

Interbull Routine Genetic Evaluation for Conformation Traits

August 2014

Introduction

The latest routine international evaluation for conformation traits took place as scheduled at the Interbull Centre. Data from twenty (22) countries were included in this evaluation.

International genetic evaluations for calving traits of bulls from Australia, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark-Finland-Sweden, Spain, France, United Kingdom, Hungary, Ireland, Italy, Japan, Korea, The Netherlands, Norway, New Zealand, Poland, South Africa, Estonia, Slovenia, Portugal and the United States of America were computed. Brown Swiss, Guernsey, Holstein, Jersey and Red Dairy Cattle breed data were included in this evaluation.

Changes in national procedures

Changes in the national genetic evaluation of conformation traits are as follows:

CAN (ALL): Base change.

CHE (BSW): Reductions in edc for conformation traits is due to slight changes in definition of contemporary groups (herd*3 year period, starting with the most recent year with data).

NOR (RDC): Base change

NZL (ALL): Changed in herd/dtr numbers due to parentage verification

DEU (BSW): Rolling base changes each evaluation, base animal group is moved by 4 month each evaluation

DEU (HOL): There is no longer a distinction nationally between 1st and 2nd crop of daughters (as consequences of genomically proven bulls), thus type of proof is either

11 (German bull) or 21 (foreign bull), there are quite a number of bulls mentioned as "missing", however most of these appear now with another (correct) ID, these are mostly danish bulls

INTERBULL CHANGES COMPARED TO THE DECEMBER ROUTINE RUN

No changes.

DATA AND METHOD OF ANALYSIS

Data were national genetic evaluations of AI sampled bulls with at least 10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least 50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at least 10 herds. Table 1 presents the amount of data included in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed jointly with a linear model including the effects of evaluation country, genetic group of bull and bull merit. Heritability estimates used in both the de-regression and international evaluation were as in each country's national evaluation.

Table 2 presents the date of evaluation as supplied by each country in the 01x-proof file.

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I and the corresponding number of common bulls are listed in APPENDIX II.

SCIENTIFIC LITERATURE

The international genetic evaluation procedure is based on international work described in the following scientific publications:

International genetic evaluation computation:

Schaeffer. 1994. *J. Dairy Sci.* 77:2671-2678

Klei, 1998. *Interbull Bulletin* 17:3-7

Verification and Genetic trend validation:

Klei et al., 2002. *Interbull Bulletin* 29:178-182.

Boichard et al., 1995. *J. Dairy Sci.* 78:431-437

Weighting factors:

Fikse and Banos, 2001. *J. Dairy Sci.* 84:1759-1767

De-regression:

Sigurdsson and G. Banos. 1995. *Acta Agric. Scand.* 45:207-219

Jairath et al. 1998. *J. Dairy Sci.* Vol. 81:550-562

Genetic parameter estimation:

Klei and Weigel, 1998, *Interbull Bulletin* 17:8-14

Sullivan, 1999. *Interbull Bulletin* 22:146-148

Post-processing of estimated genetic correlations:

Mark et al., 2003, *Interbull Bulletin* 30:126-135

Jorjani et al., 2003. *J. Dairy Sci.* 86:677-679

<https://wiki.interbull.org/public/rg%20procedure?action=print>

Time edits

Weigel and Banos. 1997. *J. Dairy Sci.* 80:3425-3430

International reliability estimation

NEXT ROUTINE INTERNATIONAL EVALUATION

The next routine evaluation of Interbull for production, conformation, udder health, longevity, calving, female fertility and workability traits is scheduled for November 2014. Deadline for sending data to the Interbull Centre is Tuesday November 11, 2014, 17:00 CET; confidential distribution of results is targeted for Thursday 20 Nov, 2014, with earliest possible official release of results on November 2, 2014. Please remark the three week turn around time.

NEXT TEST INTERNATIONAL EVALUATION

The next test run for production, conformation, udder health, longevity, calving, female fertility and workability traits will take place in September 2014.

Countries planning to introduce changes in their national evaluation procedures and wishing to have them included in the routine Interbull evaluation, should have their data examined in this test run. New data and validation results should be sent to the Interbull Centre no later than September 2, 2014, 17:00 CET.

PUBLICATION OF INTERBULL TEST RUN

Test evaluation results are meant for review purposes only and should not be published.

^LTable 1. National evaluation data considered in the Interbull evaluation for conformation traits (August Routine Evaluation 2014). Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
ARG						
AUS		48	3202	634	236	
BEL			941			
CAN	165	90	9416	523	723	
CHE	2330		1120			
CHR			1674			
CZE			3303			
DEA	2922					
DEU			22125		281	
DFS			10725	1663	5488	
ESP			2733			
EST			458			
FRA	274		15015			
FRM						
FRR			171			
GBR	15	181	4652	355	251	
HUN			2091			
IRL			1274			
ISR						
ITA	1653		8471	93		
JPN			4478			
KOR			824			
LTU						
LVA						
NLD	96		12809	34	33	
NOR					1791	
NZL			4862	3201	508	
POL			6594			
PRT			1957			
SVK						
SVN	273		325			
URY						
USA	695	622	28052	3127	204	
ZAF			773	471		
=====						
No. Records	8423	941	148045	10101	9515	
Pub. Proofs	6785	804	124462	8883	10466	0

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal

BSW sta

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.02								
CHE	0.93	1.02							
FRA	0.98	0.94	0.91						
ITA	0.96	0.95	0.94	13.71					
NLD	0.94	0.92	0.96	0.93	4.88				
USA	0.98	0.94	0.97	0.97	0.96	1.45			
DEA	0.96	0.96	0.97	0.96	0.95	0.96	11.41		
SVN	0.91	0.91	0.91	0.91	0.93	0.91	0.94	15.91	
GBR	0.95	0.90	0.95	0.93	0.92	0.94	0.88	0.87	0.83

BSW cwi

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.88								
CHE	0.87	0.86							
FRA	0.82	0.80	0.91						
ITA	0.80	0.85	0.86	16.12					
NLD	0.89	0.74	0.62	0.64	4.40				
USA	0.95	0.91	0.83	0.89	0.83	0.80			
DEA	0.85	0.83	0.71	0.75	0.73	0.83	11.98		
SVN	0.77	0.75	0.79	0.82	0.61	0.79	0.91	22.29	
GBR	0.90	0.83	0.83	0.74	0.89	0.82	0.82	0.77	1.39

BSW bde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR
CAN	7.28							
CHE	0.76	0.79						
FRA	0.84	0.84	0.89					
ITA	0.81	0.90	0.92	14.79				
NLD	0.89	0.71	0.77	0.76	4.28			
DEA	0.93	0.87	0.94	0.92	0.79	11.55		
SVN	0.66	0.78	0.84	0.85	0.50	0.81	22.19	
GBR	0.86	0.86	0.84	0.86	0.89	0.83	0.77	1.44

BSW ang

	CAN	CHE	FRA	NLD	USA	GBR
CAN	8.23					
CHE	0.36	0.92				
FRA	0.89	0.34	0.92			
NLD	0.69	0.53	0.81	3.37		
USA	0.78	0.67	0.70	0.54	1.01	
GBR	0.85	0.74	0.77	0.78	0.87	0.78

BSW ran

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.47								
CHE	0.92	0.88							
FRA	0.97	0.95	0.94						
ITA	0.94	0.94	0.93	15.78					
NLD	0.96	0.88	0.93	0.92	4.34				
USA	0.98	0.93	0.98	0.91	0.92	1.09			
DEA	0.96	0.94	0.95	0.96	0.91	0.96	12.13		
SVN	0.92	0.95	0.95	0.94	0.89	0.92	0.95	20.82	
GBR	0.94	0.90	0.95	0.91	0.94	0.94	0.88	0.86	2.08

BSW	rwi							
	CAN	CHE	FRA	NLD	USA	DEA	GBR	
CAN	6.90							
CHE	0.84	0.81						
FRA	0.76	0.69	0.98					
NLD	0.95	0.82	0.66	3.79				
USA	0.85	0.82	0.85	0.73	0.69			
DEA	0.87	0.88	0.78	0.78	0.87	12.57		
GBR	0.90	0.80	0.88	0.85	0.91	0.75	1.21	

BSW	rls									
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	6.94									
CHE	0.87	1.09								
FRA	0.95	0.88	1.00							
ITA	0.95	0.86	0.94	17.20						
NLD	0.94	0.77	0.93	0.90	5.08					
USA	0.90	0.90	0.95	0.88	0.86	0.74				
DEA	0.88	0.91	0.91	0.92	0.78	0.92	12.09			
SVN	0.86	0.81	0.84	0.86	0.83	0.83	0.84	23.07		
GBR	0.85	0.87	0.90	0.83	0.86	0.84	0.83	0.77	1.20	

BSW	fan									
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	8.22									
CHE	0.42	1.16								
FRA	0.71	0.71	1.03							
ITA	0.52	0.84	0.80	16.61						
NLD	0.36	0.68	0.76	0.75	5.38					
USA	0.66	0.66	0.87	0.80	0.88	0.68				
DEA	0.36	0.88	0.69	0.88	0.68	0.61	11.45			
SVN	0.34	0.84	0.65	0.79	0.61	0.51	0.96	25.05		
GBR	0.77	0.82	0.86	0.85	0.78	0.84	0.82	0.80	1.03	

BSW	hde							
	CAN	CHE	FRA	ITA	NLD	DEA	SVN	
CAN	8.32							
CHE	0.91	1.08						
FRA	0.95	0.85	1.12					
ITA	0.85	0.82	0.87	16.40				
NLD	0.91	0.75	0.95	0.82	5.38			
DEA	0.87	0.87	0.87	0.89	0.84	12.19		
SVN	0.79	0.69	0.83	0.82	0.86	0.92	30.19	

BSW	fua									
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	7.29									
CHE	0.07	0.98								
FRA	0.58	0.55	1.00							
ITA	0.22	0.90	0.67	12.57						
NLD	0.93	0.14	0.66	0.27	4.47					
USA	0.88	0.15	0.67	0.41	0.83	1.17				
DEA	0.72	0.28	0.81	0.47	0.77	0.78	11.70			
SVN	0.23	0.70	0.71	0.78	0.33	0.40	0.60	17.40		
GBR	0.82	0.59	0.79	0.74	0.81	0.84	0.74	0.60	1.38	

BSW		ruh								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	7.00									
CHE	0.89	0.96								
FRA	0.87	0.85	0.98							
ITA	0.72	0.85	0.83	12.03						
NLD	0.73	0.70	0.78	0.87	4.38					
USA	0.89	0.83	0.84	0.87	0.89	1.04				
DEA	0.80	0.86	0.89	0.92	0.86	0.85	12.58			
SVN	0.67	0.82	0.71	0.86	0.71	0.69	0.83	19.45		
GBR	0.78	0.80	0.82	0.85	0.87	0.88	0.74	0.66	1.26	

BSW		ruw							
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	
CAN	7.72								
CHE	0.96	0.96							
FRA	0.89	0.87	0.91						
ITA	0.86	0.87	0.75	12.67					
NLD	0.59	0.46	0.64	0.71	4.38				
USA	0.92	0.87	0.81	0.89	0.75	0.92			
DEA	0.86	0.91	0.73	0.96	0.55	0.87	12.35		
SVN	0.73	0.70	0.60	0.88	0.75	0.78	0.83	17.76	

BSW		usu								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	8.02									
CHE	0.87	0.99								
FRA	0.83	0.90	0.96							
ITA	0.94	0.87	0.89	14.31						
NLD	0.83	0.80	0.88	0.87	4.73					
USA	0.86	0.86	0.79	0.81	0.86	0.99				
DEA	0.88	0.90	0.85	0.89	0.78	0.73	11.76			
SVN	0.76	0.62	0.45	0.68	0.58	0.70	0.67	24.37		
GBR	0.85	0.81	0.87	0.86	0.91	0.92	0.74	0.61	2.66	

BSW		ude								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	6.59									
CHE	0.94	0.98								
FRA	0.94	0.95	0.98							
ITA	0.92	0.97	0.95	15.87						
NLD	0.96	0.94	0.93	0.94	4.11					
USA	0.89	0.93	0.92	0.95	0.89	1.14				
DEA	0.92	0.98	0.92	0.97	0.94	0.90	12.13			
SVN	0.91	0.92	0.85	0.93	0.93	0.88	0.94	21.59		
GBR	0.95	0.92	0.94	0.92	0.95	0.93	0.87	0.85	1.93	

BSW		ftp							
	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	
CAN	7.16								
CHE	0.99	1.19							
FRA	0.97	0.95	0.95						
NLD	0.97	0.95	0.94	4.53					
USA	0.92	0.90	0.90	0.88	1.09				
DEA	0.97	0.99	0.95	0.95	0.91	11.45			
SVN	0.89	0.88	0.92	0.91	0.77	0.87	19.27		
GBR	0.94	0.90	0.89	0.92	0.92	0.87	0.83	1.33	

BSW	ftl								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	5.78								
CHE	0.76	1.23							
FRA	0.83	0.96	0.99						
ITA	0.83	0.95	0.97	15.05					
NLD	0.75	0.94	0.94	0.92	4.66				
USA	0.79	0.96	0.98	0.98	0.96	1.37			
DEA	0.75	0.98	0.97	0.96	0.92	0.97	11.47		
SVN	0.63	0.92	0.89	0.91	0.88	0.91	0.93	19.12	
GBR	0.89	0.90	0.91	0.92	0.95	0.94	0.86	0.82	1.34

BSW	rtp								
	CAN	CHE	FRA	ITA	NLD	DEA	SVN		
CAN	7.69								
CHE	0.98	1.23							
FRA	0.98	0.98	0.98						
ITA	0.92	0.87	0.88	14.90					
NLD	0.98	0.97	0.98	0.88	4.60				
DEA	0.95	0.98	0.96	0.86	0.94	11.29			
SVN	0.89	0.91	0.89	0.80	0.91	0.94	19.82		

BSW	ocs								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.69								
CHE	0.84	0.72							
FRA	0.88	0.94	1.03						
ITA	0.77	0.83	0.86	10.16					
NLD	0.76	0.65	0.80	0.69	4.12				
USA	0.87	0.68	0.83	0.84	0.84	0.56			
DEA	0.68	0.87	0.88	0.87	0.69	0.66	14.81		
SVN	0.62	0.55	0.61	0.64	0.74	0.69	0.70	25.55	
GBR	0.84	0.84	0.88	0.87	0.88	0.89	0.77	0.71	1.73

BSW	ous								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.91								
CHE	0.90	1.07							
FRA	0.91	0.94	1.11						
ITA	0.82	0.93	0.87	11.99					
NLD	0.87	0.91	0.88	0.88	4.56				
USA	0.78	0.87	0.88	0.91	0.84	0.87			
DEA	0.84	0.92	0.94	0.92	0.89	0.86	11.17		
SVN	0.55	0.67	0.65	0.71	0.69	0.69	0.76	22.06	
GBR	0.80	0.80	0.74	0.81	0.87	0.86	0.68	0.59	1.40

BSW	ofl								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.34								
CHE	0.82	0.94							
FRA	0.48	0.63	1.40						
ITA	0.64	0.72	0.78	15.46					
NLD	0.16	0.38	0.51	0.41	4.65				
USA	0.34	0.43	0.85	0.70	0.52	0.95			
DEA	0.70	0.83	0.68	0.82	0.42	0.41	11.63		
SVN	0.60	0.79	0.46	0.58	0.54	0.30	0.82	31.63	
GBR	0.72	0.72	0.75	0.71	0.73	0.71	0.61	0.60	1.67

GUE sta		CAN	GBR	USA	AUS
CAN		6.23			
GBR		0.97	1.04		
USA		0.98	0.95	2.30	
AUS		0.83	0.86	0.85	15.42

GUE cwi		CAN	GBR	USA	AUS
CAN		6.45			
GBR		0.97	1.74		
USA		0.91	0.93	1.25	
AUS		0.84	0.83	0.63	5.80

GUE bde		CAN	GBR	USA	AUS
CAN		6.21			
GBR		0.96	1.35		
USA		0.85	0.91	1.41	
AUS		0.74	0.76	0.85	8.61

GUE ang		CAN	GBR	USA	AUS
CAN		7.49			
GBR		0.72	1.35		
USA		0.62	0.91	1.64	
AUS		0.10	0.70	0.64	8.95

GUE ran		CAN	GBR	USA	AUS
CAN		6.21			
GBR		0.98	1.73		
USA		0.97	0.97	1.58	
AUS		0.94	0.97	0.91	11.82

GUE rwi		CAN	GBR	USA	AUS
CAN		6.86			
GBR		0.94	1.42		
USA		0.96	0.88	1.33	
AUS		0.88	0.95	0.77	10.92

GUE rls		CAN	GBR	USA	AUS
CAN		7.16			
GBR		0.63	1.53		
USA		0.82	0.58	0.93	
AUS		0.67	0.83	0.57	6.28

GUE rlr

CAN CAN USA AUS
CAN 7.24
USA 0.81 1.03
AUS 0.40 0.78 5.88

GUE fan

CAN CAN GBR USA AUS
CAN 8.44
GBR 0.29 1.44
USA 0.74 0.56 0.76
AUS 0.24 0.84 0.58 6.64

GUE fua

CAN CAN GBR USA AUS
CAN 7.45
GBR 0.95 1.57
USA 0.89 0.88 1.58
AUS 0.87 0.87 0.63 7.90

GUE ruh

CAN CAN GBR USA AUS
CAN 7.21
GBR 0.66 1.58
USA 0.74 0.86 1.39
AUS 0.78 0.35 0.57 7.98

GUE usu

CAN CAN GBR USA AUS
CAN 7.08
GBR 0.52 1.65
USA 0.62 0.68 1.10
AUS 0.86 0.59 0.84 7.22

GUE ude

CAN CAN GBR USA AUS
CAN 6.06
GBR 0.97 1.62
USA 0.90 0.86 1.69
AUS 0.70 0.75 0.37 9.12

GUE ftp

CAN CAN GBR USA AUS
CAN 5.80
GBR 0.96 1.25
USA 0.90 0.82 1.28
AUS 0.70 0.65 0.78 7.53

GUE ftl

CAN CAN GBR USA AUS
CAN 4.57
GBR 0.49 1.88
USA 0.63 0.97 1.47
AUS 0.16 0.92 0.84 13.32

HOL	loc															
	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CZE	IRL	KOR	SVN	PRT
BEL	2.04															
CAN	0.83	6.41														
CHE	0.56	0.66	1.33													
DEU	0.57	0.68	0.69	12.48												
DFS	0.85	0.90	0.51	0.57	13.52											
ESP	0.55	0.69	0.70	0.73	0.66	0.99										
FRA	0.77	0.75	0.62	0.81	0.67	0.72	1.08									
GBR	0.61	0.66	0.81	0.79	0.59	0.79	0.84	1.34								
ITA	0.51	0.62	0.64	0.70	0.51	0.68	0.74	0.78	1.68							
NLD	0.84	0.77	0.64	0.81	0.74	0.66	0.80	0.73	0.54	4.84						
USA	0.58	0.72	0.58	0.79	0.62	0.72	0.76	0.71	0.82	0.62	1.59					
CZE	0.32	0.52	0.57	0.69	0.43	0.58	0.62	0.64	0.64	0.44	0.72	22.61				
IRL	0.61	0.64	0.62	0.70	0.54	0.71	0.74	0.80	0.78	0.64	0.67	0.44	1.65			
KOR	0.49	0.77	0.56	0.47	0.64	0.62	0.64	0.63	0.63	0.45	0.58	0.62	0.58	11.61		
SVN	0.68	0.83	0.71	0.64	0.79	0.76	0.70	0.71	0.72	0.67	0.77	0.72	0.55	0.74	30.40	
PRT	0.22	0.53	0.52	0.63	0.30	0.55	0.51	0.59	0.39	0.47	0.49	0.63	0.43	0.57	0.53	0.23

HOL	bcs																
	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	FRR	JPN	IRL	KOR	CAN	PRT	ESP
BEL	1.09																
CHE	0.73	10.70															
DEU	0.77	0.91	11.47														
DFS	0.66	0.72	0.78	10.08													
FRA	0.74	0.95	0.93	0.79	1.01												
GBR	0.76	0.93	0.92	0.73	0.94	1.26											
ITA	0.73	0.92	0.94	0.77	0.96	0.91	6.71										
NLD	0.76	0.94	0.95	0.77	0.94	0.91	0.93	4.95									
USA	0.78	0.68	0.72	0.63	0.75	0.76	0.76	0.71	1.38								
CZE	0.78	0.91	0.94	0.76	0.91	0.88	0.94	0.93	0.71	12.74							
FRR	0.74	0.84	0.88	0.71	0.85	0.87	0.83	0.88	0.62	0.78	0.08						
JPN	0.74	0.94	0.94	0.80	0.96	0.92	0.95	0.94	0.75	0.92	0.82	1.62					
IRL	0.68	0.89	0.85	0.68	0.90	0.95	0.84	0.88	0.65	0.81	0.85	0.87	1.08				
KOR	0.46	0.76	0.75	0.70	0.79	0.75	0.81	0.71	0.64	0.76	0.60	0.80	0.68	2.63			
CAN	0.75	0.94	0.94	0.77	0.94	0.96	0.93	0.95	0.75	0.92	0.85	0.97	0.91	0.77	6.18		
PRT	0.73	0.93	0.89	0.75	0.90	0.89	0.91	0.92	0.74	0.91	0.80	0.90	0.80	0.77	0.92	0.36	
ESP	0.80	0.92	0.94	0.77	0.95	0.95	0.93	0.94	0.75	0.94	0.84	0.94	0.89	0.83	0.95	0.90	1.13

JER	sta								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	10.12								
CAN	0.84	6.22							
DFS	0.86	0.95	12.02						
GBR	0.87	0.94	0.95	0.83					
ITA	0.87	0.95	0.93	0.97	1.41				
NZL	0.89	0.87	0.90	0.94	0.92	0.36			
USA	0.89	0.96	0.93	0.97	0.95	0.91	1.40		
ZAF	0.82	0.85	0.83	0.94	0.94	0.95	0.90	9.64	
NLD	0.92	0.96	0.96	0.95	0.95	0.90	0.97	0.88	5.35

JER	cwi								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	6.52								
CAN	0.69	6.54							
DFS	0.82	0.79	15.00						
GBR	0.76	0.86	0.83	1.44					
ITA	0.64	0.94	0.82	0.79	1.48				
NZL	0.83	0.54	0.65	0.78	0.45	0.36			
USA	0.77	0.94	0.79	0.81	0.93	0.57	0.95		
ZAF	0.86	0.83	0.70	0.88	0.72	0.82	0.83	9.38	
NLD	0.78	0.66	0.83	0.63	0.71	0.58	0.80	0.63	4.27

JER	bde								
	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	
AUS	7.93								
CAN	0.74	6.18							
DFS	0.87	0.82	14.12						
GBR	0.64	0.77	0.77	1.51					
ITA	0.46	0.68	0.71	0.80	1.46				
NZL	0.75	0.57	0.66	0.64	0.63	0.36			
ZAF	0.95	0.72	0.82	0.75	0.54	0.78	9.81		
NLD	0.50	0.82	0.72	0.61	0.82	0.48	0.45	3.32	

JER	ang								
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	
AUS	8.08								
CAN	0.56	7.22							
DFS	0.76	0.60	13.15						
GBR	0.85	0.65	0.88	0.91					
ITA	0.68	0.65	0.89	0.84	1.23				
USA	0.82	0.76	0.81	0.82	0.73	1.00			
ZAF	0.71	0.63	0.81	0.86	0.67	0.80	9.56		
NLD	0.83	0.65	0.70	0.77	0.57	0.88	0.73	3.49	

JER	ran								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	8.49								
CAN	0.87	5.75							
DFS	0.90	0.94	12.39						
GBR	0.96	0.94	0.97	1.12					
ITA	0.83	0.95	0.91	0.88	1.38				
NZL	0.96	0.84	0.89	0.93	0.83	0.28			
USA	0.92	0.93	0.95	0.97	0.88	0.92	1.11		
ZAF	0.97	0.89	0.93	0.98	0.82	0.93	0.96	10.19	
NLD	0.87	0.82	0.88	0.93	0.71	0.84	0.94	0.93	4.59

JER	rwi								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	7.07								
CAN	0.88	6.57							
DFS	0.87	0.92	11.55						
GBR	0.79	0.95	0.89	1.21					
ITA	0.66	0.78	0.82	0.73	1.63				
NZL	0.90	0.86	0.87	0.79	0.68	0.28			
USA	0.53	0.74	0.63	0.75	0.82	0.53	0.83		
ZAF	0.80	0.77	0.80	0.79	0.62	0.71	0.58	10.48	
NLD	0.73	0.51	0.63	0.37	0.42	0.78	0.17	0.55	3.99

JER	rls								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	4.63								
CAN	0.41	5.78							
DFS	0.30	0.90	13.88						
GBR	0.67	0.82	0.75	1.65					
ITA	0.37	0.73	0.81	0.77	1.73				
NZL	0.70	0.58	0.56	0.76	0.74	0.12			
USA	0.58	0.89	0.91	0.91	0.82	0.74	0.67		
ZAF	0.88	0.67	0.60	0.89	0.67	0.87	0.85	13.49	
NLD	0.41	0.71	0.80	0.68	0.94	0.72	0.77	0.64	3.49

JER	rlr					
	AUS	CAN	DFS	ITA	ZAF	NLD
AUS	4.46					
CAN	0.25	7.08				
DFS	0.56	0.64	12.14			
ITA	0.31	0.33	0.52	1.18		
ZAF	0.20	0.18	0.45	0.90	14.43	
NLD	0.64	0.58	0.69	0.81	0.69	5.04

JER	fan								
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	
AUS	4.93								
CAN	0.67	5.51							
DFS	0.71	0.91	13.82						
GBR	0.80	0.82	0.76	1.27					
ITA	0.61	0.83	0.65	0.88	1.79				
USA	0.67	0.88	0.76	0.85	0.89	0.76			
ZAF	0.74	0.73	0.59	0.89	0.88	0.81	10.84		
NLD	0.64	0.87	0.75	0.92	0.91	0.87	0.85	4.25	

JER	fua									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	
AUS	7.56									
CAN	0.61	5.07								
DFS	0.78	0.73	12.00							
GBR	0.77	0.90	0.82	1.39						
ITA	0.61	0.83	0.80	0.85	1.54					
NZL	0.85	0.58	0.63	0.76	0.56	0.40				
USA	0.77	0.93	0.82	0.93	0.83	0.66	1.16			
ZAF	0.72	0.90	0.86	0.96	0.92	0.68	0.91	12.59		
NLD	0.86	0.69	0.91	0.83	0.80	0.73	0.81	0.84	4.64	

JER	ruh									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	
AUS	8.01									
CAN	0.65	6.87								
DFS	0.51	0.84	12.16							
GBR	0.78	0.85	0.69	1.03						
ITA	0.76	0.89	0.81	0.93	1.40					
NZL	0.70	0.69	0.76	0.66	0.80	0.40				
USA	0.79	0.85	0.83	0.86	0.89	0.72	1.12			
ZAF	0.80	0.75	0.84	0.75	0.81	0.75	0.90	9.99		
NLD	0.74	0.90	0.67	0.89	0.88	0.68	0.78	0.66	4.84	

JER		usu								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	
AUS	9.00									
CAN	0.84	6.57								
DFS	0.69	0.93	12.48							
GBR	0.84	0.90	0.84	1.62						
ITA	0.38	0.63	0.56	0.42	1.68					
NZL	0.49	0.49	0.33	0.58	0.52	0.38				
USA	0.72	0.84	0.87	0.72	0.51	0.25	0.83			
ZAF	0.87	0.91	0.84	0.87	0.55	0.36	0.83	11.42		
NLD	0.72	0.75	0.68	0.54	0.67	0.46	0.75	0.65	5.32	

JER		ude								
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD		
AUS	8.13									
CAN	0.94	4.79								
DFS	0.98	0.94	12.66							
GBR	0.92	0.94	0.92	1.38						
ITA	0.97	0.92	0.96	0.86	1.38					
USA	0.93	0.97	0.95	0.91	0.91	1.51				
ZAF	0.98	0.96	0.97	0.93	0.97	0.95	11.74			
NLD	0.96	0.91	0.95	0.87	0.98	0.89	0.95	4.56		

JER		ftp								
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	
AUS	9.88									
CAN	0.87	5.84								
DFS	0.81	0.93	13.66							
GBR	0.87	0.85	0.82	1.32						
ITA	0.55	0.73	0.67	0.48	2.01					
NZL	0.90	0.92	0.86	0.82	0.67	0.30				
USA	0.85	0.96	0.92	0.84	0.71	0.86	1.11			
ZAF	0.88	0.98	0.95	0.89	0.68	0.91	0.95	11.23		
NLD	0.94	0.95	0.89	0.85	0.64	0.89	0.94	0.93	5.20	

JER		ftl								
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD		
AUS	9.74									
CAN	0.72	5.29								
DFS	0.89	0.82	12.78							
GBR	0.95	0.81	0.95	1.19						
ITA	0.91	0.61	0.84	0.91	1.86					
USA	0.93	0.82	0.96	0.95	0.90	1.02				
ZAF	0.96	0.78	0.91	0.95	0.93	0.97	11.25			
NLD	0.92	0.85	0.98	0.94	0.83	0.96	0.91	4.51		

JER		rtp						
	AUS	CAN	DFS	NZL	ZAF	NLD		
AUS	7.02							
CAN	0.93	6.10						
DFS	0.88	0.95	12.88					
NZL	0.96	0.96	0.93	0.39				
ZAF	0.92	0.98	0.94	0.93	10.53			
NLD	0.74	0.80	0.81	0.83	0.74	4.43		

JER	ocs							
	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD
AUS	10.27							
CAN	0.42	5.82						
DFS	0.33	0.44	12.69					
GBR	0.66	0.82	0.57	1.43				
ITA	0.30	0.79	0.43	0.66	0.76			
NZL	0.59	0.58	0.19	0.55	0.55	0.33		
USA	0.70	0.75	0.49	0.77	0.61	0.61	0.93	
NLD	0.46	0.77	0.63	0.72	0.90	0.49	0.68	2.79

JER	ous							
	AUS	CAN	DFS	GBR	NZL	USA	NLD	
AUS	7.17							
CAN	0.67	6.00						
DFS	0.40	0.91	12.47					
GBR	0.70	0.85	0.75	1.21				
NZL	0.65	0.75	0.64	0.75	0.46			
USA	0.66	0.90	0.79	0.85	0.65	0.70		
NLD	0.71	0.85	0.73	0.75	0.75	0.87	4.69	

JER	ofl							
	AUS	CAN	DFS	GBR	ITA	USA	NLD	
AUS	4.93							
CAN	0.62	5.90						
DFS	0.27	0.74	13.35					
GBR	0.59	0.74	0.35	1.15				
ITA	0.80	0.79	0.40	0.62	1.20			
USA	0.69	0.86	0.49	0.73	0.81	0.96		
NLD	0.70	0.90	0.58	0.73	0.87	0.82	5.17	

RDC	sta									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	
AUS	9.95									
CAN	0.88	5.93								
DEU	0.88	0.96	11.32							
DFS	0.89	0.98	0.97	9.24						
GBR	0.92	0.95	0.95	0.93	1.15					
NOR	0.91	0.96	0.96	0.99	0.94	11.48				
NZL	0.90	0.90	0.85	0.91	0.92	0.92	0.48			
USA	0.89	0.97	0.95	0.93	0.97	0.92	0.88	1.98		
NLD	0.87	0.96	0.97	0.97	0.93	0.95	0.81	0.93	4.93	

RDC	cwi									
	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD		
AUS	8.24									
CAN	0.68	7.11								
DEU	0.62	0.78	11.65							
DFS	0.76	0.72	0.82	13.63						
GBR	0.80	0.86	0.90	0.85	1.46					
NZL	0.79	0.58	0.71	0.70	0.81	0.35				
USA	0.54	0.86	0.85	0.75	0.85	0.69	1.08			
NLD	0.67	0.88	0.92	0.91	0.91	0.65	0.82	3.96		

RDC	bde								
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.73								
CAN	0.76	5.86							
DEU	0.75	0.85	10.19						
DFS	0.85	0.85	0.88	12.55					
GBR	0.78	0.85	0.88	0.87	1.41				
NOR	0.73	0.58	0.57	0.81	0.56	11.51			
NZL	0.81	0.55	0.69	0.74	0.72	0.70	0.35		
USA	0.64	0.78	0.82	0.78	0.91	0.58	0.65	1.00	
NLD	0.61	0.83	0.86	0.73	0.90	0.29	0.50	0.88	4.11

RDC	ang							
	AUS	CAN	DEU	DFS	GBR	USA	NLD	
AUS	9.47							
CAN	0.62	6.59						
DEU	0.63	0.83	11.21					
DFS	0.60	0.80	0.85	10.18				
GBR	0.73	0.81	0.83	0.84	1.29			
USA	0.71	0.87	0.82	0.76	0.86	0.88		
NLD	0.59	0.75	0.49	0.73	0.77	0.69	4.85	

RDC	ran								
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.88								
CAN	0.90	6.04							
DEU	0.86	0.97	11.02						
DFS	0.80	0.95	0.97	10.55					
GBR	0.94	0.98	0.96	0.95	1.36				
NOR	0.52	0.79	0.84	0.89	0.75	10.74			
NZL	0.92	0.92	0.89	0.87	0.94	0.72	0.29		
USA	0.91	0.98	0.97	0.95	0.98	0.80	0.92	1.05	
NLD	0.88	0.96	0.98	0.97	0.97	0.80	0.89	0.96	5.95

RDC	rwi								
	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	
AUS	8.38								
CAN	0.83	6.01							
DEU	0.86	0.90	9.98						
DFS	0.85	0.94	0.89	11.03					
GBR	0.85	0.89	0.89	0.88	1.36				
NZL	0.87	0.89	0.80	0.90	0.89	0.30			
USA	0.76	0.90	0.84	0.85	0.93	0.84	1.19		
NLD	0.88	0.95	0.93	0.94	0.89	0.82	0.82	5.60	

RDC	rls								
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	4.51								
CAN	0.63	6.43							
DEU	0.65	0.94	10.34						
DFS	0.52	0.97	0.94	9.24					
GBR	0.82	0.78	0.87	0.75	1.68				
NOR	0.40	0.89	0.86	0.95	0.65	13.19			
NZL	0.61	0.54	0.67	0.53	0.62	0.53	0.12		
USA	0.67	0.94	0.93	0.94	0.82	0.85	0.50	0.71	
NLD	0.71	0.91	0.92	0.86	0.87	0.69	0.61	0.89	4.88

RDC	r1r					
	AUS	CAN	DEU	DFS	NOR	NLD
AUS	5.18					
CAN	0.61	6.77				
DEU	0.49	0.86	12.19			
DFS	0.61	0.83	0.89	11.08		
NOR	0.34	0.76	0.89	0.92	12.70	
NLD	0.54	0.86	0.90	0.89	0.88	4.76

RDC	fan							
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	6.74							
CAN	0.55	6.67						
DEU	0.70	0.82	12.88					
DFS	0.68	0.41	0.74	10.85				
GBR	0.82	0.79	0.86	0.67	1.71			
NOR	0.36	0.45	0.69	0.58	0.58	13.18		
USA	0.71	0.84	0.85	0.56	0.86	0.51	0.83	
NLD	0.67	0.77	0.81	0.68	0.87	0.64	0.80	3.73

RDC	fua									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	
AUS	9.09									
CAN	0.73	6.00								
DEU	0.70	0.85	11.49							
DFS	0.70	0.81	0.84	12.90						
GBR	0.75	0.84	0.95	0.83	1.64					
NOR	0.68	0.82	0.70	0.92	0.74	11.64				
NZL	0.82	0.78	0.79	0.70	0.78	0.77	0.33			
USA	0.76	0.93	0.88	0.82	0.91	0.82	0.85	1.13		
NLD	0.75	0.91	0.94	0.91	0.92	0.86	0.84	0.88	3.92	

RDC	ruh									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	
AUS	8.57									
CAN	0.77	5.89								
DEU	0.72	0.86	10.99							
DFS	0.72	0.90	0.91	10.96						
GBR	0.86	0.78	0.86	0.85	1.46					
NOR	0.62	0.87	0.85	0.93	0.70	11.74				
NZL	0.84	0.76	0.81	0.76	0.93	0.65	0.31			
USA	0.79	0.87	0.90	0.89	0.90	0.81	0.84	1.05		
NLD	0.78	0.83	0.93	0.95	0.89	0.89	0.82	0.87	5.13	

RDC	usu									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	
AUS	8.02									
CAN	0.76	6.09								
DEU	0.71	0.86	12.02							
DFS	0.56	0.75	0.82	12.26						
GBR	0.82	0.83	0.76	0.65	1.94					
NOR	0.72	0.61	0.77	0.75	0.68	13.27				
NZL	0.75	0.66	0.54	0.39	0.67	0.62	0.30			
USA	0.80	0.85	0.79	0.74	0.87	0.76	0.70	1.00		
NLD	0.78	0.85	0.84	0.90	0.89	0.81	0.55	0.91	4.55	

RDC	ude								
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	
AUS	9.44								
CAN	0.92	5.53							
DEU	0.94	0.97	11.38						
DFS	0.91	0.97	0.98	10.91					
GBR	0.94	0.96	0.97	0.96	1.79				
NOR	0.78	0.81	0.88	0.89	0.83	10.80			
USA	0.94	0.97	0.97	0.96	0.97	0.85	1.09		
NLD	0.93	0.96	0.98	0.98	0.97	0.86	0.97	4.92	

RDC	ftp									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	
AUS	11.72									
CAN	0.87	5.16								
DEU	0.80	0.94	11.56							
DFS	0.79	0.96	0.89	12.77						
GBR	0.89	0.93	0.96	0.86	1.54					
NOR	0.71	0.85	0.69	0.93	0.69	12.33				
NZL	0.94	0.89	0.83	0.81	0.89	0.76	0.26			
USA	0.84	0.94	0.92	0.93	0.92	0.84	0.85	1.14		
NLD	0.89	0.98	0.96	0.95	0.95	0.80	0.88	0.92	3.88	

RDC	ftl								
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	
AUS	10.28								
CAN	0.89	5.07							
DEU	0.97	0.90	12.30						
DFS	0.96	0.79	0.97	10.62					
GBR	0.95	0.89	0.98	0.96	1.51				
NOR	0.96	0.85	0.95	0.95	0.92	10.93			
USA	0.94	0.90	0.96	0.94	0.97	0.91	1.12		
NLD	0.97	0.92	0.98	0.96	0.97	0.96	0.95	4.92	

RDC	rtp							
	AUS	CAN	DEU	DFS	NOR	NZL	NLD	
AUS	6.89							
CAN	0.83	5.91						
DEU	0.75	0.95	11.23					
DFS	0.74	0.97	0.97	12.36				
NOR	0.59	0.80	0.76	0.78	12.70			
NZL	0.89	0.94	0.90	0.91	0.76	0.34		
NLD	0.86	0.98	0.96	0.97	0.80	0.95	4.55	

RDC	ocs									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	
AUS	7.92									
CAN	0.63	5.93								
DEU	0.70	0.77	16.80							
DFS	0.52	0.73	0.70	10.36						
GBR	0.70	0.78	0.91	0.70	1.66					
NOR	0.30	0.30	0.51	0.67	0.35	15.81				
NZL	0.70	0.48	0.71	0.68	0.55	0.81	0.29			
USA	0.68	0.83	0.89	0.84	0.85	0.64	0.72	0.75		
NLD	0.63	0.79	0.90	0.86	0.90	0.62	0.67	0.89	3.26	

RDC	ous								
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.51								
CAN	0.70	5.94							
DEU	0.72	0.84	13.38						
DFS	0.47	0.80	0.78	11.50					
GBR	0.79	0.84	0.88	0.62	1.51				
NOR	0.53	0.84	0.60	0.76	0.64	10.51			
NZL	0.74	0.72	0.82	0.83	0.73	0.59	0.36		
USA	0.71	0.93	0.90	0.83	0.89	0.76	0.82	0.91	
NLD	0.74	0.86	0.92	0.78	0.89	0.78	0.80	0.91	4.67

RDC	of1								
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	
AUS	6.74								
CAN	0.16	6.40							
DEU	0.15	0.86	12.32						
DFS	-0.01	0.79	0.77	10.62					
GBR	0.28	0.71	0.77	0.51	1.59				
NOR	0.54	0.42	0.47	0.34	0.32	12.15			
USA	0.46	0.71	0.77	0.46	0.73	0.58	1.04		
NLD	0.31	0.72	0.76	0.57	0.78	0.75	0.73	6.33	

^LAPPENDIX II. Number of common bulls

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	32	103	78	19	13
CHE	76	0	127	360	50	227	419	41	13
FRA	53	94	0	133	44	79	133	33	11
ITA	69	310	103	0	64	153	429	58	13
NLD	25	45	35	47	0	45	59	21	7
USA	97	201	52	108	34	0	183	20	14
DEA	63	333	98	349	51	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	83	60	83	26	103	76	13	13
CHE	70	0	112	309	45	197	357	27	12
FRA	53	80	0	132	40	79	131	23	11
ITA	69	261	103	0	58	152	399	43	12
NLD	21	42	32	46	0	32	54	19	7
USA	97	172	52	108	25	0	165	14	14
DEA	62	276	97	317	49	125	0	42	8
SVN	11	26	21	42	16	11	39	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR
CAN	0	84	58	79	26	76	8	13
CHE	72	0	126	359	49	419	14	13
FRA	52	94	0	132	40	133	12	11
ITA	66	308	103	0	59	427	25	13
NLD	21	45	32	46	0	55	9	7
DEA	63	333	98	348	50	0	24	9
SVN	6	15	10	26	8	21	0	2
GBR	12	11	11	11	7	8	2	0

BSW

common bulls below diagonal
 common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	GBR
CAN	0	90	60	14	102	13
CHE	76	0	122	27	225	13
FRA	53	89	0	24	79	11
NLD	11	26	19	0	19	4
USA	96	201	52	14	0	14
GBR	12	11	11	4	13	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	32	103	78	19	13
CHE	76	0	127	360	50	227	419	41	13
FRA	53	94	0	133	44	79	133	33	11
ITA	69	310	103	0	64	153	429	58	13
NLD	25	45	35	47	0	45	59	21	7
USA	97	201	52	108	34	0	183	20	14
DEA	63	333	98	349	51	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	GBR
CAN	0	91	60	32	103	78	13
CHE	76	0	126	49	226	414	13
FRA	53	93	0	44	79	133	11
NLD	25	44	35	0	45	59	7
USA	97	201	52	34	0	183	14
DEA	63	332	97	51	150	0	9
GBR	12	11	11	7	13	8	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	32	103	78	19	13
CHE	76	0	127	360	50	227	419	41	13
FRA	53	94	0	133	44	79	133	33	11
ITA	69	310	103	0	64	153	429	58	13
NLD	25	45	35	47	0	45	59	21	7
USA	97	201	52	108	34	0	183	20	14
DEA	63	333	98	349	51	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	25	103	78	19	13
CHE	76	0	127	360	48	227	419	41	13
FRA	53	94	0	133	40	79	133	33	11
ITA	69	310	103	0	58	153	429	58	13
NLD	20	44	32	45	0	31	54	21	7
USA	97	201	52	108	23	0	183	20	14
DEA	63	333	98	349	49	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN
CAN	0	82	57	76	25	76	18
CHE	70	0	125	351	48	419	39
FRA	51	93	0	129	40	133	31
ITA	65	302	103	0	57	422	55
NLD	20	44	32	45	0	54	19
DEA	63	333	98	345	49	0	54
SVN	17	40	30	55	16	51	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	83	25	103	44	14	13
CHE	76	0	127	355	49	227	221	28	13
FRA	53	94	0	132	40	79	80	22	11
ITA	69	307	103	0	57	150	191	39	12
NLD	20	45	32	46	0	31	41	11	7
USA	97	201	52	108	24	0	86	14	14
DEA	36	164	52	160	38	60	0	19	6
SVN	12	30	21	41	10	11	16	0	2
GBR	12	11	11	11	7	13	6	2	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	26	103	78	19	13
CHE	76	0	127	360	49	227	419	41	13
FRA	53	94	0	133	40	79	133	33	11
ITA	69	310	103	0	59	153	429	58	13
NLD	21	45	32	46	0	32	55	21	7
USA	97	201	52	108	25	0	183	20	14
DEA	63	333	98	349	50	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	0	91	60	84	26	103	78	19
CHE	76	0	127	360	49	227	419	41
FRA	53	94	0	133	40	79	133	33
ITA	69	310	103	0	59	153	429	58
NLD	21	45	32	46	0	32	55	21
USA	97	201	52	108	25	0	183	20
DEA	63	333	98	349	50	150	0	56
SVN	17	42	32	58	18	16	53	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	32	103	78	7	13
CHE	76	0	127	360	50	227	419	15	13
FRA	53	94	0	133	44	79	133	12	11
ITA	69	310	103	0	64	153	429	26	13
NLD	25	45	35	47	0	45	59	11	7
USA	97	201	52	108	34	0	183	7	14
DEA	63	333	98	349	51	150	0	26	9
SVN	6	14	12	24	9	6	23	0	4
GBR	12	11	11	11	7	13	8	3	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	32	101	78	19	13
CHE	76	0	127	360	50	227	419	41	13
FRA	53	94	0	133	44	79	133	33	11
ITA	69	310	103	0	64	153	429	58	13
NLD	25	45	35	47	0	45	59	21	7
USA	96	201	52	108	34	0	183	20	14
DEA	63	333	98	349	51	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	32	103	67	13	13
CHE	76	0	126	49	226	383	27	13
FRA	53	93	0	44	79	123	23	11
NLD	25	44	35	0	45	54	19	7
USA	97	201	52	34	0	158	13	14
DEA	55	301	89	49	122	0	42	8
SVN	11	27	21	16	11	39	0	5
GBR	12	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	91	60	84	32	103	78	19	13
CHE	76	0	127	360	50	227	419	41	13
FRA	53	94	0	133	44	79	133	33	11
ITA	69	310	103	0	64	153	429	58	13
NLD	25	45	35	47	0	45	59	21	7
USA	97	201	52	108	34	0	183	20	14
DEA	63	333	98	349	51	150	0	56	9
SVN	17	42	32	58	18	16	53	0	5
GBR	12	11	11	11	7	13	8	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN
CAN	0	82	57	76	21	43	13
CHE	70	0	125	345	45	221	27
FRA	51	93	0	129	37	80	23
ITA	65	298	103	0	53	190	43
NLD	17	43	30	44	0	41	18
DEA	36	164	52	160	38	0	34
SVN	11	27	21	42	16	30	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	83	49	83	32	103	44	7	13
CHE	70	0	89	307	44	197	217	14	12
FRA	46	67	0	99	33	63	70	11	10
ITA	69	259	81	0	62	150	191	25	12
NLD	25	42	29	47	0	45	41	10	7
USA	97	172	44	108	34	0	86	7	14
DEA	36	160	50	160	38	60	0	22	6
SVN	6	13	11	23	8	6	20	0	4
GBR	12	11	10	11	7	13	6	3	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	83	49	84	32	102	78	7	13
CHE	70	0	90	309	45	197	368	15	12
FRA	46	67	0	99	33	63	101	12	10
ITA	69	261	81	0	64	153	423	26	13
NLD	25	42	29	47	0	45	59	11	7
USA	96	172	44	108	34	0	181	7	14
DEA	62	287	76	346	51	146	0	26	9
SVN	6	14	12	24	9	6	23	0	4
GBR	12	11	10	11	7	13	8	3	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	83	49	82	32	103	78	7	13
CHE	70	0	90	306	45	197	368	15	12
FRA	46	67	0	98	33	63	101	12	10
ITA	69	260	81	0	61	149	419	26	12
NLD	25	42	29	47	0	45	59	11	7
USA	97	172	44	105	34	0	181	7	14
DEA	62	287	76	343	51	146	0	26	9
SVN	6	14	12	24	9	6	23	0	4
GBR	12	11	10	11	7	13	8	3	0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 26 7
USA 24 0 7
AUS 5 6 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 52 20
GBR 17 0 59 11
USA 42 59 0 25
AUS 18 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

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

CAN 0 20 54 21
GBR 17 0 59 11
USA 43 59 0 25
AUS 19 8 20 0

GUE

common bulls below diagonal
common three quarter sib group above diagonal
CAN AUS

CAN 0 6
AUS 5 0

GUE

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

CAN 0 12 54 21
GBR 9 0 33 10
USA 43 31 0 25
AUS 19 7 20 0

GUE

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

CAN 0 18 52 20
GBR 15 0 57 11
USA 42 57 0 25
AUS 18 8 20 0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	18	54	21
GBR	15	0	57	11
USA	43	57	0	25
AUS	19	8	20	0

HOL

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	291	618	240	682	570	425	604	632	611	665	790	147	325	358	415	250	392	396	42	7	312	194	80	400
BEL	206	0	348	224	534	401	335	457	424	454	637	444	187	238	302	191	174	237	315	32	32	255	133	84	373
CAN	461	298	0	401	1544	821	899	924	1032	1195	864	2036	277	570	634	294	322	865	730	68	12	324	412	100	669
CHE	181	205	265	0	442	319	303	308	349	358	357	416	263	215	227	162	154	223	261	19	7	215	133	55	284
DEU	249	367	390	253	0	1891	1048	1771	1367	1997	2050	2342	402	750	1094	406	353	1004	1289	105	112	479	354	158	828
DFS	278	314	455	253	594	0	692	1179	1033	1206	1306	1321	201	552	776	383	331	613	864	78	40	441	295	137	697
ESP	267	301	449	239	432	433	0	772	776	957	754	1086	176	487	560	255	310	605	617	60	13	319	291	105	641
FRA	276	393	420	255	484	382	456	0	1113	1420	1411	1871	170	575	884	421	309	863	886	72	14	430	308	103	656
GBR	424	382	928	331	558	610	603	512	0	1221	1219	1463	220	564	702	398	342	658	758	71	19	556	325	128	720
ITA	332	368	678	284	842	699	641	514	845	0	1347	2034	260	692	890	399	356	856	1002	81	28	435	402	145	843
NLD	447	647	635	331	942	797	594	572	904	911	0	1700	363	580	866	508	336	681	997	103	80	531	297	143	808
USA	516	331	1659	319	672	650	613	711	1117	1061	1173	0	334	793	981	466	411	1350	1142	104	21	430	539	129	894
CHR	111	168	224	272	253	163	127	145	196	215	318	298	0	116	164	94	82	112	176	11	35	134	75	46	178
HUN	189	192	456	160	418	360	365	307	434	521	415	656	94	0	465	220	251	418	612	56	4	263	264	79	466
POL	170	217	362	144	479	415	331	338	437	542	559	631	125	332	0	238	233	482	714	81	47	295	281	112	589
NZL	289	134	231	132	194	218	197	178	288	267	432	370	74	167	125	0	188	249	266	25	4	276	122	52	281
ZAF	213	149	292	139	229	255	282	207	312	298	295	428	70	216	164	166	0	254	252	29	5	202	183	60	302
JPN	138	109	204	99	149	172	167	145	193	201	175	253	64	158	123	90	144	0	551	51	1	245	319	78	443
CZE	194	215	425	172	699	433	400	450	477	621	753	739	120	518	443	160	189	130	0	68	22	312	307	116	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	22	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	12	19
IRL	255	242	299	211	310	334	303	311	601	374	472	386	122	220	204	223	194	114	231	18	9	0	141	68	343
KOR	114	72	350	80	150	169	194	128	227	309	174	580	49	209	182	78	143	120	214	11	0	90	0	54	304
SVN	49	68	69	35	117	107	77	62	97	123	118	94	35	58	88	34	43	30	90	17	11	53	26	0	104
PRT	260	364	651	252	569	586	653	557	675	817	817	855	157	438	536	209	289	167	491	39	18	314	246	90	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal																			
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT	
AUS	0	285	618	240	680	569	439	474	632	611	612	790	147	325	356	415	202	392	396	42	7	312	193	66	400
BEL	206	0	343	223	517	396	342	411	418	450	590	430	186	236	299	188	155	231	314	32	30	254	132	74	370
CAN	461	298	0	401	1537	821	907	751	1032	1195	789	2036	277	570	633	294	270	865	730	68	10	324	407	84	669
CHE	181	205	265	0	441	319	307	280	349	358	350	416	263	215	226	162	133	223	261	19	6	215	132	45	284
DEU	249	364	389	253	0	1878	1081	1502	1362	1995	1838	2336	402	750	1089	406	293	999	1289	104	93	478	348	136	828
DFS	278	314	455	253	594	0	717	1001	1031	1204	1220	1320	201	551	772	382	278	613	864	78	34	439	293	117	696
ESP	277	318	456	245	481	460	0	702	800	990	748	1110	177	497	579	267	266	615	631	63	11	335	291	96	675
FRA	238	369	362	228	377	357	457	0	958	1259	1100	1431	160	523	816	329	222	698	835	67	12	374	268	83	583
GBR	424	382	928	331	558	610	636	462	0	1221	1155	1462	220	564	700	398	283	658	758	71	17	554	324	109	719
ITA	332	368	678	284	842	699	694	451	845	0	1287	2034	260	692	890	399	307	856	1002	81	28	435	398	126	843
NLD	419	598	578	322	853	771	600	459	851	866	0	1462	340	559	843	481	272	612	978	100	65	518	278	122	777
USA	516	331	1659	319	668	649	634	511	1117	1061	931	0	334	793	979	466	340	1350	1142	104	19	428	533	108	894
CHR	111	167	224	272	253	163	130	142	196	215	303	298	0	116	164	94	75	112	176	11	30	134	75	41	178
HUN	189	192	456	160	418	360	375	292	434	521	398	656	94	0	464	220	223	418	612	56	4	263	261	68	466
POL	170	217	362	144	479	415	350	323	436	542	548	631	125	332	0	238	208	481	714	81	46	295	278	100	588
NZL	289	134	231	132	194	218	206	149	288	267	411	370	74	167	125	0	152	249	266	25	3	276	121	39	281
ZAF	182	139	253	125	202	232	246	169	266	268	239	349	67	199	158	133	0	206	230	28	5	165	163	45	264
JPN	138	109	204	99	149	172	170	140	193	201	173	253	64	158	123	90	138	0	551	51	1	245	317	67	443
CZE	194	215	425	172	699	433	419	419	477	621	735	739	120	518	443	160	177	130	0	68	22	312	306	104	577
EST	14	23	26	8	47	35	27	21	29	36	60	62	7	31	43	10	14	10	33	0	0	39	30	21	62
FRR	6	28	8	6	73	28	8	12	14	25	47	13	26	4	46	3	4	1	20	0	0	10	1	10	18
IRL	255	242	299	211	310	334	325	284	600	374	458	386	122	220	204	223	166	114	231	18	9	0	139	57	343
KOR	114	72	349	80	150	169	195	121	227	308	164	573	49	208	181	78	129	120	213	11	0	90	0	49	302
SVN	39	60	58	29	103	89	71	55	83	106	99	81	31	51	77	26	34	28	79	15	9	43	24	0	89
PRT	260	364	651	252	569	586	708	524	675	817	785	855	157	438	536	209	264	167	491	39	17	314	245	74	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal																		
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	PRT	
AUS	0	290	610	239	676	564	419	596	626	610	640	782	147	325	356	409	250	391	395	42	7	310	193	397
BEL	206	0	348	224	534	400	337	457	424	454	616	444	187	238	302	191	174	237	315	32	32	255	132	373
CAN	460	298	0	401	1544	821	900	924	1032	1195	833	2036	277	570	634	294	322	865	730	68	12	324	408	669
CHE	181	205	265	0	442	319	304	308	349	358	353	416	263	215	227	162	154	223	261	19	7	215	132	284
DEU	249	367	390	253	0	1890	1052	1771	1366	1997	1926	2342	402	750	1094	406	353	1004	1289	105	112	478	350	828
DFS	278	314	455	253	594	0	695	1178	1032	1205	1261	1320	201	551	775	382	331	613	864	78	40	440	293	696
ESP	268	303	449	240	436	436	0	774	779	962	744	1088	176	489	563	255	310	607	617	60	13	321	289	645
FRA	276	393	420	255	484	382	459	0	1113	1420	1298	1871	170	575	884	421	309	863	886	72	14	430	305	656
GBR	423	382	928	331	558	610	606	512	0	1221	1193	1463	220	564	702	398	342	658	758	71	19	555	324	720
ITA	332	368	678	284	842	699	646	514	845	0	1324	2034	260	692	890	399	356	856	1002	81	28	435	399	843
NLD	444	623	628	331	902	796	596	549	893	907	0	1573	353	571	857	495	327	648	992	102	77	525	290	798
USA	514	331	1659	319	672	649	615	711	1117	1061	1136	0	334	793	981	466	411	1350	1142	104	21	429	534	894
CHR	111	168	224	272	253	163	127	145	196	215	314	298	0	116	164	94	82	112	176	11	35	134	75	178
HUN	189	192	456	160	418	360	367	307	434	521	415	656	94	0	465	220	251	418	612	56	4	263	262	466
POL	170	217	362	144	479	415	333	338	437	542	558	631	125	332	0	238	233	482	714	81	47	295	278	589
NZL	288	134	231	132	194	218	198	178	288	267	430	370	74	167	125	0	188	249	266	25	4	276	121	281
ZAF	213	149	292	139	229	255	282	207	312	298	293	428	70	216	164	166	0	254	252	29	5	202	182	302
JPN	138	109	204	99	149	172	168	145	193	201	175	253	64	158	123	90	144	0	551	51	1	245	318	443
CZE	194	215	425	172	699	433	400	450	477	621	752	739	120	518	443	160	189	130	0	68	22	312	306	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	19
IRL	255	242	299	211	310	334	305	311	600	374	469	386	122	220	204	223	194	114	231	18	9	0	140	343
KOR	114	72	349	80	150	169	194	128	227	308	171	574	49	209	181	78	143	120	213	11	0	90	0	303
PRT	260	364	651	252	569	586	658	557	675	817	810	855	157	438	536	209	289	167	491	39	18	314	246	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal																
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	PRT	
AUS	0	279	618	240	681	568	436	474	631	611	446	789	325	355	249	392	395	41	7	310	193	400
BEL	206	0	337	220	508	390	334	408	410	442	480	421	230	294	168	226	307	32	31	249	127	364
CAN	461	296	0	399	1540	818	905	751	1031	1194	623	2036	570	633	321	865	730	67	12	323	408	669
CHE	181	205	265	0	440	319	306	280	348	357	315	415	215	226	153	223	260	19	7	214	132	283
DEU	249	363	390	253	0	1873	1071	1501	1359	1993	1253	2340	748	1086	352	1002	1285	104	112	476	350	827
DFS	278	314	455	253	594	0	708	997	1024	1198	871	1314	548	765	330	611	858	77	40	438	293	694
ESP	274	313	454	245	466	452	0	695	793	981	597	1104	494	570	315	613	624	61	13	331	292	667
FRA	238	369	362	228	377	357	444	0	957	1259	748	1430	522	815	252	698	835	65	12	373	269	583
GBR	424	380	928	331	557	610	630	462	0	1220	813	1458	561	693	339	657	753	69	19	548	324	718
ITA	332	366	678	284	841	699	679	451	844	0	938	2032	691	887	354	856	999	80	27	433	398	843
NLD	301	478	508	294	672	674	508	412	696	740	0	994	442	669	270	440	779	82	53	398	229	616
USA	516	327	1659	319	671	649	630	511	1117	1061	786	0	792	978	409	1350	1138	104	21	426	532	894
HUN	189	191	456	160	418	360	373	292	434	521	335	656	0	463	251	418	610	56	4	261	261	465
POL	170	217	362	144	479	415	344	323	434	541	473	630	332	0	231	481	709	80	47	292	278	587
ZAF	213	149	292	139	229	255	286	177	312	298	240	427	216	164	0	254	249	28	5	200	182	301
JPN	138	109	204	99	149	172	170	140	193	201	160	253	158	123	144	0	551	51	1	244	318	443
CZE	194	215	425	172	699	433	414	419	476	621	654	738	518	442	189	130	0	65	22	309	306	575
EST	14	23	26	8	47	35	26	21	29	36	52	62	31	43	14	10	32	0	0	37	30	61
FRR	6	29	8	6	90	30	8	12	15	25	46	13	4	46	4	1	20	0	0	10	1	19
IRL	255	242	299	211	309	334	320	284	594	374	392	386	220	203	194	114	231	18	9	0	139	342
KOR	114	72	349	80	150	169	195	121	227	308	141	572	208	181	143	120	213	11	0	90	0	302
PRT	260	363	651	252	569	586	693	524	675	817	622	855	438	536	289	167	491	39	18	314	245	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal																			
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT	
AUS	0	291	618	240	682	570	425	604	632	611	665	790	147	325	358	415	250	392	396	42	7	312	194	80	400
BEL	206	0	348	224	534	401	334	457	424	454	637	444	187	238	302	191	174	237	315	32	32	255	133	84	373
CAN	461	298	0	401	1544	821	897	924	1032	1195	864	2036	277	570	634	294	322	865	730	68	12	324	412	100	669
CHE	181	205	265	0	442	319	302	308	349	358	357	416	263	215	227	162	154	223	261	19	7	215	133	55	284
DEU	249	367	390	253	0	1891	1045	1771	1367	1997	2050	2342	402	750	1094	406	353	1004	1289	105	112	479	354	158	828
DFS	278	314	455	253	594	0	689	1179	1033	1206	1306	1321	201	552	776	383	331	613	864	78	40	441	295	137	697
ESP	267	299	446	239	428	429	0	770	772	953	752	1084	176	485	558	255	310	603	614	60	13	319	290	105	639
FRA	276	393	420	255	484	382	453	0	1113	1420	1411	1871	170	575	884	421	309	863	886	72	14	430	308	103	656
GBR	424	382	928	331	558	610	598	512	0	1221	1219	1463	220	564	702	398	342	658	758	71	19	556	325	128	720
ITA	332	366	678	284	842	699	636	514	845	0	1347	2034	260	692	890	399	356	856	1002	81	28	435	402	145	843
NLD	447	647	635	331	942	797	590	572	904	911	0	1700	363	580	866	508	336	681	997	103	80	531	297	143	808
USA	516	331	1659	319	672	649	610	711	1117	1061	1173	0	334	793	981	466	411	1350	1142	104	21	430	539	129	894
CHR	111	168	224	272	253	163	127	145	196	215	318	298	0	116	164	94	82	112	176	11	35	134	75	46	178
HUN	189	192	456	160	418	360	364	307	434	521	415	656	94	0	465	220	251	418	612	56	4	263	264	79	466
POL	170	217	362	144	479	415	328	338	437	542	559	631	125	332	0	238	233	482	714	81	47	295	281	112	589
NZL	289	134	231	132	194	218	197	178	288	267	432	370	74	167	125	0	188	249	266	25	4	276	122	52	281
ZAF	213	149	292	139	229	255	281	207	312	298	295	428	70	216	164	166	0	254	252	29	5	202	183	60	302
JPN	138	109	204	99	149	172	165	145	193	201	175	253	64	158	123	90	144	0	551	51	1	245	319	78	443
CZE	194	215	425	172	699	433	399	450	477	621	753	739	120	518	443	160	189	130	0	68	22	312	307	116	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	22	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	12	19
IRL	255	242	299	211	310	334	302	311	601	374	472	386	122	220	204	223	194	114	231	18	9	0	141	68	343
KOR	114	72	350	80	150	169	193	128	227	309	174	580	49	209	182	78	143	120	214	11	0	90	0	54	304
SVN	49	68	69	35	117	107	77	62	97	123	118	94	35	58	88	34	43	30	90	17	11	53	26	0	104
PRT	260	364	651	252	569	586	649	557	675	817	817	855	157	438	536	209	289	167	491	39	18	314	246	90	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	PRT
AUS	0	266	618	240	682	570	425	604	632	611	663	790	147	325	358	415	250	202	396	42	7	312	192	400
BEL	205	0	331	219	494	380	317	419	401	430	557	402	184	222	288	176	161	147	299	32	30	245	123	353
CAN	461	293	0	401	1544	821	898	924	1032	1195	861	2036	277	570	634	294	322	564	730	68	12	324	409	669
CHE	181	205	265	0	442	319	303	308	349	358	355	416	263	215	227	162	154	156	261	19	7	215	131	284
DEU	249	360	390	253	0	1891	1048	1771	1367	1997	2035	2342	402	750	1094	406	353	656	1289	105	112	479	350	828
DFS	278	312	455	253	594	0	691	1179	1033	1206	1298	1321	201	552	776	383	331	386	864	78	40	441	292	697
ESP	267	298	447	239	431	431	0	771	775	955	751	1085	176	486	560	255	310	428	615	60	13	319	287	641
FRA	276	388	420	255	484	382	454	0	1113	1420	1399	1871	170	575	884	421	309	530	886	72	14	430	305	656
GBR	424	376	928	331	558	610	601	512	0	1221	1217	1463	220	564	702	398	342	421	758	71	19	556	323	720
ITA	332	363	678	284	842	699	639	514	845	0	1345	2034	260	692	890	399	356	607	1002	81	28	435	399	843
NLD	447	566	635	331	941	797	592	572	903	911	0	1693	363	580	865	507	336	437	997	102	80	530	292	807
USA	516	321	1659	319	672	649	611	711	1117	1061	1170	0	334	793	981	466	411	833	1142	104	21	430	534	894
CHR	111	166	224	272	253	163	127	145	196	215	318	298	0	116	164	94	82	89	176	11	35	134	74	178
HUN	189	189	456	160	418	360	364	307	434	521	415	656	94	0	465	220	251	300	612	56	4	263	262	466
POL	170	215	362	144	479	415	330	338	437	542	559	631	125	332	0	238	233	381	714	81	47	295	279	589
NZL	289	131	231	132	194	218	197	178	288	267	432	370	74	167	125	0	188	136	266	25	4	276	120	281
ZAF	213	146	292	139	229	255	281	207	312	298	295	428	70	216	164	166	0	155	252	29	5	202	181	302
JPN	106	85	167	84	123	144	129	120	154	170	139	203	61	129	114	69	104	0	411	39	1	161	231	288
CZE	194	214	425	172	699	433	399	450	477	621	753	739	120	518	443	160	189	114	0	68	22	312	306	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	19
IRL	255	239	299	211	310	334	302	311	601	374	472	386	122	220	204	223	194	93	231	18	9	0	139	343
KOR	114	72	350	80	150	169	193	128	227	309	174	576	49	209	182	78	143	106	214	11	0	90	0	302
PRT	260	357	651	252	569	586	652	557	675	817	816	855	157	438	536	209	289	132	491	39	18	314	246	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	291	618	240	682	570	434	604	632	611	665	790	147	325	358	415	250	392	396	42	7	312	193	80	400
BEL	206	0	348	224	534	401	341	457	424	454	637	444	187	238	302	191	174	237	315	32	32	255	132	84	373
CAN	461	298	0	401	1544	821	904	924	1032	1195	864	2036	277	570	634	294	322	865	730	68	12	324	404	100	669
CHE	181	205	265	0	442	319	306	308	349	358	357	416	263	215	227	162	154	223	261	19	7	215	132	55	284
DEU	249	367	390	253	0	1891	1066	1771	1367	1997	2050	2342	402	750	1094	406	353	1004	1289	105	112	479	348	158	828
DFS	277	314	454	253	593	0	706	1179	1033	1206	1306	1321	201	552	776	383	331	613	864	78	40	441	292	137	697
ESP	272	310	452	243	455	446	0	788	792	977	773	1101	177	493	571	264	314	611	625	61	13	329	288	106	659
FRA	276	393	420	255	484	381	478	0	1113	1420	1411	1871	170	575	884	421	309	863	886	72	14	430	301	103	656
GBR	424	382	928	331	558	609	622	512	0	1221	1219	1463	220	564	702	398	342	658	758	71	19	556	322	128	720
ITA	332	368	678	284	842	698	668	514	845	0	1347	2034	260	692	890	399	356	856	1002	81	28	435	396	145	843
NLD	447	647	635	331	942	796	615	572	904	911	0	1700	363	580	866	508	336	681	997	103	80	531	292	143	808
USA	516	331	1659	319	672	649	626	711	1117	1061	1173	0	334	793	981	466	411	1350	1142	104	21	430	530	129	894
CHR	111	168	224	272	253	163	129	145	196	215	318	298	0	116	164	94	82	112	176	11	35	134	75	46	178
HUN	189	192	456	160	418	360	370	307	434	521	415	656	94	0	465	220	251	418	612	56	4	263	261	79	466
POL	170	217	362	144	479	415	338	338	437	542	559	631	125	332	0	238	233	482	714	81	47	295	277	112	589
NZL	289	134	231	132	194	218	202	178	288	267	432	370	74	167	125	0	188	249	266	25	4	276	121	52	281
ZAF	213	149	292	139	229	255	285	207	312	298	295	428	70	216	164	166	0	254	252	29	5	202	182	60	302
JPN	138	109	204	99	149	172	169	145	193	201	175	253	64	158	123	90	144	0	551	51	1	245	316	78	443
CZE	194	215	425	172	699	433	408	450	477	621	753	739	120	518	443	160	189	130	0	68	22	312	306	116	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	22	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	12	19
IRL	255	242	299	211	310	333	315	311	601	374	472	386	122	220	204	223	194	114	231	18	9	0	139	68	343
KOR	114	72	348	80	150	169	193	127	226	306	172	571	49	208	180	78	143	119	212	11	0	89	0	54	300
SVN	49	68	69	35	117	107	79	62	97	123	118	94	35	58	88	34	43	30	90	17	11	53	26	0	104
PRT	260	364	651	252	569	586	681	557	675	817	817	855	157	438	536	209	289	167	491	39	18	314	245	90	0

HOL

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	229	435	207	486	427	340	309	488	457	461	516	136	258	268	180	268	249	35	7	262	106	62	324
BEL	195	0	311	215	467	364	313	331	384	413	520	382	181	219	265	143	200	238	31	28	232	84	71	342
CAN	350	288	0	381	1342	728	835	599	937	1133	724	1842	261	549	583	258	741	595	63	10	296	304	80	628
CHE	170	201	262	0	431	318	306	238	349	357	345	416	263	215	207	133	217	200	19	6	208	90	45	278
DEU	221	342	373	249	0	1693	1027	1206	1293	1945	1729	2166	381	736	1005	284	889	1029	103	91	441	252	130	791
DFS	264	306	451	253	581	0	702	781	1027	1196	1179	1319	201	548	723	278	568	672	78	35	415	209	115	685
ESP	251	305	441	245	461	452	0	575	787	979	717	1098	176	494	540	266	577	517	62	12	316	210	94	656
FRA	178	295	290	192	301	296	376	0	742	1015	879	1084	141	440	715	179	546	649	55	8	291	188	73	475
GBR	371	365	855	331	541	607	630	357	0	1217	1104	1455	220	563	657	283	610	603	70	17	512	237	106	708
ITA	300	356	667	284	835	697	685	376	841	0	1248	2026	260	691	853	306	812	837	81	28	415	305	123	835
NLD	357	526	558	319	798	763	580	385	826	853	0	1368	336	543	793	267	577	825	99	68	469	208	119	755
USA	398	317	1546	319	615	648	629	376	1116	1059	900	0	334	792	930	340	1221	933	104	19	402	401	105	883
CHR	109	165	210	272	244	163	130	132	196	215	300	298	0	116	161	75	110	147	11	31	131	58	38	178
HUN	179	186	450	160	412	360	373	247	434	521	401	656	94	0	439	223	403	496	56	4	252	207	67	463
POL	155	204	341	133	442	391	317	285	415	527	524	601	123	315	0	192	448	610	79	47	259	230	97	550
ZAF	176	136	250	125	200	232	246	133	266	268	237	349	67	199	148	0	198	187	28	5	161	116	44	262
JPN	132	108	201	99	147	170	166	122	191	198	170	249	64	156	117	138	0	441	49	1	217	231	64	418
CZE	142	170	347	127	557	353	312	303	365	510	640	587	106	409	387	138	116	0	59	21	234	236	94	466
EST	14	23	26	8	46	35	26	17	29	36	60	62	7	31	42	14	10	27	0	0	37	25	21	61
FRR	6	27	8	6	72	29	8	8	14	25	48	13	26	4	46	4	1	19	0	0	10	1	8	18
IRL	236	233	296	210	300	331	319	224	568	370	442	380	122	218	190	165	113	176	18	9	0	85	56	329
KOR	61	53	263	59	110	127	130	102	154	235	118	422	41	160	160	85	91	170	9	0	56	0	39	226
SVN	39	58	57	29	101	89	69	49	82	104	98	80	30	50	76	34	28	75	15	8	43	22	0	89
PRT	242	349	615	246	546	574	683	453	662	808	766	838	157	434	506	262	163	387	38	17	307	184	74	0

HOL

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	264	610	161	331	563	429	595	626	609	630	782	146	324	355	250	391	393	41	7	309	193	78	397
BEL	205	0	329	162	334	378	324	416	400	426	551	401	181	222	287	161	216	298	32	30	244	124	82	353
CAN	460	293	0	301	953	820	905	909	1032	1192	817	2036	275	568	630	322	865	724	67	12	324	408	98	669
CHE	136	153	196	0	266	220	219	212	245	268	252	302	236	155	163	94	150	184	14	5	145	101	42	196
DEU	161	257	279	163	0	968	721	957	788	1325	1118	1320	268	483	748	184	567	851	74	40	273	227	109	494
DFS	277	312	454	184	406	0	711	1149	1029	1198	1246	1317	199	547	771	331	613	853	77	40	440	293	136	695
ESP	274	311	454	160	300	451	0	781	795	980	753	1105	176	493	572	315	613	624	61	13	332	292	106	667
FRA	276	388	420	168	269	380	486	0	1098	1404	1255	1832	169	571	874	308	850	875	71	13	424	300	101	653
GBR	423	376	928	224	356	608	630	512	0	1219	1175	1461	218	562	696	341	658	750	70	19	551	324	127	719
ITA	332	361	678	204	552	697	679	513	844	0	1299	2032	255	688	881	355	854	995	79	27	433	398	144	842
NLD	440	565	622	230	534	792	616	535	884	900	0	1528	348	563	842	325	640	980	101	73	518	287	138	790
USA	514	321	1659	225	388	648	630	676	1117	1061	1120	0	332	791	974	411	1350	1137	104	20	428	531	127	894
CHR	111	166	224	247	182	163	130	145	196	214	312	298	0	114	160	81	110	172	11	35	133	74	45	177
HUN	189	189	456	115	277	358	373	307	434	520	413	656	94	0	462	250	418	609	55	4	262	261	78	465
POL	170	215	362	113	360	413	344	338	435	539	551	631	124	331	0	232	480	706	79	46	292	277	110	586
ZAF	213	146	292	85	131	255	286	207	312	298	289	428	70	216	164	0	254	250	29	5	202	182	59	302
JPN	138	109	204	83	111	172	170	145	193	201	174	253	64	158	123	144	0	549	51	1	245	318	77	443
CZE	194	213	425	121	485	432	414	450	475	617	750	739	119	517	441	189	130	0	66	22	310	306	115	574
EST	14	23	26	6	32	35	26	21	28	36	61	62	7	31	42	14	10	32	0	0	38	30	22	62
FRR	6	29	8	5	31	30	8	12	15	25	49	13	26	4	46	4	1	20	0	0	10	1	12	19
IRL	255	239	299	143	199	333	320	311	596	374	468	386	122	220	204	194	114	231	18	9	0	139	67	343
KOR	114	72	349	67	111	169	193	127	227	306	169	566	49	208	181	143	120	213	11	0	90	0	54	301
SVN	49	66	69	29	96	106	80	62	97	122	117	94	35	58	87	43	30	90	17	11	53	26	0	103
PRT	260	357	651	169	389	586	693	557	675	817	805	855	157	438	536	289	167	491	39	18	314	244	90	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	285	618	240	678	561	436	558	632	611	612	790	147	325	357	415	250	392	396	42	7	312	193	80	400
BEL	206	0	344	224	516	392	340	438	419	451	591	431	186	236	300	188	173	231	314	32	32	254	132	84	371
CAN	461	298	0	401	1537	798	905	845	1032	1195	789	2036	277	570	634	294	322	865	730	68	12	324	409	100	669
CHE	181	205	265	0	442	316	307	303	349	358	350	416	263	215	227	162	154	223	261	19	7	215	132	55	284
DEU	249	364	389	253	0	1856	1072	1647	1361	1994	1836	2331	399	750	1090	405	352	999	1288	105	112	478	350	157	827
DFS	265	309	418	249	582	0	696	1092	1013	1183	1205	1289	197	543	769	378	325	602	853	78	40	438	288	137	687
ESP	274	313	454	245	467	437	0	754	796	984	742	1105	177	495	575	265	315	613	628	62	13	332	293	107	668
FRA	275	391	417	255	475	369	487	0	1056	1365	1210	1670	165	561	871	387	294	785	874	69	13	412	288	97	637
GBR	424	382	928	331	558	581	630	507	0	1221	1156	1463	220	564	702	398	342	658	758	71	19	555	324	128	720
ITA	332	368	678	284	842	670	681	509	845	0	1287	2034	260	692	890	399	356	856	1002	81	28	435	401	145	843
NLD	419	598	579	322	852	745	591	520	852	867	0	1464	340	559	844	481	317	612	978	100	71	518	279	138	778
USA	516	331	1659	319	665	598	630	640	1117	1061	931	0	334	793	981	466	411	1350	1142	104	21	429	536	129	894
CHR	111	167	224	272	252	158	130	145	196	215	303	298	0	116	164	94	82	112	176	11	35	134	75	46	178
HUN	189	192	456	160	418	349	373	306	434	521	398	656	94	0	465	220	251	418	612	56	4	263	263	79	466
POL	170	217	362	144	477	405	345	338	437	542	550	631	125	332	0	238	233	482	714	81	47	295	280	112	589
NZL	289	134	231	132	194	213	204	176	288	267	411	370	74	167	125	0	188	249	266	25	4	276	121	52	281
ZAF	213	149	292	139	229	244	286	205	312	298	275	428	70	216	164	166	0	254	252	29	5	202	182	60	302
JPN	138	109	204	99	149	167	170	145	193	201	173	253	64	158	123	90	144	0	551	51	1	245	318	78	443
CZE	194	215	425	172	699	420	414	448	477	621	735	739	120	518	443	160	189	130	0	68	22	312	307	116	577
EST	14	23	26	8	47	35	26	21	29	36	60	62	7	31	43	10	14	10	33	0	0	39	30	22	62
FRR	6	29	8	6	90	30	8	12	15	25	49	13	26	4	46	4	4	1	20	0	0	10	1	12	19
IRL	255	242	299	211	310	328	320	309	600	374	457	386	122	220	204	223	194	114	231	18	9	0	140	68	343
KOR	114	72	349	80	150	164	195	127	227	309	164	575	49	209	182	78	143	120	214	11	0	90	0	54	303
SVN	49	68	69	35	117	107	80	62	97	123	113	94	35	58	88	34	43	30	90	17	11	53	26	0	104
PRT	260	364	651	252	569	571	695	554	675	817	785	855	157	438	536	209	289	167	491	39	18	314	246	90	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	285	618	240	681	476	432	601	632	611	642	790	147	325	358	415	249	392	396	42	7	306	193	80	400
BEL	206	0	344	224	518	367	339	446	419	451	603	431	186	236	300	188	172	231	314	32	32	251	132	84	371
CAN	461	298	0	401	1544	681	903	909	1032	1195	833	2036	277	570	634	294	322	865	730	68	12	313	411	100	669
CHE	181	205	265	0	442	291	305	306	349	358	353	416	263	215	227	162	153	223	261	19	7	207	132	55	284
DEU	249	364	390	253	0	1512	1061	1735	1365	1996	1925	2340	402	750	1093	405	351	1004	1289	105	112	466	352	158	828
DFS	259	302	414	248	550	0	620	991	902	1088	1153	1130	189	507	720	329	285	519	780	72	33	385	266	132	647
ESP	271	306	450	241	446	416	0	769	785	970	749	1094	177	489	566	258	312	609	620	61	13	318	290	106	650
FRA	276	393	420	255	479	368	466	0	1100	1406	1292	1832	170	573	879	417	307	850	881	71	14	414	302	103	653
GBR	424	382	927	331	557	564	609	511	0	1221	1193	1463	220	564	702	398	341	658	758	71	19	541	324	128	720
ITA	332	368	678	284	842	655	656	513	844	0	1324	2034	260	692	890	399	355	856	1002	81	28	425	401	145	843
NLD	444	619	628	331	901	748	601	548	892	907	0	1573	353	571	857	495	326	648	992	102	77	512	291	140	798
USA	516	331	1659	319	672	583	618	676	1117	1061	1136	0	334	793	981	466	410	1350	1142	104	21	416	537	129	894
CHR	111	167	224	272	253	157	129	145	196	215	314	298	0	116	164	94	82	112	176	11	35	126	75	46	178
HUN	189	192	456	160	418	341	367	307	434	521	415	656	94	0	465	220	251	418	612	56	4	257	264	79	466
POL	170	217	362	144	479	400	335	338	437	542	558	631	125	332	0	238	233	482	714	81	47	286	281	112	589
NZL	289	134	231	132	194	203	199	178	288	267	430	370	74	167	125	0	187	249	266	25	4	274	121	52	281
ZAF	213	149	292	139	229	236	284	207	312	298	293	428	70	216	164	166	0	254	252	29	5	200	182	60	302
JPN	138	109	204	99	149	164	168	145	193	201	175	253	64	158	123	90	144	0	551	51	1	240	318	78	443
CZE	194	215	425	172	699	415	403	450	477	621	752	739	120	518	443	160	189	130	0	68	22	302	307	116	577
EST	14	23	26	8	47	34	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	38	30	22	62
FRR	6	29	8	6	90	27	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	12	19
IRL	249	239	283	205	302	313	302	301	586	360	452	368	116	215	198	221	194	108	224	17	9	0	137	67	340
KOR	114	72	350	80	150	161	194	128	227	309	171	577	49	209	182	78	143	120	214	11	0	88	0	54	303
SVN	49	68	69	35	117	107	79	62	97	123	118	94	35	58	88	34	43	30	90	17	11	52	26	0	104
PRT	260	364	651	252	569	557	667	557	675	817	810	855	157	438	536	209	289	167	491	39	18	313	246	90	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	285	618	240	682	562	443	604	632	611	665	790	147	325	358	415	250	392	396	42	7	312	192	80	400
BEL	206	0	344	224	518	393	344	447	419	451	609	431	186	236	300	188	173	231	314	32	32	254	131	84	371
CAN	461	298	0	401	1544	798	910	924	1032	1195	864	2036	277	570	634	294	322	865	730	68	12	324	403	100	669
CHE	181	205	265	0	442	316	308	308	349	358	357	416	263	215	227	162	154	223	261	19	7	215	131	55	284
DEU	249	364	390	253	0	1874	1087	1771	1367	1997	2050	2342	402	750	1094	406	353	1004	1289	105	112	479	347	158	828
DFS	265	309	418	249	582	0	706	1169	1014	1185	1290	1290	197	544	770	379	325	602	853	78	40	439	286	137	688
ESP	278	320	457	247	488	448	0	806	804	996	790	1115	178	499	585	268	316	617	632	63	13	336	289	109	680
FRA	276	393	420	255	484	372	511	0	1113	1420	1411	1871	170	575	884	421	309	863	886	72	14	430	300	103	656
GBR	424	382	928	331	558	581	639	512	0	1221	1219	1463	220	564	702	398	342	658	758	71	19	556	321	128	720
ITA	332	368	678	284	842	670	699	514	845	0	1347	2034	260	692	890	399	356	856	1002	81	28	435	395	145	843
NLD	447	626	635	331	942	771	636	572	904	911	0	1700	363	580	866	508	336	681	997	103	80	531	291	143	808
USA	516	331	1659	319	672	598	636	711	1117	1061	1173	0	334	793	981	466	411	1350	1142	104	21	430	528	129	894
CHR	111	167	224	272	253	158	132	145	196	215	318	298	0	116	164	94	82	112	176	11	35	134	74	46	178
HUN	189	192	456	160	418	349	379	307	434	521	415	656	94	0	465	220	251	418	612	56	4	263	260	79	466
POL	170	217	362	144	479	405	358	338	437	542	559	631	125	332	0	238	233	482	714	81	47	295	276	112	589
NZL	289	134	231	132	194	213	206	178	288	267	432	370	74	167	125	0	188	249	266	25	4	276	120	52	281
ZAF	213	149	292	139	229	244	288	207	312	298	295	428	70	216	164	166	0	254	252	29	5	202	181	60	302
JPN	138	109	204	99	149	167	170	145	193	201	175	253	64	158	123	90	144	0	551	51	1	245	315	78	443
CZE	194	215	425	172	699	420	420	450	477	621	753	739	120	518	443	160	189	130	0	68	22	312	306	116	577
EST	14	23	26	8	47	35	28	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	22	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	12	19
IRL	255	242	299	211	310	328	326	311	601	374	472	386	122	220	204	223	194	114	231	18	9	0	138	68	343
KOR	113	71	347	79	149	163	192	126	225	305	171	569	48	207	180	77	142	118	212	11	0	88	0	54	299
SVN	49	68	69	35	117	107	84	62	97	123	118	94	35	58	88	34	43	30	90	17	11	53	26	0	104
PRT	260	364	651	252	569	571	716	557	675	817	817	855	157	438	536	209	289	167	491	39	18	314	244	90	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT	
AUS	0	288	610	239	676	557	419	596	626	610	661	782	147	325	356	250	391	395	42	7	309	193	79	397	
BEL	206	0	346	223	530	394	336	453	422	451	633	441	186	236	300	173	235	313	32	32	253	130	84	371	
CAN	460	297	0	401	1544	798	900	924	1032	1195	864	2036	274	570	634	294	322	865	730	68	12	324	410	100	669
CHE	181	205	265	0	442	316	304	308	349	358	357	416	263	215	227	154	223	261	19	7	215	132	55	284	
DEU	249	366	390	253	0	1874	1051	1771	1367	1997	2050	2342	391	750	1094	353	1004	1289	105	112	479	351	158	828	
DFS	265	309	418	249	582	0	681	1169	1014	1185	1290	1290	196	544	770	325	602	853	78	40	439	287	137	688	
ESP	268	303	449	240	435	422	0	774	779	961	757	1088	174	489	562	310	607	617	60	13	321	289	105	644	
FRA	276	393	420	255	484	372	459	0	1113	1420	1411	1871	168	575	884	309	863	886	72	14	430	306	103	656	
GBR	423	382	928	331	558	581	606	512	0	1221	1219	1463	218	564	702	342	658	758	71	19	553	324	128	720	
ITA	332	368	678	284	842	670	645	514	845	0	1347	2034	258	692	890	356	856	1002	81	28	435	400	145	843	
NLD	447	643	635	331	942	771	597	572	904	911	0	1700	353	580	866	336	681	997	103	80	531	294	143	808	
USA	514	330	1659	319	672	598	615	711	1117	1061	1173	0	329	793	981	411	1350	1142	104	21	430	536	129	894	
CHR	111	168	221	272	251	158	127	145	196	215	313	294	0	115	163	82	111	176	11	34	134	74	46	178	
HUN	189	192	456	160	418	349	367	307	434	521	415	656	94	0	465	251	418	612	56	4	263	263	79	466	
POL	170	217	362	144	479	405	332	338	437	542	559	631	125	332	0	233	482	714	81	47	295	280	112	589	
ZAF	213	149	292	139	229	244	282	207	312	298	295	428	70	216	164	0	254	252	29	5	202	182	60	302	
JPN	138	109	204	99	149	167	168	145	193	201	175	253	64	158	123	144	0	551	51	1	245	318	78	443	
CZE	194	215	425	172	699	420	400	450	477	621	753	739	120	518	443	189	130	0	68	22	312	307	116	577	
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	14	10	33	0	0	39	30	22	62	
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	1	20	0	0	10	1	12	19	
IRL	255	242	299	211	310	328	305	311	598	374	472	386	122	220	204	194	114	231	18	9	0	140	68	343	
KOR	114	72	350	80	150	164	194	128	227	309	174	577	49	209	182	143	120	214	11	0	90	0	54	303	
SVN	49	68	69	35	117	107	77	62	97	123	118	94	35	58	88	43	30	90	17	11	53	26	0	104	
PRT	260	363	651	252	569	571	657	557	675	817	817	855	157	438	536	289	167	491	39	18	314	246	90	0	

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	285	618	240	682	562	428	604	632	611	665	790	147	325	358	415	250	392	396	42	7	312	193	64	400
BEL	206	0	344	224	518	393	337	447	419	451	609	431	186	236	300	188	173	231	314	32	32	254	132	72	371
CAN	461	298	0	401	1544	798	901	924	1032	1195	864	2036	277	570	634	294	322	865	730	68	12	324	411	82	669
CHE	181	205	265	0	442	316	304	308	349	358	357	416	263	215	227	162	154	223	261	19	7	215	132	44	284
DEU	249	364	390	253	0	1874	1054	1771	1367	1997	2050	2342	402	750	1094	406	353	1004	1289	105	112	479	352	134	828
DFS	265	309	418	249	582	0	683	1169	1014	1185	1290	1290	197	544	770	379	325	602	853	78	40	439	288	115	688
ESP	268	303	449	240	440	422	0	776	781	964	760	1090	176	489	564	255	310	608	618	61	13	322	290	91	646
FRA	276	393	420	255	484	372	460	0	1113	1420	1411	1871	170	575	884	421	309	863	886	72	14	430	306	85	656
GBR	424	382	928	331	558	581	607	512	0	1221	1219	1463	220	564	702	398	342	658	758	71	19	556	324	107	720
ITA	332	368	678	284	842	670	650	514	845	0	1347	2034	260	692	890	399	356	856	1002	81	28	435	401	124	843
NLD	447	626	635	331	942	771	599	572	904	911	0	1700	363	580	866	508	336	681	997	103	80	531	295	122	808
USA	516	331	1659	319	672	597	615	711	1117	1061	1173	0	334	793	981	466	411	1350	1142	104	21	430	537	106	894
CHR	111	167	224	272	253	158	127	145	196	215	318	298	0	116	164	94	82	112	176	11	35	134	75	39	178
HUN	189	192	456	160	418	349	367	307	434	521	415	656	94	0	465	220	251	418	612	56	4	263	264	66	466
POL	170	217	362	144	479	405	333	338	437	542	559	631	125	332	0	238	233	482	714	81	47	295	281	98	589
NZL	289	134	231	132	194	213	198	178	288	267	432	370	74	167	125	0	188	249	266	25	4	276	121	39	281
ZAF	213	149	292	139	229	244	282	207	312	298	295	428	70	216	164	166	0	254	252	29	5	202	182	47	302
JPN	138	109	204	99	149	167	168	145	193	201	175	253	64	158	123	90	144	0	551	51	1	245	318	66	443
CZE	194	215	425	172	699	420	401	450	477	621	753	739	120	518	443	160	189	130	0	68	22	312	307	102	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	14	10	33	0	0	39	30	20	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	4	1	20	0	0	10	1	10	19
IRL	255	242	299	211	310	328	306	311	601	374	472	386	122	220	204	223	194	114	231	18	9	0	140	56	343
KOR	114	72	350	80	150	164	194	128	227	309	174	577	49	209	182	78	143	120	214	11	0	90	0	48	303
SVN	39	60	58	29	102	89	66	55	83	105	100	80	31	50	76	26	34	28	79	15	9	43	24	0	88
PRT	260	364	651	252	569	571	661	557	675	817	817	855	157	438	536	209	289	167	491	39	18	314	246	74	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	290	610	239	676	557	419	596	626	610	661	782	147	316	356	250	384	395	42	7	309	194	79	397
BEL	206	0	348	224	534	396	335	457	424	454	637	444	187	235	302	174	237	315	32	32	255	133	84	373
CAN	460	298	0	401	1544	798	899	924	1032	1195	864	2036	277	557	634	322	858	729	68	12	324	412	100	669
CHE	181	205	265	0	442	316	303	308	349	358	357	416	263	213	227	154	223	261	19	7	215	133	55	284
DEU	249	367	390	253	0	1874	1048	1771	1367	1997	2050	2342	402	731	1094	353	994	1288	105	112	479	354	158	828
DFS	265	309	418	249	582	0	678	1169	1014	1185	1290	1290	197	531	770	325	596	853	78	40	439	289	137	688
ESP	268	301	449	239	432	419	0	774	777	958	754	1087	176	481	561	310	597	617	60	13	320	291	105	641
FRA	276	393	420	255	484	372	459	0	1113	1420	1411	1871	170	559	884	309	850	886	72	14	430	308	103	656
GBR	423	382	928	331	558	581	604	512	0	1221	1219	1463	220	551	702	342	653	758	71	19	553	325	128	720
ITA	332	368	678	284	842	670	642	514	845	0	1347	2034	260	679	890	356	850	1002	81	28	435	402	145	843
NLD	447	647	635	331	942	771	594	572	904	911	0	1700	363	564	866	336	674	997	103	80	531	297	143	808
USA	514	331	1659	319	672	598	614	711	1117	1061	1173	0	334	765	981	411	1331	1141	104	21	430	539	129	894
CHR	111	168	224	272	253	158	127	145	196	215	318	298	0	114	164	82	112	176	11	35	134	75	46	178
HUN	181	185	442	157	409	342	353	299	418	506	402	630	93	0	461	244	410	601	56	4	258	264	79	460
POL	170	217	362	144	479	405	332	338	437	542	559	631	125	328	0	233	480	714	81	47	295	281	112	589
ZAF	213	149	292	139	229	244	282	207	312	298	295	428	70	205	164	0	252	252	29	5	202	183	60	302
JPN	138	109	204	99	149	167	168	145	193	201	175	253	64	152	123	144	0	550	50	1	243	319	77	442
CZE	194	215	425	172	699	420	400	450	477	621	753	739	120	507	443	189	130	0	68	22	312	307	116	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	14	10	33	0	0	39	30	22	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	1	20	0	0	10	1	12	19
IRL	255	242	299	211	310	328	304	311	598	374	472	386	122	212	204	194	114	231	18	9	0	141	68	343
KOR	114	72	350	80	150	164	194	128	227	309	174	580	49	207	182	143	120	214	11	0	90	0	54	304
SVN	49	68	69	35	117	107	77	62	97	123	118	94	35	58	88	43	30	90	17	11	53	26	0	104
PRT	260	364	651	252	569	571	654	557	675	817	817	855	157	430	536	289	167	491	39	18	314	246	90	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	POL	NZL	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT	ZAF
AUS	0	218	377	192	404	327	296	344	408	386	389	394	215	247	169	226	31	5	219	71	59	225	113
BEL	187	0	338	220	475	334	332	437	364	429	515	351	228	181	149	243	32	31	211	61	72	277	90
CAN	313	296	0	399	1355	633	901	924	850	1163	708	1623	529	288	564	597	66	12	259	210	82	509	170
CHE	161	204	265	0	417	267	303	308	316	350	323	371	172	159	156	198	19	6	180	56	44	214	77
DEU	198	347	363	242	0	1399	986	1551	1079	1862	1575	1708	893	347	647	1016	99	93	360	178	131	588	169
DFS	221	271	407	218	499	0	563	903	769	1010	1039	895	609	278	369	639	67	33	321	141	107	487	162
ESP	217	304	450	240	421	355	0	778	670	949	657	920	464	253	431	509	60	13	254	147	92	486	164
FRA	209	393	420	255	409	328	464	0	830	1345	1026	1180	730	412	530	701	69	14	319	149	85	464	141
GBR	321	340	770	296	465	483	499	406	0	1021	921	1086	556	289	406	574	59	14	369	160	103	509	168
ITA	264	357	673	283	803	598	645	494	715	0	1139	1584	762	376	604	829	80	27	349	210	122	635	190
NLD	306	508	519	299	722	667	515	458	670	784	0	1086	706	382	429	804	95	63	394	141	117	573	166
USA	315	302	1385	300	515	519	509	447	896	913	732	0	784	292	793	882	94	14	305	274	99	608	198
POL	123	163	303	108	366	336	240	262	343	453	451	509	0	159	359	577	68	43	210	169	86	442	131
NZL	199	133	230	132	179	166	197	178	220	253	332	240	81	0	134	174	23	4	212	50	38	174	84
JPN	105	85	167	84	123	143	131	120	154	170	139	203	103	69	0	384	38	1	144	150	50	265	111
CZE	134	170	347	127	554	345	303	321	358	506	634	571	367	110	110	0	58	21	217	167	94	429	152
EST	14	23	26	8	45	31	25	21	26	36	57	59	34	10	10	27	0	0	30	20	20	53	22
FRR	5	29	8	6	73	27	8	12	12	25	44	11	43	4	1	19	0	0	10	1	10	13	5
IRL	205	212	255	183	257	266	254	246	379	313	376	310	151	180	93	172	16	9	0	54	53	230	96
KOR	44	40	178	40	79	90	85	71	101	165	75	296	120	36	63	120	8	0	35	0	34	153	75
SVN	38	60	58	29	102	87	68	55	81	105	99	80	66	26	24	75	15	9	43	19	0	79	36
PRT	169	252	456	173	382	384	446	366	432	578	541	564	404	117	122	345	30	13	202	126	65	0	153
ZAF	107	84	150	69	115	140	138	109	146	158	137	195	108	72	83	118	12	4	93	52	28	148	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT
AUS	0	291	618	240	682	570	431	488	632	611	665	788	147	325	357	415	392	396	42	7	312	194	41	400
BEL	206	0	347	223	534	397	338	420	423	453	636	442	187	238	301	191	237	315	32	32	255	133	47	372
CAN	461	298	0	401	1544	821	902	767	1032	1195	864	2028	274	570	633	294	865	730	68	12	324	414	59	669
CHE	181	205	265	0	442	318	304	289	349	358	357	415	263	215	226	162	223	261	19	7	215	133	29	284
DEU	249	367	390	253	0	1851	1059	1519	1367	1997	2050	2335	391	750	1090	406	1004	1289	105	112	479	355	97	828
DFS	278	313	455	253	594	0	698	1015	1032	1202	1279	1319	194	552	768	383	613	863	78	33	440	296	82	696
ESP	270	304	450	240	444	439	0	701	784	967	763	1089	175	489	565	257	609	619	61	13	324	291	64	648
FRA	260	379	387	245	403	375	458	0	978	1277	1161	1450	161	531	823	341	709	843	67	12	385	279	60	595
GBR	424	382	928	331	558	610	610	500	0	1221	1219	1460	218	564	701	398	658	758	71	19	555	325	75	720
ITA	332	368	678	284	842	699	654	485	845	0	1347	2030	258	692	890	399	856	1002	81	28	435	403	88	843
NLD	447	647	635	331	942	796	602	512	904	911	0	1697	353	580	864	508	681	997	103	80	531	297	85	808
USA	514	330	1643	317	667	647	615	553	1111	1055	1168	0	326	793	977	466	1347	1139	103	20	429	541	73	891
CHR	111	168	221	272	251	163	128	145	196	215	313	291	0	115	163	94	111	176	11	34	134	74	25	178
HUN	189	192	456	160	418	360	367	305	434	521	415	656	94	0	464	220	418	612	56	4	263	264	50	466
POL	170	217	362	144	479	414	334	330	437	542	559	629	125	332	0	238	481	714	81	47	295	281	74	589
NZL	289	134	231	132	194	218	199	172	288	267	432	368	74	167	125	0	249	266	25	4	276	123	26	281
JPN	138	109	204	99	149	172	168	144	193	201	175	253	64	158	123	90	0	551	51	1	245	320	43	443
CZE	194	215	425	172	699	433	402	435	477	621	753	736	120	518	443	160	130	0	68	22	312	307	76	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	10	33	0	0	39	30	17	62
FRR	6	29	8	6	90	29	8	12	15	25	51	12	26	4	46	4	1	20	0	0	10	1	4	19
IRL	255	242	299	211	310	334	308	307	601	374	472	385	122	220	204	223	114	231	18	9	0	141	37	343
KOR	114	72	350	80	150	169	194	125	227	309	174	580	49	209	182	78	120	214	11	0	90	0	36	304
SVN	23	36	41	20	76	62	45	38	56	74	67	57	20	36	56	19	16	58	11	4	29	17	0	62
PRT	260	364	651	252	569	586	664	546	675	817	817	848	157	438	536	209	167	491	39	18	314	246	50	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal																	
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	NZL	JPN	CZE	EST	FRR	IRL	SVN	PRT	
AUS	0	291	618	240	682	570	431	604	632	611	665	790	147	325	358	415	392	396	42	7	300	42	400
BEL	206	0	348	224	534	401	339	457	424	454	637	444	187	238	302	191	237	315	32	32	246	48	373
CAN	461	298	0	401	1544	821	902	924	1032	1195	864	2036	274	570	634	294	865	730	68	12	311	59	669
CHE	181	205	265	0	442	319	304	308	349	358	357	416	263	215	227	162	223	261	19	7	208	29	284
DEU	249	367	390	253	0	1891	1059	1771	1367	1997	2050	2342	391	750	1094	406	1004	1289	105	112	453	99	828
DFS	278	314	455	253	594	0	700	1179	1033	1206	1306	1321	200	552	776	383	613	864	78	40	418	84	697
ESP	270	304	450	240	444	439	0	779	784	967	763	1092	175	489	565	257	609	619	61	13	310	65	648
FRA	276	393	420	255	484	382	464	0	1113	1420	1411	1871	168	575	884	421	863	886	72	14	402	61	656
GBR	424	382	927	331	556	609	607	511	0	1221	1219	1463	218	564	702	398	658	758	71	19	519	77	720
ITA	332	368	678	284	842	699	654	514	843	0	1347	2034	258	692	890	399	856	1002	81	28	417	90	843
NLD	447	647	635	331	942	797	602	572	902	911	0	1700	353	580	866	508	681	997	103	80	496	87	808
USA	516	331	1659	319	672	650	617	711	1117	1061	1173	0	329	793	981	466	1350	1142	104	21	404	75	894
CHR	111	168	221	272	251	163	128	145	196	215	313	294	0	115	163	94	111	176	11	34	131	27	178
HUN	189	192	456	160	418	360	367	307	434	521	415	656	94	0	465	220	418	612	56	4	253	51	466
POL	170	217	362	144	479	415	334	338	437	542	559	631	125	332	0	238	482	714	81	47	284	76	589
NZL	289	134	231	132	194	218	199	178	288	267	432	370	74	167	125	0	249	266	25	4	262	26	281
JPN	138	109	204	99	149	172	168	145	193	201	175	253	64	158	123	90	0	551	51	1	231	43	443
CZE	194	215	425	172	699	433	402	450	476	621	753	739	120	518	443	160	130	0	68	22	298	78	577
EST	14	23	26	8	47	35	25	21	29	36	61	62	7	31	43	10	10	33	0	0	38	17	62
FRR	6	29	8	6	90	30	8	12	15	25	51	13	26	4	46	4	1	20	0	0	10	6	19
IRL	254	241	298	210	308	333	305	306	578	371	464	380	122	218	204	219	114	230	18	9	0	37	331
SVN	24	37	41	20	77	63	46	39	57	76	69	58	21	37	57	19	16	59	11	5	30	0	63
PRT	260	364	651	252	569	586	664	557	674	817	817	855	157	438	536	209	167	491	39	18	313	51	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal																	
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CHR	HUN	POL	JPN	CZE	EST	IRL	SVN	PRT			
AUS	0	283	610	239	630	565	435	472	626	610	641	780	147	315	354	383	394	42	297	41	397		
BEL	206	0	342	223	504	396	341	411	417	447	597	426	186	231	298	227	314	32	244	47	369		
CAN	460	298	0	401	1423	821	909	751	1032	1193	832	2028	274	556	633	848	728	68	311	58	669		
CHE	181	205	265	0	431	319	307	280	349	358	354	414	263	212	226	222	261	19	208	28	284		
DEU	238	359	377	249	0	1694	1044	1480	1295	1945	1823	2160	377	720	1051	918	1260	103	442	96	801		
DFS	278	314	455	253	582	0	720	1002	1033	1201	1277	1307	200	536	773	601	861	78	418	82	697		
ESP	278	320	456	245	478	464	0	706	803	994	770	1110	175	490	582	603	630	63	322	66	679		
FRA	238	369	362	228	375	357	463	0	959	1259	1124	1424	160	518	817	690	833	67	364	60	583		
GBR	423	382	927	331	539	609	635	461	0	1219	1194	1456	218	550	700	645	757	71	516	75	720		
ITA	332	367	678	284	835	699	698	451	842	0	1316	2016	258	678	889	843	1000	81	416	88	842		
NLD	424	605	588	323	821	772	607	461	864	869	0	1588	344	556	853	641	983	101	491	85	793		
USA	514	329	1659	319	613	650	633	511	1116	1059	964	0	329	764	977	1297	1138	104	402	73	893		
CHR	111	167	221	272	244	163	130	142	196	215	304	294	0	113	162	111	176	11	131	25	178		
HUN	181	185	442	157	403	352	365	288	418	506	386	630	93	0	458	408	600	56	248	50	459		
POL	170	217	362	144	464	415	355	323	437	542	551	631	125	328	0	479	712	81	284	74	589		
JPN	138	109	204	99	148	172	170	140	193	201	173	253	64	152	123	0	548	50	226	42	437		
CZE	194	215	425	172	686	433	420	419	476	619	735	738	120	507	443	130	0	68	297	76	576		
EST	14	23	26	8	46	35	28	21	29	36	60	62	7	31	43	10	33	0	38	17	62		
IRL	254	241	298	210	300	333	323	282	575	370	454	380	122	211	204	114	230	18	0	36	331		
SVN	24	37	41	20	77	63	49	39	57	75	68	57	21	36	57	16	59	11	30	0	62		
PRT	260	364	651	252	558	586	714	524	674	817	791	853	157	430	536	167	491	39	313	51	0		

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CZE	IRL	KOR	SVN	PRT
BEL	0	312	160	362	363	301	385	386	408	470	385	233	231	54	32	259
CAN	288	0	298	1015	727	789	722	936	1132	642	1841	579	296	165	39	490
CHE	153	196	0	288	220	213	208	244	267	244	301	163	141	45	20	173
DEU	272	295	170	0	1119	763	1067	884	1463	1210	1475	869	304	131	61	467
DFS	305	451	184	442	0	617	999	1021	1191	1027	1300	649	415	113	52	486
ESP	287	386	160	324	407	0	638	689	881	612	969	493	277	118	44	478
FRA	362	360	167	281	357	421	0	957	1259	927	1423	676	363	116	43	440
GBR	367	854	224	384	607	521	462	0	1213	929	1448	583	511	125	51	518
ITA	350	667	204	614	695	577	451	838	0	1064	2011	804	415	168	59	615
NLD	464	487	223	565	690	469	418	671	729	0	1113	771	413	113	57	535
USA	317	1546	225	427	648	495	511	1114	1059	703	0	899	401	206	52	635
CZE	168	338	110	492	339	304	310	352	478	605	562	0	223	128	46	402
IRL	233	295	143	215	332	272	282	570	370	389	380	169	0	46	21	229
KOR	36	147	33	65	73	73	59	81	133	64	220	88	32	0	17	118
SVN	26	27	14	48	39	30	25	38	46	41	37	35	17	10	0	40
PRT	244	447	145	346	381	453	356	425	555	507	565	321	198	98	31	0

HOL

common bulls below diagonal

common three quarter sib group above diagonal

	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	FRR	JPN	IRL	KOR	CAN	PRT	ESP
BEL	0	204	369	240	270	401	298	540	403	211	29	105	216	65	251	155	311
CHE	191	0	322	189	181	308	271	309	373	169	7	105	176	63	283	108	270
DEU	276	196	0	755	857	889	1173	1261	1484	814	51	454	262	172	866	302	770
DFS	189	152	288	0	408	607	496	770	678	418	4	189	247	107	303	207	385
FRA	229	148	235	153	0	544	660	667	819	484	8	333	187	121	441	216	457
GBR	373	291	386	337	271	0	781	1078	1409	517	18	295	448	170	625	300	716
ITA	269	212	435	327	273	546	0	788	1271	629	18	398	239	210	766	327	695
NLD	539	287	591	486	306	794	556	0	1323	728	66	294	403	146	495	306	663
USA	324	288	429	338	282	1103	728	847	0	806	20	595	359	290	1205	374	1019
CZE	151	111	466	222	227	309	395	571	506	0	21	281	166	170	450	241	442
FRR	28	6	40	4	8	15	16	48	13	19	0	1	6	1	7	7	13
JPN	58	57	89	82	83	114	125	100	151	87	1	0	83	133	374	142	327
IRL	216	177	197	182	153	500	226	374	346	123	6	56	0	49	190	109	268
KOR	42	44	81	63	72	108	169	79	315	122	0	65	31	0	196	127	152
CAN	238	211	281	231	226	591	470	431	1106	290	6	123	207	180	0	264	595
PRT	141	84	205	154	179	230	294	261	339	189	7	78	88	101	247	0	266
ESP	294	211	307	244	288	561	419	518	562	255	8	97	269	88	316	213	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	96	14
CAN	110	0	54	89	43	62	255	92	11
DFS	34	37	0	66	50	66	106	77	13
GBR	72	92	56	0	46	61	112	72	10
ITA	37	40	46	44	0	33	55	53	13
NZL	119	64	42	62	30	0	130	79	14
USA	181	247	69	117	58	137	0	170	24
ZAF	102	94	58	71	53	76	182	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD
AUS	0	98	53	67	35	121	94	13
CAN	105	0	50	83	39	58	87	9
DFS	33	35	0	60	47	66	74	10
GBR	70	89	54	0	44	59	67	9
ITA	35	38	46	44	0	31	51	11
NZL	114	60	42	60	30	0	79	13
ZAF	101	91	55	69	52	76	0	17
NLD	11	7	7	7	9	12	15	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	0	106	56	72	39	193	102	1
CAN	110	0	54	89	43	255	103	2
DFS	32	37	0	64	50	106	84	3
GBR	71	92	54	0	46	112	77	3
ITA	37	40	46	44	0	55	54	3
USA	181	247	69	117	58	0	190	6
ZAF	106	103	62	75	54	201	0	5
NLD	1	2	3	3	3	6	5	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	ITA	ZAF	NLD
AUS	0	63	31	26	60	8
CAN	62	0	49	37	70	8
DFS	22	33	0	46	51	9
ITA	25	36	45	0	42	11
ZAF	64	68	36	42	0	12
NLD	7	6	6	8	10	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	0	104	56	71	39	192	102	14
CAN	108	0	54	89	43	255	103	11
DFS	32	37	0	64	50	106	84	13
GBR	70	92	54	0	46	112	77	10
ITA	37	40	46	44	0	55	54	13
USA	180	247	69	117	58	0	190	24
ZAF	106	103	62	75	54	201	0	21
NLD	11	7	8	8	10	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	45	73	39	125	193	103	14
CAN	110	0	39	89	43	62	255	103	11
DFS	23	27	0	45	46	47	89	66	13
GBR	72	92	39	0	46	59	112	76	10
ITA	37	40	42	44	0	33	55	53	13
NZL	119	64	27	60	30	0	130	87	14
USA	181	247	57	117	58	137	0	190	24
ZAF	107	103	49	74	53	83	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	0	104	56	71	39	192	102	14
CAN	108	0	54	89	43	252	103	11
DFS	32	37	0	64	50	106	84	13
GBR	70	91	54	0	46	112	77	10
ITA	37	40	46	44	0	55	54	13
USA	180	245	69	117	58	0	190	24
ZAF	106	103	62	75	54	201	0	21
NLD	11	7	8	8	10	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	0	106	58	73	39	125	193	103	14
CAN	110	0	54	89	43	62	255	103	11
DFS	34	37	0	66	50	66	106	85	13
GBR	72	92	56	0	46	61	112	77	10
ITA	37	40	46	44	0	33	55	54	13
NZL	119	64	42	62	30	0	130	88	14
USA	181	247	69	117	58	137	0	190	24
ZAF	107	103	63	75	54	84	201	0	21
NLD	11	7	8	8	10	12	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	0	104	56	71	39	192	95	14
CAN	108	0	54	89	43	255	92	11
DFS	32	37	0	64	50	106	76	13
GBR	70	92	54	0	46	112	72	10
ITA	37	40	46	44	0	55	53	13
USA	180	247	69	117	58	0	170	24
ZAF	101	94	57	71	53	182	0	21
NLD	11	7	8	8	10	25	17	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	NZL	ZAF	NLD
AUS	0	59	26	70	59	8
CAN	57	0	35	58	83	9
DFS	15	25	0	47	61	10
NZL	59	59	27	0	75	13
ZAF	64	83	45	67	0	15
NLD	7	6	7	11	13	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD
AUS	0	106	58	33	39	125	193	14
CAN	110	0	54	37	43	62	255	11
DFS	34	37	0	29	50	66	106	13
GBR	37	43	27	0	15	34	37	4
ITA	37	40	46	16	0	33	55	13
NZL	119	64	42	38	30	0	130	14
USA	181	247	69	40	58	137	0	24
NLD	11	7	8	5	10	12	25	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	NZL	USA	NLD
AUS	0	106	58	73	125	193	14
CAN	110	0	54	89	62	252	11
DFS	34	37	0	66	66	106	13
GBR	72	91	56	0	60	112	10
NZL	119	64	42	61	0	130	14
USA	181	245	69	117	137	0	24
NLD	11	7	8	8	12	25	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	NLD
AUS	0	104	56	71	39	191	14
CAN	108	0	54	89	43	255	11
DFS	32	37	0	64	50	106	13
GBR	70	91	54	0	46	112	10
ITA	37	40	46	44	0	55	13
USA	179	247	69	117	58	0	24
NLD	11	7	8	8	10	25	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	13	15	10	5
CAN	20	0	6	79	46	3	28	107	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	73	19	0	27	65	48	47	17
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	52	0	0	8	0	12
NZL	15	26	3	46	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	5	17	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD
AUS	0	21	9	33	7	15	10	5
CAN	20	0	7	79	46	28	107	2
DEU	9	7	0	31	0	4	0	4
DFS	24	73	21	0	27	45	47	13
GBR	6	45	0	25	0	19	35	0
NZL	15	26	4	43	16	0	17	2
USA	10	100	0	44	32	16	0	1
NLD	5	2	4	13	0	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	3	15	10	5
CAN	20	0	6	79	46	0	28	105	2
DEU	7	6	0	29	0	2	3	0	4
DFS	24	73	19	0	27	30	45	47	13
GBR	6	45	0	25	0	0	19	34	0
NOR	3	0	1	21	0	0	2	0	9
NZL	15	26	3	43	16	2	0	17	2
USA	10	99	0	44	31	0	16	0	1
NLD	5	2	4	13	0	8	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	USA	NLD
AUS	0	21	8	33	7	10	5
CAN	20	0	7	79	46	107	2
DEU	8	7	0	30	0	0	3
DFS	24	73	20	0	27	47	12
GBR	6	45	0	25	0	35	0
USA	10	100	0	44	32	0	1
NLD	5	2	3	12	0	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	13	15	10	5
CAN	20	0	6	79	46	3	28	107	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	73	19	0	27	73	45	47	15
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	58	0	0	8	0	12
NZL	15	26	3	43	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	5	15	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD
AUS	0	21	7	33	7	15	10	5
CAN	20	0	6	79	46	28	107	2
DEU	7	6	0	29	0	3	0	5
DFS	24	73	19	0	27	45	47	15
GBR	6	45	0	25	0	19	35	0
NZL	15	26	3	43	16	0	17	2
USA	10	100	0	44	32	16	0	1
NLD	5	2	5	15	0	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	13	15	10	5
CAN	20	0	6	79	46	3	28	107	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	73	19	0	27	76	48	47	17
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	60	0	0	8	0	12
NZL	15	26	3	46	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	5	17	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	NOR	NLD
AUS	0	10	7	21	11	5
CAN	10	0	6	79	3	2
DEU	7	6	0	28	7	3
DFS	15	73	18	0	73	12
NOR	9	3	6	58	0	12
NLD	5	2	3	12	11	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	0	21	4	33	7	13	10	5
CAN	20	0	3	79	46	3	107	2
DEU	4	3	0	15	0	5	0	3
DFS	24	73	9	0	27	73	47	13
GBR	6	45	0	25	0	0	35	0
NOR	10	3	4	58	0	0	0	12
USA	10	100	0	44	32	0	0	1
NLD	5	2	3	13	0	11	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	32	7	13	15	10	5
CAN	20	0	6	78	46	3	28	107	2
DEU	7	6	0	29	0	7	3	0	3
DFS	24	72	19	0	26	76	47	46	13
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	60	0	0	8	0	12
NZL	15	26	3	46	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	3	13	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	32	7	13	15	10	5
CAN	20	0	6	78	46	3	28	107	2
DEU	7	6	0	26	0	7	3	0	4
DFS	24	72	17	0	26	76	47	46	13
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	60	0	0	8	0	12
NZL	15	26	3	46	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	4	13	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	32	7	13	15	10	5
CAN	20	0	6	78	46	3	28	107	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	72	19	0	26	66	47	46	16
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	53	0	0	8	0	12
NZL	15	26	3	46	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	5	16	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	0	21	7	32	7	13	10	5
CAN	20	0	6	78	46	3	104	2
DEU	7	6	0	29	0	7	0	5
DFS	24	72	19	0	26	74	46	16
GBR	6	45	0	25	0	0	35	0
NOR	10	3	6	59	0	0	0	12
USA	10	99	0	44	32	0	0	1
NLD	5	2	5	16	0	11	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	32	7	13	15	10	5
CAN	20	0	6	78	46	3	28	107	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	72	19	0	26	73	44	46	14
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	58	0	0	8	0	12
NZL	15	26	3	43	16	7	0	17	2
USA	10	100	0	44	32	0	16	0	1
NLD	5	2	5	14	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	0	21	7	32	7	13	10	5
CAN	20	0	6	78	46	3	105	2
DEU	7	6	0	29	0	7	0	5
DFS	24	72	19	0	26	70	46	16
GBR	6	45	0	25	0	0	34	0
NOR	10	3	6	55	0	0	0	12
USA	10	99	0	44	31	0	0	1
NLD	5	2	5	16	0	11	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	NOR	NZL	NLD
AUS	0	7	6	17	9	5	5
CAN	7	0	5	73	3	28	2
DEU	6	5	0	21	7	3	3
DFS	12	66	15	0	65	39	12
NOR	7	3	6	53	0	8	12
NZL	5	26	3	39	7	0	1
NLD	5	2	3	12	11	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	13	15	10	5
CAN	20	0	6	79	43	3	28	107	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	73	19	0	27	75	45	47	17
GBR	6	42	0	25	0	0	16	33	0
NOR	10	3	6	60	0	0	8	0	12
NZL	15	26	3	43	13	7	0	17	2
USA	10	100	0	44	30	0	16	0	1
NLD	5	2	5	17	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	13	15	10	5
CAN	20	0	6	79	43	3	28	104	2
DEU	7	6	0	29	0	7	3	0	5
DFS	24	73	19	0	27	76	48	47	17
GBR	6	42	0	25	0	0	16	33	0
NOR	10	3	6	60	0	0	8	0	12
NZL	15	26	3	46	13	7	0	17	2
USA	10	99	0	44	30	0	16	0	1
NLD	5	2	5	17	0	11	2	1	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	0	21	7	33	7	13	10	5
CAN	20	0	6	79	43	3	107	2
DEU	7	6	0	28	0	7	0	5
DFS	24	73	18	0	27	76	47	17
GBR	6	42	0	25	0	0	33	0
NOR	10	3	6	60	0	0	0	12
USA	10	100	0	44	30	0	0	1
NLD	5	2	5	17	0	11	1	0
