

APPENDIX II. Number of common bulls

BSW hco

 common bulls below diagonal
 common three quarter sib group above diagonal
 CAN DEA FRA USA

CAN	0	73	46	71
DEA	66	0	149	133
FRA	42	109	0	60
USA	69	97	42	0

BSW crc

 common bulls below diagonal
 common three quarter sib group above diagonal
 CAN CHE DEA NLD NZL USA GBR FRA ITA

CAN	0	78	77	39	39	86	39	49	66
CHE	61	0	473	73	47	211	44	116	291
DEA	67	379	0	121	57	177	45	148	389
NLD	35	71	120	0	31	47	33	62	92
NZL	38	40	49	24	0	38	31	30	41
USA	84	181	138	48	36	0	46	75	120
GBR	37	33	34	30	25	46	0	34	42
FRA	41	80	106	48	24	47	28	0	120
ITA	56	231	258	72	35	80	32	85	0

BSW cc1

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common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  DEA  NLD  USA  GBR  FRA
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CAN    0   79   78   39   86   39   56
CHE   61    0  472   72  212   45  128
DEA   68  378    0  119  176   47  163
NLD   35   71  121    0   46   32   71
USA   84  181  138   48    0   47   83
GBR   37   34   36   29   47    0   37
FRA   48   91  124   58   56   32    0
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BSW cc2

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common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  DEA  NLD  NZL  USA  GBR  FRA  ITA
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CAN    0   75   76   39   43   96   39   55   66
CHE   59    0  466   73   52  270   44  128  291
DEA   66  378    0  119   62  274   44  162  382
NLD   34   71  120    0   34   71   33   71   92
NZL   41   44   52   26    0   60   34   37   45
USA   92  248  246   67   58    0   56  103  163
GBR   36   33   35   30   27   56    0   36   42
FRA   47   91  124   58   30   68   31    0  133
ITA   56  231  258   72   37  108   32   98    0
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BSW int

common bulls below diagonal

common three quarter sib group above diagonal

CAN DEA NLD NZL USA GBR ITA

CAN 0 75 39 43 96 39 66
DEA 64 0 118 62 273 44 416
NLD 34 116 0 34 70 33 92
NZL 41 51 26 0 60 34 46
USA 92 243 66 58 0 56 172
GBR 36 34 30 27 56 0 43
ITA 56 269 72 37 112 32 0

GUE crc

common bulls below diagonal
common three quarter sib group above diagonal
CAN GBR NZL USA AUS

CAN 0 15 7 27 18
GBR 12 0 22 37 28
NZL 4 21 0 14 34
USA 26 34 13 0 18
AUS 13 22 33 15 0

GUE cc1

common bulls below diagonal
common three quarter sib group above diagonal
CAN GBR USA

CAN 0 15 27
GBR 12 0 37
USA 26 34 0

GUE cc2

common bulls below diagonal
common three quarter sib group above diagonal
CAN GBR NZL USA ZAF AUS

CAN 0 12 4 30 3 16
GBR 9 0 23 69 9 28
NZL 2 22 0 42 7 34
USA 28 70 45 0 21 49
ZAF 3 7 5 17 0 7
AUS 11 22 33 45 5 0

GUE int

common bulls below diagonal

common three quarter sib group above diagonal

CAN GBR NZL USA ZAF AUS

CAN 0 12 4 30 3 16
GBR 9 0 23 69 9 28
NZL 2 22 0 42 7 34
USA 28 70 45 0 21 49
ZAF 3 7 5 17 0 7
AUS 11 22 33 45 5 0

HOL hco

 common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CZE	DEU	DFS	FRA	USA	POL	FRR
CAN	0	710	1441	752	804	1571	534	1
CZE	476	0	1343	796	850	931	583	8
DEU	742	874	0	1929	1778	1771	924	64
DFS	560	416	882	0	1173	946	565	12
FRA	522	444	750	490	0	1125	664	1
USA	1491	655	856	619	516	0	764	4
POL	371	395	528	323	270	598	0	23
FRR	1	3	44	2	0	1	35	0

HOL crc

 common bulls below diagonal
 common three quarter sib group above diagonal

	BEL	CAN	CHE	CHR	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	FRA	FRR	AUS
BEL	0	326	213	159	569	389	302	422	271	401	623	297	353	149	451	9	375
CAN	280	0	353	227	1500	779	760	975	346	1122	875	524	1736	445	817	2	756
CHE	191	248	0	243	457	305	264	340	211	313	349	227	350	88	295	3	275
CHR	148	189	258	0	404	174	146	186	117	210	334	143	254	69	161	11	174
DEU	475	770	348	323	0	2044	980	1536	664	2040	2542	841	2023	810	1872	73	1198
DFS	292	547	241	140	891	0	649	1074	552	1204	1408	672	1071	512	1207	12	875
ESP	263	440	217	115	553	420	0	709	338	816	726	427	845	327	711	2	560
GBR	353	920	300	164	930	649	541	0	687	1180	1291	767	1207	421	1148	4	968
IRL	238	323	207	103	534	396	312	673	0	507	673	560	439	157	561	2	531
ITA	294	724	247	174	1022	653	559	753	404	0	1382	688	1584	550	1458	1	902
NLD	649	761	327	309	1994	929	609	1007	605	964	0	903	1349	620	1462	34	1068
NZL	224	503	198	125	620	440	330	653	470	494	833	0	656	244	676	0	992
USA	290	1618	269	230	1009	657	483	963	389	876	1021	587	0	670	1267	4	894
POL	87	292	45	47	423	276	147	203	85	288	413	159	463	0	577	20	311
FRA	388	492	263	146	746	454	450	605	410	592	741	377	542	213	0	2	909
FRR	7	1	2	4	50	3	0	1	1	1	10	0	1	33	0	0	3
AUS	276	620	223	142	698	465	375	737	421	522	835	971	727	150	516	1	0

HOL ccl

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	CHR	CZE	DEU	DFS	FRA	GBR	ISR	ITA	NLD	USA	POL	FRR
CAN	0	355	227	712	1474	779	821	1006	65	1125	861	1755	460	2
CHE	249	0	243	197	456	305	297	341	24	313	349	349	98	3
CHR	189	258	0	130	403	174	167	187	9	210	332	254	78	11
CZE	465	116	92	0	1305	776	822	690	67	874	1000	999	528	9
DEU	711	340	314	852	0	2022	1853	1572	100	2009	2494	1991	835	73
DFS	548	241	140	399	846	0	1208	1090	88	1198	1395	1070	522	12
FRA	507	267	149	419	733	464	0	1174	86	1467	1472	1268	591	2
GBR	959	299	163	378	890	649	618	0	88	1214	1312	1244	442	4
ISR	46	16	5	54	78	64	45	59	0	92	102	90	44	0
ITA	724	247	174	497	963	652	611	760	65	0	1373	1586	569	1
NLD	745	326	308	787	1900	921	759	1022	86	957	0	1333	643	34
USA	1648	267	230	669	942	654	552	994	71	871	995	0	692	4
POL	301	49	54	343	446	288	228	214	26	306	443	484	0	20
FRR	1	2	4	3	50	3	0	1	0	1	10	1	34	0

HOL cc2

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CAN	CHE	CHR	CZE	DEU	DFS	ESP	FRA	GBR	IRL	ISR	ITA	NLD	NZL	USA	POL	ZAF	FRR	AUS
BEL	0	323	214	159	264	554	389	303	458	422	272	37	402	622	306	451	147	191	9	375
CAN	276	0	349	221	692	1396	761	758	796	960	345	64	1070	845	530	1860	433	330	2	742
CHE	192	247	0	243	198	454	306	264	297	340	211	24	311	350	231	403	84	166	3	275
CHR	148	185	258	0	131	392	174	146	167	186	117	9	209	335	146	323	64	93	11	174
CZE	165	452	116	92	0	1290	779	496	825	679	310	67	863	1001	476	1130	495	232	9	540
DEU	456	684	338	309	846	0	1999	966	1837	1508	655	101	1952	2431	857	2633	777	443	72	1176
DFS	291	531	242	140	400	842	0	652	1213	1075	552	89	1192	1406	689	1442	502	395	12	878
ESP	263	438	217	115	291	531	418	0	724	712	338	61	816	731	437	1017	322	322	2	563
FRA	396	501	267	149	419	733	465	459	0	1154	567	88	1455	1476	700	1956	572	376	2	918
GBR	353	910	300	164	372	872	648	541	617	0	687	87	1172	1291	789	1561	414	391	4	969
IRL	238	320	207	103	199	513	396	312	416	673	0	64	505	674	569	579	154	259	2	531
ISR	20	46	16	5	54	78	64	40	45	59	52	0	92	103	84	110	43	47	0	68
ITA	294	706	247	173	496	954	652	559	611	752	404	65	0	1368	706	2058	536	400	1	899
NLD	646	724	327	309	784	1816	924	610	760	1005	605	86	958	0	946	1892	600	391	34	1067
NZL	230	501	202	128	322	617	457	339	392	673	476	73	511	872	0	968	243	322	0	1016
USA	321	1676	298	292	723	1244	749	595	843	1179	463	85	1015	1402	915	0	692	502	7	1299
POL	85	282	43	43	309	387	267	145	207	197	82	22	279	391	161	450	0	113	19	304
ZAF	146	303	141	75	143	317	273	287	243	331	224	33	296	330	266	457	59	0	2	362
FRR	7	1	2	4	3	50	3	0	0	1	1	0	1	10	0	1	32	1	0	3
AUS	276	607	223	142	284	669	465	375	525	737	421	49	525	835	1000	1082	143	297	1	0

HOL int

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CAN	DEU	DFS	ESP	GBR	IRL	ITA	NLD	NZL	USA	POL	ZAF	AUS
BEL	0	323	551	386	301	419	270	398	617	302	447	145	189	373
CAN	276	0	1409	762	756	960	345	1070	841	530	1860	431	329	741
DEU	460	723	0	2018	972	1517	659	1971	2449	862	2655	776	446	1183
DFS	293	532	878	0	648	1076	550	1194	1412	689	1444	495	393	877
ESP	263	438	551	420	0	709	335	812	726	434	1012	318	320	560
GBR	353	910	912	650	541	0	684	1170	1290	787	1560	409	389	968
IRL	238	320	529	396	312	672	0	503	671	568	577	150	259	530
ITA	294	706	998	654	559	751	403	0	1365	705	2056	528	399	898
NLD	646	728	1875	938	610	1005	603	958	0	943	1886	584	389	1064
NZL	230	501	632	459	339	673	476	511	872	0	967	241	321	1014
USA	321	1676	1292	750	595	1179	463	1015	1404	915	0	688	500	1295
POL	85	282	397	268	143	197	82	279	384	159	450	0	112	299
ZAF	146	303	323	273	287	331	224	296	329	266	457	59	0	360
AUS	276	607	690	466	375	737	421	525	830	1000	1081	142	297	0

JER hco

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS USA

CAN 0 47 152
DFS 36 0 82
USA 144 62 0

JER crc

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS GBR NLD NZL USA AUS IRL

CAN 0 48 88 33 105 179 117 5
DFS 35 0 109 100 121 96 96 23
GBR 88 96 0 83 163 137 142 34
NLD 28 94 80 0 86 75 69 20
NZL 116 89 167 84 0 216 329 61
USA 180 74 149 82 252 0 238 27
AUS 114 56 148 65 371 246 0 32
IRL 4 20 34 21 64 28 30 0

JER ccl

common bulls below diagonal
common three quarter sib group above diagonal
CAN DFS GBR NLD USA

CAN 0 48 89 33 180
DFS 35 0 108 98 94
GBR 87 96 0 83 133
NLD 28 94 80 0 72
USA 181 73 142 79 0

JER cc2

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	DFS	GBR	NLD	NZL	USA	ZAF	AUS	IRL
CAN	0	48	87	33	105	184	81	116	5
DFS	35	0	109	101	124	141	102	96	23
GBR	86	96	0	83	169	158	119	143	34
NLD	28	94	80	0	89	87	82	71	20
NZL	116	92	173	86	0	317	166	335	61
USA	187	106	176	96	411	0	213	344	27
ZAF	79	75	120	80	178	223	0	169	25
AUS	112	56	148	65	378	371	160	0	32
IRL	4	20	34	21	64	28	25	30	0

JER int

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	DFS	GBR	NLD	NZL	USA	ZAF	AUS	IRL
CAN	0	48	87	33	105	184	81	116	5
DFS	35	0	109	101	124	141	102	96	23
GBR	86	96	0	84	169	158	119	143	34
NLD	28	95	80	0	90	88	83	72	21
NZL	116	92	173	87	0	317	166	335	61
USA	187	107	176	96	411	0	213	344	27
ZAF	79	75	120	80	178	223	0	169	25
AUS	112	56	148	65	378	371	160	0	32
IRL	4	20	34	21	64	28	25	30	0

RDC hco

 common bulls below diagonal
 common three quarter sib group above diagonal
 CAN DEU DFS NOR

 CAN 0 7 87 4
 DEU 6 0 36 8
 DFS 81 27 0 85
 NOR 4 8 66 0

RDC crc

 common bulls below diagonal
 common three quarter sib group above diagonal
 CAN DEU DFS GBR NOR NZL USA NLD AUS

 CAN 0 8 80 46 4 49 89 6 53
 DEU 7 0 37 3 8 10 0 10 20
 DFS 74 29 0 38 76 146 56 34 138
 GBR 47 3 37 0 10 43 33 13 37
 NOR 4 8 58 11 0 43 1 23 33
 NZL 52 10 142 42 42 0 45 13 108
 USA 87 0 51 32 0 45 0 4 38
 NLD 6 9 34 13 23 13 4 0 14
 AUS 53 19 118 36 28 114 39 12 0

RDC cc1

 common bulls below diagonal
 common three quarter sib group above diagonal
 CAN DEU DFS GBR NOR NLD USA

 CAN 0 8 80 46 4 6 89
 DEU 7 0 39 3 8 10 0
 DFS 74 31 0 38 79 34 56
 GBR 47 3 37 0 10 13 31
 NOR 4 8 61 11 0 23 1
 NLD 6 9 34 13 23 0 4
 USA 87 0 51 30 0 4 0

RDC cc2

 common bulls below diagonal
 common three quarter sib group above diagonal
 CAN DEU DFS GBR NOR NZL USA ZAF NLD AUS

 CAN 0 7 77 44 4 48 107 86 6 50
 DEU 6 0 36 3 7 11 4 1 10 20
 DFS 73 29 0 40 69 151 98 59 34 138
 GBR 45 3 39 0 10 44 55 38 13 37
 NOR 4 7 53 11 0 40 25 0 23 32
 NZL 51 10 147 43 39 0 84 47 15 110
 USA 109 4 96 55 25 85 0 85 20 69
 ZAF 97 1 57 37 0 45 84 0 3 42
 NLD 6 9 34 13 23 15 19 3 0 14
 AUS 50 19 118 36 27 116 74 46 12 0

RDC int

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	DEU	DFS	GBR	NOR	NZL	USA	ZAF	NLD	AUS
CAN	0	7	77	44	4	48	107	86	6	50
DEU	6	0	37	3	7	11	4	1	10	20
DFS	73	30	0	40	69	151	98	59	34	138
GBR	45	3	39	0	10	44	55	38	13	37
NOR	4	7	53	11	0	40	25	0	23	32
NZL	51	10	147	43	39	0	84	47	15	110
USA	109	4	96	55	25	85	0	85	20	69
ZAF	97	1	57	37	0	45	84	0	3	42
NLD	6	9	34	13	23	15	19	3	0	14
AUS	50	19	118	36	27	116	74	46	12	0
