

Introduction

The latest routine international evaluation for conformation traits took place as scheduled at the Interbull Centre. Data from twenty five (26) 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 United States of America were computed. Brown Swiss, Guernsey, Holstein, Jersey and Red Dairy Cattle breed data were included in this evaluation.

The WHFF trait definitions are available on this link http://www.interbull.org/ib/conf_trait_hol_jer

The following is a list of substitute traits as applied by countries:

COU	BRD	TRT_Code	TRT_NAME	Subs_Trt
USA	BSW	ofr	overall frame	sta
USA	BSW	oru	overall rump	rwi
USA	BSW	rle	rump length	rwi
USA	BSW	thp	thurl position	rwi

Changes in national procedures

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

EST (ALL)	Decrease in information due to the pedigree correction and updates on herd information
JPN (HOL)	Decrease in information due to pedigree changes.
CHE (ALL)	Decrease in information due to manual edits/data correction in database, change of hys assignment
BEL (HOL)	Decrease in information due to pedigree correction
USA (HOL)	Decrease in information due to pedigree verification.
NLD (HOL)	Drop in information due to change in reliability calculation
NZL (ALL)	Drop in information due to the pedigree correction, parentage testing and record changes

INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

Post-processing Windows:

According to the decision taken by ITC in Orlando (2015) to review the post-processing windows every 5 years, during the 2020 the relative working group has been re-activated and new windows have been identified.

As before, the upper bounds have been set to 0.99 as these were judged to have very little effect on evaluations while the lower values have been reduced to the 10th percentile. This reduction would provide post-processed correlations to be closer to the real estimated ones. Over the past five years, in fact, the previous adopted lower value (25th percentile) had been found too high causing estimated and post-processed correlations to differ significantly from each other. The new lower values have been applied to all breeds and traits.

The weight assigned to the magnitude of the changes tested by each country has also been revised. The new weight will allow post-processed correlations to take more in consideration the value of the new estimated ones even when no changes are applied by the countries.

The new weights are as follows:

No changes :: 2
Small changes:: 1
Big changes :: 0

More information can be read on https://interbull.org/ib/rg_procedure

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

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 ROUTINE RUN

Results were distributed by the Interbull Centre to designated representatives in each country. The international evaluation file comprised international proofs expressed on the base and unit of each country included in the analysis. Such records readily provide more information on bull performance in various countries, thereby minimizing the need to resort to conversions.

At the same time, all recipients of Interbull results are expected to honor the agreed code of practice, decided by the Interbull Steering Committee, and only publish international evaluations on their own country scale. Evaluations expressed on another country scale are confidential and may only be used internally for research and review purposes.

PUBLICATION OF INTERBULL TEST RUN

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

Table 1. National evaluation data considered in the Interbull evaluation for conformation traits (August Routine Evaluation 2023). Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		45	3919	759	247	
BEL			1705			
CAN	247	104	12652	831	901	
CHE	2929		3099	51		
CZE			4418			
DEA	3749					
DEU			21402		273	
DFS			12364	2106	6459	
ESP			4387			
EST			893			
FRA	440		18022			
FRM						
GBR	23	231	6457	463	344	
HUN			2817			
IRL			1885			
ISR						
ITA	2254		8611	74		
JPN			6235			
KOR			1587			
LTU						
LVA			1343		613	
NLD	137		15475	52	59	
NOR					2511	
NZL			6870	4173	593	
POL			9327			
PRT			2535			
SVK						
SVN	249		590			
URY						
USA	925	725	34048	4492	271	
ZAF			853	555		
HRV						
CAM					40	
No. Records	10953	1105	181494	13556	12311	
Pub. Proofs	8715	939	139804	11772	12931	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	6.36								
CHE	0.95	12.47							
FRA	0.98	0.96	0.92						
ITA	0.96	0.95	0.95	13.83					
NLD	0.95	0.95	0.96	0.91	4.27				
USA	0.98	0.95	0.97	0.95	0.94	1.63			
DEA	0.96	0.98	0.97	0.96	0.95	0.96	11.27		
SVN	0.92	0.91	0.89	0.93	0.90	0.90	0.90	17.23	
GBR	0.96	0.92	0.95	0.93	0.93	0.95	0.89	0.90	0.86

BSW cwi

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.94								
CHE	0.91	10.23							
FRA	0.88	0.91	0.89						
ITA	0.81	0.85	0.87	21.24					
NLD	0.92	0.84	0.87	0.71	4.85				
USA	0.89	0.90	0.92	0.86	0.83	0.89			
DEA	0.86	0.82	0.85	0.74	0.78	0.81	11.44		
SVN	0.88	0.91	0.90	0.82	0.84	0.85	0.90	24.83	
GBR	0.91	0.84	0.82	0.71	0.90	0.80	0.83	0.80	1.46

BSW bde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	6.97								
CHE	0.84	10.34							
FRA	0.72	0.88	0.91						
ITA	0.79	0.91	0.91	17.81					
NLD	0.82	0.85	0.85	0.85	4.60				
DEA	0.79	0.90	0.91	0.88	0.79	11.14			
SVN	0.78	0.73	0.80	0.82	0.78	0.71	25.18		
GBR	0.87	0.88	0.81	0.84	0.90	0.87	0.83	1.69	
USA	0.72	0.75	0.86	0.78	0.86	0.80	0.77	0.86	0.83

BSW ang

	CAN	CHE	FRA	NLD	USA	GBR
CAN	8.54					
CHE	0.69	11.04				
FRA	0.86	0.67	0.85			
NLD	0.79	0.68	0.67	3.75		
USA	0.86	0.67	0.76	0.77	1.08	
GBR	0.89	0.77	0.80	0.82	0.90	0.76

BSW ran

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.91								
CHE	0.94	10.67							
FRA	0.97	0.96	0.94						
ITA	0.94	0.93	0.94	23.11					
NLD	0.95	0.91	0.96	0.92	4.63				
USA	0.97	0.94	0.96	0.91	0.95	1.36			
DEA	0.97	0.94	0.96	0.94	0.91	0.97	11.84		
SVN	0.91	0.88	0.89	0.89	0.90	0.90	0.88	23.13	

GBR 0.96 0.94 0.97 0.94 0.96 0.96 0.91 0.92 1.92

BSW rwi

	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	7.27								
CHE	0.89	10.31							
FRA	0.96	0.86	0.98						
NLD	0.93	0.85	0.93	4.09					
USA	0.91	0.85	0.87	0.80	0.97				
DEA	0.91	0.88	0.93	0.78	0.89	13.35			
GBR	0.93	0.85	0.92	0.88	0.92	0.82	1.25		
SVN	0.89	0.80	0.94	0.85	0.82	0.89	0.86	25.77	
ITA	0.88	0.79	0.90	0.79	0.86	0.87	0.87	0.89	19.30

BSW rls

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.61								
CHE	0.92	13.11							
FRA	0.91	0.92	1.02						
ITA	0.91	0.86	0.92	23.68					
NLD	0.88	0.85	0.88	0.84	5.05				
USA	0.95	0.93	0.90	0.87	0.86	0.80			
DEA	0.91	0.91	0.92	0.89	0.81	0.90	12.20		
SVN	0.85	0.78	0.88	0.81	0.79	0.83	0.87	22.84	
GBR	0.85	0.86	0.90	0.83	0.86	0.83	0.87	0.80	1.46

BSW fan

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.92								
CHE	0.68	14.11							
FRA	0.79	0.72	1.10						
ITA	0.69	0.84	0.80	21.44					
NLD	0.74	0.67	0.83	0.69	4.97				
USA	0.82	0.72	0.84	0.85	0.81	0.85			
DEA	0.62	0.90	0.66	0.89	0.63	0.65	11.57		
SVN	0.71	0.77	0.71	0.79	0.68	0.71	0.83	25.18	
GBR	0.81	0.73	0.89	0.73	0.88	0.83	0.67	0.77	1.28

BSW hde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	8.22							
CHE	0.86	12.71						
FRA	0.83	0.82	1.17					
ITA	0.79	0.84	0.85	21.10				
NLD	0.76	0.74	0.83	0.73	4.97			
DEA	0.77	0.88	0.86	0.93	0.77	12.06		
SVN	0.80	0.82	0.86	0.89	0.75	0.90	32.15	
USA	0.85	0.73	0.85	0.89	0.81	0.79	0.83	0.85

BSW fua

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.72								
CHE	0.87	12.31							
FRA	0.89	0.87	0.87						
ITA	0.88	0.85	0.85	19.63					
NLD	0.89	0.84	0.88	0.85	4.79				
USA	0.94	0.86	0.86	0.93	0.87	1.27			
DEA	0.83	0.84	0.93	0.82	0.78	0.83	11.11		
SVN	0.73	0.75	0.82	0.82	0.77	0.73	0.90	22.51	

GBR 0.91 0.84 0.88 0.87 0.91 0.91 0.72 0.62 1.37

BSW ruh

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.36								
CHE	0.92	12.13							
FRA	0.85	0.82	0.92						
ITA	0.74	0.84	0.85	12.85					
NLD	0.76	0.82	0.87	0.85	4.25				
USA	0.83	0.80	0.87	0.85	0.88	1.07			
DEA	0.82	0.84	0.89	0.92	0.86	0.82	11.74		
SVN	0.80	0.82	0.80	0.86	0.88	0.83	0.87	21.49	
GBR	0.73	0.79	0.86	0.82	0.87	0.91	0.76	0.78	1.75

BSW ruw

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	8.26							
CHE	0.91	12.08						
FRA	0.84	0.86	0.86					
ITA	0.78	0.88	0.79	13.24				
NLD	0.70	0.66	0.80	0.69	4.25			
USA	0.86	0.90	0.85	0.89	0.79	1.01		
DEA	0.85	0.91	0.76	0.95	0.55	0.90	12.19	
SVN	0.83	0.86	0.80	0.80	0.68	0.83	0.80	21.03

BSW usu

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.58								
CHE	0.90	12.05							
FRA	0.82	0.91	0.89						
ITA	0.88	0.90	0.87	18.98					
NLD	0.82	0.83	0.89	0.81	4.23				
USA	0.83	0.89	0.86	0.87	0.90	0.98			
DEA	0.92	0.93	0.88	0.93	0.78	0.84	11.45		
SVN	0.80	0.78	0.61	0.74	0.63	0.70	0.79	20.73	
GBR	0.80	0.79	0.86	0.85	0.91	0.92	0.73	0.62	2.74

BSW ude

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.78								
CHE	0.96	12.18							
FRA	0.96	0.95	0.98						
ITA	0.94	0.96	0.96	19.96					
NLD	0.95	0.94	0.95	0.93	4.31				
USA	0.96	0.95	0.96	0.95	0.94	1.23			
DEA	0.92	0.97	0.93	0.97	0.94	0.93	12.05		
SVN	0.92	0.95	0.92	0.96	0.95	0.92	0.96	23.28	
GBR	0.96	0.94	0.96	0.94	0.96	0.96	0.90	0.93	2.12

BSW ftp

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	7.51								
CHE	0.97	14.01							
FRA	0.97	0.95	0.92						
NLD	0.97	0.95	0.95	5.02					
USA	0.92	0.90	0.88	0.91	1.31				
DEA	0.95	0.98	0.95	0.96	0.90	11.06			
SVN	0.93	0.93	0.92	0.94	0.91	0.94	18.47		
GBR	0.95	0.93	0.89	0.94	0.94	0.92	0.93	1.39	

ITA 0.87 0.86 0.86 0.86 0.87 0.86 0.87 0.87 21.06

BSW ftl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.60								
CHE	0.90	14.72							
FRA	0.95	0.95	0.95						
ITA	0.93	0.94	0.95	18.18					
NLD	0.92	0.96	0.92	0.92	5.01				
USA	0.93	0.96	0.95	0.93	0.96	1.75			
DEA	0.90	0.98	0.97	0.96	0.94	0.95	11.08		
SVN	0.90	0.93	0.90	0.91	0.94	0.91	0.92	18.74	
GBR	0.95	0.94	0.93	0.94	0.97	0.96	0.92	0.93	1.50

BSW rtp

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	6.78							
CHE	0.98	14.55						
FRA	0.97	0.97	0.92					
ITA	0.92	0.95	0.93	20.06				
NLD	0.97	0.96	0.97	0.92	4.57			
DEA	0.97	0.99	0.97	0.96	0.94	11.99		
SVN	0.94	0.93	0.93	0.94	0.95	0.93	18.33	
USA	0.91	0.88	0.91	0.89	0.94	0.87	0.89	1.31

BSW ocs

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.63								
CHE	0.81	9.40							
FRA	0.74	0.83	0.93						
ITA	0.77	0.81	0.89	9.01					
NLD	0.73	0.69	0.78	0.69	3.87				
USA	0.80	0.74	0.82	0.81	0.83	0.51			
DEA	0.81	0.90	0.89	0.89	0.59	0.73	10.56		
SVN	0.59	0.61	0.68	0.64	0.62	0.62	0.73	20.36	
GBR	0.75	0.82	0.84	0.79	0.86	0.86	0.70	0.68	1.72

BSW ous

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.93								
CHE	0.86	13.97							
FRA	0.88	0.90	0.92						
ITA	0.81	0.88	0.92	10.19					
NLD	0.89	0.85	0.90	0.79	5.10				
USA	0.89	0.81	0.83	0.79	0.86	0.79			
DEA	0.85	0.94	0.91	0.91	0.80	0.78	12.36		
SVN	0.75	0.84	0.78	0.82	0.75	0.72	0.92	20.32	
GBR	0.77	0.83	0.75	0.80	0.77	0.86	0.75	0.73	1.67

BSW ofl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.46								
CHE	0.82	11.77							
FRA	0.64	0.65	1.23						
ITA	0.61	0.70	0.86	17.30					
NLD	0.65	0.64	0.64	0.74	4.65				
USA	0.59	0.62	0.66	0.67	0.65	0.83			
DEA	0.69	0.85	0.71	0.81	0.58	0.57	11.21		
SVN	0.73	0.85	0.66	0.70	0.64	0.66	0.89	27.00	

GBR 0.66 0.75 0.81 0.66 0.73 0.71 0.65 0.62 1.48

BSW ofr

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	6.95						
CHE	0.80	12.02					
DEA	0.81	0.90	11.51				
ITA	0.78	0.91	0.94	16.98			
SVN	0.73	0.78	0.78	0.79	23.27		
USA	0.76	0.83	0.91	0.86	0.74	1.63	
FRA	0.74	0.87	0.93	0.91	0.80	0.89	0.90

BSW tpl

	CAN	CHE	DEA	ITA	SVN	FRA
CAN	6.99					
CHE	0.88	12.27				
DEA	0.90	0.90	11.74			
ITA	0.90	0.91	0.92	23.64		
SVN	0.88	0.86	0.84	0.85	24.60	
FRA	0.96	0.92	0.90	0.90	0.86	1.29

BSW oru

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.40						
CHE	0.76	16.50					
DEA	0.71	0.87	12.58				
ITA	0.92	0.76	0.76	17.38			
SVN	0.82	0.59	0.71	0.76	27.50		
USA	0.89	0.58	0.49	0.83	0.67	0.97	
FRA	0.90	0.88	0.86	0.89	0.75	0.85	1.10

BSW rle

	CHE	DEA	ITA	SVN	USA	FRA
CHE	11.77					
DEA	0.95	12.31				
ITA	0.82	0.85	19.20			
SVN	0.79	0.79	0.83	24.80		
USA	0.55	0.51	0.77	0.69	0.97	
FRA	0.92	0.94	0.87	0.79	0.74	1.02

BSW thp

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.29						
CHE	0.83	11.39					
DEA	0.77	0.84	12.08				
ITA	0.88	0.91	0.85	29.81			
SVN	0.79	0.85	0.85	0.88	35.75		
USA	0.87	0.87	0.71	0.83	0.72	1.36	
FRA	0.89	0.84	0.86	0.85	0.82	0.79	1.05

BSW hoq

	CAN	CHE	DEA	ITA	SVN	FRA
CAN	7.09					
CHE	0.92	12.17				
DEA	0.92	0.89	12.54			
ITA	0.91	0.84	0.85	19.56		
SVN	0.94	0.88	0.90	0.91	21.94	

FRA 0.91 0.85 0.88 0.88 0.88 1.02

BSW ful

	CHE	DEA	ITA	SVN	FRA
CHE	11.90				
DEA	0.91	12.27			
ITA	0.92	0.95	12.80		
SVN	0.83	0.91	0.86	21.39	
FRA	0.74	0.82	0.75	0.74	0.91

BSW udb

	CHE	DEA	ITA	SVN	FRA
CHE	12.36				
DEA	0.97	13.31			
ITA	0.93	0.96	26.36		
SVN	0.84	0.86	0.85	25.05	
FRA	0.91	0.87	0.85	0.80	0.96

BSW tdi

	CHE	DEA	ITA	SVN	FRA
CHE	15.81				
DEA	0.96	11.35			
ITA	0.94	0.95	20.55		
SVN	0.91	0.94	0.92	18.86	
FRA	0.96	0.97	0.91	0.92	0.89

BSW tth

	CHE	DEA	ITA	SVN	FRA
CHE	14.48				
DEA	0.98	12.97			
ITA	0.94	0.95	23.20		
SVN	0.88	0.88	0.88	20.88	
FRA	0.93	0.93	0.94	0.88	0.89

GUE sta

	CAN	GBR	USA	AUS
CAN	6.53			
GBR	0.97	1.21		
USA	0.98	0.96	2.76	
AUS	0.90	0.93	0.91	0.84

GUE cwi

	CAN	GBR	USA	AUS
CAN	6.85			
GBR	0.92	1.79		
USA	0.85	0.85	1.52	
AUS	0.72	0.80	0.66	0.34

GUE bde

	CAN	GBR	USA	AUS
CAN	6.45			
GBR	0.87	1.55		
USA	0.75	0.88	1.76	
AUS	0.80	0.77	0.70	0.45

GUE ang				
	CAN	GBR	USA	AUS
CAN	7.88			
GBR	0.89	1.67		
USA	0.88	0.91	1.86	
AUS	0.65	0.76	0.68	0.39

GUE ran				
	CAN	GBR	USA	AUS
CAN	6.52			
GBR	0.97	1.68		
USA	0.97	0.97	1.99	
AUS	0.90	0.93	0.90	0.76

GUE rwi				
	CAN	GBR	USA	AUS
CAN	7.14			
GBR	0.93	1.58		
USA	0.92	0.92	1.71	
AUS	0.85	0.84	0.77	0.64

GUE rls				
	CAN	GBR	USA	AUS
CAN	8.74			
GBR	0.82	1.84		
USA	0.93	0.81	0.89	
AUS	0.71	0.79	0.70	0.32

GUE rlr				
	CAN	USA	AUS	
CAN	7.16			
USA	0.85	0.93		
AUS	0.61	0.54	0.19	

GUE fan				
	CAN	GBR	USA	AUS
CAN	8.79			
GBR	0.80	1.72		
USA	0.84	0.76	0.86	
AUS	0.62	0.76	0.65	0.26

GUE fua				
	CAN	GBR	USA	AUS
CAN	7.41			
GBR	0.94	1.44		
USA	0.92	0.91	1.82	
AUS	0.79	0.78	0.77	0.38

GUE ruh				
	CAN	GBR	USA	AUS
CAN	6.91			
GBR	0.73	1.98		
USA	0.80	0.90	1.44	

AUS 0.76 0.77 0.76 0.36

GUE usu

	CAN	GBR	USA	AUS
CAN	6.76			
GBR	0.79	1.59		
USA	0.80	0.87	1.35	
AUS	0.76	0.78	0.75	0.29

GUE ude

	CAN	GBR	USA	AUS
CAN	6.32			
GBR	0.97	1.40		
USA	0.95	0.95	1.84	
AUS	0.89	0.89	0.88	0.53

GUE ftp

	CAN	GBR	USA	AUS
CAN	5.94			
GBR	0.95	1.29		
USA	0.92	0.92	1.60	
AUS	0.92	0.91	0.86	0.40

GUE ftl

	CAN	GBR	USA	AUS
CAN	4.68			
GBR	0.95	1.90		
USA	0.94	0.97	2.01	
AUS	0.93	0.94	0.93	0.95

GUE rtp

	CAN	AUS	USA
CAN	5.45		
AUS	0.89	0.35	
USA	0.93	0.88	1.60

GUE ocs

	CAN	GBR	USA	AUS
CAN	7.99			
GBR	0.77	2.14		
USA	0.74	0.86	0.87	
AUS	0.58	0.63	0.57	0.83

GUE ous

	CAN	GBR	USA	AUS
CAN	8.09			
GBR	0.78	1.51		
USA	0.87	0.82	0.82	
AUS	0.69	0.82	0.73	1.06

GUE ofl

	CAN	GBR	USA	AUS
CAN	7.53			

FRA	0.80	0.79	0.73	0.83	0.70	0.77	1.05													
GBR	0.67	0.69	0.89	0.82	0.65	0.79	0.86	1.51												
ITA	0.61	0.69	0.64	0.74	0.60	0.76	0.78	0.73	1.91											
NLD	0.85	0.82	0.69	0.82	0.78	0.70	0.82	0.78	0.64	4.69										
USA	0.67	0.78	0.50	0.78	0.75	0.74	0.76	0.69	0.75	0.68	1.57									
CZE	0.51	0.61	0.55	0.63	0.61	0.64	0.63	0.66	0.69	0.50	0.62	20.46								
IRL	0.58	0.56	0.51	0.63	0.52	0.63	0.68	0.72	0.62	0.61	0.56	0.51	1.64							
KOR	0.56	0.59	0.52	0.51	0.53	0.60	0.64	0.52	0.53	0.52	0.51	0.53	0.51	10.05						
SVN	0.74	0.70	0.57	0.72	0.71	0.70	0.79	0.65	0.68	0.65	0.67	0.67	0.53	0.55	27.75					
PRT	0.50	0.50	0.54	0.60	0.50	0.59	0.53	0.60	0.58	0.52	0.50	0.63	0.50	0.51	0.67	1.99				
EST	0.54	0.52	0.53	0.52	0.52	0.52	0.53	0.52	0.52	0.51	0.51	0.55	0.53	0.51	0.67	0.53	22.45			
HUN	0.69	0.70	0.51	0.67	0.73	0.62	0.75	0.68	0.64	0.65	0.66	0.82	0.51	0.62	0.78	0.55	0.62	1.18		
POL	0.51	0.55	0.52	0.64	0.50	0.55	0.64	0.54	0.62	0.50	0.67	0.71	0.51	0.51	0.75	0.50	0.53	0.67	15.79	

HOL bcs

	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	NZL	POL	
BEL	0.97																					
CHE	0.72	11.75																				
DEU	0.72	0.90	14.12																			
DFS	0.77	0.90	0.95	12.18																		
FRA	0.73	0.93	0.95	0.95	0.99																	
GBR	0.76	0.91	0.90	0.90	0.93	1.61																
ITA	0.72	0.91	0.95	0.95	0.96	0.89	6.63															
NLD	0.72	0.94	0.96	0.95	0.95	0.91	0.94	5.07														
USA	0.77	0.72	0.81	0.80	0.81	0.76	0.78	0.77	1.37													
CZE	0.74	0.87	0.96	0.95	0.92	0.89	0.94	0.93	0.77	13.82												
JPN	0.80	0.92	0.97	0.97	0.97	0.92	0.96	0.95	0.84	0.95	1.69											
IRL	0.72	0.87	0.79	0.85	0.88	0.93	0.83	0.85	0.72	0.77	0.86	0.99										
KOR	0.72	0.75	0.85	0.86	0.86	0.82	0.85	0.80	0.75	0.86	0.88	0.72	2.40									
CAN	0.74	0.93	0.96	0.94	0.95	0.95	0.94	0.95	0.82	0.94	0.98	0.87	0.84	5.92								
PRT	0.71	0.86	0.87	0.86	0.89	0.87	0.85	0.85	0.71	0.83	0.87	0.79	0.83	0.89	1.79							
ESP	0.73	0.88	0.92	0.92	0.95	0.93	0.92	0.91	0.76	0.91	0.94	0.82	0.87	0.94	0.88	1.02						
SVN	0.72	0.88	0.91	0.91	0.89	0.80	0.89	0.91	0.72	0.90	0.89	0.74	0.79	0.85	0.74	0.85	21.01					
EST	0.73	0.83	0.90	0.87	0.88	0.77	0.87	0.91	0.82	0.87	0.88	0.72	0.73	0.87	0.76	0.80	0.87	16.68				
HUN	0.72	0.87	0.94	0.92	0.92	0.87	0.94	0.90	0.75	0.95	0.93	0.76	0.85	0.93	0.84	0.91	0.86	0.83	0.99			
NZL	0.71	0.90	0.92	0.91	0.93	0.92	0.92	0.88	0.74	0.89	0.92	0.88	0.81	0.92	0.85	0.87	0.84	0.81	0.89	0.16		
POL	0.73	0.86	0.91	0.89	0.91	0.89	0.90	0.87	0.75	0.91	0.92	0.80	0.79	0.91	0.86	0.88	0.83	0.79	0.91	0.85	11.18	

JER sta

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.54									
CAN	0.89	6.71								
DFS	0.90	0.96	11.74							
GBR	0.91	0.96	0.94	1.15						
ITA	0.88	0.95	0.93	0.95	1.56					
NZL	0.87	0.84	0.85	0.90	0.87	0.36				
USA	0.90	0.97	0.95	0.96	0.94	0.89	1.65			
ZAF	0.87	0.85	0.84	0.92	0.87	0.90	0.86	8.78		
NLD	0.89	0.95	0.97	0.94	0.92	0.85	0.93	0.87	5.08	
CHE	0.90	0.96	0.96	0.95	0.93	0.85	0.94	0.87	0.97	11.62

JER cwi

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.30									
CAN	0.74	6.55								
DFS	0.72	0.81	15.64							
GBR	0.81	0.91	0.85	1.85						
ITA	0.65	0.78	0.69	0.74	1.62					
NZL	0.81	0.73	0.66	0.76	0.66	0.37				
USA	0.74	0.89	0.81	0.85	0.91	0.67	1.01			
ZAF	0.69	0.78	0.72	0.80	0.73	0.76	0.77	8.56		
NLD	0.73	0.91	0.89	0.90	0.72	0.69	0.84	0.80	4.46	
CHE	0.67	0.86	0.86	0.83	0.82	0.68	0.86	0.72	0.87	12.29

JER	bde									
	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0.33									
CAN	0.76	5.65								
DFS	0.75	0.86	13.69							
GBR	0.74	0.86	0.85	1.49						
ITA	0.70	0.74	0.78	0.85	1.62					
NZL	0.78	0.69	0.70	0.69	0.70	0.37				
ZAF	0.79	0.72	0.82	0.80	0.71	0.75	8.72			
NLD	0.70	0.83	0.84	0.89	0.88	0.70	0.78	4.63		
USA	0.69	0.70	0.73	0.77	0.91	0.69	0.71	0.87	1.01	
CHE	0.75	0.87	0.91	0.89	0.84	0.71	0.80	0.90	0.83	12.96

JER	ang									
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.33									
CAN	0.67	7.60								
DFS	0.71	0.83	13.22							
GBR	0.80	0.83	0.87	1.32						
ITA	0.73	0.85	0.82	0.85	1.54					
USA	0.70	0.83	0.86	0.83	0.80	1.01				
ZAF	0.62	0.63	0.66	0.80	0.82	0.67	8.66			
NLD	0.72	0.82	0.73	0.82	0.79	0.73	0.65	5.94		
CHE	0.63	0.79	0.71	0.72	0.74	0.72	0.65	0.74	9.70	

JER	ran									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.36									
CAN	0.88	5.80								
DFS	0.89	0.97	11.56							
GBR	0.94	0.95	0.96	1.24						
ITA	0.88	0.95	0.94	0.95	1.68					
NZL	0.90	0.88	0.88	0.92	0.89	0.30				
USA	0.89	0.95	0.96	0.97	0.94	0.91	1.23			
ZAF	0.89	0.88	0.89	0.89	0.88	0.88	0.88	8.93		
NLD	0.90	0.96	0.95	0.96	0.94	0.89	0.95	0.91	4.74	
CHE	0.91	0.96	0.95	0.95	0.94	0.89	0.94	0.89	0.95	13.00

JER	rwi									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.32									
CAN	0.80	6.29								
DFS	0.81	0.91	12.09							
GBR	0.80	0.92	0.86	1.40						
ITA	0.77	0.85	0.82	0.85	1.47					
NZL	0.88	0.82	0.82	0.80	0.80	0.30				
USA	0.77	0.82	0.81	0.84	0.87	0.78	0.99			
ZAF	0.77	0.78	0.79	0.80	0.78	0.77	0.78	9.13		
NLD	0.85	0.94	0.91	0.88	0.80	0.84	0.81	0.79	5.08	
CHE	0.83	0.92	0.83	0.87	0.80	0.80	0.79	0.78	0.92	12.91

JER	rls									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.18									
CAN	0.67	6.19								
DFS	0.68	0.91	12.59							
GBR	0.71	0.84	0.75	1.70						
ITA	0.67	0.86	0.81	0.80	1.96					

NZL	0.66	0.67	0.67	0.68	0.68	0.12				
USA	0.67	0.94	0.88	0.87	0.85	0.66	0.87			
ZAF	0.71	0.68	0.68	0.75	0.68	0.83	0.71	11.90		
NLD	0.72	0.92	0.91	0.85	0.85	0.67	0.86	0.73	3.69	
CHE	0.75	0.92	0.85	0.82	0.81	0.69	0.86	0.71	0.90	9.42

 JER rlr

	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE		
AUS	0.21									
CAN	0.52	6.38								
DFS	0.54	0.78	13.78							
ITA	0.56	0.82	0.71	1.52						
ZAF	0.51	0.53	0.52	0.55	12.34					
NLD	0.58	0.86	0.89	0.74	0.62	4.98				
USA	0.50	0.72	0.63	0.83	0.52	0.73	0.87			
CHE	0.64	0.68	0.62	0.62	0.55	0.70	0.58	11.99		

 JER fan

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.22									
CAN	0.61	6.43								
DFS	0.63	0.87	12.78							
GBR	0.71	0.79	0.77	1.51						
ITA	0.62	0.74	0.69	0.71	1.52					
USA	0.62	0.88	0.81	0.85	0.79	0.87				
ZAF	0.65	0.65	0.67	0.83	0.66	0.74	9.57			
NLD	0.68	0.75	0.78	0.86	0.71	0.77	0.70	4.11		
CHE	0.65	0.81	0.81	0.71	0.70	0.74	0.67	0.73	11.83	

 JER fua

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.37									
CAN	0.73	5.78								
DFS	0.69	0.85	12.81							
GBR	0.75	0.94	0.86	1.68						
ITA	0.68	0.86	0.74	0.87	1.55					
NZL	0.80	0.71	0.73	0.81	0.69	0.42				
USA	0.74	0.94	0.86	0.92	0.90	0.71	1.47			
ZAF	0.70	0.91	0.87	0.93	0.77	0.74	0.89	11.88		
NLD	0.74	0.91	0.87	0.92	0.84	0.81	0.87	0.85	4.68	
CHE	0.78	0.92	0.85	0.87	0.79	0.71	0.86	0.88	0.89	12.04

 JER ruh

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.35									
CAN	0.72	6.84								
DFS	0.74	0.84	10.69							
GBR	0.80	0.79	0.83	1.34						
ITA	0.73	0.72	0.80	0.83	1.38					
NZL	0.72	0.71	0.76	0.77	0.81	0.41				
USA	0.77	0.83	0.90	0.91	0.83	0.74	1.24			
ZAF	0.81	0.71	0.78	0.86	0.84	0.78	0.84	9.19		
NLD	0.74	0.76	0.91	0.88	0.82	0.81	0.87	0.77	4.22	
CHE	0.78	0.92	0.85	0.83	0.71	0.76	0.85	0.75	0.83	12.68

 JER usu

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.38									
CAN	0.74	6.38								

DFS	0.71	0.84	13.49							
GBR	0.79	0.86	0.85	1.73						
ITA	0.65	0.76	0.76	0.84	1.75					
NZL	0.58	0.59	0.59	0.63	0.64	0.40				
USA	0.73	0.82	0.89	0.84	0.82	0.60	0.97			
ZAF	0.76	0.77	0.72	0.80	0.66	0.59	0.76	10.01		
NLD	0.81	0.82	0.88	0.91	0.79	0.60	0.88	0.79	4.58	
CHE	0.75	0.90	0.86	0.81	0.80	0.61	0.83	0.78	0.85	10.67

JER ude

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.35									
CAN	0.90	5.50								
DFS	0.89	0.93	12.18							
GBR	0.89	0.97	0.93	1.45						
ITA	0.91	0.95	0.94	0.94	1.71					
USA	0.88	0.96	0.95	0.94	0.96	1.76				
ZAF	0.88	0.89	0.89	0.90	0.88	0.89	10.40			
NLD	0.90	0.96	0.96	0.96	0.95	0.95	0.91	4.34		
CHE	0.93	0.95	0.93	0.92	0.95	0.95	0.89	0.96	10.05	

JER ftp

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.46									
CAN	0.89	6.32								
DFS	0.88	0.91	12.78							
GBR	0.90	0.94	0.88	1.36						
ITA	0.87	0.87	0.86	0.86	1.65					
NZL	0.87	0.92	0.87	0.88	0.87	0.30				
USA	0.86	0.95	0.91	0.93	0.86	0.88	1.31			
ZAF	0.87	0.93	0.87	0.92	0.87	0.90	0.90	10.10		
NLD	0.92	0.97	0.94	0.93	0.86	0.90	0.90	0.90	5.57	
CHE	0.92	0.95	0.93	0.91	0.87	0.88	0.90	0.88	0.96	9.95

JER ftl

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0.33									
CAN	0.91	5.59								
DFS	0.92	0.91	13.93							
GBR	0.91	0.93	0.94	1.50						
ITA	0.90	0.92	0.91	0.93	1.77					
USA	0.90	0.91	0.94	0.97	0.92	1.08				
ZAF	0.91	0.91	0.93	0.95	0.90	0.96	10.90			
NLD	0.93	0.93	0.96	0.97	0.92	0.95	0.93	4.41		
CHE	0.92	0.92	0.94	0.96	0.90	0.94	0.93	0.96	11.65	
NZL	0.92	0.95	0.92	0.93	0.91	0.92	0.92	0.93	0.92	0.52

JER rtp

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE		
AUS	0.32									
CAN	0.87	6.30								
DFS	0.87	0.94	13.13							
NZL	0.87	0.96	0.91	0.42						
ZAF	0.87	0.90	0.88	0.87	9.30					
NLD	0.90	0.97	0.95	0.92	0.88	5.07				
USA	0.87	0.92	0.95	0.87	0.87	0.94	1.33			
CHE	0.90	0.97	0.94	0.93	0.92	0.96	0.92	11.17		

JER ocs

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0.77								
CAN	0.54	5.24							
DFS	0.51	0.63	12.60						
GBR	0.63	0.76	0.82	2.80					
ITA	0.48	0.70	0.72	0.79	1.32				
NZL	0.62	0.57	0.46	0.55	0.54	0.30			
USA	0.62	0.79	0.69	0.84	0.78	0.57	0.87		
NLD	0.57	0.72	0.86	0.87	0.80	0.63	0.81	3.35	
CHE	0.56	0.83	0.74	0.88	0.80	0.53	0.76	0.83	8.25

JER ous

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE	ITA
AUS	0.78								
CAN	0.68	6.35							
DFS	0.66	0.82	12.86						
GBR	0.73	0.81	0.70	1.44					
NZL	0.81	0.73	0.68	0.75	0.44				
USA	0.68	0.89	0.81	0.84	0.71	0.98			
NLD	0.70	0.88	0.87	0.78	0.80	0.86	4.96		
CHE	0.76	0.87	0.80	0.85	0.78	0.86	0.92	10.84	
ITA	0.69	0.83	0.88	0.78	0.72	0.85	0.85	0.86	1.70

JER ofl

	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	6.32							
CAN	0.47	4.97						
DFS	0.38	0.73	13.65					
GBR	0.61	0.62	0.64	1.32				
ITA	0.46	0.59	0.67	0.65	1.79			
USA	0.60	0.64	0.61	0.64	0.73	1.39		
NLD	0.44	0.67	0.65	0.72	0.68	0.65	4.90	
CHE	0.53	0.82	0.70	0.70	0.70	0.78	0.70	10.94

RDC sta

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.66										
CAN	0.88	6.15									
DEU	0.89	0.97	13.31								
DFS	0.87	0.96	0.97	8.66							
GBR	0.92	0.96	0.96	0.93	1.29						
NOR	0.87	0.93	0.94	0.97	0.92	13.60					
NZL	0.89	0.89	0.86	0.89	0.92	0.91	0.49				
USA	0.90	0.97	0.96	0.94	0.97	0.91	0.89	2.34			
NLD	0.87	0.95	0.97	0.97	0.94	0.96	0.84	0.93	4.83		
CAM	0.92	0.90	0.91	0.91	0.91	0.91	0.91	0.90	0.90	6.02	
LVA	0.86	0.85	0.86	0.92	0.84	0.90	0.86	0.84	0.86	0.90	0.65

RDC cwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.41										
CAN	0.73	6.94									
DEU	0.72	0.88	11.57								
DFS	0.77	0.81	0.89	13.69							
GBR	0.82	0.88	0.90	0.88	1.59						
NZL	0.79	0.69	0.71	0.68	0.80	0.35					
USA	0.66	0.84	0.81	0.83	0.83	0.71	1.28				
NLD	0.72	0.92	0.92	0.89	0.91	0.68	0.81	5.07			
CAM	0.77	0.79	0.79	0.79	0.79	0.79	0.79	0.79	6.72		
NOR	0.82	0.79	0.81	0.88	0.81	0.81	0.81	0.86	0.79	14.40	
LVA	0.68	0.72	0.68	0.66	0.67	0.70	0.65	0.71	0.79	0.80	0.30

CAN	0.70	6.48									
DEU	0.72	0.94	9.21								
DFS	0.69	0.97	0.94	9.28							
GBR	0.79	0.77	0.85	0.78	1.56						
NOR	0.72	0.86	0.85	0.93	0.80	11.81					
NZL	0.68	0.67	0.68	0.67	0.70	0.74	0.12				
USA	0.69	0.92	0.93	0.93	0.82	0.83	0.67	0.89			
NLD	0.72	0.92	0.93	0.89	0.86	0.80	0.66	0.90	5.27		
CAM	0.83	0.80	0.80	0.80	0.80	0.80	0.79	0.80	0.80	6.62	
LVA	0.70	0.78	0.83	0.74	0.75	0.71	0.72	0.77	0.81	0.80	0.28

RDC rlr

	AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM	LVA		
AUS	0.20										
CAN	0.58	6.55									
DEU	0.62	0.87	10.46								
DFS	0.55	0.82	0.90	10.91							
NOR	0.59	0.77	0.80	0.83	13.27						
NLD	0.58	0.87	0.90	0.87	0.82	5.16					
USA	0.55	0.72	0.77	0.67	0.71	0.80	0.89				
CAM	0.72	0.72	0.73	0.73	0.71	0.72	0.71	6.89			
LVA	0.62	0.72	0.76	0.79	0.64	0.69	0.71	0.73	0.24		

RDC fan

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	
AUS	0.29										
CAN	0.65	6.38									
DEU	0.69	0.81	13.75								
DFS	0.63	0.69	0.80	9.33							
GBR	0.74	0.79	0.91	0.74	1.60						
NOR	0.68	0.73	0.84	0.62	0.77	12.86					
USA	0.68	0.85	0.83	0.71	0.83	0.77	1.06				
NLD	0.68	0.75	0.88	0.79	0.88	0.68	0.80	5.05			
CAM	0.76	0.78	0.77	0.77	0.77	0.77	0.78	0.78	7.60		
LVA	0.70	0.64	0.67	0.63	0.68	0.70	0.68	0.67	0.78	0.27	

RDC fua

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.38										
CAN	0.77	5.54									
DEU	0.74	0.90	12.48								
DFS	0.72	0.80	0.84	11.66							
GBR	0.77	0.88	0.95	0.86	1.53						
NOR	0.72	0.82	0.77	0.85	0.80	12.04					
NZL	0.77	0.82	0.81	0.70	0.78	0.73	0.36				
USA	0.75	0.93	0.90	0.85	0.92	0.80	0.85	1.47			
NLD	0.75	0.91	0.93	0.87	0.93	0.88	0.84	0.89	4.00		
CAM	0.83	0.81	0.79	0.80	0.79	0.80	0.79	0.80	0.81	6.61	
LVA	0.68	0.75	0.76	0.80	0.75	0.75	0.74	0.70	0.75	0.78	0.36

RDC ruh

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.48										
CAN	0.78	5.71									
DEU	0.79	0.87	14.51								
DFS	0.78	0.87	0.90	10.72							
GBR	0.79	0.75	0.85	0.85	1.44						
NOR	0.75	0.84	0.88	0.88	0.82	12.25					
NZL	0.83	0.74	0.81	0.77	0.92	0.77	0.33				
USA	0.77	0.84	0.90	0.93	0.90	0.84	0.84	1.33			
NLD	0.74	0.75	0.91	0.91	0.88	0.91	0.83	0.86	4.10		

CAM	0.84	0.83	0.82	0.84	0.83	0.82	0.84	0.83	0.82	6.20	
LVA	0.75	0.73	0.76	0.84	0.72	0.74	0.74	0.72	0.75	0.82	0.40

RDC usu

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.34										
CAN	0.75	5.89									
DEU	0.72	0.90	12.41								
DFS	0.66	0.76	0.79	13.07							
GBR	0.80	0.80	0.75	0.79	1.83						
NOR	0.66	0.71	0.67	0.73	0.76	12.08					
NZL	0.67	0.71	0.62	0.60	0.68	0.69	0.32				
USA	0.77	0.82	0.75	0.85	0.89	0.77	0.70	1.18			
NLD	0.78	0.82	0.79	0.89	0.92	0.75	0.58	0.91	4.47		
CAM	0.80	0.78	0.76	0.76	0.78	0.76	0.77	0.78	0.78	6.06	
LVA	0.63	0.65	0.62	0.60	0.74	0.67	0.68	0.69	0.68	0.76	0.32

RDC ude

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA
AUS	0.54									
CAN	0.88	5.63								
DEU	0.90	0.97	12.61							
DFS	0.88	0.96	0.94	10.65						
GBR	0.89	0.96	0.96	0.93	1.82					
NOR	0.90	0.91	0.90	0.88	0.92	14.20				
USA	0.88	0.96	0.96	0.95	0.96	0.92	1.29			
NLD	0.89	0.97	0.97	0.95	0.97	0.89	0.96	4.33		
CAM	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93	4.49	
LVA	0.89	0.89	0.88	0.91	0.88	0.89	0.88	0.89	0.92	0.42

RDC ftp

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.54										
CAN	0.92	5.76									
DEU	0.93	0.97	12.93								
DFS	0.89	0.94	0.93	11.91							
GBR	0.91	0.93	0.94	0.89	1.48						
NOR	0.88	0.92	0.89	0.94	0.91	14.19					
NZL	0.92	0.90	0.90	0.87	0.89	0.89	0.26				
USA	0.86	0.92	0.91	0.92	0.93	0.91	0.87	1.43			
NLD	0.93	0.98	0.97	0.95	0.94	0.89	0.91	0.90	4.64		
CAM	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.61	
LVA	0.88	0.87	0.87	0.87	0.87	0.89	0.88	0.86	0.87	0.91	0.38

RDC ftl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	NZL
AUS	0.57										
CAN	0.93	4.95									
DEU	0.93	0.94	14.07								
DFS	0.92	0.90	0.97	10.59							
GBR	0.95	0.93	0.98	0.93	1.41						
NOR	0.91	0.92	0.92	0.94	0.93	12.50					
USA	0.94	0.93	0.95	0.92	0.97	0.93	1.65				
NLD	0.93	0.93	0.98	0.97	0.97	0.95	0.95	5.16			
CAM	0.94	0.93	0.94	0.93	0.93	0.94	0.93	0.94	7.34		
LVA	0.90	0.91	0.90	0.90	0.90	0.94	0.89	0.90	0.93	0.48	
NZL	0.94	0.94	0.93	0.92	0.93	0.93	0.93	0.93	0.94	0.91	0.36

RDC rtp

	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA
AUS	0.39									
CAN	0.89	5.84								
DEU	0.89	0.96	13.91							
DFS	0.87	0.93	0.96	12.30						
NOR	0.89	0.90	0.89	0.87	13.16					
NZL	0.92	0.95	0.93	0.88	0.89	0.35				
NLD	0.90	0.97	0.97	0.96	0.88	0.94	5.33			
USA	0.88	0.91	0.95	0.92	0.91	0.89	0.96	1.43		
CAM	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.08	
LVA	0.91	0.91	0.89	0.88	0.88	0.90	0.92	0.88	0.91	0.38

RDC ocs

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.11									
CAN	0.63	4.77								
DEU	0.55	0.75	20.73							
DFS	0.64	0.61	0.75	10.51						
GBR	0.65	0.74	0.78	0.75	1.64					
NOR	0.56	0.69	0.69	0.76	0.75	16.29				
NZL	0.73	0.56	0.61	0.51	0.65	0.63	0.27			
USA	0.62	0.77	0.84	0.72	0.88	0.75	0.70	0.56		
NLD	0.59	0.72	0.87	0.81	0.88	0.71	0.64	0.86	3.43	
CAM	0.72	0.76	0.76	0.76	0.76	0.76	0.73	0.78	0.78	6.28

RDC ous

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.45									
CAN	0.71	5.42								
DEU	0.75	0.88	17.15							
DFS	0.67	0.79	0.81	10.78						
GBR	0.83	0.79	0.83	0.72	1.61					
NOR	0.72	0.80	0.79	0.79	0.82	13.07				
NZL	0.83	0.81	0.79	0.74	0.81	0.75	0.36			
USA	0.75	0.88	0.85	0.85	0.86	0.82	0.88	0.97		
NLD	0.70	0.89	0.90	0.86	0.78	0.81	0.82	0.85	4.45	
CAM	0.85	0.83	0.83	0.82	0.84	0.82	0.85	0.84	0.84	6.68

RDC ofl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	0.63								
CAN	0.38	4.41							
DEU	0.41	0.74	16.44						
DFS	0.38	0.80	0.81	13.78					
GBR	0.50	0.68	0.73	0.67	1.43				
NOR	0.48	0.71	0.69	0.58	0.76	12.97			
USA	0.53	0.60	0.73	0.63	0.69	0.75	1.31		
NLD	0.44	0.67	0.76	0.64	0.73	0.64	0.67	7.02	
CAM	0.62	0.75	0.75	0.75	0.75	0.75	0.76	0.75	6.78

^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	137	85	137	42	154	119	25	20
CHE	120	0	181	498	71	276	543	55	18
FRA	78	144	0	206	60	101	203	39	14
ITA	119	440	174	0	92	216	608	73	19

NLD	34	68	50	72	0	60	84	28	12
USA	144	245	77	157	47	0	231	25	20
DEA	100	445	164	523	74	185	0	66	15
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	13	17	10	18	13	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	129	51	137	35	154	117	25	20
CHE	113	0	113	443	66	247	480	56	18
FRA	46	85	0	121	41	62	132	39	10
ITA	119	386	103	0	84	216	572	73	19
NLD	30	65	38	68	0	46	78	28	12
USA	144	212	44	157	38	0	213	25	20
DEA	99	387	105	486	72	160	0	67	14
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	9	17	10	18	13	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	0	137	85	137	35	119	23	20	154
CHE	120	0	181	498	70	543	48	18	276
FRA	78	144	0	206	54	203	37	14	101
ITA	119	440	174	0	84	608	67	19	216
NLD	30	68	47	68	0	79	27	12	46
DEA	100	445	164	523	73	0	60	15	231
SVN	21	46	38	61	27	56	0	6	22
GBR	17	16	13	17	10	13	4	0	20
USA	144	245	77	157	38	185	20	18	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	GBR
CAN	0	136	84	24	153	20
CHE	120	0	175	48	274	18
FRA	77	140	0	37	100	14
NLD	21	49	34	0	31	9
USA	143	245	76	27	0	20
GBR	17	16	13	7	18	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	137	85	137	42	154	119	25	20
CHE	120	0	181	498	71	276	543	55	18
FRA	78	144	0	206	60	101	203	39	14
ITA	119	440	174	0	92	216	608	73	19
NLD	34	68	50	72	0	60	84	28	12
USA	144	245	77	157	47	0	231	25	20
DEA	100	445	164	523	74	185	0	66	15
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	13	17	10	18	13	4	0

BSW

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common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  NLD  USA  DEA  GBR  SVN  ITA
-----
CAN    0  137  51  42  154  119  20  23  133
CHE  120    0  113  71  276  543  18  48  491
FRA   46   85   0  41  62  132  10  37  121
NLD   34   68  38   0  60  84  12  27   90
USA  144  245  44  47   0  231  20  22  202
DEA  100  445 106  74  185   0  15  60  602
GBR   17   16   9  10  18  13   0   6  19
SVN   21   46  38  27  20  56   4   0  67
ITA  116  434 103  71  143  515  17  61   0
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BSW
-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  137  85  137  42  154  119  25  20
CHE  120    0  181  498  71  276  543  55  18
FRA   78  144   0  206  60  101  203  39  14
ITA  119  440 174   0  92  216  608  73  19
NLD   34   68  50  72   0  60  84  28  12
USA  144  245  77  157  47   0  231  25  20
DEA  100  445 164  523  74  185   0  66  15
SVN   23   53  40  68  28  22  63   0   6
GBR   17   16  13  17  10  18  13   4   0
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BSW
-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  137  85  137  34  154  119  25  20
CHE  120    0  181  498  69  276  543  55  18
FRA   78  144   0  206  54  101  203  39  14
ITA  119  440 174   0  83  216  608  73  19
NLD   29   67  47  67   0  45  78  28  12
USA  144  245  77  157  36   0  231  25  20
DEA  100  445 164  523  72  185   0  66  15
SVN   23   53  40  68  28  22  63   0   6
GBR   17   16  13  17  10  18  13   4   0
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BSW
-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  USA
-----
CAN    0  137  85  133  34  119  25  154
CHE  120    0  181  492  69  543  55  276
FRA   78  144   0  205  54  203  39  101
ITA  116  435 174   0  82  602  73  202
NLD   29   67  47  66   0  78  28  45
DEA  100  445 164  515  72   0  66  231
SVN   23   53  40  68  28  63   0  25
USA  144  245  77  143  36  185  22   0
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BSW
-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  137  51  94  34  154  86  25  20
CHE  120    0  113  327  70  275  349  56  18
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FRA	46	85	0	113	40	62	122	39	10
ITA	84	279	96	0	63	118	325	67	16
NLD	29	68	37	56	0	45	67	28	12
USA	144	245	44	84	37	0	134	25	20
DEA	74	280	98	289	62	96	0	66	12
SVN	23	53	40	63	28	22	62	0	6
GBR	17	16	9	14	10	18	11	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	137	85	137	35	154	119	25	20
CHE	120	0	181	498	70	276	543	56	18
FRA	78	144	0	206	54	101	203	39	14
ITA	119	440	174	0	84	216	608	73	19
NLD	30	68	47	68	0	46	79	28	12
USA	144	245	77	157	38	0	231	25	20
DEA	100	445	164	523	73	185	0	67	15
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	13	17	10	18	13	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	0	137	85	137	35	154	119	25
CHE	120	0	181	498	70	276	543	56
FRA	78	144	0	206	54	101	203	39
ITA	119	440	174	0	84	216	608	73
NLD	30	68	47	68	0	46	79	28
USA	144	245	77	157	38	0	231	25
DEA	100	445	164	523	73	185	0	67
SVN	23	53	40	68	28	22	63	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	137	85	137	42	154	119	25	20
CHE	120	0	181	498	71	276	543	56	18
FRA	78	144	0	206	60	101	203	39	14
ITA	119	440	174	0	92	216	608	73	19
NLD	34	68	50	72	0	60	84	28	12
USA	144	245	77	157	47	0	231	25	20
DEA	100	445	164	523	74	185	0	67	15
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	13	17	10	18	13	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	137	85	137	42	152	119	25	20
CHE	120	0	181	498	72	276	543	56	18
FRA	78	144	0	206	61	101	203	39	14
ITA	119	440	174	0	96	216	608	73	19
NLD	34	69	51	76	0	61	87	28	12
USA	143	245	77	157	48	0	231	25	20
DEA	100	445	164	523	77	185	0	67	15
SVN	23	53	40	68	28	22	63	0	6

GBR 17 16 13 17 10 18 13 4 0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	0	137	85	42	154	108	25	20	125
CHE	120	0	181	72	276	511	56	18	456
FRA	78	144	0	61	101	190	39	14	189
NLD	34	69	51	0	61	81	28	12	86
USA	144	245	77	48	0	206	25	20	172
DEA	92	414	154	75	157	0	67	14	514
SVN	23	53	40	28	22	63	0	6	72
GBR	17	16	13	10	18	13	4	0	19
ITA	109	403	160	71	124	450	67	17	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	137	85	137	42	154	119	25	20
CHE	120	0	181	498	71	276	543	56	18
FRA	78	144	0	206	60	101	203	39	14
ITA	119	440	174	0	92	214	608	73	19
NLD	34	68	50	72	0	60	84	28	12
USA	144	245	77	156	47	0	231	25	20
DEA	100	445	164	523	74	185	0	67	15
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	13	17	10	18	13	4	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	0	137	85	94	30	86	25	154
CHE	120	0	178	327	67	349	56	275
FRA	78	141	0	137	52	143	39	101
ITA	84	279	116	0	66	325	67	118
NLD	26	67	46	60	0	69	28	41
DEA	74	280	111	289	65	0	66	134
SVN	23	53	40	63	28	62	0	25
USA	144	245	77	84	34	96	22	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	129	74	137	42	154	86	25	20
CHE	113	0	143	442	66	247	344	53	18
FRA	69	112	0	166	51	84	134	38	14
ITA	119	384	143	0	90	213	361	71	19
NLD	34	65	46	72	0	60	67	28	12
USA	144	212	64	157	47	0	134	25	20
DEA	74	276	108	324	62	96	0	63	12
SVN	23	52	39	66	28	22	61	0	6
GBR	17	16	13	17	10	18	11	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	129	74	137	42	153	119	25	20
CHE	113	0	143	443	66	247	488	55	18
FRA	69	112	0	167	51	84	169	39	14
ITA	119	386	143	0	92	216	601	72	19
NLD	34	65	46	72	0	60	84	28	12
USA	143	212	64	157	47	0	229	25	20
DEA	99	397	137	519	74	181	0	67	15
SVN	23	52	40	67	28	22	63	0	6
GBR	17	16	13	17	10	18	13	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	129	74	133	42	154	119	25	20
CHE	113	0	143	442	66	247	488	55	18
FRA	69	112	0	166	51	84	169	39	14
ITA	116	385	143	0	90	202	596	73	19
NLD	34	65	46	71	0	60	84	28	12
USA	144	212	64	143	47	0	229	25	20
DEA	99	397	137	512	74	181	0	66	15
SVN	23	53	40	68	28	22	63	0	6
GBR	17	16	13	17	10	18	13	4	0

BSW

BSW

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	128	118	95	24	155	52
CHE	112	0	482	327	55	246	113
DEA	100	394	0	366	65	225	132
ITA	85	278	314	0	66	118	113
SVN	23	53	62	62	0	25	38
USA	144	212	180	84	22	0	62
FRA	47	85	106	96	39	44	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	135	120	138	25	86	
CHE	119	0	543	498	55	181	
DEA	100	445	0	606	67	202	
ITA	120	440	522	0	72	204	
SVN	23	53	63	68	0	39	
FRA	79	144	164	173	40	0	

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	128	96	95	24	155	52
CHE	112	0	379	327	55	246	113
DEA	84	307	0	332	64	162	124
ITA	85	278	296	0	66	118	113

SVN	23	53	61	62	0	25	38
USA	144	212	120	84	22	0	62
FRA	47	85	100	96	39	44	0

BSW

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

CHE	0	525	327	48	275	179
DEA	430	0	365	59	216	197
ITA	279	313	0	60	118	137
SVN	46	55	55	0	22	36
USA	245	169	84	20	0	100
FRA	143	161	116	37	77	0

BSW

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

CAN	0	85	70	76	22	87	40
CHE	73	0	379	327	49	246	113
DEA	58	307	0	332	59	162	124
ITA	68	278	296	0	57	118	113
SVN	21	47	56	53	0	21	37
USA	77	212	120	84	19	0	62
FRA	35	85	100	96	38	44	0

BSW

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

CAN	0	135	120	134	25	86
CHE	119	0	543	492	54	181
DEA	100	445	0	600	66	202
ITA	117	435	514	0	72	203
SVN	23	53	63	68	0	39
FRA	79	144	164	173	40	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal
CHE DEA ITA SVN FRA

CHE	0	542	495	55	177
DEA	444	0	606	67	200
ITA	437	522	0	72	201
SVN	53	63	68	0	39
FRA	141	163	172	40	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal
CHE DEA ITA SVN FRA

CHE	0	315	302	55	126
DEA	265	0	323	66	142
ITA	263	289	0	67	134
SVN	53	62	63	0	39
FRA	100	110	114	40	0

BSW

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common bulls below diagonal
common three quarter sib group above diagonal
  CHE  DEA  ITA  SVN  FRA
-----
CHE    0  542  489   54  177
DEA  444    0  600   67  200
ITA  432  514    0   71  200
SVN   52   63   67    0   39
FRA  141  163  172   40    0
-----

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BSW

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-----
common bulls below diagonal
common three quarter sib group above diagonal
  CHE  DEA  ITA  SVN  FRA
-----
CHE    0  348  325   55  108
DEA  279    0  324   66  120
ITA  277  289    0   67  111
SVN   53   62   63    0   39
FRA   83   97   94   40    0
-----

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GUE

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-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN    0   25   66   19
GBR   22    0   78   11
USA   56   77    0   22
AUS   19    9   19    0
-----

```

GUE

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN    0   25   66   19
GBR   22    0   78   11
USA   56   77    0   22
AUS   19    9   19    0
-----

```

GUE

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN    0   25   66   19
GBR   22    0   78   11
USA   56   77    0   22
AUS   19    9   19    0
-----

```

GUE

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN    0   25   66   19
GBR   22    0   78   11
USA   56   77    0   22
AUS   19    9   19    0
-----

```

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	USA	AUS
CAN	0	39	19
USA	37	0	6
AUS	19	4	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
--	-----	-----	-----	-----

CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

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

CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

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

CAN	0	25	64	18
GBR	22	0	78	11
USA	55	77	0	22
AUS	18	9	19	0

GUE

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

CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

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

CAN	0	25	66	19
GBR	22	0	78	11
USA	56	77	0	22
AUS	19	9	19	0

GUE

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

CAN	0	19	66
AUS	19	0	22
USA	56	19	0

GUE

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

CAN	0	12	66	19
GBR	9	0	33	9
USA	56	31	0	21
AUS	19	8	18	0

GUE

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

CAN 0 23 64 18
GBR 20 0 76 10
USA 55 75 0 22
AUS 18 8 19 0

GUE

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

CAN 0 23 66 19
GBR 20 0 76 10
USA 56 75 0 22
AUS 19 8 19 0

GUE

GUE

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 NZL ZAF JPN CZE EST IRL KOR SVN PRT LVA

AUS 0 503 907 464 873 771 637 873 909 659 905 1098 471 585 501 306 570 544 99 428 342 105 549 249
BEL 432 0 682 540 913 684 603 863 757 670 1050 790 420 594 287 247 435 541 100 406 281 132 565 250
CAN 819 648 0 853 2099 1190 1341 1471 1651 1819 1397 3316 899 1201 379 376 1186 1132 178 456 733 192 1035 512
CHE 415 538 753 0 996 589 572 692 728 729 838 916 375 548 249 218 397 491 89 363 284 117 488 245
DEU 588 854 1289 846 0 2102 1463 2338 1881 2312 2611 2869 1026 1792 452 372 1194 1669 259 596 590 308 1112 730
DFS 507 597 879 532 1221 0 969 1588 1367 1253 1672 1686 735 1159 463 384 814 1080 201 548 464 198 838 432
ESP 488 582 866 471 823 697 0 1252 1109 1291 1115 1569 720 949 328 368 859 890 146 421 516 167 846 398
FRA 602 850 997 638 1231 874 950 0 1565 1523 1998 2418 853 1532 518 390 1145 1253 171 574 555 192 929 447
GBR 766 753 1666 722 1265 948 898 1052 0 1520 1715 2180 792 1187 489 396 908 1062 181 750 532 193 954 461
ITA 553 670 1593 667 1523 1001 959 1013 1305 0 1532 2418 872 1390 312 325 964 1218 213 469 626 247 1018 573
NLD 740 1149 1247 820 1907 1224 949 1275 1438 1322 0 2248 806 1382 622 381 923 1406 227 678 503 224 1003 494
USA 911 677 3348 846 1600 1053 1046 1325 1993 2006 1802 0 1164 1650 550 467 1725 1613 231 591 896 216 1304 707
HUN 332 340 795 316 688 528 556 572 639 741 608 1053 0 747 277 300 607 842 121 336 448 127 653 334
POL 377 473 911 397 1173 758 618 960 910 1085 1064 1383 577 0 318 291 766 1137 203 414 526 217 886 521
NZL 403 223 326 209 314 298 269 303 385 265 554 465 207 197 0 204 325 337 50 341 190 59 307 139
ZAF 281 212 350 192 293 302 340 319 369 288 343 496 257 217 186 0 308 303 54 237 232 56 323 137
JPN 295 242 425 231 348 321 326 332 363 381 351 490 249 262 157 197 0 753 115 338 528 123 615 322
CZE 347 403 786 357 1112 626 617 812 756 929 1191 1224 714 796 221 226 239 0 158 407 499 197 784 436
EST 49 58 92 44 150 124 64 81 97 120 147 154 68 116 23 23 30 88 0 73 84 55 128 118
IRL 382 390 429 362 480 438 405 505 803 438 618 547 280 303 280 226 195 304 39 0 212 82 394 179
KOR 238 199 677 203 354 310 371 331 401 530 347 1015 348 379 129 178 252 345 34 147 0 101 481 265
SVN 73 100 145 85 286 153 116 144 143 214 190 169 91 169 44 38 53 140 28 66 63 0 142 106
PRT 420 566 1055 441 906 732 816 820 879 1021 998 1355 614 823 242 307 306 644 74 337 412 111 0 424
LVA 110 140 304 124 553 244 201 221 262 381 307 602 229 353 73 82 93 272 62 103 156 62 329 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 NZL ZAF JPN CZE EST IRL KOR SVN PRT LVA

AUS 0 496 907 464 872 770 648 746 909 659 851 1098 471 583 501 256 569 544 98 428 341 105 552 227
BEL 431 0 676 537 907 677 616 797 750 668 997 773 417 590 283 216 425 539 100 403 280 132 566 231
CAN 819 648 0 853 2097 1190 1350 1310 1651 1819 1324 3316 899 1200 379 323 1183 1132 178 456 730 192 1038 486
CHE 415 537 753 0 995 589 581 664 728 729 820 916 375 547 249 197 396 491 89 363 283 117 489 226
DEU 588 854 1289 846 0 2101 1488 2207 1879 2311 2568 2868 1025 1785 451 334 1191 1668 258 595 586 308 1112 702

DFS	507	596	879	532	1222	0	992	1419	1365	1253	1595	1685	734	1154	462	330	813	1080	200	546	462	198	842	406
ESP	498	609	877	483	862	724	0	1194	1132	1306	1108	1588	730	969	339	323	863	910	150	436	519	171	865	384
FRA	565	805	942	614	1161	847	959	0	1422	1499	1659	1995	811	1444	435	306	991	1199	166	528	518	192	896	416
GBR	766	754	1666	722	1265	948	931	1009	0	1520	1650	2178	792	1185	489	340	906	1062	181	747	530	193	956	433
ITA	553	670	1593	667	1523	1001	980	1005	1305	0	1523	2418	872	1390	312	315	962	1218	213	469	622	247	1020	560
NLD	710	1091	1192	797	1878	1202	954	1133	1386	1313	0	2013	786	1358	597	319	852	1387	224	665	484	224	989	460
USA	911	676	3348	846	1600	1052	1064	1129	1993	2006	1560	0	1164	1648	550	398	1722	1613	231	589	890	216	1308	676
HUN	332	340	795	316	688	528	567	560	639	741	592	1053	0	746	277	272	607	842	121	336	445	127	657	317
POL	377	473	911	397	1173	758	642	915	909	1085	1053	1383	577	0	318	265	765	1137	202	414	523	217	889	500
NZL	403	223	326	209	314	298	277	279	385	265	534	465	207	197	0	167	325	337	50	341	189	59	308	121
ZAF	241	195	308	176	273	278	301	272	318	283	285	411	240	209	149	0	261	282	53	200	212	56	307	122
JPN	291	238	420	228	345	318	325	322	357	379	342	483	248	260	156	182	0	752	115	338	525	123	617	304
CZE	347	403	786	357	1112	626	640	781	756	929	1174	1224	714	796	221	214	238	0	158	407	498	197	786	421
EST	49	58	92	44	150	124	68	80	97	120	146	154	68	116	23	23	30	88	0	73	84	55	128	112
IRL	382	390	429	362	480	438	425	486	801	438	605	547	280	303	280	195	194	304	39	0	210	82	395	165
KOR	238	199	676	203	354	310	375	323	400	529	337	1009	346	378	129	161	249	345	34	147	0	101	480	255
SVN	73	100	145	85	286	153	121	144	143	214	190	169	91	169	44	38	53	140	28	66	63	0	142	106
PRT	421	568	1057	441	906	734	840	810	882	1022	987	1356	619	827	242	297	302	646	74	338	411	111	0	407
LVA	100	129	290	114	531	230	197	208	244	374	285	581	216	341	63	74	88	264	57	93	154	62	317	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA	
AUS	0	503	907	464	873	770	639	873	909	659	879	1098	471	585	501	306	570	544	99	428	341	552	105	249
BEL	432	0	682	540	913	683	606	863	757	670	1026	790	420	594	287	247	435	541	100	406	280	567	132	250
CAN	819	648	0	853	2099	1190	1344	1471	1651	1819	1366	3316	899	1201	379	376	1185	1132	178	456	731	1038	192	512
CHE	415	538	753	0	996	589	573	693	728	729	832	916	375	548	249	218	397	491	89	363	283	489	116	245
DEU	588	854	1289	846	0	2102	1468	2339	1881	2312	2598	2869	1026	1792	452	372	1194	1669	259	596	588	1113	307	730
DFS	507	597	879	532	1221	0	972	1587	1366	1253	1630	1685	734	1158	462	384	814	1080	201	547	462	843	197	432
ESP	489	585	867	473	830	700	0	1257	1111	1295	1104	1572	721	953	330	368	859	894	148	422	514	851	167	400
FRA	602	850	997	639	1232	874	955	0	1565	1523	1883	2418	853	1532	518	390	1145	1253	171	574	553	935	191	447
GBR	766	753	1666	722	1265	948	901	1052	0	1520	1686	2179	792	1187	489	396	908	1062	181	748	531	958	192	461
ITA	553	670	1593	667	1523	1001	962	1013	1305	0	1528	2418	872	1390	312	325	964	1218	213	469	624	1020	246	573
NLD	736	1124	1240	819	1905	1223	951	1253	1426	1321	0	2120	797	1373	609	371	889	1401	226	671	496	1001	222	489
USA	911	677	3348	846	1600	1052	1048	1325	1993	2006	1760	0	1164	1650	550	467	1724	1613	231	590	892	1308	215	707
HUN	332	340	795	316	688	528	557	572	639	741	608	1053	0	747	277	300	607	842	121	336	447	657	127	334
POL	377	473	911	397	1173	758	621	960	910	1085	1063	1383	577	0	318	291	766	1137	203	414	524	889	216	521
NZL	403	223	326	209	314	298	270	303	385	265	552	465	207	197	0	204	325	337	50	341	189	308	59	139
ZAF	281	212	350	192	293	302	341	319	369	288	341	496	257	217	186	0	308	303	54	237	231	323	55	137
JPN	293	241	423	230	347	320	325	330	361	381	348	487	248	261	156	196	0	753	115	338	526	618	123	322
CZE	347	403	786	357	1112	626	620	812	756	929	1190	1224	714	796	221	226	238	0	158	407	499	787	196	436
EST	49	58	92	44	150	124	65	81	97	120	147	154	68	116	23	23	30	88	0	73	84	128	55	118
IRL	382	390	429	362	480	438	406	505	801	438	615	547	280	303	280	226	194	304	39	0	211	395	82	179
KOR	238	199	677	203	354	310	371	331	401	530	344	1011	348	379	129	177	251	345	34	147	0	481	101	265
PRT	421	567	1057	441	906	734	821	824	881	1022	998	1356	618	827	242	307	305	646	74	338	412	0	142	424
SVN	73	100	145	85	286	153	116	143	143	213	188	169	91	169	44	38	53	140	28	66	63	111	0	106
LVA	110	140	304	124	553	244	203	221	262	381	306	602	229	353	73	82	92	272	62	103	156	329	62	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	IRL	KOR	PRT	SVN	LVA	
AUS	0	485	907	448	155	769	651	743	906	658	489	1095	468	577	302	569	544	97	426	341	543	100	249
BEL	429	0	660	508	182	658	608	783	731	657	645	751	407	569	235	417	530	97	394	275	551	124	246
CAN	819	643	0	816	431	1180	1352	1305	1649	1817	945	3316	895	1185	371	1183	1132	174	454	730	1022	178	512
CHE	411	512	723	0	231	573	573	653	714	710	575	860	365	523	214	394	466	85	359	281	471	108	240
DEU	122	172	395	196	0	315	268	355	359	530	521	458	150	374	26	146	252	77	93	108	174	130	199
DFS	507	593	879	522	280	0	991	1401	1349	1234	966	1665	724	1129	380	803	1071	197	542	458	818	183	430
ESP	500	611	878	480	175	732	0	1199	1135	1309	760	1592	730	965	370	866	913	151	437	519	856	161	408
FRA	564	802	942	606	296	841	971	0	1419	1491	1017	1985	806	1423	342	988	1198	160	526	517	875	178	434
GBR	766	745	1666	712	303	947	938	1007	0	1519	1012	2172	786	1168	390	905	1061	178	738	530	936	180	460
ITA	553	666	1593	655	476	997	985	1002	1304	0	1196	2413	869	1365	321	961	1216	206	467	622	1004	231	572
NLD	459	702	958	550	524	897	681	863	967	1122	0	1155	502	1000	207	482	978	185	387	345	680	206	382
USA	910	668	3348	793	397	1051	1066	1127	1991	2005	1052	0	1158	1627	461	1722	1612	229	586	889	1282	201	707

HUN	332	337	795	311	97	527	571	559	638	740	401	1051	0	736	296	606	840	120	332	444	645	121	333
POL	377	462	911	377	303	753	650	911	904	1072	880	1382	574	0	286	757	1122	196	407	519	864	196	516
ZAF	278	209	347	188	18	299	340	295	366	284	186	491	255	214	0	304	298	51	234	228	316	50	135
JPN	291	238	420	228	79	318	325	322	357	379	271	483	248	260	193	0	752	114	336	525	612	116	322
CZE	347	403	786	345	184	626	644	781	756	929	945	1224	714	796	222	238	0	155	405	498	773	186	436
EST	49	57	92	44	44	124	70	80	97	119	129	154	67	114	23	30	88	0	71	84	122	54	117
IRL	382	387	429	358	72	438	428	486	794	436	385	547	280	301	224	194	304	39	0	210	385	78	179
KOR	238	199	676	202	77	310	376	323	400	529	263	1008	346	378	176	249	345	34	147	0	479	94	265
PRT	421	560	1057	431	153	729	841	810	879	1015	699	1354	617	816	303	302	646	72	337	411	0	136	418
SVN	72	99	144	85	119	148	120	140	142	208	186	168	91	162	34	52	140	28	64	63	109	0	100
LVA	110	140	304	122	146	244	219	218	262	381	247	602	229	353	81	92	272	62	103	156	329	61	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	503	907	464	873	771	636	873	909	659	905	1098	471	585	501	306	570	544	99	428	342	106	552	249
BEL	432	0	682	540	913	684	599	863	757	670	1050	790	420	594	287	247	435	541	100	406	281	133	567	250
CAN	819	648	0	853	2099	1190	1338	1471	1651	1819	1397	3316	899	1201	379	376	1185	1132	178	456	733	193	1037	512
CHE	415	538	753	0	996	589	571	692	728	729	838	916	375	548	249	218	397	491	89	363	284	118	489	245
DEU	588	854	1289	846	0	2102	1454	2338	1881	2312	2611	2869	1026	1792	452	372	1194	1669	259	596	590	309	1112	730
DFS	507	597	879	532	1221	0	963	1588	1367	1253	1672	1686	735	1159	463	384	814	1080	201	548	464	199	842	432
ESP	487	578	863	469	814	691	0	1246	1103	1285	1109	1562	719	946	326	368	855	888	146	420	515	168	847	397
FRA	602	850	997	638	1231	873	943	0	1565	1523	1998	2418	853	1532	518	390	1145	1253	171	574	555	193	934	447
GBR	766	753	1666	722	1265	948	891	1052	0	1520	1715	2180	792	1187	489	396	908	1062	181	750	532	194	958	461
ITA	553	670	1593	667	1523	1001	952	1013	1305	0	1532	2418	872	1390	312	325	964	1218	213	469	626	248	1019	573
NLD	740	1149	1247	820	1907	1224	942	1275	1438	1322	0	2248	806	1382	622	381	923	1406	227	678	503	225	1005	494
USA	911	677	3348	846	1600	1052	1040	1325	1993	2006	1802	0	1164	1650	550	467	1724	1613	231	591	896	217	1307	707
HUN	332	340	795	316	688	528	556	572	639	741	608	1053	0	747	277	300	607	842	121	336	448	128	656	334
POL	377	473	911	397	1173	758	614	960	910	1085	1064	1383	577	0	318	291	766	1137	203	414	526	218	888	521
NZL	403	223	326	209	314	298	267	303	385	265	554	465	207	197	0	204	325	337	50	341	190	59	308	139
ZAF	281	212	350	192	293	302	340	319	369	288	343	496	257	217	186	0	308	303	54	237	232	57	323	137
JPN	294	241	423	230	347	320	325	331	362	381	350	488	248	261	156	196	0	753	115	338	527	124	617	322
CZE	347	403	786	357	1112	626	615	812	756	929	1191	1224	714	796	221	226	239	0	158	407	499	198	787	436
EST	49	58	92	44	150	124	64	81	97	120	147	154	68	116	23	23	30	88	0	73	84	56	128	118
IRL	382	390	429	362	480	438	404	505	803	438	618	547	280	303	280	226	194	304	39	0	212	83	395	179
KOR	238	199	677	203	354	310	369	331	401	530	347	1015	348	379	129	178	251	345	34	147	0	102	481	265
SVN	74	101	146	86	287	154	117	145	144	215	191	170	92	170	44	38	54	141	28	67	64	0	143	107
PRT	421	567	1057	441	906	734	815	824	881	1021	1000	1355	617	826	242	307	305	646	74	338	412	111	0	424
LVA	110	140	304	124	553	244	199	221	262	381	307	602	229	353	73	82	92	272	62	103	156	62	329	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA
AUS	0	479	907	464	873	771	636	873	909	659	903	1098	471	585	501	306	375	544	99	428	340	552	105	249
BEL	429	0	662	533	892	663	583	817	726	666	962	744	405	582	272	235	325	527	100	391	271	559	132	249
CAN	819	638	0	853	2099	1190	1340	1471	1651	1819	1394	3316	899	1201	379	376	883	1132	178	456	730	1037	192	512
CHE	415	534	753	0	996	589	571	693	728	729	838	916	375	548	249	218	334	491	89	363	282	489	116	245
DEU	588	848	1289	846	0	2102	1457	2339	1881	2312	2609	2869	1026	1792	452	372	955	1669	259	596	587	1112	307	730
DFS	507	592	879	532	1221	0	966	1588	1367	1253	1664	1686	735	1159	463	384	586	1080	201	548	461	842	197	432
ESP	487	573	866	469	818	694	0	1248	1106	1288	1108	1565	720	947	327	368	676	889	146	420	513	848	167	397
FRA	602	837	997	639	1232	874	947	0	1565	1523	1987	2418	853	1532	518	390	802	1253	171	574	552	934	191	447
GBR	766	736	1666	722	1265	948	895	1052	0	1520	1712	2180	792	1187	489	396	667	1062	181	750	530	958	192	461
ITA	553	670	1593	667	1523	1001	956	1013	1305	0	1532	2418	872	1390	312	325	868	1218	213	469	623	1019	246	573
NLD	740	1052	1247	820	1906	1224	944	1276	1437	1322	0	2241	806	1381	621	381	679	1406	226	677	498	1005	222	493
USA	911	662	3348	846	1600	1052	1044	1325	1993	2006	1799	0	1164	1650	550	467	1203	1613	231	591	890	1307	215	707
HUN	332	336	795	316	688	528	556	572	639	741	608	1053	0	747	277	300	489	842	121	336	446	656	127	334
POL	377	470	911	397	1173	758	616	960	910	1085	1064	1383	577	0	318	291	662	1137	203	414	523	888	216	521
NZL	403	217	326	209	314	298	269	303	385	265	554	465	207	197	0	204	212	337	50	341	188	308	59	139
ZAF	280	209	349	191	292	301	339	318	368	287	342	495	256	216	186	0	210	303	54	237	230	323	55	137
JPN	254	213	383	211	319	290	282	294	313	362	309	429	220	251	132	151	0	610	103	250	440	501	120	282
CZE	347	400	786	357	1112	626	616	812	756	929	1191	1224	714	796	221	226	220	0	158	407	498	787	196	436
EST	49	58	92	44	150	124	64	81	97	120	147	154	68	116	23	23	30	88	0	73	84	128	55	118
IRL	382	384	429	362	480	438	404	505	803	438	618	547	280	303	280	225	170	304	39	0	210	395	82	179

KOR	238	199	677	203	354	310	371	331	401	530	347	1011	348	379	129	177	235	345	34	147	0	480	101	264
PRT	421	564	1057	441	906	734	817	824	881	1021	1000	1355	617	826	242	306	275	646	74	338	412	0	142	424
SVN	73	100	145	85	286	153	116	143	143	213	188	169	91	169	44	38	53	140	28	66	63	111	0	106
LVA	110	140	304	124	553	244	199	221	262	381	307	602	229	353	73	82	88	272	62	103	156	329	62	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	503	907	464	873	771	640	873	909	659	905	1098	471	585	501	306	569	544	99	428	341	106	552	249
BEL	432	0	682	540	913	684	606	863	757	670	1050	790	420	594	287	247	433	541	100	406	280	133	568	250
CAN	819	648	0	853	2099	1190	1345	1471	1651	1819	1397	3316	899	1201	379	376	1183	1132	178	456	730	193	1039	512
CHE	415	538	753	0	996	589	574	692	728	729	838	916	375	548	249	218	396	491	89	363	283	118	490	245
DEU	588	854	1289	846	0	2102	1471	2338	1881	2312	2611	2869	1026	1792	452	372	1192	1669	259	596	587	309	1113	730
DFS	507	597	879	532	1221	0	976	1588	1367	1253	1672	1686	735	1159	463	384	813	1080	201	548	462	199	843	432
ESP	490	586	868	475	834	703	0	1260	1114	1296	1121	1573	722	955	331	369	858	896	148	423	515	168	853	401
FRA	602	850	997	638	1231	874	960	0	1565	1523	1998	2418	853	1532	518	390	1143	1253	171	574	549	193	936	447
GBR	766	753	1666	722	1265	948	904	1052	0	1520	1715	2180	792	1187	489	396	906	1062	181	750	530	194	958	461
ITA	553	670	1593	667	1523	1001	964	1013	1305	0	1532	2418	872	1390	312	325	962	1218	213	469	622	248	1020	573
NLD	740	1149	1247	820	1907	1224	955	1275	1438	1322	0	2248	806	1382	622	381	921	1406	227	678	498	225	1007	494
USA	911	677	3348	846	1600	1053	1050	1325	1993	2006	1802	0	1164	1650	550	467	1722	1613	231	591	888	217	1309	707
HUN	332	340	795	316	688	528	559	572	639	741	608	1053	0	747	277	300	607	842	121	336	445	128	657	334
POL	377	473	911	397	1173	758	623	960	910	1085	1064	1383	577	0	318	291	766	1137	203	414	523	218	889	521
NZL	403	223	326	209	314	298	271	303	385	265	554	465	207	197	0	204	325	337	50	341	189	59	308	139
ZAF	281	212	350	192	293	302	342	319	369	288	343	496	257	217	186	0	307	303	54	237	231	57	323	137
JPN	291	238	420	228	345	318	322	326	357	379	345	483	248	260	156	194	0	752	115	338	524	124	617	322
CZE	347	403	786	357	1112	626	623	812	756	929	1191	1224	714	796	221	226	238	0	158	407	498	198	787	436
EST	49	58	92	44	150	124	65	81	97	120	147	154	68	116	23	23	30	88	0	73	84	56	128	118
IRL	382	390	429	362	480	438	407	505	803	438	618	547	280	303	280	226	194	304	39	0	210	83	395	179
KOR	238	199	676	203	354	310	371	329	400	529	345	1008	346	378	129	177	249	345	34	147	0	102	479	265
SVN	74	101	146	86	287	154	117	145	144	215	191	170	92	170	44	38	54	141	28	67	64	0	143	107
PRT	421	569	1058	442	906	734	825	826	883	1023	1003	1359	620	827	242	307	302	647	74	338	412	111	0	424
LVA	110	140	304	124	553	244	204	221	262	381	307	602	229	353	73	82	92	272	62	103	156	62	330	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	IRL	KOR	SVN	PRT	LVA
AUS	0	459	825	464	870	770	638	624	906	659	813	1097	469	546	258	531	428	98	413	257	105	549	227
BEL	423	0	633	522	865	634	574	711	697	660	906	713	395	550	207	390	450	97	368	225	132	550	229
CAN	766	627	0	830	2034	1094	1277	1170	1557	1811	1261	3122	877	1150	313	1061	998	175	426	627	192	1019	484
CHE	415	524	738	0	995	588	576	635	728	729	811	916	373	530	198	389	424	89	356	236	116	486	226
DEU	588	830	1286	846	0	2100	1473	2007	1877	2311	2545	2866	1021	1754	336	1163	1464	258	578	513	307	1110	703
DFS	507	583	876	532	1221	0	972	1211	1361	1253	1558	1684	730	1106	332	770	890	200	521	375	197	837	406
ESP	493	575	858	477	842	709	0	1067	1114	1300	1072	1573	723	926	324	824	791	147	413	437	168	856	382
FRA	503	720	871	576	1118	783	845	0	1215	1442	1468	1652	739	1371	272	842	1019	158	448	437	191	825	400
GBR	765	717	1593	721	1264	946	913	876	0	1520	1601	2172	789	1141	342	859	906	180	705	443	192	952	434
ITA	553	667	1593	667	1523	1001	968	984	1305	0	1522	2418	872	1379	317	957	1164	213	465	567	246	1020	560
NLD	683	995	1172	792	1883	1172	923	1056	1362	1316	0	1918	769	1309	315	820	1236	224	616	413	222	979	460
USA	911	652	3235	846	1600	1052	1053	963	1992	2006	1527	0	1161	1599	401	1590	1404	231	563	756	215	1302	676
HUN	332	327	789	316	688	528	561	512	638	741	595	1053	0	720	273	592	726	121	322	389	127	656	317
POL	363	456	890	384	1156	735	600	900	887	1080	1031	1353	559	0	252	730	1033	201	377	476	216	867	501
ZAF	244	194	307	177	274	279	302	244	321	284	286	414	241	201	0	254	241	53	197	166	55	307	122
JPN	286	236	417	227	344	316	317	306	352	378	338	475	246	253	182	0	641	113	311	438	123	609	302
CZE	295	347	710	301	995	546	526	655	644	891	1081	1072	605	740	178	222	0	151	326	427	194	712	407
EST	49	57	92	44	150	124	65	77	97	120	146	154	68	115	23	30	83	0	71	79	55	128	112
IRL	380	375	426	359	478	436	411	417	769	438	589	541	278	290	196	193	249	39	0	156	82	381	161
KOR	178	174	587	176	316	266	307	292	324	483	291	854	297	356	119	215	300	32	113	0	100	421	240
SVN	73	100	145	85	286	153	117	143	143	213	188	169	91	169	38	53	139	28	66	63	0	142	106
PRT	418	559	1037	439	906	732	829	766	880	1023	982	1355	619	815	297	300	586	74	335	365	111	0	407
LVA	100	129	290	114	532	230	193	206	244	374	286	581	216	341	74	88	259	57	93	145	62	317	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	IRL	KOR	SVN	PRT	LVA	
AUS	0	477	907	464	615	770	648	869	909	659	869	1098	470	584	306	569	544	99	427	340	105	557	249
BEL	429	0	660	532	717	659	600	811	725	665	956	743	405	581	235	411	527	100	390	272	132	563	248
CAN	819	638	0	853	1715	1190	1350	1455	1651	1819	1352	3316	898	1199	376	1183	1132	178	456	729	192	1042	512
CHE	415	534	753	0	836	589	581	689	728	728	828	916	375	546	218	396	490	89	363	283	116	493	245
DEU	483	698	1167	705	0	1503	1216	1714	1431	2110	2011	2165	791	1520	252	879	1304	233	434	492	301	904	670
DFS	507	592	879	532	1039	0	992	1560	1365	1252	1617	1684	733	1156	384	813	1080	201	547	462	197	848	432
ESP	498	600	876	483	693	723	0	1268	1132	1306	1120	1588	729	967	373	862	909	151	436	518	171	870	405
FRA	602	833	997	638	1008	872	993	0	1551	1523	1830	2378	850	1522	389	1129	1248	169	568	546	191	939	446
GBR	766	737	1666	722	1055	948	930	1053	0	1520	1671	2177	791	1183	395	905	1062	181	744	530	192	962	461
ITA	553	670	1593	667	1415	1001	979	1013	1305	0	1523	2418	872	1389	325	962	1218	213	469	621	246	1020	573
NLD	731	1050	1234	818	1602	1221	977	1231	1418	1320	0	2077	790	1359	369	880	1396	226	664	492	222	1001	488
USA	911	662	3348	846	1342	1052	1063	1290	1993	2006	1744	0	1163	1646	467	1721	1613	231	589	887	215	1311	707
HUN	332	336	795	316	538	527	566	572	639	741	606	1053	0	746	299	607	841	121	335	443	127	658	334
POL	377	470	911	396	1059	757	639	960	909	1085	1056	1383	576	0	290	766	1134	201	412	521	215	890	520
ZAF	281	210	350	192	202	302	344	319	369	288	337	496	257	217	0	306	303	54	237	231	55	329	137
JPN	291	237	419	227	300	317	323	324	355	378	341	481	247	259	193	0	752	115	338	524	123	622	322
CZE	347	400	786	357	913	626	639	812	756	929	1189	1224	714	796	226	237	0	157	407	497	196	788	436
EST	49	58	92	44	136	124	68	81	97	120	147	154	68	115	23	30	88	0	73	84	55	127	118
IRL	382	384	429	362	372	438	425	505	797	438	614	547	280	303	226	194	304	39	0	210	82	396	179
KOR	237	199	675	203	315	310	372	327	400	528	341	1001	345	377	177	247	344	34	147	0	100	481	264
SVN	73	100	145	85	286	153	121	143	143	213	188	169	91	169	38	53	140	28	66	62	0	142	106
PRT	423	569	1060	445	775	738	845	829	889	1023	1001	1362	623	830	308	301	650	73	339	412	111	0	424
LVA	110	140	304	124	524	244	211	221	262	381	306	602	229	353	82	92	272	62	103	155	62	330	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	
AUS	0	496	907	464	873	770	648	827	909	659	850	1098	471	584	501	306	569	544	99	428	341	103	552	249
BEL	431	0	678	539	909	679	618	844	752	669	999	775	417	591	283	245	426	539	100	404	280	130	567	250
CAN	819	648	0	853	2098	1190	1350	1399	1651	1819	1323	3316	899	1201	379	376	1183	1132	178	456	732	190	1038	512
CHE	415	537	753	0	996	589	581	690	728	729	819	916	375	548	249	218	396	491	89	363	283	115	489	245
DEU	588	854	1289	846	0	2102	1489	2320	1881	2312	2568	2869	1026	1791	452	372	1192	1669	259	596	589	305	1113	730
DFS	507	596	879	532	1222	0	992	1514	1366	1253	1595	1685	734	1158	462	384	813	1080	201	547	463	195	843	432
ESP	498	609	877	483	862	724	0	1248	1133	1306	1107	1588	730	969	339	373	863	909	151	436	520	170	865	405
FRA	601	847	992	637	1230	871	991	0	1516	1518	1796	2226	840	1522	490	377	1070	1242	169	560	539	190	927	442
GBR	766	754	1666	722	1265	948	931	1045	0	1520	1650	2179	792	1187	489	396	906	1062	181	748	531	191	958	461
ITA	553	670	1593	667	1523	1001	980	1012	1305	0	1520	2418	872	1390	312	325	962	1218	213	469	625	245	1020	573
NLD	710	1091	1193	797	1878	1201	953	1209	1387	1311	0	2011	786	1360	597	363	852	1386	224	665	486	222	988	484
USA	911	676	3348	846	1600	1053	1064	1255	1993	2006	1557	0	1164	1650	550	467	1722	1613	231	590	893	214	1308	707
HUN	332	340	795	316	688	528	567	570	639	741	592	1053	0	747	277	300	607	842	121	336	448	127	657	334
POL	377	473	911	397	1173	758	641	959	910	1085	1055	1383	577	0	318	291	766	1137	203	414	525	215	889	521
NZL	403	223	326	209	314	298	277	302	385	265	534	465	207	197	0	204	325	337	50	341	189	58	308	139
ZAF	281	212	350	192	293	302	344	318	369	288	324	496	257	217	186	0	307	303	54	237	231	55	323	137
JPN	291	238	420	228	345	318	325	326	357	379	342	483	248	260	156	194	0	752	115	338	525	122	617	322
CZE	347	403	786	357	1112	626	639	809	756	929	1173	1224	714	796	221	226	238	0	158	407	499	197	787	436
EST	49	58	92	44	150	124	68	81	97	120	146	154	68	116	23	23	30	88	0	73	84	55	128	118
IRL	382	390	429	362	480	438	425	501	801	438	604	547	280	303	280	226	194	304	39	0	211	81	395	179
KOR	238	199	677	203	354	310	375	331	401	530	338	1011	348	379	129	177	249	345	34	147	0	100	481	265
SVN	72	99	144	85	283	151	120	143	142	212	189	168	91	168	43	37	52	140	28	65	63	0	141	105
PRT	421	568	1057	441	906	734	840	822	882	1022	987	1356	619	827	242	307	302	646	74	338	412	110	0	424
LVA	110	140	304	124	553	244	211	221	262	381	303	602	229	353	73	82	92	272	62	103	156	61	329	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	
AUS	0	496	907	464	873	724	641	869	909	659	878	1098	471	585	501	306	570	544	99	428	341	105	551	249
BEL	431	0	678	539	909	668	605	849	751	669	1011	775	417	591	283	245	427	539	100	404	280	132	566	250
CAN	819	648	0	853	2099	1112	1346	1456	1651	1819	1365	3316	899	1201	379	376	1184	1132	178	456	732	192	1036	512
CHE	415	537	753	0	996	585	576	692	728	729	831	916	375	548	249	218	396	491	89	363	283	117	489	245
DEU	588	854	1289	846	0	2048	1473	2334	1881	2312	2596	2869	1026	1792	452	372	1193	1669	259	596	589	308	1111	730

DFS	507	596	879	532	1221	0	935	1477	1307	1250	1596	1592	718	1138	435	357	760	1046	199	530	450	198	833	428
ESP	490	587	869	476	835	704	0	1250	1116	1297	1107	1575	723	957	332	371	860	897	148	424	517	167	852	402
FRA	602	849	997	638	1230	873	962	0	1552	1523	1874	2379	851	1529	514	389	1131	1248	170	569	550	192	931	446
GBR	766	752	1665	722	1264	947	903	1050	0	1520	1685	2179	792	1187	489	396	907	1062	181	748	531	193	956	461
ITA	553	670	1593	667	1523	1000	965	1013	1304	0	1525	2418	872	1390	312	325	963	1218	213	469	625	247	1019	573
NLD	736	1119	1240	819	1905	1223	954	1251	1425	1319	0	2116	797	1373	609	371	888	1400	226	671	497	224	999	489
USA	911	676	3348	846	1600	1052	1051	1290	1993	2006	1757	0	1164	1650	550	467	1723	1613	231	590	894	216	1306	707
HUN	332	340	795	316	688	528	560	572	639	741	608	1053	0	747	277	300	607	842	121	336	448	127	657	334
POL	377	473	911	397	1173	758	625	960	910	1085	1063	1383	577	0	318	291	766	1137	203	414	525	217	887	521
NZL	403	223	326	209	314	298	271	303	385	265	552	465	207	197	0	204	325	337	50	341	189	59	308	139
ZAF	281	212	350	192	293	302	343	319	369	288	341	496	257	217	186	0	308	303	54	237	231	56	322	137
JPN	291	239	421	228	346	319	324	327	358	380	345	484	248	260	156	195	0	753	115	338	526	123	618	322
CZE	347	403	786	357	1112	626	624	812	756	929	1189	1224	714	796	221	226	238	0	158	407	499	197	786	436
EST	49	58	92	44	150	124	65	81	97	120	147	154	68	116	23	23	30	88	0	73	84	55	127	118
IRL	382	390	429	362	480	438	408	505	801	438	615	547	280	303	280	226	194	304	39	0	211	82	395	179
KOR	238	199	677	203	354	310	373	331	401	530	344	1012	348	379	129	178	250	345	34	147	0	101	481	265
SVN	73	100	145	85	286	153	116	144	143	214	190	169	91	169	44	38	53	140	28	66	63	0	142	106
PRT	421	567	1057	441	906	731	825	824	881	1022	998	1356	618	827	242	307	303	646	74	338	412	111	0	424
LVA	110	140	304	124	553	244	205	221	262	381	306	602	229	353	73	82	92	272	62	103	156	62	329	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	
AUS	0	496	907	464	873	771	651	873	909	659	904	1098	471	585	501	306	569	544	99	428	341	106	552	249
BEL	431	0	678	539	909	680	620	853	752	669	1020	775	417	591	283	245	426	539	100	404	280	133	568	250
CAN	819	648	0	853	2099	1190	1352	1471	1651	1819	1396	3316	899	1201	379	376	1183	1132	178	456	730	193	1039	512
CHE	415	537	753	0	996	589	581	692	728	729	837	916	375	548	249	218	396	491	89	363	283	118	490	245
DEU	588	854	1289	846	0	2102	1497	2338	1881	2312	2609	2869	1026	1792	452	372	1192	1669	259	596	587	309	1113	730
DFS	507	596	880	532	1222	0	998	1588	1367	1253	1672	1686	735	1159	463	384	813	1080	201	548	462	199	843	432
ESP	499	612	878	483	876	731	0	1287	1137	1310	1151	1593	732	976	341	373	866	913	152	438	519	172	869	407
FRA	602	850	997	638	1231	874	1008	0	1566	1523	1997	2418	853	1532	518	390	1143	1253	171	574	548	193	936	447
GBR	766	754	1666	722	1265	948	937	1053	0	1520	1715	2180	792	1187	489	396	906	1062	181	750	530	194	958	461
ITA	553	670	1593	667	1523	1001	985	1013	1305	0	1529	2418	872	1390	312	325	962	1218	213	469	622	248	1020	573
NLD	740	1127	1247	820	1907	1224	994	1276	1439	1320	0	2244	806	1382	622	381	921	1405	227	678	498	225	1006	494
USA	911	676	3348	846	1600	1054	1066	1325	1993	2006	1799	0	1164	1650	550	467	1722	1613	231	591	887	217	1309	707
HUN	332	340	795	316	688	529	570	572	639	741	608	1053	0	747	277	300	607	842	121	336	445	128	657	334
POL	377	473	911	397	1173	758	649	960	910	1085	1064	1383	577	0	318	291	766	1137	203	414	523	218	889	521
NZL	403	223	326	209	314	298	278	303	385	265	554	465	207	197	0	204	325	337	50	341	189	59	308	139
ZAF	281	212	350	192	293	303	344	319	369	288	343	496	257	217	186	0	307	303	54	237	231	57	323	137
JPN	291	238	420	228	345	318	325	326	357	379	345	483	248	260	156	194	0	752	115	338	524	124	617	322
CZE	347	403	786	357	1112	626	642	812	756	929	1190	1224	714	796	221	226	238	0	158	407	498	198	787	436
EST	49	58	92	44	150	124	69	81	97	120	147	154	68	116	23	23	30	88	0	73	84	56	128	118
IRL	382	390	429	362	480	438	427	505	803	438	618	547	280	303	280	226	194	304	39	0	210	83	395	179
KOR	238	199	676	203	354	310	375	329	400	529	345	1007	346	378	129	177	249	345	34	147	0	102	479	265
SVN	74	101	146	86	287	154	122	145	144	215	191	170	92	170	44	38	54	141	28	67	64	0	143	107
PRT	421	569	1058	442	906	734	843	826	883	1023	1003	1359	620	827	242	307	302	647	74	338	412	111	0	424
LVA	110	140	304	124	553	244	218	221	262	381	307	602	229	353	73	82	92	272	62	103	156	62	330	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	IRL	KOR	SVN	PRT	LVA		
AUS	0	499	907	464	873	771	638	873	909	659	908	1098	471	585	306	570	544	99	427	341	106	552	249	
BEL	430	0	678	538	907	679	603	856	751	670	1045	784	417	591	244	431	539	100	401	277	133	566	250	
CAN	819	644	0	853	2099	1190	1343	1471	1651	1819	1480	3316	899	1201	376	1185	1132	178	456	731	193	1037	512	
CHE	415	536	753	0	996	589	572	692	728	729	842	916	375	548	218	397	491	89	363	283	118	489	245	
DEU	588	853	1289	846	0	2102	1463	2338	1881	2312	2642	2869	1026	1792	372	1194	1669	259	596	588	309	1112	730	
DFS	507	596	880	532	1221	0	971	1588	1367	1253	1683	1686	735	1159	384	814	1080	201	548	462	199	842	432	
ESP	488	581	866	471	825	698	0	1254	1111	1293	1130	1568	721	952	368	859	893	148	422	514	168	851	400	
FRA	602	848	997	638	1231	874	951	0	1565	1523	2008	2418	853	1532	390	1145	1253	171	574	553	193	934	447	
GBR	766	749	1666	722	1265	948	899	1052	0	1520	1738	2180	792	1187	396	908	1062	181	747	531	194	958	461	
ITA	553	670	1593	667	1523	1001	959	1013	1305	0	1558	2419	873	1391	325	964	1218	213	469	624	248	1019	573	
NLD	746	1141	1288	827	1945	1233	957	1283	1464	1354	0	2279	810	1402	381	927	1418	231	681	506	228	1013	502	
USA	911	673	3348	846	1600	1054	1046	1325	1993	2006	1840	0	1164	1651	467	1724	1613	231	591	892	217	1307	707	

HUN	332	339	795	316	688	529	557	572	639	741	612	1053	0	748	300	607	842	121	336	447	128	656	334
POL	377	473	911	397	1173	758	620	960	910	1086	1085	1383	578	0	291	766	1137	203	414	524	218	888	521
ZAF	281	212	350	192	293	303	340	319	369	288	344	496	257	217	0	308	303	54	237	231	57	323	137
JPN	294	241	423	230	347	320	325	331	362	381	352	488	248	261	196	0	753	115	338	526	124	617	322
CZE	347	403	786	357	1112	626	619	812	756	929	1197	1224	714	796	226	239	0	158	407	499	198	787	436
EST	49	58	92	44	150	124	65	81	97	120	148	154	68	116	23	30	88	0	73	84	56	128	118
IRL	382	389	429	362	480	438	405	505	800	438	621	547	280	303	226	194	304	39	0	211	83	395	179
KOR	238	199	677	203	354	310	371	331	401	530	352	1012	348	379	178	251	345	34	147	0	102	481	265
SVN	74	101	146	86	287	154	117	145	144	215	195	170	92	170	38	54	141	28	67	64	0	143	107
PRT	421	566	1057	441	906	734	820	824	881	1021	1006	1355	617	826	307	305	646	74	338	412	111	0	424
LVA	110	140	304	124	553	244	202	221	262	381	312	602	229	353	82	92	272	62	103	156	62	329	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	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	496	907	464	873	771	641	873	909	659	908	1098	471	585	501	306	570	544	98	428	341	104	552	227
BEL	431	0	678	539	909	680	605	852	751	669	1022	775	417	591	283	245	428	539	100	404	280	131	567	231
CAN	819	648	0	853	2099	1190	1345	1471	1651	1819	1430	3316	899	1201	379	376	1185	1132	178	456	732	190	1037	486
CHE	415	537	753	0	996	589	575	692	728	729	842	916	375	548	249	218	397	491	89	363	283	115	489	226
DEU	588	854	1289	846	0	2102	1472	2338	1881	2312	2642	2869	1026	1793	452	372	1194	1669	258	596	589	305	1112	702
DFS	507	596	880	532	1221	0	976	1588	1367	1253	1683	1686	735	1159	463	384	814	1080	200	548	463	195	842	406
ESP	490	587	868	475	834	703	0	1261	1115	1296	1135	1574	722	956	332	370	859	896	147	423	516	167	853	380
FRA	602	849	997	638	1231	874	961	0	1565	1523	2008	2418	853	1532	518	390	1145	1253	170	574	554	190	934	422
GBR	766	753	1666	722	1265	948	904	1052	0	1520	1738	2180	792	1187	489	396	908	1062	181	750	531	191	958	433
ITA	553	670	1593	667	1523	1001	964	1013	1305	0	1558	2419	873	1392	312	325	964	1218	213	469	625	246	1019	560
NLD	746	1129	1288	827	1945	1233	962	1283	1464	1354	0	2279	810	1402	622	381	927	1418	230	681	508	225	1013	469
USA	911	676	3348	846	1600	1053	1050	1325	1993	2006	1840	0	1164	1652	550	467	1724	1613	231	591	894	214	1307	676
HUN	332	340	795	316	688	529	559	572	639	741	612	1053	0	748	277	300	607	842	121	336	448	128	656	317
POL	377	473	911	397	1173	758	624	960	910	1087	1085	1383	578	0	318	291	766	1137	202	414	525	216	888	500
NZL	403	223	326	209	314	298	271	303	385	265	554	465	207	197	0	204	325	337	50	341	189	58	308	121
ZAF	281	212	350	192	293	303	342	319	369	288	344	496	257	217	186	0	308	303	54	237	231	56	323	124
JPN	293	241	423	230	347	320	325	330	361	381	351	487	248	261	156	196	0	753	115	338	526	123	617	304
CZE	347	403	786	357	1112	626	623	812	756	929	1197	1224	714	796	221	226	238	0	158	407	499	197	787	421
EST	49	58	92	44	150	124	65	81	97	120	148	154	68	116	23	30	88	0	73	84	56	128	112	
IRL	382	390	429	362	480	438	407	505	803	438	621	547	280	303	280	226	194	304	39	0	211	82	395	165
KOR	238	199	677	203	354	310	372	331	401	530	352	1012	348	379	129	178	251	345	34	147	0	101	481	255
SVN	73	100	145	86	283	151	116	143	143	213	194	169	92	169	43	37	53	141	28	66	64	0	142	106
PRT	421	567	1057	441	906	734	824	824	881	1021	1006	1355	617	826	242	307	305	646	74	338	412	110	0	407
LVA	100	129	290	114	531	230	191	210	244	374	291	581	216	341	63	74	88	264	57	93	154	61	317	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	IRL	KOR	SVN	PRT	LVA	NZL
AUS	0	503	907	464	873	771	638	873	909	659	904	1098	459	585	306	562	544	99	427	342	104	552	249	54
BEL	432	0	682	540	913	684	606	863	757	670	1050	790	413	594	247	434	541	100	406	281	131	567	250	43
CAN	819	648	0	853	2099	1190	1344	1471	1651	1819	1396	3316	885	1201	376	1178	1132	178	456	733	190	1037	512	63
CHE	415	538	753	0	996	589	573	692	728	729	837	916	371	548	218	397	491	89	363	284	115	489	245	45
DEU	588	854	1289	846	0	2102	1465	2338	1881	2312	2609	2869	1017	1793	372	1192	1669	259	596	590	305	1112	730	69
DFS	507	597	880	532	1221	0	972	1588	1367	1253	1672	1686	721	1159	384	808	1080	201	548	464	195	842	432	49
ESP	488	584	867	472	827	699	0	1255	1111	1294	1117	1570	712	953	368	849	894	148	422	516	167	851	400	54
FRA	602	850	997	638	1231	874	952	0	1565	1523	1996	2418	835	1532	390	1132	1253	171	574	555	190	934	447	52
GBR	766	753	1666	722	1265	948	900	1052	0	1520	1714	2180	778	1187	396	903	1062	181	747	532	191	958	461	61
ITA	553	670	1593	667	1523	1001	961	1013	1305	0	1529	2418	871	1391	325	964	1218	213	469	626	246	1019	573	63
NLD	740	1149	1247	820	1907	1224	952	1275	1438	1320	0	2244	789	1382	381	917	1405	227	678	503	222	1004	494	87
USA	911	677	3348	846	1600	1054	1047	1325	1993	2006	1799	0	1135	1651	467	1704	1613	231	591	896	214	1307	707	64
HUN	320	331	781	312	681	520	543	561	623	738	596	1027	0	742	292	598	830	121	330	447	128	654	334	38
POL	377	473	911	397	1173	758	621	960	910	1086	1064	1383	573	0	291	764	1137	203	414	526	216	888	521	47
ZAF	281	212	350	192	293	303	340	319	369	288	343	496	246	217	0	305	303	54	237	232	56	323	137	19
JPN	293	241	423	230	347	320	325	330	361	381	349	487	242	261	196	0	752	114	336	527	123	617	322	47
CZE	347	403	786	357	1112	626	620	812	756	929	1190	1224	703	796	226	238	0	158	407	499	197	787	436	49
EST	49	58	92	44	150	124	65	81	97	120	147	154	68	116	23	30	88	0	73	84	56	128	118	16
IRL	382	390	429	362	480	438	406	505	800	438	618	547	272	303	226	194	304	39	0	212	82	395	179	40
KOR	238	199	677	203	354	310	371	331	401	530	347	1015	346	379	178	251	345	34	147	0	101	481	265	40

SVN	73	100	145	86	283	151	116	143	143	213	190	169	92	169	37	53	141	28	66	64	0	142	106	23
PRT	421	567	1057	441	906	734	821	824	881	1021	1000	1355	614	826	307	305	646	74	338	412	110	0	424	47
LVA	110	140	304	124	553	244	203	221	262	381	307	602	229	353	82	92	272	62	103	156	61	329	0	27
NZL	59	40	66	40	66	45	51	51	59	59	85	68	25	33	20	43	39	5	36	35	14	47	14	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	IRL	KOR	SVN	PRT	ZAF	HUN	LVA
AUS	0	489	906	447	868	646	643	871	773	658	754	818	482	494	374	427	98	361	221	104	466	165	316	249
BEL	430	0	670	513	897	624	607	836	671	667	910	672	506	278	326	455	100	344	198	131	495	144	305	250
CAN	818	643	0	816	2091	1033	1346	1470	1472	1817	1279	2903	1097	374	883	1002	177	391	552	190	918	227	729	512
CHE	411	513	723	0	907	546	569	673	682	711	723	828	473	244	333	410	88	320	209	114	423	133	292	240
DEU	587	852	1288	790	0	1952	1474	2309	1719	2309	2493	2544	1656	442	954	1461	258	523	451	305	996	223	798	730
DFS	471	558	849	491	1175	0	872	1351	1121	1227	1464	1290	1002	374	578	865	194	434	316	195	718	212	530	419
ESP	492	593	871	474	840	657	0	1268	1006	1299	1039	1403	859	333	673	790	147	355	385	168	756	219	562	403
FRA	602	844	997	623	1215	816	973	0	1276	1521	1598	1717	1364	509	802	1065	169	458	400	190	803	215	642	446
GBR	680	688	1510	666	1205	844	797	921	0	1486	1441	1806	1041	381	652	880	169	556	380	190	813	221	578	444
ITA	553	670	1593	656	1522	983	968	1013	1289	0	1533	2344	1343	310	868	1164	212	445	499	246	956	236	777	573
NLD	658	990	1176	718	1879	1138	890	1138	1235	1340	0	1669	1242	499	674	1230	224	544	363	225	862	212	597	485
USA	741	637	3077	767	1518	953	944	1034	1772	1991	1397	0	1458	377	1164	1354	221	465	652	214	1099	258	865	685
POL	322	409	853	333	1077	679	533	858	816	1046	979	1262	0	240	640	1001	190	330	427	214	786	188	605	495
NZL	400	221	324	206	313	267	273	302	317	265	458	337	153	0	210	247	49	276	118	58	240	100	157	138
JPN	254	213	383	211	319	289	283	294	313	362	311	429	238	132	0	583	102	233	369	120	479	164	434	282
CZE	295	347	710	292	994	542	526	669	637	891	1081	1056	720	171	216	0	150	313	371	195	676	203	642	414
EST	49	58	92	44	150	121	65	81	94	120	144	151	107	23	30	83	0	66	75	56	120	46	109	118
IRL	336	351	388	325	448	377	357	426	573	423	527	472	251	237	170	247	39	0	130	82	323	125	226	171
KOR	164	154	521	158	283	231	267	260	280	428	261	749	322	87	194	258	31	96	0	100	356	128	322	217
SVN	73	100	145	86	283	151	117	143	143	213	194	169	169	43	53	140	28	66	64	0	142	54	125	106
PRT	362	490	913	376	817	622	703	704	737	959	849	1147	739	190	262	556	69	279	314	110	0	212	506	401
ZAF	158	132	212	111	182	187	192	189	197	207	186	263	160	92	124	155	21	119	88	36	202	0	171	104
HUN	239	246	658	243	535	401	406	430	462	648	454	801	484	116	196	545	61	195	246	91	483	151	0	299
LVA	110	140	304	122	553	243	207	220	258	381	306	591	338	73	88	262	62	103	131	61	311	64	202	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	NZL	JPN	CZE	EST	IRL	KOR	SVN	PRT	
AUS	0	503	907	464	871	771	638	750	909	659	905	1095	471	584	501	570	544	98	428	342	105	552	
BEL	432	0	680	538	911	682	609	803	756	669	1049	785	420	593	287	434	541	100	405	281	131	566	
CAN	819	648	0	853	2098	1190	1336	1315	1651	1819	1397	3297	899	1200	379	1185	1132	178	456	735	191	1037	
CHE	415	538	753	0	995	589	576	669	728	729	838	911	375	547	249	397	491	89	363	284	115	489	
DEU	588	853	1289	846	0	2101	1474	2213	1880	2311	2610	2859	1025	1787	451	1193	1668	258	595	589	305	1111	
DFS	507	597	880	532	1221	0	975	1424	1367	1253	1672	1683	735	1156	463	814	1080	200	547	465	195	842	
ESP	493	595	871	477	842	709	0	1187	1118	1300	1130	1570	726	961	337	856	901	147	429	519	168	860	
FRA	572	809	952	623	1168	849	945	0	1428	1500	1709	1998	813	1447	437	997	1200	166	531	523	189	896	
GBR	766	754	1666	722	1265	948	914	1020	0	1520	1716	2174	792	1186	489	908	1062	181	749	532	191	956	
ITA	553	670	1593	667	1523	1001	968	1006	1305	0	1532	2414	872	1390	312	964	1218	213	469	627	245	1020	
NLD	740	1150	1247	820	1907	1224	967	1171	1439	1322	0	2241	806	1380	622	923	1406	226	678	503	220	1006	
USA	907	675	3317	840	1592	1049	1050	1145	1985	1998	1794	0	1161	1645	549	1720	1607	230	588	898	214	1305	
HUN	332	340	795	316	688	529	561	564	639	741	608	1051	0	746	277	607	842	121	336	448	127	656	
POL	377	473	911	397	1173	758	628	916	910	1085	1064	1379	577	0	318	765	1137	202	414	526	216	889	
NZL	403	223	326	209	314	298	274	284	385	265	554	463	207	197	0	325	337	50	341	191	59	308	
JPN	293	240	422	230	347	320	325	328	361	381	349	487	248	261	156	0	753	115	338	528	123	618	
CZE	347	403	786	357	1112	626	628	785	756	929	1191	1218	714	796	221	239	0	158	407	499	194	786	
EST	49	58	92	44	150	124	65	80	97	120	147	154	68	116	23	30	88	0	73	84	55	128	
IRL	382	390	429	362	480	438	415	490	803	438	618	546	280	303	280	194	304	39	0	212	82	395	
KOR	238	199	677	203	354	310	374	324	401	530	347	1013	348	379	129	251	345	34	147	0	101	481	
SVN	73	99	145	85	284	151	117	141	143	212	187	169	91	169	44	53	139	28	66	63	0	142	
PRT	421	568	1057	441	906	734	831	810	882	1022	1002	1348	619	827	242	304	646	74	338	412	111	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	NZL	JPN	CZE	EST	IRL	SVN	PRT
AUS	0	503	907	464	872	771	644	873	909	659	904	1098	471	585	501	570	544	98	415	104	552
BEL	432	0	682	540	913	684	613	864	758	670	1051	790	420	594	287	435	541	100	394	130	567
CAN	819	648	0	853	2099	1190	1347	1471	1651	1819	1396	3316	899	1201	379	1185	1132	178	442	190	1037
CHE	415	538	753	0	996	589	577	692	728	729	837	916	375	548	249	397	491	89	356	115	489
DEU	588	854	1289	846	0	2102	1478	2338	1881	2312	2609	2869	1026	1792	452	1194	1669	258	580	304	1112
DFS	507	597	880	532	1221	0	982	1588	1367	1253	1672	1686	735	1159	463	814	1080	200	524	194	843
ESP	493	595	871	477	842	709	0	1270	1124	1300	1132	1581	726	963	338	862	902	147	416	168	860
FRA	602	851	997	638	1231	874	973	0	1566	1523	1997	2418	853	1532	518	1145	1253	170	545	189	935
GBR	766	752	1665	722	1263	947	911	1051	0	1520	1715	2180	792	1187	489	908	1062	181	712	191	958
ITA	553	670	1593	667	1523	1001	968	1013	1303	0	1529	2418	872	1390	312	964	1218	213	465	245	1020
NLD	740	1150	1247	820	1907	1224	967	1276	1437	1320	0	2244	806	1382	622	923	1405	226	642	220	1005
USA	911	677	3348	846	1600	1054	1056	1325	1993	2006	1799	0	1164	1650	550	1724	1613	231	565	214	1308
HUN	332	340	795	316	688	529	561	572	639	741	608	1053	0	747	277	607	842	121	325	128	656
POL	377	473	911	397	1173	758	628	960	910	1085	1064	1383	577	0	318	766	1137	202	403	216	889
NZL	403	223	326	209	314	298	275	303	385	265	554	465	207	197	0	325	337	50	327	58	308
JPN	293	240	422	230	347	320	325	330	361	381	349	487	248	261	156	0	753	115	324	123	618
CZE	347	403	786	357	1112	626	628	812	755	929	1190	1224	714	796	221	239	0	158	392	196	787
EST	49	58	92	44	150	124	65	81	97	120	147	154	68	116	23	30	88	0	72	56	128
IRL	380	389	428	360	478	437	412	498	779	438	610	541	278	303	276	194	303	39	0	82	384
SVN	73	99	145	86	282	150	117	142	143	212	188	169	92	169	43	53	140	28	66	0	142
PRT	421	568	1057	441	906	734	831	824	881	1022	1002	1356	619	827	242	304	646	74	338	110	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	JPN	CZE	EST	IRL	SVN	PRT
AUS	0	495	907	464	871	771	646	746	909	659	886	1096	459	583	561	544	98	414	105	558
BEL	431	0	675	535	905	677	611	797	749	668	1004	768	409	588	421	538	100	391	131	570
CAN	819	647	0	853	2098	1190	1349	1310	1651	1819	1367	3308	885	1200	1169	1132	178	442	191	1045
CHE	415	535	753	0	995	589	579	664	728	729	829	914	371	547	395	491	89	356	115	495
DEU	588	853	1289	846	0	2101	1481	2207	1880	2311	2585	2868	1016	1786	1188	1668	258	579	305	1119
DFS	507	595	880	532	1221	0	986	1420	1367	1253	1645	1672	721	1156	803	1080	200	524	195	851
ESP	494	602	873	480	848	714	0	1185	1126	1303	1120	1579	718	965	851	904	149	417	169	870
FRA	565	805	942	614	1161	847	943	0	1423	1499	1683	1988	804	1445	985	1199	166	518	189	902
GBR	766	751	1665	722	1263	947	917	1007	0	1520	1692	2173	778	1186	896	1062	181	709	191	964
ITA	553	670	1593	667	1523	1001	973	1005	1303	0	1528	2417	871	1390	962	1218	213	465	245	1021
NLD	717	1094	1202	799	1880	1203	947	1137	1400	1314	0	2139	783	1369	886	1395	225	637	220	1004
USA	907	672	3348	846	1599	1054	1057	1129	1992	2006	1594	0	1135	1648	1671	1611	231	563	214	1316
HUN	320	331	781	312	681	520	549	551	623	738	581	1027	0	741	597	830	121	320	127	657
POL	377	472	911	397	1173	758	631	915	910	1085	1056	1383	573	0	763	1137	202	403	216	894
JPN	291	239	421	228	346	319	325	323	358	380	344	484	242	260	0	750	114	320	123	623
CZE	347	402	786	357	1112	626	631	781	755	929	1174	1223	703	796	238	0	158	392	194	790
EST	49	58	92	44	150	124	67	80	97	120	146	154	68	116	30	88	0	72	55	128
IRL	380	389	428	360	478	437	414	484	776	438	601	541	271	303	194	303	39	0	82	387
SVN	73	99	145	85	284	151	118	141	143	212	187	169	91	169	53	139	28	66	0	142
PRT	423	573	1062	446	912	740	841	816	890	1023	995	1362	620	831	303	650	74	339	111	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	EST	HUN	POL
BEL	0	630	447	742	630	551	752	693	589	850	711	441	366	185	105	483	66	303	355
CAN	627	0	741	1772	1094	1237	1278	1556	1669	1179	3120	983	426	495	160	902	120	727	758
CHE	447	647	0	793	499	486	584	626	638	647	771	386	295	191	90	399	63	284	324
DEU	714	1173	668	0	1648	1255	1800	1522	1912	2086	2307	1324	464	397	233	886	176	762	1072
DFS	579	877	445	1074	0	894	1416	1356	1055	1413	1666	872	521	287	154	712	135	535	690
ESP	548	806	384	705	665	0	1122	1025	1151	979	1452	778	379	349	137	739	98	559	619
FRA	778	938	521	1008	846	890	0	1420	1269	1464	1986	1030	517	357	150	783	111	640	949
GBR	715	1592	593	1074	945	813	1008	0	1341	1424	2164	890	704	341	159	818	126	585	731
ITA	611	1492	586	1331	893	871	921	1181	0	1292	2111	1034	397	443	197	867	151	727	908
NLD	925	1103	624	1621	1124	822	1055	1208	1178	0	1660	1182	555	324	174	825	154	585	822
USA	652	3234	688	1371	1053	922	1129	1990	1843	1331	0	1374	562	579	180	1116	148	878	1003
CZE	344	699	274	925	532	524	651	630	806	1046	1047	0	316	322	162	656	99	637	715

IRL	375	425	286	388	437	372	484	770	388	532	541	241	0	119	67	320	46	228	242
KOR	146	480	147	262	215	250	241	257	386	240	671	225	90	0	83	318	47	288	307
SVN	84	123	67	218	125	100	114	125	174	152	145	119	55	56	0	122	38	105	163
PRT	481	907	354	759	615	687	694	727	867	814	1143	537	275	283	94	0	76	500	556
EST	37	62	29	95	84	40	52	72	80	96	85	54	26	19	16	43	0	76	119
HUN	244	651	235	519	401	401	427	457	619	445	795	536	193	219	77	476	41	0	463
POL	277	584	225	682	463	381	565	571	700	609	786	479	193	213	134	508	59	369	0

HOL

common bulls below diagonal
common three quarter sib group above diagonal

	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	NZL	POL
BEL	0	496	722	302	603	690	603	899	701	404	265	337	192	521	366	558	129	81	260	209	433
CHE	500	0	873	247	570	699	700	784	885	392	285	316	209	720	331	546	116	77	258	198	422
DEU	693	738	0	802	1609	1529	2056	2146	2323	1260	764	416	438	1624	747	1266	303	219	677	273	1407
DFS	241	201	368	0	495	625	532	788	686	437	220	276	133	322	268	418	82	61	225	194	420
FRA	607	512	982	259	0	1010	1269	1216	1386	855	612	341	369	999	587	957	188	136	549	222	1114
GBR	710	684	1088	352	769	0	1429	1576	2129	822	543	640	381	1253	624	1057	192	154	517	348	930
ITA	618	636	1364	365	901	1232	0	1403	2278	1062	738	395	496	1619	749	1229	242	186	684	245	1191
NLD	979	768	1667	502	938	1332	1237	0	1873	1144	537	546	355	1037	640	1033	222	191	514	442	1072
USA	632	816	1389	343	864	1980	1916	1475	0	1278	968	517	651	2490	879	1508	215	185	791	347	1327
CZE	314	279	899	231	577	588	819	1012	992	0	484	264	364	852	521	723	193	129	555	195	883
JPN	175	180	280	107	255	270	322	268	376	193	0	170	347	696	362	580	114	82	371	143	537
IRL	347	320	361	206	334	703	381	521	503	201	129	0	118	318	206	364	76	52	179	232	254
KOR	146	158	283	78	259	280	424	255	752	192	88	0	522	330	382	100	69	309	111	414	
CAN	540	656	1169	247	794	1337	1478	1052	2807	653	336	339	507	0	693	1051	189	143	628	218	942
PRT	360	292	647	197	546	558	749	617	939	427	219	178	288	717	0	570	138	100	414	161	642
ESP	563	447	704	275	765	863	917	884	1003	479	247	367	266	748	521	0	169	125	503	237	753
SVN	97	85	286	55	142	143	211	188	169	139	52	60	63	145	105	118	0	53	122	58	208
EST	49	38	128	26	70	87	107	129	118	74	28	31	31	85	62	59	28	0	96	37	170
HUN	208	208	469	148	382	411	572	390	724	470	171	149	238	603	403	361	89	55	0	126	540
NZL	176	175	231	127	187	291	221	408	302	145	108	196	85	223	139	204	43	19	97	0	162
POL	353	305	973	255	752	751	946	860	1188	645	215	205	315	820	619	476	166	100	446	124	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	152	89	104	35	152	256	132	17	15
CAN	158	0	97	139	37	76	451	144	13	23
DFS	66	85	0	108	47	92	158	126	22	34
GBR	103	144	104	0	43	76	173	114	16	34
ITA	35	35	46	41	0	33	47	47	10	16
NZL	154	77	71	78	30	0	149	104	17	19
USA	251	453	127	180	50	156	0	253	35	36
ZAF	136	144	109	112	48	100	260	0	26	25
NLD	13	8	16	13	7	14	35	21	0	5
CHE	13	21	33	32	17	17	36	25	4	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	152	89	104	35	152	256	125	17	22
CAN	158	0	97	139	37	76	451	133	13	28
DFS	66	85	0	108	47	92	158	117	22	43
GBR	103	144	104	0	43	76	173	109	16	41
ITA	35	35	46	41	0	33	47	47	10	22
NZL	154	77	71	78	30	0	149	95	17	25
USA	251	453	127	180	50	156	0	233	35	43
ZAF	130	135	103	108	48	92	242	0	26	36
NLD	13	8	16	13	7	14	35	21	0	9
CHE	20	27	42	40	24	23	44	36	7	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0	152	89	104	35	152	125	17	256	26
CAN	158	0	97	139	37	76	133	13	451	32
DFS	66	85	0	108	47	92	117	22	158	46
GBR	103	144	104	0	43	76	109	16	173	44
ITA	35	35	46	41	0	33	47	10	47	25
NZL	154	77	71	78	30	0	95	17	149	29
ZAF	130	135	103	108	48	92	0	26	233	40
NLD	13	8	16	13	7	14	21	0	35	11
USA	251	453	127	180	50	156	242	35	0	47
CHE	23	29	45	43	26	27	39	8	48	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	152	86	103	35	256	131	5	26
CAN	158	0	97	139	37	451	144	5	32
DFS	63	84	0	106	47	158	125	11	46
GBR	102	144	102	0	43	173	114	10	44
ITA	35	35	46	41	0	47	47	5	25
USA	251	453	126	180	50	0	252	18	47
ZAF	135	144	108	112	48	259	0	11	40
NLD	2	3	10	8	4	16	9	0	6
CHE	23	29	45	43	26	48	39	6	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	152	89	104	35	152	256	132	17	26
CAN	158	0	97	139	37	76	451	144	13	32
DFS	66	85	0	108	47	92	158	126	22	46
GBR	103	144	104	0	43	76	173	114	16	44
ITA	35	35	46	41	0	33	47	47	10	25
NZL	154	77	71	78	30	0	149	104	17	29
USA	251	453	127	180	50	156	0	253	35	47
ZAF	136	144	109	112	48	100	260	0	26	40
NLD	13	8	16	13	7	14	35	21	0	11
CHE	23	29	45	43	26	27	48	39	8	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	152	84	104	35	152	256	132	17	26
CAN	158	0	86	139	37	76	451	144	13	32
DFS	58	71	0	104	44	85	147	119	20	45
GBR	103	144	97	0	43	76	173	114	16	44
ITA	35	35	41	41	0	33	47	47	10	25
NZL	154	77	63	78	30	0	149	104	17	29
USA	251	453	113	180	50	156	0	253	35	47
ZAF	136	144	99	112	48	100	260	0	26	40
NLD	13	8	14	13	7	14	35	21	0	11
CHE	23	29	44	43	26	27	48	39	8	0

JER


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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  ZAF  NLD  CHE
-----
AUS   0  152  89  104  35  152  256  132  17  26
CAN  158   0  97  139  37  76  451  144  13  32
DFS   66  85   0  108  47  92  158  126  22  46
GBR  103 144 104   0  43  76  173  114  16  44
ITA   35  35  46  41   0  33  47  47  10  25
NZL  154  77  71  78  30   0  149  104  17  29
USA  251 453 127 180  50 156   0  253  35  47
ZAF  136 144 109 112  48 100 260   0  26  40
NLD   13   8  16  13   7  14  35  21   0  11
CHE   23  29  45  43  26  27  48  39   8   0
-----

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JER
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  ITA  ZAF  NLD  USA  CHE
-----
AUS   0  152  81  35  104  17  256  26
CAN  158   0  86  37  119  13  451  32
DFS   56  71   0  44  89  20  147  45
ITA   35  35  41   0  44  10  47  25
ZAF  105 115  75  44   0  23  199  40
NLD   13   8  14   7  16   0  35  11
USA  251 453 113  50 196  35   0  47
CHE   23  29  44  26  39   8  48   0
-----

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JER
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  USA  ZAF  NLD  CHE
-----
AUS   0  152  86  103  35  256  131  17  26
CAN  158   0  97  139  37  451  144  13  32
DFS   64  85   0  106  47  158  125  22  46
GBR  102 144 102   0  43  173  114  16  44
ITA   35  35  46  41   0  47  47  10  25
USA  251 453 127 180  50   0  252  35  47
ZAF  135 144 108 112  48 259   0  26  40
NLD   13   8  16  13   7  35  21   0  11
CHE   23  29  45  43  26  48  39   8   0
-----

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JER
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  ZAF  NLD  CHE
-----
AUS   0  152  89  104  35  152  256  132  17  26
CAN  158   0  97  139  37  76  451  144  13  32
DFS   66  85   0  108  47  92  158  126  21  46
GBR  103 144 104   0  43  76  173  114  16  44
ITA   35  35  46  41   0  33  47  47  10  25
NZL  154  77  71  78  30   0  149  104  16  29
USA  251 453 127 180  50 156   0  253  33  47
ZAF  136 144 109 112  48 100 260   0  26  40
NLD   13   8  15  13   7  13  34  21   0  10
CHE   23  29  45  43  26  27  48  39   7   0
-----

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JER
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  ZAF  NLD  CHE
-----

```

AUS	0	152	81	104	35	152	256	132	17	26
CAN	158	0	80	139	37	76	451	144	13	32
DFS	56	69	0	95	44	78	140	114	20	45
GBR	103	144	93	0	43	76	173	114	16	44
ITA	35	35	41	41	0	33	47	47	10	25
NZL	154	77	58	78	30	0	149	104	17	29
USA	251	453	108	180	50	156	0	253	34	47
ZAF	136	144	97	112	48	100	260	0	26	40
NLD	13	8	14	13	7	14	34	21	0	10
CHE	23	29	44	43	26	27	48	39	7	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	152	89	104	35	152	256	132	17	26
CAN	158	0	97	139	37	76	451	144	13	32
DFS	66	85	0	108	47	92	158	126	22	46
GBR	103	144	104	0	43	76	173	114	16	44
ITA	35	35	46	41	0	33	47	47	10	25
NZL	154	77	71	78	30	0	149	104	17	29
USA	251	453	127	180	50	156	0	253	34	47
ZAF	136	144	109	112	48	100	260	0	26	40
NLD	13	8	16	13	7	14	34	21	0	10
CHE	23	29	45	43	26	27	48	39	7	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	152	87	103	35	256	132	17	26
CAN	158	0	97	138	37	448	144	13	32
DFS	65	85	0	106	47	158	126	23	46
GBR	102	143	102	0	43	173	114	17	44
ITA	35	35	46	41	0	47	47	10	25
USA	251	451	127	180	50	0	252	34	47
ZAF	136	144	109	112	48	259	0	27	40
NLD	13	8	17	14	7	35	22	0	10
CHE	23	29	45	43	26	48	39	7	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	152	89	104	35	152	256	132	18	26
CAN	158	0	97	139	37	76	451	144	14	32
DFS	66	85	0	108	46	92	158	126	29	46
GBR	103	144	104	0	43	76	173	114	21	44
ITA	35	35	45	41	0	33	46	47	10	25
NZL	154	77	71	78	30	0	149	104	19	29
USA	251	453	127	180	49	156	0	253	37	47
ZAF	136	144	109	112	48	100	260	0	31	40
NLD	14	9	23	18	7	16	37	26	0	12
CHE	23	29	45	43	26	27	48	39	9	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0	152	86	103	35	256	124	17	26	18

CAN	158	0	97	139	37	451	133	13	32	11
DFS	64	85	0	106	47	158	116	22	46	14
GBR	102	144	102	0	43	173	109	16	44	11
ITA	35	35	46	41	0	47	47	10	25	2
USA	251	453	127	180	50	0	233	34	47	14
ZAF	129	135	102	108	48	242	0	26	40	13
NLD	13	8	16	13	7	34	21	0	10	2
CHE	23	29	45	43	26	48	39	7	0	4
NZL	18	11	13	10	1	14	12	1	4	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE
AUS	0	152	73	152	122	18	256	26
CAN	158	0	75	76	130	14	451	32
DFS	51	66	0	71	101	27	133	45
NZL	154	77	53	0	91	19	149	29
ZAF	125	129	85	84	0	31	228	40
NLD	14	9	21	16	26	0	37	12
USA	251	453	103	156	229	37	0	47
CHE	23	29	44	27	39	9	48	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0	152	89	35	35	152	256	17	22
CAN	158	0	97	38	37	76	451	13	28
DFS	66	85	0	32	47	92	158	22	43
GBR	40	43	30	0	12	35	37	4	3
ITA	35	35	46	13	0	33	47	10	22
NZL	154	77	71	39	30	0	149	17	25
USA	251	453	127	40	50	156	0	34	43
NLD	13	8	16	5	7	14	34	0	8
CHE	20	27	42	4	24	23	44	6	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE	ITA
AUS	0	152	86	104	152	256	17	22	35
CAN	158	0	91	138	76	448	13	28	37
DFS	64	83	0	98	84	151	21	43	46
GBR	103	143	99	0	73	173	16	41	43
NZL	154	77	65	75	0	149	16	25	33
USA	251	451	122	180	156	0	33	43	46
NLD	13	8	15	13	13	34	0	8	10
CHE	20	27	42	40	23	44	6	0	22
ITA	35	35	45	41	30	49	7	24	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	0	124	74	83	32	212	15	19
CAN	129	0	97	138	37	451	13	28
DFS	53	85	0	106	47	158	22	43
GBR	81	143	102	0	43	173	16	41
ITA	31	35	46	41	0	47	10	22
USA	201	453	127	180	50	0	35	43

NLD	11	8	16	13	7	35	0	9
CHE	17	27	42	40	24	44	7	0

JER

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RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	23	10	45	9	15	21	13	9	4	16
CAN	23	0	10	147	72	4	33	150	3	0	10
DEU	10	10	0	55	4	11	10	4	12	0	29
DFS	34	148	46	0	57	83	57	82	35	0	122
GBR	8	71	4	52	0	0	26	60	1	0	3
NOR	11	4	10	63	0	0	6	0	24	0	11
NZL	20	31	10	55	23	5	0	22	2	2	6
USA	13	143	4	77	56	0	21	0	2	0	4
NLD	9	3	11	34	1	23	2	2	0	0	12
CAM	4	0	0	0	0	0	2	0	0	0	0
LVA	15	10	23	84	3	9	6	4	11	0	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0	23	10	45	9	21	13	9	4	8	15
CAN	23	0	10	147	72	33	150	3	0	1	10
DEU	10	10	0	55	4	10	4	12	0	5	27
DFS	34	148	46	0	57	55	82	33	0	48	103
GBR	8	71	4	52	0	26	60	1	0	0	3
NZL	20	31	10	53	23	0	22	2	2	3	5
USA	13	143	4	77	56	21	0	2	0	0	4
NLD	9	3	11	32	1	2	2	0	0	14	11
CAM	4	0	0	0	0	2	0	0	0	0	0
NOR	7	1	4	35	0	3	0	13	0	0	1
LVA	14	10	21	69	3	5	4	10	0	0	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	23	10	45	9	8	21	13	9	4	16
CAN	23	0	10	147	72	1	33	148	3	0	10
DEU	10	10	0	55	4	6	10	4	12	0	29
DFS	34	148	46	0	57	59	55	82	33	0	122
GBR	8	71	4	52	0	0	26	59	1	0	3
NOR	7	1	5	43	0	0	3	0	19	0	2
NZL	20	31	10	53	23	3	0	22	2	2	6
USA	13	142	4	77	55	0	21	0	2	0	4
NLD	9	3	11	32	1	18	2	2	0	0	12
CAM	4	0	0	0	0	0	2	0	0	0	0
LVA	15	10	23	84	3	1	6	4	11	0	0

RDC

common bulls below diagonal
 common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	USA	NLD	CAM	NOR	LVA
AUS	0	23	1	45	9	13	9	4	8	16
CAN	23	0	0	147	72	150	3	0	3	10

DEU	1	0	0	15	0	0	0	0	1	1
DFS	34	148	13	0	57	82	32	0	56	122
GBR	8	71	0	52	0	60	1	0	0	3
USA	13	143	0	77	56	0	2	0	0	4
NLD	9	3	0	31	1	2	0	0	14	11
CAM	4	0	0	0	0	0	0	0	0	0
NOR	7	2	1	44	0	0	13	0	0	1
LVA	15	10	0	84	3	4	10	0	0	0

RDC

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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   23   10   45   9   17   21   13   9   4   16
CAN   23   0   10  147   72   4   33  150   3   0   10
DEU   10   0   0   55   4   11   10   4   12   0   29
DFS   34  148  46   0   57  93   54   82  34   0  122
GBR   8   71   4   52   0   0   26   60   1   0   3
NOR   13   4   0   71   0   0   7   0   24   0  12
NZL   20  31  10   50  23   6   0   22   2   2   6
USA   13  143  4   77   56   0   21   0   2   0   4
NLD   9   3  11   33   1  23   2   2   0   0  12
CAM   4   0   0   0   0   0   2   0   0   0   0
LVA  15  10  23   84   3  10   6   4  11   0   0

```

RDC

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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NZL  USA  NLD  CAM  NOR  LVA
-----
AUS   0   23   10   45   9   21   13   9   4   8  16
CAN   23   0   10  147   72  33  150   3   0   1  10
DEU   10   0   0   55   4   10   4   12   0   5  29
DFS   34  148  46   0   57  55  82  34   0  47  122
GBR   8   71   4   52   0  26  60   1   0   0   3
NZL   20  31  10   53  23   0  22   2   2   3   6
USA   13  143  4   77   56  21   0   2   0   0   4
NLD   9   3  11   33   1   2   2   0   0  14  12
CAM   4   0   0   0   0   2   0   0   0   0   0
NOR   7   1   4   34   0   3   0  13   0   0   1
LVA  15  10  23   84   3   6   4  11   0   0   0

```

RDC

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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   23   10   45   9   17   21   13   9   4  16
CAN   23   0   10  147   72   4  33  150   3   0  10
DEU   10   0   0   55   4   11   10   4   12   0  29
DFS   34  148  46   0   57  96  57  82  35   0  122
GBR   8   71   4   52   0   0  26  60   1   0   3
NOR   13   4   0   73   0   0   7   0  24   0  12
NZL   20  31  10   55  23   6   0  22   2   2   6
USA   13  143  4   77   56   0  21   0   2   0   4
NLD   9   3  11   34   1  23   2   2   0   0  12
CAM   4   0   0   0   0   0   2   0   0   0   0
LVA  15  10  23   84   3  10   6   4  11   0   0

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RDC

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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  NOR  NLD  USA  CAM  LVA
-----

```

AUS	0	23	10	45	17	9	13	4	15
CAN	23	0	10	146	4	3	150	0	10
DEU	10	10	0	55	11	12	4	0	27
DFS	34	147	46	0	93	32	82	0	103
NOR	13	4	10	71	0	24	0	0	10
NLD	9	3	11	31	23	0	2	0	11
USA	13	143	4	77	0	2	0	0	4
CAM	4	0	0	0	0	0	0	0	0
LVA	14	10	21	69	8	10	4	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA
AUS	0	23	7	45	9	17	13	9	4	16
CAN	23	0	8	147	72	4	150	3	0	10
DEU	7	8	0	46	4	10	4	12	0	16
DFS	34	148	40	0	57	93	82	33	0	122
GBR	8	71	4	52	0	0	60	1	0	3
NOR	13	4	9	71	0	0	0	24	0	12
USA	13	143	4	77	56	0	0	2	0	4
NLD	9	3	11	32	1	23	2	0	0	12
CAM	4	0	0	0	0	0	0	0	0	0
LVA	15	10	13	84	3	10	4	11	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	23	10	45	9	17	21	13	9	4	16
CAN	23	0	10	147	72	4	33	150	3	0	10
DEU	10	10	0	55	4	11	10	4	12	0	29
DFS	34	148	46	0	57	96	57	82	32	0	122
GBR	8	71	4	52	0	0	26	60	1	0	3
NOR	13	4	10	73	0	0	7	0	24	0	12
NZL	20	31	10	55	23	6	0	22	2	2	6
USA	13	143	4	77	56	0	21	0	2	0	4
NLD	9	3	11	31	1	23	2	2	0	0	12
CAM	4	0	0	0	0	0	2	0	0	0	0
LVA	15	10	23	84	3	10	6	4	11	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	23	10	45	9	17	21	13	9	4	16
CAN	23	0	10	147	72	4	33	150	3	0	10
DEU	10	10	0	55	4	11	10	4	12	0	29
DFS	34	148	46	0	57	93	55	82	32	0	116
GBR	8	71	4	52	0	0	26	60	1	0	3
NOR	13	4	10	71	0	0	7	0	24	0	12
NZL	20	31	10	52	23	6	0	22	2	2	6
USA	13	143	4	77	56	0	21	0	2	0	4
NLD	9	3	11	31	1	23	2	2	0	0	12
CAM	4	0	0	0	0	0	2	0	0	0	0
LVA	15	10	23	80	3	10	6	4	11	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
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AUS	0	23	10	45	9	17	21	13	9	4	16
CAN	23	0	10	147	72	4	33	150	3	0	10
DEU	10	10	0	55	4	12	10	4	12	0	29
DFS	34	148	46	0	57	88	57	82	34	0	122
GBR	8	71	4	52	0	0	26	60	1	0	3
NOR	13	4	11	68	0	0	7	0	24	0	12
NZL	20	31	10	55	23	6	0	22	2	2	6
USA	13	143	4	77	56	0	21	0	2	0	4
NLD	9	3	11	33	1	23	2	2	0	0	12
CAM	4	0	0	0	0	0	2	0	0	0	0
LVA	15	10	23	84	3	10	6	4	11	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA
AUS	0	23	10	45	9	17	13	9	4	16
CAN	23	0	10	147	72	4	147	3	0	10
DEU	10	10	0	55	4	11	4	13	0	29
DFS	34	148	46	0	57	96	82	38	0	122
GBR	8	71	4	52	0	0	60	1	0	3
NOR	13	4	10	73	0	0	0	30	0	12
USA	13	142	4	77	56	0	0	2	0	4
NLD	9	3	12	37	1	29	2	0	0	12
CAM	4	0	0	0	0	0	0	0	0	0
LVA	15	10	23	84	3	10	4	11	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	23	10	45	9	17	21	13	9	4	15
CAN	23	0	10	147	72	4	33	150	3	0	10
DEU	10	10	0	55	4	12	10	4	13	0	27
DFS	34	148	46	0	57	95	55	82	37	0	103
GBR	8	71	4	52	0	0	26	60	1	0	3
NOR	13	4	11	73	0	0	7	0	30	0	11
NZL	20	31	10	53	23	6	0	22	2	2	5
USA	13	143	4	77	56	0	21	0	2	0	4
NLD	9	3	12	36	1	29	2	2	0	0	11
CAM	4	0	0	0	0	0	2	0	0	0	0
LVA	14	10	21	69	3	9	5	4	10	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	NZL
AUS	0	23	10	45	9	17	13	9	4	16	2
CAN	23	0	10	147	72	4	148	3	0	10	2
DEU	10	10	0	55	4	11	4	12	0	29	3
DFS	34	148	46	0	57	90	82	34	0	122	7
GBR	8	71	4	52	0	0	59	1	0	3	3
NOR	13	4	10	68	0	0	0	24	0	12	1
USA	13	142	4	77	55	0	0	2	0	4	2
NLD	9	3	11	33	1	23	2	0	0	12	0
CAM	4	0	0	0	0	0	0	0	0	0	0
LVA	15	10	23	84	3	10	4	11	0	0	0
NZL	2	2	3	7	3	1	2	0	0	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA
AUS	0	23	10	40	17	21	9	13	4	16
CAN	23	0	10	141	4	33	3	150	0	10
DEU	10	10	0	52	12	10	13	4	0	29
DFS	31	141	46	0	87	50	35	77	0	105
NOR	13	4	11	68	0	7	30	0	0	12
NZL	20	31	10	49	6	0	1	22	2	6
NLD	9	3	12	34	29	1	0	2	0	11
USA	13	143	4	73	0	21	2	0	0	4
CAM	4	0	0	0	0	2	0	0	0	0
LVA	15	10	23	72	10	6	10	4	0	0

RDC

common bulls below diagonal										
common three quarter sib group above diagonal										
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0	23	10	45	8	18	21	13	9	4
CAN	23	0	10	147	69	6	33	150	3	0
DEU	10	10	0	55	4	13	10	4	12	0
DFS	34	148	46	0	57	111	57	82	35	0
GBR	7	68	4	52	0	0	23	58	1	0
NOR	14	5	12	89	0	0	8	0	25	0
NZL	20	31	10	55	20	7	0	22	2	2
USA	13	143	4	77	54	0	21	0	2	0
NLD	9	3	11	34	1	24	2	2	0	0
CAM	4	0	0	0	0	0	2	0	0	0

RDC

common bulls below diagonal										
common three quarter sib group above diagonal										
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0	23	10	45	8	17	21	13	9	4
CAN	23	0	10	147	69	4	33	147	3	0
DEU	10	10	0	55	4	11	10	4	12	0
DFS	34	148	46	0	57	96	57	82	34	0
GBR	7	68	4	52	0	0	23	58	1	0
NOR	13	4	10	73	0	0	7	0	24	0
NZL	20	31	10	55	20	6	0	22	2	2
USA	13	142	4	77	54	0	21	0	2	0
NLD	9	3	11	33	1	23	2	2	0	0
CAM	4	0	0	0	0	0	2	0	0	0

RDC

common bulls below diagonal										
common three quarter sib group above diagonal										
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	
AUS	0	23	10	45	8	17	13	9	4	
CAN	23	0	10	147	69	4	150	3	0	
DEU	10	10	0	55	4	11	4	12	0	
DFS	34	148	46	0	57	96	82	35	0	
GBR	7	68	4	52	0	0	58	1	0	
NOR	13	4	10	73	0	0	0	24	0	
USA	13	143	4	77	54	0	0	2	0	
NLD	9	3	11	34	1	23	2	0	0	
CAM	4	0	0	0	0	0	0	0	0	

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