48.28
29	19.77	39.09	17.71	42.56	16.05	45.72	14.26	49.59
30	20.60	40.26	18.49	43.77	16.79	46.98	14.95	50.89
40	29.05	51.81	26.51	55.76	24.43	59.34	22.16	63.69
50	37.69	63.17	34.76	67.50	32.36	71.42	29.71	76.15
60	46.46	74.40	43.19	79.08	40.48	83.30	37.48	88.38
70	55.33	85.53	51.74	90.53	48.76	95.02	45.44	100.43
80	64.28	96.58	60.39	101.88	57.15	106.63	53.54	112.33
90	73.29	107.57	69.13	113.15	65.65	118.14	61.75	124.12
100	82.36	118.50	77.93	124.34	74.22	129.56	70.06	135.81

Table 6 Critical values of r for the correlation test with $\rho = 0$

The distribution is symmetrical with respect to $\rho = 0$.

	Level of significance α				
Two-sided	0.10	0.05	0.02	0.01	0.001
One-sided	0.05	0.025	0.01	0.005	0.0005
$\nu = n - 2$					
1	0.988	0.997	0.9995	0.9999	1.000
2	0.900	0.950	0.980	0.990	0.999
3	0.805	0.878	0.934	0.959	0.991
4	0.729	0.811	0.882	0.917	0.974
5	0.669	0.754	0.833	0.874	0.951
6	0.622	0.707	0.789	0.834	0.925
7	0.582	0.666	0.750	0.798	0.898
8	0.549	0.632	0.716	0.765	0.872
9	0.521	0.602	0.685	0.735	0.847
10	0.497	0.576	0.658	0.708	0.823
11	0.476	0.553	0.634	0.684	0.801
12	0.458	0.532	0.612	0.661	0.780
13	0.441	0.514	0.592	0.641	0.760
14	0.426	0.497	0.574	0.623	0.742
15	0.412	0.482	0.558	0.606	0.725
16	0.400	0.468	0.542	0.590	0.708
17	0.389	0.456	0.528	0.575	0.693
18	0.378	0.444	0.516	0.561	0.679
19	0.369	0.433	0.503	0.549	0.665
20	0.360	0.423	0.492	0.537	0.652
22	0.344	0.404	0.472	0.515	0.629
24	0.330	0.388	0.453	0.496	0.607
25	0.323	0.381	0.445	0.487	0.597
30	0.296	0.349	0.409	0.449	0.554
35	0.275	0.325	0.381	0.418	0.519
40	0.257	0.304	0.358	0.372	0.490
45	0.243	0.288	0.338	0.372	0.415
50	0.231	0.273	0.322	0.354	0.443
55	0.220	0.261	0.307	0.338	0.424
60	0.211	0.250	0.295	0.325	0.408
65	0.203	0.240	0.284	0.312	0.393
70	0.195	0.232	0.274	0.302	0.380
75	0.189	0.224	0.264	0.292	0.368
80	0.183	0.217	0.256	0.283	0.357
85	0.178	0.211	0.249	0.275	0.347
90	0.173	0.205	0.242	0.267	0.338
95	0.168	0.200	0.236	0.260	0.329
100	0.164	0.195	0.230	0.254	0.321
125	0.147	0.174	0.206	0.228	0.288
150	0.134	0.159	0.189	0.208	0.264
175	0.124	0.148	0.174	0.194	0.248
200	0.116	0.138	0.164	0.181	0.235
300	0.095	0.113	0.134	0.148	0.188
500	0.074	0.088	0.104	0.115	0.148
1000	0.052	0.062	0.073	0.081	0.104
2000	0.037	0.044	0.056	0.058	0.074

Source: De Jonge, 1963–4

Table 7 Critical values of g_1 and g_2 for Fisher's cumulant test

The g_1 distribution may be considered as symmetrical with respect to 0;
the g_2 distribution has to be considered as asymmetrical.
The columns *a* denote the lower boundaries or left-sided critical values.
The columns *b* denote the upper boundaries or right-sided critical values.

	g_1		g_2			
	Level of significance α					
Two-sided	0.10	0.02	0.10		0.02	
One-sided	0.05	0.01	0.05		0.01	
n			*a*	*b*	*a*	*b*
50	0.550	0.812	–	–	–	–
75	0.454	0.664	–	–	–	–
100	0.395	0.576	−0.62	1.53	−0.80	1.53
125	0.354	0.514	−0.57	1.34	−0.74	1.34
150	0.324	0.469	−0.53	1.22	−0.69	1.22
175	0.301	0.434	−0.50	1.11	−0.66	1.11
200	0.282	0.406	−0.47	1.04	−0.62	1.04
250	0.253	0.362	−0.44	0.91	−0.57	0.91
300	0.231	0.331	−0.40	0.82	−0.53	0.82
350	0.214	0.306	−0.37	0.75	−0.49	0.75
400	0.201	0.286	−0.35	0.69	−0.48	0.69
450	0.189	0.270	−0.33	0.65	−0.44	0.65
500	0.180	0.256	−0.32	0.62	−0.42	0.62
550	0.171	0.244	−0.30	0.59	−0.41	0.59
600	0.163	0.234	−0.29	0.55	−0.39	0.55
650	0.157	0.225	−0.28	0.53	−0.38	0.53
700	0.151	0.215	−0.27	0.51	−0.37	0.51
750	0.146	0.208	−0.26	0.49	−0.35	0.49
800	0.142	0.202	−0.25	0.47	−0.34	0.47
850	0.138	0.196	−0.25	0.46	−0.33	0.46
900	0.134	0.190	−0.24	0.44	−0.33	0.44
950	0.130	0.185	−0.23	0.43	−0.32	0.43
1000	0.127	0.180	−0.23	0.42	−0.31	0.42

Source: Geary and Pearson, n.d.; Bennett and Franklin, 1961

Table 8 Critical values for the Dixon test of outliers

Test Statistic	n	Level of significance α 0.30	0.20	0.10	0.05	0.02	0.01	0.005
$r_{10} = \dfrac{x_2 - x_1}{x_n - x_1}$	3	0.684	0.781	0.886	0.941	0.976	0.988	0.994
	4	0.471	0.560	0.679	0.765	0.846	0.889	0.926
	5	0.373	0.451	0.557	0.642	0.729	0.780	0.821
	6	0.318	0.386	0.482	0.560	0.644	0.698	0.740
	7	0.281	0.344	0.434	0.507	0.586	0.637	0.680
$r_{11} = \dfrac{x_2 - x_1}{x_{n-1} - x_1}$	8	0.318	0.385	0.479	0.554	0.631	0.683	0.725
	9	0.288	0.352	0.441	0.512	0.587	0.635	0.677
	10	0.265	0.325	0.409	0.477	0.551	0.597	0.639
$r_{21} = \dfrac{x_3 - x_1}{x_{n-1} - x_1}$	11	0.391	0.442	0.517	0.576	0.638	0.679	0.713
	12	0.370	0.419	0.490	0.546	0.605	0.642	0.675
	13	0.351	0.399	0.467	0.521	0.578	0.615	0.649
$r_{22} = \dfrac{x_3 - x_1}{x_{n-2} - x_1}$	14	0.370	0.421	0.492	0.546	0.602	0.641	0.674
	15	0.353	0.402	0.472	0.525	0.579	0.616	0.647
	16	0.338	0.386	0.454	0.507	0.559	0.595	0.624
	17	0.325	0.373	0.438	0.490	0.542	0.577	0.605
	18	0.314	0.361	0.424	0.475	0.527	0.561	0.589
	19	0.304	0.350	0.412	0.462	0.514	0.547	0.575
	20	0.295	0.340	0.401	0.450	0.502	0.535	0.562
	21	0.287	0.331	0.391	0.440	0.491	0.524	0.551
	22	0.280	0.323	0.382	0.430	0.481	0.514	0.541
	23	0.274	0.316	0.374	0.421	0.472	0.505	0.532
	24	0.268	0.310	0.367	0.413	0.464	0.497	0.524
	25	0.262	0.304	0.360	0.406	0.457	0.489	0.516

Source: Dixon and Massey, 1957

Table 9 Critical values of the Studentized range for multiple comparison

Level of significance $\alpha = 0.05$

ν_2 \ K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	17.969	26.98	32.82	37.08	40.41	43.12	45.40	47.36	49.07	50.59	51.96	53.20	54.33	55.36	56.32	57.22	58.04	58.83	59.56
2	6.085	8.33	9.80	10.88	11.74	12.44	13.03	13.54	13.99	14.39	14.75	15.08	15.38	15.65	15.91	16.14	16.37	16.57	16.77
3	4.501	5.91	6.82	7.50	8.04	8.48	8.85	9.18	9.46	9.72	9.95	10.15	10.35	10.52	10.69	10.84	10.98	11.11	11.24
4	3.926	5.04	5.76	6.29	6.71	7.05	7.35	7.60	7.83	8.03	8.21	8.37	8.52	8.66	8.79	8.91	9.03	9.13	9.23
5	3.635	4.60	5.22	5.67	6.03	6.33	6.58	6.80	6.99	7.17	7.32	7.47	7.60	7.72	7.83	7.93	8.03	8.12	8.21
6	3.460	4.34	4.90	5.30	5.63	5.90	6.12	6.32	6.49	6.65	6.79	6.92	7.03	7.14	7.24	7.34	7.43	7.51	7.59
7	3.344	4.16	4.68	5.06	5.36	5.61	5.82	6.00	6.16	6.30	6.43	6.55	6.66	6.76	6.85	6.94	7.02	7.10	7.17
8	3.261	4.04	4.53	4.89	5.17	5.40	5.60	5.77	5.92	6.05	6.18	6.29	6.39	6.48	6.57	6.65	6.73	6.80	6.87
9	3.199	3.95	4.41	4.76	5.02	5.24	5.43	5.59	5.74	5.87	5.98	6.09	6.19	6.28	6.36	6.44	6.51	6.58	6.64
10	3.151	3.88	4.33	4.65	4.91	5.12	5.30	5.46	5.60	5.72	5.83	5.93	6.03	6.11	6.19	6.27	6.34	6.40	6.47
11	3.113	3.82	4.26	4.57	4.82	5.03	5.20	5.35	5.49	5.61	5.71	5.81	5.90	5.98	6.06	6.13	6.20	6.27	6.33
12	3.081	3.77	4.20	4.51	4.75	4.95	5.12	5.27	5.39	5.51	5.61	5.71	5.80	5.88	5.95	6.02	6.09	6.15	6.21
13	3.055	3.73	4.15	4.45	4.69	4.88	5.05	5.19	5.32	5.43	5.53	5.63	5.71	5.79	5.85	5.93	5.99	6.05	6.11
14	3.033	3.70	4.11	4.41	4.64	4.83	4.99	5.13	5.25	5.36	5.46	5.55	5.64	5.71	5.79	5.85	5.91	5.97	6.03
15	3.014	3.67	4.08	4.37	4.59	4.78	4.94	5.08	5.20	5.31	5.40	5.49	5.57	5.65	5.72	5.78	5.85	5.90	5.96
16	2.998	3.65	4.05	4.33	4.56	4.74	4.90	5.03	5.15	5.26	5.35	5.44	5.52	5.59	5.66	5.73	5.79	5.84	5.90
17	2.984	3.63	4.02	4.30	4.52	4.70	4.86	4.99	5.11	5.21	5.31	5.39	5.47	5.54	5.61	5.67	5.73	5.79	5.84
18	2.971	3.61	4.00	4.28	4.49	4.67	4.82	4.96	5.07	5.17	5.27	5.35	5.43	5.50	5.57	5.63	5.69	5.74	5.79
19	2.960	3.59	3.98	4.25	4.47	4.65	4.79	4.92	5.04	5.14	5.23	5.31	5.39	5.46	5.53	5.59	5.65	5.70	5.75
20	2.950	3.58	3.96	4.23	4.45	4.62	4.77	4.90	5.01	5.11	5.20	5.28	5.36	5.43	5.49	5.55	5.61	5.66	5.71
21	2.941	3.56	3.94	4.21	4.43	4.60	4.74	4.87	4.98	5.08	5.17	5.25	5.33	5.40	5.46	5.52	5.58	5.62	5.67
22	2.933	3.55	3.93	4.20	4.41	4.58	4.72	4.85	4.96	5.05	5.15	5.23	5.30	5.37	5.43	5.49	5.55	5.59	5.64
23	2.926	3.54	3.91	4.18	4.39	4.56	4.70	4.83	4.94	5.03	5.12	5.20	5.27	5.34	5.40	5.46	5.52	5.57	5.62
24	2.919	3.53	3.90	4.17	4.37	4.54	4.68	4.81	4.92	5.01	5.10	5.18	5.25	5.32	5.38	5.44	5.49	5.55	5.59

Table 9 continued

ν_2 \ K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
25	2.913	3.52	3.89	4.16	4.36	4.52	4.66	4.79	4.90	4.99	5.08	5.16	5.23	5.30	5.36	5.42	5.48	5.52	5.57
26	2.907	3.51	3.88	4.14	4.34	4.51	4.65	4.78	4.89	4.97	5.06	5.14	5.21	5.28	5.34	5.40	5.46	5.50	5.55
27	2.902	3.51	3.87	4.13	4.33	4.50	4.63	4.76	4.87	4.96	5.04	5.12	5.19	5.26	5.32	5.38	5.43	5.48	5.53
28	2.897	3.50	3.86	4.12	4.32	4.48	4.62	4.75	4.86	4.94	5.03	5.11	5.18	5.24	5.30	5.36	5.42	5.46	5.51
29	2.892	3.49	3.85	4.11	4.31	4.47	4.61	4.73	4.84	4.93	5.01	5.09	5.16	5.23	5.29	5.35	5.40	5.44	5.49
30	2.888	3.49	3.85	4.10	4.30	4.46	4.60	4.72	4.82	4.92	5.00	5.08	5.15	5.21	5.27	5.33	5.38	5.43	5.47
31	2.884	3.48	3.83	4.09	4.29	4.45	4.59	4.71	4.82	4.91	4.99	5.07	5.14	5.20	5.26	5.32	5.37	5.41	5.46
32	2.881	3.48	3.83	4.09	4.28	4.44	4.58	4.70	4.81	4.89	4.98	5.06	5.13	5.19	5.24	5.30	5.35	5.40	5.45
33	2.877	3.47	3.82	4.08	4.27	4.44	4.57	4.69	4.80	4.88	4.97	5.04	5.11	5.17	5.23	5.29	5.34	5.39	5.44
34	2.874	3.47	3.82	4.07	4.27	4.43	4.56	4.68	4.79	4.87	4.96	5.03	5.10	5.16	5.22	5.28	5.33	5.37	5.42
35	2.871	3.46	3.81	4.07	4.26	4.42	4.55	4.67	4.78	4.86	4.95	5.02	5.09	5.15	5.21	5.27	5.32	5.36	5.41
36	2.868	3.46	3.81	4.06	4.25	4.41	4.55	4.66	4.77	4.85	4.94	5.01	5.08	5.14	5.20	5.26	5.31	5.35	5.40
37	2.865	3.45	3.80	4.05	5.25	4.41	4.54	4.65	4.76	4.84	4.93	5.00	5.08	5.14	5.19	5.25	5.30	5.34	5.39
38	2.863	3.45	3.80	4.05	4.24	4.40	4.53	4.64	4.75	4.84	4.92	5.00	5.07	5.13	5.18	5.24	5.29	5.33	5.38
39	2.861	3.44	3.79	4.04	4.24	4.40	4.53	4.64	4.75	4.83	4.92	4.99	5.06	5.12	5.17	5.23	5.28	5.32	5.37
40	2.858	3.44	3.79	4.04	4.23	4.39	4.52	4.63	4.73	4.82	4.90	4.98	5.04	5.11	5.16	5.22	5.27	5.22	5.36
50	2.841	3.41	3.76	4.00	4.19	4.34	4.47	4.58	4.69	4.76	4.85	4.92	4.99	5.05	5.10	5.15	5.20	5.24	5.29
60	2.829	3.40	3.74	3.98	4.16	4.31	4.44	4.55	4.65	4.73	4.81	4.88	4.94	5.00	5.06	5.11	5.15	5.20	5.24
120	2.800	3.36	3.68	3.92	4.10	4.24	4.36	4.47	4.56	4.64	4.71	4.78	4.84	4.90	4.95	5.00	5.04	5.09	5.13
∞	2.772	3.31	3.63	3.86	4.03	4.17	4.29	4.39	4.47	4.55	4.62	4.68	4.74	4.80	4.85	4.89	4.93	4.97	5.01

Table 9 continued

Level of significance $\alpha = 0.01$

ν_2 \ K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	90.025	135.0	164.3	185.6	202.2	215.8	227.2	237.0	245.6	253.2	260.0	266.2	271.8	277.0	281.8	286.3	290.4	294.3	298.0
2	14.036	19.02	22.29	24.72	26.63	28.20	29.53	30.68	31.69	32.59	33.40	34.13	34.81	35.43	36.00	36.53	37.03	37.50	37.95
3	8.260	10.62	12.17	13.33	14.24	15.00	15.64	16.20	16.69	17.13	17.53	17.89	18.22	18.52	18.81	19.07	19.32	19.55	19.77
4	6.511	8.12	9.17	9.96	10.58	11.10	11.55	11.93	12.27	12.57	12.84	13.09	13.32	13.53	13.73	13.91	14.08	14.24	14.40
5	5.702	6.98	7.80	8.42	8.91	9.32	9.67	9.97	10.24	10.48	10.70	10.89	11.08	11.24	11.40	11.55	11.68	11.81	11.93
6	5.243	6.33	7.08	7.56	7.97	8.32	8.61	8.87	9.10	9.30	9.48	9.65	9.81	9.95	10.08	10.21	10.32	10.43	10.54
7	4.949	5.92	6.54	7.01	7.37	7.68	7.94	8.17	8.37	8.55	8.71	8.86	9.00	9.12	9.24	9.35	9.46	9.55	9.65
8	4.745	5.64	6.20	6.62	6.96	7.24	7.47	7.68	7.86	8.03	8.18	8.31	8.44	8.55	8.66	8.76	8.85	8.94	9.03
9	4.596	5.43	5.96	6.35	6.66	6.91	7.13	7.33	7.49	7.65	7.78	7.91	8.03	8.13	8.23	8.33	8.41	8.49	8.57
10	4.482	5.27	5.77	6.14	6.43	6.67	6.87	7.05	7.21	7.36	7.49	7.60	7.71	7.81	7.91	7.99	8.08	8.15	8.23
11	4.392	5.15	5.62	5.97	6.25	6.48	6.67	6.84	6.99	7.13	7.25	7.36	7.46	7.56	7.65	7.73	7.81	7.88	7.95
12	4.320	5.05	5.50	5.84	6.10	6.32	6.51	6.67	6.81	6.94	7.06	7.17	7.26	7.36	7.44	7.52	7.59	7.66	7.73
13	4.260	4.96	5.40	5.73	5.98	6.19	6.37	6.53	6.67	6.79	6.90	7.01	7.10	7.19	7.27	7.35	7.42	7.48	7.55
14	4.210	4.89	5.32	5.63	5.88	6.08	6.26	6.41	6.54	6.66	6.77	6.87	6.96	7.05	7.13	7.20	7.27	7.33	7.39
15	4.167	4.84	5.25	5.56	5.80	5.99	6.16	6.31	6.44	6.55	6.66	6.76	6.84	6.93	7.00	7.07	7.14	7.20	7.26
16	4.131	4.79	5.19	5.49	5.72	5.92	6.08	6.22	6.35	6.46	6.56	6.66	6.74	6.82	6.90	6.97	7.03	7.09	7.15
17	4.099	4.74	5.14	5.43	5.66	5.85	6.01	6.15	6.27	6.38	6.48	6.57	6.66	6.73	6.81	6.87	6.94	7.00	7.05
18	4.071	4.70	5.09	5.38	5.60	5.79	5.94	6.08	6.20	6.31	6.41	6.50	6.58	6.65	6.73	6.79	6.85	6.91	6.97
19	4.045	4.67	5.05	5.33	5.55	5.73	5.89	6.02	6.14	6.25	6.34	6.43	6.51	6.58	6.65	6.72	6.78	6.84	6.89
20	4.024	4.64	5.02	5.29	5.51	5.69	5.84	5.97	6.09	6.19	6.28	6.37	6.45	6.52	6.59	6.65	6.71	6.77	6.82
21	4.004	4.61	4.99	5.26	5.47	5.65	5.80	5.92	6.04	6.14	6.24	6.32	6.39	6.47	6.53	6.59	6.65	6.70	6.76
22	3.986	4.58	4.96	5.22	5.43	5.61	5.76	5.88	6.00	6.10	6.19	6.27	6.35	6.42	6.48	6.54	6.60	6.65	6.70
23	3.970	4.56	4.93	5.20	5.40	5.57	5.72	5.84	5.96	6.06	6.15	6.23	6.30	6.37	6.43	6.49	6.55	6.60	6.65
24	3.955	4.55	4.91	5.17	5.37	5.54	5.69	5.81	5.92	6.02	6.11	6.19	6.26	6.33	6.39	6.45	6.51	6.56	6.61

Table 9 continued

ν_2 \ K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
25	3.942	4.52	4.89	5.15	5.34	5.51	5.66	5.78	5.89	5.99	6.07	6.15	6.22	6.29	6.35	6.41	6.47	6.52	6.57
26	3.930	4.50	4.87	5.12	5.32	5.49	5.63	5.75	5.86	5.95	6.04	6.12	6.19	6.26	6.32	6.38	6.43	6.48	6.53
27	3.918	4.49	4.85	5.10	5.30	5.46	5.61	5.72	5.83	5.93	6.01	6.09	6.16	6.22	6.28	6.34	6.40	6.45	6.50
28	3.908	4.47	4.83	5.08	5.28	5.44	5.58	5.70	5.80	5.90	5.98	6.06	6.13	6.19	6.25	6.31	6.37	6.42	6.47
29	3.889	4.45	4.80	5.05	5.24	5.40	5.54	5.65	5.76	5.85	5.93	6.01	6.08	6.14	6.20	6.26	6.31	6.36	6.41
30	3.889	4.45	4.80	5.05	5.24	5.40	5.54	5.65	5.76	5.85	5.93	6.01	6.08	6.14	6.20	6.26	6.31	6.36	6.41
31	3.881	4.44	4.79	5.03	5.22	5.38	5.52	5.63	5.74	5.83	5.91	5.99	6.06	6.12	6.18	6.23	6.29	6.34	6.38
32	3.873	4.43	4.78	5.02	5.21	5.37	5.50	5.61	5.72	5.81	5.89	5.97	6.03	6.09	6.16	6.21	6.26	6.31	6.36
33	3.865	4.42	4.76	5.01	5.19	5.35	5.48	5.59	5.70	5.79	5.87	5.95	6.01	6.07	6.13	6.19	6.24	6.29	6.34
34	3.859	4.41	4.75	4.99	5.18	5.34	5.47	5.58	5.68	5.77	5.86	5.93	5.99	6.05	6.12	6.17	6.22	6.27	6.31
35	3.852	4.41	4.74	4.98	5.16	5.33	5.45	5.56	5.67	5.76	5.84	5.91	5.98	6.04	6.10	6.15	6.20	6.25	6.29
36	3.846	4.40	4.73	4.97	5.15	5.31	5.44	5.55	5.65	5.74	S.82	5.90	5.96	6.02	6.08	6.13	6.18	6.23	6.28
37	3.841	4.39	4.72	4.96	5.14	5.30	5.43	5.54	5.64	5.73	5.81	5.88	5.94	6.00	6.06	6.12	6.17	6.22	6.26
38	3.835	4.38	4.72	4.95	5.13	5.29	5.41	5.52	5.62	5.72	5.80	5.87	5.93	5.99	6.05	6.10	6.15	6.20	6.24
39	3.830	4.38	4.71	4.94	5.12	5.28	5.40	5.51	5.62	5.70	5.78	5.85	5.91	5.97	6.03	6.08	6.13	6.18	6.23
40	3.825	4.37	4.70	4.93	5.11	5.26	5.39	5.50	5.60	5.69	5.76	5.83	5.90	5.96	6.02	6.07	6.12	6.16	6.21
50	3.787	4.32	4.64	4.86	5.04	5.19	5.30	5.41	5.51	5.59	5.67	5.74	5.80	5.86	5.91	5.96	6.01	6.06	6.09
60	3.762	4.28	4.59	4.82	4.99	5.13	5.25	5.36	5.45	5.53	5.60	5.67	5.73	5.78	5.84	5.89	5.93	5.97	6.01
120	3.702	4.20	4.50	4.71	4.87	5.01	5.12	5.21	5.30	5.37	5.44	5.50	5.56	5.61	5.66	5.71	5.75	5.79	5.83
∞	3.643	4.12	4.40	4.60	4.76	4.88	4.99	5.08	5.16	5.23	5.29	5.35	5.40	5.45	5.49	5.54	5.57	5.61	5.65

Source: Sachs, 1972

Table 10 Critical values of K for the Link–Wallace test

Level of significance $\alpha = 0.05$

n \ K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	30	40	50
2	3.43	2.35	1.74	1.39	1.15	0.99	0.87	0.77	0.70	0.63	0.58	0.54	0.50	0.47	0.443	0.418	0.396	0.376	0.158	0.245	0.187	0.151
3	1.90	1.44	1.14	0.94	0.80	0.70	0.62	0.56	0.51	0.47	0.43	0.40	0.38	0.35	0.335	0.317	0.301	0.287	0.274	0.189	0.146	0.119
4	1.62	1.25	1.01	0.84	0.72	0.63	0.57	0.51	0.47	1.43	0.40	0.37	0.35	0.33	0.310	0.294	0.279	0.266	0.254	0.177	0.136	0.112
5	1.53	1.19	0.96	0.81	0.70	0.61	0.55	0.50	0.45	0.42	0.39	0.36	0.34	0.32	0.303	0.287	0.273	0.260	0.249	0.173	0.134	0.110
6	1.50	1.17	0.95	0.80	0.69	0.61	0.55	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.302	0.287	0.273	0.260	0.249	0.174	0.135	0.110
7	1.49	1.17	0.95	0.80	0.69	0.61	0.55	0.50	0.45	0.42	0.39	0.36	0.34	0.32	0.304	0.289	0.275	0.262	0.251	0.175	0.136	0.111
8	1.49	1.18	0.96	0.81	0.70	0.62	0.55	0.50	0.46	0.42	0.39	0.37	0.35	0.33	0.308	0.292	0.278	0.265	0.254	0.178	0.138	0.113
9	1.50	1.19	0.97	0.82	0.71	0.62	0.56	0.51	0.47	0.43	0.40	0.37	0.35	0.33	0.312	0.297	0.282	0.269	0.258	0.180	0.140	0.115
10	1.52	1.20	0.98	0.83	0.72	0.63	0.57	0.52	0.47	0.44	0.41	0.38	0.36	0.34	0.317	0.301	0.287	0.274	0.262	0.183	0.142	0.117
11	1.54	1.22	0.99	0.84	0.73	0.64	0.58	0.52	0.48	0.44	0.41	0.38	0.36	0.34	0.322	0.306	0.291	0.278	0.266	0.186	0.145	0.119
12	1.56	1.23	1.01	0.85	0.74	0.65	0.58	0.53	0.49	0.45	0.42	0.39	0.37	0.35	0.327	0.311	0.296	0.282	0.270	0.189	0.147	0.121
13	1.58	1.25	1.02	0.86	0.75	0.66	0.59	0.54	0.49	0.46	0.42	0.40	0.37	0.35	0.332	0.316	0.300	0.287	0.274	0.192	0.149	0.122
14	1.60	1.26	1.03	0.87	0.76	0.67	0.60	0.55	0.50	0.46	0.43	0.40	0.38	0.36	0.337	0.320	0.305	0.291	0.279	0.195	0.152	0.124
15	1.62	1.28	1.05	0.89	0.77	0.68	0.61	0.55	0.51	0.47	0.44	0.41	0.38	0.36	0.342	0.325	0.310	0.295	0.283	0.198	0.154	0.126
16	1.64	1.30	1.06	0.90	0.78	0.69	0.62	0.56	0.52	0.48	0.44	0.41	0.39	0.37	0.348	0.330	0.314	0.300	0.287	0.201	0.156	0.128
17	1.66	1.32	1.08	0.91	0.79	0.70	0.63	0.57	0.52	0.48	0.45	0.42	0.39	0.37	0.352	0.335	0.319	0.304	0.291	0.204	0.158	0.130
18	1.68	1.33	1.09	0.92	0.80	0.71	0.64	0.58	0.53	0.49	0.46	0.43	0.40	0.38	0.357	0.339	0.323	0.308	0.295	0.207	0.161	0.132
19	1.70	1.35	1.10	0.93	0.81	0.72	0.64	0.59	0.54	0.50	0.46	0.43	0.41	0.38	0.362	0.344	0.327	0.312	0.299	0.210	0.163	0.134
20	1.72	1.36	1.12	0.95	0.82	0.73	0.65	0.59	0.54	0.50	0.47	0.44	0.41	0.39	0.367	0.348	0.3.32	0.317	0.303	0.212	0.165	0.135
30	1.92	1.52	1.24	1.05	0.91	0.81	0.73	0.66	0.60	0.56	0.52	0.49	0.46	0.43	0.408	0.387	0.369	0.352	0.337	0.237	0.184	0.151
40	2.08	1.66	1.35	1.14	0.99	0.88	0.79	0.72	0.66	0.61	0.57	0.53	0.50	0.47	0.444	0.422	0.402	0.384	0.367	0.258	0.201	0.165
50	2.23	1.77	1.45	1.22	1.06	0.94	0.85	0.77	0.71	0.65	0.61	0.57	0.53	0.50	0.476	0.453	0.431	0.412	0.394	0.277	0.216	0.177
100	2.81	2.23	1.83	1.55	1.34	1.19	1.07	0.97	0.89	0.83	0.77	0.72	0.67	0.64	0.60	0.573	0.546	0.521	0.499	0.351	0.273	0.224
200	3.61	2.88	2.35	1.99	1.73	1.53	1.38	1.25	1.15	1.06	0.99	0.93	0.87	0.82	0.78	0.74	0.70	0.67	0.64	0.454	0.353	0.290
500	5.15	4.10	3.35	2.84	2.47	2.19	1.97	1.79	1.64	1.52	1.42	1.32	1.24	1.17	1.11	1.06	1.01	0.96	0.92	0.65	0.504	0.414
1000	6.81	5.43	4.44	3.77	3.28	2.90	2.61	2.37	2.18	2.22	1.88	1.76	1.65	1.56	1.47	1.40	1.33	1.27	1.22	0.86	0.669	0.549

Table 10 continued

Level of significance $\alpha = 0.01$

V_2 \ K	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	30	40	50
2	7.92	4.32	2.84	2.10	1.66	1.38	1.17	1.02	0.91	0.82	0.74	0.68	0.63	0.58	0.54	0.51	0.480	0.454	0.430	0.285	0.214	0.172
3	3.14	2.12	1.57	1.25	1.04	0.89	0.78	0.69	0.62	1.57	0.52	0.48	0.45	0.42	0.39	0.37	0.352	0.334	0.318	0.217	0.165	0.134
4	2.48	1.74	1.33	1.08	0.91	0.78	0.69	0.62	0.56	0.51	0.47	0.44	0.41	0.38	0.36	0.34	0.323	0.307	0.293	0.200	0.153	0.125
5	2.24	1.60	1.24	1.02	0.86	0.75	0.66	0.59	0.54	0.49	0.46	0.42	0.40	0.37	0.35	0.33	0.314	0.299	0.285	0.196	0.151	0.123
6	2.14	1.55	1.21	0.99	0.85	0.74	0.65	0.59	0.53	0.49	0.45	0.42	0.39	0.37	0.35	0.33	0.313	0.298	0.284	0.196	0.151	0.123
7	2.10	1.53	1.20	0.99	0.84	0.73	0.65	0.59	0.53	0.49	0.45	0.42	0.39	0.37	0.35	0.33	0.314	0.299	0.286	0.198	0.152	0.124
8	2.09	1.53	1.20	0.99	0.85	0.74	0.66	0.59	0.54	0.49	0.46	0.43	0.40	0.37	0.35	0.33	0.318	0.303	0.289	0.200	0.154	0.126
9	2.09	1.54	1.21	1.00	0.85	0.75	0.66	0.60	0.54	0.50	0.46	0.43	0.40	0.38	0.36	0.34	0.322	0.307	0.293	0.200	0.156	0.127
10	2.10	1.55	1.22	1.01	0.86	0.76	0.67	0.61	0.55	0.51	0.47	0.44	0.41	0.38	0.36	0.34	0.327	0.311	0.297	0.206	0.159	0.129
11	2.11	1.56	1.23	1.02	0.87	0.76	0.68	0.61	0.56	0.51	0.48	0.44	0.42	0.39	0.37	0.35	0.332	0.316	0.302	0.209	0.161	0.132
12	2.13	1.58	1.25	1.04	0.89	0.78	0.69	0.62	0.57	0.52	0.48	0.45	0.42	0.40	0.37	0.35	0.337	0.321	0.306	0.213	0.164	0.134
13	2.15	1.60	1.26	1.05	0.90	0.79	0.70	0.63	0.58	0.53	0.49	0.46	0.43	0.40	0.38	0.36	0.342	0.326	0.311	0.216	0.166	0.136
14	2.18	1.62	1.28	1.06	0.91	0.80	0.71	0.64	0.58	0.54	0.50	0.46	0.43	0.41	0.39	0.36	0.347	0.330	0.316	0.219	0.169	0.138
15	2.20	1.63	1.30	1.08	0.92	0.81	0.72	0.65	0.59	0.54	0.50	0.47	0.44	0.41	0.39	0.37	0.352	0.335	0.320	0.222	0.171	0.140
16	2.22	1.65	1.31	1.09	0.93	0.82	0.73	0.66	0.60	0.55	0.51	0.48	0.45	0.42	0.40	0.38	0.357	0.340	0.325	0.226	0.174	0.142
17	2.25	1.67	1.33	1.10	0.95	0.83	0.74	0.67	0.61	0.56	0.52	0.48	0.45	0.43	0.40	0.38	0.362	0.345	0.329	0.229	0.176	0.144
18	2.27	1.69	1.34	1.12	0.96	0.84	0.75	0.68	0.62	0.57	0.53	0.49	0.46	0.43	0.41	0.39	0.367	0.350	0.334	0.232	0.179	0.146
19	2.30	1.71	1.36	1.13	0.97	0.85	0.76	0.68	0.62	0.57	0.53	0.50	0.46	0.44	0.41	0.39	0.372	0.354	0.338	0.235	0.181	0.148
20	2.32	1.73	1.38	1.14	0.98	0.86	0.77	0.69	0.63	0.58	0.54	0.50	0.47	0.44	0.42	0.40	0.376	0.359	0.343	0.238	0.184	0.150
30	2.59	1.95	1.54	1.27	1.09	0.96	0.85	0.77	0.70	0.65	0.60	0.56	0.52	0.49	0.46	0.44	0.419	0.399	0.381	0.266	0.205	0.168
40	2.80	2.11	1.66	1.38	1.18	1.04	0.93	0.84	0.76	0.70	0.65	0.61	0.57	0.54	0.51	0.48	0.456	0.435	0.415	0.289	0.223	0.183
50	2.99	2.25	1.78	1.48	1.27	1.11	0.99	0.90	0.82	0.75	0.70	0.65	0.61	0.57	0.54	0.51	0.489	0.466	0.446	0.310	0.240	0.196
100	3.74	2.83	2.24	1.86	1.60	1.40	1.25	1.13	1.03	0.95	0.88	0.82	0.77	0.73	0.69	0.65	0.62	0.590	0.564	0.393	0.304	0.248
200	4.79	3.63	2.88	2.39	2.06	1.81	1.61	1.46	1.33	1.23	1.14	1.06	0.99	0.94	0.88	0.84	0.80	0.76	0.73	0.507	0.392	0.320
500	6.81	5.16	4.10	3.41	2.93	2.58	2.30	2.08	1.90	1.75	1.62	1.52	1.42	1.34	1.26	1.20	1.14	1.09	1.04	0.73	0.560	0.458
1000	9.01	6.83	5.42	4.52	3.88	3.41	3.05	2.76	2.52	2.32	2.15	2.01	1.88	1.77	1.68	1.59	1.51	1.44	1.38	0.96	0.743	0.608

Source: Sachs, 1972

Table 11 Critical values for the Dunnett test

Level of significance $\alpha = 0.01$

ν \ K	2	3	4	5	6	7	8	9
5	3.90	4.21	4.43	4.60	4.73	4.85	4.94	5.03
6	3.61	3.88	4.07	4.21	4.33	4.43	4.51	4.59
7	3.42	3.66	3.83	3.96	4.07	4.15	4.23	4.30
8	3.29	3.51	3.67	3.79	3.88	3.96	4.03	4.09
9	3.19	3.40	3.55	3.66	3.75	3.82	3.89	3.94
10	3.11	3.31	3.45	3.56	3.64	3.71	3.78	3.83
11	3.06	3.25	3.38	3.48	3.56	3.63	3.69	3.74
12	3.01	3.19	3.32	3.42	3.50	3.56	3.62	3.67
13	2.97	3.15	3.27	3.37	3.44	3.51	3.56	3.61
14	2.94	3.11	3.23	3.32	3.40	3.46	3.51	3.56
15	2.91	3.08	3.20	3.29	3.36	3.42	3.47	3.52
16	2.88	3.05	3.17	3.26	3.33	3.39	3.44	3.48
17	2.86	3.03	3.14	3.23	3.30	3.36	3.41	3.43
18	2.84	3.01	3.12	3.21	3.27	3.33	3.38	3.42
20	2.81	2.97	3.08	3.17	3.23	3.29	3.34	3.38
24	2.77	2.92	3.03	3.11	3.17	3.22	3.27	3.31
30	2.72	2.87	2.97	3.05	3.11	3.16	3.21	3.24
40	2.68	2.82	2.92	2.99	3.05	3.10	3.14	3.18
60	2.64	2.78	2.87	2.94	3.00	3.04	3.08	3.12
120	2.60	2.73	2.82	2.89	2.94	2.99	3.03	3.06
∞	2.56	2.68	2.77	2.84	2.89	2.93	2.97	3.00

Level of significance $\alpha = 0.05$

ν \ K	2	3	4	5	6	7	8	9
5	2.44	2.68	2.85	2.98	3.08	3.16	3.24	3.30
6	2.34	2.56	2.71	2.83	2.92	3.00	3.07	3.12
7	2.27	2.48	2.62	2.73	2.82	2.89	2.95	3.01
8	2.22	2.42	2.55	2.66	2.74	2.81	2.87	2.92
9	2.18	2.37	2.50	2.60	2.68	2.75	2.81	2.86
10	2.15	2.34	2.47	2.56	2.64	2.70	2.76	2.81
11	2.13	2.31	2.44	2.53	2.60	2.67	2.72	2.77
12	2.11	2.29	2.41	2.50	2.58	2.64	2.69	2.74
13	2.09	2.27	2.39	2.48	2.55	2.61	2.66	2.71
14	2.08	2.25	2.37	2.46	2.53	2.59	2.64	2.69
15	2.07	2.24	2.36	2.44	2.51	2.57	2.62	2.67
16	2.06	2.23	2.34	2.43	2.50	2.56	2.61	2.65
17	2.05	2.22	2.33	2.42	2.49	2.54	2.59	2.64
18	2.04	2.21	2.32	2.41	2.48	2.53	2.58	2.62
20	2.03	2.19	2.30	2.39	2.46	2.51	2.56	2.60
24	2.01	2.17	2.28	2.36	2.43	2.48	2.53	2.57
30	1.99	2.15	2.25	2.33	2.40	2.45	2.50	2.54
40	1.97	2.13	2.23	2.31	2.37	2.42	2.47	2.51
60	1.95	2.10	2.21	2.28	2.35	2.39	2.44	2.48
120	1.93	2.08	2.18	2.26	2.32	2.37	2.41	2.45
∞	1.92	2.06	2.16	2.23	2.29	2.34	2.38	2.46

Source: De Jonge, 1963–4

Table 12 Critical values of *M* for the Bartlett test

C = constant values.

Level of significance $\alpha = 0.01$

K \ C_i	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
3	9.21	9.92	10.47	10.78	10.81	10.50	9.83	–	–	–	–	–	–	–	–	–
4	11.34	11.95	12.46	12.86	13.11	13.18	13.03	12.65	12.03	–	–	–	–	–	–	–
5	13.28	13.81	14.30	14.71	15.03	15.25	15.34	15.28	15.06	14.66	14.07	–	–	–	–	–
6	15.09	15.58	16.03	16.44	16.79	17.07	17.27	17.37	17.37	17.24	16.98	16.03	–	–	–	–
7	16.81	17.27	17.70	18.10	18.46	18.77	19.02	19.21	19.32	19.35	19.28	18.84	17.92	–	–	–
8	18.48	18.91	19.32	19.71	20.07	20.39	20.67	20.90	21.08	21.20	21.35	21.13	20.64	19.76	–	–
9	20.09	20.50	20.90	21.28	21.64	21.97	22.26	22.52	22.74	22.91	23.03	23.10	22.91	22.41	21.56	–
10	21.67	22.06	22.45	22.82	23.17	23.50	23.80	24.08	24.32	24.52	24.69	24.90	24.90	24.66	24.15	23.33
11	23.21	23.59	23.97	24.33	24.67	25.00	25.31	25.59	25.85	26.08	26.28	26.57	26.70	26.65	26.38	25.86
12	24.72	25.10	25.46	25.81	26.15	26.48	26.79	27.08	27.35	27.59	27.81	28.16	28.39	28.46	28.37	28.07
13	26.22	26.58	26.93	27.28	27.62	27.94	28.25	28.54	28.81	29.07	29.30	29.70	29.99	30.16	30.19	30.06
14	27.69	28.04	28.39	28.73	29.06	29.38	29.69	29.98	30.26	30.52	30.77	31.19	31.53	31.77	31.89	31.88
15	29.14	29.39	29.83	30.16	30.49	30.80	30.11	31.40	31.68	31.95	32.20	32.66	33.03	33.32	33.51	33.59

Table 12 continued

Level of significance $\alpha = 0.05$

K \ C_i	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	9.0	10.0
3	5.99	6.47	5.89	7.20	7.38	7.39	7.22	–	–	–	–	–	–	–	–	–
4	7.81	8.24	8.63	8.96	9.21	9.38	9.43	9.37	9.18	–	–	–	–	–	–	–
5	9.49	9.88	10.24	10.57	10.86	11.08	11.24	11.32	11.31	11.21	11.02	–	–	–	–	–
6	11.07	11.43	11.78	12.11	12.40	12.65	12.86	13.01	13.11	13.14	13.10	12.78	–	–	–	–
7	12.59	12.94	13.27	13.59	13.88	14.15	14.38	14.58	14.73	14.83	14.88	14.81	14.49	–	–	–
8	14.07	14.40	14.72	15.03	15.32	15.60	15.84	16.06	16.25	16.40	16.51	16.60	16.49	16.16	–	–
9	15.51	15.83	16.14	16.44	16.73	17.01	17.26	17.49	17.70	17.88	18.03	16.22	18.26	18.12	17.79	–
10	16.92	17.23	17.54	17.83	18.12	18.39	18.65	18.89	19.11	19.31	19.48	19.75	19.89	19.89	19.73	19.40
11	18.31	18.61	18.91	19.20	19.48	19.76	20.02	20.26	20.49	20.70	20.89	21.21	21.42	21.52	21.49	21.32
12	19.68	19.97	20.26	20.55	20.83	21.10	21.36	21.61	21.84	22.06	22.27	22.62	22.88	23.06	23.12	23.07
13	21.03	21.32	21.60	21.89	22.16	22.43	22.69	22.94	23.18	23.40	23.62	23.99	24.30	24.53	24.66	24.70
14	22.36	22.65	22.93	23.21	23.48	23.75	24.01	24.26	24.50	24.73	24.95	25.34	25.68	25.95	26.14	26.25
15	23.68	23.97	24.24	24.52	24.79	25.05	25.31	25.56	25.80	26.04	26.26	26.67	27.03	27.33	27.56	27.73

Source: Merrington and Thompson, 1946

Table 13 Critical values for the Hartley test (right-sided)

Level of significance $\alpha = 0.01$

$n-1$ \ K	2	3	4	5	6	7	8	9	10	11	12
2	199	448	729	1036	1362	1705	2063	2432	2813	3204	3605
3	47.5	85	120	151	184	216*	249*	281*	310*	337*	361*
4	23.2	37	49	59	69	79	89	97	106	113	120
5	14.9	22	28	33	38	42	46	50	54	57	60
6	11.1	15.5	19.1	22	25	27	30	32	34	36	37
7	8.89	12.1	14.5	16.5	18.4	20	22	23	24	26	27
8	7.50	9.9	11.7	13.2	14.5	15.8	16.9	17.9	18.9	19.8	21
9	6.54	8.5	9.9	11.1	12.1	13.1	13.9	14.7	15.3	16.0	16.6
10	5.85	7.4	8.6	9.6	10.4	11.1	11.8	12.4	12.9	13.4	13.9
12	4.91	6.1	6.9	7.6	8.2	8.7	9.1	9.5	9.9	10.2	10.6
15	4.07	4.9	5.5	6.0	6.4	6.7	7.1	7.3	7.5	7.8	8.0
20	3.32	3.8	4.3	4.6	4.9	5.1	5.3	5.5	5.6	5.8	5.9
30	2.63	3.0	3.3	3.4	3.6	3.7	3.8	3.9	4.0	4.1	4.2
60	1.96	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.6	2.7	2.7
∞	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

* The unit digit is uncertain.

Table 13 continued

Level of significance $\alpha = 0.05$

$n-1$ \ K	2	3	4	5	6	7	8	9	10	11	12
2	39.0	87.5	142	202	266	333	403	475	550	626	704
3	15.4	27.8	39.2	50.7	62.0	72.9	83.5	93.9	104	114	124
4	9.60	15.5	20.6	25.2	29.5	33.6	37.5	41.1	44.6	48.0	51.4
5	7.15	10.8	13.7	16.3	18.7	20.8	22.9	24.7	26.5	28.2	29.9
6	5.82	8.38	10.4	12.1	13.7	15.0	16.3	17.5	18.6	19.7	20.7
7	4.99	6.94	8.44	9.70	10.8	11.8	12.7	13.5	14.3	15.1	15.8
8	4.43	6.00	7.18	8.12	9.03	9.78	10.5	11.1	11.7	12.2	12.7
9	4.03	5.34	6.31	7.11	7.80	8.41	8.95	9.45	9.91	10.3	10.7
10	3.72	4.85	5.67	6.34	6.92	7.42	7.87	8.28	8.66	9.01	9.34
12	3.28	4.16	4.79	5.30	5.72	6.09	6.42	6.72	7.00	7.25	7.48
15	2.86	3.54	4.01	4.37	4.68	4.95	5.19	5.40	5.59	5.77	5.93
20	2.46	2.95	3.29	3.54	3.76	3.94	4.10	4.24	4.37	4.49	4.59
30	2.07	2.40	2.61	2.78	2.91	3.02	3.12	3.21	3.29	3.36	3.39
60	1.67	1.85	1.96	2.04	2.11	2.17	2.22	2.26	2.30	2.33	2.36
∞	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: De Jonge, 1963–4

Table 14 Critical values of w/s for the normality test

Columns *a* denote the lower boundaries or the left-sided critical values.
Columns *b* denote the upper boundaries or the right-sided critical values.

n	Level of significance α											
	0.000		0.005		0.01		0.025		0.05		0.10	
	a	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*	*a*	*b*
3	1.732	2.000	1.735	2.000	1.737	2.000	1.745	2.000	1.758	1.999	1.782	1.997
4	1.732	2.449	1.82	2.447	1.87	2.445	1.93	2.439	1.98	2.429	2.04	2.409
5	1.826	2.828	1.98	2.813	2.02	2.803	2.09	2.782	2.15	2.753	2.22	2.712
6	1.826	3.162	2.11	3.115	2.15	3.095	2.22	3.056	2.28	3.012	2.37	2.949
7	1.871	3.464	2.22	3.369	2.26	3.338	2.33	3.282	2.40	3.222	2.49	3.143
8	1.871	3.742	2.31	3.585	2.35	3.543	2.43	3.471	2.50	3.399	2.59	3.308
9	1.897	4.000	2.39	3.772	2.44	3.720	2.51	3.634	2.59	3.552	2.68	3.449
10	1.897	4.243	2.46	3.935	2.51	3.875	2.59	3.777	2.67	3.685	2.76	3.57
11	1.915	4.472	2.53	4.079	2.58	4.012	2.66	3.903	2.74	3.80	2.84	3.68
12	1.915	4.690	2.59	4.208	2.64	4.134	2.72	4.02	2.80	3.91	2.90	3.78
13	1.927	4.899	2.64	4.325	2.70	4.244	2.78	4.12	2.86	4.00	2.96	3.87
14	1.927	5.099	2.70	4.431	2.75	4.34	2.83	4.21	2.92	4.09	3.02	3.95
15	1.936	5.292	2.74	4.53	2.80	4.44	2.88	4.29	2.97	4.17	3.07	4.02
16	1.936	5.477	2.79	4.62	2.84	4.52	2.93	4.37	3.01	4.24	3.12	4.09
17	1.944	5.657	2.83	4.70	2.88	4.60	2.97	4.44	3.06	4.31	3.17	4.15
18	1.944	5.831	2.87	4.78	2.92	4.67	3.01	4.51	3.10	4.37	3.21	4.21
19	1.949	6.000	2.90	4.85	2.96	4.74	3.05	4.56	3.14	4.43	3.25	4.27
20	1.949	6.164	2.94	4.91	2.99	4.80	3.09	4.63	3.18	4.49	3.29	4.32
25	1.961	6.93	3.09	5.19	3.15	5.06	3.24	4.87	3.34	4.71	3.45	4.53
30	1.966	7.62	3.21	5.40	3.27	5.26	3.37	5.06	3.47	4.89	3.59	4.70
35	1.972	8.25	3.32	5.57	3.38	5.42	3.48	5.21	3.58	5.04	3.70	4.84
40	1.975	8.83	3.41	5.71	3.47	5.56	3.57	5.34	3.67	5.16	3.79	4.96
45	1.978	9.38	3.49	5.83	3.55	5.67	3.66	5.45	3.75	5.26	3.88	5.06
50	1.980	9.90	3.56	5.93	3.62	5.77	3.73	5.54	3.83	5.35	3.95	5.14
55	1.982	10.39	3.62	6.02	3.69	5.86	3.80	5.63	3.90	5.43	4.02	5.22
60	1.983	10.86	3.68	6.10	3.75	5.94	3.86	5.70	3.96	5.51	4.08	5.29
65	1.985	11.31	3.74	6.17	3.80	6.01	3.91	5.77	4.01	5.57	4.14	5.35
70	1.986	11.75	3.79	6.24	3.85	6.07	3.96	5.83	4.06	5.63	4.19	5.41
75	1.987	12.17	3.83	6.30	3.90	6.13	4.01	5.88	4.11	5.68	4.24	5.46
80	1.987	12.57	3.88	6.35	3.94	6.18	4.05	5.93	4.16	5.73	4.28	5.51
85	1.988	12.96	3.92	6.40	3.99	6.23	4.09	5.98	4.20	5.78	4.33	5.56
90	1.989	13.34	3.96	6.45	4.02	6.27	4.13	6.03	4.24	5.82	4.36	5.60
95	1.990	13.71	3.99	6.49	4.06	6.32	4.17	6.07	4.27	5.86	4.40	5.64
100	1.990	14.07	4.03	6.53	4.10	6.36	4.21	6.11	4.31	5.90	4.44	5.68
150	1.993	17.26	4.32	6.82	4.38	6.64	4.48	6.39	4.59	6.18	4.72	5.96
200	1.995	19.95	4.53	7.01	4.59	6.84	4.68	6.60	4.78	6.39	4.90	6.15
500	1.998	31.59	5.06	7.60	5.13	7.42	5.25	7.15	5.47	6.94	5.49	6.72
1000	1.999	44.70	5.50	7.99	5.57	7.80	5.68	7.54	5.79	7.33	5.92	7.11

Source: Sachs, 1972

Table 15 Critical values for the Cochran test for variance outliers

Degrees of freedom $\nu = n - 1$.

Level of significance $\alpha = 0.01$

K \ ν_X	1	2	3	4	5	6	7	8	9	10	16	36	144	∞
2	0.9999	0.9950	0.9794	0.9586	0.9373	0.9172	0.8988	0.8823	0.8674	0.8539	0.7949	0.7067	0.6062	0.5000
3	0.9933	0.9423	0.8831	0.8335	0.7933	0.7606	0.7335	0.7107	0.6912	0.6743	0.6059	0.5153	0.4230	0.3333
4	0.9676	0.8643	0.7814	0.7212	0.6761	0.6410	0.6129	0.5897	0.5702	0.5536	0.4884	0.4057	0.3251	0.2500
5	0.9279	0.7885	0.6957	0.6329	0.5875	0.5531	0.5259	0.5037	0.4854	0.4697	0.4094	0.3351	0.2644	0.2000
6	0.8828	0.7218	0.6258	0.5635	0.5195	0.4866	0.4608	0.4401	0.4229	0.4084	0.3529	0.2858	0.2229	0.1667
7	0.8376	0.6644	0.5685	0.5080	0.4659	0.4347	0.4105	0.3911	0.3751	0.3616	0.3105	0.2494	0.1929	0.1429
8	0.7945	0.6152	0.5209	0.4627	0.4226	0.3932	0.3704	0.3522	0.3373	0.3248	0.2779	0.2214	0.1700	0.1250
9	0.7544	0.5727	0.4810	0.4251	0.3870	0.3592	0.3378	0.3207	0.3067	0.2950	0.2514	0.1992	0.1521	0.1111
10	0.7175	0.5358	0.4469	0.3934	0.3572	0.3308	0.3106	0.2945	0.2813	0.2704	0.2297	0.1811	0.1376	0.1000
12	0.6528	0.4751	0.3919	0.3428	0.3099	0.2861	0.2680	0.2535	0.2419	0.2320	0.1961	0.1535	0.1157	0.0833
15	0.5747	0.4069	0.3317	0.2882	0.2593	0.2386	0.2228	0.2104	0.2002	0.1918	0.1612	0.1251	0.0934	0.0667
20	0.4799	0.3297	0.2654	0.2288	0.2048	0.1877	0.1748	0.1646	0.1567	0.1501	0.1248	0.0960	0.0709	0.0500
24	0.4247	0.2871	0.2295	0.1970	0.1759	0.1608	0.1495	0.1406	0.1338	0.1283	0.1060	0.0810	0.0595	0.0417
30	0.3632	0.2412	0.1913	0.1635	0.1454	0.1327	0.1232	0.1157	0.1100	0.1054	0.0867	0.0658	0.0480	0.0333
40	0.2940	0.1915	0.1508	0.1281	0.1135	0.1033	0.0957	0.0898	0.0853	0.0816	0.0668	0.0503	0.0363	0.0250
60	0.2151	0.1371	0.1069	0.0902	0.0796	0.0722	0.0668	0.0625	0.0594	0.0567	0.0461	0.0344	0.0245	0.0167
120	0.1225	0.0759	0.0585	0.0489	0.0429	0.0387	0.0357	0.0334	0.0316	0.0302	0.0242	0.0178	0.0125	0.0083
∞	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 15 continued

Level of significance $\alpha = 0.05$

K \ ν_x	1	2	3	4	5	6	7	8	9	10	16	36	144	∞
2	0.9985	0.9750	0.9392	0.9057	0.8772	0.8534	0.8332	0.8159	0.8010	0.7880	0.7341	0.6602	0.5813	0.5000
3	0.9669	0.8709	0.7977	0.7457	0.7071	0.6771	0.6530	0.6333	0.6167	0.6025	0.5466	0.4748	0.4031	0.3333
4	0.9065	0.7679	0.6841	0.6287	0.5895	0.5598	0.5365	0.5175	0.5017	0.4884	0.4366	0.3720	0.3093	0.2500
5	0.8412	0.6838	0.5981	0.5441	0.5065	0.4783	0.4564	0.4387	0.4241	0.4118	0.3645	0.3066	0.2513	0.2000
6	0.7808	0.6161	0.5321	0.4803	0.4447	0.4184	0.3980	0.3817	0.3682	0.3568	0.3135	0.2612	0.2119	0.1667
7	0.7271	0.5612	0.4800	0.4307	0.3974	0.3726	0.3535	0.3384	0.3259	0.3154	0.2756	0.2278	0.1833	0.1429
8	0.6798	0.5157	0.4377	0.3910	0.3595	0.3362	0.3185	0.3043	0.2926	0.2829	0.2462	0.2022	0.1616	0.1250
9	0.6385	0.4775	0.4027	0.3584	0.3286	0.3067	0.2901	0.2768	0.2659	0.2568	0.2226	0.1820	0.1446	0.1111
10	0.6020	0.4450	0.3733	0.3311	0.3029	0.2823	0.2666	0.2541	0.2439	0.2353	0.2032	0.1655	0.1308	0.1000
12	0.5410	0.3924	0.3264	0.2880	0.2624	0.2439	0.2299	0.2187	0.2098	0.2020	0.1737	0.1403	0.1100	0.0833
15	0.4709	0.3346	0.2758	0.2419	0.2195	0.2034	0.1911	0.1815	0.1736	0.1671	0.1429	0.1144	0.0889	0.0667
20	0.3894	0.2705	0.2205	0.1921	0.1735	O.1602	0.1501	0.1422	0.1357	0.1303	0.1108	0.0879	0.0675	0.0500
24	0.3434	0.2354	0.1907	0.1656	0.1493	0.1374	0.1286	0.1216	0.1160	0.1113	0.0942	0.0743	0.0567	0.0417
30	0.2929	0.1980	0.1593	0.1377	0.1237	0.1137	0.1061	0.1002	0.0958	0.0921	0.0771	0.0604	0.0457	0.0333
40	0.2370	0.1576	0.1259	0.1082	0.0968	0.0887	0.0827	0.0780	0.0745	0.0713	0.0595	0.0462	0.0347	0.0250
60	0.1737	0.1131	0.0895	0.0765	0.0682	0.0623	0.0583	0.0552	0.0520	0.0497	0.0411	0.0316	0.0234	0.0167
120	0.0998	0.0632	0.0495	0.0419	0.0371	0.0337	0.0312	0.0292	0.0279	0.0266	0.0218	0.0165	0.0120	0.0083
∞	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: Dixon and Massey, 1957

Table 16 Critical values of *D* for the Kolmogorov–Smirnov one-sample test

D = maximum values of the differences.

n	Level of significance α				
	0.20	0.15	0.10	0.05	0.01
1	0.900	0.925	0.950	0.975	0.995
2	0.684	0.726	0.776	0.842	0.929
3	0.565	0.597	0.642	0.708	0.823
4	0.494	0.525	0.564	0.624	0.733
5	0.446	0.474	0.510	0.565	0.669
6	0.410	0.436	0.470	0.521	0.618
7	0.381	0.405	0.438	0.486	0.577
8	0.358	0.381	0.411	0.457	0.543
9	0.339	0.360	0.388	0.432	0.514
10	0.322	0.342	0.368	0.410	0.490
11	0.307	0.326	0.352	0.391	0.468
12	0.295	0.313	0.338	0.375	0.450
13	0.284	0.302	0.325	0.361	0.433
14	0.274	0.292	0.314	0.349	0.418
15	0.266	0.283	0.304	0.338	0.404
16	0.258	0.274	0.295	0.328	0.392
17	0.250	0.266	0.286	0.318	0.381
18	0.244	0.259	0.278	0.309	0.371
19	0.237	0.252	0.272	0.301	0.363
20	0.231	0.246	0.264	0.294	0.356
25	0.21	0.22	0.24	0.27	0.32
30	0.19	0.20	0.22	0.24	0.29
35	0.18	0.19	0.21	0.23	0.27
Over 35	$\frac{1.07}{\sqrt{n}}$	$\frac{1.14}{\sqrt{n}}$	$\frac{1.22}{\sqrt{n}}$	$\frac{1.36}{\sqrt{n}}$	$\frac{1.63}{\sqrt{n}}$

Source: Massey, 1951

Table 17 Critical values of *T* for the sign test

Level of significance α					Level of significance α				
Two-sided	0.10	0.05	0.02	0.01	Two-sided	0.10	0.05	0.02	0.01
One-sided	0.05	0.025	0.01	0.005	One-sided	0.05	0.025	0.01	0.005
n					n				
1	–	–	–	–	31	11	13	15	17
2	–	–	–	–	32	12	14	16	16
3	–	–	–	–	33	11	13	15	17
4	–	–	–	–	34	12	14	16	16
5	5	–	–	–	35	11	13	15	17
6	6	6	–	–	36	12	14	16	18
7	7	7	7	–	37	11	13	17	17
8	6	8	8	8	38	12	14	16	18
9	7	7	9	9	39	13	15	17	17
10	8	8	10	10	40	12	14	16	18
11	7	9	9	11	45	13	15	17	19
12	8	8	10	10	46	14	16	18	20
13	7	9	11	11	49	13	15	19	19
14	8	10	10	12	50	14	16	18	20
15	9	9	11	11	55	15	17	19	21
16	8	10	12	12	56	14	16	18	20
17	9	9	11	13	59	15	17	19	21
18	8	10	12	12	60	14	18	20	22
19	9	11	11	13	65	15	17	21	23
20	10	10	12	14	66	16	18	20	22
21	9	11	13	13	69	15	19	23	25
22	10	12	12	14	70	16	18	22	24
23	9	11	13	15	75	17	19	23	25
24	10	12	14	14	76	16	20	22	24
25	11	11	13	15	79	17	19	23	25
26	10	12	14	14	80	16	20	22	24
27	11	13	13	15	89	17	21	23	27
28	10	12	14	16	90	18	20	24	26
29	11	13	15	15	99	19	21	25	27
30	10	12	14	16	100	18	22	26	28

Source: Wijvekate, 1962

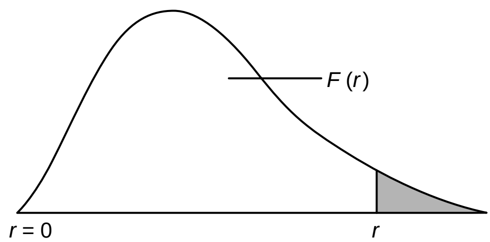

Table 18 Critical values of *r* for the sign test for paired observations

N is the total number of equally probable dichotomous events, r the smaller of the number of events of either kind. If $r \le r_{N;\alpha}$ then there are too few events of one kind at the $1 - \alpha$ confidence level. For large values of N, r is approximately distributed as z. Use $\mu = N/2$, $\sigma = \sqrt{N}/2$ and $Z_\alpha = (\mu - r_{N;\alpha})/\sigma$.

N	$r_{N;0.10}$	$r_{N;0.05}$	$r_{N;0.01}$	$r_{N;0.005}$	$r_{N;0.001}$
8	1	0	0		
10	1	1	0	0	
12	2	2	1	0	0
14	3	2	1	0	0
16	4	3	1	0	0
18	5	4	3	2	1
20	5	5	3	3	2
22	6	5	4	4	3
25	7	7	5	5	4
30	10	9	7	6	5
35	12	11	9	8	7
40	14	13	11	10	9
45	16	15	13	12	11
50	18	17	15	15	13
55	20	19	17	17	15

Source: Dixon and Massey, 1957

Table 19 Critical values of *T* for the signed rank test for paired differences

n is the number of pairs of observations.

n	Level of significance α					*n*	Level of significance α				
	Two-sided			One-sided			Two-sided			One-sided	
	0.05	0.01	0.001	0.05	0.01		0.05	0.01	0.001	0.05	0.01
6	0			2		36	208	171	130	227	185
7	2			3	0	37	221	182	140	241	198
8	3	0		5	1	38	235	194	150	256	211
9	5	1		8	3	39	249	207	161	271	224
10	8	3		10	5	40	264	220	172	286	238
11	10	5	0	13	7	41	279	233	183	302	252
12	13	7	1	17	9	42	294	247	195	319	266
13	17	9	2	21	12	43	310	261	207	336	281
14	21	12	4	25	15	44	327	276	220	353	296
15	25	15	6	30	19	45	343	291	233	371	312
16	29	19	8	35	23	46	361	307	246	389	328
17	34	23	11	41	27	47	378	322	260	407	345
18	40	27	14	47	32	48	396	339	274	426	362
19	46	32	18	53	37	49	415	355	289	446	379
20	52	37	21	60	43	50	434	373	304	466	397
21	58	42	25	67	49	51	453	390	319	486	416
22	65	48	30	75	55	52	473	408	335	507	434
23	73	54	35	83	62	53	494	427	351	429	454
24	81	61	40	91	69	54	514	445	368	550	473
25	89	68	45	100	76	55	536	465	385	573	493
26	98	75	51	110	84	56	557	484	402	595	514
27	107	83	57	119	92	57	579	504	420	618	535
28	116	91	64	130	101	58	602	525	438	642	556
29	126	100	71	140	110	59	625	546	457	666	578
30	137	109	78	151	120	60	648	567	476	690	600
31	147	118	86	163	130	61	672	589	495	715	623
32	159	128	94	175	140	62	697	611	515	741	646
33	170	138	102	187	151	63	721	634	535	767	669
34	182	148	111	200	162	64	747	657	556	793	693
35	195	159	120	213	173	65	772	681	577	820	718

Source: Sachs, 1972

Table 20 Critical values of *U* for the Wilcoxon inversion test

n_1 = number of elements in the largest sample;
n_2 = number of elements in the smallest sample.

		Level of significance α						Level of significance α			
Two-sided		0.10	0.05	0.02	0.01	Two-sided		0.10	0.05	0.02	0.01
One-sided		0.05	0.025	0.01	0.005	One-sided		0.05	0.025	0.01	0.005
n_1	n_2					n_1	n_2				
3	3	0	–	–	–	9	2	1	0	–	–
4	3	0	–	–	–	9	3	4	2	1	0
4	4	1	0	–	–	9	4	6	4	3	1
						9	5	9	7	5	3
5	2	0	–	–	–	9	6	12	10	7	5
5	3	1	0	–	–	9	7	15	12	9	7
5	4	2	1	0	–	9	8	18	15	12	9
5	5	4	2	1	0	9	9	21	17	14	11
6	2	0	–	–	–	10	2	1	0		
6	3	2	1	–	–	10	3	4	3	1	0
6	4	3	2	1	0	10	4	7	5	3	2
6	5	5	3	2	1	10	5	11	8	6	4
6	6	7	5	3	2	10	6	14	11	8	6
						10	7	17	14	11	9
7	2	0	–	–	–	10	8	20	17	13	11
7	3	2	1	0	–	10	9	24	20	16	13
7	4	4	3	1	0	10	10	27	23	19	16
7	5	6	5	3	1						
7	6	8	6	4	3						
7	7	11	8	6	4						
8	2	1	0	–	–						
8	3	3	2	0	–						
8	4	5	4	2	1						
8	5	8	6	4	2						
8	6	10	8	6	4						
8	7	13	10	7	6						
8	8	15	13	9	7						

Source: Wijvekate, 1962

Table 21 Critical values of the smallest rank sum for the Wilcoxon–Mann–Whitney test

n_1 = number of elements in the largest sample;
n_2 = number of elements in the smallest sample.

		Level of significance α			
Two-sided		0.20	0.10	0.05	0.01
One-sided		0.10	0.05	0.025	0.005
n_1	n_2				
3	2	3	–	–	–
3	3	7	6	–	–
4	2	3	–	–	–
4	3	7	6	–	–
4	4	13	11	10	–
5	2	4	3	–	–
5	3	8	7	6	–
5	4	14	12	11	–
5	5	20	19	17	15
6	2	4	3	–	–
6	3	9	8	7	–
6	4	15	13	12	10
6	5	22	20	18	16
6	6	30	28	26	13
7	2	4	3	–	–
7	3	10	8	7	–
7	4	16	14	13	10
7	5	23	21	20	16
7	6	32	29	27	24
7	7	41	39	36	32
8	2	5	4	3	–
8	3	11	9	8	–
8	4	17	15	14	11
8	5	25	23	21	17
8	6	34	31	29	25
8	7	44	41	38	34
8	8	55	51	49	43
9	1	1	–	–	–
9	2	5	4	3	–
9	3	11	9	8	6
9	4	19	16	14	11
9	5	27	24	22	18
9	6	36	33	31	26
9	7	46	43	40	35
9	8	58	54	51	45
9	9	70	66	62	56
10	1	1	–	–	–
10	2	6	4	3	–
10	3	12	10	9	6
10	4	20	17	15	12
10	5	28	26	23	19

		Level of significance α			
Two-sided		0.20	0.10	0.05	0.01
One-sided		0.10	0.05	0.025	0.005
n_1	n_2				
10	6	38	35	32	27
10	7	49	45	42	37
10	8	60	56	53	47
10	9	73	69	65	58
10	10	87	82	78	71
11	1	1	–	–	–
11	2	6	4	3	–
11	3	13	11	9	6
11	4	21	18	16	12
11	5	30	27	24	20
11	6	40	37	34	28
11	7	51	47	44	38
11	8	63	59	55	49
11	9	76	72	68	61
11	10	91	86	81	73
11	11	106	100	96	87
12	1	1	–	–	–
12	2	7	5	4	–
12	3	14	11	10	7
12	4	22	19	17	13
12	5	32	28	26	21
12	6	42	38	35	30
12	7	54	49	46	40
12	8	66	62	58	51
12	9	80	75	71	63
12	10	94	89	84	76
12	11	110	104	99	90
12	12	127	120	115	105
13	1	–	–	–	–
13	2	7	5	4	–
13	3	15	12	10	7
13	4	23	20	18	14
13	5	33	30	27	22
13	6	44	40	37	31
13	7	56	52	48	44
13	8	69	64	60	53
13	9	83	78	73	65
13	10	98	92	88	79
13	11	114	108	103	93
13	12	131	125	119	109
13	13	149	142	136	125

Table 21 continued

Two-sided One-sided		0.20 0.10	0.10 0.05	0.05 0.025	0.01 0.005	Two-sided One-sided		0.20 0.10	0.10 0.05	0.05 0.025	0.01 0.005
		Level of significance α						Level of significance α			
n_1	n_2					n_1	n_2				
14	1	1	–	–	–	17	4	28	25	21	16
14	2	7	5	4	–	17	5	40	35	32	25
14	3	16	13	11	7	17	6	52	47	43	36
14	4	25	21	19	14	17	7	66	61	56	47
14	5	35	31	28	22	17	8	81	75	70	60
14	6	46	42	38	32	17	9	97	90	84	74
14	7	59	54	50	43	17	10	113	106	100	89
14	8	72	67	62	54	17	11	131	123	117	105
14	9	86	81	76	67	17	12	150	142	135	122
14	10	102	96	91	81	17	13	170	161	154	140
14	11	118	112	106	96	17	14	190	182	174	159
14	12	136	129	123	112	17	15	212	203	195	180
14	13	154	147	141	129	17	16	235	225	217	201
14	14	174	166	160	147	17	17	259	249	240	223
15	1	1	–	–	–	18	1	1	–	–	–
15	2	8	6	4	–	18	2	9	7	5	–
15	3	16	13	11	8	18	3	19	15	13	8
15	4	26	22	20	15	18	4	30	26	22	16
15	5	37	33	29	23	18	5	42	37	33	26
15	6	48	44	40	33	18	6	55	49	45	37
15	7	61	56	52	44	18	7	69	63	58	49
15	8	75	69	65	56	18	8	84	77	72	62
15	9	90	84	79	69	18	9	100	93	87	76
15	10	106	99	94	84	18	10	117	110	103	92
15	11	123	116	110	99	18	11	135	127	121	108
15	12	141	133	127	115	18	12	155	146	139	125
15	13	159	152	145	133	18	13	175	166	158	144
15	14	179	171	164	151	18	14	196	187	179	163
15	15	200	192	184	171	18	15	218	208	200	184
						18	16	242	231	222	206
16	1	1	–	–	–	18	17	266	255	246	228
16	2	8	6	4	–	18	18	291	280	270	252
16	3	17	14	12	8						
16	4	27	24	21	15	19	1	2	1	–	–
16	5	38	34	30	24	19	2	10	7	5	3
16	6	50	46	42	34	19	3	20	16	13	9
16	7	64	58	54	46	19	4	31	27	23	17
16	8	78	72	67	58	19	5	43	38	34	27
16	9	93	87	82	72	19	6	57	51	46	38
16	10	109	103	97	86	19	7	71	65	60	50
16	11	127	120	113	102	19	8	87	80	74	64
16	12	145	138	131	119	19	9	103	96	90	78
16	13	165	156	150	130	19	10	121	113	107	94
16	14	185	176	169	155	19	11	139	131	124	111
16	15	206	197	190	175	19	12	159	150	143	129
16	16	229	219	211	196	19	13	180	171	163	147
						19	14	202	192	182	168
17	1	1	–	–	–	19	15	224	214	205	189
17	2	9	6	5	–	19	16	248	237	228	210
17	3	18	15	12	8						

Source: Natrella, 1963

Table 22 The Kruskal–Wallis test

Critical region: $H \geq$ tabulated value.

$K = 3$		
Sample sizes	$\alpha = 0.05$	$\alpha = 0.01$
2 2 2	–	–
3 2 1	–	–
3 2 2	4.714	–
3 3 1	5.143	–
3 3 2	5.361	–
3 3 3	5.600	7.200
4 2 1	–	–
4 2 2	5.333	–
4 3 1	5.208	–
4 3 2	5.444	6.444
4 3 3	5.791	6.745
4 4 1	4.967	6.667
4 4 2	5.455	7.036
4 4 3	5.598	7.144
4 4 4	5.692	7.654
5 2 1	5.000	–
5 2 2	5.160	6.533
5 3 1	4.960	–
5 3 2	5.251	6.909
5 3 3	5.648	7.079
5 4 1	4.985	6.955
5 4 2	5.273	7.205
5 4 3	5.656	7.445
5 4 4	5.657	7.760
5 5 1	5.127	7.309
5 5 2	5.338	7.338
5 5 3	5.705	7.578
5 5 4	5.666	7.823
5 5 5	5.780	8.000
6 1 1	–	–
6 2 1	4.822	–
6 2 2	5.345	6.655
6 3 1	4.855	6.873
6 3 2	5.348	6.970
6 3 3	5.615	7.410
6 4 1	4.947	7.106
6 4 2	5.340	7.340
6 4 3	5.610	7.500
6 4 4	5.681	7.795
6 5 1	4.990	7.182
6 5 2	5.338	7.376
6 5 3	5.602	7.590
6 5 4	5.661	7.936
6 5 5	5.729	8.028
6 6 1	4.945	7.121
6 6 2	5.410	7.467
6 6 3	5.625	7.725
6 6 4	5.724	8.000
6 6 5	5.765	8.124
6 6 6	5.801	8.222
7 7 7	5.819	8.378
8 8 8	5.805	8.465

$K = 4$		
Sample sizes	$\alpha = 0.05$	$\alpha = 0.01$
2 2 1 1	–	–
2 2 2 1	5.679	–
2 2 2 2	6.167	6.667
3 1 1 1	–	–
3 2 1 1	–	–
3 2 2 1	5.833	–
3 2 2 2	6.333	7.133
3 3 1 1	6.333	–
3 3 2 1	6.244	7.200
3 3 2 2	6.527	7.636
3 3 3 1	6.600	7.400
3 3 3 2	6.727	8.015
3 3 3 3	7.000	8.538
4 1 1 1	–	–
4 2 1 1	5.833	–
4 2 2 1	6.133	7.000
4 2 2 2	6.545	7.391
4 3 1 1	6.178	7.067
4 3 2 1	6.309	7.455
4 3 2 2	6.621	7.871
4 3 3 1	6.545	7.758
4 3 3 2	6.795	8.333
4 3 3 3	6.984	8.659
4 4 1 1	5.945	7.909
4 4 2 1	6.386	7.909
4 4 2 2	6.731	8.346
4 4 3 1	6.635	8.231
4 4 3 2	6.874	8.621
4 4 3 3	7.038	8.876
4 4 4 1	6.725	8.588
4 4 4 2	6.957	8.871
4 4 4 3	7.142	9.075
4 4 4 4	7.235	9.287

$K = 5$		
Sample sizes	$\alpha = 0.05$	$\alpha = 0.01$
2 2 1 1 1	–	–
2 2 2 1 1	6.750	–
2 2 2 2 1	7.133	7.533
2 2 2 2 2	7.418	8.291
3 1 1 1 1	–	–
3 2 1 1 1	6.583	–
3 2 2 1 1	6.800	7.600
3 2 2 2 1	7.309	8.127
3 2 2 2 2	7.682	8.682
3 3 1 1 1	7.111	–
3 3 2 1 1	7.200	8.073
3 3 2 2 1	7.591	8.576
3 3 2 2 2	7.910	9.115
3 3 3 1 1	7.576	8.424
3 3 3 2 1	7.769	9.051
3 3 3 2 2	8.044	9.505
3 3 3 3 1	8.000	9.451
3 3 3 3 2	8.200	9.876
3 3 3 3 3	8.333	10.20

Source: Neave, 1978

Table 23 Critical values for the rank sum difference test (two-sided)

Level of significance $\alpha = 0.01$

n \ K	3	4	5	6	7	8	9	10
1	4.1	5.7	7.3	8.9	10.5	12.2	13.9	15.6
2	10.9	15.3	19.7	24.3	28.9	33.6	38.3	43.1
3	19.5	27.5	35.7	44.0	52.5	61.1	69.8	78.6
4	29.7	41.9	54.5	67.3	80.3	93.6	107.0	120.6
5	41.2	58.2	75.8	93.6	111.9	130.4	149.1	168.1
6	53.9	76.3	99.3	122.8	146.7	171.0	195.7	220.6
7	67.6	95.8	124.8	154.4	184.6	215.2	246.3	277.7
8	82.4	116.8	152.2	188.4	225.2	262.6	300.6	339.0
9	98.1	139.2	181.4	224.5	268.5	313.1	358.4	404.2
10	114.7	162.8	212.2	262.7	314.2	366.5	419.5	473.1
11	132.1	187.6	244.6	302.9	362.2	422.6	483.7	545.6
12	150.4	213.5	278.5	344.9	412.5	481.2	551.0	621.4
13	169.4	240.6	313.8	388.7	464.9	542.4	621.0	700.5
14	189.1	268.7	350.5	434.2	519.4	606.0	693.8	782.6
15	209.6	297.8	388.5	481.3	575.8	671.9	769.3	867.7
16	230.7	327.9	427.9	530.1	634.2	740.0	847.3	955.7
17	252.5	359.0	468.4	580.3	694.4	810.2	927.8	1046.5
18	275.0	391.0	510.2	632.1	756.4	882.6	1010.6	1140.0
19	298.1	423.8	553.1	685.4	820.1	957.0	1095.8	1236.2
20	321.8	457.6	597.2	740.0	885.5	1033.3	1183.3	1334.9
21	346.1	492.2	642.4	796.0	952.6	1111.6	1273.0	1436.0
22	371.0	527.6	688.7	853.4	1021.3	1191.8	1364.8	1539.7
23	396.4	563.8	736.0	912.1	1091.5	1273.8	1458.8	1645.7
24	422.4	600.9	784.4	972.1	1163.4	1357.6	1554.8	1754.0
25	449.0	638.7	833.8	1033.3	1236.7	1443.2	1652.8	1864.6

Level of significance $\alpha = 0.05$

n \ K	3	4	5	6	7	8	9	10
1	3.3	4.7	6.1	7.5	9.0	10.5	12.0	13.5
2	8.8	12.6	16.5	20.5	24.7	28.9	33.1	37.4
3	15.7	22.7	29.9	37.3	44.8	52.5	60.3	68.2
4	23.9	34.6	45.6	57.0	68.6	80.4	92.4	104.6
5	33.1	48.1	63.5	79.3	95.5	112.0	128.8	145.8
6	43.3	62.9	83.2	104.0	125.3	147.0	169.1	191.4
7	54.4	79.1	104.6	130.8	157.6	184.9	212.8	240.9
8	66.3	96.4	127.6	159.6	192.4	225.7	259.7	294.1
9	7.89	114.8	152.0	190.2	229.3	269.1	309.6	350.6
10	92.3	134.3	177.8	222.6	268.4	315.0	362.4	410.5
11	106.3	154.8	205.0	256.6	309.4	363.2	417.9	473.3
12	120.9	176.2	233.4	292.2	352.4	413.6	476.0	539.1
13	136.2	198.5	263.0	329.3	397.1	466.2	536.5	607.7

Table 23 continued

Level of significance $\alpha = 0.05$

n \ K	3	4	5	6	7	8	9	10
14	152.1	221.7	293.8	367.8	443.6	520.8	599.4	679.0
15	168.6	245.7	325.7	407.8	491.9	577.4	664.6	752.8
16	185.6	270.6	358.6	449.1	541.7	635.9	732.0	829.2
17	203.1	296.2	392.6	491.7	593.1	696.3	801.5	907.9
18	221.2	322.6	427.6	535.5	646.1	758.5	873.1	989.0
19	239.8	349.7	463.6	580.6	700.5	822.4	946.7	1072.4
20	258.8	377.6	500.5	626.9	756.4	888.1	1022.3	1158.1
21	278.4	406.1	538.4	674.4	813.7	955.4	1099.8	1245.9
22	298.4	435.3	577.2	723.0	872.3	1024.3	1179.1	1335.7
23	318.9	464.2	616.9	772.7	932.4	1094.8	1260.3	1427.7
24	339.8	495.8	657.4	823.5	993.7	1166.8	1343.2	1521.7
25	361.1	527.0	698.8	875.4	1056.3	1240.4	1427.9	1616.6

Level of significance $\alpha = 0.10$

n \ K	3	4	5	6	7	8	9	10
1	2.9	4.2	5.5	6.8	8.2	9.6	11.1	12.5
2	7.6	11.2	14.9	18.7	22.5	26.5	30.5	34.5
3	13.8	20.2	26.9	33.9	40.9	48.1	55.5	63.0
4	20.9	30.9	41.2	51.8	62.6	73.8	85.1	96.5
5	29.0	42.9	57.2	72.1	87.3	102.8	118.6	134.6
6	37.9	56.1	75.0	94.5	114.4	134.8	155.6	176.6
7	47.6	70.5	94.3	118.8	144.0	169.6	195.8	222.3
8	58.0	86.0	115.0	145.0	175.7	207.0	239.0	271.4
9	69.1	102.4	137.0	172.8	209.4	246.8	284.9	323.6
10	80.8	119.8	160.3	202.2	245.1	288.9	333.5	378.8
11	93.1	138.0	184.8	233.1	282.6	333.1	384.6	436.8
12	105.9	157.1	210.4	265.4	321.8	379.3	438.0	497.5
13	119.3	177.0	237.1	299.1	362.7	427.6	493.7	560.8
14	133.2	197.7	264.8	334.1	405.1	477.7	551.6	626.6
15	147.6	219.1	293.6	370.4	449.2	529.6	611.6	694.8
16	162.5	241.3	323.3	407.9	494.7	583.3	673.6	765.2
17	177.9	264.2	353.9	446.6	541.6	638.7	737.6	837.9
18	193.7	287.7	385.5	486.5	590.0	695.7	803.4	912.8
19	210.0	311.9	417.9	527.5	639.7	754.3	871.2	989.7
20	226.7	336.7	451.2	569.5	690.7	814.5	940.7	1068.8
21	243.8	362.2	485.4	612.6	743.0	876.2	1012.0	1149.8
22	261.3	388.2	520.4	656.8	796.6	939.4	1085.0	1232.7
23	279.2	414.9	556.1	702.0	851.4	1004.1	1159.7	1317.6
24	297.5	442.2	592.7	748.1	907.4	1070.2	1236.0	1404.3
25	316.2	470.0	630.0	795.3	964.6	1137.6	1314.0	1492.9

Source: Sachs, 1972

Table 24 Critical values for the rank sum maximum test

n	K	Level of significance α			
		0.10	0.05	0.01	0.001
3	3	22	23		
	4	30	31		
	5	38	39		
	6	46	48	50	
4	2	24	25		
	3	37	38	41	
	4	50	52	55	
	5	63	66	70	73
	6	77	80	85	89
5	2	35	37	39	
	3	55	57	61	64
	4	75	78	83	87
	5	95	98	105	111
	6	115	119	127	134
6	2	49	51	54	
	3	77	79	85	90
	4	104	108	115	122
	5	133	138	149	161
	6	161	167	180	196
7	2	65	68	72	76
	3	102	105	112	119
	4	138	144	154	167
	5	176	182	196	212
	6	213	221	237	257
8	2	84	87	92	97
	3	130	135	144	156
	4	177	183	197	212
	5	225	233	249	269
	6	273	282	302	326

Source: Sachs, 1970

Table 25 Critical values for the Steel test

One-sided testing

		Number of samples K							
n	α	2	3	4	5	6	7	8	9
4	0.05	11	10	10	10	10	–	–	–
	0.01	–	–	–	–	–	–	–	
5	0.05	18	17	17	16	16	16	16	15
	0.01	15	–	–	–	–	–	–	–
6	0.05	27	26	25	25	24	24	24	23
	0.01	23	22	21	21	–	–	–	–
7	0.05	37	36	35	35	34	34	33	33
	0.01	32	31	30	30	29	29	29	29
8	0.05	49	48	47	46	46	45	45	44
	0.01	43	42	41	40	40	40	39	39
9	0.05	63	62	61	60	59	59	58	58
	0.01	56	55	54	53	52	52	51	51
10	0.05	79	77	76	75	74	74	73	72
	0.01	71	69	68	67	66	66	65	65
11	0.05	97	95	93	92	91	90	90	89
	0.01	87	85	84	83	82	81	81	80
12	0.05	116	114	112	111	110	109	108	108
	0.01	105	103	102	100	99	99	98	98
13	0.05	138	135	133	132	130	129	129	128
	0.01	125	123	121	120	119	118	117	117
14	0.05	161	158	155	154	153	152	151	150
	0.01	147	144	142	141	140	139	138	137
15	0.05	186	182	180	178	177	176	175	174
	0.01	170	167	165	164	162	161	160	160
16	0.05	213	209	206	204	203	201	200	199
	0.01	196	192	190	188	187	186	185	184
17	0.05	241	237	234	232	231	229	228	227
	0.01	223	219	217	215	213	212	211	210
18	0.05	272	267	264	262	260	259	257	256
	0.01	252	248	245	243	241	240	239	238
19	0.05	304	299	296	294	292	290	288	287
	0.01	282	278	275	273	271	270	268	267
20	0.05	339	333	330	327	325	323	322	320
	0.01	315	310	307	305	303	301	300	299

Table 25 continued

Two-sided testing

n	*α*	Number of samples *K*							
		2	3	4	5	6	7	8	9
4	0.05	10	–	–	–	–	–	–	–
	0.01	–	–	–	–	–	–	–	–
5	0.05	16	16	16	15	–	–	–	–
	0.01	–	–	–	–	–	–	–	–
6	0.05	25	24	23	23	22	22	22	21
	0.01	21	–	–	–	–	–	–	–
7	0.05	35	33	33	32	32	31	31	30
	0.01	30	29	28	28	–	–	–	–
8	0.05	46	45	44	43	43	42	42	41
	0.01	41	40	39	38	38	37	37	37
9	0.05	60	58	57	56	55	55	54	54
	0.01	53	52	51	50	49	49	49	48
10	0.05	75	73	72	71	70	69	69	68
	0.01	68	66	65	64	63	62	62	62
11	0.05	92	90	88	87	86	85	85	84
	0.01	84	82	80	79	78	78	77	77
12	0.05	111	108	107	105	104	103	103	102
	0.01	101	99	97	96	95	94	94	93
13	0.05	132	129	127	125	124	123	122	121
	0.01	121	118	116	115	114	113	112	112
14	0.05	154	151	149	147	145	144	144	143
	0.01	142	139	137	135	134	133	132	132
15	0.05	179	175	172	171	169	168	167	166
	0.01	165	162	159	158	156	155	154	154
16	0.05	205	201	196	196	194	193	192	191
	0.01	189	186	184	182	180	179	178	177
17	0.05	233	228	225	223	221	219	218	217
	0.01	216	212	210	208	206	205	204	203
18	0.05	263	258	254	252	250	248	247	246
	0.01	244	240	237	235	233	232	231	230
19	0.05	294	289	285	283	280	279	277	276
	0.01	274	270	267	265	262	261	260	259
20	0.05	328	322	318	315	313	311	309	308
	0.01	306	302	298	296	293	292	290	289

Source: De Jonge, 1963–4

Table 26 Critical values of r_s for the Spearman rank correlation test

n	Level of significance α					
	0.001	0.005	0.010	0.025	0.050	0.100
4	–	–	–	–	0.8000	0.8000
5	–	–	0.9000	0.9000	0.8000	0.7000
6	–	0.9429	0.8857	0.8286	0.7714	0.6000
7	0.9643	0.8929	0.8571	0.7450	0.6786	0.5357
8	0.9286	0.8571	0.8095	0.6905	0.5952	0.4762
9	0.9000	0.8167	0.7667	0.6833	0.5833	0.4667
10	0.8667	0.7818	0.7333	0.6364	0.5515	0.4424
11	0.8455	0.7545	0.7000	0.6091	0.5273	0.4182
12	0.8182	0.7273	0.6713	0.5804	0.4965	0.3986
13	0.7912	0.6978	0.6429	0.5549	0.4780	0.3791
14	0.7670	0.6747	0.6220	0.5341	0.4593	0.3626
15	0.7464	0.6536	0.6000	0.5179	0.4429	0.3500
16	0.7265	0.6324	0.5824	0.5000	0.4265	0.3382
17	0.7083	0.6152	0.5637	0.4853	0.4118	0.3260
18	0.6904	0.5975	0.5480	0.4716	0.3994	0.3148
19	0.6737	0.5825	0.5333	0.4579	0.3895	0.3070
20	0.6586	0.5684	0.5203	0.4451	0.3789	0.2977
21	0.6455	0.5545	0.5078	0.4351	0.3688	0.2909
22	0.6318	0.5426	0.4963	0.4241	0.3597	0.2829
23	0.6186	0.5306	0.4852	0.4150	0.3518	0.2767
24	0.6070	0.5200	0.4748	0.4061	0.3435	0.2704
25	0.5962	0.5100	0.4654	0.3977	0.3362	0.2646
26	0.5856	0.5002	0.4564	0.3894	0.3299	0.2588
27	0.5757	0.4915	0.4481	0.3822	0.3236	0.2540
28	0.5660	0.4828	0.4401	0.3749	0.3175	0.2490
29	0.5567	0.4744	0.4320	0.3685	0.3113	0.2443
30	0.5479	0.4665	0.4251	0.3620	0.3059	0.2400

Source: Sachs, 1972

Table 27 Critical values of *S* for the Kendall rank correlation test

	Level of significance α			
Two-sided One-sided	0.10 0.05	0.05 0.025	0.02 0.01	0.05 0.005
n				
4	6	–		–
5	8	10	10	–
6	11	13	13	15
7	13	15	17	19
8	16	18	20	22
9	18	20	24	26
10	21	23	27	29
11	23	27	31	33
12	26	30	36	38
13	28	34	40	44
14	33	37	43	47
15	35	41	49	53
16	38	46	52	58
17	42	50	58	64
18	45	53	63	69
19	49	57	67	75
20	52	62	72	80
21	56	66	78	86
22	61	71	83	91
23	65	75	89	99
24	68	80	94	104
25	72	86	100	110
26	77	91	107	117
27	81	95	113	125
28	86	100	118	130
29	90	106	126	138
30	95	111	131	145
31	99	117	137	151
32	104	122	144	160
33	108	128	152	166
34	113	133	157	175
35	117	139	165	181
36	122	146	172	190
37	128	152	178	198
38	133	157	185	205
39	139	163	193	213
40	144	170	200	222

Source: De Jonge, 1963–4

Table 28 Critical values of *D* for the adjacency test

Columns *a* denote the lower boundaries or the left-sided critical values.
Columns *b* denote the upper boundaries or the right-sided critical values.

	Level of significance α			
Two-sided	0.10		0.02	
One-sided	0.05		0.01	
n	*a*	*b*	*a*	*b*
4	0.78	3.22	0.63	3.37
5	0.82	3.18	0.54	3.46
6	0.89	3.11	0.56	3.44
7	0.94	3.06	0.61	3.39
8	0.98	3.02	0.66	3.34
9	1.02	2.98	0.71	3.29
10	1.06	2.94	0.75	3.25
11	1.10	2.90	0.79	3.21
12	1.13	2.87	0.83	3.17
15	1.21	2.79	0.92	3.08
20	1.30	2.70	1.04	2.96
25	1.37	2.63	1.13	2.87

Source: Hart, 1942

Table 29 Critical values of *r* for the serial correlation test

Columns *a* denote the lower boundaries or the left-sided critical values.
Columns *b* denote the upper boundaries or the right-sided critical values.

	Level of significance α			
Two-sided	0.10		0.02	
One-sided	0.05		0.01	
n	*a*	*b*	*a*	*b*
5	−0.753	0.253	−0.798	0.297
6	−0.708	0.345	−0.863	0.447
7	−0.674	0.370	−0.799	0.510
8	−0.625	0.371	−0.764	0.531
9	−0.593	0.366	−0.737	0.533
10	−0.564	0.360	−0.705	0.525
11	−0.539	0.353	−0.679	0.515
12	−0.516	0.348	−0.655	0.505
13	−0.497	0.341	−0.634	0.495
14	−0.479	0.335	−0.615	0.485
15	−0.462	0.328	−0.597	0.475
20	−0.399	0.328	−0.524	0.432
25	−0.356	0.276	−0.473	0.398
30	−0.325	0.257	−0.433	0.370

Source: Anderson, 1942

Table 30 Critical values for the run test on successive differences

Columns *a* denote the lower boundaries or the left-sided critical values.
Columns *b* denote the upper boundaries or the right-sided critical values.

	Level of significance α			
Two-sided One-sided	0.02 0.01		0.10 0.05	
n	*a*	*b*	*a*	*b*
5	–	–	1	–
6	1	–	1	–
7	1	–	2	–
8	2	–	2	–
9	2	–	3	8
10	3	–	3	9
11	3	–	4	10
12	4	–	4	11
13	4	–	5	12
14	5	13	6	12
15	5	14	6	13
16	6	15	7	14
17	6	16	7	15
18	7	17	8	15
19	7	17	8	16
20	8	18	9	17
21	8	19	10	18
22	9	20	10	18
23	10	21	11	19
24	10	21	11	20
25	11	22	12	21
26	11	23	13	21
27	12	24	13	22
28	12	24	14	23
29	13	25	14	24
30	13	26	15	24
31	14	27	16	25
32	15	27	16	26
33	15	28	17	27
34	16	29	17	27
35	16	30	18	28
36	17	30	19	29
37	18	31	19	29
38	18	32	20	30
39	19	33	20	31
40	19	33	21	32

Source: De Jonge, 1963–4

Table 31 Critical values for the run test (equal sample sizes)

Columns a denote the lower boundaries or the left-sided critical values.
Columns b denote the upper boundaries or the right-sided critical values.

	Level of significance α							
Two-sided One-sided	0.10 0.05		0.05 0.025		0.02 0.01		0.01 0.005	
$n_1 = n_2$	a	b	a	b	a	b	a	b
5	3	9			2	10		
6	3	11			2	12		
7	4	12			3	13		
8	5	13			4	14		
9	6	14			4	16		
10	6	16			5	17		
11	7	17	7	16	6	18	5	18
12	8	18	7	18	7	19	6	19
13	9	19	8	19	7	21	7	20
14	10	20	9	20	8	22	7	22
15	11	21	10	21	9	23	8	23
16	11	23	11	22	10	24	9	24
17	12	24	11	24	10	26	10	25
18	13	25	12	25	11	27	10	27
19	14	26	13	26	12	28	11	28
20	15	27	14	27	13	29	12	29
21	16	28			14	30		
22	17	29			14	32		
23	17	31			15	33		
24	18	32			16	34		
25	19	33	18	33	17	35	16	35
26	20	34			18	36		
27	21	35			19	37		
28	22	36			19	39		
29	23	37			20	40		
30	24	38	22	39	21	41	20	41
35	28	43	27	44	25	46	24	47
40	33	48	31	50	30	51	29	52
45	37	54	36	55	34	57	33	58
50	42	59	40	61	38	63	37	64
55	46	65	45	66	43	68	42	69
60	51	70	49	72	47	74	46	75
65	56	75	54	77	52	79	50	81
70	60	81	58	83	56	85	55	86
75	65	86	63	88	61	90	59	92
80	70	91	68	93	65	96	64	97
85	74	97	72	99	70	101	68	103
90	79	102	77	104	74	107	73	108
95	84	107	82	109	79	112	77	114
100	88	117	80	115	84	113	82	119

Source: Dixon and Massey, 1957

Table 32 Critical values for the Wilcoxon–Wilcox test (two-sided)

Level of significance $\alpha = 0.01$

n \ K	3	4	5	6	7	8	9	10
1	4.1	5.7	7.3	8.9	10.5	12.2	13.9	15.6
2	5.8	8.0	10.3	12.6	14.9	17.3	19.7	22.1
3	7.1	9.8	12.6	15.4	18.3	21.2	24.1	27.0
4	8.2	11.4	14.6	17.8	21.1	24.4	27.8	31.2
5	9.2	12.7	16.3	19.9	23.6	27.3	31.1	34.9
6	10.1	13.9	17.8	21.8	25.8	29.9	34.1	38.2
7	10.9	15.0	19.3	23.5	27.9	32.3	36.8	41.3
8	11.7	16.1	20.6	25.2	29.8	34.6	39.3	44.2
9	12.4	17.1	21.8	26.7	31.6	36.6	41.7	46.8
10	13.0	18.0	23.0	28.1	33.4	38.6	44.0	49.4
11	13.7	18.9	24.1	29.5	35.0	40.5	46.1	51.8
12	14.3	19.7	25.2	30.8	36.5	42.3	48.2	54.1
13	14.9	20.5	26.2	32.1	38.0	44.0	50.1	56.3
14	15.4	21.3	27.2	33.3	39.5	45.7	52.0	58.4
15	16.0	22.0	28.2	34.5	40.8	47.3	53.9	60.5
16	16.5	22.7	29.1	35.6	42.2	48.9	55.6	62.5
17	17.0	23.4	30.0	36.7	43.5	50.4	57.3	64.4
18	17.5	24.1	30.9	37.8	44.7	51.8	59.0	66.2
19	18.0	24.8	31.7	38.8	46.0	53.2	60.6	68.1
20	18.4	25.4	32.5	39.8	47.2	54.6	62.2	69.8
21	18.9	26.0	33.4	40.9	48.3	56.0	63.7	71.6
22	19.3	26.7	34.1	41.7	49.5	57.3	65.2	73.2
23	19.8	27.3	34.9	42.7	50.6	58.6	66.7	74.9
24	20.2	27.8	35.7	43.6	51.7	59.8	68.1	76.5
25	20.6	28.4	36.4	44.5	52.7	61.1	69.5	78.1

Level of significance $\alpha = 0.05$

n \ K	3	4	5	6	7	8	9	10
1	3.3	4.7	6.1	7.5	9.0	10.5	12.0	13.5
2	4.7	6.6	8.6	10.7	12.7	14.8	17.0	19.2
3	5.7	8.1	10.6	13.1	15.6	18.2	20.8	23.5
4	6.6	9.4	12.2	15.1	18.0	21.0	24.0	27.1
5	7.4	10.5	13.6	16.9	20.1	23.5	26.9	30.3
6	8.1	11.5	14.9	18.5	22.1	25.7	29.4	33.2
7	8.8	12.4	16.1	19.9	23.9	27.8	31.8	35.8
8	9.4	13.3	17.3	21.3	25.5	29.7	34.0	38.3
9	9.9	14.1	18.3	22.6	27.0	31.5	36.0	40.6
10	10.5	14.8	19.3	23.8	28.5	33.2	38.0	42.8
11	11.0	15.6	20.2	25.0	29.9	34.8	39.8	44.9
12	11.5	16.2	21.1	26.1	31.2	36.4	41.6	46.9
13	11.9	16.9	22.0	27.2	32.5	37.9	43.3	48.8
14	12.4	17.5	22.8	28.2	33.7	39.3	45.0	50.7
15	12.8	18.2	23.6	29.2	34.9	40.7	46.5	52.5

Table 32 continued

Level of significance $\alpha = 0.05$

n \ K	3	4	5	6	7	8	9	10
16	13.3	18.8	24.4	30.2	36.0	42.0	48.1	54.2
17	13.7	19.3	25.2	31.1	37.1	43.3	49.5	55.9
18	14.1	19.9	25.9	32.0	38.2	44.5	51.0	57.5
19	14.4	20.4	26.6	32.9	39.3	45.8	52.4	59.0
20	14.8	21.0	27.3	33.7	40.3	47.0	53.7	60.6
21	15.2	21.5	28.0	34.6	41.3	48.1	55.1	62.1
22	15.5	22.0	28.6	35.4	42.3	49.2	56.4	63.5
23	15.9	22.5	29.3	36.2	43.2	50.3	57.6	65.0
24	16.2	23.0	29.9	36.9	44.1	51.4	58.9	66.4
25	16.6	23.5	30.5	37.7	45.0	52.5	60.1	67.7

Level of significance $\alpha = 0.10$

n \ K	3	4	5	6	7	8	9	10
1	2.9	4.2	5.5	6.8	8.2	9.6	11.1	12.5
2	4.1	5.9	7.8	9.7	11.6	13.6	15.6	17.7
3	5.0	7.2	9.5	11.9	14.2	16.7	19.1	21.7
4	5.8	8.4	11.0	13.7	16.5	19.3	22.1	25.0
5	6.5	9.4	12.3	15.3	18.4	21.5	24.7	28.0
6	7.1	10.2	13.5	16.8	20.2	23.6	27.1	30.6
7	7.7	11.1	14.5	18.1	21.8	25.5	29.3	33.1
8	8.2	11.8	15.6	19.4	23.3	27.2	31.3	35.4
9	8.7	12.5	16.5	20.5	24.7	28.9	33.2	37.5
10	9.2	13.2	17.4	21.7	26.0	30.4	35.0	39.5
11	9.6	13.9	18.2	22.7	27.3	31.9	36.7	41.5
12	10.1	14.5	19.0	23.7	28.5	33.4	38.3	43.3
13	10.5	15.1	19.8	24.7	29.7	34.7	39.9	45.1
14	10.9	15.7	20.6	25.6	30.8	36.0	41.4	46.8
15	11.2	16.2	21.3	26.5	31.9	37.3	42.8	48.4
16	11.6	16.7	22.0	27.4	32.9	38.5	44.2	50.0
17	12.0	17.2	22.7	28.2	33.9	39.7	45.6	51.5
18	12.3	17.7	23.3	29.1	34.9	40.9	46.9	53.0
19	12.6	18.2	24.0	29.9	35.9	42.0	48.2	54.5
20	13.0	18.7	24.6	30.6	36.8	43.1	49.4	55.9
21	13.3	19.2	25.2	31.4	37.7	44.1	50.7	57.3
22	13.6	19.6	25.8	32.1	38.6	45.2	51.9	58.6
23	13.9	20.1	26.4	32.8	39.5	46.2	53.0	60.0
24	14.2	20.5	26.9	33.6	40.3	47.2	54.2	61.2
25	14.5	20.9	27.5	34.2	41.1	48.1	55.3	62.5

Source: Sachs, 1972

Table 33 Durbin–Watson test bounds

d_L denotes the lower boundary or left-sided critical values.
d_U denotes the upper boundary or right-sided critical values.
Example: for $n = 20$, $\alpha = 0.01$, and two independent variables, $d_L = 0.86$ and $d_U = 1.27$.

Level of significance $\alpha = 0.05$

	Number of independent variables ($p - 1$)									
	1		2		3		4		5	
n	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
15	1.08	1.36	0.95	1.54	0.82	1.75	0.69	1.97	0.56	2.21
16	1.10	1.37	0.98	1.54	0.86	1.73	0.74	1.93	0.62	2.15
17	1.13	1.38	1.02	1.54	0.90	1.71	0.78	1.90	0.67	2.10
18	1.16	1.39	1.05	1.53	0.93	1.69	0.82	1.87	0.71	2.06
19	1.18	1.40	1.08	1.53	0.97	1.68	0.86	1.85	0.75	2.02
20	1.20	1.41	1.10	1.54	1.00	1.68	0.90	1.83	0.79	1.99
21	1.22	1.42	1.13	1.54	1.03	1.67	0.93	1.81	0.83	1.96
22	1.24	1.43	1.15	1.54	1.05	1.66	0.96	1.80	0.86	1.94
23	1.26	1.44	1.17	1.54	1.08	1.66	0.99	1.79	0.90	1.92
24	1.27	1.45	1.19	1.55	1.10	1.66	1.01	1.78	0.93	1.90
25	1.29	1.45	1.21	1.55	1.12	1.66	1.04	1.77	0.95	1.89
26	1.30	1.46	1.22	1.55	1.14	1.65	1.06	1.76	0.98	1.88
27	1.32	1.47	1.24	1.56	1.16	1.65	1.08	1.76	1.01	1.86
28	1.33	1.48	1.26	1.56	1.18	1.65	1.10	1.75	1.03	1.85
29	1.34	1.48	1.27	1.56	1.20	1.65	1.12	1.74	1.05	1.84
30	1.35	1.49	1.28	1.57	1.21	1.65	1.14	1.74	1.07	1.83
31	1.36	1.50	1.30	1.57	1.23	1.65	1.16	1.74	1.09	1.83
32	1.37	1.50	1.31	1.57	1.24	1.65	1.18	1.73	1.11	1.82
33	1.38	1.51	1.32	1.58	1.26	1.65	1.19	1.73	1.13	1.81
34	1.39	1.51	1.33	1.58	1.27	1.65	1.21	1.73	1.15	1.81
35	1.40	1.52	1.34	1.58	1.28	1.65	1.22	1.73	1.16	1.80
36	1.41	1.52	1.35	1.59	1.29	1.65	1.24	1.73	1.18	1.80
37	1.42	1.53	1.36	1.59	1.31	1.66	1.25	1.72	1.19	1.80
38	1.43	1.54	1.37	1.59	1.32	1.66	1.26	1.72	1.21	1.79
39	1.43	1.54	1.38	1.60	1.33	1.66	1.27	1.72	1.22	1.79
40	1.44	1.54	1.39	1.60	1.34	1.66	1.27	1.72	1.23	1.79
45	1.48	1.57	1.43	1.62	1.38	1.67	1.34	1.72	1.29	1.78
50	1.50	1.59	1.46	1.63	1.42	1.67	1.38	1.72	1.34	1.77
55	1.53	1.60	1.49	1.64	1.45	1.68	1.41	1.72	1.38	1.77
60	1.55	1.62	1.51	1.65	1.48	1.69	1.44	1.73	1.41	1.77
65	1.57	1.63	1.54	1.66	1.50	1.70	1.47	1.73	1.44	1.77
70	1.58	1.64	1.55	1.67	1.52	1.70	1.49	1.74	1.46	1.77
75	1.60	1.65	1.57	1.68	1.54	1.71	1.51	1.74	1.49	1.77
80	1.61	1.66	1.59	1.69	1.56	1.72	1.53	1.74	1.51	1.77
85	1.62	1.67	1.60	1.70	1.57	1.72	1.55	1.75	1.52	1.77
90	1.63	1.68	1.61	1.70	1.59	1.73	1.57	1.75	1.54	1.78
95	1.64	1.69	1.62	1.71	1.60	1.73	1.58	1.75	1.56	1.78
100	1.65	1.69	1.63	1.72	1.61	1.74	1.59	1.76	1.57	1.78

Table 33 continued

Level of significance $\alpha = 0.01$

	Number of independent variables $(p-1)$									
	1		2		3		4		5	
n	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
15	0.81	1.07	0.70	1.25	0.59	1.46	0.49	1.70	0.39	1.96
16	0.84	1.09	0.74	1.25	0.63	1.44	0.53	1.66	0.44	1.90
17	0.87	1.10	0.77	1.25	0.67	1.43	0.57	1.63	0.48	1.85
18	0.90	1.12	0.80	1.26	0.71	1.42	0.61	1.60	0.52	1.80
19	0.93	1.13	0.83	1.26	0.74	1.41	0.65	1.58	0.56	1.77
20	0.95	1.15	0.86	1.27	0.77	1.41	0.68	1.57	0.60	1.74
21	0.97	1.16	0.89	1.27	0.80	1.41	0.72	1.55	0.63	1.71
22	1.00	1.17	0.91	1.28	0.83	1.40	0.75	1.54	0.66	1.69
23	1.02	1.19	0.94	1.29	0.86	1.40	0.77	1.53	0.70	1.67
24	1.04	1.20	0.96	1.30	0.88	1.41	0.80	1.53	0.72	1.66
25	1.05	1.21	0.98	1.30	0.90	1.41	0.83	1.52	0.75	1.65
26	1.07	1.22	1.00	1.31	0.93	1.41	0.85	1.52	0.78	1.64
27	1.09	1.23	1.02	1.32	0.95	1.41	0.88	1.51	0.81	1.63
28	1.10	1.24	1.04	1.32	0.97	1.41	0.90	1.51	0.83	1.62
29	1.12	1.25	1.05	1.33	0.99	1.42	0.92	1.51	0.85	1.61
30	1.13	1.26	1.07	1.34	1.01	1.42	0.94	1.51	0.88	1.61
31	1.15	1.27	1.08	1.34	1.02	1.42	0.96	1.51	0.90	1.60
32	1.16	1.28	1.10	1.35	1.04	1.43	0.98	1.51	0.92	1.60
33	1.17	1.29	1.11	1.36	1.05	1.43	1.00	1.51	0.94	1.59
34	1.18	1.30	1.13	1.36	1.07	1.43	1.01	1.51	0.95	1.59
35	1.19	1.31	1.14	1.37	1.08	1.44	1.03	1.51	0.97	1.59
36	1.21	1.32	1.15	1.38	1.10	1.44	1.04	1.51	0.99	1.59
37	1.22	1.32	1.16	1.38	1.11	1.45	1.06	1.51	1.00	1.59
38	1.23	1.33	1.18	1.39	1.12	1.45	1.07	1.52	1.02	1.58
39	1.24	1.34	1.19	1.39	1.14	1.45	1.09	1.52	1.03	1.58
40	1.25	1.34	1.20	1.40	1.15	1.46	1.10	1.52	1.05	1.58
45	1.29	1.38	1.24	1.42	1.20	1.48	1.16	1.53	1.11	1.58
50	1.32	1.40	1.28	1.45	1.24	1.49	1.20	1.54	1.16	1.59
55	1.36	1.43	1.32	1.47	1.28	1.51	1.25	1.55	1.21	1.59
60	1.38	1.45	1.35	1.48	1.32	1.52	1.28	1.56	1.25	1.60
65	1.41	1.47	1.38	1.50	1.35	1.53	1.31	1.57	1.28	1.61
70	1.43	1.49	1.40	1.52	1.37	1.55	1.34	1.58	1.31	1.61
75	1.45	1.50	1.42	1.53	1.39	1.56	1.37	1.59	1.34	1.62
80	1.47	1.52	1.44	1.54	1.42	1.57	1.39	1.60	1.36	1.62
85	1.48	1.53	1.46	1.55	1.43	1.58	1.41	1.60	1.39	1.63
90	1.50	1.54	1.47	1.56	1.45	1.59	1.43	1.61	1.41	1.64
95	1.51	1.55	1.49	1.57	1.47	1.60	1.45	1.62	1.42	1.64
100	1.52	1.56	1.50	1.58	1.48	1.60	1.46	1.63	1.44	1.65

Source: Durbin and Watson, 1951

Table 34 Modified Rayleigh test (V-test)

	Level of significance α					
n	0.10	0.05	0.01	0.005	0.001	0.0001
5	1.3051	1.6524	2.2505	2.4459	2.7938	3.0825
6	1.3009	1.6509	2.2640	2.4695	2.8502	3.2114
7	1.2980	1.6499	2.2734	2.4858	2.8886	3.2970
8	1.2958	1.6492	2.2803	2.4978	2.9164	3.3578
9	1.2942	1.6484	2.2856	2.5070	2.9375	3.4034
10	1.2929	1.6482	2.2899	2.5143	2.9540	3.4387
11	1.2918	1.6479	2.2933	2.5201	2.9672	3.4669
12	1.2909	1.6476	2.2961	2.5250	2.9782	3.4899
13	1.2902	1.6474	2.2985	2.5290	2.9873	3.5091
14	1.2895	1.6472	2.3006	2.5325	2.9950	3.5253
15	1.2890	1.6470	2.3023	2.5355	3.0017	3.5392
16	1.2885	1.6469	2.3039	2.5381	3.0075	3.5512
17	1.2881	1.6467	2.3052	2.5404	3.0126	3.5617
18	1.2877	1.6466	2.3064	2.5424	3.0171	3.5710
19	1.2874	1.6465	2.3075	2.5442	3.0211	3.5792
20	1.2871	1.6464	2.3085	2.5458	3.0247	3.5866
21	1.2868	1.6464	2.3093	2.5473	3.0279	3.5932
22	1.2866	1.6463	2.3101	2.5486	3.0308	3.5992
23	1.2864	1.6462	2.3108	2.5498	3.0335	3.6047
24	1.2862	1.6462	2.3115	2.5509	3.0359	3.6096
25	1.2860	1.6461	2.3121	2.5519	3.0382	3.6142
26	1.2858	1.6461	2.3127	2.5529	3.0402	3.6184
27	1.2856	1.6460	2.3132	2.5538	3.0421	3.6223
28	1.2855	1.6460	2.3136	2.5546	3.0439	3.6258
29	1.2853	1.6459	2.3141	2.5553	3.0455	3.6292
30	1.2852	1.6459	2.3145	2.5560	3.0471	3.6323
40	1.2843	1.6456	2.3175	2.5610	3.0580	3.6545
50	1.2837	1.6455	2.3193	2.5640	3.0646	3.6677
60	1.2834	1.6454	2.3205	2.5660	3.0689	3.6764
70	1.2831	1.6453	2.3213	2.5674	3.0720	3.6826
100	1.2826	1.6452	2.3228	2.5699	3.0775	3.6936
500	1.2818	1.6449	2.3256	2.5747	3.0877	3.7140
1000	1.2817	1.6449	2.3260	2.5752	3.0890	3.7165

Source: Batschelet, 1981; original provided by W.T. Keeton

Table 35 Watson's U_n^2-test

	Level of significance α				
n	0.10	0.05	0.025	0.01	0.005
2	0.143	O.155	0.161	0.164	0.165
3	0.145	0.173	0.194	0.213	0.224
4	0.146	0.176	0.202	0.233	0.252
5	0.148	0.177	0.205	0.238	0.262
6	0.149	0.179	0.208	0.243	0.269
7	0.149	0.180	0.210	0.247	0.274
8	0.150	0.181	0.211	0.250	0.278
9	0.150	0.182	0.212	0.252	0.281
10	0.150	0.182	0.213	0.254	0.283
12	0.150	0.183	0.215	0.256	0.287
14	0.151	0.184	0.216	0.258	0.290
16	0.151	0.184	0.216	0.259	0.291
18	0.151	0.184	0.217	0.259	0.292
20	0.151	0.185	0.217	0.261	0.293
30	0.152	0.185	0.219	0.263	0.296
40	0.152	0.186	0.219	0.264	0.298
50	0.152	0.186	0.220	0.265	0.299
100	0.152	0.186	0.221	0.266	0.301
∞	0.152	0.187	0.221	0.267	0.302

Source: Batschelet, 1981; adapted from Stephens, 1964

Table 36 Watson's two-sample U^2-test

n and *m* are sample sizes.

		Level of significance α								
n	m	0.50	0.20	0.10	0.05	0.02	0.01	0.005	0.002	0.001
5	5	0.089	0.161	0.225	0.225					
5	6	0.085	0.133	0.182	0.242					
5	7	0.086	0.128	0.171	0.200	0.257				
5	8	0.085	0.131	0.165	0.215	0.269				
5	9	0.080	0.124	0.159	0.191	0.280	0.280			
5	10	0.084	0.124	0.161	0.196	0.241	0.289	0.289		
5	11	0.081	0.124	0.156	0.190	0.229	0.297	0.297		
5	12	0.078	0.124	0.155	0.186	0.226	0.261	0.304		
6	6	0.088	0.132	0.171	0.206	0.264				
6	7	0.081	0.121	0.154	0.194	0.282	0.282			
6	8	0.083	0.127	0.161	0.196	0.246	0.298	0.298		
6	9	0.082	0.126	0.156	0.193	0.232	0.262	0.311		
6	10	0.077	0.126	0.156	0.190	0.231	0.248	0.323	0.323	
6	11	0.078	0.121	0.157	0.187	0.225	0.262	0.289	0.333	
6	12	0.080	0.124	0.155	0.183	0.226	0.259	0.275	0.343	0.343
7	7	0.079	0.135	0.158	0.199	0.251	0.304	0.304		
7	8	0.079	0.120	0.156	0.182	0.225	0.272	0.322		
7	9	0.079	0.122	0.156	0.182	0.222	0.255	0.291	0.339	
7	10	0.077	0.123	0.155	0.187	0.227	0.262	0.277	0.353	0.353
7	11	0.077	0.122	0.155	0.184	0.221	0.253	0.281	0.323	0.366
7	12	0.076	0.122	0.154	0.186	0.226	0.252	0.276	0.308	0.377
8	8	0.078	0.125	0.156	0.184	0.226	0.250	0.296	0.344	
8	9	0.078	0.123	0.155	0.186	0.226	0.258	0.283	0.363	0.363
8	10	0.078	0.122	0.155	0.185	0.222	0.249	0.280	0.336	0.380
8	11	0.077	0.122	0.154	0.184	0.225	0.252	0.280	0.319	0.353
8	12	0.077	0.121	0.156	0.185	0.223	0.252	0.281	0.317	0.340
9	9	0.077	0.125	0.155	0.187	0.225	0.266	0.286	0.340	0.384
9	10	0.076	0.122	0.154	0.186	0.226	0.254	0.287	0.321	0.361
9	11	0.076	0.121	0.154	0.185	0.225	0.255	0.281	0.317	0.341
9	12	0.077	0.122	0.154	0.185	0.226	0.254	0.280	0.316	0.340
10	10	0.075	0.123	0.155	0.185	0.225	0.255	0.283	0.317	0.345
10	11	0.076	0.122	0.154	0.186	0.224	0.255	0.279	0.317	0.341
10	12	0.076	0.121	0.153	0.185	0.225	0.255	0.282	0.316	0.341
∞	∞	0.071	0.117	0.152	0.187	0.233	0.268	0.304	0.350	0.385

Source: Batschelet, 1981: adapted from Zar, 1974

Table 37 Maximum likelihood estimate $\hat{k}$ for given $\bar{R}$ in the von Mises case

For the solution $k = A^{-1}(\rho)$, replace $\hat{k}$ by k, $\bar{R}$ by ρ.

$\bar{R}$	$\hat{k}$	$\bar{R}$	$\hat{k}$	$\bar{R}$	$\hat{k}$
0.00	0.00000	0.35	0.74783	0.70	2.01363
0.01	0.02000	0.36	0.77241	0.71	2.07685
0.02	0.04001	0.37	0.79730	0.72	2.14359
0.03	0.06003	0.38	0.82253	0.73	2.21425
0.04	0.08006	0.39	0.84812	0.74	2.28930
0.05	0.10013	0.40	0.87408	0.75	2.36930
0.06	0.12022	0.41	0.90043	0.76	2.45490
0.07	0.14034	0.42	0.92720	0.77	2.54686
0.08	0.16051	0.43	0.95440	0.78	2.64613
0.09	0.18073	0.44	0.98207	0.79	2.75382
0.10	0.20101	0.45	1.01022	0.80	2.87129
0.11	0.22134	0.46	1.03889	0.81	3.00020
0.12	0.24175	0.47	1.06810	0.82	3.14262
0.13	0.26223	0.48	1.09788	0.83	3.30114
0.14	0.28279	0.49	1.12828	0.84	3.47901
0.15	0.30344	0.50	1.15932	0.85	3.68041
0.16	0.32419	0.51	1.19105	0.86	3.91072
0.17	0.34503	0.52	1.22350	0.87	4.17703
0.18	0.36599	0.53	1.25672	0.88	4.48876
0.19	0.38707	0.54	1.29077	0.89	4.85871
0.20	0.40828	0.55	1.32570	0.90	5.3047
0.21	0.42962	0.56	1.36156	0.91	5.8522
0.22	0.45110	0.57	1.39842	0.92	6.5394
0.23	0.47273	0.58	1.43635	0.93	7.4257
0.24	0.49453	0.59	1.47543	0.94	8.6104
0.25	0.51649	0.60	1.51574	0.95	10.2716
0.26	0.53863	0.61	1.55738	0.96	12.7661
0.27	0.56097	0.62	1.60044	0.97	16.9266
0.28	0.58350	0.63	1.64506	0.98	25.2522
0.29	0.60625	0.64	1.69134	0.99	50.2421
0.30	0.62922	0.65	1.73945	1.00	∞
0.31	0.65242	0.66	1.78953		
0.32	0.67587	0.67	1.84177		
0.33	0.69958	0.68	1.89637		
0.34	0.72356	0.69	1.95357		

Source: Mardia, 1972

Table 38 Mardia–Watson–Wheeler test

n_1 = smaller of the two sample sizes n_1, n_2; $n = n_1 + n_2$.

		Level of significance α			
n	n_1	0.001	0.01	0.05	0.10
8	4				6.83
9	3				6.41
	4			8.29	4.88
10	3				6.85
	4			9.47	6.24
	5			10.47	6.85
11	3			7.20	5.23
	4			10.42	7.43
	5		12.34	8.74	6.60
12	3			7.46	5.73
	4		11.20	8.46	7.46
	5		13.93	10.46	7.46
	6		14.93	11.20	7.46
13	3			7.68	6.15
	4		11.83	9.35	7.03
	5		15.26	10.15	7.39
	6		17.31	10.42	8.04
14	3			7.85	6.49
	4		12.34	9.30	7.60
	5		16.39	10.30	7.85
	6	19.20	15.59	12.21	7.94
	7	20.20	16.39	11.65	8.85
15	3			7.99	6.78
	4		12.78	8.74	7.91
	5	17.35	14.52	10.36	7.91
	6	20.92	17.48	11.61	9.12
	7	22.88	16.14	11.57	9.06
16	3			8.11	5.83
	4		13.14	9.44	7.38
	5	18.16	15.55	10.44	9.03
	6	22.43	16.98	11.54	9.11
	7	25.27	18.16	12.66	9.78
17	3		8.21	7.23	6.14
	4	13.44	11.76	9.74	7.64
	5	18.86	16.44	11.03	8.76
	6	23.73	17.76	12.21	9.41
	7	27.40	17.98	12.63	10.11
	8	29.37	19.11	13.36	10.15

Source: Mardia, 1972