

Appendix A

***Two-Stretch
Transformations of
Proportions: Arcsin,
Probit, and Logit***

For proportions of .00 and 1.00, the values of .0025 and .9975 are used for probit and logit. Arcsin in radians equals $2\arcsin\sqrt{p}$, where p is the proportion.

Two-Stretch Transformations of Proportions

Proportion	Arcsin	Probit	Logit	Proportion	Arcsin	Probit	Logit
.00	.000	-2.807	-5.989	.51	1.591	.025	.040
.01	.200	-2.326	-4.595	.52	1.611	.050	.080
.02	.284	-2.054	-3.892	.53	1.631	.075	.120
.03	.348	-1.881	-3.476	.54	1.651	.100	.160
.04	.403	-1.751	-3.178	.55	1.671	.126	.201
.05	.451	-1.645	-2.944	.56	1.691	.151	.241
.06	.495	-1.555	-2.752	.57	1.711	.176	.282
.07	.536	-1.476	-2.587	.58	1.731	.202	.323
.08	.574	-1.405	-2.442	.59	1.752	.228	.364
.09	.609	-1.341	-2.314	.60	1.772	.253	.405
.10	.644	-1.282	-2.197	.61	1.793	.279	.447
.11	.676	-1.227	-2.091	.62	1.813	.305	.490
.12	.707	-1.175	-1.992	.63	1.834	.332	.532
.13	.738	-1.126	-1.901	.64	1.855	.358	.575
.14	.767	-1.080	-1.815	.65	1.875	.385	.619
.15	.795	-1.036	-1.735	.66	1.897	.412	.663
.16	.823	-.994	-1.658	.67	1.918	.440	.708
.17	.850	-.954	-1.586	.68	1.939	.468	.754
.18	.876	-.915	-1.516	.69	1.961	.496	.800
.19	.902	-.878	-1.450	.70	1.982	.524	.847
.20	.927	-.842	-1.386	.71	2.004	.553	.895
.21	.952	-.806	-1.325	.72	2.026	.583	.944
.22	.976	-.772	-1.266	.73	2.049	.613	.995
.23	1.000	-.739	-1.208	.74	2.071	.643	1.046
.24	1.024	-.706	-1.153	.75	2.094	.674	1.099
.25	1.047	-.674	-1.099	.76	2.118	.706	1.153
.26	1.070	-.643	-1.046	.77	2.141	.739	1.208
.27	1.093	-.613	-.995	.78	2.165	.772	1.266
.28	1.115	-.583	-.944	.79	2.190	.806	1.325
.29	1.137	-.553	-.895	.80	2.214	.842	1.386
.30	1.159	-.524	-.847	.81	2.240	.878	1.450
.31	1.181	-.496	-.800	.82	2.265	.915	1.516
.32	1.203	-.468	-.754	.83	2.292	.954	1.586
.33	1.224	-.440	-.708	.84	2.319	.994	1.658
.34	1.245	-.412	-.663	.85	2.346	1.036	1.735
.35	1.266	-.385	-.619	.86	2.375	1.080	1.815
.36	1.287	-.358	-.575	.87	2.404	1.126	1.901
.37	1.308	-.332	-.532	.88	2.434	1.175	1.992
.38	1.328	-.305	-.490	.89	2.465	1.227	2.091
.39	1.349	-.279	-.447	.90	2.498	1.282	2.197
.40	1.369	-.253	-.405	.91	2.532	1.341	2.314
.41	1.390	-.228	-.364	.92	2.568	1.405	2.442
.42	1.410	-.202	-.323	.93	2.606	1.476	2.587
.43	1.430	-.176	-.282	.94	2.647	1.555	2.752
.44	1.451	-.151	-.241	.95	2.691	1.645	2.944
.45	1.471	-.126	-.201	.96	2.739	1.751	3.178
.46	1.491	-.100	-.160	.97	2.793	1.881	3.476
.47	1.511	-.075	-.120	.98	2.858	2.054	3.892
.48	1.531	-.050	-.080	.99	2.941	2.326	4.595
.49	1.551	-.025	-.040	1.00	3.142	2.807	5.989
.50	1.571	.000	.000				

Appendix B

***Random Number
Table***

56307	81882	01267	60636	27616	94931	85877	33199	31923	04299
53170	66366	22597	69962	72660	36044	39661	46332	69063	69126
25441	24626	23769	44450	23392	55407	52835	80126	44220	21071
67767	75065	46060	52061	75922	75232	70485	02836	50285	76779
72158	36963	33973	61639	21384	11576	35060	83597	82196	57290
32677	29310	32886	42903	55303	84893	91062	92422	32258	79833
44262	70799	84371	61764	71740	12999	81527	95516	95997	63689
99218	78661	33220	90874	62120	15759	50368	63479	66303	27846
93070	74521	22764	95558	22262	09234	41209	65445	36943	90999
17536	73852	98382	45537	45349	16219	98549	69084	01392	71552
67557	97691	01644	11410	25441	52188	65424	42944	54006	88783
37779	64441	76173	59967	55136	37006	85750	56453	88846	60510
20213	92212	68812	60050	29080	89076	04321	78746	98507	06600
08921	99991	19084	80209	41627	27679	62120	77491	77637	44282
98842	07646	74416	91041	85667	71803	05700	21238	19419	94011
82280	31234	76089	59339	53797	38971	77804	80586	17913	73601
53589	92380	69774	55115	43007	49929	22053	22325	66889	02919
06830	07729	97336	46918	44137	20443	82949	16470	59820	99197
34600	97147	03860	01831	51246	73016	02354	31569	89891	81715
32719	79038	32970	91334	59276	22827	26529	34705	52333	68289
93195	72681	27993	81924	61702	90623	96750	97357	40916	79958
10092	95893	31966	43320	51706	95684	58690	87194	47942	33952
78348	68540	89975	44952	24521	54655	55386	71593	67767	49552
89096	09026	45642	53609	71573	88574	30753	21154	94450	44575
39034	34286	41125	40477	87507	14672	28411	03839	20589	38887
19878	65654	22974	71760	66679	51058	91689	88490	42003	50891
26570	21824	31589	18059	03149	19063	64797	43655	50702	98695
52585	18854	14107	48507	89515	35040	91648	38762	41920	02459
91104	78369	11514	29603	19251	18561	15864	41773	07080	79707
36189	17014	69188	32238	87884	87737	80774	21530	43175	48841
82782	54655	29874	23496	88302	63898	30585	47754	41042	30314
22012	10866	38364	73685	13103	62225	09214	87528	95914	40769
49406	02585	37988	50473	58106	03463	59109	11159	00389	00075
59025	49971	71781	22409	15320	06893	25943	86315	49113	27804
43467	70548	84830	60092	78808	89159	52752	82719	36441	42066
97377	83890	19586	30314	43509	71301	82279	67453	55261	60677
15111	08105	20548	01915	01727	70548	59318	10824	99343	03505
88386	63354	31924	44617	48988	06182	27197	81673	63334	88950
12142	67160	95286	26675	77010	97190	30125	48549	39243	35123
79854	37926	57771	17223	80732	61096	12016	78536	22305	62183
85876	94931	60364	85102	52459	18645	15320	43112	05115	87654
23099	58336	47273	98863	88888	86775	85709	08775	82321	29937
86462	44492	62413	25587	80565	85646	65048	45245	47105	09485
68269	72973	50577	36754	23601	32781	97252	20777	94701	44115
62873	63061	55094	00034	10301	47754	28285	05680	16533	52522
64337	33743	19000	82802	33847	48674	99134	66449	08419	53107
66428	03714	86211	55658	90644	55701	55178	73978	62371	65152
62622	90205	00347	86566	72116	85186	40331	95349	73622	07645
46102	13668	05909	45538	72911	57875	97043	99699	34768	99281
12100	90748	47106	98779	86210	91878	69816	55868	40456	57290
53212	43656	65508	16888	07248	06181	01685	33576	82697	02124
10050	97189	28076	53818	20213	90163	74082	41020	85291	23078
83659	51435	42463	86315	98088	31610	26863	57164	11054	19691
01225	72639	53630	27302	51664	45956	58607	38762	43969	96018
57101	80084	07248	44450	74416	52773	12936	52606	76633	71928
45349	92756	44011	07478	60699	71343	32007	67536	03693	64651
57394	28180	10176	85814	02229	19481	61200	54446	19502	93467
90226	07101	48193	46248	95119	17056	44429	80418	15780	78536
34684	47628	01392	58795	31673	82468	25316	14588	88637	36210

Random Number Table

86001	68750	16324	92003	06244	32655	46018	25796	30377	87235
37946	87989	33388	15299	12894	90122	51915	82593	34182	49720
83994	24919	97377	96646	44220	70046	86922	54404	95287	41480
18499	97650	52793	04885	94868	92003	93488	09193	06286	83555
34350	25169	43844	08566	58021	76445	16114	15801	61828	92003
25316	27344	13271	75943	28913	41188	99009	42777	55094	87278
84872	22576	03525	78495	98967	03756	84914	59548	80146	87194
07373	27804	61451	81548	64002	83722	18624	34078	30753	10447
88051	64358	27741	55994	17202	01539	42296	36378	00389	76612
17160	48590	48653	68917	51455	72681	02480	33827	82237	04969
91689	01246	66638	90623	60531	18184	39577	95851	71531	13334
03651	40435	25023	89954	40247	57625	99552	90414	60866	19230
47105	83973	68017	34287	81443	06767	25734	87528	44889	43404
16993	51727	40707	93049	80523	86943	61158	55742	15612	03964
05617	62100	84370	34203	28912	15676	50912	63312	69440	19899
06161	33199	44680	28934	22430	11368	37445	78201	97796	09904
13856	85186	65843	43446	53087	93299	64086	71594	95328	92380
22472	35583	89431	47168	14943	81631	76215	09695	55219	85437
24312	03965	60239	10406	02940	92714	17746	61932	72702	09235
14902	08440	21593	99657	10552	47294	31129	97440	40372	81297
85959	67997	18875	84642	29791	62309	59695	85060	51706	21196
33597	01330	93655	33617	57060	57917	48821	93341	01058	47043
50117	26842	90727	16888	83785	51644	41251	91710	82488	78996
29875	63814	54592	00953	04613	63061	80606	48131	89766	33408
65759	31234	27114	56704	13898	11451	11389	31443	15194	31024
51539	46624	54550	51225	04530	14630	76633	10197	54300	91125
81861	30732	78180	54822	70276	91292	20255	52647	98799	29184
49908	00493	43676	33994	05784	61012	87047	29100	44805	67411
50912	76069	92902	59632	03065	41898	19168	08398	84621	23036
76299	74981	70945	99991	57352	52940	60824	56746	12602	15341
20715	16805	22598	23036	62413	12831	55930	45914	21635	62141
77344	19649	88846	98779	11723	41146	49281	42694	06663	83304
41418	02501	15069	94596	99636	54823	83032	15926	59987	96060
06705	84057	45182	79916	17871	72848	01393	35332	77135	20862
64337	82718	21635	23873	62539	16261	48277	69168	50996	75525
11012	18938	90100	94136	24772	01121	67306	86566	74165	78745
39620	09360	92442	60426	01267	47880	02982	55198	42463	50096
42756	73852	74919	90999	83743	74354	98340	44784	47900	07687
15069	30815	77637	54989	67139	99238	97294	24751	85709	70506
50912	99532	47440	21238	44931	43279	44296	61891	48486	57248
43174	97817	27365	58294	10301	22242	79017	26215	30879	86316
85625	45538	60155	33241	57311	56286	51665	86274	24897	75817
71739	59925	90602	17557	78557	65278	01811	10322	26947	45913
97043	61430	62037	78912	71029	65278	74250	68666	28452	15299
53254	67871	17494	85855	24395	77909	12309	27804	25232	02375
35312	97942	02062	07813	36232	19816	60196	58628	09298	25253
35521	70046	59360	11576	96792	10865	61827	28223	74709	04090
02773	95851	09799	86065	01769	22325	54132	78285	48277	07436
23308	06976	48862	42192	08754	77616	63040	24877	83868	74563
32300	55073	79351	25211	33889	74939	44680	54446	70527	90832
22639	57959	45475	03672	72702	34747	42379	35834	00556	74647
89264	35500	88803	47001	18080	73685	00347	37591	69482	44115
24480	04927	55303	23162	63793	11619	61326	29142	69021	19397
21468	85520	87130	02167	03316	66951	70109	79624	94115	18017
76633	97441	29665	50221	31004	58963	68854	56704	39410	59548
81401	57039	25651	39096	40916	05470	04112	28933	96918	63271
30418	83889	17536	35583	25651	26340	16282	65738	60699	45830
18038	98444	52167	09695	78682	39975	51330	36253	24521	27093
37152	17349	70234	28808	95537	64483	52585	08147	83032	26633

80355	59297	16825	63522	69015	18854	63083	51142	29414	62560
44639	45036	36734	80628	93153	22953	26737	33492	57729	52689
19669	91502	72116	48967	61159	94011	88344	24333	61744	18060
03024	17683	67181	38260	66302	51309	91230	91334	33764	74730
86127	43446	65843	17934	03818	13835	78432	04215	69314	43153
63626	86022	11723	55952	67474	00284	93864	32405	61284	41146
28703	65864	48151	19983	49574	29059	82321	42693	04613	88573
75420	00787	20506	79749	44471	19439	85960	06265	91606	03839
97545	08314	70360	04676	45056	90414	50159	89327	15445	05052
89724	09193	42505	61555	47440	59506	17662	62476	71363	11200
43969	21531	81443	21572	43927	46290	32091	93676	53128	42150
54341	64316	29038	52104	27700	68875	37947	51769	54216	13960
15780	55073	30376	21405	92819	47419	78264	05303	67808	48256
20589	13375	30251	99782	34224	99448	96959	23706	87967	62853
64295	58503	69648	54906	44220	44534	38825	74939	08461	75274
39787	08272	95119	55324	17160	99615	46019	27846	23936	06265
39661	82551	48235	70464	47106	86022	62748	52145	26403	72764
59737	98569	73789	68289	26654	21280	32928	16094	11096	94931
92024	76779	15111	18812	51623	23789	00179	87654	70611	90288
30585	34998	16407	90582	12852	11660	09004	36838	99594	78410
70360	91920	21594	50682	06746	06223	02438	31025	91230	78578
03651	65947	73120	69419	25901	23831	25567	39640	39578	08607
24814	76361	16658	14462	64965	84057	19670	31819	38406	87194
27908	42150	94073	55533	15947	05010	29247	75232	81192	32739
06704	82008	50451	62058	72911	06850	99678	40770	62288	65696
54676	13166	29414	00828	31966	07101	73706	94345	74584	02710
65006	57248	74291	41857	84245	25336	93780	07436	13020	64818
31756	30899	29289	52521	24103	79665	05575	46541	69900	68080
49866	52815	37152	04592	45600	89075	53296	81380	39578	34120
11640	42568	41501	63689	43677	72262	77344	81381	16115	79582
11431	19440	88009	99824	09465	48800	24855	13333	93279	23162
42129	00075	19712	81547	38490	35625	39160	48423	63375	85604
98674	05512	79352	78285	24814	52898	62120	54028	23099	83848
74542	52982	10552	58001	61033	19314	38825	98402	62998	36880
62915	62936	58984	89536	41794	52103	12894	51853	79184	63396
59026	52020	66512	41439	60280	72890	27658	80878	65132	82969
54299	40101	77051	83137	09381	98319	27323	56369	12852	13709
44555	45580	35395	82593	85207	47085	55805	46583	17579	75776
21803	86566	84872	09820	80063	37591	56725	20653	71907	85521
81276	84392	69691	32196	87131	91460	73413	45077	71656	62518
15571	54236	31422	19147	01644	24166	48904	91920	08837	26047
19335	18017	17202	39808	15027	55575	29456	27093	77512	95098
86922	92672	68018	61849	24270	05262	56349	20904	71447	87193
70318	67704	69607	81715	89599	34496	92986	36797	49866	78327
32426	56454	78139	30607	18289	22325	03108	80920	89348	34956
26027	49552	71279	24500	09632	22200	78264	28766	22346	09862
44889	66867	94116	32823	58859	51936	63835	46541	44387	19983
83660	27972	87925	25881	57395	30230	03735	03672	47189	85479
34350	48632	98381	69000	99887	76654	40414	69293	25692	25044
92192	51351	68519	34245	80690	09318	17202	12246	73371	57080
49782	51309	42254	88699	93865	47210	79477	99908	83408	00870
02940	69251	63208	00326	30836	07854	71155	02878	51037	74228
42505	23287	74709	40310	88595	11995	33513	87946	68854	97022
64881	33576	20966	74855	57980	77742	13396	26299	30335	86482
61493	16470	47064	74563	34224	22911	51497	84140	29833	63062
28160	92715	94283	07394	11095	67369	94074	32070	61410	44576
58064	79247	07122	42192	83242	29519	83576	38051	17662	49720
42923	96227	30962	47503	41501	27470	64504	72096	93237	96896

Random Number Table

80021	62350	07373	91585	82279	80209	79895	00410	82489	06558
60489	96018	81150	44743	98172	07604	73664	93592	77135	95349
78683	16512	96792	74646	83827	26884	89431	19606	73287	83137
28662	41648	96165	51016	31255	58503	71698	48465	63250	88322
04195	90121	24354	40937	35688	19105	63500	47545	40205	30188
98758	81505	24981	13542	90895	28557	09925	86274	99385	27721
05533	35082	41376	38845	90351	06433	52250	32614	34559	98444
19753	67495	17745	85395	27239	69669	36148	56579	38030	61932
34015	99783	98005	20276	95621	38427	04655	25545	05324	36294
42965	48005	24604	13793	90435	31401	01685	10113	28159	41690
39787	33785	43216	34789	03986	66993	70861	77072	02648	94471
17369	74939	95704	51811	29456	63312	56684	96437	19920	15382
70652	88992	27156	31945	62078	39347	01016	35583	76675	23706
93111	96688	81192	45495	95621	14964	50117	65111	63459	36085
79101	14964	01142	61304	22388	08566	45265	51811	76382	72388
21510	63982	30041	47921	37904	38260	32133	66868	08921	51016
14107	61263	12977	74772	35061	21865	53755	76487	53086	91250
50368	25211	93572	08649	07625	80418	54048	51267	05282	12079
24646	77449	15153	19565	49072	31150	76633	59172	56934	31024
31004	33450	20757	77240	52584	93342	64839	67871	02689	67662
63208	13082	55470	48758	13396	85981	64045	48256	36901	41271
13563	35918	61744	03254	25274	26591	15822	68582	52459	69670
77595	20067	85249	09569	80523	35918	63793	96813	43132	71552
47022	84517	67850	36252	73496	30899	54802	01790	03567	66491
17955	46792	53463	52731	98255	30523	29540	52062	26947	71426
82697	27637	86880	28139	49741	54655	31923	17055	06160	07687
35604	45161	11430	30146	19084	20527	07917	65906	36148	92798
69565	17181	70150	27302	00639	48590	99678	66282	10385	45161
79519	62392	08126	89034	89640	56662	51414	86733	23225	84057
58942	00368	67808	84475	79854	63438	05868	97859	66386	27302
01017	50389	93697	81296	63585	87319	07833	66449	35981	95935
98632	30272	30000	49218	34015	48758	00640	61347	24312	06014
47900	58712	19461	56495	87549	64400	28494	52271	24563	76821
41125	55282	05700	72262	15612	52940	35311	08649	33137	28515
71489	38093	33220	65362	14023	35123	63542	97273	41460	79791
34224	24960	45056	03170	74793	29059	58858	88155	43007	47880
21928	36922	86294	55115	91983	52564	63124	49845	33304	52062
29247	90037	99385	91501	59360	24332	21426	50598	05240	11326
48193	05931	28829	78829	70401	65111	76215	60720	52585	44366
75169	01246	17662	87988	20632	90665	73162	46709	68812	70757

Appendix C

Probabilities for the Z Distribution

The value of p is the probability that a sampled value is greater than or equal to zero and less than or equal to Z . To determine the probability that a sampled value is greater than or equal to Z , subtract p from .5.

Z	P	Z	P	Z	P
.00	.0000	.50	.1915	1.00	.3413
.01	.0040	.51	.1950	1.01	.3438
.02	.0080	.52	.1985	1.02	.3461
.03	.0120	.53	.2019	1.03	.3485
.04	.0160	.54	.2054	1.04	.3508
.05	.0199	.55	.2088	1.05	.3531
.06	.0239	.56	.2123	1.06	.3554
.07	.0279	.57	.2157	1.07	.3577
.08	.0319	.58	.2190	1.08	.3599
.09	.0359	.59	.2224	1.09	.3621
.10	.0398	.60	.2257	1.10	.3643
.11	.0438	.61	.2291	1.11	.3665
.12	.0478	.62	.2324	1.12	.3686
.13	.0517	.63	.2357	1.13	.3708
.14	.0557	.64	.2389	1.14	.3729
.15	.0596	.65	.2422	1.15	.3749
.16	.0636	.66	.2454	1.16	.3770
.17	.0675	.67	.2486	1.17	.3790
.18	.0714	.68	.2517	1.18	.3810
.19	.0753	.69	.2549	1.19	.3830
.20	.0793	.70	.2580	1.20	.3849
.21	.0832	.71	.2611	1.21	.3869
.22	.0871	.72	.2642	1.22	.3888
.23	.0910	.73	.2673	1.23	.3907
.24	.0948	.74	.2704	1.24	.3925
.25	.0987	.75	.2734	1.25	.3944
.26	.1026	.76	.2764	1.26	.3962
.27	.1064	.77	.2794	1.27	.3980
.28	.1103	.78	.2823	1.28	.3997
.29	.1141	.79	.2852	1.29	.4015
.30	.1179	.80	.2881	1.30	.4032
.31	.1217	.81	.2910	1.31	.4049
.32	.1255	.82	.2939	1.32	.4066
.33	.1293	.83	.2967	1.33	.4082
.34	.1331	.84	.2995	1.34	.4099
.35	.1368	.85	.3023	1.35	.4115
.36	.1406	.86	.3051	1.36	.4131
.37	.1443	.87	.3078	1.37	.4147
.38	.1480	.88	.3106	1.38	.4162
.39	.1517	.89	.3133	1.39	.4177
.40	.1554	.90	.3159	1.40	.4192
.41	.1591	.91	.3186	1.41	.4207
.42	.1628	.92	.3212	1.42	.4222
.43	.1664	.93	.3238	1.43	.4236
.44	.1700	.94	.3264	1.44	.4251
.45	.1736	.95	.3289	1.45	.4265
.46	.1772	.96	.3315	1.46	.4279
.47	.1808	.97	.3340	1.47	.4292
.48	.1844	.98	.3365	1.48	.4306
.49	.1879	.99	.3389	1.49	.4319

Z	p	Z	p	Z	p
1.50	.4332	2.00	.4772	2.50	.4938
1.51	.4345	2.01	.4778	2.51	.4940
1.52	.4357	2.02	.4783	2.52	.4941
1.53	.4370	2.03	.4788	2.53	.4943
1.54	.4382	2.04	.4793	2.54	.4945
1.55	.4394	2.05	.4798	2.55	.4946
1.56	.4406	2.06	.4803	2.56	.4948
1.57	.4418	2.07	.4808	2.57	.4949
1.58	.4429	2.08	.4812	2.58	.4951
1.59	.4441	2.09	.4817	2.59	.4952
1.60	.4452	2.10	.4821	2.60	.4953
1.61	.4463	2.11	.4826	2.61	.4955
1.62	.4474	2.12	.4830	2.62	.4956
1.63	.4484	2.13	.4834	2.63	.4957
1.64	.4495	2.14	.4838	2.64	.4959
1.65	.4505	2.15	.4842	2.65	.4960
1.66	.4515	2.16	.4846	2.66	.4961
1.67	.4525	2.17	.4850	2.67	.4962
1.68	.4535	2.18	.4854	2.68	.4963
1.69	.4545	2.19	.4857	2.69	.4964
1.70	.4554	2.20	.4861	2.70	.4965
1.71	.4564	2.21	.4864	2.71	.4966
1.72	.4573	2.22	.4868	2.72	.4967
1.73	.4582	2.23	.4871	2.73	.4968
1.74	.4591	2.24	.4875	2.74	.4969
1.75	.4599	2.25	.4878	2.75	.4970
1.76	.4608	2.26	.4881	2.80	.4974
1.77	.4616	2.27	.4884	2.85	.4978
1.78	.4625	2.28	.4887	2.90	.4981
1.79	.4633	2.29	.4890	2.95	.4984
1.80	.4641	2.30	.4893	3.00	.4987
1.81	.4649	2.31	.4896	3.05	.4989
1.82	.4656	2.32	.4898	3.10	.4990
1.83	.4664	2.33	.4901	3.15	.4992
1.84	.4671	2.34	.4904	3.20	.4993
1.85	.4678	2.35	.4906	3.25	.4994
1.86	.4686	2.36	.4909	3.30	.4995
1.87	.4693	2.37	.4911	3.35	.49960
1.88	.4699	2.38	.4913	3.40	.49966
1.89	.4706	2.39	.4916	3.45	.49972
1.90	.4713	2.40	.4918	3.50	.49977
1.91	.4719	2.41	.4920	3.55	.49981
1.92	.4726	2.42	.4922	3.60	.49984
1.93	.4732	2.43	.4925	3.65	.49987
1.94	.4738	2.44	.4927	3.70	.49989
1.95	.4744	2.45	.4929	3.75	.49991
1.96	.4750	2.46	.4931	3.80	.49993
1.97	.4756	2.47	.4932	3.85	.49994
1.98	.4761	2.48	.4934	3.90	.49995
1.99	.4767	2.49	.4936	3.95	.49996

Appendix D

***Two-Tailed Critical
Values of t***

To determine the approximate p value, first round down the degrees of freedom (df). Then locate the largest value that the t test statistic equals or exceeds. Finally, read the column heading for the approximate p value.

<i>df</i>	<i>Critical Values for t</i>						
	.20	.10	.05	.02	.01	.002	.001
1	3.078	6.314	12.706	31.821	63.657	318.309	636.619
2	1.886	2.920	4.303	6.965	9.925	22.327	31.598
3	1.638	2.353	3.182	4.541	5.841	10.214	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
35	1.306	1.690	2.030	2.438	2.724	3.340	3.591
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
45	1.301	1.679	2.014	2.412	2.690	3.281	3.520
50	1.299	1.676	2.009	2.403	2.678	3.261	3.496
55	1.297	1.673	2.004	2.396	2.668	3.245	3.476
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
70	1.294	1.667	1.994	2.381	2.648	3.211	3.435
80	1.292	1.664	1.990	2.374	2.639	3.195	3.416
90	1.291	1.662	1.987	2.368	2.632	3.183	3.402
100	1.290	1.660	1.984	2.364	2.626	3.174	3.390
120	1.289	1.658	1.980	2.358	2.617	3.153	3.373
200	1.286	1.652	1.972	2.345	2.601	3.131	3.340
500	1.283	1.648	1.965	2.334	2.586	3.107	3.310
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Appendix E

Critical Values for the F Distribution

To determine the approximate p value, round down the degrees of freedom on the numerator (df_n) and the degrees of freedom on the denominator (df_d). Locate df_n in the top row and df_d in the first column. Using the row labels (.10, .05, .01, and .001), determine the approximate p value for the intersection of df_n and df_d .

df_n	1	2	3	4	5	6	7	8	9	10	
df_o											
1	.10 .05	39.86 161.4	49.50 199.5	53.59 215.7	55.83 224.6	57.24 230.2	58.20 234.0	58.91 236.8	59.44 238.9	59.86 240.5	60.19 241.9
2	.10 .05 .01 .001	8.53 18.51 98.50 998.5	9.00 19.00 99.00 999.0	9.16 19.16 99.17 999.2	9.24 19.25 99.25 999.2	9.29 19.30 99.30 999.3	9.33 19.33 99.33 999.3	9.35 19.35 99.36 999.4	9.37 19.37 99.37 999.4	9.38 19.38 99.39 999.4	9.39 19.40 99.40 999.4
3	.10 .05 .01 .001	5.54 10.13 34.12 167.0	5.46 9.55 30.82 148.5	5.39 9.28 29.46 141.1	5.34 9.12 28.71 137.1	5.31 9.01 28.24 134.6	5.28 8.94 27.91 132.8	5.27 8.89 27.67 131.6	5.25 8.85 27.49 130.6	5.24 8.81 27.35 129.9	5.23 8.79 27.23 129.2
4	.10 .05 .01 .001	4.54 7.71 21.20 74.14	4.32 6.94 18.00 61.25	4.19 6.59 16.69 56.18	4.11 6.39 15.98 53.44	4.05 6.26 15.52 51.71	4.01 6.16 15.21 50.53	3.98 6.09 14.98 49.66	3.95 6.04 14.80 49.00	3.94 6.00 14.66 48.47	3.92 5.96 14.55 48.05
5	.10 .05 .01 .001	4.06 6.61 16.26 47.18	3.78 5.79 13.27 37.12	3.62 5.41 12.06 33.20	3.52 5.19 11.39 31.09	3.45 5.05 10.97 29.75	3.40 4.95 10.67 28.84	3.37 4.88 10.46 28.16	3.34 4.82 10.29 27.64	3.32 4.77 10.16 27.24	3.30 4.74 10.05 26.92
6	.10 .05 .01 .001	3.78 5.99 13.75 35.51	3.46 5.14 10.92 27.00	3.29 4.76 9.78 23.70	3.18 4.53 9.15 21.92	3.11 4.39 8.75 20.81	3.05 4.28 8.47 20.03	3.01 4.21 8.26 19.46	2.98 4.15 8.10 19.03	2.96 4.10 7.98 18.69	2.94 4.06 7.87 18.41
7	.10 .05 .01 .001	3.59 5.59 12.25 29.25	3.26 4.74 9.55 21.69	3.07 4.35 8.45 18.77	2.96 4.12 7.85 17.19	2.88 3.97 7.46 16.21	2.83 3.87 7.19 15.52	2.78 3.79 6.99 15.02	2.75 3.73 6.84 14.63	2.72 3.68 6.72 14.33	2.70 3.64 6.62 14.08
8	.10 .05 .01 .001	3.46 5.32 11.26 25.42	3.11 4.46 8.65 18.49	2.92 4.07 7.59 15.83	2.81 3.84 7.01 14.39	2.73 3.69 6.63 13.49	2.67 3.58 6.37 12.86	2.62 3.50 6.18 12.40	2.59 3.44 6.03 12.04	2.56 3.39 5.91 11.77	2.54 3.35 5.81 11.54
9	.10 .05 .01 .001	3.36 5.12 10.56 22.86	3.01 4.26 8.02 16.39	2.81 3.86 6.99 13.90	2.69 3.63 6.42 12.56	2.61 3.48 6.06 11.71	2.55 3.37 5.80 11.13	2.51 3.29 5.61 10.70	2.47 3.23 5.47 10.37	2.44 3.18 5.35 10.11	2.42 3.14 5.26 9.89
10	.10 .05 .01 .001	3.29 4.96 10.04 21.04	2.92 4.10 7.56 14.91	2.73 3.71 6.55 12.55	2.61 3.48 5.99 11.28	2.52 3.33 5.64 10.48	2.46 3.22 5.39 9.92	2.41 3.14 5.20 9.52	2.38 3.07 5.06 9.20	2.35 3.02 4.94 8.96	2.32 2.98 4.85 8.75
11	.10 .05 .01 .001	3.23 4.84 9.65 19.69	2.86 3.98 7.21 13.81	2.66 3.59 6.22 11.56	2.54 3.36 5.67 10.35	2.45 3.20 5.32 9.58	2.39 3.09 5.07 9.05	2.34 3.01 4.89 8.66	2.30 2.95 4.74 8.35	2.27 2.90 4.63 8.12	2.25 2.85 4.54 7.92
12	.10 .05 .01 .001	3.18 4.75 9.33 18.64	2.81 3.89 6.93 12.97	2.61 3.49 5.95 10.80	2.48 3.26 5.41 9.63	2.39 3.11 5.06 8.89	2.33 3.00 4.82 8.38	2.28 2.91 4.64 8.00	2.24 2.85 4.50 7.71	2.21 2.80 4.39 7.48	2.19 2.75 4.30 7.29

Critical Values for the F Distribution

df_n	12	15	20	24	30	40	60	120	∞	
1	.10	60.71	61.22	61.74	62.00	62.26	62.53	62.79	63.06	63.33
	.05	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	.10	9.41	9.42	9.44	9.45	9.46	9.47	9.47	9.48	9.49
	.05	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
	.01	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50
	.001	999.4	999.4	999.4	999.5	999.5	999.5	999.5	999.5	999.5
3	.10	5.22	5.20	5.18	5.18	5.17	5.16	5.15	5.14	5.13
	.05	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
	.01	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13
	.001	128.3	127.4	126.4	125.9	125.4	125.0	124.5	124.0	123.5
4	.10	3.90	3.87	3.84	3.83	3.82	3.80	3.79	3.78	3.76
	.05	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
	.01	14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46
	.001	47.41	46.76	46.10	45.77	45.43	45.09	44.75	44.40	44.05
5	.10	3.27	3.24	3.21	3.19	3.17	3.16	3.14	3.12	3.10
	.05	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
	.01	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
	.001	26.42	25.91	25.39	25.14	24.87	24.60	24.33	24.06	23.79
6	.10	2.90	2.87	2.84	2.82	2.80	2.78	2.76	2.74	2.72
	.05	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
	.01	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88
	.001	17.99	17.56	17.12	16.89	16.67	16.44	16.21	15.99	15.75
7	.10	2.67	2.63	2.59	2.58	2.56	2.54	2.51	2.49	2.47
	.05	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
	.01	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65
	.001	13.71	13.32	12.93	12.73	12.53	12.33	12.12	11.91	11.70
8	.10	2.50	2.46	2.42	2.40	2.38	2.36	2.34	2.32	2.29
	.05	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
	.01	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86
	.001	11.19	10.84	10.48	10.30	10.11	9.92	9.73	9.53	9.33
9	.10	2.38	2.34	2.30	2.28	2.25	2.23	2.21	2.18	2.16
	.05	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
	.01	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31
	.001	9.57	9.24	8.90	8.72	8.55	8.37	8.19	8.00	7.81
10	.10	2.28	2.24	2.20	2.18	2.16	2.13	2.11	2.08	2.06
	.05	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
	.01	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91
	.001	8.45	8.13	7.80	7.64	7.47	7.30	7.12	6.94	6.76
11	.10	2.21	2.17	2.12	2.10	2.08	2.05	2.03	2.00	1.97
	.05	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
	.01	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60
	.001	7.63	7.32	7.01	6.85	6.68	6.52	6.35	6.17	6.00
12	.10	2.15	2.10	2.06	2.04	2.01	1.99	1.96	1.93	1.90
	.05	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
	.01	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36
	.001	7.00	6.71	6.40	6.25	6.09	5.93	5.76	5.59	5.42

	df_n	1	2	3	4	5	6	7	8	9	10
13	.10	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14
	.05	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67
	.01	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10
	.001	17.81	12.31	10.21	9.07	8.35	7.86	7.49	7.21	6.98	6.80
14	.10	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10
	.05	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60
	.01	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94
	.001	17.14	11.78	9.73	8.62	7.92	7.43	7.08	6.80	6.58	6.40
15	.10	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06
	.05	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54
	.01	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80
	.001	16.59	11.34	9.34	8.25	7.57	7.09	6.74	6.47	6.26	6.08
16	.10	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06	2.03
	.05	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49
	.01	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69
	.001	16.12	10.97	9.00	7.94	7.27	6.81	6.46	6.19	5.98	5.81
17	.10	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03	2.00
	.05	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45
	.01	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59
	.001	15.72	10.66	8.73	7.68	7.02	6.56	6.22	5.96	5.75	5.58
18	.10	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98
	.05	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41
	.01	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51
	.001	15.38	10.39	8.49	7.46	6.81	6.35	6.02	5.76	5.56	5.39
19	.10	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96
	.05	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38
	.01	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43
	.001	15.08	10.16	8.28	7.26	6.62	6.18	5.85	5.59	5.39	5.22
20	.10	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94
	.05	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35
	.01	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37
	.001	14.82	9.95	8.10	7.10	6.46	6.02	5.69	5.44	5.24	5.08
21	.10	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92
	.05	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32
	.01	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31
	.001	14.59	9.77	7.94	6.95	6.32	5.88	5.56	5.31	5.11	4.95
22	.10	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90
	.05	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30
	.01	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26
	.001	14.38	9.61	7.80	6.81	6.19	5.76	5.44	5.19	4.99	4.83
23	.10	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92	1.89
	.05	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27
	.01	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21
	.001	14.19	9.47	7.67	6.69	6.08	5.65	5.33	5.09	4.89	4.73

Critical Values for the F Distribution

df_n	12	15	20	24	30	40	60	120	∞
df_d									
.10	2.10	2.05	2.01	1.98	1.96	1.93	1.90	1.88	1.85
13	.05	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.21
	.01	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.17
	.001	6.52	6.23	5.93	5.78	5.63	5.47	5.30	4.97
.10	2.05	2.01	1.96	1.94	1.91	1.89	1.86	1.83	1.80
14	.05	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.13
	.01	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.00
	.001	6.13	5.85	5.56	5.41	5.25	5.10	4.94	4.60
.10	2.02	1.97	1.92	1.90	1.87	1.85	1.82	1.79	1.76
15	.05	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.07
	.01	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.87
	.001	5.81	5.54	5.25	5.10	4.95	4.80	4.64	4.31
.10	1.99	1.94	1.89	1.87	1.84	1.81	1.78	1.75	1.72
16	.05	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.01
	.01	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.75
	.001	5.55	5.27	4.99	4.85	4.70	4.54	4.39	4.06
.10	1.96	1.91	1.86	1.84	1.81	1.78	1.75	1.72	1.69
17	.05	2.38	2.31	2.23	2.19	2.15	2.10	2.06	1.96
	.01	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.65
	.001	5.32	5.05	4.78	4.63	4.48	4.33	4.18	3.85
.10	1.93	1.89	1.84	1.81	1.78	1.75	1.72	1.69	1.66
18	.05	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.92
	.01	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.57
	.001	5.13	4.87	4.59	4.45	4.30	4.15	4.00	3.67
.10	1.91	1.86	1.81	1.79	1.76	1.73	1.70	1.67	1.63
19	.05	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.88
	.01	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.49
	.001	4.97	4.70	4.43	4.29	4.14	3.99	3.84	3.51
.10	1.89	1.84	1.79	1.77	1.74	1.71	1.68	1.64	1.61
20	.05	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.84
	.01	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.42
	.001	4.82	4.56	4.29	4.15	4.00	3.86	3.70	3.38
.10	1.87	1.83	1.78	1.75	1.72	1.69	1.66	1.62	1.59
21	.05	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.81
	.01	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.36
	.001	4.70	4.44	4.17	4.03	3.88	3.74	3.58	3.26
.10	1.86	1.81	1.76	1.73	1.70	1.67	1.64	1.60	1.57
22	.05	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.78
	.01	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.31
	.001	4.58	4.33	4.06	3.92	3.78	3.63	3.48	3.15
.10	1.84	1.80	1.74	1.72	1.69	1.66	1.62	1.59	1.55
23	.05	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.76
	.01	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.26
	.001	4.48	4.23	3.96	3.82	3.68	3.53	3.38	3.05

	df_n	1	2	3	4	5	6	7	8	9	10
24	.10	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91	1.88
	.05	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25
	.01	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17
	.001	14.03	9.34	7.55	6.59	5.98	5.55	5.23	4.99	4.80	4.64
25	.10	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89	1.87
	.05	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24
	.01	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13
	.001	13.88	9.22	7.45	6.49	5.88	5.46	5.15	4.91	4.71	4.56
26	.10	2.91	2.52	2.31	2.17	2.08	2.01	1.96	1.92	1.88	1.86
	.05	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22
	.01	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18	3.09
	.001	13.74	9.12	7.36	6.41	5.80	5.38	5.07	4.83	4.64	4.48
27	.10	2.90	2.51	2.30	2.17	2.07	2.00	1.95	1.91	1.87	1.85
	.05	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20
	.01	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15	3.06
	.001	13.61	9.02	7.27	6.33	5.73	5.31	5.00	4.76	4.57	4.41
28	.10	2.89	2.50	2.29	2.16	2.06	2.00	1.94	1.90	1.87	1.84
	.05	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19
	.01	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12	3.03
	.001	13.50	8.93	7.19	6.25	5.66	5.24	4.93	4.69	4.50	4.35
29	.10	2.89	2.50	2.28	2.15	2.06	1.99	1.93	1.89	1.86	1.83
	.05	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18
	.01	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09	3.00
	.001	13.39	8.85	7.12	6.19	5.59	5.18	4.87	4.64	4.45	4.29
30	.10	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82
	.05	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16
	.01	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98
	.001	13.29	8.77	7.05	6.12	5.53	5.12	4.82	4.58	4.39	4.24
40	.10	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76
	.05	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08
	.01	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80
	.001	12.61	8.25	6.60	5.70	5.13	4.73	4.44	4.21	4.02	3.87
60	.10	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71
	.05	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99
	.01	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63
	.001	11.97	7.76	6.17	5.31	4.76	4.37	4.09	3.87	3.69	3.54
120	.10	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68	1.65
	.05	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91
	.01	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47
	.001	11.38	7.32	5.79	4.95	4.42	4.04	3.77	3.55	3.38	3.24
∞	.10	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63	1.60
	.05	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83
	.01	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32
	.001	10.83	6.91	5.42	4.62	4.10	3.74	3.47	3.27	3.10	2.96

Critical Values for the F Distribution

df_n		12	15	20	24	30	40	60	120	∞
24	df_a									
	.10	1.83	1.78	1.73	1.70	1.67	1.64	1.61	1.57	1.53
	.05	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
	.01	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21
25	.10	1.82	1.77	1.72	1.69	1.66	1.63	1.59	1.56	1.52
	.05	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
	.01	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17
	.001	4.31	4.06	3.79	3.66	3.52	3.37	3.22	3.06	2.89
26	.10	1.81	1.76	1.71	1.68	1.65	1.61	1.58	1.54	1.50
	.05	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
	.01	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13
	.001	4.24	3.99	3.72	3.59	3.44	3.30	3.15	2.99	2.82
27	.10	1.80	1.75	1.70	1.67	1.64	1.60	1.57	1.53	1.49
	.05	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
	.01	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10
	.001	4.17	3.92	3.66	3.52	3.38	3.23	3.08	2.92	2.75
28	.10	1.79	1.74	1.69	1.66	1.63	1.59	1.56	1.52	1.48
	.05	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
	.01	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06
	.001	4.11	3.86	3.60	3.46	3.32	3.18	3.02	2.86	2.69
29	.10	1.78	1.73	1.68	1.65	1.62	1.58	1.55	1.51	1.47
	.05	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
	.01	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03
	.001	4.05	3.80	3.54	3.41	3.27	3.12	2.97	2.81	2.64
30	.10	1.77	1.72	1.67	1.64	1.61	1.57	1.54	1.50	1.46
	.05	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
	.01	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
	.001	4.00	3.75	3.49	3.36	3.22	3.07	2.92	2.76	2.59
40	.10	1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
	.05	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
	.01	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
	.001	3.64	3.40	3.15	3.01	2.87	2.73	2.57	2.41	2.23
60	.10	1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
	.05	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
	.01	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
	.001	3.31	3.08	2.83	2.69	2.55	2.41	2.25	2.08	1.89
120	.10	1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26	1.19
	.05	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
	.01	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
	.001	3.02	2.78	2.53	2.40	2.26	2.11	1.95	1.76	1.54
∞	.10	1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17	1.00
	.05	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00
	.01	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00
	.001	2.74	2.51	2.27	2.13	1.99	1.84	1.66	1.45	1.00

Appendix F

***I. Transformation of
r to Fisher's z***

***II. Transformation of
Fisher's z to r***

I. Transformation of r to Fisher's z

r	z	r	z	r	z
.01	.0100	.34	.3541	.67	.8107
.02	.0200	.35	.3654	.68	.8291
.03	.0300	.36	.3769	.69	.8480
.04	.0400	.37	.3884	.70	.8673
.05	.0500	.38	.4001	.71	.8872
.06	.0601	.39	.4118	.72	.9076
.07	.0701	.40	.4236	.73	.9287
.08	.0802	.41	.4356	.74	.9505
.09	.0902	.42	.4477	.75	.9730
.10	.1003	.43	.4599	.76	.9962
.11	.1104	.44	.4722	.77	1.0203
.12	.1206	.45	.4847	.78	1.0454
.13	.1307	.46	.4973	.79	1.0714
.14	.1409	.47	.5101	.80	1.0986
.15	.1511	.48	.5230	.81	1.1270
.16	.1614	.49	.5361	.82	1.1568
.17	.1717	.50	.5493	.83	1.1881
.18	.1820	.51	.5627	.84	1.2212
.19	.1923	.52	.5763	.85	1.2562
.20	.2027	.53	.5901	.86	1.2933
.21	.2132	.54	.6042	.87	1.3331
.22	.2237	.55	.6184	.88	1.3758
.23	.2342	.56	.6328	.89	1.4219
.24	.2448	.57	.6475	.90	1.4722
.25	.2554	.58	.6625	.91	1.5275
.26	.2661	.59	.6777	.92	1.5890
.27	.2769	.60	.6931	.93	1.6584
.28	.2877	.61	.7089	.94	1.7380
.29	.2986	.62	.7250	.95	1.8318
.30	.3095	.63	.7414	.96	1.9459
.31	.3205	.64	.7582	.97	2.0923
.32	.3316	.65	.7753	.98	2.2976
.33	.3428	.66	.7928	.99	2.6467

NOTE: For a given correlation, r , its corresponding Fisher's z is presented.

II. Transformation of Fisher's z to r

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0100	.0200	.0300	.0400	.0500	.0599	.0699	.0798	.0898
.1	.0997	.1096	.1194	.1293	.1391	.1489	.1586	.1684	.1781	.1877
.2	.1974	.2070	.2165	.2260	.2355	.2449	.2543	.2636	.2729	.2821
.3	.2913	.3004	.3095	.3185	.3275	.3364	.3452	.3540	.3627	.3714
.4	.3800	.3885	.3969	.4053	.4136	.4219	.4301	.4382	.4462	.4542
.5	.4621	.4699	.4777	.4854	.4930	.5005	.5080	.5154	.5227	.5299
.6	.5370	.5441	.5511	.5581	.5649	.5717	.5784	.5850	.5915	.5980
.7	.6044	.6107	.6169	.6231	.6291	.6351	.6411	.6469	.6527	.6584
.8	.6640	.6696	.6751	.6805	.6858	.6911	.6963	.7014	.7064	.7114
.9	.7163	.7211	.7259	.7306	.7352	.7398	.7443	.7487	.7531	.7574
1.0	.7616	.7658	.7699	.7739	.7779	.7818	.7857	.7895	.7932	.7969
1.1	.8005	.8041	.8076	.8110	.8144	.8178	.8210	.8243	.8275	.8306
1.2	.8337	.8367	.8397	.8426	.8455	.8483	.8511	.8538	.8565	.8591
1.3	.8617	.8643	.8668	.8692	.8717	.8741	.8764	.8787	.8810	.8832
1.4	.8854	.8875	.8896	.8917	.8937	.8957	.8977	.8996	.9015	.9033
1.5	.9051	.9069	.9087	.9104	.9121	.9138	.9154	.9170	.9186	.9201
1.6	.9217	.9232	.9246	.9261	.9275	.9289	.9302	.9316	.9329	.9341
1.7	.9354	.9366	.9379	.9391	.9402	.9414	.9425	.9436	.9447	.9458
1.8	.9468	.9478	.9488	.9498	.9508	.9517	.9527	.9536	.9545	.9554
1.9	.9562	.9571	.9579	.9587	.9595	.9603	.9611	.9618	.9626	.9633
2.0	.9640	.9647	.9654	.9661	.9667	.9674	.9680	.9687	.9693	.9699
2.1	.9705	.9710	.9716	.9721	.9727	.9732	.9737	.9743	.9748	.9753
2.2	.9757	.9762	.9767	.9771	.9776	.9780	.9785	.9789	.9793	.9797
2.3	.9801	.9905	.9809	.9812	.9816	.9820	.9823	.9827	.9830	.9833
2.4	.9837	.9840	.9843	.9846	.9849	.9852	.9855	.9858	.9861	.9863
2.5	.9866	.9869	.9871	.9874	.9876	.9879	.9881	.9884	.9886	.9888
2.6	.9890	.9892	.9895	.9897	.9899	.9901	.9903	.9905	.9906	.9908
2.7	.9910	.9912	.9914	.9915	.9917	.9919	.9920	.9922	.9923	.9925
2.8	.9926	.9928	.9929	.9931	.9932	.9933	.9935	.9936	.9937	.9938
2.9	.9940	.9941	.9942	.9943	.9944	.9945	.9946	.9947	.9949	.9950

NOTE: To determine r locate the digits of z to the left and right of the decimal place in the first column. Locate the second decimal place in the top column. The intersection of the row and column gives r.

Appendix G

Critical Values for Chi Square

To determine the approximate p value, locate the degrees of freedom (df) in the first column. Then find the largest value that the chi square test statistic equals or exceeds, and read the column heading for the approximate p value.

Critical Values for Chi Square

<i>df</i>	.20	.10	.05	.02	.01	.001
1	1.64	2.71	3.84	5.41	6.63	10.83
2	3.22	4.61	5.99	7.82	9.21	13.82
3	4.64	6.25	7.81	9.84	11.34	16.27
4	5.99	7.78	9.49	11.67	13.28	18.47
5	7.29	9.24	11.07	13.39	15.09	20.52
6	8.56	10.64	12.59	15.03	16.81	22.46
7	9.80	12.02	14.07	16.62	18.48	24.32
8	11.03	13.36	15.51	18.17	20.09	26.12
9	12.24	14.68	16.92	19.68	21.67	27.88
10	13.44	15.99	18.31	21.16	23.21	29.59
11	14.63	17.28	19.68	22.62	24.72	31.26
12	15.81	18.55	21.03	24.05	26.22	32.91
13	16.98	19.81	22.36	25.47	27.69	34.53
14	18.15	21.06	23.68	26.87	29.14	36.12
15	19.31	22.31	25.00	28.26	30.58	37.70
16	20.46	23.54	26.30	29.63	32.00	39.25
17	21.62	24.77	27.59	31.00	33.41	40.79
18	22.76	25.99	28.87	32.35	34.81	42.31
19	23.90	27.20	30.14	33.69	36.19	43.82
20	25.04	28.41	31.41	35.02	37.57	45.32
21	26.17	29.62	32.67	36.34	38.93	46.80
22	27.30	30.81	33.92	37.66	40.29	48.27
23	28.43	32.01	35.17	38.97	41.64	49.73
24	29.55	33.20	36.42	40.27	42.98	51.18
25	30.68	34.38	37.65	41.57	44.31	52.62
26	31.80	35.56	38.89	42.86	45.64	54.05
27	32.91	36.74	40.11	44.14	46.96	55.48
28	34.03	37.92	41.34	45.42	48.28	56.89
29	35.14	39.09	42.56	46.69	49.59	58.30
30	36.25	40.26	43.77	47.96	50.89	59.70

Appendix H

Two-Tailed Critical Values for the Mann-Whitney U Test

To determine the approximate p value, locate n_1 , the number of scores in the smaller group, in the first column and n_2 in the second column. The value of U must be smaller than or equal to the first number, or larger than or equal to the second number, to be significant at the level given by the column heading.

n_1	n_2	.10	.05	.02	.01
3	3	0-9	—	—	—
3	4	0-12	—	—	—
4	4	1-15	0-16	—	—
2	5	0-10	—	—	—
3	5	1-14	0-15	—	—
4	5	2-18	1-19	0-20	—
5	5	4-21	2-23	1-24	0-25
2	6	0-12	—	—	—
3	6	2-16	1-17	—	—
4	6	3-21	2-22	1-23	0-24
5	6	5-25	3-27	2-28	1-29
6	6	7-29	5-31	3-33	2-34
2	7	0-14	—	—	—
3	7	2-19	1-20	0-21	—
4	7	4-24	3-25	1-27	0-28
5	7	6-29	5-30	3-32	1-34
6	7	8-34	6-36	4-38	3-39
7	7	11-38	8-41	6-43	4-45
2	8	1-15	0-16	—	—
3	8	3-21	2-22	0-24	—
4	8	5-27	4-28	2-30	1-31
5	8	8-32	6-34	4-36	2-38
6	8	10-38	8-40	6-42	4-44
7	8	13-43	10-46	7-49	6-50
8	8	15-49	13-51	9-55	7-57
2	9	1-17	0-18	—	—
3	9	4-23	2-25	1-26	0-27
4	9	6-30	4-32	3-33	1-35
5	9	9-36	7-38	5-40	3-42
6	9	12-42	10-44	7-47	5-49
7	9	15-48	12-51	9-54	7-56
8	9	18-54	15-57	11-61	9-63
9	9	21-60	17-64	14-67	11-70
2	10	1-19	0-20	—	—
3	10	4-26	3-27	1-29	0-30
4	10	7-33	5-35	3-37	2-38
5	10	11-39	8-42	6-44	4-46
6	10	14-46	11-49	8-52	6-54
7	10	17-53	14-56	11-59	9-61
8	10	20-60	17-63	13-67	11-69
9	10	24-66	20-70	16-74	13-77
10	10	27-73	23-77	19-81	16-84
2	11	1-21	0-22	—	—
3	11	5-28	3-30	1-32	0-33
4	11	8-36	6-38	4-40	2-42
5	11	12-43	9-46	7-48	5-50
6	11	16-50	13-53	9-57	7-59
7	11	19-58	16-61	12-65	10-67

Two-Tailed Critical Values for the Mann-Whitney U Test

n_1	n_2	.10	.05	.02	.01
8	11	23-65	19-69	15-73	13-75
9	11	27-72	23-76	18-81	16-83
10	11	31-79	26-84	22-88	18-92
11	11	34-87	30-91	25-96	21-100
2	12	2-22	1-23	—	—
3	12	5-31	4-32	2-34	1-35
4	12	9-39	7-41	5-43	3-45
5	12	13-47	11-49	8-52	6-54
6	12	17-55	14-58	11-61	9-63
7	12	21-63	18-66	14-70	12-72
8	12	26-70	22-74	17-79	15-81
9	12	30-78	26-82	21-87	18-90
10	12	34-86	29-91	24-96	21-99
11	12	38-94	33-99	28-104	24-108
12	12	42-102	37-107	31-113	27-117
2	13	2-24	1-25	0-26	—
3	13	6-33	4-35	2-37	1-38
4	13	10-42	8-44	5-47	3-49
5	13	15-50	12-53	9-56	7-58
6	13	19-59	16-62	12-66	10-68
7	13	24-67	20-71	16-75	13-78
8	13	28-76	24-80	20-84	17-87
9	13	33-84	28-89	23-94	20-97
10	13	37-93	33-97	27-103	24-106
11	13	42-101	37-106	31-112	27-116
12	13	47-109	41-115	35-121	31-125
13	13	51-118	45-124	39-130	34-135
2	14	3-25	1-27	0-28	—
3	14	7-35	5-37	2-40	1-41
4	14	11-45	9-47	6-50	4-52
5	14	16-54	13-57	10-60	7-63
6	14	21-63	17-67	13-71	11-73
7	14	26-72	22-76	17-81	15-83
8	14	31-81	26-86	22-90	18-94
9	14	36-90	31-95	26-100	22-104
10	14	41-99	36-104	30-110	26-114
11	14	46-108	40-114	34-120	30-124
12	14	51-117	45-123	38-130	34-134
13	14	56-126	50-132	43-139	38-144
14	14	61-135	55-141	47-149	42-154
2	15	3-27	1-29	0-30	—
3	15	7-38	5-40	3-42	2-43
4	15	12-48	10-50	7-53	5-55
5	15	18-57	14-61	11-64	8-67
6	15	23-67	19-71	15-75	12-78
7	15	28-77	24-81	19-86	16-89
8	15	33-87	29-91	24-96	20-100
9	15	39-96	34-101	28-107	24-111
10	15	44-106	39-111	33-117	29-121
11	15	50-115	44-121	37-128	33-132
12	15	55-125	49-131	42-138	37-143
13	15	61-134	54-141	47-148	42-153

n_1	n_2	.10	.05	.02	.01
14	15	66-144	59-151	51-159	46-164
15	15	72-153	64-161	56-169	51-174
2	16	3-29	1-31	0-32	—
3	16	8-40	6-42	3-45	2-46
4	16	14-50	11-53	7-57	5-59
5	16	19-61	15-65	12-68	9-71
6	16	25-71	21-75	16-80	13-83
7	16	30-82	26-86	21-91	18-94
8	16	36-92	31-97	26-102	22-106
9	16	42-102	37-107	31-113	27-117
10	16	48-112	42-118	36-124	31-129
11	16	54-122	47-129	41-135	36-140
12	16	60-132	53-139	46-146	41-151
13	16	65-143	59-149	51-157	45-163
14	16	71-153	64-160	56-168	50-174
15	16	77-163	70-170	61-179	55-185
16	16	83-173	75-181	66-190	60-196
2	17	3-31	2-32	0-34	—
3	17	9-42	6-45	4-47	2-49
4	17	15-53	11-57	8-60	6-62
5	17	20-65	17-68	13-72	10-75
6	17	26-76	22-80	18-84	15-87
7	17	33-86	28-91	23-96	19-100
8	17	39-97	34-102	28-108	24-112
9	17	45-108	39-114	33-120	29-124
10	17	51-119	45-125	38-132	34-136
11	17	57-130	51-136	44-143	39-148
12	17	64-140	57-147	49-155	44-160
13	17	70-151	63-158	55-166	49-172
14	17	77-161	69-169	60-178	54-184
15	17	83-172	75-180	66-189	60-195
16	17	89-183	81-191	71-201	65-207
17	17	96-193	87-202	77-212	70-219
2	18	4-32	2-34	0-36	—
3	18	9-45	7-47	4-50	2-52
4	18	16-56	12-60	9-63	6-66
5	18	22-68	18-72	14-76	11-79
6	18	28-80	24-84	19-89	16-92
7	18	35-91	30-96	24-102	21-105
8	18	41-103	36-108	30-114	26-118
9	18	48-114	42-120	36-126	31-131
10	18	55-125	48-132	41-139	37-143
11	18	61-137	55-143	47-151	42-156
12	18	68-148	61-155	53-163	47-169
13	18	75-159	67-167	59-175	53-181
14	18	82-170	74-178	65-187	58-194
15	18	88-182	80-190	70-200	64-206
16	18	95-193	86-202	76-212	70-218
17	18	102-204	93-213	82-224	75-231
18	18	109-215	99-225	88-236	81-243
1	19	0-19	—	—	—
2	19	4-34	2-36	1-37	0-38

n_1	n_2	.10	.05	.02	.01
3	19	10-47	7-50	4-53	3-54
4	19	17-59	13-63	9-67	7-69
5	19	23-72	19-76	15-80	12-83
6	19	30-84	25-89	20-94	17-97
7	19	37-96	32-101	26-107	22-111
8	19	44-108	38-114	32-120	28-124
9	19	51-120	45-126	38-133	33-138
10	19	58-132	52-138	44-146	39-151
11	19	65-144	58-151	50-159	45-164
12	19	72-156	65-163	56-172	51-177
13	19	80-167	72-175	63-184	57-190
14	19	87-179	78-188	69-197	63-203
15	19	94-191	85-200	75-210	69-216
16	19	101-203	92-212	82-222	74-230
17	19	109-214	99-224	88-235	81-242
18	19	116-226	106-236	94-248	87-255
19	19	123-238	113-248	101-260	93-268
1	20	0-20	—	—	—
2	20	4-36	2-38	1-39	0-40
3	20	11-49	8-52	5-55	3-57
4	20	18-62	14-66	10-70	8-72
5	20	25-75	20-80	16-84	13-87
6	20	32-88	27-93	22-98	18-102
7	20	39-101	34-106	28-112	24-116
8	20	47-113	41-119	34-126	30-130
9	20	54-126	48-132	40-140	36-144
10	20	62-138	55-145	47-153	42-158
11	20	69-151	62-158	53-167	48-172
12	20	77-163	69-171	60-180	54-186
13	20	84-176	76-184	67-193	60-200
14	20	92-188	83-197	73-207	67-213
15	20	100-200	90-210	80-220	73-227
16	20	107-213	98-222	87-233	79-241
17	20	115-225	105-235	93-247	86-254
18	20	123-237	112-248	100-260	92-268
19	20	130-250	119-261	107-273	99-281
20	20	138-262	127-273	114-286	105-295

Appendix I

***Two-Tailed Critical
Values for the Sign
Test ($n < 26$)***

Locate n , the number of untied cases, in the first column. Let c be the number of positive differences. To determine the approximate p value, note the largest value that c or $n - c$ equals or exceeds. Read up to the column heading for the approximate p value.

<i>n</i>	<i>Sign Test Critical Values</i>					
	.10	.05	.02	.01	.002	.001
5	5	—	—	—	—	—
6	6	6	—	—	—	—
7	7	7	7	—	—	—
8	7	8	8	8	—	—
9	8	8	9	9	—	—
10	9	9	10	10	10	—
11	9	10	10	11	11	11
12	10	10	11	11	12	12
13	10	11	12	12	13	13
14	11	12	12	13	13	14
15	12	12	13	13	14	14
16	12	13	14	14	15	15
17	13	13	14	15	16	16
18	13	14	15	15	16	17
19	14	15	15	16	17	17
20	15	15	16	17	18	18
21	15	16	17	17	18	19
22	16	17	17	18	19	19
23	16	17	18	19	20	20
24	17	18	19	19	20	21
25	18	18	19	20	21	21

Appendix J

***Two-Tailed Critical
Values for
Spearman's Rho***

To determine the approximate p value, locate the number of pairs of scores in the left-hand column. Find the largest value that the test statistic, ignoring sign, equals or exceeds. Read the column heading for the approximate p value.

Spearman's Rho Critical Values

Number of Pairs	.10	.05	.02	.01	.002
4	1.000	—	—	—	—
5	.900	1.000	1.000	—	—
6	.829	.886	.943	1.000	—
7	.714	.786	.893	.929	1.000
8	.643	.738	.833	.881	.952
9	.600	.700	.783	.833	.917
10	.564	.648	.745	.794	.879
11	.536	.619	.709	.764	.845
12	.503	.587	.678	.734	.825
13	.484	.560	.648	.703	.797
14	.464	.538	.626	.679	.771
15	.446	.521	.604	.657	.750
16	.429	.503	.585	.635	.729
17	.414	.488	.566	.618	.711
18	.401	.474	.550	.600	.692
19	.391	.460	.535	.584	.675
20	.380	.447	.522	.570	.660
21	.370	.436	.509	.556	.647
22	.361	.425	.497	.544	.633
23	.353	.416	.486	.532	.620
24	.344	.407	.476	.521	.608
25	.337	.398	.466	.511	.597
26	.331	.390	.475	.501	.586
27	.324	.383	.449	.492	.576
28	.318	.375	.441	.483	.567
29	.312	.369	.433	.475	.557
30	.306	.362	.426	.467	.548