

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:

NDL (HOL, JER)	Reduction in information due to pedigree verification.
CHE (ALL)	Reduction in information is due to data edits.
BEL (ALL)	The observed decreases in information is attributed to the existence of breeds alias or errors/corrections in the pedigree.
AUS (HOL, JER)	Reduction in information is a result of data clean-up and pedigree verification.
DEA (BSW)	Base change.
JPN (HOL)	Reduction in information due to pedigree verification.
DFS (ALL)	OCS, OFL, and OUS are made by a linear combination of the linear traits. These weights have been changed.
USA (HOL)	Reduction in information due to due to pedigree verification. Two bulls are missing from the evaluation due to a change in their Type of Proof.
USA (BSW)	RTP for BSW is now an actual single trait and not a proxy of the trait ftp.
USA (BSW, JER, RDC, GUE)	Drops in information due to pedigree varification and data edits.
GBR (ALL)	Drops in information due to data changes and edits.
NZL (ALL)	Pedigree verification due to genomic information, causing change in information for many animals. New heritability value for FTL.
CZE (HOL)	New system for linear traits collection which can lead to some changes.
HUN (HOL)	First data submission since 2021. Revision of scope of data used in breeding value estimation, data editing cut-off changed cows having their first lactation from 2000 onwards.
ESP (HOL)	Reduction in daughters due to pedigree verification.
POL (HOL)	Reduction in information due to data edits.

INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

In 2020 new post-processing windows\200\231 correlations for all breeds and traits have been applied: 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. The previously lower value adopted (based on the 25th percentile) had been found too high causing estimated and post-processed correlations to differ significantly from each other. It is a recommendation from the Interbull Technical Committee to review such windows every 5 years. 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. More information can be read on https://interbull.org/ib/rg_procedure

Since 2021 a new trait group has been added to the MACE evaluation, called stcm (SNP Training for clinical mastitis) evaluating the trait cma (pure clinical mastitis). New trait group codes have been issued as follows: 041 for international ebv files (.itb), 071 for parent average (ipr).

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

CHE	0.95	12.54								
FRA	0.98	0.97	0.94							
ITA	0.96	0.96	0.95	13.77						
NLD	0.95	0.95	0.97	0.91	4.34					
USA	0.98	0.95	0.97	0.95	0.93	1.63				
DEA	0.96	0.97	0.98	0.95	0.96	0.96	11.18			
SVN	0.93	0.91	0.91	0.94	0.90	0.90	0.91	17.02		
GBR	0.96	0.92	0.96	0.93	0.93	0.96	0.90	0.90	0.88	

BSW cwi

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	7.73									
CHE	0.91	10.18								
FRA	0.87	0.91	0.83							
ITA	0.80	0.85	0.85	21.17						
NLD	0.92	0.85	0.88	0.71	4.79					
USA	0.89	0.90	0.91	0.86	0.83	0.89				
DEA	0.86	0.82	0.86	0.73	0.75	0.80	11.38			
SVN	0.89	0.91	0.91	0.81	0.85	0.85	0.90	24.70		
GBR	0.91	0.84	0.81	0.69	0.90	0.80	0.83	0.81	1.46	

BSW bde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA	
CAN	7.09									
CHE	0.84	10.36								
FRA	0.72	0.87	0.90							
ITA	0.79	0.92	0.90	17.78						
NLD	0.81	0.85	0.84	0.85	4.71					
DEA	0.79	0.89	0.91	0.87	0.80	11.02				
SVN	0.79	0.73	0.79	0.79	0.78	0.71	25.13			
GBR	0.87	0.88	0.78	0.83	0.89	0.86	0.84	1.69		
USA	0.72	0.75	0.84	0.77	0.86	0.80	0.78	0.86	0.82	

BSW ang

	CAN	CHE	FRA	NLD	USA	GBR				
CAN	8.75									
CHE	0.69	11.03								
FRA	0.87	0.67	0.83							
NLD	0.79	0.68	0.67	3.73						
USA	0.85	0.67	0.75	0.78	1.09					
GBR	0.88	0.77	0.79	0.82	0.90	0.78				

BSW ran

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR	
CAN	6.91									
CHE	0.94	10.70								
FRA	0.97	0.96	0.91							
ITA	0.93	0.93	0.93	23.20						
NLD	0.95	0.91	0.95	0.91	4.65					
USA	0.97	0.94	0.96	0.91	0.94	1.35				
DEA	0.97	0.94	0.96	0.94	0.91	0.97	11.77			
SVN	0.91	0.88	0.89	0.89	0.90	0.90	0.88	22.61		
GBR	0.96	0.93	0.97	0.93	0.96	0.96	0.91	0.92	1.91	

BSW rwi

	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA	
CAN	7.23									
CHE	0.89	10.34								
FRA	0.95	0.87	0.96							

NLD	0.93	0.85	0.93	4.10					
USA	0.91	0.86	0.86	0.80	0.98				
DEA	0.90	0.88	0.92	0.78	0.89	13.24			
GBR	0.92	0.84	0.90	0.88	0.92	0.81	1.20		
SVN	0.89	0.79	0.93	0.86	0.81	0.88	0.86	25.70	
ITA	0.87	0.79	0.90	0.78	0.87	0.87	0.86	0.90	19.19

BSW rls

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.66								
CHE	0.92	13.10							
FRA	0.91	0.93	0.96						
ITA	0.91	0.86	0.92	23.73					
NLD	0.87	0.85	0.88	0.83	5.05				
USA	0.95	0.93	0.90	0.87	0.85	0.79			
DEA	0.91	0.91	0.93	0.89	0.80	0.89	12.11		
SVN	0.86	0.79	0.87	0.82	0.81	0.83	0.87	22.38	
GBR	0.85	0.86	0.90	0.83	0.86	0.83	0.86	0.79	1.49

BSW fan

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.57								
CHE	0.68	14.21							
FRA	0.74	0.73	1.04						
ITA	0.69	0.84	0.81	21.31					
NLD	0.72	0.67	0.80	0.69	5.07				
USA	0.81	0.73	0.80	0.85	0.80	0.85			
DEA	0.61	0.88	0.68	0.89	0.62	0.64	11.49		
SVN	0.69	0.76	0.72	0.78	0.67	0.71	0.79	24.84	
GBR	0.80	0.72	0.84	0.72	0.87	0.82	0.67	0.75	1.22

BSW hde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA	
CAN	8.00								
CHE	0.85	12.62							
FRA	0.79	0.82	1.07						
ITA	0.79	0.83	0.82	20.89					
NLD	0.74	0.73	0.80	0.72	5.07				
DEA	0.75	0.87	0.85	0.93	0.76	11.90			
SVN	0.80	0.85	0.86	0.88	0.74	0.90	31.77		
USA	0.84	0.73	0.80	0.89	0.80	0.80	0.81	0.85	

BSW fua

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.69								
CHE	0.86	12.41							
FRA	0.89	0.88	0.85						
ITA	0.88	0.85	0.85	19.27					
NLD	0.89	0.85	0.86	0.86	4.77				
USA	0.93	0.85	0.86	0.93	0.87	1.27			
DEA	0.81	0.85	0.90	0.82	0.76	0.83	11.03		
SVN	0.72	0.72	0.77	0.80	0.77	0.72	0.89	21.80	
GBR	0.91	0.83	0.87	0.87	0.90	0.91	0.71	0.58	1.46

BSW ruh

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.59								
CHE	0.91	12.19							
FRA	0.85	0.82	0.89						

ITA	0.75	0.84	0.86	12.93					
NLD	0.75	0.80	0.87	0.83	4.28				
USA	0.82	0.79	0.88	0.84	0.88	1.07			
DEA	0.83	0.84	0.91	0.92	0.84	0.81	11.68		
SVN	0.79	0.79	0.81	0.86	0.88	0.82	0.87	21.04	
GBR	0.72	0.78	0.86	0.81	0.87	0.91	0.75	0.78	1.78

BSW ruw

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	
CAN	8.72								
CHE	0.92	12.07							
FRA	0.84	0.88	0.82						
ITA	0.79	0.88	0.80	13.27					
NLD	0.69	0.66	0.80	0.68	4.28				
USA	0.86	0.90	0.87	0.89	0.79	1.01			
DEA	0.85	0.91	0.77	0.95	0.55	0.90	12.04		
SVN	0.83	0.84	0.80	0.82	0.67	0.83	0.83	21.23	

BSW usu

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.95								
CHE	0.91	12.09							
FRA	0.84	0.91	0.87						
ITA	0.88	0.91	0.88	19.04					
NLD	0.81	0.83	0.88	0.80	4.28				
USA	0.83	0.89	0.86	0.86	0.90	0.98			
DEA	0.93	0.93	0.90	0.93	0.78	0.84	11.35		
SVN	0.81	0.81	0.69	0.76	0.65	0.70	0.82	20.50	
GBR	0.78	0.79	0.84	0.83	0.91	0.92	0.72	0.61	2.73

BSW ude

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.65								
CHE	0.96	12.20							
FRA	0.96	0.96	0.98						
ITA	0.95	0.96	0.97	19.80					
NLD	0.95	0.94	0.95	0.93	4.40				
USA	0.96	0.95	0.96	0.95	0.94	1.23			
DEA	0.93	0.97	0.95	0.97	0.94	0.92	12.18		
SVN	0.92	0.95	0.92	0.96	0.95	0.92	0.96	22.85	
GBR	0.96	0.94	0.96	0.94	0.96	0.96	0.90	0.94	2.15

BSW ftp

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	7.50								
CHE	0.98	13.99							
FRA	0.97	0.96	0.90						
NLD	0.97	0.95	0.96	5.27					
USA	0.92	0.90	0.88	0.91	1.30				
DEA	0.95	0.98	0.95	0.96	0.90	11.00			
SVN	0.93	0.93	0.93	0.96	0.90	0.95	18.35		
GBR	0.95	0.93	0.89	0.93	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	21.12

BSW ftl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.56								
CHE	0.90	14.70							
FRA	0.95	0.95	0.97						

ITA	0.93	0.94	0.95	18.11					
NLD	0.92	0.96	0.92	0.92	5.08				
USA	0.93	0.96	0.95	0.93	0.95	1.75			
DEA	0.90	0.98	0.97	0.95	0.94	0.96	11.04		
SVN	0.90	0.91	0.90	0.90	0.92	0.90	0.91	18.60	
GBR	0.95	0.94	0.93	0.94	0.97	0.96	0.92	0.92	1.59

BSW rtp

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA	
CAN	6.87								
CHE	0.98	14.56							
FRA	0.97	0.98	0.89						
ITA	0.92	0.95	0.94	19.96					
NLD	0.96	0.95	0.96	0.91	4.78				
DEA	0.96	0.99	0.97	0.96	0.94	11.90			
SVN	0.94	0.93	0.94	0.92	0.95	0.93	18.29		
USA	0.94	0.94	0.94	0.91	0.95	0.95	0.93	1.48	

BSW ocs

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.82								
CHE	0.80	9.41							
FRA	0.74	0.83	0.97						
ITA	0.77	0.81	0.87	8.97					
NLD	0.72	0.68	0.77	0.69	3.84				
USA	0.79	0.73	0.80	0.81	0.82	0.52			
DEA	0.81	0.90	0.86	0.87	0.58	0.70	10.38		
SVN	0.59	0.64	0.65	0.63	0.60	0.62	0.74	19.78	
GBR	0.74	0.82	0.84	0.77	0.86	0.85	0.68	0.69	1.72

BSW ous

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.06								
CHE	0.84	13.96							
FRA	0.89	0.87	0.96						
ITA	0.81	0.88	0.84	10.14					
NLD	0.88	0.84	0.89	0.77	5.13				
USA	0.89	0.81	0.83	0.80	0.86	0.79			
DEA	0.85	0.94	0.84	0.91	0.78	0.79	12.43		
SVN	0.75	0.81	0.71	0.80	0.77	0.73	0.89	19.60	
GBR	0.76	0.82	0.74	0.80	0.77	0.85	0.74	0.72	1.64

BSW ofl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.31								
CHE	0.81	11.77							
FRA	0.63	0.63	1.67						
ITA	0.59	0.71	0.84	15.49					
NLD	0.65	0.65	0.73	0.63	4.33				
USA	0.59	0.61	0.65	0.67	0.65	0.83			
DEA	0.67	0.84	0.64	0.80	0.58	0.57	11.02		
SVN	0.72	0.84	0.62	0.71	0.63	0.65	0.87	26.70	
GBR	0.66	0.75	0.81	0.66	0.73	0.71	0.65	0.62	1.46

BSW ofr

	CAN	CHE	DEA	ITA	SVN	USA	FRA		
CAN	7.29								
CHE	0.80	11.99							
DEA	0.80	0.90	11.37						

ITA	0.77	0.91	0.92	16.89			
SVN	0.73	0.78	0.79	0.82	23.09		
USA	0.75	0.83	0.89	0.86	0.76	1.63	
FRA	0.73	0.90	0.91	0.90	0.80	0.88	0.86

BSW tpl

	CAN	CHE	DEA	ITA	SVN	FRA	
CAN	7.52						
CHE	0.88	12.26					
DEA	0.88	0.89	11.80				
ITA	0.91	0.91	0.90	23.64			
SVN	0.88	0.86	0.84	0.86	24.66		
FRA	0.96	0.92	0.92	0.90	0.86	1.25	

BSW oru

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.45						
CHE	0.75	16.63					
DEA	0.72	0.87	12.44				
ITA	0.92	0.76	0.77	17.67			
SVN	0.83	0.58	0.70	0.78	26.78		
USA	0.88	0.58	0.49	0.82	0.67	0.98	
FRA	0.83	0.87	0.80	0.78	0.67	0.83	1.25

BSW rle

	CHE	DEA	ITA	SVN	USA	FRA	
CHE	11.80						
DEA	0.94	12.20					
ITA	0.81	0.85	19.19				
SVN	0.78	0.76	0.82	24.60			
USA	0.55	0.51	0.76	0.68	0.98		
FRA	0.93	0.94	0.86	0.78	0.73	1.04	

BSW thp

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.20						
CHE	0.84	11.39					
DEA	0.78	0.82	11.95				
ITA	0.87	0.91	0.85	29.91			
SVN	0.76	0.84	0.85	0.87	35.16		
USA	0.88	0.87	0.71	0.83	0.73	1.35	
FRA	0.88	0.81	0.85	0.84	0.75	0.78	0.97

BSW hoq

	CAN	CHE	DEA	ITA	SVN	FRA	
CAN	6.91						
CHE	0.91	12.22					
DEA	0.92	0.89	12.51				
ITA	0.91	0.84	0.85	19.45			
SVN	0.94	0.88	0.91	0.91	21.92		
FRA	0.91	0.85	0.88	0.87	0.89	1.00	

BSW ful

	CHE	DEA	ITA	SVN	FRA	
CHE	11.86					
DEA	0.91	12.10				
ITA	0.92	0.95	12.79			

SVN	0.82	0.91	0.84	21.30	
FRA	0.76	0.84	0.78	0.75	0.87

BSW udb

	CHE	DEA	ITA	SVN	FRA
CHE	12.45				
DEA	0.96	13.30			
ITA	0.93	0.95	26.25		
SVN	0.83	0.85	0.85	24.24	
FRA	0.91	0.88	0.86	0.81	0.91

BSW tdi

	CHE	DEA	ITA	SVN	FRA
CHE	15.88				
DEA	0.96	11.27			
ITA	0.94	0.95	20.46		
SVN	0.90	0.93	0.91	18.90	
FRA	0.97	0.97	0.91	0.91	0.86

BSW tth

	CHE	DEA	ITA	SVN	FRA
CHE	14.52				
DEA	0.98	12.88			
ITA	0.94	0.95	23.17		
SVN	0.88	0.87	0.88	20.93	
FRA	0.93	0.95	0.95	0.87	0.88

GUE sta

	CAN	GBR	USA	AUS
CAN	6.59			
GBR	0.97	1.23		
USA	0.98	0.96	2.78	
AUS	0.90	0.92	0.91	0.87

GUE cwi

	CAN	GBR	USA	AUS
CAN	6.78			
GBR	0.92	1.85		
USA	0.85	0.84	1.52	
AUS	0.72	0.80	0.65	0.33

GUE bde

	CAN	GBR	USA	AUS
CAN	6.42			
GBR	0.87	1.56		
USA	0.75	0.88	1.75	
AUS	0.80	0.77	0.69	0.44

GUE ang

	CAN	GBR	USA	AUS
CAN	7.83			
GBR	0.89	1.68		
USA	0.87	0.91	1.86	
AUS	0.66	0.76	0.66	0.38

GUE ran				
	CAN	GBR	USA	AUS
CAN	6.45			
GBR	0.97	1.66		
USA	0.97	0.97	1.98	
AUS	0.90	0.93	0.89	0.73

GUE rwi				
	CAN	GBR	USA	AUS
CAN	7.07			
GBR	0.93	1.60		
USA	0.92	0.92	1.71	
AUS	0.84	0.83	0.77	0.65

GUE rls				
	CAN	GBR	USA	AUS
CAN	8.35			
GBR	0.82	1.86		
USA	0.93	0.81	0.88	
AUS	0.70	0.78	0.70	0.31

GUE rlr				
	CAN	USA	AUS	
CAN	7.26			
USA	0.84	0.92		
AUS	0.59	0.54	0.18	

GUE fan				
	CAN	GBR	USA	AUS
CAN	8.93			
GBR	0.78	1.76		
USA	0.84	0.75	0.86	
AUS	0.62	0.75	0.64	0.26

GUE fua				
	CAN	GBR	USA	AUS
CAN	7.21			
GBR	0.94	1.42		
USA	0.92	0.92	1.81	
AUS	0.78	0.78	0.76	0.37

GUE ruh				
	CAN	GBR	USA	AUS
CAN	6.95			
GBR	0.72	1.97		
USA	0.80	0.91	1.44	
AUS	0.75	0.76	0.75	0.38

GUE usu				
	CAN	GBR	USA	AUS
CAN	6.95			
GBR	0.78	1.58		
USA	0.79	0.87	1.35	

HOL	ous																				
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	JPN	CZE	EST	IRL	SVN	PRT
AUS	1.29																				
BEL	0.66	1.28																			
CAN	0.68	0.81	6.11																		
CHE	0.79	0.84	0.92	11.68																	
DEU	0.73	0.79	0.89	0.92	13.54																
DFS	0.66	0.83	0.88	0.88	0.85	13.72															
ESP	0.74	0.68	0.75	0.86	0.82	0.72	0.72														
FRA	0.66	0.80	0.88	0.93	0.91	0.89	0.80	0.95													
GBR	0.83	0.68	0.77	0.85	0.81	0.69	0.87	0.74	1.43												
ITA	0.68	0.79	0.84	0.92	0.86	0.86	0.84	0.90	0.81	1.17											
NLD	0.69	0.81	0.89	0.94	0.90	0.85	0.80	0.91	0.77	0.84	4.75										
USA	0.74	0.72	0.87	0.90	0.84	0.74	0.85	0.79	0.87	0.85	0.85	1.16									
HUN	0.70	0.78	0.81	0.86	0.85	0.77	0.80	0.78	0.78	0.76	0.74	0.76	1.16								
POL	0.71	0.80	0.74	0.80	0.80	0.72	0.71	0.76	0.80	0.78	0.75	0.75	0.72	11.17							
NZL	0.81	0.67	0.80	0.88	0.79	0.67	0.78	0.77	0.84	0.73	0.82	0.87	0.76	0.73	0.42						
JPN	0.75	0.81	0.87	0.92	0.88	0.78	0.78	0.84	0.84	0.87	0.85	0.87	0.79	0.85	0.81	0.74					
CZE	0.67	0.86	0.87	0.91	0.91	0.89	0.77	0.90	0.74	0.85	0.86	0.78	0.88	0.77	0.75	0.84	12.81				
EST	0.69	0.83	0.86	0.89	0.84	0.93	0.78	0.89	0.75	0.86	0.83	0.74	0.81	0.71	0.75	0.88	16.04				
IRL	0.81	0.66	0.67	0.79	0.73	0.66	0.81	0.66	0.95	0.76	0.70	0.82	0.71	0.73	0.81	0.76	0.68	0.70	0.93		
SVN	0.69	0.78	0.69	0.71	0.74	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.84	0.68	0.73	0.71	0.72	0.68	15.19	
PRT	0.68	0.68	0.74	0.75	0.73	0.68	0.75	0.70	0.79	0.74	0.75	0.76	0.69	0.73	0.74	0.78	0.70	0.69	0.74	0.69	0.42

HOL	of1																				
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	JPN	CZE	EST	IRL	SVN	PRT	
AUS	0.76																				
BEL	0.65	1.70																			
CAN	0.35	0.62	4.74																		
CHE	0.58	0.76	0.82	11.41																	
DEU	0.38	0.76	0.76	0.78	11.62																
DFS	0.35	0.60	0.79	0.75	0.77	12.59															
ESP	0.41	0.69	0.73	0.76	0.71	0.80	0.76														
FRA	0.55	0.79	0.67	0.77	0.76	0.59	0.75	0.96													
GBR	0.51	0.73	0.66	0.79	0.73	0.70	0.79	0.84	1.57												
ITA	0.51	0.72	0.59	0.71	0.71	0.57	0.73	0.78	0.67	1.58											
NLD	0.45	0.82	0.66	0.73	0.76	0.61	0.66	0.81	0.73	0.67	4.96										
USA	0.51	0.69	0.60	0.79	0.73	0.66	0.74	0.69	0.72	0.79	0.68	1.46									
HUN	0.60	0.76	0.56	0.61	0.69	0.57	0.57	0.75	0.63	0.71	0.68	0.69	1.17								
POL	0.49	0.68	0.56	0.68	0.67	0.56	0.60	0.65	0.57	0.72	0.57	0.78	0.72	13.72							
JPN	0.46	0.64	0.65	0.79	0.77	0.71	0.70	0.58	0.59	0.73	0.59	0.85	0.59	0.77	0.54						
CZE	0.49	0.75	0.61	0.73	0.78	0.60	0.66	0.67	0.63	0.78	0.62	0.83	0.79	0.83	0.79	17.36					
EST	0.47	0.63	0.58	0.60	0.65	0.58	0.58	0.67	0.58	0.58	0.74	0.59	0.68	0.58	0.59	0.68	20.20				
IRL	0.58	0.72	0.61	0.79	0.67	0.63	0.69	0.69	0.79	0.68	0.63	0.67	0.66	0.62	0.69	0.63	0.44	1.35			
SVN	0.44	0.78	0.57	0.65	0.68	0.60	0.57	0.70	0.57	0.66	0.66	0.70	0.82	0.75	0.71	0.74	0.70	0.61	22.51		
PRT	0.35	0.56	0.56	0.57	0.58	0.56	0.61	0.67	0.60	0.67	0.63	0.60	0.64	0.58	0.56	0.60	0.68	0.46	0.63	0.18	

HOL	loc																				
	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CZE	IRL	KOR	SVN	PRT	EST	HUN	POL		
BEL	1.79																				
CAN	0.85	6.71																			
CHE	0.56	0.60	12.49																		
DEU	0.66	0.74	0.69	11.43																	
DFS	0.88	0.91	0.50	0.69	13.19																
ESP	0.63	0.74	0.68	0.74	0.74	0.85															
FRA	0.79	0.77	0.73	0.82	0.70	0.76	0.96														
GBR	0.65	0.69	0.89	0.82	0.65	0.79	0.85	1.52													
ITA	0.59	0.69	0.63	0.74	0.60	0.77	0.73	1.92													
NLD	0.84	0.82	0.70	0.82	0.78	0.70	0.82	0.78	0.64	4.48											
USA	0.66	0.78	0.50	0.78	0.74	0.74	0.72	0.67	0.74	0.68	1.53										
CZE	0.51	0.60	0.55	0.62	0.61	0.65	0.61	0.65	0.69	0.50	20.29										
IRL	0.57	0.56	0.53	0.63	0.52	0.64	0.68	0.73	0.62	0.62	0.55	0.51	1.65								
KOR	0.55	0.53	0.51	0.51	0.51	0.54	0.58	0.51	0.51	0.51	0.50	0.51	0.51	9.88							
SVN	0.75	0.73	0.58	0.77	0.74	0.71	0.82	0.67	0.69	0.69	0.70	0.66	0.54	0.53	27.00						

PRT	0.50	0.50	0.53	0.58	0.50	0.60	0.54	0.60	0.59	0.52	0.50	0.61	0.50	0.51	0.66	1.91							
EST	0.53	0.52	0.53	0.53	0.52	0.52	0.54	0.52	0.51	0.54	0.51	0.53	0.53	0.64	0.70	0.53	22.37						
HUN	0.68	0.69	0.51	0.66	0.73	0.64	0.75	0.68	0.64	0.64	0.66	0.82	0.51	0.54	0.78	0.55	0.59	1.17					
POL	0.54	0.64	0.53	0.69	0.57	0.60	0.69	0.58	0.70	0.53	0.76	0.76	0.54	0.51	0.78	0.54	0.52	0.69	16.00				

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	0.71	11.72																				
DEU	0.71	0.90	14.09																			
DFS	0.74	0.89	0.95	12.18																		
FRA	0.71	0.93	0.95	0.95	0.95																	
GBR	0.75	0.91	0.90	0.90	0.92	1.61																
ITA	0.71	0.91	0.95	0.95	0.96	0.90	6.55															
NLD	0.71	0.94	0.96	0.95	0.95	0.91	0.93	5.02														
USA	0.76	0.71	0.81	0.80	0.81	0.75	0.78	0.76	1.35													
CZE	0.72	0.87	0.96	0.95	0.92	0.89	0.94	0.93	0.77	13.85												
JPN	0.78	0.93	0.97	0.97	0.97	0.92	0.96	0.95	0.84	0.95	1.68											
IRL	0.71	0.86	0.79	0.85	0.87	0.93	0.83	0.85	0.71	0.77	0.86	0.97										
KOR	0.72	0.75	0.85	0.85	0.86	0.81	0.84	0.80	0.74	0.84	0.87	0.72	2.33									
CAN	0.72	0.93	0.96	0.94	0.95	0.94	0.94	0.95	0.82	0.94	0.98	0.87	0.84	5.88								
PRT	0.71	0.85	0.88	0.87	0.89	0.87	0.85	0.86	0.72	0.84	0.87	0.78	0.83	0.89	1.78							
ESP	0.72	0.87	0.92	0.92	0.94	0.92	0.92	0.90	0.75	0.91	0.93	0.82	0.84	0.94	0.89	1.02						
SVN	0.72	0.88	0.92	0.91	0.88	0.81	0.89	0.91	0.72	0.91	0.90	0.74	0.79	0.85	0.75	0.84	20.51					
EST	0.72	0.83	0.91	0.87	0.88	0.78	0.88	0.90	0.81	0.89	0.90	0.72	0.75	0.89	0.77	0.80	0.85	16.58				
HUN	0.71	0.86	0.94	0.92	0.92	0.87	0.94	0.90	0.76	0.95	0.93	0.76	0.84	0.93	0.85	0.90	0.88	0.84	0.99			
NZL	0.71	0.90	0.91	0.91	0.93	0.91	0.91	0.88	0.72	0.87	0.92	0.87	0.81	0.91	0.85	0.86	0.85	0.82	0.89	0.16		
POL	0.72	0.85	0.91	0.89	0.89	0.89	0.90	0.87	0.75	0.91	0.92	0.78	0.79	0.91	0.84	0.87	0.84	0.82	0.91	0.85	11.13	

JER sta

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.54									
CAN	0.89	6.78								
DFS	0.90	0.97	11.73							
GBR	0.91	0.96	0.94	1.16						
ITA	0.87	0.95	0.93	0.95	1.66					
NZL	0.87	0.84	0.86	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	0.89	0.86	8.68		
NLD	0.88	0.95	0.97	0.94	0.92	0.85	0.93	0.86	5.13	
CHE	0.89	0.96	0.96	0.95	0.93	0.85	0.94	0.86	0.97	11.64

JER cwi

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.29									
CAN	0.74	6.62								
DFS	0.72	0.79	15.56							
GBR	0.82	0.91	0.84	1.83						
ITA	0.65	0.77	0.69	0.73	1.64					
NZL	0.82	0.73	0.66	0.75	0.66	0.38				
USA	0.74	0.89	0.80	0.85	0.90	0.67	1.00			
ZAF	0.68	0.77	0.74	0.79	0.73	0.75	0.76	8.44		
NLD	0.72	0.91	0.89	0.90	0.71	0.69	0.83	0.80	4.50	
CHE	0.67	0.85	0.85	0.82	0.81	0.68	0.84	0.71	0.88	12.57

JER bde

	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0.33									
CAN	0.78	5.64								
DFS	0.75	0.85	13.73							
GBR	0.74	0.86	0.86	1.54						

ITA	0.70	0.73	0.78	0.84	1.53					
NZL	0.78	0.69	0.70	0.69	0.70	0.38				
ZAF	0.79	0.72	0.81	0.80	0.71	0.74	8.63			
NLD	0.70	0.82	0.83	0.89	0.87	0.70	0.78	4.55		
USA	0.68	0.70	0.73	0.76	0.90	0.69	0.71	0.86	1.00	
CHE	0.74	0.87	0.92	0.89	0.83	0.71	0.79	0.89	0.81	13.56

JER ang

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.33									
CAN	0.67	7.51								
DFS	0.71	0.81	13.18							
GBR	0.80	0.84	0.86	1.34						
ITA	0.73	0.85	0.80	0.85	1.64					
USA	0.70	0.84	0.84	0.83	0.79	1.00				
ZAF	0.62	0.63	0.65	0.80	0.82	0.67	8.59			
NLD	0.72	0.82	0.74	0.82	0.80	0.74	0.65	5.73		
CHE	0.65	0.78	0.71	0.71	0.75	0.72	0.65	0.76	9.80	

JER ran

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.35									
CAN	0.88	5.77								
DFS	0.89	0.96	11.50							
GBR	0.94	0.95	0.95	1.27						
ITA	0.88	0.95	0.94	0.95	1.63					
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	0.88	0.88	0.88	0.89	0.88	0.88	0.88	8.90		
NLD	0.90	0.96	0.95	0.96	0.94	0.89	0.95	0.91	5.06	
CHE	0.91	0.96	0.95	0.95	0.94	0.90	0.94	0.89	0.95	13.04

JER rwi

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.32									
CAN	0.80	6.28								
DFS	0.81	0.91	12.05							
GBR	0.80	0.93	0.86	1.37						
ITA	0.77	0.85	0.81	0.84	1.47					
NZL	0.88	0.83	0.82	0.80	0.80	0.30				
USA	0.76	0.81	0.81	0.84	0.87	0.78	0.98			
ZAF	0.77	0.78	0.78	0.80	0.78	0.77	0.78	9.04		
NLD	0.84	0.93	0.91	0.87	0.78	0.84	0.80	0.79	5.11	
CHE	0.82	0.92	0.82	0.86	0.79	0.80	0.79	0.78	0.91	13.33

JER rls

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.18									
CAN	0.67	6.24								
DFS	0.67	0.90	12.56							
GBR	0.71	0.85	0.75	1.68						
ITA	0.67	0.86	0.81	0.80	1.92					
NZL	0.66	0.66	0.67	0.67	0.68	0.12				
USA	0.66	0.95	0.87	0.87	0.85	0.66	0.87			
ZAF	0.71	0.68	0.67	0.73	0.67	0.82	0.70	11.86		
NLD	0.71	0.91	0.90	0.84	0.85	0.67	0.86	0.73	3.83	
CHE	0.74	0.92	0.86	0.81	0.80	0.68	0.85	0.70	0.90	9.71

JER rlr

	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE
AUS	0.21							
CAN	0.52	6.43						
DFS	0.53	0.79	13.80					
ITA	0.56	0.81	0.71	1.48				
ZAF	0.51	0.53	0.52	0.55	12.09			
NLD	0.58	0.86	0.89	0.74	0.61	5.64		
USA	0.50	0.70	0.62	0.84	0.52	0.73	0.87	
CHE	0.62	0.68	0.62	0.61	0.55	0.70	0.57	13.02

JER fan

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.22								
CAN	0.61	6.61							
DFS	0.62	0.87	12.77						
GBR	0.69	0.79	0.77	1.52					
ITA	0.62	0.74	0.68	0.70	1.61				
USA	0.61	0.87	0.82	0.85	0.79	0.86			
ZAF	0.66	0.65	0.66	0.81	0.65	0.74	9.50		
NLD	0.66	0.73	0.77	0.85	0.70	0.76	0.69	4.04	
CHE	0.64	0.81	0.81	0.70	0.69	0.76	0.66	0.71	12.09

JER fua

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.37									
CAN	0.72	5.77								
DFS	0.68	0.86	12.74							
GBR	0.74	0.94	0.86	1.68						
ITA	0.67	0.86	0.74	0.87	1.52					
NZL	0.81	0.71	0.72	0.80	0.69	0.42				
USA	0.73	0.94	0.86	0.92	0.90	0.71	1.46			
ZAF	0.69	0.90	0.87	0.92	0.78	0.74	0.88	11.85		
NLD	0.72	0.90	0.86	0.92	0.85	0.80	0.88	0.83	5.59	
CHE	0.77	0.92	0.85	0.87	0.80	0.71	0.87	0.88	0.89	12.28

JER ruh

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.35									
CAN	0.72	6.81								
DFS	0.73	0.83	10.68							
GBR	0.79	0.79	0.84	1.39						
ITA	0.72	0.72	0.79	0.83	1.35					
NZL	0.71	0.71	0.77	0.76	0.80	0.41				
USA	0.77	0.82	0.90	0.90	0.83	0.74	1.23			
ZAF	0.81	0.70	0.77	0.86	0.84	0.77	0.83	9.15		
NLD	0.74	0.75	0.91	0.87	0.81	0.81	0.87	0.76	4.41	
CHE	0.78	0.91	0.85	0.81	0.71	0.76	0.84	0.74	0.82	12.63

JER usu

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.38									
CAN	0.73	6.34								
DFS	0.71	0.83	13.48							
GBR	0.79	0.85	0.85	1.74						
ITA	0.65	0.76	0.75	0.83	1.69					
NZL	0.58	0.59	0.59	0.62	0.63	0.40				
USA	0.74	0.81	0.89	0.84	0.82	0.60	0.97			
ZAF	0.74	0.76	0.71	0.79	0.64	0.59	0.74	9.88		
NLD	0.80	0.81	0.87	0.91	0.79	0.61	0.88	0.78	4.97	
CHE	0.76	0.90	0.86	0.81	0.78	0.61	0.83	0.76	0.85	11.18

JER ude									
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.35								
CAN	0.91	5.58							
DFS	0.88	0.93	12.19						
GBR	0.89	0.97	0.93	1.44					
ITA	0.91	0.95	0.94	0.94	1.69				
USA	0.88	0.95	0.95	0.94	0.95	1.76			
ZAF	0.87	0.89	0.88	0.89	0.88	0.88	10.30		
NLD	0.89	0.96	0.96	0.96	0.95	0.95	0.91	5.29	
CHE	0.93	0.95	0.93	0.92	0.95	0.95	0.89	0.96	10.04

JER ftp										
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.46									
CAN	0.89	6.24								
DFS	0.88	0.91	12.75							
GBR	0.90	0.94	0.88	1.35						
ITA	0.87	0.87	0.87	0.87	1.68					
NZL	0.87	0.92	0.87	0.88	0.87	0.31				
USA	0.86	0.95	0.91	0.94	0.87	0.88	1.31			
ZAF	0.87	0.93	0.87	0.92	0.87	0.90	0.90	10.04		
NLD	0.92	0.97	0.94	0.93	0.86	0.90	0.90	0.90	6.01	
CHE	0.92	0.96	0.93	0.91	0.87	0.89	0.90	0.88	0.96	10.00

JER ftl										
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0.33									
CAN	0.91	5.52								
DFS	0.92	0.91	13.89							
GBR	0.91	0.93	0.94	1.48						
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	0.90	0.92	0.95	0.90	0.96	10.77			
NLD	0.92	0.93	0.96	0.97	0.92	0.95	0.93	4.45		
CHE	0.91	0.92	0.94	0.96	0.90	0.94	0.92	0.96	11.58	
NZL	0.92	0.96	0.93	0.95	0.91	0.94	0.93	0.93	0.93	0.51

JER rtp								
	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE
AUS	0.32							
CAN	0.87	6.23						
DFS	0.87	0.93	13.14					
NZL	0.87	0.95	0.90	0.43				
ZAF	0.87	0.89	0.87	0.87	9.19			
NLD	0.89	0.96	0.95	0.91	0.87	5.90		
USA	0.87	0.93	0.95	0.87	0.86	0.93	1.33	
CHE	0.89	0.97	0.94	0.93	0.91	0.96	0.92	11.33

JER ocs									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0.77								
CAN	0.54	5.20							
DFS	0.49	0.61	10.24						
GBR	0.62	0.75	0.77	2.92					
ITA	0.48	0.70	0.71	0.78	1.28				
NZL	0.63	0.58	0.47	0.56	0.53	0.30			
USA	0.62	0.79	0.66	0.84	0.78	0.58	0.87		
NLD	0.55	0.71	0.84	0.87	0.80	0.62	0.81	3.83	

CHE 0.56 0.82 0.68 0.88 0.79 0.54 0.74 0.82 8.07

JER ous

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE	ITA
AUS	0.77								
CAN	0.67	6.32							
DFS	0.67	0.81	12.84						
GBR	0.73	0.81	0.70	1.46					
NZL	0.81	0.72	0.68	0.75	0.44				
USA	0.68	0.89	0.82	0.84	0.71	0.97			
NLD	0.69	0.88	0.86	0.78	0.79	0.86	5.75		
CHE	0.76	0.87	0.79	0.84	0.77	0.85	0.92	10.68	
ITA	0.69	0.83	0.87	0.79	0.71	0.84	0.84	0.86	1.67

JER ofl

	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	6.32							
CAN	0.45	4.97						
DFS	0.37	0.72	13.57					
GBR	0.62	0.62	0.63	1.31				
ITA	0.47	0.59	0.67	0.65	1.76			
USA	0.61	0.64	0.62	0.64	0.73	1.39		
NLD	0.46	0.67	0.63	0.72	0.68	0.66	5.50	
CHE	0.55	0.83	0.70	0.70	0.69	0.79	0.72	11.13

RDC sta

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.68										
CAN	0.88	6.31									
DEU	0.88	0.97	13.21								
DFS	0.86	0.96	0.97	8.64							
GBR	0.91	0.96	0.96	0.93	1.32						
NOR	0.87	0.93	0.94	0.97	0.92	13.62					
NZL	0.90	0.89	0.86	0.89	0.92	0.92	0.50				
USA	0.89	0.97	0.96	0.94	0.97	0.91	0.89	2.28			
NLD	0.86	0.95	0.97	0.97	0.94	0.96	0.84	0.93	4.90		
CAM	0.92	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	6.09	
LVA	0.85	0.85	0.85	0.90	0.84	0.89	0.86	0.84	0.86	0.90	0.66

RDC cwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.40										
CAN	0.72	6.81									
DEU	0.71	0.89	11.54								
DFS	0.75	0.82	0.89	13.66							
GBR	0.83	0.87	0.90	0.88	1.59						
NZL	0.78	0.68	0.70	0.68	0.80	0.35					
USA	0.66	0.84	0.81	0.83	0.83	0.72	1.26				
NLD	0.72	0.92	0.92	0.89	0.91	0.69	0.81	5.41			
CAM	0.75	0.79	0.79	0.79	0.79	0.78	0.79	0.79	6.88		
NOR	0.81	0.78	0.81	0.90	0.82	0.82	0.81	0.87	0.79	14.48	
LVA	0.68	0.69	0.66	0.65	0.66	0.70	0.65	0.68	0.79	0.78	0.29

RDC bde

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.50										
CAN	0.80	5.98									
DEU	0.76	0.87	9.98								
DFS	0.79	0.84	0.92	11.89							

GBR	0.78	0.86	0.92	0.90	1.60						
NOR	0.75	0.80	0.82	0.89	0.83	15.37					
NZL	0.78	0.70	0.73	0.73	0.75	0.81	0.35				
USA	0.70	0.76	0.89	0.84	0.89	0.83	0.73	1.26			
NLD	0.70	0.82	0.90	0.85	0.91	0.88	0.69	0.90	5.08		
CAM	0.86	0.82	0.84	0.83	0.83	0.82	0.84	0.83	0.83	5.87	
LVA	0.73	0.77	0.80	0.82	0.79	0.82	0.75	0.69	0.75	0.83	0.34

RDC ang

	AUS	CAN	DEU	DFS	GBR	USA	NLD	CAM	NOR	LVA
AUS	0.45									
CAN	0.66	6.81								
DEU	0.65	0.61	6.98							
DFS	0.71	0.73	0.68	9.04						
GBR	0.77	0.81	0.62	0.83	1.36					
USA	0.69	0.86	0.61	0.80	0.86	1.17				
NLD	0.73	0.82	0.61	0.73	0.83	0.75	5.61			
CAM	0.83	0.77	0.79	0.79	0.79	0.79	0.79	7.38		
NOR	0.70	0.75	0.78	0.63	0.77	0.77	0.72	0.77	16.03	
LVA	0.66	0.63	0.63	0.62	0.63	0.62	0.64	0.77	0.76	0.31

RDC ran

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.46										
CAN	0.90	5.66									
DEU	0.91	0.97	9.10								
DFS	0.90	0.95	0.95	10.01							
GBR	0.92	0.97	0.97	0.95	1.57						
NOR	0.90	0.94	0.90	0.91	0.93	12.14					
NZL	0.92	0.91	0.89	0.88	0.92	0.93	0.28				
USA	0.89	0.98	0.96	0.94	0.97	0.93	0.90	1.61			
NLD	0.90	0.97	0.98	0.96	0.97	0.93	0.88	0.96	5.61		
CAM	0.94	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.92	5.55	
LVA	0.89	0.92	0.92	0.91	0.90	0.89	0.89	0.90	0.91	0.92	0.42

RDC rwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.48										
CAN	0.84	6.41									
DEU	0.79	0.94	9.84								
DFS	0.80	0.93	0.92	10.48							
GBR	0.84	0.92	0.89	0.88	1.46						
NZL	0.82	0.88	0.81	0.87	0.90	0.33					
USA	0.77	0.90	0.85	0.89	0.93	0.87	1.38				
NLD	0.83	0.94	0.95	0.92	0.88	0.83	0.81	6.23			
CAM	0.86	0.87	0.86	0.88	0.87	0.88	0.87	0.87	6.77		
NOR	0.82	0.87	0.84	0.94	0.87	0.88	0.87	0.89	0.87	13.90	
LVA	0.79	0.82	0.81	0.85	0.78	0.80	0.77	0.81	0.86	0.86	0.41

RDC rls

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.23										
CAN	0.69	6.51									
DEU	0.71	0.94	9.15								
DFS	0.68	0.97	0.94	9.28							
GBR	0.77	0.77	0.85	0.77	1.53						
NOR	0.71	0.87	0.85	0.93	0.79	11.84					
NZL	0.67	0.67	0.68	0.67	0.69	0.73	0.12				
USA	0.68	0.92	0.93	0.93	0.82	0.83	0.67	0.89			
NLD	0.71	0.92	0.93	0.88	0.86	0.80	0.66	0.90	5.38		
CAM	0.81	0.80	0.80	0.79	0.80	0.80	0.78	0.81	0.80	6.86	

DEU	0.72	0.90	12.27									
DFS	0.65	0.75	0.80	13.02								
GBR	0.80	0.78	0.75	0.78	1.87							
NOR	0.65	0.70	0.67	0.73	0.76	12.15						
NZL	0.63	0.70	0.61	0.59	0.65	0.68	0.32					
USA	0.77	0.82	0.75	0.85	0.87	0.78	0.68	1.18				
NLD	0.79	0.81	0.79	0.88	0.92	0.74	0.58	0.91	4.37			
CAM	0.83	0.77	0.76	0.76	0.78	0.76	0.75	0.77	0.78	5.75		
LVA	0.63	0.64	0.62	0.60	0.72	0.66	0.67	0.66	0.66	0.76	0.32	

RDC ude

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA		
AUS	0.57											
CAN	0.88	5.65										
DEU	0.89	0.97	12.72									
DFS	0.88	0.96	0.93	10.68								
GBR	0.89	0.96	0.96	0.92	1.78							
NOR	0.89	0.91	0.90	0.87	0.92	14.25						
USA	0.87	0.96	0.95	0.95	0.96	0.92	1.29					
NLD	0.88	0.97	0.97	0.95	0.97	0.89	0.96	4.23				
CAM	0.91	0.92	0.92	0.92	0.92	0.92	0.92	0.92	4.54			
LVA	0.89	0.89	0.88	0.91	0.88	0.89	0.88	0.88	0.92	0.42		

RDC ftp

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA	
AUS	0.54											
CAN	0.92	6.07										
DEU	0.93	0.97	12.83									
DFS	0.88	0.95	0.93	11.91								
GBR	0.91	0.93	0.93	0.89	1.49							
NOR	0.88	0.92	0.89	0.92	0.91	14.20						
NZL	0.91	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	0.88	1.40				
NLD	0.92	0.98	0.97	0.95	0.94	0.90	0.91	0.90	4.40			
CAM	0.90	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.58		
LVA	0.88	0.87	0.87	0.87	0.87	0.88	0.88	0.86	0.87	0.91	0.39	

RDC ftl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	NZL	
AUS	0.58											
CAN	0.93	5.06										
DEU	0.93	0.94	13.94									
DFS	0.92	0.90	0.97	10.58								
GBR	0.94	0.93	0.97	0.93	1.45							
NOR	0.91	0.92	0.92	0.94	0.93	12.58						
USA	0.94	0.93	0.95	0.93	0.97	0.93	1.62					
NLD	0.92	0.93	0.98	0.97	0.97	0.95	0.95	5.14				
CAM	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	7.25			
LVA	0.90	0.90	0.90	0.91	0.89	0.93	0.89	0.90	0.93	0.47		
NZL	0.94	0.94	0.93	0.92	0.93	0.93	0.94	0.93	0.93	0.90	0.41	

RDC rtp

	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA		
AUS	0.39											
CAN	0.88	6.01										
DEU	0.89	0.96	13.86									
DFS	0.87	0.93	0.96	12.28								
NOR	0.88	0.90	0.89	0.87	13.14							
NZL	0.91	0.95	0.92	0.88	0.89	0.35						
NLD	0.90	0.97	0.97	0.96	0.88	0.93	5.07					
USA	0.88	0.91	0.95	0.91	0.91	0.89	0.96	1.40				

CAM	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.13
LVA	0.90	0.89	0.88	0.88	0.88	0.89	0.90	0.87	0.91	0.38

RDC ocs

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.11									
CAN	0.64	4.73								
DEU	0.53	0.74	20.60							
DFS	0.58	0.59	0.70	9.19						
GBR	0.65	0.73	0.86	0.73	1.62					
NOR	0.51	0.69	0.67	0.80	0.75	16.34				
NZL	0.72	0.57	0.62	0.54	0.64	0.64	0.27			
USA	0.62	0.76	0.82	0.71	0.86	0.75	0.71	0.55		
NLD	0.59	0.71	0.85	0.84	0.87	0.74	0.65	0.86	3.60	
CAM	0.74	0.75	0.75	0.76	0.75	0.76	0.72	0.78	0.78	6.25

RDC ous

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.48									
CAN	0.71	5.32								
DEU	0.75	0.87	17.09							
DFS	0.68	0.78	0.81	10.60						
GBR	0.83	0.78	0.81	0.71	1.59					
NOR	0.72	0.80	0.81	0.79	0.82	13.07				
NZL	0.83	0.82	0.78	0.73	0.81	0.75	0.36			
USA	0.75	0.87	0.84	0.84	0.86	0.82	0.87	0.96		
NLD	0.71	0.88	0.90	0.85	0.77	0.81	0.82	0.85	4.60	
CAM	0.85	0.83	0.82	0.82	0.83	0.82	0.85	0.84	0.84	6.58

RDC ofl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	0.66								
CAN	0.37	4.41							
DEU	0.41	0.73	16.53						
DFS	0.38	0.79	0.79	13.02					
GBR	0.53	0.66	0.73	0.65	1.44				
NOR	0.46	0.70	0.71	0.58	0.76	13.01			
USA	0.58	0.59	0.73	0.62	0.69	0.75	1.31		
NLD	0.46	0.67	0.76	0.63	0.73	0.77	0.68	6.83	
CAM	0.56	0.75	0.75	0.75	0.75	0.75	0.75	0.75	6.86

^LAPPENDIX II. Number of common bulls

BSW

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	142	87	139	42	163	123	26	20
CHE	124	0	182	515	73	289	558	62	18
FRA	80	148	0	214	64	109	210	41	14
ITA	120	456	180	0	98	228	620	78	19
NLD	34	70	53	78	0	64	90	29	12
USA	155	260	87	170	52	0	243	29	20
DEA	103	462	169	535	79	198	0	72	15
SVN	24	59	42	72	29	25	67	0	6
GBR	17	16	13	17	10	18	13	4	0

BSW

common bulls below diagonal

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common three quarter sib group above diagonal
      CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN   0  134  53  139  35  163  121  26  20
CHE  117   0  115  460  68  260  495  62  18
FRA   48   89   0  130  45   68  140  41  10
ITA  120  402  109   0   90  228  584  79  19
NLD   30   67  41   74   0   50   84  29  12
USA  155  226  51  170  43   0  225  29  20
DEA  102  403  110  498  77  173   0   73  14
SVN   24   59  42   73  29  25   68   0   6
GBR   17   16   9   17  10  18   13   4   0
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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  FRA  ITA  NLD  DEA  SVN  GBR  USA
-----
CAN   0  142  87  139  35  123  23  20  163
CHE  124   0  182  515  72  558  48  18  289
FRA   80  148   0  214  58  210  37  14  109
ITA  120  456  180   0   90  620  67  19  228
NLD   30   70  50   74   0   85  28  12  50
DEA  103  462  169  535  78   0   60  15  243
SVN   21   46  38   61  27   56   0   6   24
GBR   17   16  13   17  10  13   4   0   20
USA  155  260  87  170  43  198  22  18   0
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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  FRA  NLD  USA  GBR
-----
CAN   0  141  86  24  162  20
CHE  124   0  176  50  287  18
FRA   79  144   0  41  108  14
NLD   21   51  37   0  35   9
USA  154  260  86  31   0  20
GBR   17   16  13   7  18   0
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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN   0  142  87  139  42  163  123  26  20
CHE  124   0  182  515  73  289  558  62  18
FRA   80  148   0  214  64  109  210  41  14
ITA  120  456  180   0   98  228  620  78  19
NLD   34   70  53   78   0   64  90  29  12
USA  155  260  87  170  52   0  243  29  20
DEA  103  462  169  535  79  198   0   72  15
SVN   24   59  42   72  29  25   67   0   6
GBR   17   16  13   17  10  18  13   4   0
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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  142  53  42  163  123  20  23  135
CHE  124   0  115  73  289  558  18  48  508
FRA   48   89   0  45   68  140  10  37  130
NLD   34   70  41   0   64  90  12  28  96
USA  155  260  51  52   0  243  20  24  214
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DEA	103	462	111	79	198	0	15	60	614
GBR	17	16	9	10	18	13	0	6	19
SVN	21	46	38	27	22	56	4	0	67
ITA	117	450	109	77	156	527	17	61	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	142	87	139	42	163	123	26	20
CHE	124	0	182	515	73	289	558	62	18
FRA	80	148	0	214	64	109	210	41	14
ITA	120	456	180	0	98	228	620	78	19
NLD	34	70	53	78	0	64	90	29	12
USA	155	260	87	170	52	0	243	29	20
DEA	103	462	169	535	79	198	0	72	15
SVN	24	59	42	72	29	25	67	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	142	87	139	34	163	123	26	20
CHE	124	0	182	515	71	289	558	62	18
FRA	80	148	0	214	58	109	210	41	14
ITA	120	456	180	0	89	228	620	78	19
NLD	29	69	50	73	0	49	84	29	12
USA	155	260	87	170	41	0	243	29	20
DEA	103	462	169	535	77	198	0	72	15
SVN	24	59	42	72	29	25	67	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	142	87	135	34	123	26	163
CHE	124	0	182	509	71	558	62	289
FRA	80	148	0	213	58	210	41	109
ITA	117	451	180	0	88	614	78	214
NLD	29	69	50	72	0	84	29	49
DEA	103	462	169	527	77	0	72	243
SVN	24	59	42	72	29	67	0	29
USA	155	260	87	156	41	198	25	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	142	53	96	34	163	91	26	20
CHE	124	0	115	344	72	288	365	62	18
FRA	48	89	0	123	43	68	130	41	10
ITA	85	295	102	0	69	130	338	73	16
NLD	29	70	39	62	0	49	73	29	12
USA	155	260	51	97	42	0	144	29	20
DEA	77	296	103	301	67	106	0	72	12
SVN	24	59	42	68	29	25	67	0	6
GBR	17	16	9	14	10	18	11	4	0

BSW

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-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN   0  142  87  139  35  163  123  26  20
CHE  124   0  182  515  72  289  558  62  18
FRA   80  148   0  214  57  109  210  41  14
ITA  120  456  180   0  90  228  620  79  19
NLD   30   70  49   74   0   50   85  29  12
USA  155  260  87  170  43   0  243  29  20
DEA  103  462  169  535  78  198   0  73  15
SVN   24   59  42   73  29  25   68   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
-----
CAN   0  142  87  139  35  163  123  26
CHE  124   0  182  515  72  289  558  62
FRA   80  148   0  214  57  109  210  41
ITA  120  456  180   0  90  228  620  79
NLD   30   70  49   74   0   50   85  29
USA  155  260  87  170  43   0  243  29
DEA  103  462  169  535  78  198   0  73
SVN   24   59  42   73  29  25   68   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  142  87  139  42  163  123  26  20
CHE  124   0  182  515  73  289  558  62  18
FRA   80  148   0  214  63  109  210  41  14
ITA  120  456  180   0  98  228  620  79  19
NLD   34   70  52   78   0   64   90  29  12
USA  155  260  87  170  52   0  243  29  20
DEA  103  462  169  535  79  198   0  73  15
SVN   24   59  42   73  29  25   68   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  142  87  139  43  161  123  26  20
CHE  124   0  182  515  78  289  558  62  18
FRA   80  148   0  214  67  109  210  41  14
ITA  120  456  180   0  103  228  620  79  19
NLD   35   74  55   82   0   65   95  30  12
USA  154  260  87  170  53   0  243  29  20
DEA  103  462  169  535  84  198   0  73  15
SVN   24   59  42   73  30  25   68   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  NLD  USA  DEA  SVN  GBR  ITA
-----
CAN   0  142  87  43  163  112  26  20  127
-----

```

CHE	124	0	182	78	289	526	62	18	473
FRA	80	148	0	67	109	197	41	14	197
NLD	35	74	55	0	65	89	30	12	93
USA	155	260	87	53	0	218	29	20	184
DEA	95	431	159	82	170	0	73	14	526
SVN	24	59	42	30	25	68	0	6	78
GBR	17	16	13	10	18	13	4	0	19
ITA	110	419	166	77	137	462	72	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	142	87	139	42	163	123	26	20
CHE	124	0	182	515	73	289	558	62	18
FRA	80	148	0	214	63	109	210	41	14
ITA	120	456	180	0	98	226	620	79	19
NLD	34	70	52	78	0	64	90	29	12
USA	155	260	87	169	52	0	243	29	20
DEA	103	462	169	535	79	198	0	73	15
SVN	24	59	42	73	29	25	68	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	132	82	94	31	89	26	48
CHE	118	0	176	342	73	364	62	48
FRA	74	142	0	146	58	150	41	17
ITA	83	293	121	0	73	337	73	41
NLD	27	72	50	66	0	77	30	17
DEA	76	295	115	301	72	0	72	41
SVN	24	59	42	68	30	67	0	12
USA	47	40	12	30	16	35	10	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	134	76	139	42	163	91	26	20
CHE	117	0	145	459	68	260	360	61	18
FRA	71	116	0	175	55	91	142	40	14
ITA	120	400	149	0	96	225	374	76	19
NLD	34	67	49	78	0	64	73	29	12
USA	155	226	73	170	52	0	144	29	20
DEA	77	292	113	336	67	106	0	70	12
SVN	24	58	41	70	29	25	65	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	134	76	139	42	162	123	26	20
CHE	117	0	145	460	68	260	503	61	18
FRA	71	116	0	176	54	91	177	41	14
ITA	120	402	149	0	98	228	613	78	19
NLD	34	67	48	78	0	64	90	29	12
USA	154	226	73	170	52	0	241	29	20
DEA	102	413	142	531	79	194	0	73	15

SVN	24	58	42	72	29	25	68	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  134  76  135  42  163  123  26  20
CHE  117   0  145  459  68  260  503  62  18
FRA   71  116   0  175  55   91  177  41  14
ITA  117  401  149   0   96  214  608  78  19
NLD   34   67  49   77   0   64   90  29  12
USA  155  226  73  156  52   0  241  29  20
DEA  102  413  142  524  79  194   0   72  15
SVN   24   59  42   72  29  25   67   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  135  123  98  26  164  55
CHE  118   0  497  344  62  259  115
DEA  104  410   0  378  71  237  140
ITA   87  294  326   0  71  130  123
SVN   25   59  66   66   0  29  40
USA  155  226  193  97  25   0  68
FRA   50   89  111  102  41  51   0

```

BSW

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common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  DEA  ITA  SVN  USA  FRA
-----
CAN   0  142  125  141  27  89
CHE  125   0  558  514  61  182
DEA  104  462   0  618  72  209
ITA  122  456  534   0  78  212
SVN   25   59  68   73   0  41
FRA   82  148  169  179  42   0

```

BSW

```

common bulls below diagonal
common three quarter sib group above diagonal
      CAN  CHE  DEA  ITA  SVN  USA  FRA
-----
CAN   0  135  102  98  26  164  55
CHE  118   0  395  344  62  259  115
DEA   88  323   0  345  70  174  132
ITA   87  294  308   0  71  130  123
SVN   25   59  65   66   0  29  40
USA  155  226  132  97  25   0  68
FRA   50   89  105  102  41  51   0

```

BSW

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

```

CHE	0	540	344	48	288	181
DEA	447	0	377	59	228	204
ITA	295	325	0	60	130	147
SVN	46	55	55	0	24	36
USA	260	182	97	22	0	109
FRA	147	166	122	37	87	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	92	75	79	25	94	43
CHE	79	0	395	344	58	259	115
DEA	62	323	0	345	67	174	132
ITA	70	294	308	0	64	130	123
SVN	24	55	62	60	0	27	40
USA	86	226	132	97	23	0	68
FRA	38	89	105	102	41	51	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	FRA
CAN	0	142	125	137	27	89
CHE	125	0	558	508	61	182
DEA	104	462	0	612	71	209
ITA	119	451	526	0	77	211
SVN	25	59	67	72	0	41
FRA	82	148	169	179	42	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CHE	DEA	ITA	SVN	FRA
CHE	0	557	511	61	178
DEA	461	0	618	72	207
ITA	453	534	0	78	209
SVN	59	68	73	0	41
FRA	145	168	178	42	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CHE	DEA	ITA	SVN	FRA
CHE	0	331	318	61	129
DEA	281	0	336	71	150
ITA	279	301	0	73	144
SVN	59	67	68	0	41
FRA	104	115	120	42	0

BSW

common bulls below diagonal
common three quarter sib group above diagonal

	CHE	DEA	ITA	SVN	FRA
CHE	0	557	505	60	178
DEA	461	0	612	72	207
ITA	448	526	0	77	208
SVN	58	68	72	0	41

FRA 145 168 178 42 0

BSW

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

CHE 0 364 341 61 110
DEA 295 0 337 71 128
ITA 293 301 0 73 121
SVN 59 67 68 0 41
FRA 87 102 100 42 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 43 20
USA 41 0 9
AUS 21 8 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

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

CAN 0 25 70 20
GBR 22 0 81 12
USA 60 79 0 25
AUS 21 10 23 0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	70	20
GBR	22	0	81	12
USA	60	79	0	25
AUS	21	10	23	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	68	19
GBR	22	0	81	12
USA	59	79	0	25
AUS	20	10	23	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	70	20
GBR	22	0	81	12
USA	60	79	0	25
AUS	21	10	23	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	25	70	20
GBR	22	0	81	12
USA	60	79	0	25
AUS	21	10	23	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	AUS	USA
CAN	0	20	70
AUS	21	0	25
USA	60	23	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	12	70	20
GBR	9	0	34	9
USA	60	32	0	24
AUS	21	8	22	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	23	68	19
GBR	20	0	79	11

ESP	528	626	949	501	750	751	0	1320	1172	1342	1180	1666	769	1037	372	886	947	164	457	558	186	939	425
FRA	625	860	1043	663	1065	898	1043	0	1586	1501	1874	2404	861	1574	389	1147	1276	175	580	569	200	981	466
GBR	812	769	1756	752	1119	967	965	1091	0	1526	1717	2247	827	1241	395	938	1097	198	780	567	202	1022	490
ITA	553	682	1679	674	1488	991	1012	1026	1338	0	1528	2463	980	1448	298	958	1242	231	483	647	266	1076	607
NLD	777	1093	1317	847	1715	1266	1037	1283	1483	1355	0	2140	828	1417	371	917	1438	247	697	529	234	1067	525
USA	975	699	3540	882	1423	1071	1142	1325	2080	2111	1832	0	1245	1728	467	1763	1678	264	628	952	227	1411	763
HUN	336	343	876	316	624	541	585	589	662	848	643	1139	0	810	279	605	873	145	337	466	148	709	371
POL	404	493	983	417	1134	774	703	1012	970	1155	1112	1469	643	0	290	794	1186	227	440	551	232	949	555
ZAF	287	210	349	192	202	302	344	319	368	261	339	495	236	217	0	307	303	54	238	231	54	334	138
JPN	313	250	457	239	327	326	342	341	387	401	378	521	251	283	193	0	778	125	351	548	132	653	342
CZE	369	414	831	367	950	638	673	835	789	967	1233	1287	742	843	225	258	0	174	430	524	205	833	465
EST	53	65	116	50	154	137	72	83	109	138	162	182	81	131	23	34	95	0	79	91	62	139	132
IRL	404	398	454	373	395	448	436	514	833	443	643	581	270	326	226	202	321	39	0	224	92	419	196
KOR	251	212	726	215	347	317	402	343	430	548	372	1062	363	398	178	264	369	37	156	0	107	519	285
SVN	76	105	156	87	316	162	130	150	148	232	198	179	108	182	37	56	145	32	72	66	0	155	110
PRT	452	606	1143	473	839	767	911	869	935	1072	1065	1466	673	879	311	316	689	80	353	443	120	0	457
LVA	120	148	342	141	591	253	227	238	284	399	338	660	257	379	83	102	294	69	109	174	65	361	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 0 515 951 482 911 795 680 842 941 650 878 1143 470 609 515 309 589 565 107 443 359 109 569 263
BEL 453 0 707 554 951 697 647 871 783 673 1037 809 426 617 288 246 439 562 109 422 302 134 586 264
CAN 883 679 0 896 2175 1220 1427 1435 1719 1878 1387 3476 981 1272 390 376 1220 1180 206 490 790 203 1071 552
CHE 438 550 798 0 1036 607 602 713 754 743 848 947 388 570 257 218 411 508 100 382 302 121 500 266
DEU 631 898 1368 883 0 2155 1572 2373 1937 2325 2670 2946 1100 1871 466 372 1220 1713 285 625 625 333 1142 801
DFS 538 614 911 550 1278 0 1022 1538 1382 1228 1633 1707 745 1182 469 384 822 1099 217 563 482 208 854 451
ESP 528 634 949 501 918 751 0 1300 1173 1342 1164 1666 770 1039 347 372 886 947 164 457 560 184 897 425
FRA 624 874 1038 662 1287 897 1040 0 1551 1496 1838 2254 860 1574 496 377 1088 1270 175 572 562 198 941 462
GBR 812 786 1756 752 1328 967 965 1083 0 1526 1692 2249 828 1245 500 396 938 1097 198 784 568 200 978 490
ITA 553 682 1679 674 1572 991 1012 1025 1338 0 1520 2462 980 1449 299 298 956 1242 231 483 651 264 1020 607
NLD 753 1132 1271 826 1990 1243 1010 1258 1448 1345 0 2069 830 1415 622 364 886 1426 244 696 521 233 1013 521
USA 975 713 3540 882 1680 1072 1142 1290 2080 2111 1637 0 1246 1732 562 467 1763 1678 264 629 958 226 1343 763
HUN 336 344 876 316 760 542 585 588 662 848 631 1139 0 811 266 280 605 874 145 338 471 148 683 371
POL 404 496 983 418 1248 775 704 1011 971 1155 1110 1469 644 0 327 291 793 1189 229 442 555 232 914 556
NZL 418 226 335 214 325 304 282 306 395 254 558 477 193 205 0 205 333 345 53 350 196 62 314 145
ZAF 287 212 349 192 293 302 344 318 368 261 325 495 236 217 186 0 308 303 54 238 231 54 323 138
JPN 312 249 456 239 370 326 342 341 387 400 377 521 251 282 163 194 0 778 125 351 549 131 632 342
CZE 369 417 831 367 1149 638 673 832 789 967 1217 1287 742 843 228 225 258 0 175 430 526 206 806 465
EST 53 65 116 50 168 137 72 83 109 138 160 182 81 132 25 23 34 95 0 79 91 62 137 132
IRL 405 404 454 373 503 448 436 510 837 443 632 581 270 326 285 226 202 321 39 0 225 91 407 196
KOR 252 212 728 215 386 317 405 347 431 550 368 1072 366 400 136 178 265 370 37 156 0 107 505 286
SVN 75 104 155 87 313 161 129 150 147 231 199 178 108 182 45 36 55 145 32 71 67 0 148 109
PRT 438 585 1088 450 934 743 869 837 897 1017 1011 1390 645 853 246 307 311 662 79 344 428 115 0 443
LVA 120 148 342 141 620 253 227 238 284 399 335 660 257 379 76 83 102 294 69 109 175 64 347 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 0 515 951 482 911 749 672 884 941 650 907 1143 470 610 515 309 591 565 107 443 359 111 568 263
BEL 453 0 707 554 951 686 634 876 782 673 1049 809 426 617 288 246 441 562 109 422 302 136 585 264
CAN 883 679 0 896 2176 1142 1423 1492 1719 1878 1430 3476 981 1272 390 376 1222 1180 206 490 790 205 1069 552
CHE 438 550 798 0 1036 603 597 715 754 743 860 947 388 570 257 218 411 508 100 382 302 123 500 266
DEU 631 898 1368 883 0 2101 1556 2387 1937 2325 2698 2946 1100 1872 466 372 1222 1713 285 625 625 336 1140 801
DFS 538 614 911 550 1277 0 965 1501 1323 1226 1635 1614 736 1162 442 357 769 1065 215 546 469 210 844 447
ESP 519 614 943 495 893 733 0 1302 1156 1335 1165 1653 764 1027 340 370 884 935 161 445 557 182 884 422
FRA 625 876 1043 663 1287 899 1013 0 1587 1501 1917 2407 863 1581 520 389 1150 1276 176 581 573 201 945 466
GBR 812 784 1755 752 1327 966 939 1088 0 1526 1728 2249 828 1245 500 396 940 1097 198 784 568 203 976 490
ITA 553 682 1679 674 1572 990 1001 1026 1337 0 1526 2463 980 1449 299 298 959 1242 231 483 651 267 1020 607
NLD 782 1162 1320 848 2017 1266 1014 1301 1487 1351 0 2175 835 1428 635 373 924 1440 246 703 533 236 1025 525
USA 975 713 3540 882 1680 1071 1130 1325 2080 2111 1839 0 1246 1732 562 467 1765 1678 264 629 959 228 1341 763
HUN 336 344 876 316 760 542 580 589 662 848 644 1139 0 811 266 280 605 874 145 338 471 148 683 371
POL 404 496 983 418 1248 775 689 1012 971 1155 1118 1469 644 0 327 291 794 1189 229 442 555 234 912 556


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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  507  754  302  621  712  629  930  729  421  278  354  210  546  398  577  133  88  285  215  453
CHE  509    0  913  247  593  726  726  814  917  410  301  335  227  763  369  566  122  88  281  205  444
DEU  729  775    0  802 1661 1587 2154 2246 2399 1304  792  445  471 1702  818 1342  331 245  774  288 1487
DFS  241  201  368    0  495  625  531  788  686  437  220  276  133  322  273  419  82  61  225  195  422
FRA  626  537 1039  259    0 1046 1317 1258 1414  883  631  353  392 1036  625 1006  197 142  598  229 1165
GBR  733  714 1152  353  807    0 1498 1621 2199  857  576  676  415 1322  684 1092  202 171  587  359  988
ITA  645  664 1462  365  948 1316    0 1470 2413 1125  772  427  539 1721  841 1302  262 212  823  259 1289
NLD 1012  796 1780  504  987 1397 1316    0 1936 1185  572  578  388 1103  702 1084  234 212  582  469 1128
USA  662  852 1470  343  899 2067 2072 1560    0 1342 1010  556  713 2651  979 1580  227 218  929  360 1408
CZE  325  289  936  231  600  621  883 1054 1054    0  510  287  388  900  562  760  202 146  612  202  935
JPN  185  191  306  107  271  301  352  302  415  213    0  183  370  734  392  602  123  92  394  153  564
IRL  359  331  384  206  343  740  405  549  537  218  137    0  131  353  227  383  86  58  199  241  282
KOR  156  169  313   78  274  309  458  282  810  276  207   96    0  577  363  421  106  76  340  119  443
CAN  567  701 1249  247  841 1428 1593 1133 2999  698  373  365  556    0  779 1122  202 171  740  230 1013
PRT  390  320  712  198  581  600  840  674 1038  461  234  190  316  795    0  636  151 111  475  174  695
ESP  579  464  754  275  814  895  982  936 1075  512  264  378  294  817  582    0  183 137  565  245  819
SVN  102   87  316   55  149  148  227  198  179  144   55   66   66  156  114  126   0   60  143   61  225
EST   54   44  146   26   72   99  127  144  146   81   32   31   34  109   68   62   32   0  120   41  196
HUN  228  220  556  148  426  469  713  455  866  517  186  160  263  712  462  410  106  68   0  136  618
NZL  181  181  243  127  192  302  233  432  316  150  116  202   92  232  148  210  44  21  107   0  172
POL  370  326 1047  255  804  812 1046  915 1274  692  238  228  336  892  666  537  179 116  522  133   0
-----

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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  159   93  107   35  155  265  137   18   18
CAN  165    0  106  142   37   79  477  149   15   25
DFS   70   94    0  112   47   97  174  130   23   34
GBR  105  147  108    0   43   77  183  116   18   35
ITA   35   35   46   41    0   33   47   47   10   16
NZL  157   80   76   79   30    0  160  105   18   21
USA  261  479  142  190   50  166    0  263   39   39
ZAF  141  149  113  114   48  101  270    0   28   26
NLD   14   10   17   15    7   15   39   23    0    4
CHE   16   23   33   33   17   19   39   25    3    0
-----

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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  159   93  107   35  155  265  130   18   25
CAN  165    0  106  142   37   79  477  138   15   30
DFS   70   94    0  112   47   97  174  121   23   44
GBR  105  147  108    0   43   77  183  111   18   42
ITA   35   35   46   41    0   33   47   47   10   23
NZL  157   80   76   79   30    0  160   96   18   27
USA  261  479  142  190   50  166    0  241   39   46
ZAF  135  140  107  110   48   93  250    0   28   38
NLD   14   10   17   15    7   15   39   23    0    8
CHE   23   29  43   41   24  25  47   37    6    0
-----

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JER

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-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  ZAF  NLD  USA  CHE
-----
AUS    0  159   93  107   35  155  130   18  265   29
CAN  165    0  106  142   37   79  138   15  477   34
-----

```

DFS	70	94	0	112	47	97	121	23	174	47
GBR	105	147	108	0	43	77	111	18	183	45
ITA	35	35	46	41	0	33	47	10	47	26
NZL	157	80	76	79	30	0	96	18	160	31
ZAF	135	140	107	110	48	93	0	28	241	42
NLD	14	10	17	15	7	15	23	0	39	10
USA	261	479	142	190	50	166	250	39	0	50
CHE	26	31	46	44	26	29	40	7	51	0

JER

common bulls below diagonal

common three quarter sib group above diagonal

AUS CAN DFS GBR ITA USA ZAF NLD CHE

AUS	0	159	90	106	35	264	136	6	29
CAN	165	0	106	142	37	477	149	7	34
DFS	68	94	0	110	47	173	129	12	47
GBR	104	147	106	0	43	182	116	12	45
ITA	35	35	46	41	0	47	47	5	26
USA	260	479	141	189	50	0	262	22	50
ZAF	140	149	112	114	48	269	0	13	42
NLD	3	5	11	10	4	20	11	0	5
CHE	26	31	46	44	26	51	40	5	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	159	93	107	35	155	265	137	18	29
CAN	165	0	106	142	37	79	477	149	15	34
DFS	70	94	0	112	47	97	174	130	23	47
GBR	105	147	108	0	43	77	183	116	18	45
ITA	35	35	46	41	0	33	47	47	10	26
NZL	157	80	76	79	30	0	160	105	18	31
USA	261	479	142	190	50	166	0	263	39	50
ZAF	141	149	113	114	48	101	270	0	28	42
NLD	14	10	17	15	7	15	39	23	0	10
CHE	26	31	46	44	26	29	51	40	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	159	88	107	35	155	265	137	18	29
CAN	165	0	95	142	37	79	477	149	15	34
DFS	62	80	0	108	44	90	163	123	21	46
GBR	105	147	101	0	43	77	183	116	18	45
ITA	35	35	41	41	0	33	47	47	10	26
NZL	157	80	68	79	30	0	160	105	18	31
USA	261	479	128	190	50	166	0	263	39	50
ZAF	141	149	103	114	48	101	270	0	28	42
NLD	14	10	15	15	7	15	39	23	0	10
CHE	26	31	45	44	26	29	51	40	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	159	93	107	35	155	265	137	18	29
CAN	165	0	106	142	37	79	477	149	15	34
DFS	70	94	0	112	47	97	174	130	23	47
GBR	105	147	108	0	43	77	183	116	18	45

ITA	35	35	46	41	0	33	47	47	10	26
NZL	157	80	76	79	30	0	160	105	18	31
USA	261	479	142	190	50	166	0	263	39	50
ZAF	141	149	113	114	48	101	270	0	28	42
NLD	14	10	17	15	7	15	39	23	0	10
CHE	26	31	46	44	26	29	51	40	7	0

JER

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE
AUS	0	159	85	35	108	18	264	29
CAN	165	0	95	37	124	15	477	34
DFS	60	80	0	44	93	21	162	46
ITA	35	35	41	0	44	10	47	26
ZAF	110	120	79	44	0	25	205	42
NLD	14	10	15	7	18	0	39	10
USA	260	479	127	50	203	39	0	50
CHE	26	31	45	26	40	7	51	0

JER

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	159	90	106	35	264	136	18	29
CAN	165	0	106	142	37	477	149	15	34
DFS	68	94	0	110	47	173	129	23	47
GBR	104	147	106	0	43	182	116	18	45
ITA	35	35	46	41	0	47	47	10	26
USA	260	479	141	189	50	0	262	39	50
ZAF	140	149	112	114	48	269	0	28	42
NLD	14	10	17	15	7	39	23	0	10
CHE	26	31	46	44	26	51	40	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	159	93	107	35	155	265	137	18	29
CAN	165	0	106	142	37	79	477	149	15	34
DFS	70	94	0	112	47	97	174	130	23	47
GBR	105	147	108	0	43	77	183	116	18	45
ITA	35	35	46	41	0	33	47	47	10	26
NZL	157	80	76	79	30	0	160	105	18	31
USA	261	479	142	190	50	166	0	263	39	50
ZAF	141	149	113	114	48	101	270	0	28	42
NLD	14	10	17	15	7	15	39	23	0	10
CHE	26	31	46	44	26	29	51	40	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	159	85	107	35	155	265	137	18	29
CAN	165	0	89	142	37	79	477	149	15	34
DFS	60	78	0	99	44	83	155	118	21	46
GBR	105	147	97	0	43	77	183	116	18	45
ITA	35	35	41	41	0	33	47	47	10	26
NZL	157	80	63	79	30	0	160	105	18	31
USA	261	479	122	190	50	166	0	263	39	50
ZAF	141	149	101	114	48	101	270	0	28	42

NLD	14	10	15	15	7	15	39	23	0	10
CHE	26	31	45	44	26	29	51	40	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	159	93	107	35	155	265	137	18	29
CAN	165	0	106	142	37	79	477	149	15	34
DFS	70	94	0	112	47	97	174	130	23	47
GBR	105	147	108	0	43	77	183	116	18	45
ITA	35	35	46	41	0	33	47	47	10	26
NZL	157	80	76	79	30	0	160	105	18	31
USA	261	479	142	190	50	166	0	263	39	50
ZAF	141	149	113	114	48	101	270	0	28	42
NLD	14	10	17	15	7	15	39	23	0	10
CHE	26	31	46	44	26	29	51	40	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	159	91	106	35	264	137	19	29
CAN	165	0	106	142	37	474	149	18	34
DFS	69	94	0	110	47	173	130	35	47
GBR	104	146	106	0	43	182	116	23	45
ITA	35	35	46	41	0	47	47	10	26
USA	260	477	141	189	50	0	262	45	50
ZAF	141	149	113	114	48	269	0	34	42
NLD	15	13	29	20	7	45	29	0	12
CHE	26	31	46	44	26	51	40	9	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	159	93	107	35	155	265	137	19	29
CAN	165	0	106	142	37	79	477	149	18	34
DFS	70	94	0	112	46	97	174	130	35	47
GBR	105	147	108	0	43	77	183	116	23	45
ITA	35	35	45	41	0	33	46	47	10	26
NZL	157	80	76	79	30	0	160	105	21	31
USA	261	479	142	190	49	166	0	263	45	50
ZAF	141	149	113	114	48	101	270	0	34	42
NLD	15	13	29	20	7	18	45	29	0	12
CHE	26	31	46	44	26	29	51	40	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	159	90	106	35	264	129	18	29	21
CAN	165	0	106	142	37	477	138	15	34	15
DFS	68	94	0	110	47	173	120	23	47	20
GBR	104	147	106	0	43	182	111	18	45	13
ITA	35	35	46	41	0	47	47	10	26	3
USA	260	479	141	189	50	0	241	39	50	21
ZAF	134	140	106	110	48	250	0	28	42	15
NLD	14	10	17	15	7	39	23	0	10	4
CHE	26	31	46	44	26	51	40	7	0	7
NZL	21	14	19	12	1	19	13	2	6	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE
AUS	0	159	77	155	127	19	265	29
CAN	165	0	84	79	135	18	477	34
DFS	55	75	0	76	105	33	145	46
NZL	157	80	58	0	92	21	159	31
ZAF	130	134	89	85	0	34	236	42
NLD	15	13	27	18	29	0	45	12
USA	261	479	114	165	237	45	0	50
CHE	26	31	45	29	40	9	51	0

JER

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0	159	93	35	35	155	265	18	25
CAN	165	0	105	37	37	79	477	15	30
DFS	70	93	0	32	47	97	173	23	44
GBR	40	43	30	0	12	35	40	4	3
ITA	35	35	46	13	0	33	47	10	23
NZL	157	80	76	39	30	0	160	18	27
USA	261	479	141	43	50	166	0	39	46
NLD	14	10	17	5	7	15	39	0	8
CHE	23	29	43	4	24	25	47	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	159	90	107	155	265	18	25	35
CAN	165	0	100	142	79	474	15	30	37
DFS	68	92	0	102	89	165	23	44	46
GBR	105	146	103	0	74	182	18	42	43
NZL	157	80	70	76	0	159	18	27	33
USA	261	477	135	189	165	0	39	46	46
NLD	14	10	17	15	15	39	0	8	10
CHE	23	29	43	41	25	47	6	0	23
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	215	15	19
CAN	129	0	106	142	37	477	15	30
DFS	53	94	0	110	47	173	23	44
GBR	81	146	106	0	43	182	18	42
ITA	31	35	46	41	0	47	10	23
USA	205	479	141	189	50	0	39	46
NLD	11	10	17	15	7	39	0	8
CHE	17	29	43	41	24	47	6	0

JER

JER

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   27   13   55   12   18   25   16   10   5   18
CAN  27   0   11  150   77   5   35  157   4   0   10
DEU  13  11   0   59   4   12  11   4   14   0   30
DFS  43 151   0   50   61  89   60  84   36   0  128
GBR  10  76   4   56   0   0   28   64   1   0   3
NOR  14   5  11   69   0   0   6   0   27   0  12
NZL  24  33  11   58  25   5   0  25   3   2   7
USA  16 151   4   81   60   0  24   0   2   0   4
NLD  10   4  13   35   1  26   3   2   0   0  12
CAM   5   0   0   0   0   0   2   0   0   0   0
LVA  17  10  24   90   3  10   7   4  11   0   0
-----

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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   27   13   55   12  25  16  10   5  11  17
CAN  27   0   11  150   77  35 157   4   0   3  10
DEU  13  11   0   59   4  11   4  14   0   6  28
DFS  43 151   0   50   61  58  84  34   0  56 109
GBR  10  76   4   56   0  28  64   1   0   0   3
NZL  24  33  11   56  25   0  25   3   2   3   6
USA  16 151   4   81   60  24   0   2   0   0   4
NLD  10   4  13   33   1   3   2   0   0  17  11
CAM   5   0   0   0   0   2   0   0   0   0   0
NOR  10   2   5  43   0   3   0  16   0   0   2
LVA  16  10  22   75   3   6   4  10   0   1   0
-----

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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   27   13   55   12  11  25  16  10   5  18
CAN  27   0   11  150   77   2  35 155   4   0  10
DEU  13  11   0   59   4   7  11   4  14   0  30
DFS  43 151   0   50   61  65  58  84  34   0 128
GBR  10  76   4   56   0   0  28  63   1   0   3
NOR  10   2   6  49   0   0   3   0  22   0   3
NZL  24  33  11   56  25   3   0  25   3   2   7
USA  16 150   4   81  59   0  24   0   2   0   4
NLD  10   4  13   33   1  21   3   2   0   0  12
CAM   5   0   0   0   0   0   2   0   0   0   0
LVA  17  10  24   90   3   2   7   4  11   0   0
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RDC
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  USA  NLD  CAM  NOR  LVA
-----
AUS   0   27   3   55  12  16  10   5  12  18
CAN  27   0   0  150  77 157   4   0   4  10
DEU   3   0   0  19   0   0   2   0   3   2
DFS  43 151  17   0  61  84  33   0  66 128
GBR  10  76   0   56   0  64   1   0   0   3
USA  16 151   0   81  60   0   2   0   0   4
NLD  10   4   2  32   1   2   0   0  17  11
CAM   5   0   0   0   0   0   0   0   0   0
NOR  11   3   3  54   0   0  16   0   0   4
LVA  17  10   1  90   3   4  10   0   3   0
-----

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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	27	13	55	12	20	25	16	10	5	18
CAN	27	0	11	150	77	5	35	157	4	0	10
DEU	13	11	0	59	4	12	11	4	14	0	30
DFS	43	151	50	0	61	99	57	84	35	0	128
GBR	10	76	4	56	0	0	28	64	1	0	3
NOR	16	5	11	77	0	0	7	0	27	0	13
NZL	24	33	11	53	25	6	0	25	3	2	7
USA	16	151	4	81	60	0	24	0	2	0	4
NLD	10	4	13	34	1	26	3	2	0	0	12
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	17	10	24	90	3	11	7	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	27	13	55	12	25	16	10	5	11	18
CAN	27	0	11	150	77	35	157	4	0	2	10
DEU	13	11	0	59	4	11	4	14	0	6	30
DFS	43	151	50	0	61	58	84	35	0	53	128
GBR	10	76	4	56	0	28	64	1	0	0	3
NZL	24	33	11	56	25	0	25	3	2	3	7
USA	16	151	4	81	60	24	0	2	0	0	4
NLD	10	4	13	34	1	3	2	0	0	17	12
CAM	5	0	0	0	0	2	0	0	0	0	0
NOR	10	2	5	40	0	3	0	16	0	0	2
LVA	17	10	24	90	3	7	4	11	0	1	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	27	13	55	12	20	25	16	10	5	18
CAN	27	0	11	150	77	5	35	157	4	0	10
DEU	13	11	0	59	4	12	11	4	14	0	30
DFS	43	151	50	0	61	102	60	84	36	0	128
GBR	10	76	4	56	0	0	28	64	1	0	3
NOR	16	5	11	79	0	0	7	0	27	0	13
NZL	24	33	11	58	25	6	0	25	3	2	7
USA	16	151	4	81	60	0	24	0	2	0	4
NLD	10	4	13	35	1	26	3	2	0	0	12
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	17	10	24	90	3	11	7	4	11	0	0

RDC

common bulls below diagonal
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM	LVA
AUS	0	27	13	55	20	10	16	5	17
CAN	27	0	11	149	5	4	157	0	10
DEU	13	11	0	59	12	14	4	0	28
DFS	43	150	50	0	99	33	84	0	109
NOR	16	5	11	77	0	27	0	0	11
NLD	10	4	13	32	26	0	2	0	11
USA	16	151	4	81	0	2	0	0	4
CAM	5	0	0	0	0	0	0	0	0
LVA	16	10	22	75	9	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	27	10	55	12	20	16	10	5	18
CAN	27	0	9	150	77	5	157	4	0	10
DEU	10	9	0	50	4	11	4	14	0	17
DFS	43	151	44	0	61	99	84	34	0	128
GBR	10	76	4	56	0	0	64	1	0	3
NOR	16	5	10	77	0	0	0	27	0	13
USA	16	151	4	81	60	0	0	2	0	4
NLD	10	4	13	33	1	26	2	0	0	12
CAM	5	0	0	0	0	0	0	0	0	0
LVA	17	10	14	90	3	11	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	27	13	55	12	20	25	16	10	5	18
CAN	27	0	11	150	77	5	35	157	4	0	10
DEU	13	11	0	59	4	12	11	4	14	0	30
DFS	43	151	50	0	61	102	60	84	34	0	128
GBR	10	76	4	56	0	0	28	64	1	0	3
NOR	16	5	11	79	0	0	7	0	26	0	13
NZL	24	33	11	58	25	6	0	25	3	2	7
USA	16	151	4	81	60	0	24	0	2	0	4
NLD	10	4	13	33	1	25	3	2	0	0	12
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	17	10	24	90	3	11	7	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	27	13	55	12	20	25	16	10	5	18
CAN	27	0	11	150	77	5	35	157	4	0	10
DEU	13	11	0	59	4	12	11	4	14	0	30
DFS	43	151	50	0	61	99	58	84	34	0	122
GBR	10	76	4	56	0	0	28	64	1	0	3
NOR	16	5	11	77	0	0	7	0	26	0	13
NZL	24	33	11	55	25	6	0	25	3	2	7
USA	16	151	4	81	60	0	24	0	2	0	4
NLD	10	4	13	33	1	25	3	2	0	0	12
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	17	10	24	86	3	11	7	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	27	13	55	12	20	25	16	10	5	18
CAN	27	0	11	150	77	5	35	157	4	0	10
DEU	13	11	0	59	4	13	11	4	14	0	30
DFS	43	151	50	0	61	94	60	84	36	0	128
GBR	10	76	4	56	0	0	28	64	1	0	3
NOR	16	5	12	74	0	0	7	0	26	0	13
NZL	24	33	11	58	25	6	0	25	3	2	7
USA	16	151	4	81	60	0	24	0	2	0	4
NLD	10	4	13	35	1	25	3	2	0	0	12

CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	17	10	24	90	3	11	7	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	27	13	55	12	20	16	11	5	18
CAN	27	0	11	150	77	5	154	4	0	10
DEU	13	11	0	59	4	12	4	14	0	30
DFS	43	151	50	0	61	102	84	42	0	128
GBR	10	76	4	56	0	0	64	1	0	3
NOR	16	5	11	79	0	0	0	33	0	13
USA	16	150	4	81	60	0	0	2	0	4
NLD	11	4	13	41	1	32	2	0	0	14
CAM	5	0	0	0	0	0	0	0	0	0
LVA	17	10	24	90	3	11	4	13	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	27	13	55	12	20	25	16	11	5	17
CAN	27	0	11	150	77	5	35	157	4	0	10
DEU	13	11	0	59	4	13	11	4	14	0	28
DFS	43	151	50	0	61	101	58	84	41	0	109
GBR	10	76	4	56	0	0	28	64	1	0	3
NOR	16	5	12	79	0	0	7	0	33	0	12
NZL	24	33	11	56	25	6	0	25	3	2	6
USA	16	151	4	81	60	0	24	0	2	0	4
NLD	11	4	13	40	1	32	3	2	0	0	13
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	16	10	22	75	3	10	6	4	12	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	27	13	55	12	20	16	10	5	18	5
CAN	27	0	11	150	77	5	155	4	0	10	3
DEU	13	11	0	59	4	12	4	14	0	30	4
DFS	43	151	50	0	61	96	84	36	0	128	9
GBR	10	76	4	56	0	0	63	1	0	3	4
NOR	16	5	11	74	0	0	0	26	0	13	1
USA	16	150	4	81	59	0	0	2	0	4	3
NLD	10	4	13	35	1	25	2	0	0	12	1
CAM	5	0	0	0	0	0	0	0	0	0	0
LVA	17	10	24	90	3	11	4	11	0	0	1
NZL	5	3	4	9	4	1	3	1	0	1	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	27	13	50	20	25	11	16	5	18
CAN	27	0	11	144	5	35	4	157	0	10
DEU	13	11	0	56	13	11	14	4	0	30
DFS	40	144	50	0	93	53	39	79	0	111
NOR	16	5	12	74	0	7	33	0	0	13
NZL	24	33	11	52	6	0	2	25	2	7
NLD	11	4	13	38	32	2	0	2	0	13

USA	16	151	4	77	0	24	2	0	0	4
CAM	5	0	0	0	0	2	0	0	0	0
LVA	17	10	24	78	11	7	12	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	27	13	55	11	22	25	16	10	5
CAN	27	0	11	150	74	7	35	157	4	0
DEU	13	11	0	59	4	15	11	4	14	0
DFS	43	151	50	0	61	121	60	84	36	0
GBR	9	73	4	56	0	0	25	62	1	0
NOR	18	6	14	99	0	0	9	0	28	0
NZL	24	33	11	58	22	8	0	25	3	2
USA	16	151	4	81	58	0	24	0	2	0
NLD	10	4	13	35	1	27	3	2	0	0
CAM	5	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	27	13	55	11	20	25	16	10	5
CAN	27	0	11	150	74	5	35	154	4	0
DEU	13	11	0	59	4	12	11	4	14	0
DFS	43	151	50	0	61	102	60	84	36	0
GBR	9	73	4	56	0	0	25	62	1	0
NOR	16	5	11	79	0	0	7	0	26	0
NZL	24	33	11	58	22	6	0	25	3	2
USA	16	150	4	81	58	0	24	0	2	0
NLD	10	4	13	35	1	25	3	2	0	0
CAM	5	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	27	13	55	11	20	16	10	5
CAN	27	0	11	150	74	5	157	4	0
DEU	13	11	0	59	4	12	4	14	0
DFS	43	151	50	0	61	102	84	36	0
GBR	9	73	4	56	0	0	62	1	0
NOR	16	5	11	79	0	0	0	27	0
USA	16	151	4	81	58	0	0	2	0
NLD	10	4	13	35	1	26	2	0	0
CAM	5	0	0	0	0	0	0	0	0

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