

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:

NOR RDC Change in model for OFL,OUS,UDE

The rolling definition of hys is causing the daughters to distribute somewhat differently over hys-classes at each evaluation. Therefore some bulls occasionally may lose EDC although the number of daughters stay the same. Reliability changes is a function of the EDC changes.

DEA BSW/SIM we have a continuous shift of the base group in each evaluation

DFS HOL/JER New parameters, new model, new editing
RDC

SVN ALL Changed time period for data inclusion, average cut was 4 years. Changed the definition of genetic reference base to year 2010.

Genetic parameters were recalculated
for all breeds and traits. Changed herd to herd-year effect.

Performed cleaning data based on genomic parentage test as a consequence the pedigree changed for some animals.

DEU HOL/RDC Change data inclusion, model, parameters

ITA HOL Submitted locomotion as direct trait, and no more the indirect measure.
Changes are also in the OFL and OCS trait, because loc has been included.
In the OFL trait, substituted FAN with LOC.

NLD BSW/HOL Data edit for Angularity, which results in a decrease in
JER/RDC herds/daughters for older bulls.

INTERBULL CHANGES COMPARED TO THE PREVIOUS RUN

No changes made.

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

Harris and Johnson. 1998. Interbull Bulletin 17:31-36

NEXT ROUTINE INTERNATIONAL EVALUATION

Dates for the next routine evaluation can be found on
<http://www.interbull.org/ib/servicecalendar>.

NEXT TEST INTERNATIONAL EVALUATION

Dates for the next test run can be found on
<http://www.interbull.org/ib/servicecalendar>.

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 (December Routine Evaluation 2014).
Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
ARG						
AUS		48	3202	634	236	
BEL			954			
CAN	168	90	9544	531	732	
CHE	2362		1136			
CHR			1693			
CZE			3346			
DEA	2958					
DEU			18777		228	
DFU			10553	1715	5455	
ESP			2752			
EST			469			
FRA	277		15085			
FRM						
FRR			197			
GBR	15	182	4720	360	254	
HUN			2119			
IRL			1283			
ISR						
ITA	1657		8585	95		
JPN			4478			
KOR			855			
LTU						
LVA						
NLD	98		12903	34	32	
NOR					1791	
NZL			4968	3269	509	
POL			6727			
PRT			1963			
SVK						
SVN	227		301			
URY						
USA	712	628	28403	3190	209	
ZAF			769	471		
HRV						
No. Records	8474	948	145782	10299	9446	
Pub. Proofs	6842	811	121948	9068	10391	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	6.94								
CHE	0.93	1.02							
FRA	0.97	0.94	0.91						
ITA	0.96	0.95	0.94	13.71					
NLD	0.94	0.91	0.96	0.93	4.85				
USA	0.98	0.94	0.96	0.97	0.95	1.44			
DEA	0.95	0.96	0.97	0.96	0.94	0.95	11.40		
SVN	0.87	0.88	0.89	0.90	0.89	0.87	0.91	16.45	
GBR	0.95	0.89	0.94	0.93	0.92	0.94	0.87	0.85	0.84

BSW cwi

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.91								
CHE	0.88	0.86							
FRA	0.83	0.80	0.90						
ITA	0.81	0.85	0.86	16.13					
NLD	0.89	0.74	0.65	0.65	4.45				
USA	0.95	0.91	0.84	0.89	0.83	0.81			
DEA	0.85	0.83	0.70	0.75	0.73	0.82	12.00		
SVN	0.84	0.77	0.77	0.81	0.74	0.82	0.90	22.32	
GBR	0.90	0.83	0.83	0.74	0.89	0.82	0.82	0.78	1.37

BSW bde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR
CAN	7.22							
CHE	0.77	0.80						
FRA	0.80	0.85	0.89					
ITA	0.81	0.90	0.91	14.81				
NLD	0.87	0.73	0.79	0.77	4.16			
DEA	0.92	0.88	0.94	0.92	0.79	11.52		
SVN	0.76	0.80	0.78	0.84	0.73	0.81	26.63	
GBR	0.86	0.85	0.83	0.86	0.89	0.82	0.79	1.42

BSW ang

	CAN	CHE	FRA	NLD	USA	GBR
CAN	8.05					
CHE	0.39	0.92				
FRA	0.88	0.36	0.91			
NLD	0.69	0.53	0.75	3.62		
USA	0.80	0.68	0.72	0.55	1.00	
GBR	0.85	0.75	0.77	0.77	0.87	0.79

BSW ran

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.38								
CHE	0.92	0.89							
FRA	0.97	0.95	0.95						
ITA	0.94	0.94	0.93	15.81					
NLD	0.95	0.88	0.93	0.92	4.24				
USA	0.98	0.93	0.97	0.91	0.92	1.08			
DEA	0.96	0.94	0.95	0.95	0.90	0.96	12.10		
SVN	0.88	0.88	0.90	0.92	0.85	0.88	0.92	21.69	
GBR	0.94	0.90	0.95	0.91	0.94	0.94	0.87	0.84	2.14

BSW rwi

	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN
CAN	6.86							
CHE	0.85	0.81						
FRA	0.78	0.70	0.97					
NLD	0.94	0.83	0.69	3.81				
USA	0.86	0.82	0.85	0.74	0.68			
DEA	0.88	0.88	0.77	0.78	0.86	12.53		
GBR	0.89	0.80	0.88	0.85	0.91	0.74	1.20	
SVN	0.83	0.77	0.78	0.81	0.76	0.81	0.78	27.62

BSW rls

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.97								
CHE	0.88	1.09							
FRA	0.93	0.89	0.99						
ITA	0.94	0.86	0.94	17.20					
NLD	0.92	0.78	0.92	0.89	5.09				
USA	0.91	0.90	0.93	0.88	0.86	0.74			
DEA	0.89	0.91	0.92	0.92	0.78	0.92	12.10		
SVN	0.82	0.81	0.85	0.84	0.81	0.84	0.86	22.44	
GBR	0.85	0.87	0.90	0.83	0.86	0.84	0.84	0.78	1.16

BSW fan

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.28								
CHE	0.43	1.16							
FRA	0.72	0.72	1.02						
ITA	0.55	0.85	0.80	16.58					
NLD	0.45	0.66	0.78	0.74	5.43				
USA	0.69	0.67	0.86	0.81	0.86	0.68			
DEA	0.36	0.89	0.69	0.89	0.65	0.61	11.43		
SVN	0.53	0.83	0.70	0.85	0.63	0.67	0.94	26.79	
GBR	0.77	0.78	0.87	0.82	0.80	0.84	0.75	0.75	1.07

BSW hde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN
CAN	8.36						
CHE	0.91	1.08					
FRA	0.91	0.84	1.12				
ITA	0.83	0.82	0.87	16.37			
NLD	0.88	0.74	0.92	0.80	5.43		
DEA	0.86	0.87	0.86	0.89	0.82	12.20	
SVN	0.69	0.68	0.81	0.87	0.74	0.86	31.57

BSW fua

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.39								
CHE	0.18	0.98							
FRA	0.62	0.57	1.00						
ITA	0.32	0.90	0.68	12.57					
NLD	0.92	0.25	0.70	0.36	4.48				
USA	0.89	0.21	0.69	0.46	0.83	1.17			
DEA	0.74	0.29	0.81	0.46	0.77	0.79	11.67		
SVN	0.53	0.46	0.70	0.55	0.67	0.55	0.81	23.43	
GBR	0.83	0.61	0.79	0.75	0.81	0.85	0.71	0.59	1.39

BSW ruh

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.07								
CHE	0.89	0.96							
FRA	0.87	0.85	0.97						
ITA	0.73	0.85	0.83	12.02					
NLD	0.75	0.74	0.80	0.87	4.53				
USA	0.88	0.83	0.85	0.87	0.88	1.03			
DEA	0.80	0.86	0.89	0.92	0.88	0.85	12.53		
SVN	0.75	0.75	0.73	0.81	0.83	0.75	0.83	19.95	
GBR	0.78	0.80	0.83	0.85	0.87	0.88	0.74	0.66	1.27

BSW ruw

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	7.71							
CHE	0.94	0.96						
FRA	0.89	0.87	0.90					
ITA	0.84	0.87	0.76	12.66				
NLD	0.63	0.50	0.67	0.71	4.53			
USA	0.91	0.87	0.82	0.89	0.76	0.92		
DEA	0.85	0.91	0.73	0.96	0.55	0.87	12.34	
SVN	0.76	0.71	0.71	0.79	0.76	0.76	0.80	18.55

BSW usu

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.91								
CHE	0.88	0.99							
FRA	0.83	0.90	0.94						
ITA	0.93	0.87	0.89	14.33					
NLD	0.83	0.81	0.88	0.86	4.72				
USA	0.86	0.86	0.80	0.82	0.87	1.00			
DEA	0.89	0.90	0.85	0.89	0.79	0.73	11.77		
SVN	0.78	0.76	0.63	0.76	0.65	0.64	0.75	26.81	
GBR	0.85	0.81	0.87	0.86	0.91	0.92	0.75	0.61	2.59

BSW ude

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.55								
CHE	0.94	0.98							
FRA	0.94	0.95	0.99						
ITA	0.92	0.97	0.95	15.88					
NLD	0.96	0.95	0.93	0.94	4.17				
USA	0.90	0.93	0.93	0.95	0.90	1.14			
DEA	0.91	0.98	0.92	0.97	0.94	0.90	12.11		
SVN	0.87	0.92	0.88	0.93	0.90	0.87	0.92	22.31	
GBR	0.95	0.92	0.94	0.92	0.95	0.94	0.87	0.84	1.98

BSW ftp

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR
CAN	7.15							
CHE	0.98	1.19						
FRA	0.97	0.95	0.94					
NLD	0.96	0.94	0.94	4.62				
USA	0.92	0.90	0.90	0.88	1.10			
DEA	0.96	0.98	0.95	0.94	0.91	11.48		
SVN	0.88	0.87	0.91	0.85	0.82	0.86	18.83	
GBR	0.94	0.90	0.88	0.92	0.92	0.86	0.84	1.27

BSW ftl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	5.83								
CHE	0.77	1.22							
FRA	0.84	0.95	0.99						
ITA	0.84	0.95	0.97	15.04					
NLD	0.78	0.94	0.93	0.92	4.75				
USA	0.82	0.96	0.97	0.97	0.96	1.36			
DEA	0.76	0.98	0.97	0.96	0.91	0.97	11.47		
SVN	0.79	0.87	0.84	0.89	0.90	0.87	0.86	19.05	
GBR	0.89	0.90	0.91	0.92	0.95	0.94	0.86	0.84	1.27

BSW rtp

	CAN	CHE	FRA	ITA	NLD	DEA	SVN
CAN	7.73						
CHE	0.97	1.23					
FRA	0.98	0.98	0.97				
ITA	0.91	0.87	0.89	14.90			
NLD	0.97	0.96	0.97	0.89	4.64		
DEA	0.95	0.98	0.96	0.86	0.94	11.30	
SVN	0.88	0.89	0.88	0.79	0.88	0.90	18.65

BSW ocs

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.71								
CHE	0.84	0.73							
FRA	0.87	0.92	1.01						
ITA	0.78	0.83	0.86	10.16					
NLD	0.77	0.66	0.80	0.71	4.12				
USA	0.87	0.69	0.83	0.84	0.85	0.55			
DEA	0.69	0.88	0.88	0.87	0.70	0.67	11.07		
SVN	0.67	0.67	0.76	0.75	0.76	0.72	0.82	25.52	
GBR	0.84	0.85	0.88	0.86	0.87	0.89	0.77	0.68	1.70

BSW ous

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.00								
CHE	0.90	1.07							
FRA	0.90	0.94	1.09						
ITA	0.83	0.93	0.87	12.00					
NLD	0.88	0.90	0.90	0.86	4.58				
USA	0.81	0.88	0.88	0.91	0.86	0.87			
DEA	0.85	0.93	0.94	0.92	0.89	0.87	11.90		
SVN	0.66	0.75	0.70	0.76	0.69	0.67	0.84	23.82	
GBR	0.80	0.81	0.74	0.82	0.87	0.86	0.69	0.57	1.38

BSW ofl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.45								
CHE	0.83	0.94							
FRA	0.51	0.64	1.37						
ITA	0.63	0.72	0.80	15.45					
NLD	0.36	0.42	0.57	0.46	4.62				
USA	0.41	0.44	0.83	0.71	0.54	0.96			
DEA	0.70	0.83	0.69	0.83	0.40	0.42	11.49		
SVN	0.74	0.81	0.68	0.77	0.55	0.63	0.86	31.95	
GBR	0.73	0.71	0.76	0.70	0.73	0.71	0.58	0.61	1.60

GUE sta

	CAN	GBR	USA	AUS
CAN	6.10			
GBR	0.97	1.06		
USA	0.98	0.95	2.30	
AUS	0.84	0.87	0.86	15.42

GUE cwi

	CAN	GBR	USA	AUS
CAN	6.44			
GBR	0.95	1.75		
USA	0.91	0.91	1.25	
AUS	0.80	0.82	0.61	5.80

GUE bde

	CAN	GBR	USA	AUS
CAN	6.07			
GBR	0.94	1.36		
USA	0.83	0.90	1.40	
AUS	0.76	0.76	0.81	8.61

GUE ang

	CAN	GBR	USA	AUS
CAN	7.57			
GBR	0.75	1.35		
USA	0.68	0.91	1.64	
AUS	0.22	0.72	0.66	8.95

GUE ran

	CAN	GBR	USA	AUS
CAN	6.35			
GBR	0.97	1.73		
USA	0.97	0.97	1.59	
AUS	0.93	0.96	0.90	11.82

GUE rwi

	CAN	GBR	USA	AUS
CAN	6.86			
GBR	0.94	1.44		
USA	0.95	0.89	1.32	
AUS	0.89	0.93	0.77	10.92

GUE rls

	CAN	GBR	USA	AUS
CAN	7.24			
GBR	0.67	1.54		
USA	0.84	0.62	0.92	
AUS	0.69	0.84	0.60	6.28

GUE rlr

	CAN	USA	AUS
CAN	7.24		
USA	0.83	1.01	
AUS	0.46	0.74	5.88

GUE	fan			
	CAN	GBR	USA	AUS
CAN	8.58			
GBR	0.40	1.45		
USA	0.76	0.62	0.76	
AUS	0.34	0.83	0.61	6.64

GUE	fua			
	CAN	GBR	USA	AUS
CAN	7.46			
GBR	0.95	1.57		
USA	0.89	0.88	1.58	
AUS	0.85	0.85	0.65	7.90

GUE	ruh			
	CAN	GBR	USA	AUS
CAN	7.22			
GBR	0.69	1.58		
USA	0.77	0.87	1.39	
AUS	0.79	0.46	0.61	7.98

GUE	usu			
	CAN	GBR	USA	AUS
CAN	7.18			
GBR	0.59	1.66		
USA	0.67	0.72	1.10	
AUS	0.83	0.65	0.82	7.22

GUE	ude			
	CAN	GBR	USA	AUS
CAN	5.99			
GBR	0.97	1.64		
USA	0.91	0.87	1.68	
AUS	0.75	0.79	0.48	9.12

GUE	ftp			
	CAN	GBR	USA	AUS
CAN	5.74			
GBR	0.96	1.25		
USA	0.91	0.84	1.28	
AUS	0.74	0.71	0.79	7.53

GUE	ftl			
	CAN	GBR	USA	AUS
CAN	4.63			
GBR	0.59	1.89		
USA	0.69	0.97	1.46	
AUS	0.32	0.91	0.85	13.32

GUE	rtp	
	CAN	AUS
CAN	5.59	
AUS	0.53	7.92

GUE ocs

	CAN	GBR	USA	AUS
CAN	8.18			
GBR	0.89	1.55		
USA	0.73	0.77	1.08	
AUS	0.43	0.32	0.60	7.94

GUE ous

	CAN	GBR	USA	AUS
CAN	8.03			
GBR	0.92	1.47		
USA	0.80	0.71	0.76	
AUS	0.50	0.45	0.57	6.01

GUE ofl

	CAN	GBR	USA	AUS
CAN	7.36			
GBR	0.51	1.50		
USA	0.77	0.42	1.16	
AUS	0.63	0.67	0.55	6.64

HOL ang

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD
USA	HUN	POL	ZAF	JPN	CZE	EST	FRR	IRL	KOR	PRT	SVN
AUS	7.74										
BEL	0.57	0.97									
CAN	0.66	0.79	6.26								
CHE	0.53	0.80	0.86	1.17							
DEU	0.61	0.75	0.85	0.76	12.58						
DFS	0.64	0.85	0.88	0.79	0.87	10.78					
ESP	0.67	0.79	0.91	0.82	0.77	0.86	0.83				
FRA	0.62	0.82	0.88	0.85	0.80	0.86	0.86	0.98			
GBR	0.78	0.80	0.91	0.79	0.82	0.89	0.85	0.81	1.18		
ITA	0.72	0.75	0.89	0.75	0.84	0.85	0.84	0.81	0.89	1.32	
NLD	0.63	0.69	0.74	0.75	0.43	0.63	0.77	0.72	0.77	0.66	4.86
USA	0.69	0.80	0.94	0.81	0.85	0.89	0.88	0.85	0.91	0.89	0.69
1.38											
HUN	0.60	0.74	0.77	0.66	0.87	0.80	0.74	0.77	0.75	0.80	0.44
0.80	0.89										
POL	0.48	0.67	0.71	0.71	0.64	0.72	0.77	0.74	0.69	0.73	0.69
0.70	0.58	6.92									
ZAF	0.66	0.83	0.78	0.70	0.82	0.82	0.73	0.74	0.87	0.81	0.53
0.80	0.80	0.56	9.41								
JPN	0.64	0.81	0.89	0.78	0.81	0.90	0.87	0.86	0.86	0.89	0.74
0.86	0.73	0.75	0.77	1.46							
CZE	0.59	0.78	0.81	0.70	0.80	0.84	0.74	0.78	0.75	0.81	0.54
0.78	0.81	0.62	0.69	0.74	14.44						
EST	0.35	0.72	0.58	0.56	0.66	0.68	0.48	0.56	0.55	0.58	0.37
0.56	0.72	0.43	0.70	0.62	0.65	15.24					
FRR	0.43	0.59	0.58	0.47	0.75	0.61	0.55	0.62	0.59	0.63	0.29
0.61	0.65	0.37	0.58	0.63	0.53	0.57	0.08				
IRL	0.75	0.82	0.92	0.82	0.86	0.90	0.87	0.87	0.97	0.89	0.73
0.93	0.80	0.70	0.87	0.86	0.76	0.56	0.59	0.79			
KOR	0.63	0.81	0.78	0.75	0.72	0.75	0.76	0.73	0.78	0.76	0.58
0.75	0.68	0.57	0.84	0.79	0.60	0.63	0.62	0.79	2.45		
PRT	0.56	0.70	0.77	0.60	0.74	0.73	0.71	0.71	0.79	0.81	0.49
0.80	0.70	0.57	0.71	0.75	0.71	0.47	0.75	0.77	0.77	0.27	
SVN	0.53	0.62	0.60	0.72	0.49	0.52	0.66	0.57	0.54	0.60	0.71
0.58	0.40	0.71	0.37	0.59	0.56	0.44	0.40	0.54	0.56	0.48	25.48

HOL rtp

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD
USA	POL	NZL	JPN	CZE	EST	FRR	IRL	KOR	SVN	PRT	ZAF
AUS	9.88										
BEL	0.96	1.29									
CAN	0.97	0.96	6.04								
CHE	0.94	0.96	0.96	1.02							
DEU	0.94	0.96	0.97	0.94	14.63						
DFS	0.92	0.94	0.96	0.93	0.97	10.99					
ESP	0.94	0.95	0.97	0.92	0.97	0.96	0.95				
FRA	0.97	0.96	0.97	0.96	0.97	0.96	0.97	1.06			
GBR	0.96	0.95	0.97	0.94	0.97	0.97	0.96	0.98	1.33		
ITA	0.84	0.85	0.87	0.85	0.94	0.93	0.90	0.90	0.91	1.28	
NLD	0.95	0.95	0.97	0.94	0.98	0.97	0.97	0.97	0.97	0.91	4.86
USA	0.92	0.93	0.94	0.90	0.95	0.96	0.95	0.94	0.97	0.90	0.95
1.63											
POL	0.89	0.92	0.93	0.90	0.97	0.94	0.96	0.95	0.94	0.91	0.95
0.92	10.61										
NZL	0.96	0.93	0.94	0.93	0.95	0.92	0.93	0.95	0.95	0.88	0.93
0.89	0.92	0.44									
JPN	0.96	0.96	0.98	0.94	0.96	0.96	0.97	0.98	0.97	0.90	0.97
0.95	0.94	0.94	1.55								
CZE	0.91	0.96	0.94	0.92	0.97	0.94	0.95	0.94	0.95	0.89	0.94
0.93	0.95	0.93	0.94	13.99							
EST	0.91	0.94	0.93	0.91	0.96	0.93	0.93	0.93	0.94	0.89	0.94
0.91	0.94	0.91	0.93	0.95	13.15						
FRR	0.83	0.83	0.81	0.82	0.81	0.79	0.77	0.83	0.83	0.74	0.77
0.79	0.72	0.79	0.77	0.79	0.78	0.10					
IRL	0.95	0.93	0.96	0.93	0.95	0.95	0.94	0.96	0.97	0.88	0.94
0.93	0.91	0.94	0.95	0.92	0.90	0.82	1.26				
KOR	0.88	0.89	0.92	0.89	0.93	0.93	0.95	0.93	0.93	0.93	0.93
0.93	0.92	0.86	0.94	0.89	0.87	0.72	0.90	2.54			
SVN	0.87	0.88	0.90	0.86	0.92	0.87	0.93	0.89	0.89	0.86	0.88
0.85	0.91	0.87	0.87	0.90	0.88	0.74	0.87	0.88	15.87		
PRT	0.87	0.90	0.90	0.85	0.93	0.91	0.92	0.92	0.93	0.88	0.90
0.92	0.92	0.86	0.91	0.93	0.89	0.77	0.91	0.91	0.88	0.48	
ZAF	0.89	0.86	0.91	0.82	0.89	0.85	0.88	0.87	0.86	0.81	0.87
0.87	0.84	0.86	0.90	0.86	0.86	0.73	0.84	0.84	0.82	0.83	7.81

HOL	ous										
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD
USA	CHR	HUN	POL	NZL	JPN	CZE	EST	FRR	IRL	SVN	PRT
AUS	6.59										
BEL	0.57	1.26									
CAN	0.66	0.79	5.41								
CHE	0.67	0.85	0.95	1.32							
DEU	0.66	0.80	0.90	0.88	13.56						
DFS	0.43	0.83	0.86	0.89	0.88	12.76					
ESP	0.62	0.69	0.86	0.87	0.87	0.85	1.06				
FRA	0.55	0.82	0.85	0.90	0.89	0.94	0.86	1.03			
GBR	0.80	0.65	0.84	0.85	0.87	0.68	0.86	0.75	1.09		
ITA	0.65	0.72	0.90	0.90	0.86	0.83	0.94	0.88	0.85	1.03	
NLD	0.66	0.79	0.88	0.88	0.92	0.83	0.88	0.88	0.89	0.87	4.68
USA	0.69	0.79	0.93	0.93	0.89	0.86	0.92	0.89	0.89	0.94	0.91
1.15											
CHR	0.65	0.86	0.88	0.94	0.83	0.82	0.79	0.86	0.78	0.83	0.87
0.85	9.41										
HUN	0.59	0.82	0.86	0.89	0.88	0.86	0.87	0.83	0.75	0.83	0.80
0.83	0.83	1.12									
POL	0.65	0.77	0.68	0.72	0.77	0.68	0.65	0.67	0.74	0.68	0.74
0.70	0.73	0.66	8.13								
NZL	0.78	0.76	0.82	0.85	0.82	0.76	0.74	0.83	0.81	0.77	0.82
0.85	0.83	0.78	0.74	0.44							
JPN	0.71	0.81	0.93	0.91	0.88	0.80	0.80	0.82	0.87	0.87	0.87
0.93	0.85	0.76	0.75	0.81	0.76						
CZE	0.58	0.86	0.89	0.90	0.94	0.91	0.86	0.91	0.77	0.86	0.87
0.85	0.86	0.91	0.75	0.78	0.82	17.23					
EST	0.52	0.79	0.83	0.80	0.84	0.88	0.78	0.88	0.64	0.81	0.78
0.84	0.72	0.80	0.66	0.71	0.77	0.87	13.94				
FRR	0.62	0.83	0.72	0.73	0.87	0.74	0.78	0.77	0.76	0.73	0.85
0.79	0.74	0.75	0.71	0.67	0.75	0.80	0.70	0.10			
IRL	0.84	0.60	0.78	0.80	0.80	0.61	0.80	0.69	0.96	0.79	0.79
0.84	0.74	0.71	0.76	0.82	0.82	0.71	0.58	0.67	1.01		
SVN	0.41	0.53	0.50	0.44	0.50	0.41	0.42	0.43	0.40	0.44	0.57
0.49	0.50	0.40	0.62	0.51	0.52	0.48	0.52	0.46	0.43	21.52	
PRT	0.69	0.72	0.78	0.79	0.79	0.71	0.77	0.73	0.76	0.78	0.78
0.78	0.74	0.72	0.68	0.71	0.77	0.80	0.66	0.74	0.74	0.54	0.95

HOL ofl

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD
USA	CHR	HUN	POL	JPN	CZE	EST	IRL	SVN	PRT		
AUS	7.67										
BEL	0.47	1.78									
CAN	0.28	0.74	6.22								
CHE	0.36	0.76	0.87	1.10							
DEU	0.31	0.77	0.86	0.73	11.89						
DFS	0.31	0.67	0.87	0.75	0.79	13.15					
ESP	0.24	0.69	0.82	0.71	0.74	0.83	0.98				
FRA	0.33	0.78	0.67	0.63	0.74	0.59	0.72	1.08			
GBR	0.33	0.73	0.79	0.77	0.78	0.71	0.82	0.82	1.22		
ITA	0.33	0.70	0.70	0.68	0.71	0.54	0.67	0.78	0.74	1.64	
NLD	0.29	0.80	0.68	0.61	0.73	0.59	0.67	0.81	0.79	0.67	4.78
USA	0.41	0.77	0.83	0.72	0.75	0.66	0.73	0.73	0.76	0.76	0.69
1.59											
CHR	0.28	0.69	0.85	0.91	0.72	0.79	0.73	0.62	0.74	0.60	0.59
0.67	10.35										
HUN	0.46	0.71	0.60	0.64	0.67	0.40	0.57	0.76	0.66	0.76	0.68
0.72	0.49	1.09									
POL	0.47	0.80	0.74	0.71	0.74	0.53	0.63	0.70	0.68	0.76	0.56
0.81	0.55	0.70	11.35								
JPN	0.34	0.63	0.87	0.77	0.76	0.72	0.68	0.57	0.64	0.69	0.58
0.86	0.75	0.53	0.73	0.64							
CZE	0.44	0.79	0.81	0.73	0.79	0.59	0.62	0.66	0.68	0.75	0.62
0.85	0.58	0.80	0.86	0.74	15.95						
EST	0.35	0.73	0.58	0.53	0.62	0.57	0.68	0.78	0.62	0.69	0.74
0.70	0.49	0.71	0.65	0.57	0.67	15.35					
IRL	0.40	0.76	0.79	0.79	0.73	0.70	0.75	0.69	0.85	0.69	0.70
0.73	0.71	0.71	0.70	0.71	0.73	0.54	1.45				
SVN	0.50	0.58	0.64	0.53	0.55	0.49	0.53	0.64	0.49	0.66	0.63
0.77	0.50	0.72	0.54	0.70	0.69	0.70	0.51	26.81			
PRT	0.23	0.55	0.51	0.40	0.61	0.46	0.60	0.73	0.63	0.67	0.69
0.63	0.38	0.65	0.46	0.48	0.62	0.84	0.44	0.71	0.40		

HOL	loc										
	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA
CZE	IRL	KOR	SVN	PRT							
BEL	2.04										
CAN	0.83	6.43									
CHE	0.53	0.63	1.35								
DEU	0.64	0.72	0.56	11.92							
DFS	0.85	0.91	0.42	0.68	12.97						
ESP	0.55	0.69	0.67	0.78	0.69	0.99					
FRA	0.76	0.75	0.62	0.82	0.69	0.72	1.08				
GBR	0.61	0.65	0.79	0.80	0.60	0.78	0.84	1.34			
ITA	0.58	0.67	0.67	0.71	0.56	0.70	0.76	0.75	1.96		
NLD	0.84	0.77	0.61	0.83	0.76	0.66	0.80	0.73	0.60	4.84	
USA	0.57	0.72	0.54	0.78	0.65	0.71	0.76	0.71	0.80	0.61	1.59
CZE	0.32	0.51	0.53	0.65	0.49	0.57	0.61	0.63	0.63	0.44	0.71
22.68											
IRL	0.61	0.63	0.60	0.69	0.58	0.71	0.73	0.79	0.63	0.64	0.66
0.42	1.65										
KOR	0.50	0.77	0.53	0.52	0.73	0.63	0.63	0.63	0.57	0.47	0.57
0.59	0.58	11.61									
SVN	0.62	0.71	0.60	0.64	0.73	0.69	0.70	0.68	0.74	0.67	0.65
0.70	0.49	0.67	30.46								
PRT	0.24	0.51	0.50	0.59	0.43	0.54	0.51	0.59	0.49	0.48	0.48
0.63	0.42	0.55	0.60	0.23							

HOL	bcs										
	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	FRR
	IRL	KOR	CAN	PRT	ESP						
JPN											
BEL	1.09										
CHE	0.72	10.67									
DEU	0.75	0.89	13.00								
DFS	0.75	0.89	0.94	12.18							
FRA	0.74	0.94	0.92	0.94	1.01						
GBR	0.75	0.92	0.90	0.84	0.94	1.25					
ITA	0.73	0.92	0.95	0.94	0.96	0.90	6.66				
NLD	0.75	0.94	0.95	0.95	0.95	0.91	0.93	4.95			
USA	0.78	0.67	0.73	0.76	0.75	0.75	0.75	0.71	1.38		
CZE	0.77	0.90	0.95	0.93	0.91	0.87	0.94	0.93	0.70	12.70	
FRR	0.71	0.77	0.81	0.71	0.80	0.82	0.76	0.85	0.58	0.74	0.08
JPN	0.74	0.93	0.94	0.95	0.96	0.92	0.94	0.93	0.75	0.91	0.71
1.62											
IRL	0.67	0.88	0.83	0.82	0.89	0.95	0.83	0.87	0.65	0.80	0.74
0.86	1.08										
KOR	0.48	0.75	0.77	0.78	0.78	0.75	0.81	0.71	0.64	0.75	0.55
0.80	0.67	2.68									
CAN	0.75	0.94	0.93	0.92	0.94	0.95	0.93	0.95	0.75	0.92	0.75
0.97	0.91	0.77	6.17								
PRT	0.71	0.91	0.88	0.87	0.90	0.88	0.90	0.91	0.74	0.90	0.70
0.89	0.78	0.77	0.91	0.36							
ESP	0.79	0.91	0.94	0.93	0.95	0.94	0.93	0.94	0.75	0.93	0.81
0.94	0.88	0.82	0.95	0.90	1.12						

JER	sta									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	
AUS	10.12									
CAN	0.84	6.16								
DFS	0.86	0.95	11.89							
GBR	0.87	0.94	0.94	0.84						
ITA	0.87	0.95	0.91	0.97	1.39					
NZL	0.89	0.87	0.85	0.94	0.91	0.37				
USA	0.89	0.96	0.93	0.97	0.95	0.91	1.39			
ZAF	0.81	0.85	0.84	0.94	0.93	0.94	0.90	9.64		
NLD	0.91	0.96	0.96	0.95	0.94	0.88	0.96	0.87	5.31	

JER	cwi									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	
AUS	6.52									
CAN	0.69	6.55								
DFS	0.81	0.82	15.42							
GBR	0.76	0.87	0.82	1.49						
ITA	0.62	0.92	0.75	0.78	1.44					
NZL	0.83	0.57	0.68	0.79	0.49	0.36				
USA	0.75	0.93	0.78	0.81	0.92	0.58	0.94			
ZAF	0.84	0.83	0.70	0.88	0.72	0.81	0.83	9.38		
NLD	0.76	0.72	0.89	0.69	0.72	0.61	0.81	0.67	4.29	

JER	bde									
	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD		
AUS	7.93									
CAN	0.75	6.25								
DFS	0.84	0.86	13.56							
GBR	0.66	0.78	0.78	1.52						
ITA	0.49	0.69	0.73	0.81	1.43					
NZL	0.75	0.58	0.64	0.65	0.64	0.36				
ZAF	0.93	0.73	0.83	0.76	0.56	0.77	9.81			
NLD	0.55	0.83	0.85	0.68	0.83	0.50	0.52	3.34		

JER ang

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	8.08							
CAN	0.57	7.14						
DFS	0.69	0.76	13.35					
GBR	0.85	0.67	0.87	0.93				
ITA	0.69	0.69	0.85	0.86	1.22			
USA	0.81	0.78	0.87	0.83	0.75	1.00		
ZAF	0.71	0.63	0.79	0.87	0.72	0.80	9.56	
NLD	0.80	0.66	0.63	0.77	0.59	0.82	0.68	3.53

JER ran

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	8.49								
CAN	0.88	5.75							
DFS	0.89	0.95	11.51						
GBR	0.96	0.94	0.96	1.14					
ITA	0.84	0.95	0.93	0.89	1.39				
NZL	0.96	0.84	0.86	0.93	0.82	0.29			
USA	0.92	0.93	0.94	0.97	0.89	0.91	1.12		
ZAF	0.97	0.89	0.90	0.98	0.83	0.92	0.95	10.19	
NLD	0.87	0.85	0.93	0.93	0.77	0.84	0.93	0.92	4.54

JER rwi

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	7.07								
CAN	0.87	6.61							
DFS	0.79	0.87	11.96						
GBR	0.80	0.94	0.86	1.23					
ITA	0.65	0.78	0.78	0.74	1.58				
NZL	0.89	0.85	0.80	0.79	0.66	0.28			
USA	0.54	0.75	0.65	0.77	0.82	0.54	0.83		
ZAF	0.79	0.77	0.69	0.79	0.59	0.70	0.59	10.48	
NLD	0.74	0.62	0.83	0.52	0.51	0.76	0.31	0.58	4.01

JER rls

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	4.63								
CAN	0.44	5.68							
DFS	0.53	0.91	12.96						
GBR	0.68	0.82	0.76	1.70					
ITA	0.40	0.74	0.78	0.77	1.71				
NZL	0.69	0.57	0.55	0.75	0.72	0.12			
USA	0.60	0.89	0.90	0.90	0.82	0.73	0.68		
ZAF	0.87	0.66	0.64	0.88	0.67	0.86	0.83	13.49	
NLD	0.48	0.76	0.88	0.72	0.91	0.68	0.80	0.64	3.47

JER rlr

	AUS	CAN	DFS	ITA	ZAF	NLD
AUS	4.46					
CAN	0.30	7.01				
DFS	0.53	0.77	12.70			
ITA	0.37	0.44	0.56	1.17		
ZAF	0.25	0.30	0.56	0.80	14.41	
NLD	0.63	0.65	0.86	0.79	0.69	5.04

JER fan

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	4.93							
CAN	0.66	5.48						
DFS	0.67	0.86	12.87					
GBR	0.79	0.81	0.74	1.30				
ITA	0.57	0.81	0.63	0.84	1.79			
USA	0.67	0.88	0.77	0.85	0.87	0.77		
ZAF	0.76	0.73	0.76	0.89	0.82	0.82	10.84	
NLD	0.66	0.85	0.78	0.90	0.87	0.85	0.84	4.48

JER fua

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	7.56								
CAN	0.64	4.96							
DFS	0.80	0.83	12.68						
GBR	0.77	0.91	0.82	1.42					
ITA	0.62	0.83	0.80	0.85	1.53				
NZL	0.85	0.60	0.70	0.76	0.57	0.40			
USA	0.77	0.93	0.85	0.92	0.85	0.67	1.17		
ZAF	0.73	0.91	0.84	0.95	0.90	0.70	0.91	12.59	
NLD	0.83	0.74	0.91	0.85	0.81	0.75	0.82	0.84	4.69

JER ruh

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	8.01								
CAN	0.66	6.83							
DFS	0.73	0.88	11.20						
GBR	0.80	0.84	0.78	1.06					
ITA	0.77	0.87	0.82	0.91	1.40				
NZL	0.70	0.70	0.79	0.68	0.80	0.40			
USA	0.79	0.85	0.88	0.87	0.87	0.72	1.13		
ZAF	0.81	0.76	0.84	0.79	0.81	0.75	0.90	10.02	
NLD	0.74	0.87	0.91	0.88	0.87	0.71	0.80	0.70	4.74

JER usu

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	9.00								
CAN	0.83	6.55							
DFS	0.74	0.86	12.83						
GBR	0.85	0.90	0.84	1.67					
ITA	0.44	0.67	0.65	0.50	1.66				
NZL	0.49	0.50	0.39	0.59	0.55	0.38			
USA	0.73	0.85	0.86	0.75	0.58	0.28	0.83		
ZAF	0.86	0.89	0.79	0.86	0.58	0.37	0.83	11.42	
NLD	0.74	0.77	0.87	0.64	0.70	0.48	0.79	0.69	5.35

JER ude

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	8.13							
CAN	0.94	4.74						
DFS	0.93	0.93	12.19					
GBR	0.93	0.94	0.92	1.42				
ITA	0.96	0.93	0.93	0.87	1.36			
USA	0.93	0.97	0.95	0.91	0.92	1.52		
ZAF	0.97	0.95	0.93	0.93	0.96	0.95	11.74	
NLD	0.95	0.92	0.95	0.89	0.97	0.90	0.94	4.51

JER ftp

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD
AUS	9.88								
CAN	0.88	5.85							
DFS	0.86	0.94	13.05						
GBR	0.88	0.87	0.86	1.36					
ITA	0.58	0.75	0.79	0.55	1.99				
NZL	0.90	0.92	0.85	0.83	0.70	0.30			
USA	0.86	0.96	0.94	0.86	0.74	0.87	1.12		
ZAF	0.88	0.97	0.91	0.90	0.70	0.91	0.94	11.23	
NLD	0.93	0.95	0.95	0.87	0.69	0.88	0.92	0.92	5.21

JER ftl

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD
AUS	9.74							
CAN	0.75	5.32						
DFS	0.91	0.86	13.84					
GBR	0.95	0.83	0.94	1.21				
ITA	0.90	0.65	0.87	0.91	1.82			
USA	0.93	0.83	0.94	0.95	0.91	1.02		
ZAF	0.96	0.80	0.91	0.95	0.91	0.97	11.25	
NLD	0.92	0.87	0.96	0.95	0.85	0.95	0.92	4.58

JER rtp

	AUS	CAN	DFS	NZL	ZAF	NLD
AUS	7.02					
CAN	0.94	6.10				
DFS	0.89	0.94	13.03			
NZL	0.95	0.96	0.89	0.39		
ZAF	0.93	0.97	0.91	0.93	10.53	
NLD	0.78	0.83	0.95	0.84	0.77	4.44

JER ocs

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD
AUS	10.27							
CAN	0.44	5.75						
DFS	0.48	0.66	13.04					
GBR	0.66	0.83	0.68	1.44				
ITA	0.34	0.79	0.59	0.69	0.76			
NZL	0.60	0.59	0.44	0.57	0.57	0.33		
USA	0.70	0.77	0.63	0.79	0.65	0.62	0.93	
NLD	0.51	0.78	0.85	0.76	0.88	0.54	0.72	2.77

JER ous

	AUS	CAN	DFS	GBR	NZL	USA	NLD
AUS	7.17						
CAN	0.67	5.96					
DFS	0.44	0.87	12.63				
GBR	0.72	0.86	0.74	1.26			
NZL	0.65	0.76	0.73	0.75	0.46		
USA	0.66	0.90	0.82	0.85	0.66	0.70	
NLD	0.66	0.87	0.81	0.75	0.78	0.89	4.70

JER ofl

	AUS	CAN	DFS	GBR	ITA	USA	NLD
AUS	4.93						
CAN	0.59	5.82					
DFS	0.36	0.80	13.85				
GBR	0.58	0.75	0.45	1.19			
ITA	0.69	0.78	0.59	0.65	1.21		
USA	0.68	0.86	0.57	0.74	0.80	0.97	
NLD	0.53	0.77	0.59	0.73	0.75	0.72	5.32

RDC sta

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	9.95								
CAN	0.87	5.92							
DEU	0.88	0.94	12.19						
DFS	0.86	0.96	0.94	8.80					
GBR	0.90	0.89	0.93	0.86	1.19				
NOR	0.86	0.89	0.91	0.94	0.87	11.50			
NZL	0.89	0.89	0.83	0.87	0.86	0.86	0.48		
USA	0.88	0.96	0.94	0.93	0.92	0.85	0.87	2.03	
NLD	0.86	0.94	0.98	0.94	0.92	0.90	0.81	0.92	5.02

RDC cwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD
AUS	8.24							
CAN	0.67	7.09						
DEU	0.69	0.84	11.19					
DFS	0.76	0.84	0.88	12.84				
GBR	0.78	0.81	0.90	0.80	1.46			
NZL	0.78	0.58	0.72	0.70	0.76	0.35		
USA	0.53	0.86	0.81	0.76	0.80	0.69	1.09	
NLD	0.67	0.88	0.93	0.89	0.91	0.66	0.82	3.91

RDC bde

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.73								
CAN	0.76	5.89							
DEU	0.79	0.87	9.31						
DFS	0.83	0.84	0.91	11.75					
GBR	0.77	0.80	0.89	0.80	1.42				
NOR	0.73	0.59	0.77	0.78	0.56	11.55			
NZL	0.80	0.56	0.68	0.79	0.67	0.70	0.35		
USA	0.63	0.77	0.85	0.78	0.87	0.59	0.64	1.01	
NLD	0.64	0.83	0.91	0.82	0.89	0.48	0.52	0.87	4.31

RDC ang

	AUS	CAN	DEU	DFS	GBR	USA	NLD
AUS	9.47						
CAN	0.62	6.58					
DEU	0.63	0.84	11.89				
DFS	0.63	0.81	0.86	9.26			
GBR	0.74	0.78	0.82	0.77	1.33		
USA	0.71	0.86	0.85	0.79	0.83	0.89	
NLD	0.62	0.73	0.46	0.62	0.76	0.68	5.41

RDC ran

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.88								
CAN	0.90	6.03							
DEU	0.87	0.97	8.45						
DFS	0.81	0.95	0.96	10.08					
GBR	0.93	0.95	0.96	0.94	1.36				
NOR	0.61	0.81	0.85	0.90	0.76	10.93			
NZL	0.93	0.92	0.88	0.88	0.92	0.78	0.29		
USA	0.91	0.98	0.96	0.95	0.95	0.82	0.91	1.08	
NLD	0.89	0.96	0.98	0.97	0.97	0.83	0.89	0.96	5.89

RDC rwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD
AUS	8.38							
CAN	0.84	5.98						
DEU	0.84	0.90	8.49					
DFS	0.84	0.93	0.90	10.61				
GBR	0.84	0.79	0.88	0.74	1.37			
NZL	0.87	0.88	0.80	0.89	0.78	0.30		
USA	0.76	0.90	0.83	0.86	0.85	0.84	1.20	
NLD	0.88	0.94	0.94	0.91	0.88	0.82	0.82	5.67

RDC rls

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	4.51								
CAN	0.64	6.42							
DEU	0.73	0.93	8.90						
DFS	0.59	0.96	0.92	9.09					
GBR	0.82	0.74	0.87	0.72	1.69				
NOR	0.44	0.86	0.88	0.92	0.65	13.24			
NZL	0.63	0.56	0.66	0.57	0.62	0.55	0.12		
USA	0.68	0.95	0.93	0.94	0.79	0.83	0.51	0.71	
NLD	0.72	0.91	0.91	0.86	0.87	0.71	0.61	0.89	4.90

RDC rlr

	AUS	CAN	DEU	DFS	NOR	NLD
AUS	5.18					
CAN	0.62	6.76				
DEU	0.62	0.88	9.20			
DFS	0.64	0.86	0.90	10.72		
NOR	0.40	0.76	0.84	0.87	12.72	
NLD	0.55	0.86	0.90	0.88	0.88	4.51

RDC fan

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	6.74							
CAN	0.57	6.71						
DEU	0.72	0.84	13.26					
DFS	0.68	0.61	0.77	9.46				
GBR	0.81	0.75	0.88	0.64	1.72			
NOR	0.42	0.52	0.77	0.51	0.61	13.38		
USA	0.71	0.84	0.84	0.72	0.82	0.56	0.83	
NLD	0.69	0.77	0.87	0.71	0.88	0.67	0.80	3.76

RDC fua

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	9.09								
CAN	0.73	6.03							
DEU	0.76	0.88	11.22						
DFS	0.75	0.82	0.82	11.80					
GBR	0.75	0.81	0.94	0.78	1.65				
NOR	0.69	0.79	0.74	0.85	0.72	11.20			
NZL	0.80	0.78	0.79	0.70	0.75	0.74	0.33		
USA	0.75	0.93	0.89	0.82	0.87	0.80	0.84	1.15	
NLD	0.75	0.90	0.93	0.90	0.91	0.85	0.82	0.88	3.83

RDC ruh

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	8.57								
CAN	0.77	5.87							
DEU	0.79	0.87	12.99						
DFS	0.76	0.90	0.90	10.71					
GBR	0.84	0.74	0.87	0.79	1.46				
NOR	0.64	0.84	0.82	0.88	0.70	11.66			
NZL	0.84	0.75	0.79	0.75	0.87	0.64	0.31		
USA	0.79	0.87	0.90	0.91	0.87	0.80	0.84	1.07	
NLD	0.78	0.82	0.93	0.93	0.89	0.87	0.81	0.87	5.31

RDC usu

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	8.02								
CAN	0.77	6.06							
DEU	0.72	0.87	12.15						
DFS	0.61	0.78	0.78	12.48					
GBR	0.81	0.78	0.75	0.66	1.93				
NOR	0.73	0.64	0.68	0.76	0.69	13.45			
NZL	0.74	0.66	0.52	0.39	0.64	0.62	0.30		
USA	0.80	0.85	0.74	0.83	0.84	0.76	0.69	1.02	
NLD	0.78	0.85	0.78	0.88	0.90	0.83	0.55	0.91	4.55

RDC ude

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	9.44							
CAN	0.91	5.56						
DEU	0.92	0.95	11.53					
DFS	0.91	0.97	0.94	10.58				
GBR	0.92	0.90	0.95	0.87	1.80			
NOR	0.82	0.82	0.87	0.91	0.78	10.91		
USA	0.93	0.97	0.95	0.96	0.92	0.81	1.13	
NLD	0.93	0.95	0.98	0.94	0.96	0.87	0.97	4.82

RDC ftp

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	11.72								
CAN	0.88	5.17							
DEU	0.89	0.94	13.28						
DFS	0.84	0.94	0.88	11.80					
GBR	0.88	0.88	0.95	0.81	1.54				
NOR	0.72	0.81	0.76	0.90	0.68	12.36			
NZL	0.91	0.88	0.84	0.75	0.85	0.71	0.26		
USA	0.84	0.93	0.91	0.91	0.89	0.81	0.83	1.16	
NLD	0.90	0.96	0.97	0.93	0.94	0.81	0.86	0.91	3.83

RDC ftl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	10.28							
CAN	0.87	5.08						
DEU	0.94	0.89	13.85					
DFS	0.92	0.81	0.94	10.46				
GBR	0.93	0.85	0.96	0.90	1.53			
NOR	0.87	0.79	0.88	0.90	0.87	11.17		
USA	0.93	0.89	0.95	0.92	0.93	0.84	1.15	
NLD	0.96	0.90	0.98	0.94	0.96	0.90	0.95	4.92

RDC rtp

	AUS	CAN	DEU	DFS	NOR	NZL	NLD
AUS	6.89						
CAN	0.85	5.91					
DEU	0.89	0.96	14.24				
DFS	0.85	0.93	0.96	12.47			
NOR	0.58	0.71	0.59	0.43	12.56		
NZL	0.88	0.94	0.92	0.89	0.69	0.34	
NLD	0.87	0.98	0.97	0.94	0.68	0.94	4.42

RDC ocs

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.92								
CAN	0.63	5.89							
DEU	0.64	0.81	18.42						
DFS	0.60	0.71	0.70	9.37					
GBR	0.69	0.76	0.90	0.71	1.65				
NOR	0.37	0.41	0.72	0.66	0.45	15.69			
NZL	0.71	0.49	0.67	0.70	0.58	0.75	0.29		
USA	0.67	0.83	0.88	0.82	0.83	0.66	0.72	0.75	
NLD	0.63	0.79	0.87	0.86	0.89	0.62	0.66	0.88	3.26

RDC ous

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD
AUS	7.51								
CAN	0.70	5.91							
DEU	0.69	0.87	14.64						
DFS	0.53	0.78	0.83	10.98					
GBR	0.79	0.80	0.86	0.61	1.51				
NOR	0.69	0.79	0.73	0.81	0.68	10.83			
NZL	0.75	0.73	0.82	0.76	0.72	0.73	0.36		
USA	0.70	0.93	0.89	0.86	0.86	0.79	0.82	0.93	
NLD	0.68	0.88	0.91	0.83	0.89	0.81	0.82	0.91	4.62

RDC ofl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD
AUS	6.74							
CAN	0.21	6.38						
DEU	0.37	0.84	13.66					
DFS	0.36	0.79	0.76	13.07				
GBR	0.29	0.69	0.76	0.56	1.60			
NOR	0.64	0.61	0.72	0.37	0.50	9.45		
USA	0.46	0.71	0.75	0.52	0.71	0.68	1.04	
NLD	0.33	0.68	0.73	0.56	0.77	0.73	0.68	6.38

^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	92	60	85	33	105	78	16	13
CHE	77	0	128	361	51	229	421	32	13
FRA	53	95	0	134	46	81	134	26	11
ITA	70	310	105	0	66	154	431	47	13
NLD	25	46	37	47	0	47	62	21	7
USA	99	202	54	108	35	0	186	17	14
DEA	63	333	100	350	52	151	0	47	9
SVN	14	31	24	46	18	14	43	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	84	60	84	26	105	76	15	13
CHE	71	0	113	310	46	199	359	31	12
FRA	53	81	0	133	42	81	132	25	11
ITA	70	261	105	0	59	153	401	46	12
NLD	21	43	34	46	0	33	56	21	7
USA	99	173	54	108	26	0	168	16	14
DEA	62	276	99	318	50	126	0	45	8
SVN	13	29	23	45	18	13	42	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	85	58	80	26	76	9	13
CHE	73	0	127	360	50	421	19	13
FRA	52	95	0	133	42	134	14	11
ITA	67	308	105	0	60	429	29	13
NLD	21	46	34	46	0	57	13	7
DEA	63	333	100	349	51	0	28	9
SVN	8	17	14	27	11	26	0	4
GBR	12	11	11	11	7	8	3	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	GBR
CAN	0	91	60	13	104	13
CHE	77	0	123	25	227	13
FRA	53	90	0	24	81	11
NLD	10	24	20	0	17	3
USA	98	202	54	14	0	14
GBR	12	11	11	3	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	92	60	85	33	105	78	16	13
CHE	77	0	128	361	51	229	421	32	13
FRA	53	95	0	134	46	81	134	26	11
ITA	70	310	105	0	66	154	431	47	13
NLD	25	46	37	47	0	47	62	21	7
USA	99	202	54	108	35	0	186	17	14
DEA	63	333	100	350	52	151	0	47	9
SVN	14	31	24	46	18	14	43	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	SVN
CAN	0	92	60	33	105	78	13	9
CHE	77	0	127	50	228	416	13	19
FRA	53	94	0	46	81	134	11	14
NLD	25	45	37	0	47	62	7	13
USA	99	202	54	35	0	186	14	9
DEA	63	332	99	52	151	0	9	28
GBR	12	11	11	7	13	8	0	4
SVN	8	17	14	11	8	26	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	92	60	85	33	105	78	16	13
CHE	77	0	128	361	51	229	421	32	13
FRA	53	95	0	134	46	81	134	26	11
ITA	70	310	105	0	66	154	431	47	13
NLD	25	46	37	47	0	47	62	21	7
USA	99	202	54	108	35	0	186	17	14
DEA	63	333	100	350	52	151	0	47	9
SVN	14	31	24	46	18	14	43	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	92	60	85	25	105	78	16	13
CHE	77	0	128	361	49	229	421	32	13
FRA	53	95	0	134	42	81	134	26	11
ITA	70	310	105	0	59	154	431	47	13
NLD	20	45	34	45	0	32	56	21	7
USA	99	202	54	108	24	0	186	17	14
DEA	63	333	100	350	50	151	0	47	9
SVN	14	31	24	46	18	14	43	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	83	57	77	25	76	16
CHE	71	0	126	352	49	421	32
FRA	51	94	0	130	42	134	26
ITA	66	302	105	0	58	424	47
NLD	20	45	34	45	0	56	21
DEA	63	333	100	346	50	0	47
SVN	14	31	24	46	18	43	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	92	60	84	25	105	44	8	13
CHE	77	0	128	356	50	229	223	18	13
FRA	53	95	0	133	42	81	81	13	11
ITA	70	307	105	0	57	151	193	28	12
NLD	20	46	34	46	0	32	43	12	7
USA	99	202	54	108	25	0	89	8	14
DEA	36	164	54	161	39	61	0	25	6
SVN	7	16	13	26	10	7	23	0	4
GBR	12	11	11	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	92	60	85	26	105	78	16	13
CHE	77	0	128	361	50	229	421	32	13
FRA	53	95	0	134	42	81	134	26	11
ITA	70	310	105	0	60	154	431	47	13
NLD	21	46	34	46	0	33	57	21	7
USA	99	202	54	108	26	0	186	17	14
DEA	63	333	100	350	51	151	0	47	9
SVN	14	31	24	46	18	14	43	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	92	60	85	26	105	78	16
CHE	77	0	128	361	50	229	421	32
FRA	53	95	0	134	42	81	134	26
ITA	70	310	105	0	60	154	431	47
NLD	21	46	34	46	0	33	57	21
USA	99	202	54	108	26	0	186	17
DEA	63	333	100	350	51	151	0	47
SVN	14	31	24	46	18	14	43	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	92	60	85	33	105	78	8	13
CHE	77	0	128	361	51	229	421	18	13
FRA	53	95	0	134	46	81	134	13	11
ITA	70	310	105	0	66	154	431	28	13
NLD	25	46	37	47	0	47	62	12	7
USA	99	202	54	108	35	0	186	8	14
DEA	63	333	100	350	52	151	0	27	9
SVN	7	16	13	26	10	7	25	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	92	60	85	33	103	78	15	13
CHE	77	0	128	361	51	229	421	31	13
FRA	53	95	0	134	46	81	134	25	11
ITA	70	310	105	0	66	154	431	46	13
NLD	25	46	37	47	0	47	62	20	7
USA	98	202	54	108	35	0	186	16	14
DEA	63	333	100	350	52	151	0	46	9
SVN	13	30	23	45	17	13	42	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	92	60	33	105	67	14	13
CHE	77	0	127	50	228	385	30	13
FRA	53	94	0	46	81	124	24	11
NLD	25	45	37	0	47	56	20	7
USA	99	202	54	35	0	161	14	14
DEA	55	301	91	50	123	0	44	8
SVN	12	29	22	17	12	41	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	92	60	85	33	105	78	14	13
CHE	77	0	128	361	51	229	421	30	13
FRA	53	95	0	134	46	81	134	24	11
ITA	70	310	105	0	66	154	431	45	13
NLD	25	46	37	47	0	47	62	20	7
USA	99	202	54	108	35	0	186	15	14
DEA	63	333	100	350	52	151	0	45	9
SVN	12	29	22	44	17	12	41	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	83	57	77	21	43	14
CHE	71	0	126	346	46	223	30
FRA	51	94	0	130	39	81	24
ITA	66	298	105	0	53	192	45
NLD	17	44	32	44	0	43	19
DEA	36	164	54	161	39	0	36
SVN	12	29	22	44	17	32	0

BSW

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

CAN	0	84	49	84	33	105	44	9	13
CHE	71	0	90	308	45	199	219	19	12
FRA	46	68	0	100	35	65	71	14	10
ITA	70	259	83	0	63	151	193	29	12
NLD	25	43	31	47	0	47	43	13	7
USA	99	173	46	108	35	0	89	9	14
DEA	36	160	52	161	39	61	0	26	6
SVN	8	17	14	27	11	8	24	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	84	49	85	33	104	78	8	13
CHE	71	0	91	310	46	199	370	18	12
FRA	46	68	0	100	35	65	102	13	10
ITA	70	261	83	0	66	154	425	28	13
NLD	25	43	31	47	0	47	62	12	7
USA	98	173	46	108	35	0	184	8	14
DEA	62	287	78	347	52	147	0	27	9
SVN	7	16	13	26	10	7	25	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	84	49	83	33	105	78	9	13
CHE	71	0	91	307	46	199	370	19	12
FRA	46	68	0	99	35	65	102	14	10
ITA	70	260	83	0	63	150	421	29	12
NLD	25	43	31	47	0	47	62	13	7
USA	99	173	46	105	35	0	184	9	14
DEA	62	287	78	344	52	147	0	28	9
SVN	8	17	14	27	11	8	26	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	287	620	241	626	575	440	475	634	611	615	790	151	331	365	417	202	392
397	44	8	311	195	67	408												
BEL	208	0	350	228	509	401	348	417	429	459	597	435	194	243	308	190	156	233
322	33	32	256	134	78	366												
CAN	462	307	0	404	1434	841	915	767	1054	1215	810	2070	285	584	657	296	267	866
747	71	10	326	424	90	682												
CHE	183	209	271	0	432	325	311	288	357	362	352	419	269	220	230	163	136	224
264	19	6	215	135	47	280												
DEU	231	358	371	247	0	1631	1044	1491	1311	1962	1782	2163	385	744	1074	376	279	925
1268	107	92	455	342	138	802												
DFS	284	323	474	260	555	0	729	1010	1055	1206	1210	1331	193	560	778	389	279	620
863	81	23	441	302	120	708												
ESP	278	321	463	246	468	466	0	713	809	1002	754	1114	181	505	595	269	265	616
637	65	11	337	301	100	675												
FRA	240	375	375	236	376	373	466	0	975	1275	1118	1444	167	537	839	330	223	702
847	70	13	376	279	88	593												
GBR	424	391	949	336	536	627	640	477	0	1245	1180	1482	228	579	721	399	284	664
774	74	17	555	331	114	730												
ITA	332	378	701	288	828	710	701	465	862	0	1303	2050	265	707	915	400	306	859
1014	87	28	435	411	133	835												
NLD	421	609	595	327	808	799	606	478	868	878	0	1479	344	574	865	483	272	614
998	105	69	517	284	131	782												
USA	516	337	1711	323	600	660	638	524	1140	1076	947	0	340	809	1007	467	337	1350
1156	107	19	428	552	113	910												
CHR	115	175	231	279	247	167	133	149	204	219	310	304	0	121	169	95	78	115
178	12	30	136	78	43	169												
HUN	194	198	471	163	408	373	381	299	446	531	407	673	97	0	478	224	224	424
626	57	4	264	274	73	476												
POL	174	224	377	148	465	432	359	337	447	558	562	658	129	343	0	242	207	489
734	86	62	296	292	108	599												
NZL	290	136	233	134	187	223	209	152	291	270	414	372	75	170	130	0	150	249
267	25	3	277	122	37	282												
ZAF	179	138	253	124	197	231	249	173	268	268	240	344	67	202	157	131	0	208
233	30	5	168	163	50	266												
JPN	138	109	205	99	145	175	170	141	194	201	174	253	66	159	123	91	138	0
554	51	1	245	323	68	447												
CZE	195	222	440	175	682	441	423	431	487	630	753	755	121	524	455	162	176	130
0	71	24	311	317	114	581												
EST	14	24	26	8	46	36	27	21	29	37	62	62	7	31	44	10	14	10
33	0	0	39	30	21	63												
FRR	6	29	8	6	71	23	8	12	14	25	47	13	26	4	60	3	4	1
20	0	0	9	1	12	18												
IRL	254	244	299	212	297	337	325	289	602	374	459	386	125	221	206	226	167	114
231	18	9	0	141	60	344												
KOR	115	73	358	81	142	173	198	127	233	316	165	594	49	216	189	78	130	120
218	11	0	90	0	52	315												
SVN	41	64	66	32	111	99	76	61	91	117	108	91	34	56	87	27	37	33
87	15	11	47	29	0	95												
PRT	262	352	673	247	547	593	710	530	679	785	783	883	147	450	544	209	262	174
496	40	17	312	259	79	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	SVN												
AUS	0	292	612	240	624	571	420	597	628	610	643	782	151	331	365	411	249	391
396	44	8	309	195	405	42												
BEL	208	0	355	229	514	405	344	463	435	463	623	449	195	245	311	193	175	239
323	33	34	257	134	369	49												
CAN	461	307	0	404	1435	841	908	939	1054	1215	854	2070	285	584	658	296	318	866
747	71	12	326	424	682	65												
CHE	183	209	271	0	432	325	308	315	357	362	355	419	269	220	231	163	155	224
264	19	7	215	135	280	31												
DEU	231	358	371	247	0	1631	1016	1636	1312	1962	1832	2163	385	744	1077	376	324	925
1268	107	105	455	342	802	104												
DFS	284	323	474	260	555	0	707	1185	1056	1207	1247	1331	193	560	781	389	332	620
863	81	24	442	302	708	88												
ESP	270	307	457	241	424	442	0	786	788	974	750	1092	180	497	579	257	308	608
624	62	13	323	298	645	69												
FRA	278	399	433	262	460	398	468	0	1130	1436	1316	1883	177	589	905	422	307	867
896	75	15	432	315	665	65												
GBR	423	391	949	336	536	627	610	527	0	1245	1218	1483	228	579	723	399	341	664
774	74	19	556	331	731	81												
ITA	332	378	701	288	828	710	652	528	862	0	1340	2050	265	707	915	400	353	859
1014	87	29	435	412	835	99												
NLD	446	634	645	336	839	822	602	568	910	919	0	1590	357	586	879	497	325	650
1011	107	80	524	296	803	92												
USA	514	337	1711	323	600	660	620	724	1140	1076	1152	0	340	809	1009	467	404	1350
1156	107	21	429	553	910	81												
CHR	115	176	231	279	247	167	130	152	204	219	321	304	0	121	169	95	82	115
178	12	35	136	78	169	27												
HUN	194	198	471	163	408	373	373	314	446	531	424	673	97	0	479	224	250	424
626	57	4	264	275	476	56												
POL	174	224	377	148	465	432	341	352	448	558	572	658	129	343	0	242	232	490
734	86	65	296	292	600	83												
NZL	289	136	233	134	187	223	201	181	291	270	433	372	75	170	130	0	186	249
267	25	4	277	122	282	27												
ZAF	210	149	293	138	221	255	285	212	316	298	296	426	68	217	164	165	0	251
253	31	5	205	181	303	32												
JPN	138	109	205	99	145	175	168	146	194	201	176	253	66	159	123	91	143	0
554	51	1	245	323	447	47												
CZE	195	222	440	175	682	441	405	462	487	630	770	755	121	524	455	162	188	130
0	71	24	311	317	581	86												
EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	63	17												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	19	7												
IRL	254	244	299	212	297	337	306	316	602	374	470	386	125	221	206	226	196	114
231	18	9	0	142	344	39												
KOR	115	73	358	81	142	173	197	134	233	316	172	595	49	217	189	78	143	120
218	11	0	90	0	316	39												
PRT	262	352	673	247	547	593	660	563	679	785	808	883	147	450	544	209	288	174
496	40	18	312	260	0	67												
SVN	26	41	49	23	85	73	49	45	65	86	77	68	24	42	67	20	24	21
67	11	7	34	22	56	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	SVN															
8	AUS	0	281	620	241	625	574	437	475	631	611	268	788	330	363	248	392	395	42
32	BEL	309	195	408	41														
12	CAN	251	129	360	48														
7	CHE	462	305	0	402	1433	837	913	767	1052	1214	427	2070	584	657	317	866	746	70
105	DEU	325	424	682	65														
24	DFS	183	208	271	0	429	325	310	288	356	360	210	418	220	230	154	224	263	19
13	ESP	214	135	279	31														
13	FRA	231	356	371	246	0	1619	1034	1490	1309	1959	858	2160	741	1072	323	924	1264	106
19	GBR	454	342	801	103														
28	ITA	284	322	474	260	555	0	720	1006	1045	1199	588	1322	556	769	331	617	857	79
37	NLD	440	302	706	87														
21	USA	275	315	461	246	454	457	0	707	802	993	393	1108	502	587	313	614	630	63
4	HUN	333	301	667	68														
65	POL	240	375	375	236	376	373	453	0	974	1275	532	1443	536	838	254	702	847	68
5	ZAF	375	279	593	65														
1	JPN	424	388	949	336	535	627	633	477	0	1242	540	1475	575	714	338	663	768	71
24	CZE	548	331	728	80														
0	EST	332	374	701	286	826	710	685	465	858	0	644	2046	705	912	351	859	1010	85
9	KOR	433	411	835	98														
18	PRT	205	304	355	188	433	490	313	291	446	491	0	620	290	517	160	245	588	67
7	SVN	248	147	396	83														
0	IRL	516	333	1711	323	600	660	634	524	1139	1075	435	0	807	1006	402	1350	1151	106
0	FRR	425	551	909	81														
9	KOR	194	197	471	163	408	373	379	299	445	530	213	672	0	477	250	424	624	57
0	IRL	261	274	474	56														
0	KOR	174	223	377	148	465	430	352	337	445	557	394	657	343	0	230	489	728	85
0	PRT	293	292	598	82														
0	IRL	210	149	293	138	221	255	290	182	316	298	139	425	217	164	0	251	250	30
0	IRL	203	181	302	32														
0	IRL	138	109	205	99	145	175	170	141	194	201	109	253	159	123	143	0	554	51
0	IRL	244	323	447	47														
0	IRL	195	221	440	175	682	441	418	431	485	630	522	754	524	453	188	130	0	67
0	IRL	308	317	579	85														
0	IRL	14	24	26	8	46	36	26	21	29	37	44	62	31	44	14	10	32	0
0	IRL	37	30	62	16														
0	IRL	6	29	8	6	80	24	8	12	15	26	28	13	4	60	4	1	20	0
0	IRL	9	1	19	7														
0	IRL	254	244	299	212	296	337	320	289	596	374	244	386	221	205	196	114	231	18
0	IRL	0	141	343	39														
0	IRL	115	73	358	81	142	173	197	127	233	315	92	592	216	189	143	120	218	11
0	IRL	90	0	315	39														
0	IRL	262	351	673	247	547	593	694	530	679	785	389	883	450	544	288	174	496	40
0	IRL	312	259	0	66														
0	IRL	26	41	49	23	85	73	50	45	65	86	76	68	42	67	24	21	66	11
0	IRL	34	22	56	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	293	620	241	626	576	426	605	634	611	668	790	151	331	367	417	249	392
397	44	8	311	197	67	408												
BEL	208	0	355	229	514	406	341	463	435	463	644	449	195	245	311	193	175	239
323	33	34	257	136	78	369												
CAN	462	307	0	404	1435	841	906	939	1054	1215	885	2070	285	584	658	296	318	866
747	71	12	326	428	90	682												
CHE	183	209	271	0	432	325	306	315	357	362	359	419	269	220	231	163	155	224
264	19	7	215	137	47	280												
DEU	231	358	371	247	0	1631	1010	1636	1312	1962	1873	2163	385	744	1077	376	324	925
1268	107	105	455	346	138	802												
DFS	283	322	474	260	555	0	703	1186	1057	1208	1288	1332	193	561	782	390	332	620
863	81	24	443	305	120	709												
ESP	269	305	456	240	420	437	0	782	782	967	760	1088	180	495	577	257	308	605
622	62	13	321	300	96	641												
FRA	278	399	433	262	460	395	463	0	1130	1436	1429	1883	177	589	905	422	307	867
896	75	15	432	319	89	665												
GBR	424	391	949	336	536	625	605	527	0	1245	1244	1483	228	579	723	399	341	664
774	74	19	557	334	114	731												
ITA	332	378	701	288	828	709	646	528	862	0	1363	2050	265	707	915	400	353	859
1014	87	29	435	417	133	835												
NLD	449	658	652	336	847	823	600	591	921	923	0	1717	367	595	888	510	335	683
1015	108	83	530	304	131	813												
USA	516	337	1711	323	600	660	617	724	1140	1076	1189	0	340	809	1009	467	404	1350
1156	107	21	430	560	113	910												
CHR	115	176	231	279	247	167	130	152	204	219	325	304	0	121	169	95	82	115
178	12	35	136	78	43	169												
HUN	194	198	471	163	408	371	372	314	446	531	424	673	97	0	479	224	250	424
626	57	4	264	277	73	476												
POL	174	224	377	148	465	432	339	352	448	558	573	658	129	343	0	242	232	490
734	86	65	296	294	108	600												
NZL	290	136	233	134	187	223	200	181	291	270	435	372	75	170	130	0	186	249
267	25	4	277	124	37	282												
ZAF	210	149	293	138	221	255	285	212	316	298	298	426	68	217	164	165	0	251
253	31	5	205	182	50	303												
JPN	138	109	205	99	145	175	167	146	194	201	176	253	66	159	123	91	143	0
554	51	1	245	325	68	447												
CZE	195	222	440	175	682	439	403	462	487	630	770	755	121	524	455	162	188	130
0	71	24	311	318	114	581												
EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	21	63												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	12	19												
IRL	254	244	299	212	297	336	305	316	603	374	473	386	125	221	206	226	196	114
231	18	9	0	144	60	344												
KOR	116	74	360	82	143	174	197	135	235	318	176	602	49	218	190	79	144	120
219	11	0	91	0	52	317												
SVN	41	64	66	32	111	99	70	61	91	117	110	91	34	56	87	27	37	33
87	15	11	47	29	0	95												
PRT	262	352	673	247	547	591	655	563	679	785	815	883	147	450	544	209	288	174
496	40	18	312	260	79	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	SVN												
AUS	0	268	620	241	626	576	426	605	634	611	666	790	151	331	367	417	249	202
397	44	8	311	194	408	42												
BEL	207	0	338	224	491	385	325	425	413	440	565	408	192	230	298	178	163	149
308	33	32	248	125	350	49												
CAN	462	302	0	404	1435	841	906	939	1054	1215	882	2070	285	584	658	296	318	565
747	71	12	326	423	682	65												
CHE	183	209	271	0	432	325	307	315	357	362	357	419	269	220	231	163	155	158
264	19	7	215	134	280	31												
DEU	231	355	371	247	0	1631	1011	1636	1312	1962	1868	2163	385	744	1077	376	324	649
1268	107	105	455	341	802	104												
DFS	284	321	474	260	555	0	703	1186	1057	1208	1280	1332	193	561	782	390	332	393
863	81	24	443	301	709	88												
ESP	269	304	456	240	421	439	0	782	783	968	758	1088	180	495	577	257	308	429
622	62	13	321	296	642	69												
FRA	278	394	433	262	460	398	463	0	1130	1436	1417	1883	177	589	905	422	307	534
896	75	15	432	314	665	65												
GBR	424	386	949	336	536	627	606	527	0	1245	1242	1483	228	579	723	399	341	427
774	74	19	557	330	731	81												
ITA	332	374	701	288	828	710	647	528	862	0	1361	2050	265	707	915	400	353	610
1014	87	29	435	411	835	99												
NLD	449	578	652	336	846	823	600	591	920	923	0	1710	367	595	887	509	335	439
1015	107	83	529	298	812	92												
USA	516	328	1711	323	600	660	617	724	1140	1076	1186	0	340	809	1009	467	404	833
1156	107	21	430	551	910	81												
CHR	115	174	231	279	247	167	130	152	204	219	325	304	0	121	169	95	82	92
178	12	35	136	77	169	27												
HUN	194	196	471	163	408	373	372	314	446	531	424	673	97	0	479	224	250	306
626	57	4	264	274	476	56												
POL	174	223	377	148	465	432	339	352	448	558	573	658	129	343	0	242	232	389
734	86	65	296	291	600	83												
NZL	290	133	233	134	187	223	200	181	291	270	435	372	75	170	130	0	186	136
267	25	4	277	121	282	27												
ZAF	210	147	293	138	221	255	285	212	316	298	298	426	68	217	164	165	0	154
253	31	5	205	180	303	32												
JPN	106	85	168	84	121	147	130	121	155	170	140	203	63	130	114	70	103	0
414	39	1	161	236	293	44												
CZE	195	221	440	175	682	441	403	462	487	630	770	755	121	524	455	162	188	114
0	71	24	311	316	581	86												
EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	63	17												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	19	7												
IRL	254	242	299	212	297	337	305	316	603	374	473	386	125	221	206	226	196	93
231	18	9	0	141	344	39												
KOR	115	73	359	81	142	173	196	134	233	316	175	595	49	217	189	78	144	106
218	11	0	90	0	315	39												
PRT	262	346	673	247	547	593	656	563	679	785	814	883	147	450	544	209	288	139
496	40	18	312	260	0	67												
SVN	26	41	49	23	85	73	49	45	65	86	77	68	24	42	67	20	24	21
67	11	7	34	22	56	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	293	620	241	626	576	435	605	634	611	668	790	151	331	367	417	249	392
397	44	8	311	195	67	408												
BEL	208	0	355	229	514	406	347	463	435	463	644	449	195	245	311	193	175	239
323	33	34	257	134	78	369												
CAN	462	307	0	404	1435	841	912	939	1054	1215	885	2070	285	584	658	296	318	866
747	71	12	326	422	90	682												
CHE	183	209	271	0	432	325	310	315	357	362	359	419	269	220	231	163	155	224
264	19	7	215	135	47	280												
DEU	231	358	371	247	0	1631	1029	1636	1312	1962	1873	2163	385	744	1077	376	324	925
1268	107	105	455	340	138	802												
DFS	284	323	474	260	555	0	718	1186	1057	1208	1288	1332	193	561	782	390	332	620
863	81	24	443	301	120	709												
ESP	273	312	459	244	443	452	0	799	801	989	779	1105	181	501	587	266	312	612
631	63	13	331	299	97	659												
FRA	278	399	433	262	460	398	486	0	1130	1436	1429	1883	177	589	905	422	307	867
896	75	15	432	314	89	665												
GBR	424	391	949	336	536	627	625	527	0	1245	1244	1483	228	579	723	399	341	664
774	74	19	557	330	114	731												
ITA	332	378	701	288	828	710	674	528	862	0	1363	2050	265	707	915	400	353	859
1014	87	29	435	410	133	835												
NLD	449	658	652	336	847	823	620	591	921	923	0	1717	367	595	888	510	335	683
1015	108	83	530	299	131	813												
USA	516	337	1711	323	600	661	630	724	1140	1076	1189	0	340	809	1009	467	404	1350
1156	107	21	430	549	113	910												
CHR	115	176	231	279	247	167	132	152	204	219	325	304	0	121	169	95	82	115
178	12	35	136	78	43	169												
HUN	194	198	471	163	408	373	376	314	446	531	424	673	97	0	479	224	250	424
626	57	4	264	274	73	476												
POL	174	224	377	148	465	432	346	352	448	558	573	658	129	343	0	242	232	490
734	86	65	296	291	108	600												
NZL	290	136	233	134	187	223	205	181	291	270	435	372	75	170	130	0	186	249
267	25	4	277	122	37	282												
ZAF	210	149	293	138	221	255	289	212	316	298	298	426	68	217	164	165	0	251
253	31	5	205	181	50	303												
JPN	138	109	205	99	145	175	169	146	194	201	176	253	66	159	123	91	143	0
554	51	1	245	323	68	447												
CZE	195	222	440	175	682	441	412	462	487	630	770	755	121	524	455	162	188	130
0	71	24	311	316	114	581												
EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	21	63												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	12	19												
IRL	254	244	299	212	297	337	315	316	603	374	473	386	125	221	206	226	196	114
231	18	9	0	141	60	344												
KOR	115	73	355	81	142	173	197	133	232	314	174	591	49	216	189	78	143	120
218	11	0	90	0	52	314												
SVN	41	64	66	32	111	99	72	61	91	117	110	91	34	56	87	27	37	33
87	15	11	47	29	0	95												
PRT	262	352	673	247	547	593	682	563	679	785	815	883	147	450	544	209	288	174
496	40	18	312	259	79	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	231	437	208	480	433	342	310	490	457	464	516	140	264	276	181	268	251
37	8	261	108	63	332													
BEL	197	0	318	220	471	369	320	337	395	422	527	387	189	226	273	144	202	246
32	30	234	86	75	338													
CAN	351	297	0	384	1354	747	843	615	959	1153	745	1876	269	563	606	256	742	613
66	10	298	321	87	641													
CHE	172	205	268	0	432	324	310	246	357	361	347	419	269	220	210	136	218	203
19	6	208	93	47	274													
DEU	215	342	367	247	0	1630	1034	1218	1310	1960	1738	2163	385	743	1025	279	888	1037
107	93	437	262	135	793													
DFS	270	315	471	260	555	0	715	789	1051	1198	1172	1330	193	558	729	279	575	677
81	23	417	217	119	696													
ESP	253	308	449	246	460	460	0	586	797	992	725	1104	180	503	556	265	578	527
65	12	318	220	100	659													
FRA	180	301	303	200	302	310	385	0	759	1032	897	1097	148	454	737	180	550	663
58	9	293	200	79	485													
GBR	371	374	876	336	536	625	635	372	0	1242	1129	1475	228	578	678	284	616	620
73	17	513	244	111	719													
ITA	300	366	690	288	827	709	692	390	858	0	1264	2043	265	706	877	305	815	849
87	29	415	319	130	828													
NLD	359	537	575	324	794	794	587	404	843	865	0	1385	340	558	814	267	579	847
104	71	468	214	128	760													
USA	398	323	1598	323	600	660	635	389	1139	1074	916	0	340	808	958	337	1221	948
107	19	402	419	110	899													
CHR	113	173	217	279	247	167	133	139	204	219	307	304	0	121	166	78	113	149
12	31	133	61	40	169													
HUN	184	192	465	163	408	373	380	254	446	531	410	673	97	0	454	224	409	510
57	4	253	220	72	473													
POL	159	211	356	137	444	408	327	299	426	543	538	628	127	326	0	192	455	632
84	65	260	244	105	561													
ZAF	174	135	250	124	197	231	249	137	268	268	238	344	67	202	148	0	200	191
30	5	164	117	49	264													
JPN	132	108	202	99	144	173	166	123	192	198	171	249	66	157	117	138	0	444
49	1	217	237	68	422													
CZE	143	177	362	130	553	361	318	315	375	519	659	603	107	415	399	139	116	0
63	23	234	246	105	471													
EST	14	24	26	8	46	36	27	17	29	37	62	62	7	31	43	14	10	28
0	0	37	25	21	62													
FRR	6	28	8	6	72	23	8	8	14	26	48	13	26	4	60	4	1	19
0	0	9	1	10	18													
IRL	235	235	296	211	295	335	319	229	570	370	443	380	125	219	192	166	113	176
18	9	0	87	59	330													
KOR	62	54	269	60	108	130	133	108	159	243	119	441	41	168	168	86	91	175
9	0	56	0	44	239													
SVN	41	62	65	32	109	99	75	55	90	115	107	90	33	55	86	37	33	83
15	10	47	27	0	95													
PRT	244	337	637	241	537	580	687	459	666	777	764	866	147	446	515	260	170	392
39	17	305	198	79	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	265	612	162	325	570	430	596	628	608	633	782	150	329	363	249	391	394
42	8	308	194	65	405													
BEL	207	0	335	167	338	382	330	422	412	435	558	406	189	229	296	163	217	306
32	32	247	126	77	350													
CAN	461	302	0	305	964	840	913	924	1054	1211	838	2070	283	581	653	318	866	741
69	12	326	423	88	682													
CHE	138	157	202	0	268	225	223	220	253	272	254	306	241	160	168	95	151	187
14	5	145	103	41	193													
DEU	157	257	276	163	0	931	724	968	804	1340	1129	1320	272	489	769	183	566	859
77	42	268	235	115	501													
DFS	284	320	474	190	388	0	723	1157	1054	1199	1232	1328	191	556	776	332	620	855
79	24	442	301	118	707													
ESP	275	314	461	161	298	457	0	792	804	991	759	1109	180	500	587	313	614	631
62	13	334	301	96	667													
FRA	278	394	433	176	271	397	495	0	1115	1420	1273	1844	176	585	896	306	854	889
74	14	426	309	88	662													
GBR	423	386	949	229	354	627	633	527	0	1243	1200	1481	226	577	718	340	664	768
73	19	552	330	113	730													
ITA	332	371	701	208	549	708	685	527	861	0	1314	2047	260	702	905	352	856	1006
84	28	433	410	131	834													
NLD	442	576	639	235	534	819	621	554	901	911	0	1545	352	577	863	323	642	1000
105	76	517	292	129	795													
USA	514	328	1711	229	380	660	634	689	1140	1076	1136	0	338	806	1002	404	1350	1151
106	20	428	548	111	910													
CHR	115	174	231	253	185	167	133	152	204	218	319	304	0	119	165	81	113	174
12	35	135	77	42	168													
HUN	194	195	471	118	275	370	379	314	446	529	421	673	97	0	476	249	423	622
55	4	263	273	71	475													
POL	174	222	377	117	362	429	352	352	446	554	564	658	128	341	0	231	487	727
83	64	294	291	105	597													
ZAF	210	147	293	85	130	255	290	212	316	298	292	426	68	217	164	0	251	252
31	5	205	181	50	303													
JPN	138	109	205	83	109	175	170	146	194	201	175	253	66	159	123	143	0	551
50	1	245	323	66	447													
CZE	195	219	440	124	483	440	418	462	486	625	767	755	120	522	452	188	130	0
68	24	310	316	112	579													
EST	14	23	26	6	32	35	26	21	28	36	62	62	7	30	42	14	10	31
0	0	38	30	20	63													
FRR	6	30	8	5	31	24	8	12	15	26	49	13	26	4	60	4	1	20
0	0	9	1	12	19													
IRL	254	242	299	144	196	337	320	316	598	374	469	386	125	221	206	196	114	231
18	9	0	141	59	344													
KOR	115	73	358	68	110	173	196	133	233	314	170	587	49	216	189	143	120	218
11	0	90	0	52	313													
SVN	41	63	66	31	100	97	73	61	91	115	109	91	34	55	85	37	33	86
14	11	47	29	0	94													
PRT	262	346	673	164	385	593	694	563	679	785	803	883	147	450	544	288	174	496
40	18	312	258	79	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	287	620	241	626	575	437	559	634	611	615	790	151	331	366	417	249	392
397	44	8	311	195	67	408												
BEL	208	0	351	229	509	402	346	444	430	460	598	436	194	243	309	190	174	233
322	33	34	256	134	78	367												
CAN	462	307	0	404	1434	841	913	860	1054	1215	810	2070	285	584	658	296	318	866
747	71	12	326	425	90	682												
CHE	183	209	271	0	432	325	311	310	357	362	352	419	269	220	231	163	155	224
264	19	7	215	135	47	280												
DEU	231	358	371	247	0	1631	1036	1600	1312	1962	1783	2163	385	744	1076	376	324	925
1268	107	105	455	343	138	802												
DFS	284	323	474	260	555	0	723	1108	1056	1206	1210	1331	193	560	781	389	332	620
863	81	24	442	303	120	708												
ESP	276	315	461	246	455	457	0	765	805	996	748	1109	181	503	591	267	313	614
634	64	13	334	302	98	668												
FRA	277	397	430	262	457	395	496	0	1073	1381	1228	1682	172	575	893	388	292	789
886	72	14	414	298	89	646												
GBR	424	391	949	336	536	627	633	522	0	1245	1181	1483	228	579	723	399	341	664
774	74	19	556	331	114	731												
ITA	332	378	701	288	828	710	688	523	862	0	1303	2050	265	707	915	400	353	859
1014	87	29	435	413	133	835												
NLD	421	609	596	327	808	798	596	539	869	879	0	1481	344	574	866	483	316	614
998	105	74	517	285	131	783												
USA	516	337	1711	323	600	661	634	653	1140	1076	947	0	340	809	1009	467	404	1350
1156	107	21	429	554	113	910												
CHR	115	175	231	279	247	167	133	152	204	219	310	304	0	121	169	95	82	115
178	12	35	136	78	43	169												
HUN	194	198	471	163	408	373	379	313	446	531	407	673	97	0	479	224	250	424
626	57	4	264	276	73	476												
POL	174	224	377	148	465	432	353	352	448	558	564	658	129	343	0	242	232	490
734	86	65	296	293	108	600												
NZL	290	136	233	134	187	223	207	179	291	270	414	372	75	170	130	0	186	249
267	25	4	277	122	37	282												
ZAF	210	149	293	138	221	255	290	210	316	298	278	426	68	217	164	165	0	251
253	31	5	205	181	50	303												
JPN	138	109	205	99	145	175	170	146	194	201	174	253	66	159	123	91	143	0
554	51	1	245	323	68	447												
CZE	195	222	440	175	682	441	419	460	487	630	753	755	121	524	455	162	188	130
0	71	24	311	317	114	581												
EST	14	24	26	8	46	36	26	21	29	37	62	62	7	31	44	10	14	10
33	0	0	39	30	21	63												
FRR	6	30	8	6	80	24	8	12	15	26	49	13	26	4	60	4	4	1
20	0	0	9	1	12	19												
IRL	254	244	299	212	297	337	321	314	602	374	458	386	125	221	206	226	196	114
231	18	9	0	142	60	344												
KOR	115	73	358	81	142	173	198	133	233	316	165	595	49	217	189	78	143	120
218	11	0	90	0	52	316												
SVN	41	64	66	32	111	99	73	61	91	117	108	91	34	56	87	27	37	33
87	15	11	47	29	0	95												
PRT	262	352	673	247	547	593	696	560	679	785	783	883	147	450	544	209	288	174
496	40	18	312	260	79	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	287	620	241	626	527	433	602	634	611	645	790	151	331	367	417	248	392
397	44	8	311	195	67	408												
BEL	208	0	351	229	509	395	345	452	430	460	610	436	194	243	309	190	173	233
322	33	34	256	134	78	367												
CAN	462	307	0	404	1435	761	911	924	1054	1215	854	2070	285	584	658	296	318	866
747	71	12	326	425	90	682												
CHE	183	209	271	0	432	309	309	313	357	362	355	419	269	220	231	163	154	224
264	19	7	215	135	47	280												
DEU	231	358	371	247	0	1541	1024	1624	1312	1962	1832	2163	385	744	1077	376	323	925
1268	107	105	455	343	138	802												
DFS	284	322	474	260	553	0	670	1075	996	1155	1211	1235	190	544	757	361	303	564
830	77	24	423	289	120	683												
ESP	273	309	458	242	434	445	0	781	794	982	755	1098	181	497	582	260	310	610
626	63	13	326	299	97	650												
FRA	278	399	433	262	458	397	475	0	1117	1422	1310	1844	177	587	901	418	305	854
892	74	15	427	311	89	662												
GBR	424	391	948	336	535	625	613	526	0	1245	1218	1483	228	579	723	399	340	664
774	74	19	556	331	114	731												
ITA	332	378	701	288	828	708	662	527	861	0	1340	2050	265	707	915	400	352	859
1014	87	29	435	413	133	835												
NLD	446	630	645	336	839	821	607	567	909	919	0	1590	357	586	879	497	324	650
1011	107	80	524	297	131	803												
USA	516	337	1711	323	600	660	623	689	1140	1076	1152	0	340	809	1009	467	403	1350
1156	107	21	429	554	113	910												
CHR	115	175	231	279	247	167	132	152	204	219	321	304	0	121	169	95	82	115
178	12	35	136	78	43	169												
HUN	194	198	471	163	408	373	373	314	446	531	424	673	97	0	479	224	250	424
626	57	4	264	276	73	476												
POL	174	224	377	148	465	432	343	352	448	558	572	658	129	343	0	242	232	490
734	86	65	296	293	108	600												
NZL	290	136	233	134	187	223	202	181	291	270	433	372	75	170	130	0	185	249
267	25	4	277	122	37	282												
ZAF	210	149	293	138	221	254	287	212	316	298	296	426	68	217	164	165	0	251
253	31	5	204	181	50	303												
JPN	138	109	205	99	145	175	168	146	194	201	176	253	66	159	123	91	143	0
554	51	1	245	323	68	447												
CZE	195	222	440	175	682	441	407	462	487	630	770	755	121	524	455	162	188	130
0	71	24	311	317	114	581												
EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	21	63												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	12	19												
IRL	254	244	299	212	297	336	309	316	602	374	470	386	125	221	206	226	196	114
231	18	9	0	142	60	344												
KOR	115	73	359	81	142	173	197	134	233	316	172	596	49	217	189	78	144	120
218	11	0	90	0	52	316												
SVN	41	64	66	32	111	99	72	61	91	117	110	91	34	56	87	27	37	33
87	15	11	47	29	0	95												
PRT	262	352	673	247	547	589	669	563	679	785	808	883	147	450	544	209	288	174
496	40	18	312	260	79	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	287	620	241	626	576	444	605	634	611	668	790	151	331	367	417	249	392
397	44	8	311	194	67	408												
BEL	208	0	351	229	509	403	350	453	430	460	616	436	194	243	309	190	174	233
322	33	34	256	133	78	367												
CAN	462	307	0	404	1435	841	917	939	1054	1215	885	2070	285	584	658	296	318	866
747	71	12	326	421	90	682												
CHE	183	209	271	0	432	325	311	315	357	362	359	419	269	220	231	163	155	224
264	19	7	215	134	47	280												
DEU	231	358	371	247	0	1631	1050	1636	1312	1962	1873	2163	385	744	1077	376	324	925
1268	107	105	455	339	138	802												
DFS	284	323	475	260	555	0	733	1186	1057	1208	1288	1332	193	561	782	390	332	620
863	81	24	443	300	120	709												
ESP	280	323	463	248	475	470	0	816	813	1007	796	1118	181	507	600	270	314	618
638	65	13	338	300	100	680												
FRA	278	399	433	262	460	398	519	0	1130	1436	1429	1883	177	589	905	422	307	867
896	75	15	432	313	89	665												
GBR	424	391	949	336	536	627	643	527	0	1245	1244	1483	228	579	723	399	341	664
774	74	19	557	329	114	731												
ITA	332	378	701	288	828	710	705	528	862	0	1363	2050	265	707	915	400	353	859
1014	87	29	435	409	133	835												
NLD	449	637	652	336	847	823	642	591	921	923	0	1717	367	595	888	510	335	683
1015	108	83	530	298	131	813												
USA	516	337	1711	323	600	662	640	724	1140	1076	1189	0	340	809	1009	467	404	1350
1156	107	21	430	547	113	910												
CHR	115	175	231	279	247	167	135	152	204	219	325	304	0	121	169	95	82	115
178	12	35	136	77	43	169												
HUN	194	198	471	163	408	374	385	314	446	531	424	673	97	0	479	224	250	424
626	57	4	264	273	73	476												
POL	174	224	377	148	465	432	366	352	448	558	573	658	129	343	0	242	232	490
734	86	65	296	290	108	600												
NZL	290	136	233	134	187	223	209	181	291	270	435	372	75	170	130	0	186	249
267	25	4	277	121	37	282												
ZAF	210	149	293	138	221	256	291	212	316	298	298	426	68	217	164	165	0	251
253	31	5	205	180	50	303												
JPN	138	109	205	99	145	175	170	146	194	201	176	253	66	159	123	91	143	0
554	51	1	245	322	68	447												
CZE	195	222	440	175	682	441	425	462	487	630	770	755	121	524	455	162	188	130
0	71	24	311	316	114	581												
EST	14	24	26	8	46	36	28	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	21	63												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	12	19												
IRL	254	244	299	212	297	337	327	316	603	374	473	386	125	221	206	226	196	114
231	18	9	0	140	60	344												
KOR	114	72	354	80	141	172	196	132	231	313	173	589	48	215	189	77	142	119
218	11	0	89	0	52	313												
SVN	41	64	66	32	111	99	77	61	91	117	110	91	34	56	87	27	37	33
87	15	11	47	29	0	95												
PRT	262	352	673	247	547	593	717	563	679	785	815	883	147	450	544	209	288	174
496	40	18	312	258	79	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														
44	AUS	0	290	612	240	624	572	420	597	628	610	664	782	151	331	365	249	391	396
33	BEL	8	308	195	67	405													
71	CAN	34	255	132	78	367													
19	CHE	461	306	0	404	1435	841	908	939	1054	1215	885	2070	282	584	658	318	866	747
107	DEU	12	326	424	90	682													
81	DFS	183	209	271	0	432	325	308	315	357	362	359	419	269	220	231	155	224	264
62	ESP	7	215	135	47	280													
74	FRA	231	358	371	247	0	1631	1014	1636	1312	1962	1873	2163	381	744	1077	324	925	1268
87	GBR	105	455	342	138	802													
108	ITA	284	323	475	260	555	0	707	1186	1057	1208	1288	1332	192	561	782	332	620	863
107	NLD	24	443	302	120	709													
51	USA	270	306	457	241	423	442	0	785	788	973	763	1092	178	497	578	308	608	623
57	CHR	13	323	298	96	644													
86	HUN	278	399	433	262	460	398	467	0	1130	1436	1429	1883	175	589	905	307	867	896
31	POL	15	432	315	89	665													
71	ZAF	423	391	949	336	536	627	610	527	0	1245	1244	1483	226	579	723	341	664	774
40	JPN	19	554	331	114	731													
40	CZE	332	378	701	288	828	710	651	528	862	0	1363	2050	263	707	915	353	859	1014
0	EST	29	435	412	133	835													
18	FRR	449	654	652	336	847	823	603	591	921	923	0	1717	357	595	888	335	683	1015
11	IRL	83	530	300	131	813													
15	KOR	514	336	1711	323	600	662	620	724	1140	1076	1189	0	335	809	1009	404	1350	1156
15	SVN	21	430	553	113	910													
18	PRT	115	176	228	279	247	167	130	152	204	219	320	300	0	120	168	82	114	178
11	AUS	34	136	77	43	169													
11	BEL	194	198	471	163	408	374	373	314	446	531	424	673	97	0	479	250	424	626
15	CAN	4	264	275	73	476													
15	CHE	174	224	377	148	465	432	340	352	448	558	573	658	129	343	0	232	490	734
15	DEU	65	296	292	108	600													
15	ESP	210	149	293	138	221	256	285	212	316	298	298	426	68	217	164	0	251	253
15	FRA	5	205	181	50	303													
15	GBR	138	109	205	99	145	175	168	146	194	201	176	253	66	159	123	143	0	554
15	ITA	1	245	323	68	447													
15	NLD	195	222	440	175	682	441	404	462	487	630	770	755	121	524	455	188	130	0
15	USA	24	311	317	114	581													
15	CHR	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	14	10	33
15	HUN	0	39	30	21	63													
15	POL	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	1	20
15	ZAF	0	9	1	12	19													
15	JPN	254	244	299	212	297	337	306	316	600	374	473	386	125	221	206	196	114	231
15	CZE	9	0	142	60	344													
15	AUS	115	73	359	81	142	173	197	134	233	316	175	596	49	217	189	144	120	218
15	BEL	0	90	0	52	316													
15	CAN	41	64	66	32	111	99	70	61	91	117	110	91	34	56	87	37	33	87
15	DEU	11	47	29	0	95													
15	ESP	262	351	673	247	547	593	659	563	679	785	815	883	147	450	544	288	174	496
15	FRA	18	312	260	79	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	287	620	241	626	576	430	605	634	611	668	790	151	331	367	417	249	392
397	44	8	311	195	65	408												
BEL	208	0	351	229	509	403	344	453	430	460	616	436	194	243	309	190	174	233
322	33	34	256	134	76	367												
CAN	462	307	0	404	1435	841	910	939	1054	1215	885	2070	285	584	658	296	318	866
747	71	12	326	425	88	682												
CHE	183	209	271	0	432	325	308	315	357	362	359	419	269	220	231	163	155	224
264	19	7	215	135	46	280												
DEU	231	358	371	247	0	1631	1018	1636	1312	1962	1873	2163	385	744	1077	376	324	925
1268	107	105	455	343	136	802												
DFS	284	323	475	260	555	0	710	1186	1057	1208	1288	1332	193	561	782	390	332	620
863	81	24	443	303	119	709												
ESP	271	307	458	241	428	443	0	789	791	977	767	1095	181	497	580	257	308	610
625	63	13	325	299	95	646												
FRA	278	399	433	262	460	398	470	0	1130	1436	1429	1883	177	589	905	422	307	867
896	75	15	432	315	87	665												
GBR	424	391	949	336	536	627	612	527	0	1245	1244	1483	228	579	723	399	341	664
774	74	19	557	331	112	731												
ITA	332	378	701	288	828	710	657	528	862	0	1363	2050	265	707	915	400	353	859
1014	87	29	435	413	131	835												
NLD	449	637	652	336	847	823	606	591	921	923	0	1717	367	595	888	510	335	683
1015	108	83	530	301	129	813												
USA	516	337	1711	323	600	661	621	724	1140	1076	1189	0	340	809	1009	467	404	1350
1156	107	21	430	554	111	910												
CHR	115	175	231	279	247	167	131	152	204	219	325	304	0	121	169	95	82	115
178	12	35	136	78	41	169												
HUN	194	198	471	163	408	374	373	314	446	531	424	673	97	0	479	224	250	424
626	57	4	264	276	71	476												
POL	174	224	377	148	465	432	341	352	448	558	573	658	129	343	0	242	232	490
734	86	65	296	293	106	600												
NZL	290	136	233	134	187	223	201	181	291	270	435	372	75	170	130	0	186	249
267	25	4	277	122	37	282												
ZAF	210	149	293	138	221	256	285	212	316	298	298	426	68	217	164	165	0	251
253	31	5	205	181	49	303												
JPN	138	109	205	99	145	175	168	146	194	201	176	253	66	159	123	91	143	0
554	51	1	245	323	67	447												
CZE	195	222	440	175	682	441	406	462	487	630	770	755	121	524	455	162	188	130
0	71	24	311	317	112	581												
EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	14	10
33	0	0	39	30	20	63												
FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	4	1
20	0	0	9	1	12	19												
IRL	254	244	299	212	297	337	308	316	603	374	473	386	125	221	206	226	196	114
231	18	9	0	142	59	344												
KOR	115	73	359	81	142	173	197	134	233	316	175	596	49	217	189	78	144	120
218	11	0	90	0	51	316												
SVN	41	64	66	32	110	99	70	61	91	116	109	90	34	55	86	27	37	33
87	15	11	47	29	0	94												
PRT	262	352	673	247	547	593	663	563	679	785	815	883	147	450	544	209	288	174
496	40	18	312	260	79	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														
44	AUS	0	292	612	240	624	572	420	597	628	610	664	782	151	321	365	249	384	396
33	BEL	8	308	197	65	405													
71	CAN	34	257	136	76	369													
19	CHE	461	307	0	404	1435	841	907	939	1054	1215	885	2070	285	570	658	318	859	746
107	DEU	12	326	428	88	682													
81	DFS	183	209	271	0	432	325	307	315	357	362	359	419	269	217	231	155	224	264
62	ESP	7	215	137	46	280													
74	FRA	231	358	371	247	0	1631	1012	1636	1312	1962	1873	2163	385	727	1077	324	922	1268
87	GBR	105	455	346	136	802													
108	ITA	284	323	475	260	555	0	705	1186	1057	1208	1288	1332	193	547	782	332	614	863
107	NLD	24	443	305	119	709													
57	USA	270	305	457	240	421	440	0	785	786	971	761	1091	180	488	577	308	598	623
86	CHR	13	323	301	95	642													
31	HUN	278	399	433	262	460	398	467	0	1130	1436	1429	1883	177	572	905	307	854	896
50	POL	15	432	319	87	665													
71	ZAF	423	391	949	336	536	627	608	527	0	1245	1244	1483	228	565	723	341	659	774
40	JPN	19	554	334	112	731													
0	CZE	332	378	701	288	828	710	649	528	862	0	1363	2050	265	693	915	353	853	1014
18	EST	29	435	417	131	835													
11	FRR	449	658	652	336	847	823	601	591	921	923	0	1717	367	578	888	335	676	1015
15	IRL	83	530	304	129	813													
40	KOR	514	337	1711	323	600	662	619	724	1140	1076	1189	0	340	780	1009	404	1331	1155
18	SVN	21	430	560	111	910													
11	PRT	115	176	231	279	247	167	130	152	204	219	325	304	0	119	169	82	115	178
11	EST	35	136	78	41	169													
11	FRR	186	191	457	160	399	365	359	306	430	516	411	647	96	0	474	242	415	614
11	IRL	4	258	276	71	469													
15	KOR	174	224	377	148	465	432	340	352	448	558	573	658	129	339	0	232	488	734
15	SVN	65	296	294	106	600													
40	PRT	210	149	293	138	221	256	285	212	316	298	298	426	68	206	164	0	249	253
11	EST	5	205	182	49	303													
11	FRR	138	109	205	99	145	175	168	146	194	201	176	253	66	153	123	143	0	553
11	IRL	1	243	325	67	446													
11	KOR	195	222	440	175	682	441	404	462	487	630	770	755	121	513	455	188	130	0
11	SVN	24	311	318	112	581													
11	PRT	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	14	10	33
11	EST	0	39	30	20	63													
11	FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	1	20
11	IRL	0	9	1	12	19													
11	KOR	254	244	299	212	297	337	306	316	600	374	473	386	125	213	206	196	114	231
11	SVN	9	0	144	59	344													
11	PRT	116	74	360	82	143	174	198	135	235	318	176	602	49	216	190	144	120	219
11	EST	0	91	0	51	317													
11	FRR	41	64	66	32	110	99	70	61	91	116	109	90	34	55	86	37	33	87
11	IRL	11	47	29	0	94													
11	KOR	262	352	673	247	547	593	657	563	679	785	815	883	147	442	544	288	174	496
11	SVN	18	312	260	79	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	220	379	193	398	344	297	345	410	386	392	394	224	249	169	228	33	6
218	79	60	233	112														
BEL	189	0	345	225	479	358	338	443	375	438	522	356	237	183	151	251	33	33
213	69	76	273	88														
CAN	314	305	0	402	1367	684	910	939	872	1183	729	1657	553	290	565	615	69	12
261	243	88	523	166														
CHE	163	208	271	0	418	285	307	315	324	354	324	375	176	160	158	201	19	6
180	67	46	210	72														
DEU	193	347	359	242	0	1383	992	1562	1096	1877	1585	1707	914	348	646	1025	103	95
356	197	136	593	161														
DFS	234	295	444	236	499	0	604	957	813	1047	1064	935	622	304	380	647	72	24
329	156	115	504	159														
ESP	220	308	458	242	421	394	0	789	678	962	663	925	479	255	432	517	62	13
256	167	96	488	159														
FRA	211	399	433	262	410	360	472	0	847	1361	1044	1193	752	413	534	715	72	15
321	171	87	473	140														
GBR	321	349	791	301	462	524	504	421	0	1045	946	1106	578	290	412	591	62	14
370	180	110	521	164														
ITA	264	367	696	286	797	644	653	508	732	0	1155	1600	787	377	607	841	86	28
349	236	131	630	185														
NLD	308	518	536	303	720	726	523	478	687	796	0	1103	727	384	431	825	100	66
393	155	126	579	162														
USA	315	308	1437	304	504	561	515	460	919	928	748	0	813	293	793	897	97	14
305	312	108	625	192														
POL	127	170	318	112	368	353	248	276	354	469	465	536	0	163	367	599	73	60
212	190	96	455	129														
NZL	200	135	232	134	181	191	200	181	223	256	336	242	86	0	134	176	23	4
213	55	36	175	81														
JPN	105	85	168	84	121	146	131	121	155	170	140	203	103	70	0	387	38	1
144	162	56	270	107														
CZE	135	177	362	130	551	356	307	333	368	515	652	587	379	112	110	0	61	23
217	188	105	434	151														
EST	14	24	26	8	45	33	25	21	26	37	59	59	35	10	10	27	0	0
30	20	20	54	23														
FRR	5	30	8	6	73	24	8	12	12	26	44	11	56	4	1	19	0	0
9	1	12	13	5														
IRL	204	214	255	184	254	276	255	251	381	313	377	310	153	183	93	172	16	9
0	61	57	232	94														
KOR	50	44	202	46	80	96	93	81	117	182	82	336	133	39	67	133	8	0
39	0	39	169	77														
SVN	40	64	66	32	110	97	72	61	89	116	108	90	76	27	29	83	15	11
47	24	0	85	40														
PRT	171	240	478	168	378	394	451	373	436	550	538	592	413	117	129	351	31	13
201	142	70	0	153														
ZAF	102	81	148	64	108	137	136	110	143	153	135	186	106	71	79	115	12	4
90	54	30	143	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	293	620	241	626	576	432	489	634	611	668	788	151	331	366	417	392	397
44	8	311	198	42	408														
	BEL	208	0	354	228	514	405	344	426	434	462	643	447	195	245	310	193	239	323
33	34	257	136	49	368														
	CAN	462	307	0	404	1435	841	911	783	1054	1215	885	2062	282	584	657	296	866	747
71	12	326	429	65	682														
	CHE	183	209	271	0	432	325	308	297	357	362	359	418	269	220	230	163	224	264
19	7	215	137	31	280														
	DEU	231	358	371	247	0	1631	1023	1507	1312	1962	1873	2156	381	744	1076	376	925	1268
107	105	455	346	104	802														
	DFS	284	323	475	260	555	0	712	1026	1057	1207	1288	1331	192	561	780	390	620	863
81	24	442	307	88	709														
	ESP	273	308	458	242	434	446	0	712	793	980	769	1093	179	497	581	259	610	625
63	13	326	301	69	649														
	FRA	262	385	400	253	399	391	466	0	995	1293	1179	1463	168	545	846	342	713	855
70	13	387	290	65	605														
	GBR	424	391	949	336	536	627	615	515	0	1245	1244	1480	226	579	722	399	664	774
74	19	556	334	81	731														
	ITA	332	378	701	288	828	710	662	499	862	0	1363	2046	263	707	915	400	859	1014
87	29	435	417	99	835														
	NLD	449	658	652	336	847	823	609	531	921	923	0	1714	357	595	887	510	683	1015
108	83	530	305	92	813														
	USA	514	336	1695	321	595	659	621	566	1134	1070	1184	0	332	809	1005	467	1347	1153
106	20	429	562	81	907														
	CHR	115	176	228	279	247	167	132	152	204	219	320	297	0	120	168	95	114	178
12	34	136	77	27	169														
	HUN	194	198	471	163	408	374	373	312	446	531	424	673	97	0	478	224	424	626
57	4	264	277	56	476														
	POL	174	224	377	148	465	432	342	344	448	558	573	656	129	343	0	242	489	734
86	65	296	294	83	600														
	NZL	290	136	233	134	187	223	202	175	291	270	435	370	75	170	130	0	249	267
25	4	277	125	27	282														
	JPN	138	109	205	99	145	175	168	145	194	201	176	253	66	159	123	91	0	554
51	1	245	326	47	447														
	CZE	195	222	440	175	682	441	406	447	487	630	770	752	121	524	455	162	130	0
71	24	311	318	86	581														
	EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	10	33
0	0	39	30	17	63														
	FRR	6	30	8	6	80	24	8	12	15	26	51	12	26	4	60	4	1	20
0	0	9	1	7	19														
	IRL	254	244	299	212	297	337	309	312	603	374	473	385	125	221	206	226	114	231
18	9	0	144	39	344														
	KOR	116	74	360	82	143	174	198	132	235	318	176	603	49	218	190	79	120	219
11	0	91	0	39	317														
	SVN	26	41	49	23	85	73	50	45	65	86	77	68	24	42	67	20	21	67
11	7	34	22	0	67														
	PRT	262	352	673	247	547	593	668	552	679	785	815	876	147	450	544	209	174	496
40	18	312	260	56	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	293	620	241	626	576	432	605	634	611	668	790	151	331	367	417	392	397
44	8	299	42	408															
	BEL	208	0	355	229	514	406	345	463	435	463	644	449	195	245	311	193	239	323
33	34	248	49	369															
	CAN	462	307	0	404	1435	841	911	939	1054	1215	885	2070	282	584	658	296	866	747
71	12	313	65	682															
	CHE	183	209	271	0	432	325	308	315	357	362	359	419	269	220	231	163	224	264
19	7	208	31	280															
	DEU	231	358	371	247	0	1631	1023	1636	1312	1962	1873	2163	381	744	1077	376	925	1268
107	105	438	105	802															
	DFS	284	323	475	260	555	0	712	1186	1057	1208	1288	1332	192	561	782	390	620	863
81	24	420	89	709															
	ESP	273	308	458	242	434	446	0	790	793	980	769	1097	179	497	581	259	610	625
63	13	312	69	649															
	FRA	278	399	433	262	460	398	472	0	1130	1436	1429	1883	175	589	905	422	867	896
75	15	404	65	665															
	GBR	424	391	948	336	534	626	612	526	0	1245	1244	1483	226	579	723	399	664	774
74	19	520	82	731															
	ITA	332	378	701	288	828	710	662	528	860	0	1363	2050	263	707	915	400	859	1014
87	29	417	100	835															
	NLD	449	658	652	336	847	823	609	591	919	923	0	1717	357	595	888	510	683	1015
108	83	495	93	813															
	USA	516	337	1711	323	600	662	623	724	1140	1076	1189	0	335	809	1009	467	1350	1156
107	21	404	82	910															
	CHR	115	176	228	279	247	167	132	152	204	219	320	300	0	120	168	95	114	178
12	34	133	28	169															
	HUN	194	198	471	163	408	374	373	314	446	531	424	673	97	0	479	224	424	626
57	4	254	56	476															
	POL	174	224	377	148	465	432	342	352	448	558	573	658	129	343	0	242	490	734
86	65	286	84	600															
	NZL	290	136	233	134	187	223	202	181	291	270	435	372	75	170	130	0	249	267
25	4	263	27	282															
	JPN	138	109	205	99	145	175	168	146	194	201	176	253	66	159	123	91	0	554
51	1	231	47	447															
	CZE	195	222	440	175	682	441	406	462	486	630	770	755	121	524	455	162	130	0
71	24	297	87	581															
	EST	14	24	26	8	46	36	25	21	29	37	63	62	7	31	44	10	10	33
0	0	38	17	63															
	FRR	6	30	8	6	80	24	8	12	15	26	51	13	26	4	60	4	1	20
0	0	9	8	19															
	IRL	253	243	298	211	295	336	306	311	580	371	465	380	125	219	206	222	114	230
18	9	0	39	332															
	SVN	26	41	49	23	85	73	50	45	65	87	78	68	24	42	67	20	21	67
11	7	34	0	67															
	PRT	262	352	673	247	547	593	668	563	678	785	815	883	147	450	544	209	174	496
40	18	311	56	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	285	612	240	624	572	436	473	628	610	644	780	151	321	363	383	396	44
296	42	405																
BEL	208	0	349	228	508	401	347	417	428	456	604	431	194	238	307	229	322	33
246	49	365																
CAN	461	307	0	404	1435	841	917	767	1054	1213	853	2062	282	570	657	849	746	71
313	65	682																
CHE	183	209	271	0	432	325	311	288	357	362	356	417	269	217	230	223	264	19
208	31	280																
DEU	231	358	371	247	0	1631	1049	1491	1312	1960	1833	2157	381	727	1070	917	1268	107
438	104	802																
DFS	284	323	475	260	555	0	732	1011	1057	1203	1261	1318	192	547	780	608	863	81
420	88	709																
ESP	279	322	463	246	474	469	0	717	812	1006	776	1114	179	498	598	604	638	65
324	71	679																
FRA	240	375	375	236	376	373	472	0	976	1275	1142	1437	167	532	840	694	847	70
366	65	593																
GBR	423	391	948	336	534	626	638	476	0	1243	1219	1476	226	565	722	651	774	74
517	81	731																
ITA	332	377	701	288	827	710	704	465	859	0	1332	2032	263	693	914	846	1012	87
416	99	834																
NLD	426	616	605	328	817	800	612	480	881	881	0	1605	348	571	874	643	1004	106
490	92	798																
USA	514	335	1711	323	598	662	637	524	1139	1074	980	0	335	780	1006	1297	1153	107
402	81	909																
CHR	115	175	228	279	247	167	133	149	204	219	311	300	0	118	167	114	178	12
133	27	169																
HUN	186	191	457	160	399	365	371	295	430	516	395	647	96	0	473	414	614	57
249	56	469																
POL	174	224	377	148	465	432	363	337	448	558	565	658	129	339	0	487	734	86
286	83	600																
JPN	138	109	205	99	145	175	170	141	194	201	174	253	66	153	123	0	551	50
226	47	441																
CZE	195	222	440	175	682	441	425	431	486	628	753	754	121	513	455	130	0	71
297	86	581																
EST	14	24	26	8	46	36	28	21	29	37	62	62	7	31	44	10	33	0
38	17	63																
IRL	253	243	298	211	295	336	323	287	577	370	455	380	125	212	206	114	230	18
0	39	332																
SVN	26	41	49	23	85	73	53	45	65	86	77	68	24	42	67	21	67	11
34	0	67																
PRT	262	352	673	247	547	593	715	530	678	785	789	881	147	442	544	174	496	40
311	56	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	317	164	365	366	305	389	394	279	476	388	241	232	55	26	255
CAN	297	0	301	1026	746	797	737	956	836	663	1873	596	298	165	34	507
CHE	156	202	0	290	224	216	215	251	228	245	304	167	140	45	17	170
DEU	272	291	170	0	1081	771	1078	901	1054	1222	1475	884	300	128	57	476
DFS	312	472	189	421	0	628	1007	1043	640	1027	1309	656	417	113	49	503
ESP	289	392	161	325	414	0	650	697	632	619	974	504	278	118	40	478
FRA	368	373	175	283	373	432	0	973	696	946	1436	691	365	116	37	450
GBR	373	875	228	381	624	524	477	0	717	954	1464	602	512	126	47	530
ITA	253	507	181	412	458	394	326	512	0	690	1114	612	242	155	47	456
NLD	474	505	227	562	720	477	437	688	510	0	1130	794	412	113	50	543
USA	323	1596	229	418	661	500	524	1137	663	720	0	914	401	206	46	653
CZE	175	352	114	491	348	309	322	362	394	626	577	0	223	128	43	410
IRL	235	295	144	212	336	274	287	571	235	390	380	169	0	46	21	233
KOR	36	149	33	63	73	73	61	82	129	64	220	89	32	0	16	125
SVN	26	25	14	48	42	31	24	37	43	40	35	36	20	10	0	39
PRT	233	470	141	343	387	453	362	429	412	506	594	327	198	107	32	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	209	373	247	276	412	308	547	408	219	31	107	219	67	258	153	318
CHE	195	0	324	195	189	316	275	310	377	172	7	107	176	66	288	108	275
DEU	276	196	0	758	870	906	1192	1272	1483	821	53	454	260	180	878	311	775
DFS	195	157	287	0	415	615	503	777	684	422	4	190	249	108	314	212	389
FRA	235	156	238	160	0	561	679	685	832	498	9	337	189	134	457	227	467
GBR	382	296	384	341	286	0	808	1103	1429	534	18	301	450	179	647	313	725
ITA	279	215	433	334	288	564	0	806	1289	641	19	402	242	225	786	328	709
NLD	550	291	590	493	325	811	567	0	1340	748	69	296	404	153	516	314	671
USA	330	292	420	342	295	1126	745	863	0	821	20	595	359	309	1239	393	1023
CZE	158	114	463	224	239	319	406	589	522	0	23	284	167	181	468	249	451
FRR	29	6	40	4	8	15	17	48	13	19	0	1	6	1	7	7	13
JPN	58	57	88	82	84	115	125	101	151	87	1	0	83	140	375	147	328
IRL	219	178	195	185	158	503	229	377	346	124	6	56	0	51	192	111	270
KOR	43	45	79	63	78	114	178	81	336	129	0	66	32	0	215	140	163
CAN	247	217	278	238	239	612	490	448	1158	305	6	124	207	189	0	281	602
PRT	134	81	208	155	185	237	279	265	369	200	7	85	90	115	269	0	271
ESP	298	212	307	249	298	568	427	526	568	259	8	98	271	92	325	222	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	61	73	39	125	194	96	14
CAN	110	0	57	90	43	62	259	92	11
DFS	38	40	0	70	53	71	110	79	13
GBR	72	93	60	0	47	62	115	73	10
ITA	37	40	50	45	0	33	57	54	13
NZL	119	64	47	63	30	0	130	79	14
USA	182	253	75	119	60	137	0	170	24
ZAF	102	94	62	72	54	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	55	67	35	121	94	13
CAN	105	0	52	84	39	58	87	9
DFS	37	38	0	64	50	70	76	10
GBR	70	90	58	0	45	60	67	9
ITA	35	38	50	45	0	31	52	11
NZL	114	60	47	61	30	0	79	13
ZAF	101	91	59	69	53	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	59	72	39	194	102	1
CAN	110	0	57	90	43	259	103	2
DFS	36	40	0	68	53	110	87	3
GBR	71	93	58	0	47	115	78	3
ITA	37	40	50	45	0	57	55	3
USA	182	253	75	119	60	0	190	6
ZAF	106	103	66	76	55	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	33	26	60	8
CAN	62	0	51	37	70	8
DFS	25	36	0	49	54	9
ITA	25	36	49	0	43	11
ZAF	64	68	40	43	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	59	71	39	193	102	14
CAN	108	0	57	90	43	259	103	11
DFS	36	40	0	68	53	110	87	13
GBR	70	93	58	0	47	115	78	10
ITA	37	40	50	45	0	57	55	13
USA	181	253	75	119	60	0	190	24
ZAF	106	103	66	76	55	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	59	73	39	125	194	103	14
CAN	110	0	51	90	43	62	259	103	11
DFS	37	38	0	60	53	64	103	80	13
GBR	72	93	54	0	47	61	115	77	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	42	62	30	0	130	87	14
USA	182	253	71	119	60	137	0	190	24
ZAF	107	103	64	75	55	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	59	71	39	193	102	14
CAN	108	0	57	90	43	256	103	11
DFS	36	40	0	68	53	110	87	13
GBR	70	92	58	0	47	115	78	10
ITA	37	40	50	45	0	57	55	13
USA	181	251	75	119	60	0	190	24
ZAF	106	103	66	76	55	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	61	73	39	125	194	103	14
CAN	110	0	57	90	43	62	259	103	11
DFS	38	40	0	70	53	71	110	88	13
GBR	72	93	60	0	47	62	115	78	10
ITA	37	40	50	45	0	33	57	55	13
NZL	119	64	47	63	30	0	130	88	14
USA	182	253	75	119	60	137	0	190	24
ZAF	107	103	67	76	55	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	59	71	39	193	95	14
CAN	108	0	57	90	43	259	92	11
DFS	36	40	0	68	53	110	78	13
GBR	70	93	58	0	47	115	73	10
ITA	37	40	50	45	0	57	54	13
USA	181	253	75	119	60	0	170	24
ZAF	101	94	61	72	54	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	29	70	59	8
CAN	57	0	42	58	83	9
DFS	20	33	0	57	67	10
NZL	60	59	38	0	75	13
ZAF	64	83	51	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	61	33	39	125	194	14
CAN	110	0	57	37	43	62	259	11
DFS	38	40	0	29	53	71	110	13
GBR	37	43	27	0	15	34	37	4
ITA	37	40	50	16	0	33	57	13
NZL	119	64	47	38	30	0	130	14
USA	182	253	75	40	60	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	61	73	125	194	14
CAN	110	0	57	90	62	256	11
DFS	38	40	0	70	71	110	13
GBR	72	92	60	0	61	115	10
NZL	119	64	47	62	0	130	14
USA	182	251	75	119	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	59	71	39	192	14
CAN	108	0	57	90	43	259	11
DFS	36	40	0	68	53	110	13
GBR	70	92	58	0	47	115	10
ITA	37	40	50	45	0	57	13
USA	180	253	75	119	60	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	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	65	48	47	15
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	102	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	78	46	28	109	2
DEU	7	6	0	28	0	3	0	3
DFS	24	73	18	0	27	45	47	13
GBR	6	45	0	25	0	19	35	0
NZL	15	26	3	43	16	0	17	2
USA	10	102	0	44	32	16	0	1
NLD	5	2	3	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	78	46	0	28	107	2
DEU	7	6	0	28	0	2	3	0	4
DFS	24	73	18	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	101	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	7	33	7	10	5
CAN	20	0	6	78	46	109	2
DEU	7	6	0	28	0	0	3
DFS	24	73	18	0	27	47	12
GBR	6	45	0	25	0	35	0
USA	10	102	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	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	73	44	47	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	40	16	7	0	17	2
USA	10	102	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	NZL	USA	NLD
AUS	0	21	7	33	7	15	10	5
CAN	20	0	6	78	46	28	109	2
DEU	7	6	0	28	0	3	0	5
DFS	24	73	18	0	27	45	47	14
GBR	6	45	0	25	0	19	35	0
NZL	15	26	3	43	16	0	17	2
USA	10	102	0	44	32	16	0	1
NLD	5	2	5	14	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	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	76	48	47	15
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	102	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	NOR	NLD
AUS	0	10	7	21	11	5
CAN	10	0	6	78	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	78	46	3	109	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	102	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	33	7	13	15	10	5
CAN	20	0	6	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	3
DFS	24	73	18	0	27	76	48	47	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	102	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	33	7	13	15	10	5
CAN	20	0	6	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	4
DFS	24	73	18	0	27	73	45	47	13
GBR	6	45	0	25	0	0	19	35	0
NOR	10	3	6	58	0	0	8	0	12
NZL	15	26	3	42	16	7	0	17	2
USA	10	102	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	33	7	13	15	10	5
CAN	20	0	6	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	66	48	47	15
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	102	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	NOR	USA	NLD
AUS	0	21	7	33	7	13	10	5
CAN	20	0	6	78	46	3	106	2
DEU	7	6	0	28	0	7	0	5
DFS	24	73	18	0	27	76	47	15
GBR	6	45	0	25	0	0	35	0
NOR	10	3	6	60	0	0	0	12
USA	10	101	0	44	32	0	0	1
NLD	5	2	5	15	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	33	7	13	15	10	5
CAN	20	0	6	78	46	3	28	109	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	73	45	47	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	102	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	33	7	13	10	5
CAN	20	0	6	78	46	3	107	2
DEU	7	6	0	28	0	7	0	5
DFS	24	73	18	0	27	70	47	15
GBR	6	45	0	25	0	0	34	0
NOR	10	3	6	55	0	0	0	12
USA	10	101	0	44	31	0	0	1
NLD	5	2	5	15	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	72	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	78	43	3	28	109	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	75	46	47	15
GBR	6	42	0	25	0	0	16	33	0
NOR	10	3	6	60	0	0	8	0	12
NZL	15	26	3	44	13	7	0	17	2
USA	10	102	0	44	30	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	NOR	NZL	USA	NLD
AUS	0	21	7	33	7	13	15	10	5
CAN	20	0	6	78	43	3	28	106	2
DEU	7	6	0	28	0	7	3	0	5
DFS	24	73	18	0	27	76	48	47	15
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	101	0	44	30	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	NOR	USA	NLD
AUS	0	21	7	33	7	13	10	5
CAN	20	0	6	78	43	3	109	2
DEU	7	6	0	28	0	7	0	5
DFS	24	73	18	0	27	76	47	15
GBR	6	42	0	25	0	0	33	0
NOR	10	3	6	60	0	0	0	12
USA	10	102	0	44	30	0	0	1
NLD	5	2	5	15	0	11	1	0
