

## Introduction

The latest routine international evaluation for conformation traits took place as scheduled at the Interbull Centre. Data from twenty four (24) countries were included in this evaluation.

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

The WHFF trait definitions are available on this link [http://www.interbull.org/ib/conf\\_trait\\_hol\\_jer](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:

NOR (RDC) Base changed to a rolling cow base, based on cows born 3 to 8 years ago. Std is based on bulls born 5 to 12 years ago, but the limits will be updated only every second year.

JPN (HOL) Small changes in information due to additional records and pedigree changes.

IRL (HOL) The code for assigning Proof Type/Status of Bull/Publishable was rewritten, as it was based on a very old code and lots of recent AI bulls were not getting any values for these.

CHE (JER) Introduced a change of herd-year-season assignment for certain data records, which is causing a very small change in EDC for certain bulls.

CHE (BSW) Based on manual data edits and the removal of data errors, the number of herds and the number of daughters for very few bulls decreased.

BEL (HOL) Definition of genetic groups were updated/improved. Genetic groups are always based on selection path, type of breed, degree of Holsteinisation, origin (North-America vs Europe) and time. Periods of time were updated and improved.

USA (HOL) Parrentage corrections resulting in small drop in information.

DEA (BSW) Change in base definition.

SVN (HOL,BSW) Changes in data base related to the pedigree completeness and improvement of phenotypic data resulting in small drop in information.

ESP (HOL) Updating the database used for extracting the data resulting in drop in information higher than usually.

HUN (HOL) Correction of reliabilities for LOC.

USA (GUE) BDE- fixed the bud that was causing drop in reliabilities.

FRA (BSW) cChange in trait definition for CWI and RWI.  
- For CWI was actually Â« chest depth Â» and now has changed into Â« chest width Â» (breadth)  
- For RWI was actually Â« hip width Â» and now has changed into Â« ischium width Â».

The changes caused change in heritability and dropping in information due to the fact that these two traits have been recorded for lesser time than the original two.

## INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

### Subsetting:

As decided by the ITC in Orlando, new subsetting was introduced in the september test run. Sub-setting is necessary for operational purposes and restrictions of time scales. To minimize the effect of subsetting, larger subsets with 10-12 countries and with 4 link providing countries have been applied.

### Window:

According to the decision taken by ITC in Orlando, the following changes have been introduced in regards to the windows used for post processing:

The upper bounds have been set to 0.99 as these were judged to have very little effect on evaluations. The lower values have been set to about the 25% percentile value. The largest changes are for the lower values for conformation traits, with the lowest window being 40% for OFL otherwise it is about 50% for all other confirmation traits. It is anticipated that these low values may not have large impact on evaluations since there were very few countries combinations whose estimated correlations fell between the old limit of 0.30 and these new limits.

#### DATA AND METHOD OF ANALYSIS

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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

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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

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

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

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PUBLICATION OF INTERBULL TEST RUN  
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Test evaluation results are meant for review purposes only and should not be published.

^LTable 1. National evaluation data considered in the Interbull evaluation for conformation traits (December Routine Evaluation 2019).  
Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		45	3745	714	232	
BEL			1518			
CAN	207	100	11548	713	846	
CHE	2693		3213	40		
CZE			3984			
DEA	3439					
DEU			21204		277	
DFS			11853	1960	6169	
ESP			3799			
EST			715			
FRA	350		16731			
FRM						
GBR	19	216	5832	428	309	
HUN			2604			
IRL			1632			
ISR						
ITA	2050		8976	101		
JPN			5598			
KOR			1259			
LTU						
LVA						
NLD	122		14595	43	50	
NOR					2360	
NZL			6184	3865	576	
POL			8464			
PRT			2088			
SVK						
SVN	301		504			
URY						
USA	838	690	32239	4078	253	
ZAF			837	536		
HRV						
MEX						
CAM					31	
=====						
No. Records	10019	1051	169122	12478	11103	
Pub. Proofs	8076	899	137120	10913	11834	0
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^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal  
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BSW     sta

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.82								
CHE	0.95	12.36							
FRA	0.98	0.96	0.92						
ITA	0.96	0.95	0.95	14.69					
NLD	0.95	0.95	0.96	0.92	4.55				
USA	0.98	0.95	0.97	0.95	0.94	1.60			
DEA	0.97	0.98	0.97	0.96	0.96	0.96	11.31		
SVN	0.92	0.90	0.91	0.93	0.91	0.90	0.93	16.26	
GBR	0.96	0.93	0.96	0.94	0.93	0.96	0.91	0.89	0.72

BSW cwi

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.79								
CHE	0.89	10.25							
FRA	0.85	0.85	0.95						
ITA	0.81	0.85	0.86	22.08					
NLD	0.89	0.80	0.82	0.72	4.29				
USA	0.90	0.90	0.88	0.85	0.81	0.86			
DEA	0.86	0.82	0.72	0.74	0.80	0.77	11.48		
SVN	0.86	0.85	0.81	0.86	0.74	0.84	0.87	22.59	
GBR	0.91	0.84	0.82	0.72	0.89	0.81	0.76	0.81	1.30

BSW bde

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	6.54								
CHE	0.86	10.27							
FRA	0.74	0.88	0.90						
ITA	0.78	0.91	0.91	18.16					
NLD	0.83	0.84	0.86	0.85	4.13				
DEA	0.84	0.90	0.92	0.90	0.84	11.27			
SVN	0.79	0.77	0.77	0.85	0.79	0.75	25.33		
GBR	0.87	0.88	0.82	0.85	0.90	0.86	0.86	1.30	
USA	0.73	0.76	0.86	0.78	0.86	0.78	0.79	0.87	0.79

BSW ang

	CAN	CHE	FRA	NLD	USA	GBR
CAN	8.48					
CHE	0.70	10.96				
FRA	0.88	0.67	0.88			
NLD	0.76	0.66	0.67	3.88		
USA	0.88	0.69	0.77	0.70	1.22	
GBR	0.89	0.77	0.80	0.79	0.90	0.68

BSW ran

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.86								
CHE	0.94	10.63							
FRA	0.97	0.96	0.94						
ITA	0.94	0.93	0.94	23.19					
NLD	0.95	0.92	0.95	0.93	4.39				
USA	0.97	0.94	0.97	0.92	0.95	1.11			
DEA	0.96	0.94	0.95	0.94	0.91	0.97	11.97		
SVN	0.92	0.91	0.92	0.91	0.92	0.92	0.91	20.77	
GBR	0.96	0.94	0.97	0.94	0.97	0.96	0.92	0.92	1.75

BSW	rwi								
	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	7.26								
CHE	0.89	10.14							
FRA	0.96	0.86	0.95						
NLD	0.92	0.86	0.93	3.85					
USA	0.91	0.83	0.87	0.81	0.75				
DEA	0.93	0.89	0.93	0.81	0.88	13.32			
GBR	0.93	0.86	0.93	0.88	0.93	0.84	1.15		
SVN	0.91	0.84	0.94	0.87	0.84	0.90	0.87	26.68	
ITA	0.88	0.80	0.89	0.81	0.85	0.86	0.89	0.83	20.46

BSW	rls								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.25								
CHE	0.92	12.94							
FRA	0.91	0.91	1.03						
ITA	0.91	0.85	0.93	23.89					
NLD	0.88	0.82	0.88	0.85	5.01				
USA	0.95	0.93	0.90	0.86	0.86	0.74			
DEA	0.93	0.92	0.93	0.89	0.81	0.92	12.34		
SVN	0.87	0.83	0.88	0.86	0.83	0.88	0.89	21.99	
GBR	0.85	0.89	0.91	0.83	0.87	0.84	0.89	0.83	1.00

BSW	fan								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.67								
CHE	0.70	13.76							
FRA	0.75	0.72	1.09						
ITA	0.71	0.85	0.80	22.37					
NLD	0.74	0.68	0.82	0.70	5.39				
USA	0.79	0.70	0.84	0.85	0.81	0.71			
DEA	0.66	0.91	0.67	0.89	0.66	0.65	11.72		
SVN	0.70	0.84	0.70	0.85	0.67	0.70	0.94	24.32	
GBR	0.81	0.71	0.90	0.73	0.88	0.83	0.70	0.69	0.93

BSW	hde								
	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA	
CAN	8.78								
CHE	0.88	12.62							
FRA	0.81	0.80	1.16						
ITA	0.79	0.83	0.85	22.84					
NLD	0.77	0.73	0.84	0.74	5.39				
DEA	0.78	0.86	0.83	0.91	0.77	12.30			
SVN	0.77	0.76	0.83	0.89	0.75	0.89	30.18		
USA	0.84	0.74	0.86	0.89	0.82	0.77	0.82	0.71	

BSW	fua								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.13								
CHE	0.86	11.80							
FRA	0.89	0.86	0.90						
ITA	0.90	0.83	0.84	21.16					
NLD	0.91	0.84	0.90	0.84	4.72				
USA	0.94	0.85	0.85	0.91	0.87	1.29			
DEA	0.86	0.85	0.94	0.83	0.83	0.85	11.28		
SVN	0.80	0.75	0.84	0.86	0.79	0.79	0.89	21.44	

GBR 0.93 0.85 0.88 0.89 0.91 0.92 0.77 0.72 1.36

BSW ruh

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.72								
CHE	0.91	11.65							
FRA	0.87	0.83	0.94						
ITA	0.78	0.86	0.85	13.12					
NLD	0.79	0.85	0.87	0.87	4.51				
USA	0.86	0.85	0.88	0.88	0.86	1.17			
DEA	0.83	0.86	0.89	0.93	0.92	0.87	11.88		
SVN	0.82	0.83	0.80	0.85	0.89	0.82	0.90	19.17	
GBR	0.77	0.82	0.86	0.85	0.87	0.91	0.79	0.78	1.24

BSW ruw

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	8.29							
CHE	0.91	11.68						
FRA	0.87	0.86	0.85					
ITA	0.81	0.88	0.79	13.49				
NLD	0.71	0.66	0.79	0.70	4.51			
USA	0.86	0.89	0.85	0.90	0.78	1.04		
DEA	0.85	0.91	0.76	0.95	0.56	0.91	12.37	
SVN	0.82	0.80	0.73	0.83	0.69	0.79	0.82	17.74

BSW usu

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.68								
CHE	0.91	11.96							
FRA	0.84	0.91	0.91						
ITA	0.90	0.89	0.88	18.83					
NLD	0.83	0.83	0.90	0.82	4.35				
USA	0.84	0.89	0.87	0.86	0.89	1.08			
DEA	0.92	0.92	0.88	0.94	0.78	0.81	11.58		
SVN	0.84	0.82	0.72	0.83	0.68	0.72	0.83	23.56	
GBR	0.83	0.80	0.87	0.88	0.91	0.93	0.76	0.69	2.44

BSW ude

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.74								
CHE	0.95	11.98							
FRA	0.95	0.95	0.98						
ITA	0.94	0.97	0.95	21.21					
NLD	0.96	0.95	0.95	0.94	4.23				
USA	0.96	0.95	0.96	0.95	0.95	1.22			
DEA	0.93	0.98	0.92	0.97	0.94	0.92	12.06		
SVN	0.93	0.95	0.91	0.97	0.94	0.92	0.95	21.24	
GBR	0.96	0.94	0.96	0.94	0.97	0.96	0.92	0.91	1.93

BSW ftp

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	7.28								
CHE	0.97	13.99							
FRA	0.97	0.95	0.94						
NLD	0.96	0.95	0.95	4.66					
USA	0.92	0.90	0.88	0.91	1.18				

DEA	0.96	0.99	0.95	0.95	0.89	11.09			
SVN	0.94	0.93	0.92	0.92	0.90	0.92	17.94		
GBR	0.96	0.93	0.90	0.94	0.95	0.89	0.93	1.22	
ITA	0.87	0.85	0.85	0.86	0.88	0.85	0.86	0.88	22.86

BSW ftl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.34								
CHE	0.91	14.70							
FRA	0.94	0.95	0.96						
ITA	0.92	0.94	0.95	18.73					
NLD	0.92	0.96	0.92	0.92	5.01				
USA	0.93	0.96	0.95	0.94	0.96	1.37			
DEA	0.90	0.97	0.98	0.96	0.94	0.96	11.14		
SVN	0.91	0.93	0.90	0.93	0.95	0.91	0.92	17.88	
GBR	0.95	0.94	0.93	0.95	0.97	0.96	0.92	0.93	1.30

BSW rtp

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	7.02							
CHE	0.97	14.58						
FRA	0.96	0.97	0.93					
ITA	0.92	0.95	0.93	21.49				
NLD	0.97	0.96	0.97	0.93	4.47			
DEA	0.96	0.99	0.97	0.96	0.95	12.16		
SVN	0.94	0.93	0.92	0.94	0.94	0.92	17.52	
USA	0.93	0.90	0.92	0.91	0.94	0.90	0.91	1.18

BSW ocs

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.14								
CHE	0.86	8.98							
FRA	0.80	0.87	0.98						
ITA	0.83	0.83	0.89	9.56					
NLD	0.77	0.79	0.82	0.78	3.74				
USA	0.86	0.78	0.85	0.83	0.83	0.62			
DEA	0.83	0.91	0.90	0.89	0.77	0.76	10.77		
SVN	0.79	0.78	0.78	0.77	0.78	0.79	0.79	21.52	
GBR	0.83	0.89	0.89	0.83	0.88	0.89	0.82	0.79	1.57

BSW ous

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.43								
CHE	0.89	13.42							
FRA	0.88	0.93	0.97						
ITA	0.83	0.90	0.90	10.74					
NLD	0.88	0.87	0.92	0.81	4.45				
USA	0.86	0.89	0.88	0.88	0.87	0.94			
DEA	0.87	0.96	0.90	0.91	0.86	0.89	12.39		
SVN	0.76	0.82	0.76	0.82	0.77	0.82	0.91	20.35	
GBR	0.83	0.85	0.76	0.82	0.78	0.88	0.79	0.76	1.35

BSW ofl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.16								
CHE	0.86	11.36							

FRA	0.67	0.69	1.27						
ITA	0.68	0.72	0.86	16.82					
NLD	0.68	0.68	0.76	0.67	4.66				
USA	0.75	0.68	0.78	0.75	0.68	0.99			
DEA	0.69	0.85	0.70	0.81	0.66	0.65	11.43		
SVN	0.76	0.86	0.67	0.76	0.69	0.74	0.89	27.96	
GBR	0.74	0.77	0.82	0.69	0.75	0.73	0.70	0.68	1.48

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BSW ofr

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.52						
CHE	0.83	12.03					
DEA	0.88	0.90	11.66				
ITA	0.84	0.91	0.95	18.47			
SVN	0.81	0.83	0.79	0.86	22.69		
USA	0.85	0.83	0.91	0.86	0.80	1.60	
FRA	0.82	0.87	0.93	0.91	0.83	0.90	0.90

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BSW tpl

	CAN	CHE	DEA	ITA	SVN	FRA
CAN	7.05					
CHE	0.91	11.80				
DEA	0.92	0.91	11.78			
ITA	0.93	0.92	0.94	24.47		
SVN	0.91	0.90	0.90	0.89	23.21	
FRA	0.97	0.94	0.91	0.91	0.90	1.31

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BSW oru

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.38						
CHE	0.77	16.06					
DEA	0.71	0.87	12.63				
ITA	0.92	0.78	0.76	18.80			
SVN	0.84	0.63	0.65	0.72	27.50		
USA	0.90	0.56	0.47	0.83	0.76	0.75	
FRA	0.91	0.89	0.82	0.90	0.73	0.84	1.09

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BSW rle

	CHE	DEA	ITA	SVN	USA	FRA
CHE	11.81					
DEA	0.96	12.40				
ITA	0.83	0.87	21.32			
SVN	0.82	0.85	0.83	26.94		
USA	0.53	0.51	0.78	0.71	0.75	
FRA	0.93	0.93	0.90	0.84	0.73	1.03

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BSW thp

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.70						
CHE	0.84	11.21					
DEA	0.76	0.86	12.22				
ITA	0.88	0.91	0.82	30.51			
SVN	0.80	0.86	0.85	0.88	36.53		
USA	0.88	0.88	0.70	0.84	0.74	1.11	
FRA	0.89	0.86	0.87	0.85	0.84	0.81	1.02



BSW hoq						
	CAN	CHE	DEA	ITA	SVN	FRA
CAN	6.39					
CHE	0.92	11.87				
DEA	0.92	0.89	12.55			
ITA	0.91	0.82	0.87	19.96		
SVN	0.92	0.84	0.87	0.87	21.22	
FRA	0.90	0.83	0.89	0.88	0.88	1.02

BSW ful					
	CHE	DEA	ITA	SVN	FRA
CHE	11.61				
DEA	0.91	12.44			
ITA	0.91	0.96	12.66		
SVN	0.79	0.87	0.85	20.90	
FRA	0.66	0.80	0.74	0.75	0.97

BSW udb					
	CHE	DEA	ITA	SVN	FRA
CHE	11.39				
DEA	0.97	13.21			
ITA	0.93	0.97	26.56		
SVN	0.82	0.86	0.80	25.31	
FRA	0.91	0.89	0.85	0.80	0.95

BSW tdi					
	CHE	DEA	ITA	SVN	FRA
CHE	15.74				
DEA	0.96	11.42			
ITA	0.94	0.95	21.27		
SVN	0.92	0.92	0.94	17.92	
FRA	0.96	0.96	0.91	0.91	0.93

BSW tth					
	CHE	DEA	ITA	SVN	FRA
CHE	14.37				
DEA	0.97	13.02			
ITA	0.93	0.93	23.25		
SVN	0.88	0.91	0.88	19.92	
FRA	0.93	0.91	0.95	0.88	0.88

GUE sta				
	CAN	GBR	USA	AUS
CAN	6.30			
GBR	0.97	1.08		
USA	0.98	0.96	2.43	
AUS	0.90	0.93	0.90	0.84

GUE cwi				
	CAN	GBR	USA	AUS
CAN	7.07			
GBR	0.92	1.60		

USA	0.88	0.86	1.31	
AUS	0.72	0.80	0.67	0.38

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GUE     bde  
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	CAN	GBR	USA	AUS
CAN	6.19			
GBR	0.87	1.31		
USA	0.76	0.90	1.42	
AUS	0.84	0.83	0.75	0.41

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GUE     ang  
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	CAN	GBR	USA	AUS
CAN	7.93			
GBR	0.87	1.39		
USA	0.87	0.91	1.78	
AUS	0.66	0.77	0.68	0.40

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GUE     ran  
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	CAN	GBR	USA	AUS
CAN	6.58			
GBR	0.97	1.61		
USA	0.97	0.97	1.68	
AUS	0.93	0.96	0.92	0.77

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GUE     rwi  
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	CAN	GBR	USA	AUS
CAN	6.74			
GBR	0.93	1.43		
USA	0.92	0.92	1.36	
AUS	0.88	0.86	0.81	0.63

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GUE     rls  
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	CAN	GBR	USA	AUS
CAN	7.98			
GBR	0.82	1.78		
USA	0.93	0.80	1.00	
AUS	0.78	0.86	0.76	0.35

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GUE     rlr  
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	CAN	USA	AUS
CAN	7.10		
USA	0.85	0.70	
AUS	0.70	0.59	0.47

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GUE     fan  
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	CAN	GBR	USA	AUS
CAN	7.84			
GBR	0.79	1.59		
USA	0.84	0.76	0.81	
AUS	0.68	0.79	0.70	0.36

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GUE fua				
	CAN	GBR	USA	AUS
CAN	7.18			
GBR	0.94	1.50		
USA	0.92	0.91	1.65	
AUS	0.84	0.82	0.78	0.49

GUE ruh				
	CAN	GBR	USA	AUS
CAN	7.00			
GBR	0.76	1.73		
USA	0.81	0.90	1.52	
AUS	0.80	0.79	0.77	0.43

GUE usu				
	CAN	GBR	USA	AUS
CAN	7.23			
GBR	0.80	1.52		
USA	0.80	0.86	1.15	
AUS	0.84	0.79	0.78	0.37

GUE ude				
	CAN	GBR	USA	AUS
CAN	6.17			
GBR	0.97	1.56		
USA	0.95	0.94	1.60	
AUS	0.95	0.95	0.93	0.54

GUE ftp				
	CAN	GBR	USA	AUS
CAN	5.61			
GBR	0.96	1.22		
USA	0.92	0.91	1.35	
AUS	0.94	0.93	0.88	0.43

GUE ftl				
	CAN	GBR	USA	AUS
CAN	4.69			
GBR	0.94	1.76		
USA	0.94	0.97	1.47	
AUS	0.95	0.96	0.95	0.82

GUE rtp				
	CAN	AUS	USA	
CAN	5.63			
AUS	0.95	0.53		
USA	0.94	0.93	1.35	

GUE ocs				
	CAN	GBR	USA	AUS
CAN	8.20			



HUN	0.65	0.82	0.85	0.83	0.84	0.83	0.83	0.89	0.77	0.81	0.81	0.88	1.09										
POL	0.65	0.88	0.87	0.83	0.85	0.85	0.87	0.85	0.83	0.77	0.84	0.82	0.83	12.31									
NZL	0.79	0.66	0.70	0.66	0.70	0.69	0.69	0.65	0.79	0.65	0.66	0.66	0.65	0.65	0.37								
ZAF	0.66	0.89	0.85	0.87	0.85	0.86	0.87	0.88	0.90	0.78	0.86	0.87	0.84	0.83	0.70	0.84							
JPN	0.65	0.82	0.77	0.83	0.71	0.71	0.80	0.91	0.66	0.91	0.73	0.90	0.83	0.75	0.64	0.76	1.50						
CZE	0.70	0.90	0.92	0.84	0.91	0.91	0.91	0.84	0.88	0.76	0.88	0.84	0.86	0.89	0.69	0.87	0.77	15.02					
EST	0.71	0.78	0.82	0.74	0.71	0.83	0.81	0.71	0.77	0.65	0.79	0.66	0.66	0.74	0.66	0.72	0.66	0.77	14.95				
IRL	0.77	0.78	0.83	0.80	0.87	0.81	0.75	0.78	0.94	0.68	0.84	0.75	0.74	0.76	0.83	0.85	0.65	0.83	0.71	1.38			
KOR	0.65	0.73	0.65	0.65	0.70	0.72	0.70	0.70	0.65	0.65	0.65	0.70	0.70	0.64	0.68	0.66	0.70	0.75	0.64	0.66	2.61		
SVN	0.67	0.75	0.82	0.80	0.83	0.83	0.83	0.76	0.80	0.71	0.81	0.81	0.81	0.79	0.66	0.84	0.68	0.79	0.70	0.75	0.66	20.87	
PRT	0.65	0.83	0.81	0.78	0.85	0.82	0.81	0.83	0.79	0.74	0.84	0.83	0.84	0.83	0.65	0.78	0.75	0.84	0.66	0.74	0.69	0.74	2.10

HOL bde

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN
AUS	0.53																						
BEL	0.70	1.37																					
CAN	0.88	0.77	5.68																				
CHE	0.74	0.91	0.86	11.18																			
DEU	0.80	0.90	0.88	0.90	11.67																		
DFS	0.84	0.85	0.92	0.86	0.93	11.58																	
ESP	0.79	0.90	0.89	0.92	0.91	0.89	0.99																
FRA	0.70	0.92	0.70	0.88	0.82	0.73	0.84	1.07															
GBR	0.82	0.91	0.87	0.91	0.92	0.90	0.92	0.82	1.17														
ITA	0.70	0.87	0.71	0.85	0.85	0.76	0.87	0.89	0.87	1.23													
NLD	0.72	0.88	0.83	0.92	0.91	0.84	0.90	0.86	0.92	0.88	4.69												
USA	0.70	0.91	0.74	0.90	0.88	0.80	0.90	0.92	0.88	0.92	0.90	1.16											
HUN	0.70	0.91	0.79	0.87	0.89	0.85	0.90	0.85	0.88	0.85	0.84	0.90	1.05										
POL	0.80	0.81	0.85	0.81	0.91	0.89	0.86	0.70	0.86	0.78	0.82	0.80	0.86	12.29									
NZL	0.79	0.70	0.70	0.70	0.70	0.70	0.70	0.69	0.70	0.69	0.69	0.69	0.70	0.71	0.37								
ZAF	0.79	0.87	0.84	0.84	0.88	0.87	0.89	0.75	0.93	0.79	0.83	0.85	0.85	0.88	0.71	0.87							
JPN	0.70	0.93	0.73	0.90	0.88	0.80	0.89	0.95	0.85	0.90	0.90	0.94	0.88	0.77	0.69	0.79	1.42						
CZE	0.85	0.83	0.93	0.83	0.94	0.92	0.88	0.70	0.89	0.75	0.83	0.79	0.87	0.92	0.70	0.88	0.78	15.89					
EST	0.77	0.84	0.88	0.85	0.88	0.88	0.88	0.78	0.86	0.77	0.84	0.84	0.85	0.86	0.68	0.81	0.82	0.86	14.09				
IRL	0.83	0.86	0.85	0.88	0.90	0.89	0.89	0.77	0.95	0.84	0.87	0.84	0.83	0.84	0.72	0.89	0.80	0.87	0.80	1.18			
KOR	0.70	0.80	0.70	0.79	0.82	0.82	0.78	0.75	0.74	0.70	0.71	0.73	0.80	0.72	0.69	0.74	0.80	0.78	0.71	0.72	3.35		
PRT	0.79	0.81	0.79	0.78	0.89	0.86	0.83	0.70	0.85	0.77	0.78	0.80	0.84	0.87	0.70	0.83	0.79	0.87	0.78	0.85	0.71	2.01	
SVN	0.79	0.88	0.84	0.89	0.90	0.86	0.92	0.83	0.89	0.84	0.91	0.86	0.86	0.83	0.71	0.80	0.87	0.84	0.84	0.84	0.76	0.77	20.25

HOL ang

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	
AUS	0.44																						
BEL	0.60	1.06																					
CAN	0.66	0.76	6.39																				
CHE	0.60	0.77	0.88	11.53																			
DEU	0.65	0.73	0.84	0.77	12.57																		
DFS	0.69	0.85	0.89	0.81	0.85	10.55																	
ESP	0.66	0.76	0.88	0.78	0.73	0.84	0.73																
FRA	0.64	0.83	0.88	0.87	0.80	0.88	0.83	0.95															
GBR	0.79	0.75	0.90	0.80	0.78	0.87	0.82	0.81	1.19														
ITA	0.68	0.74	0.90	0.77	0.79	0.85	0.85	0.81	0.86	1.31													
NLD	0.74	0.60	0.74	0.69	0.60	0.66	0.76	0.63	0.79	0.73	4.55												
USA	0.69	0.76	0.93	0.81	0.85	0.90	0.85	0.85	0.91	0.86	0.68	1.38											
HUN	0.61	0.71	0.76	0.71	0.84	0.78	0.69	0.81	0.71	0.75	0.60	0.79	1.00										
POL	0.60	0.68	0.71	0.69	0.62	0.72	0.77	0.74	0.66	0.78	0.63	0.69	0.60	6.54									
ZAF	0.66	0.79	0.72	0.67	0.76	0.79	0.70	0.73	0.85	0.77	0.61	0.76	0.76	0.61	0.73								
JPN	0.69	0.80	0.90	0.79	0.80	0.90	0.88	0.85	0.86	0.91	0.74	0.87	0.74	0.76	0.77	1.57							
CZE	0.64	0.77	0.82	0.74	0.75	0.85	0.73	0.77	0.74	0.80	0.60	0.78	0.80	0.63	0.66	0.78	15.18						
EST	0.63	0.76	0.66	0.64	0.70	0.80	0.62	0.67	0.64	0.62	0.61	0.64	0.74	0.64	0.71	0.70	0.76	16.22					
IRL	0.74	0.73	0.88	0.78	0.80	0.83	0.80	0.83	0.93	0.83	0.69	0.89	0.73	0.65	0.81	0.86	0.76	0.62	0.75				
KOR	0.70	0.77	0.78	0.73	0.73	0.74	0.77	0.74	0.78	0.74	0.61	0.76	0.74	0.63	0.78	0.84	0.68	0.67	0.75	2.30			
PRT	0.60	0.69	0.78	0.63	0.75	0.79	0.75	0.73	0.78	0.80	0.60	0.80	0.69	0.65	0.69	0.80	0.70	0.62	0.74	0.77	1.27		
SVN	0.71	0.68	0.75	0.77	0.61	0.65	0.70	0.68	0.72	0.74	0.74	0.70	0.61	0.83	0.63	0.71	0.65	0.67	0.65	0.72	0.64	21.76	















ESP	0.40	0.72	0.82	0.76	0.71	0.82	0.91													
FRA	0.40	0.80	0.69	0.73	0.75	0.65	0.76	1.07												
GBR	0.40	0.74	0.75	0.79	0.74	0.72	0.80	0.84	1.19											
ITA	0.40	0.72	0.71	0.70	0.71	0.64	0.69	0.79	0.69	1.72										
NLD	0.40	0.83	0.68	0.69	0.74	0.65	0.66	0.82	0.76	0.68	5.21									
USA	0.40	0.71	0.81	0.77	0.73	0.66	0.73	0.72	0.73	0.77	0.69	1.53								
HUN	0.46	0.75	0.65	0.65	0.68	0.64	0.65	0.77	0.65	0.75	0.69	0.71	1.13							
POL	0.46	0.72	0.69	0.69	0.70	0.64	0.65	0.68	0.65	0.72	0.65	0.77	0.72	10.84						
JPN	0.40	0.65	0.85	0.77	0.77	0.71	0.69	0.65	0.65	0.71	0.65	0.84	0.65	0.73	0.55					
CZE	0.42	0.75	0.80	0.72	0.79	0.65	0.65	0.69	0.66	0.78	0.65	0.83	0.81	0.86	0.80	17.31				
EST	0.44	0.66	0.65	0.65	0.66	0.65	0.66	0.67	0.65	0.66	0.69	0.66	0.69	0.66	0.67	0.68	14.98			
IRL	0.65	0.70	0.74	0.79	0.68	0.65	0.69	0.67	0.79	0.67	0.63	0.66	0.64	0.61	0.69	0.65	0.45	1.36		
SVN	0.43	0.72	0.67	0.66	0.67	0.66	0.66	0.66	0.66	0.66	0.70	0.85	0.78	0.76	0.78	0.82	0.72	0.61	24.77	
PRT	0.40	0.65	0.65	0.65	0.65	0.65	0.65	0.68	0.65	0.66	0.65	0.65	0.65	0.65	0.65	0.69	0.48	0.66	0.19	

HOL loc

	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CZE	IRL	KOR	SVN	PRT	EST	HUN	
BEL	1.94																		
CAN	0.85	6.78																	
CHE	0.54	0.63	12.43																
DEU	0.64	0.73	0.67	11.71															
DFS	0.87	0.90	0.51	0.66	12.88														
ESP	0.60	0.72	0.70	0.73	0.73	0.96													
FRA	0.78	0.77	0.71	0.82	0.69	0.75	1.07												
GBR	0.64	0.68	0.88	0.80	0.62	0.79	0.85	1.27											
ITA	0.60	0.68	0.65	0.72	0.56	0.74	0.78	0.74	1.96										
NLD	0.84	0.80	0.68	0.83	0.77	0.69	0.81	0.76	0.64	4.76									
USA	0.55	0.71	0.50	0.74	0.63	0.71	0.73	0.67	0.78	0.60	1.53								
CZE	0.51	0.60	0.60	0.66	0.60	0.65	0.65	0.67	0.73	0.50	0.65	20.62							
IRL	0.58	0.57	0.51	0.66	0.52	0.64	0.69	0.72	0.62	0.64	0.56	0.50	1.67						
KOR	0.57	0.73	0.55	0.55	0.63	0.71	0.67	0.59	0.62	0.62	0.59	0.60	0.51	11.20					
SVN	0.66	0.63	0.57	0.62	0.62	0.64	0.72	0.61	0.61	0.60	0.59	0.65	0.53	0.60	29.05				
PRT	0.50	0.50	0.52	0.61	0.50	0.58	0.52	0.60	0.58	0.51	0.50	0.66	0.51	0.57	0.52	2.31			
EST	0.54	0.53	0.53	0.53	0.53	0.53	0.54	0.54	0.53	0.52	0.53	0.54	0.53	0.57	0.69	0.53	14.41		
HUN	0.68	0.69	0.52	0.68	0.71	0.59	0.76	0.68	0.65	0.65	0.62	0.83	0.51	0.68	0.63	0.59	0.63	1.15	

HOL bcs

	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	
BEL	1.02																			
CHE	0.75	11.62																		
DEU	0.75	0.90	13.25																	
DFS	0.76	0.89	0.95	12.18																
FRA	0.75	0.92	0.94	0.95	1.00															
GBR	0.76	0.91	0.90	0.90	0.93	1.19														
ITA	0.75	0.90	0.95	0.95	0.96	0.89	6.64													
NLD	0.75	0.93	0.95	0.96	0.95	0.91	0.93	4.87												
USA	0.77	0.75	0.76	0.78	0.77	0.75	0.76	0.75	1.38											
CZE	0.76	0.86	0.96	0.95	0.92	0.89	0.94	0.93	0.75	14.49										
JPN	0.81	0.92	0.96	0.97	0.96	0.92	0.96	0.95	0.81	0.94	1.82									
IRL	0.75	0.87	0.81	0.85	0.87	0.94	0.82	0.86	0.75	0.78	0.86	1.03								
KOR	0.76	0.76	0.83	0.86	0.86	0.81	0.84	0.79	0.75	0.85	0.87	0.76	2.51							
CAN	0.75	0.92	0.95	0.94	0.94	0.95	0.93	0.95	0.79	0.94	0.97	0.88	0.84	6.09						
PRT	0.75	0.83	0.87	0.86	0.87	0.86	0.83	0.86	0.75	0.83	0.87	0.78	0.82	0.87	1.98					
ESP	0.76	0.88	0.93	0.94	0.95	0.93	0.92	0.92	0.75	0.92	0.95	0.84	0.87	0.95	0.88	1.06				
SVN	0.76	0.84	0.89	0.91	0.85	0.79	0.88	0.92	0.76	0.89	0.88	0.76	0.79	0.85	0.77	0.86	22.34			
EST	0.78	0.84	0.87	0.87	0.85	0.77	0.87	0.89	0.77	0.84	0.88	0.78	0.79	0.82	0.77	0.77	0.87	12.98		
HUN	0.76	0.87	0.94	0.92	0.92	0.88	0.93	0.90	0.75	0.95	0.92	0.77	0.83	0.92	0.83	0.91	0.85	0.81	0.98	

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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
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AUS	0.56									
CAN	0.89	6.56								
DFS	0.90	0.96	11.77							
GBR	0.91	0.96	0.94	1.02						
ITA	0.88	0.94	0.92	0.94	1.19					
NZL	0.90	0.86	0.88	0.92	0.88	0.37				
USA	0.91	0.97	0.95	0.96	0.93	0.89	1.30			
ZAF	0.88	0.87	0.86	0.93	0.87	0.92	0.88	8.88		
NLD	0.88	0.96	0.97	0.94	0.92	0.87	0.93	0.87	5.06	
CHE	0.90	0.95	0.96	0.95	0.92	0.87	0.94	0.88	0.96	11.28

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JER      cwi

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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.32									
CAN	0.76	6.76								
DFS	0.76	0.85	15.60							
GBR	0.83	0.91	0.84	1.56						
ITA	0.67	0.82	0.71	0.73	1.35					
NZL	0.83	0.69	0.69	0.80	0.67	0.37				
USA	0.78	0.91	0.81	0.84	0.88	0.66	0.88			
ZAF	0.72	0.82	0.72	0.85	0.72	0.80	0.79	8.78		
NLD	0.70	0.90	0.90	0.89	0.73	0.68	0.85	0.80	4.29	
CHE	0.69	0.89	0.87	0.83	0.83	0.69	0.88	0.73	0.87	12.11

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JER      bde

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	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0.37									
CAN	0.78	5.64								
DFS	0.84	0.86	13.55							
GBR	0.77	0.86	0.84	1.52						
ITA	0.72	0.73	0.75	0.83	1.40					
NZL	0.79	0.71	0.71	0.72	0.72	0.37				
ZAF	0.84	0.75	0.83	0.82	0.74	0.80	9.01			
NLD	0.73	0.83	0.83	0.90	0.86	0.71	0.79	3.40		
USA	0.70	0.72	0.75	0.78	0.89	0.71	0.73	0.88	0.88	
CHE	0.80	0.87	0.89	0.89	0.83	0.74	0.83	0.90	0.85	13.35

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JER      ang

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	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.37								
CAN	0.66	7.63							
DFS	0.70	0.80	13.24						
GBR	0.79	0.77	0.86	1.08					
ITA	0.68	0.82	0.79	0.85	1.30				
USA	0.73	0.83	0.88	0.85	0.78	0.94			
ZAF	0.62	0.63	0.71	0.81	0.71	0.71	8.88		
NLD	0.75	0.76	0.67	0.78	0.74	0.69	0.65	4.80	
CHE	0.63	0.80	0.71	0.72	0.72	0.73	0.64	0.71	9.95

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JER      ran

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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.40									
CAN	0.91	5.85								
DFS	0.92	0.96	11.44							
GBR	0.96	0.95	0.95	1.19						
ITA	0.91	0.96	0.94	0.93	1.40					
NZL	0.95	0.90	0.90	0.93	0.90	0.30				
USA	0.92	0.95	0.96	0.97	0.93	0.91	1.06			



CAN	0.79	5.53								
DFS	0.82	0.86	12.58							
GBR	0.80	0.94	0.85	1.57						
ITA	0.72	0.87	0.79	0.87	1.49					
NZL	0.83	0.73	0.73	0.81	0.73	0.40				
USA	0.80	0.94	0.87	0.93	0.90	0.73	1.21			
ZAF	0.77	0.91	0.86	0.93	0.83	0.74	0.90	11.89		
NLD	0.79	0.91	0.90	0.92	0.82	0.81	0.87	0.87	4.85	
CHE	0.83	0.92	0.84	0.87	0.82	0.75	0.86	0.88	0.89	11.14

JER ruh

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.39									
CAN	0.77	6.90								
DFS	0.77	0.87	10.91							
GBR	0.84	0.81	0.85	1.13						
ITA	0.76	0.79	0.82	0.86	1.31					
NZL	0.76	0.76	0.79	0.80	0.80	0.40				
USA	0.78	0.84	0.90	0.91	0.83	0.78	1.07			
ZAF	0.86	0.75	0.83	0.90	0.82	0.76	0.88	9.32		
NLD	0.77	0.78	0.92	0.88	0.84	0.80	0.85	0.78	4.47	
CHE	0.81	0.91	0.86	0.84	0.79	0.79	0.84	0.79	0.83	12.35

JER usu

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.43									
CAN	0.81	6.42								
DFS	0.72	0.86	12.98							
GBR	0.84	0.89	0.84	1.65						
ITA	0.70	0.77	0.72	0.79	1.54					
NZL	0.64	0.64	0.64	0.65	0.66	0.39				
USA	0.75	0.85	0.87	0.83	0.79	0.63	0.81			
ZAF	0.79	0.81	0.75	0.82	0.67	0.64	0.80	10.35		
NLD	0.82	0.83	0.88	0.90	0.80	0.65	0.88	0.80	4.99	
CHE	0.77	0.90	0.88	0.80	0.78	0.67	0.84	0.76	0.86	9.65

JER ude

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.40								
CAN	0.95	5.23							
DFS	0.95	0.94	12.09						
GBR	0.95	0.97	0.94	1.52					
ITA	0.94	0.94	0.94	0.93	1.43				
USA	0.94	0.96	0.96	0.94	0.95	1.42			
ZAF	0.91	0.91	0.92	0.94	0.91	0.92	10.66		
NLD	0.95	0.97	0.96	0.96	0.95	0.95	0.93	4.20	
CHE	0.96	0.95	0.94	0.94	0.95	0.94	0.91	0.96	9.33

JER ftp

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.49									
CAN	0.91	6.36								
DFS	0.88	0.95	12.86							
GBR	0.92	0.93	0.91	1.35						
ITA	0.86	0.87	0.86	0.86	1.60					
NZL	0.90	0.93	0.87	0.87	0.86	0.30				
USA	0.88	0.96	0.95	0.93	0.87	0.89	1.08			
ZAF	0.87	0.93	0.91	0.93	0.86	0.90	0.90	10.33		

NLD	0.94	0.97	0.95	0.94	0.85	0.89	0.90	0.91	5.26	
CHE	0.93	0.95	0.92	0.93	0.86	0.88	0.90	0.88	0.96	10.32

JER ftl

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.33								
CAN	0.92	5.79							
DFS	0.92	0.91	14.00						
GBR	0.93	0.92	0.94	1.39					
ITA	0.91	0.90	0.91	0.93	1.64				
USA	0.91	0.92	0.95	0.96	0.93	0.92			
ZAF	0.94	0.90	0.91	0.94	0.91	0.97	11.04		
NLD	0.94	0.93	0.97	0.97	0.92	0.96	0.94	4.56	
CHE	0.93	0.92	0.94	0.96	0.91	0.94	0.93	0.96	11.75

JER rtp

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE
AUS	0.39							
CAN	0.97	6.42						
DFS	0.92	0.95	12.99					
NZL	0.95	0.95	0.92	0.41				
ZAF	0.94	0.94	0.91	0.90	9.60			
NLD	0.94	0.97	0.96	0.93	0.90	4.60		
USA	0.90	0.91	0.93	0.90	0.89	0.94	1.39	
CHE	0.96	0.98	0.96	0.94	0.93	0.97	0.93	11.55

JER ocs

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0.84								
CAN	0.57	6.15							
DFS	0.61	0.76	12.77						
GBR	0.65	0.84	0.84	1.95					
ITA	0.58	0.81	0.78	0.82	0.74				
NZL	0.64	0.59	0.58	0.63	0.59	0.30			
USA	0.64	0.79	0.81	0.87	0.81	0.61	0.91		
NLD	0.60	0.77	0.87	0.88	0.80	0.64	0.84	2.96	
CHE	0.63	0.90	0.79	0.91	0.81	0.63	0.83	0.82	7.93

JER ous

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE
AUS	0.90							
CAN	0.70	6.40						
DFS	0.57	0.84	12.85					
GBR	0.77	0.88	0.72	1.27				
NZL	0.81	0.72	0.62	0.73	0.42			
USA	0.66	0.90	0.80	0.86	0.67	0.65		
NLD	0.64	0.88	0.89	0.79	0.75	0.89	4.36	
CHE	0.72	0.92	0.81	0.87	0.69	0.88	0.92	10.87

JER ofl

	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	6.33							
CAN	0.52	5.97						
DFS	0.42	0.81	13.63					
GBR	0.58	0.72	0.67	1.30				
ITA	0.42	0.73	0.65	0.73	1.10			



USA	0.66	0.83	0.66	0.72	0.76	0.93			
NLD	0.42	0.68	0.66	0.75	0.69	0.68	5.31		
CHE	0.47	0.87	0.72	0.73	0.69	0.74	0.71	10.45	

RDC sta

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.61									
CAN	0.89	6.17								
DEU	0.90	0.97	13.20							
DFS	0.88	0.97	0.97	8.63						
GBR	0.92	0.96	0.96	0.93	1.16					
NOR	0.92	0.94	0.96	0.98	0.93	13.35				
NZL	0.90	0.91	0.87	0.91	0.93	0.93	0.49			
USA	0.90	0.97	0.95	0.94	0.97	0.92	0.89	2.11		
NLD	0.87	0.95	0.97	0.97	0.93	0.96	0.85	0.93	4.80	
CAM	0.93	0.92	0.92	0.92	0.93	0.93	0.92	0.92	0.92	5.47

RDC cwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR
AUS	0.42									
CAN	0.74	7.17								
DEU	0.71	0.87	11.74							
DFS	0.79	0.83	0.89	12.79						
GBR	0.81	0.87	0.90	0.86	1.48					
NZL	0.81	0.69	0.72	0.69	0.82	0.35				
USA	0.69	0.86	0.82	0.82	0.84	0.71	1.14			
NLD	0.70	0.91	0.92	0.88	0.91	0.67	0.83	4.67		
CAM	0.81	0.81	0.81	0.82	0.82	0.83	0.82	0.82	6.96	
NOR	0.84	0.82	0.80	0.84	0.83	0.83	0.83	0.86	0.82	15.06

RDC bde

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.44									
CAN	0.84	6.10								
DEU	0.80	0.88	9.70							
DFS	0.84	0.84	0.92	11.78						
GBR	0.82	0.85	0.91	0.88	1.34					
NOR	0.83	0.83	0.80	0.89	0.83	14.71				
NZL	0.80	0.71	0.73	0.76	0.75	0.82	0.35			
USA	0.72	0.76	0.88	0.83	0.90	0.83	0.74	1.03		
NLD	0.73	0.83	0.90	0.84	0.91	0.82	0.70	0.90	4.14	
CAM	0.85	0.83	0.84	0.84	0.84	0.84	0.85	0.84	0.83	4.82

RDC ang

	AUS	CAN	DEU	DFS	GBR	USA	NLD	CAM		
AUS	0.49									
CAN	0.66	6.87								
DEU	0.66	0.82	12.47							
DFS	0.67	0.80	0.84	9.12						
GBR	0.78	0.81	0.77	0.83	1.25					
USA	0.69	0.86	0.84	0.85	0.85	1.03				
NLD	0.75	0.75	0.62	0.68	0.79	0.69	4.83			
CAM	0.77	0.76	0.76	0.76	0.76	0.77	0.77	7.15		

RDC ran

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
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AUS	0.42									
CAN	0.92	5.98								
DEU	0.93	0.97	8.85							
DFS	0.92	0.94	0.95	10.04						
GBR	0.96	0.97	0.97	0.95	1.48					
NOR	0.92	0.94	0.92	0.91	0.95	12.25				
NZL	0.94	0.93	0.91	0.91	0.94	0.93	0.29			
USA	0.92	0.98	0.96	0.94	0.97	0.95	0.92	1.04		
NLD	0.93	0.97	0.98	0.96	0.97	0.95	0.90	0.96	5.79	
CAM	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	5.51

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RDC      rwi

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	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR
AUS	0.41									
CAN	0.88	6.03								
DEU	0.85	0.94	9.49							
DFS	0.87	0.93	0.93	10.48						
GBR	0.87	0.92	0.89	0.88	1.26					
NZL	0.86	0.88	0.82	0.89	0.89	0.32				
USA	0.81	0.91	0.84	0.88	0.93	0.86	1.17			
NLD	0.88	0.94	0.95	0.92	0.89	0.82	0.81	5.83		
CAM	0.89	0.88	0.87	0.89	0.88	0.89	0.88	0.88	6.65	
NOR	0.87	0.89	0.87	0.95	0.88	0.90	0.88	0.90	0.89	13.93

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RDC      rls

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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.26									
CAN	0.77	6.26								
DEU	0.79	0.94	9.17							
DFS	0.75	0.97	0.94	9.24						
GBR	0.85	0.80	0.86	0.79	1.55					
NOR	0.78	0.90	0.90	0.96	0.83	13.53				
NZL	0.74	0.74	0.74	0.74	0.75	0.78	0.12			
USA	0.76	0.93	0.93	0.94	0.83	0.87	0.74	0.75		
NLD	0.79	0.92	0.92	0.89	0.87	0.81	0.73	0.90	5.14	
CAM	0.84	0.84	0.84	0.83	0.84	0.84	0.83	0.84	0.84	6.36

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RDC      rlr

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	AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM		
AUS	0.30									
CAN	0.64	6.48								
DEU	0.64	0.88	9.61							
DFS	0.63	0.84	0.91	10.74						
NOR	0.65	0.77	0.85	0.89	15.18					
NLD	0.60	0.87	0.91	0.89	0.84	5.53				
USA	0.59	0.73	0.76	0.70	0.74	0.81	0.75			
CAM	0.79	0.75	0.74	0.74	0.74	0.74	0.74	6.86		

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RDC      fan

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	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	
AUS	0.29									
CAN	0.66	6.22								
DEU	0.74	0.81	13.78							
DFS	0.66	0.73	0.80	9.31						
GBR	0.78	0.79	0.91	0.72	1.55					
NOR	0.71	0.74	0.83	0.66	0.76	14.48				
USA	0.70	0.84	0.84	0.73	0.85	0.76	0.91			
NLD	0.72	0.76	0.89	0.78	0.89	0.69	0.81	4.64		



CAN	0.93	5.21								
DEU	0.94	0.97	12.82							
DFS	0.89	0.95	0.92	11.83						
GBR	0.94	0.93	0.96	0.89	1.47					
NOR	0.89	0.91	0.89	0.88	0.92	11.81				
NZL	0.93	0.89	0.89	0.86	0.89	0.90	0.26			
USA	0.88	0.93	0.92	0.92	0.93	0.92	0.87	1.16		
NLD	0.95	0.98	0.97	0.95	0.95	0.88	0.90	0.90	4.11	
CAM	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	6.55

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RDC      ftl  
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	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	0.45								
CAN	0.94	4.90							
DEU	0.96	0.94	13.47						
DFS	0.95	0.91	0.97	10.56					
GBR	0.96	0.93	0.98	0.94	1.40				
NOR	0.93	0.94	0.94	0.93	0.95	12.77			
USA	0.96	0.94	0.96	0.93	0.97	0.95	1.16		
NLD	0.95	0.93	0.98	0.97	0.97	0.94	0.95	5.42	
CAM	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	7.11

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RDC      rtp  
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	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM
AUS	0.40								
CAN	0.95	6.17							
DEU	0.93	0.97	13.90						
DFS	0.91	0.94	0.96	12.14					
NOR	0.92	0.93	0.91	0.90	13.73				
NZL	0.94	0.96	0.94	0.90	0.92	0.35			
NLD	0.94	0.98	0.97	0.96	0.91	0.95	5.23		
USA	0.93	0.92	0.95	0.93	0.94	0.91	0.96	1.16	
CAM	0.93	0.94	0.94	0.94	0.94	0.93	0.94	0.94	6.20

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RDC      ocs  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.69									
CAN	0.60	5.26								
DEU	0.60	0.83	18.83							
DFS	0.69	0.76	0.82	10.45						
GBR	0.68	0.81	0.91	0.84	1.48					
NOR	0.66	0.84	0.81	0.76	0.86	11.76				
NZL	0.73	0.61	0.65	0.60	0.67	0.70	0.26			
USA	0.64	0.82	0.88	0.82	0.89	0.86	0.70	0.80		
NLD	0.61	0.77	0.88	0.86	0.89	0.79	0.64	0.86	3.26	
CAM	0.77	0.86	0.86	0.86	0.86	0.86	0.79	0.87	0.86	6.08

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RDC      ous  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.67									
CAN	0.72	5.39								
DEU	0.73	0.89	15.69							
DFS	0.60	0.80	0.82	10.99						
GBR	0.84	0.84	0.85	0.73	1.40					
NOR	0.60	0.84	0.83	0.82	0.88	11.22				
NZL	0.82	0.79	0.77	0.71	0.78	0.61	0.34			
USA	0.74	0.91	0.90	0.89	0.88	0.88	0.83	0.97		
NLD	0.67	0.88	0.90	0.89	0.79	0.82	0.78	0.89	4.10	

CAM 0.72 0.89 0.88 0.88 0.89 0.88 0.71 0.89 0.90 6.42

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 RDC of1  
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	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	7.29								
CAN	0.42	5.62							
DEU	0.43	0.83	14.83						
DFS	0.42	0.80	0.79	13.26					
GBR	0.42	0.74	0.73	0.69	1.39				
NOR	0.49	0.72	0.75	0.66	0.74	14.85			
USA	0.46	0.74	0.73	0.66	0.71	0.74	1.17		
NLD	0.42	0.68	0.74	0.66	0.75	0.71	0.69	7.15	
CAM	0.57	0.74	0.74	0.74	0.74	0.74	0.75	0.74	7.05

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 ^LAPPENDIX II. Number of common bulls  
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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	114	71	112	39	135	99	26	16
CHE	95	0	152	435	63	258	490	56	14
FRA	61	112	0	168	54	90	167	41	13
ITA	93	379	132	0	84	194	528	73	15
NLD	32	59	42	65	0	54	78	28	10
USA	120	229	61	143	40	0	212	28	16
DEA	77	397	123	445	67	169	0	71	12
SVN	23	54	39	71	27	23	66	0	7
GBR	12	12	12	13	8	14	10	5	0

BSW

-----  
 common bulls below diagonal  
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	108	42	112	33	135	97	25	16
CHE	92	0	89	380	58	229	427	53	14
FRA	38	61	0	95	35	54	105	32	10
ITA	93	325	73	0	76	194	493	71	15
NLD	29	56	29	61	0	40	72	28	10
USA	120	196	35	143	31	0	194	27	16
DEA	76	338	74	409	65	144	0	69	11
SVN	22	51	31	69	27	22	65	0	7
GBR	12	12	9	13	8	14	10	5	0

BSW

-----  
 common bulls below diagonal  
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	0	114	71	112	33	99	19	16	135
CHE	95	0	152	435	62	490	41	14	258
FRA	61	112	0	168	50	167	29	13	90
ITA	93	379	132	0	76	528	55	15	194
NLD	29	59	39	61	0	73	20	10	40
DEA	77	397	123	445	66	0	52	12	212
SVN	17	38	29	52	20	49	0	6	20
GBR	12	12	12	13	8	10	4	0	16
USA	120	229	61	143	31	169	17	14	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	GBR
CAN	0	113	71	22	134	16
CHE	95	0	147	38	256	14
FRA	61	108	0	32	90	13
NLD	19	39	27	0	25	7
USA	119	229	61	20	0	16
GBR	12	12	12	5	14	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	114	71	112	39	135	99	26	16
CHE	95	0	152	435	63	258	490	56	14
FRA	61	112	0	168	54	90	167	41	13
ITA	93	379	132	0	84	194	528	73	15
NLD	32	59	42	65	0	54	78	28	10
USA	120	229	61	143	40	0	212	28	16
DEA	77	397	123	445	67	169	0	71	12
SVN	23	54	39	71	27	23	66	0	7
GBR	12	12	12	13	8	14	10	5	0

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BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	0	114	42	39	135	99	16	19	109
CHE	95	0	89	63	258	490	14	42	428
FRA	38	61	0	35	54	105	10	29	95
NLD	32	59	29	0	54	78	10	20	83
USA	120	229	35	40	0	212	16	20	182
DEA	77	397	74	67	169	0	12	52	522
GBR	12	12	9	8	14	10	0	6	15
SVN	17	39	29	20	17	49	4	0	55
ITA	91	373	73	65	131	438	13	52	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	114	71	112	39	135	99	26	16
CHE	95	0	152	435	63	258	490	56	14
FRA	61	112	0	168	54	90	167	41	13
ITA	93	379	132	0	84	194	528	73	15
NLD	32	59	42	65	0	54	78	28	10
USA	120	229	61	143	40	0	212	28	16
DEA	77	397	123	445	67	169	0	71	12
SVN	23	54	39	71	27	23	66	0	7
GBR	12	12	12	13	8	14	10	5	0

-----

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	114	71	112	32	135	99	26	16
CHE	95	0	152	435	61	258	490	56	14
FRA	61	112	0	168	50	90	167	41	13
ITA	93	379	132	0	75	194	528	73	15
NLD	28	58	39	60	0	39	72	28	10
USA	120	229	61	143	29	0	212	28	16
DEA	77	397	123	445	65	169	0	71	12
SVN	23	54	39	71	27	23	66	0	7
GBR	12	12	12	13	8	14	10	5	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	0	114	71	109	32	99	26	135
CHE	95	0	152	429	61	490	56	258
FRA	61	112	0	167	50	167	41	90
ITA	91	374	132	0	75	522	73	182
NLD	28	58	39	60	0	72	28	39
DEA	77	397	123	438	65	0	71	212
SVN	23	54	39	71	27	66	0	28
USA	120	229	61	131	29	169	23	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	114	42	72	32	135	66	19	16
CHE	95	0	89	263	62	257	296	42	14
FRA	38	61	0	87	34	54	95	29	10
ITA	65	218	66	0	56	97	246	48	12
NLD	28	59	28	50	0	39	60	20	10
USA	120	229	35	72	30	0	115	20	16
DEA	54	231	67	213	54	80	0	50	9
SVN	17	39	29	46	20	17	47	0	6
GBR	12	12	9	10	8	14	8	4	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	114	71	112	33	135	99	26	16
CHE	95	0	152	435	62	258	490	56	14
FRA	61	112	0	168	50	90	167	41	13
ITA	93	379	132	0	76	194	528	73	15
NLD	29	59	39	61	0	40	73	28	10
USA	120	229	61	143	31	0	212	28	16
DEA	77	397	123	445	66	169	0	71	12
SVN	23	54	39	71	27	23	66	0	7
GBR	12	12	12	13	8	14	10	5	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	0	114	71	112	33	135	99	26

CHE	95	0	152	435	62	258	490	56
FRA	61	112	0	168	50	90	167	41
ITA	93	379	132	0	76	194	528	73
NLD	29	59	39	61	0	40	73	28
USA	120	229	61	143	31	0	212	28
DEA	77	397	123	445	66	169	0	71
SVN	23	54	39	71	27	23	66	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	114	71	112	39	135	99	19	16
CHE	95	0	152	435	63	258	490	41	14
FRA	61	112	0	168	54	90	167	29	13
ITA	93	379	132	0	84	194	528	55	15
NLD	32	59	42	65	0	54	78	20	10
USA	120	229	61	143	40	0	212	20	16
DEA	77	397	123	445	67	169	0	52	12
SVN	17	38	29	52	20	17	49	0	6
GBR	12	12	12	13	8	14	10	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	114	71	112	39	133	99	26	16
CHE	95	0	152	435	63	258	490	56	14
FRA	61	112	0	168	54	90	167	41	13
ITA	93	379	132	0	84	194	528	73	15
NLD	32	59	42	65	0	54	78	28	10
USA	119	229	61	143	40	0	212	28	16
DEA	77	397	123	445	67	169	0	71	12
SVN	23	54	39	71	27	23	66	0	7
GBR	12	12	12	13	8	14	10	5	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	0	114	71	39	135	88	25	16	101
CHE	95	0	152	63	258	458	54	14	393
FRA	61	112	0	54	90	157	40	13	155
NLD	32	59	42	0	54	72	28	10	75
USA	120	229	61	40	0	187	27	16	152
DEA	69	366	115	65	141	0	69	11	435
SVN	22	52	38	27	22	65	0	7	70
GBR	12	12	12	8	14	10	5	0	15
ITA	84	342	120	61	112	374	68	13	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	114	71	112	39	135	99	25	16
CHE	95	0	152	435	63	258	490	55	14
FRA	61	112	0	168	54	90	167	40	13
ITA	93	379	132	0	84	192	528	72	15



NLD	32	59	42	65	0	54	78	28	10
USA	120	229	61	142	40	0	212	27	16
DEA	77	397	123	445	67	169	0	70	12
SVN	22	53	38	70	27	22	65	0	7
GBR	12	12	12	13	8	14	10	5	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	0	114	71	72	28	66	25	135
CHE	95	0	149	263	58	296	54	257
FRA	61	109	0	107	47	115	40	90
ITA	65	218	80	0	55	246	58	97
NLD	25	57	37	50	0	59	27	34
DEA	54	231	78	213	54	0	62	115
SVN	22	52	38	57	27	56	0	26
USA	120	229	61	72	26	80	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	108	61	112	39	135	66	19	16
CHE	92	0	114	379	58	229	291	41	14
FRA	56	84	0	134	44	75	104	29	13
ITA	93	323	108	0	82	191	282	55	15
NLD	32	56	37	65	0	54	60	20	10
USA	120	196	54	143	40	0	115	20	16
DEA	54	227	75	248	54	80	0	50	9
SVN	17	38	29	52	20	17	47	0	6
GBR	12	12	12	13	8	14	8	4	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	108	61	112	39	134	99	19	16
CHE	92	0	114	380	58	229	435	41	14
FRA	56	84	0	134	44	75	136	29	13
ITA	93	325	108	0	84	194	521	55	15
NLD	32	56	37	65	0	54	78	20	10
USA	119	196	54	143	40	0	210	20	16
DEA	76	348	101	441	67	165	0	52	12
SVN	17	38	29	52	20	17	49	0	6
GBR	12	12	12	13	8	14	10	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	108	61	109	39	135	99	19	16
CHE	92	0	114	379	58	229	435	42	14
FRA	56	84	0	133	44	75	136	29	13
ITA	91	324	108	0	83	182	516	55	15
NLD	32	56	37	65	0	54	78	20	10
USA	120	196	54	131	40	0	210	20	16
DEA	76	348	101	435	67	165	0	52	12

SVN	17	39	29	52	20	17	49	0	6
GBR	12	12	12	13	8	14	10	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	109	99	74	19	143	43
CHE	92	0	429	263	41	228	89
DEA	77	345	0	286	52	206	105
ITA	66	217	238	0	48	97	87
SVN	17	38	49	46	0	20	29
USA	120	196	164	72	17	0	54
FRA	39	61	74	66	29	35	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	FRA
CAN	0	116	101	117	26	74
CHE	95	0	490	435	55	152
DEA	77	397	0	527	71	167
ITA	94	379	444	0	72	168
SVN	23	54	66	71	0	41
FRA	62	112	123	132	39	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	109	77	74	19	143	43
CHE	92	0	326	263	41	228	89
DEA	64	258	0	253	51	143	97
ITA	66	217	220	0	48	97	87
SVN	17	38	48	46	0	20	29
USA	120	196	104	72	17	0	54
FRA	39	61	69	66	29	35	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CHE	DEA	ITA	SVN	USA	FRA
CHE	0	472	263	41	257	150
DEA	382	0	285	52	197	163
ITA	218	237	0	48	97	107
SVN	38	49	46	0	20	29
USA	229	153	72	17	0	89
FRA	111	121	80	29	61	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
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CAN	0	66	51	56	15	75	31
CHE	56	0	326	263	35	228	89
DEA	39	258	0	253	46	143	97
ITA	49	217	220	0	40	97	87
SVN	13	33	43	39	0	18	26
USA	66	196	104	72	15	0	54
FRA	27	61	69	66	26	35	0

BSW

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

CAN	0	116	101	114	25	74
CHE	95	0	490	429	53	152
DEA	77	397	0	521	70	167
ITA	92	374	437	0	70	167
SVN	22	52	65	69	0	40
FRA	62	112	123	132	38	0

BSW

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

CHE	0	489	432	41	149
DEA	396	0	527	52	166
ITA	376	444	0	54	166
SVN	39	49	52	0	29
FRA	111	122	132	29	0

BSW

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

CHE	0	262	238	40	102
DEA	216	0	245	50	114
ITA	202	213	0	48	106
SVN	38	47	46	0	29
FRA	74	77	80	29	0

BSW

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

CHE	0	489	426	54	149
DEA	396	0	521	70	166
ITA	371	437	0	71	165
SVN	53	65	70	0	40
FRA	111	122	132	38	0

BSW

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

CHE	0	295	261	54	85
DEA	230	0	246	62	93

ITA	216	213	0	58	86
SVN	53	56	57	0	32
FRA	60	66	65	31	0

GUE

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

CAN	0	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
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GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	0	22
AUS	19	9	19	0

GUE

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

CAN	0	35	10
USA	33	0	5
AUS	11	4	0

GUE

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

CAN	0	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11

USA	52	73	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	22	61	17
GBR	19	0	74	11
USA	51	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	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	22	63	18
GBR	19	0	74	11
USA	52	73	0	22
AUS	19	9	19	0

GUE

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

CAN	0	7	63
AUS	8	0	9
USA	52	8	0

GUE

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

CAN	0	12	63	18
GBR	9	0	33	11
USA	52	31	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	20	61	17
GBR	17	0	72	10
USA	51	71	0	22

AUS 18 8 19 0

GUE

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

Table with 4 columns: CAN, GBR, USA, AUS. Values: CAN (0, 20, 63, 21), GBR (17, 0, 72, 12), USA (52, 71, 0, 26), AUS (20, 9, 22, 0)

GUE

GUE

HOL

common bulls below diagonal
common three quarter sib group above diagonal

Large table with 24 columns (AUS to PRT) and 24 rows (AUS to PRT) showing values for various countries.

HOL

common bulls below diagonal
common three quarter sib group above diagonal

Large table with 24 columns (AUS to PRT) and 24 rows (AUS to HUN) showing values for various countries.

POL	319	392	674	341	725	647	512	564	715	853	832	1112	484	0	296	255	675	969	150	368	432	194	737
NZL	379	207	298	196	246	280	256	196	355	297	481	435	199	182	0	169	306	313	38	327	169	57	281
ZAF	232	185	298	168	227	269	288	202	306	303	275	396	227	194	146	0	257	274	46	196	198	71	292
JPN	255	201	343	191	229	274	269	232	304	315	284	395	217	208	138	172	0	687	94	309	438	119	529
CZE	307	360	633	325	856	573	547	568	650	826	1017	1010	651	645	204	204	195	0	115	371	423	182	677
EST	38	46	54	32	85	62	47	43	58	73	96	99	54	81	16	20	20	61	0	56	59	46	97
IRL	356	359	383	324	378	410	392	365	724	450	550	482	262	271	268	188	174	281	29	0	180	87	358
KOR	197	156	524	166	223	252	293	206	325	443	254	822	293	314	115	152	195	293	24	129	0	82	394
SVN	78	114	118	81	218	155	120	106	138	184	175	143	90	155	42	50	56	133	27	66	51	0	136
PRT	355	487	845	377	590	641	694	563	745	868	829	1091	526	675	217	280	245	558	61	308	329	109	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
AUS	0	454	804	428	780	717	576	759	804	686	799	980	430	502	472	297	519	494	80	390	283	471	84
BEL	391	0	579	478	792	614	531	701	663	650	916	693	375	494	267	238	392	484	76	372	223	483	108
CAN	719	543	0	780	1744	1088	1184	1217	1385	1587	1148	2800	810	967	351	372	1084	962	127	402	593	844	137
CHE	365	477	621	0	877	574	520	558	643	689	756	847	360	489	237	216	375	467	69	330	239	437	88
DEU	401	664	617	582	0	1932	1281	1987	1581	2149	2198	2532	923	1435	427	371	1112	1467	182	535	483	884	214
DFS	468	534	774	484	868	0	888	1377	1266	1340	1502	1591	688	1035	442	380	761	1013	136	514	394	754	161
ESP	436	510	694	412	581	609	0	1027	986	1214	954	1403	653	808	305	362	791	787	112	390	426	721	129
FRA	453	637	662	457	699	576	660	0	1333	1492	1575	2155	755	1219	469	351	1048	1071	124	505	436	733	134
GBR	662	665	1374	616	773	848	789	716	0	1467	1464	1889	718	988	457	389	829	939	129	669	445	816	147
ITA	534	623	1238	609	1056	980	878	696	1198	0	1506	2310	870	1222	385	371	987	1178	156	489	544	917	182
NLD	670	1008	995	718	1217	1102	809	813	1197	1204	0	1892	734	1153	555	366	818	1240	164	613	405	852	165
USA	792	585	2712	737	882	964	865	948	1667	1636	1502	0	1058	1403	520	460	1596	1406	171	518	739	1076	157
HUN	299	301	700	282	530	479	486	430	577	697	533	939	0	651	263	293	555	774	95	310	375	550	105
POL	319	392	674	341	725	647	496	607	716	853	842	1112	484	0	296	281	676	969	150	368	433	737	169
NZL	379	207	298	196	246	280	248	225	355	297	501	435	199	182	0	206	306	313	38	327	169	281	47
ZAF	272	202	342	184	252	293	328	242	357	323	332	481	244	202	183	0	304	295	47	233	217	308	53
JPN	256	203	345	192	230	275	269	240	307	316	289	398	217	208	138	186	0	688	94	309	439	530	96
CZE	307	360	633	325	856	573	528	603	650	826	1033	1010	651	645	204	216	195	0	115	371	424	678	154
EST	38	46	54	32	85	62	45	43	58	73	97	99	54	81	16	20	20	61	0	56	59	97	42
IRL	356	359	383	324	378	410	376	396	724	450	561	482	262	271	268	219	174	281	29	0	181	358	65
KOR	197	156	525	166	223	252	291	214	326	444	262	824	295	315	115	167	196	293	24	129	0	395	69
PRT	355	486	845	377	590	641	681	575	744	868	841	1091	525	675	217	290	247	558	61	308	330	0	110
SVN	61	87	101	66	192	129	94	90	112	155	144	121	76	135	35	37	41	113	23	52	44	89	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
AUS	0	440	804	412	778	719	589	618	800	684	408	978	429	497	294	518	490	78	388	283	462	83
BEL	388	0	563	451	770	598	537	620	640	638	531	659	366	481	228	376	473	75	362	218	470	107
CAN	719	538	0	742	1742	1084	1192	1040	1381	1586	723	2799	810	965	367	1081	961	126	401	592	838	137
CHE	361	452	590	0	779	559	518	497	629	662	474	789	352	465	211	372	443	66	327	237	422	87
DEU	400	653	617	521	0	1917	1307	1776	1578	2146	1230	2526	919	1423	366	1109	1460	181	534	482	864	213
DFS	468	529	774	474	865	0	909	1184	1253	1334	845	1578	683	1019	376	757	1003	134	512	394	735	160
ESP	446	533	702	416	623	635	0	950	1007	1236	609	1424	662	824	364	799	800	114	403	430	730	131
FRA	407	590	603	412	571	543	660	0	1171	1408	752	1706	700	1123	295	880	1016	118	444	399	675	134
GBR	662	655	1374	605	772	848	820	662	0	1463	788	1880	714	976	383	826	932	126	660	444	799	146
ITA	533	621	1237	589	1054	980	910	662	1196	0	964	2307	868	1216	366	984	1176	154	488	542	902	181
NLD	387	580	705	439	810	771	529	517	732	872	0	924	439	790	201	408	821	124	327	256	534	156
USA	792	576	2711	681	881	964	882	745	1666	1633	787	0	1056	1396	454	1594	1397	170	514	736	1060	157
HUN	299	299	700	277	530	479	498	413	576	696	321	938	0	648	290	555	772	95	307	373	544	105
POL	319	387	674	319	725	644	520	564	712	851	661	1111	484	0	276	674	961	149	365	432	726	168
ZAF	270	201	339	180	249	290	328	209	354	320	175	477	242	199	0	300	289	45	230	214	304	50
JPN	255	201	343	191	229	274	269	232	304	315	210	395	217	208	183	0	687	94	308	438	526	96
CZE	307	356	633	312	854	568	552	568	648	826	786	1007	651	641	213	195	0	111	368	423	665	153
EST	38	46	54	32	85	62	49	43	58	73	78	99	54	81	20	20	60	0	54	59	95	41
IRL	356	357	383	320	377	410	395	365	717	450	330	482	262	270	217	174	281	29	0	180	351	65



KOR	197	156	524	165	223	252	293	206	325	443	180	821	293	314	166	195	293	24	129	0	394	69
PRT	355	481	845	367	587	633	695	563	743	866	542	1089	525	667	289	245	550	60	308	329	0	110
SVN	61	87	101	65	192	129	97	90	112	155	143	121	76	135	34	41	112	23	52	44	89	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
AUS	0	455	804	428	780	720	574	760	804	686	826	981	430	503	476	297	519	494	80	390	285	110	471
BEL	391	0	579	478	792	615	525	701	663	650	940	693	375	494	267	238	392	484	76	372	224	139	483
CAN	719	543	0	780	1744	1088	1179	1217	1385	1587	1179	2800	810	967	351	372	1084	962	127	402	598	162	844
CHE	365	477	621	0	877	574	517	557	643	689	764	847	360	489	237	216	375	467	69	330	240	113	437
DEU	401	664	617	582	0	1932	1270	1986	1581	2149	2239	2532	923	1435	427	371	1112	1467	182	535	487	248	884
DFS	468	534	774	484	868	0	880	1378	1267	1341	1544	1592	689	1036	443	380	761	1013	136	515	398	193	754
ESP	434	504	691	408	567	601	0	1020	979	1206	960	1395	651	802	302	362	788	782	110	388	430	157	717
FRA	453	637	662	456	698	575	651	0	1333	1492	1690	2155	755	1219	469	351	1048	1071	124	505	440	158	733
GBR	662	665	1374	616	773	848	780	716	0	1467	1493	1890	718	988	457	389	829	939	129	671	447	180	816
ITA	534	623	1238	609	1056	980	867	696	1198	0	1514	2310	870	1222	385	371	987	1178	156	489	549	215	917
NLD	674	1034	1002	719	1225	1103	801	835	1209	1205	0	2020	743	1162	568	376	852	1244	165	620	414	204	857
USA	793	585	2712	737	882	964	858	948	1667	1636	1544	0	1058	1403	520	460	1596	1406	171	519	745	188	1076
HUN	299	301	700	282	530	479	485	430	577	697	533	939	0	651	263	293	555	774	95	310	379	122	550
POL	319	392	674	341	725	647	490	607	716	853	843	1112	484	0	296	281	676	969	150	368	436	194	737
NZL	379	207	298	196	246	280	246	225	355	297	503	435	199	182	0	206	306	313	38	327	170	57	281
ZAF	272	202	342	184	252	293	327	242	357	323	334	481	244	202	183	0	304	295	47	233	219	71	308
JPN	257	203	345	192	231	275	269	241	308	316	291	399	217	208	138	186	0	688	94	309	443	119	530
CZE	307	360	633	325	856	573	524	603	650	826	1033	1010	651	645	204	216	196	0	115	371	427	182	678
EST	38	46	54	32	85	62	44	43	58	73	97	99	54	81	16	20	20	61	0	56	59	46	97
IRL	356	359	383	324	378	410	374	396	726	450	564	482	262	271	268	219	174	281	29	0	182	87	358
KOR	198	156	529	166	223	254	292	216	327	447	267	831	298	316	115	169	197	296	24	129	0	84	397
SVN	78	114	118	81	218	155	114	106	138	184	177	143	90	155	42	50	56	133	27	66	53	0	136
PRT	355	486	845	377	590	641	675	575	744	868	844	1091	525	675	217	290	247	558	61	308	332	109	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
AUS	0	430	804	428	780	720	574	760	804	686	824	981	430	503	476	296	324	494	80	390	282	471	84
BEL	388	0	557	471	762	593	508	654	631	635	850	645	360	482	252	225	281	470	76	357	214	475	108
CAN	719	533	0	780	1744	1088	1180	1217	1385	1587	1176	2800	810	967	351	371	780	962	127	402	594	844	137
CHE	365	473	621	0	877	574	517	558	643	689	762	847	360	489	237	215	292	467	69	330	238	437	88
DEU	401	645	617	582	0	1932	1271	1987	1581	2149	2234	2532	923	1435	427	370	833	1467	182	535	483	884	214
DFS	468	529	774	484	868	0	882	1378	1267	1341	1536	1592	689	1036	443	379	533	1013	136	515	395	754	161
ESP	434	498	693	408	569	603	0	1021	981	1208	958	1397	652	803	302	361	608	783	110	388	427	718	129
FRA	453	625	662	457	699	576	654	0	1333	1492	1679	2155	755	1219	469	350	711	1071	124	505	436	733	134
GBR	662	647	1374	616	773	848	783	716	0	1467	1490	1890	718	988	457	388	586	939	129	671	445	816	147
ITA	534	620	1238	609	1056	980	870	696	1198	0	1513	2310	870	1222	385	370	821	1178	156	489	545	917	182
NLD	674	935	1002	719	1224	1103	802	836	1208	1205	0	2013	743	1161	567	375	605	1244	164	619	409	857	165
USA	793	570	2712	737	882	964	861	948	1667	1636	1541	0	1058	1403	520	459	1075	1406	171	519	739	1076	157
HUN	299	297	700	282	530	479	485	430	577	697	533	939	0	651	263	292	437	774	95	310	376	550	105
POL	319	389	674	341	725	647	492	607	716	853	843	1112	484	0	296	280	571	969	150	368	433	737	169
NZL	379	201	298	196	246	280	247	225	355	297	503	435	199	182	0	205	192	313	38	327	168	281	47
ZAF	271	199	341	183	251	292	326	241	356	322	333	480	243	201	183	0	205	294	46	232	216	307	52
JPN	217	175	305	173	204	245	226	210	259	289	248	340	189	198	114	141	0	545	82	221	356	416	93
CZE	307	357	633	325	856	573	525	603	650	826	1033	1010	651	645	204	216	177	0	115	371	425	678	154
EST	38	46	54	32	85	62	44	43	58	73	97	99	54	81	16	20	20	61	0	56	59	97	42
IRL	356	353	383	324	378	410	374	396	726	450	564	482	262	271	268	218	150	281	29	0	180	358	65
KOR	197	156	528	166	223	254	293	215	327	446	267	826	297	315	115	168	181	295	24	129	0	395	70
PRT	355	483	845	377	590	641	677	575	744	868	844	1091	525	675	217	289	217	558	61	308	331	0	110
SVN	61	87	101	66	192	129	93	90	112	155	144	121	76	135	35	37	41	113	23	52	45	89	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	
AUS	0	455	804	428	780	720	578	760	804	686	826	981	430	503	476	297	518	494	80	390	282	110	471
BEL	391	0	579	478	792	615	532	701	663	650	940	693	375	494	267	238	390	484	76	372	223	139	483
CAN	719	543	0	780	1744	1088	1185	1217	1385	1587	1179	2800	810	967	351	372	1082	962	127	402	591	162	845
CHE	365	477	621	0	877	574	520	557	643	689	764	847	360	489	237	216	374	467	69	330	239	113	437
DEU	401	664	617	582	0	1932	1283	1986	1581	2149	2239	2532	923	1435	427	371	1110	1467	182	535	482	248	885
DFS	468	534	774	484	868	0	892	1378	1267	1341	1544	1592	689	1036	443	380	760	1013	136	515	394	193	755
ESP	437	512	695	413	584	612	0	1029	989	1216	971	1404	653	809	307	363	791	788	112	391	425	158	722
FRA	453	637	662	456	698	576	663	0	1333	1492	1690	2155	755	1219	469	351	1046	1071	124	505	433	158	734
GBR	662	665	1374	616	773	848	792	716	0	1467	1493	1890	718	988	457	389	827	939	129	671	444	180	816
ITA	534	623	1238	609	1056	980	881	696	1198	0	1514	2310	870	1222	385	371	985	1178	156	489	541	215	918
NLD	674	1034	1002	719	1225	1103	814	835	1209	1205	0	2020	743	1162	568	376	850	1244	165	620	407	204	858
USA	793	585	2712	737	882	965	867	948	1667	1636	1544	0	1058	1403	520	460	1594	1406	171	519	735	188	1077
HUN	299	301	700	282	530	479	487	430	577	697	533	939	0	651	263	293	555	774	95	310	373	122	551
POL	319	392	674	341	725	647	497	607	716	853	843	1112	484	0	296	281	676	969	150	368	432	194	738
NZL	379	207	298	196	246	280	250	225	355	297	503	435	199	182	0	206	306	313	38	327	169	57	281
ZAF	272	202	342	184	252	293	329	242	357	323	334	481	244	202	183	0	303	295	47	233	217	71	308
JPN	255	201	343	191	229	274	267	238	304	315	287	395	217	208	138	184	0	687	94	309	438	119	530
CZE	307	360	633	325	856	573	530	603	650	826	1033	1010	651	645	204	216	195	0	115	371	423	182	678
EST	38	46	54	32	85	62	45	43	58	73	97	99	54	81	16	20	20	61	0	56	59	46	97
IRL	356	359	383	324	378	410	377	396	726	450	564	482	262	271	268	219	174	281	29	0	180	87	358
KOR	197	156	524	166	223	252	290	212	325	443	263	820	293	314	115	167	195	293	24	129	0	82	393
SVN	78	114	118	81	218	155	116	106	138	184	177	143	90	155	42	50	56	133	27	66	51	0	136
PRT	355	487	845	377	590	641	684	575	746	870	846	1094	528	676	217	290	245	559	61	308	330	109	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	
AUS	0	402	690	413	725	666	532	479	738	662	692	865	407	447	245	455	370	78	366	196	107	454
BEL	381	0	527	459	730	564	499	533	601	624	790	612	350	450	198	346	394	73	334	169	136	465
CAN	641	522	0	745	1662	992	1117	891	1290	1558	1039	2606	788	915	309	959	828	123	372	489	159	827
CHE	362	463	606	0	877	573	522	464	643	689	731	847	358	463	194	366	389	69	321	190	110	433
DEU	394	623	613	582	0	1931	1286	1546	1579	2149	2104	2532	920	1382	327	1075	1236	182	516	403	245	881
DFS	463	520	771	484	868	0	888	978	1261	1340	1427	1590	684	982	328	717	826	136	488	309	192	749
ESP	428	499	684	414	591	617	0	822	988	1222	921	1404	654	780	318	757	686	112	380	349	159	725
FRA	348	507	533	383	526	488	567	0	963	1267	1142	1367	620	1052	224	728	840	109	362	319	150	608
GBR	636	626	1301	615	773	846	799	562	0	1465	1377	1881	715	943	335	779	785	128	626	357	177	810
ITA	529	615	1233	609	1056	979	888	607	1196	0	1478	2308	868	1195	346	965	1058	156	480	465	212	915
NLD	603	872	925	690	1173	1074	779	642	1131	1183	0	1688	705	1088	309	747	1076	163	557	322	201	829
USA	732	560	2599	737	882	964	870	614	1666	1636	1267	0	1055	1351	394	1462	1198	171	491	604	185	1070
HUN	294	288	694	282	530	479	489	370	576	697	519	939	0	624	266	540	658	95	296	319	120	550
POL	305	375	653	328	704	623	474	557	693	842	808	1082	466	0	242	640	866	149	331	385	191	716
ZAF	234	184	297	169	228	270	289	168	309	304	276	399	228	186	0	250	234	46	193	153	70	292
JPN	250	200	341	191	229	273	263	210	300	314	281	388	216	202	172	0	576	92	282	352	119	523
CZE	254	304	555	269	727	493	435	458	538	741	922	858	542	589	168	180	0	108	291	353	173	605
EST	38	45	54	32	85	62	45	39	58	73	96	99	54	80	20	20	56	0	54	54	46	97
IRL	347	344	380	321	376	408	379	307	692	448	534	476	260	258	189	173	226	29	0	127	86	344
KOR	138	132	436	140	188	209	228	187	251	378	208	669	245	292	110	163	249	22	95	0	74	337
SVN	77	111	117	80	216	155	117	102	137	182	174	142	89	154	50	56	129	27	66	49	0	135
PRT	352	477	824	374	590	639	687	518	743	869	824	1090	527	664	280	244	499	61	305	285	109	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	
AUS	0	426	804	428	467	717	586	755	804	686	789	981	428	501	297	518	492	78	389	283	108	476
BEL	388	0	553	469	563	587	523	645	629	634	840	642	359	480	226	366	468	74	356	215	138	478
CAN	719	533	0	779	1273	1087	1190	1201	1385	1587	1132	2800	807	962	372	1082	956	124	402	593	160	848

CHE	365	473	621	0	636	573	526	550	642	687	751	846	359	487	216	373	464	69	330	239	112	441
DEU	308	510	520	454	0	1232	990	1274	1074	1681	1501	1692	671	1130	229	750	1061	153	346	376	225	662
DFS	468	528	774	484	701	0	907	1348	1264	1338	1487	1588	684	1030	380	760	1005	133	514	395	191	758
ESP	444	523	701	419	450	627	0	1034	1005	1228	968	1419	658	818	367	795	797	112	402	431	159	738
FRA	452	620	662	456	474	575	692	0	1318	1487	1519	2114	751	1208	350	1032	1064	121	499	430	157	736
GBR	662	647	1374	616	590	848	815	716	0	1467	1447	1887	716	983	388	826	933	128	665	444	179	819
ITA	534	620	1238	608	848	980	901	695	1198	0	1496	2310	868	1219	371	985	1177	156	489	543	214	919
NLD	665	930	989	716	913	1099	832	793	1188	1202	0	1847	725	1137	364	808	1229	162	606	402	202	852
USA	792	570	2712	737	662	964	880	912	1667	1636	1486	0	1055	1396	460	1593	1401	170	517	736	186	1079
HUN	299	296	700	282	395	476	494	430	577	697	530	939	0	648	292	554	770	93	309	374	120	551
POL	319	388	674	340	622	644	511	607	714	853	834	1112	482	0	280	674	961	147	366	431	191	739
ZAF	272	200	342	184	161	293	331	242	357	323	328	481	244	202	0	302	294	47	233	217	71	313
JPN	255	201	343	191	189	274	268	237	303	315	284	394	217	208	183	0	684	93	309	439	117	534
CZE	307	355	633	324	656	572	547	603	649	826	1030	1010	649	642	216	195	0	112	370	424	180	677
EST	38	45	54	32	71	61	47	43	57	73	96	99	53	78	20	20	59	0	55	59	45	96
IRL	356	353	383	324	278	410	392	396	720	450	560	482	262	271	219	174	281	29	0	180	86	359
KOR	197	156	525	166	190	253	292	212	325	444	260	816	294	314	167	195	294	24	129	0	82	396
SVN	78	113	118	81	207	153	120	106	138	184	176	143	89	153	50	56	132	26	66	51	0	135
PRT	357	487	848	381	491	645	700	578	751	871	844	1098	530	679	291	245	562	60	309	331	109	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
AUS	0	448	804	428	780	719	586	709	804	686	770	981	430	502	476	297	518	494	80	390	283	110	471
BEL	390	0	574	477	786	610	542	675	657	647	885	678	372	491	263	236	383	482	76	370	223	139	483
CAN	719	543	0	780	1743	1088	1190	1139	1385	1587	1104	2800	810	967	351	372	1082	962	127	402	596	162	845
CHE	365	476	621	0	877	574	526	548	643	689	741	847	360	489	237	216	374	467	69	330	239	113	437
DEU	401	663	617	582	0	1932	1300	1950	1581	2149	2150	2532	923	1434	427	371	1110	1467	182	535	485	248	885
DFS	468	533	774	484	868	0	907	1299	1266	1340	1465	1591	688	1035	442	380	760	1013	136	514	397	193	755
ESP	444	531	701	419	608	627	0	1008	1006	1228	955	1419	661	822	315	367	796	800	114	402	433	161	733
FRA	451	633	659	456	695	573	692	0	1278	1477	1484	1955	741	1207	436	336	968	1061	122	487	420	158	726
GBR	662	665	1374	616	773	848	815	711	0	1467	1427	1889	718	988	457	389	827	939	129	669	446	180	816
ITA	534	623	1238	609	1056	980	901	695	1198	0	1486	2310	870	1222	385	371	985	1178	156	489	547	215	918
NLD	642	970	946	695	1186	1078	806	782	1156	1181	0	1785	722	1140	541	357	780	1227	163	606	396	204	840
USA	793	584	2712	737	882	965	880	877	1667	1636	1300	0	1058	1403	520	460	1594	1406	171	518	742	188	1077
HUN	299	301	700	282	530	479	494	429	577	697	516	939	0	651	263	293	555	774	95	310	378	122	551
POL	319	392	674	341	725	647	512	607	716	853	834	1112	484	0	296	281	676	969	150	368	435	194	738
NZL	379	207	298	196	246	280	256	223	355	297	481	435	199	182	0	206	306	313	38	327	169	57	281
ZAF	272	202	342	184	252	293	331	240	357	323	314	481	244	202	183	0	303	295	47	233	218	71	308
JPN	255	201	343	191	229	274	269	238	304	315	284	395	217	208	138	184	0	687	94	309	440	119	530
CZE	307	360	633	325	856	573	547	601	650	826	1017	1010	651	645	204	216	195	0	115	371	426	182	678
EST	38	46	54	32	85	62	47	43	58	73	96	99	54	81	16	20	20	61	0	56	59	46	97
IRL	356	359	383	324	378	410	392	394	724	450	549	482	262	271	268	219	174	281	29	0	181	87	358
KOR	197	156	527	166	223	254	295	214	327	446	257	826	297	315	115	168	195	295	24	129	0	83	396
SVN	78	114	118	81	218	155	120	106	138	184	175	143	90	155	42	50	56	133	27	66	52	0	136
PRT	355	487	845	377	590	641	694	573	745	869	830	1092	527	676	217	290	245	558	61	308	331	109	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
AUS	0	448	804	428	780	673	579	756	804	686	800	981	430	503	476	297	519	494	80	390	283	110	470
BEL	390	0	574	477	786	599	531	687	657	647	901	678	372	491	263	236	384	482	76	370	223	139	482
CAN	719	543	0	780	1744	1010	1186	1202	1385	1587	1148	2800	810	967	351	372	1083	962	127	402	596	162	842
CHE	365	476	621	0	877	555	522	554	643	689	756	847	360	489	237	216	374	467	69	330	239	113	437
DEU	401	663	617	582	0	1845	1285	1974	1581	2149	2198	2532	923	1435	427	371	1111	1467	182	535	485	248	882
DFS	468	533	774	484	867	0	851	1268	1208	1322	1468	1498	672	1014	415	353	707	982	133	497	384	193	744
ESP	437	513	696	414	585	613	0	1019	991	1217	958	1406	654	811	308	365	793	789	112	392	430	158	721
FRA	453	636	662	456	696	575	665	0	1320	1488	1568	2116	753	1215	465	350	1034	1067	123	500	434	158	729
GBR	662	664	1373	616	772	847	791	715	0	1467	1464	1889	718	988	457	389	828	939	129	669	446	180	814
ITA	534	623	1238	609	1056	979	882	696	1197	0	1506	2310	870	1222	385	371	986	1178	156	489	547	215	916

NLD	670	1003	995	718	1217	1102	813	811	1196	1204	0	1892	734	1153	555	366	817	1240	164	613	408	204	851
USA	793	584	2712	737	882	964	868	913	1667	1636	1502	0	1058	1403	520	460	1595	1406	171	518	743	188	1074
HUN	299	301	700	282	530	479	488	430	577	697	533	939	0	651	263	293	555	774	95	310	378	122	550
POL	319	392	674	341	725	647	499	607	716	853	842	1112	484	0	296	281	676	969	150	368	435	194	735
NZL	379	207	298	196	246	280	250	225	355	297	501	435	199	182	0	206	306	313	38	327	169	57	281
ZAF	272	202	342	184	252	293	330	242	357	323	332	481	244	202	183	0	304	295	47	233	218	71	307
JPN	255	202	344	191	230	275	269	239	305	316	287	396	217	208	138	185	0	688	94	309	441	119	530
CZE	307	360	633	325	856	573	531	603	650	826	1033	1010	651	645	204	216	195	0	115	371	426	182	677
EST	38	46	54	32	85	62	45	43	58	73	97	99	54	81	16	20	20	61	0	56	59	46	96
IRL	356	359	383	324	378	410	378	396	724	450	561	482	262	271	268	219	174	281	29	0	181	87	358
KOR	197	156	528	166	223	254	294	215	327	446	264	827	297	315	115	169	196	295	24	129	0	83	396
SVN	78	114	118	81	218	155	116	106	138	184	177	143	90	155	42	50	56	133	27	66	52	0	136
PRT	355	486	845	377	590	638	683	575	744	868	841	1091	525	675	217	290	246	558	61	308	331	109	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
AUS	0	448	804	428	780	720	589	760	804	686	826	981	430	503	476	297	518	494	80	390	282	110	471
BEL	390	0	574	477	786	611	544	690	657	647	909	678	372	491	263	236	383	482	76	370	223	139	483
CAN	719	543	0	780	1744	1088	1192	1217	1385	1587	1179	2800	810	967	351	372	1082	962	127	402	590	162	845
CHE	365	476	621	0	877	574	526	557	643	689	764	847	360	489	237	216	374	467	69	330	238	113	437
DEU	401	663	617	582	0	1932	1308	1986	1581	2149	2239	2532	923	1435	427	371	1110	1467	182	535	481	248	885
DFS	468	533	775	484	868	0	913	1378	1267	1341	1544	1592	689	1036	443	380	760	1013	136	515	394	193	755
ESP	445	534	702	419	621	634	0	1052	1010	1236	1000	1424	663	829	317	367	799	804	115	404	429	161	737
FRA	453	636	662	456	698	576	704	0	1333	1492	1690	2155	755	1219	469	351	1046	1071	124	505	432	158	734
GBR	662	665	1374	616	773	848	820	716	0	1467	1493	1890	718	988	457	389	827	939	129	671	444	180	816
ITA	534	623	1238	609	1056	980	910	696	1198	0	1514	2310	870	1222	385	371	985	1178	156	489	541	215	918
NLD	674	1010	1002	719	1225	1103	848	835	1209	1205	0	2020	743	1162	568	376	850	1244	165	620	407	204	858
USA	793	584	2712	737	882	966	882	948	1667	1636	1544	0	1058	1403	520	460	1594	1406	171	519	734	188	1077
HUN	299	301	700	282	530	480	497	430	577	697	533	939	0	651	263	293	555	774	95	310	373	122	551
POL	319	392	674	341	725	647	519	607	716	853	843	1112	484	0	296	281	676	969	150	368	432	194	738
NZL	379	207	298	196	246	280	257	225	355	297	503	435	199	182	0	206	306	313	38	327	169	57	281
ZAF	272	202	342	184	252	294	331	242	357	323	334	481	244	202	183	0	303	295	47	233	217	71	308
JPN	255	201	343	191	229	274	269	238	304	315	287	395	217	208	138	184	0	687	94	309	438	119	530
CZE	307	360	633	325	856	573	550	603	650	826	1033	1010	651	645	204	216	195	0	115	371	423	182	678
EST	38	46	54	32	85	62	48	43	58	73	97	99	54	81	16	20	20	61	0	56	59	46	97
IRL	356	359	383	324	378	410	394	396	726	450	564	482	262	271	268	219	174	281	29	0	180	87	358
KOR	197	156	524	166	223	252	292	212	325	443	263	819	293	314	115	167	195	293	24	129	0	82	393
SVN	78	114	118	81	218	155	120	106	138	184	177	143	90	155	42	50	56	133	27	66	51	0	136
PRT	355	487	845	377	590	641	697	575	746	870	846	1094	528	676	217	290	245	559	61	308	330	109	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
AUS	0	451	804	428	780	719	576	760	804	686	826	981	430	503	297	519	494	80	389	283	110	471
BEL	389	0	574	476	785	610	527	694	657	647	932	687	372	491	235	388	482	76	367	220	139	482
CAN	719	539	0	780	1744	1088	1182	1217	1385	1587	1179	2800	810	967	372	1084	962	127	402	595	162	844
CHE	365	475	621	0	877	574	518	557	643	689	764	847	360	489	216	375	467	69	330	239	113	437
DEU	401	660	617	582	0	1932	1276	1986	1581	2149	2239	2532	923	1435	371	1112	1467	182	535	484	248	884
DFS	468	533	775	484	868	0	886	1378	1267	1341	1544	1592	689	1036	380	761	1013	136	515	396	193	754
ESP	435	506	693	410	575	606	0	1024	985	1211	966	1400	652	806	362	791	785	111	390	428	157	720
FRA	453	635	662	456	698	576	656	0	1333	1492	1690	2155	755	1219	351	1048	1071	124	505	437	158	733
GBR	662	661	1374	616	773	848	786	716	0	1467	1493	1890	718	988	389	829	939	129	668	446	180	816
ITA	534	623	1238	609	1056	980	874	696	1198	0	1514	2310	870	1222	371	987	1178	156	489	546	215	917
NLD	674	1022	1002	719	1225	1103	807	835	1209	1205	0	2020	743	1162	376	852	1244	165	620	411	204	857
USA	792	581	2712	737	882	966	863	948	1667	1636	1544	0	1058	1403	460	1596	1406	171	519	741	188	1076
HUN	299	300	700	282	530	480	485	430	577	697	533	939	0	651	293	555	774	95	310	377	122	550
POL	319	392	674	341	725	647	494	607	716	853	843	1112	484	0	281	676	969	150	368	434	194	737
ZAF	272	202	342	184	252	294	327	242	357	323	334	481	244	202	0	304	295	47	233	218	71	308
JPN	257	203	345	192	231	275	269	241	308	316	291	399	217	208	186	0	688	94	309	441	119	530

CZE	307	360	633	325	856	573	526	603	650	826	1033	1010	651	645	216	196	0	115	371	426	182	678
EST	38	46	54	32	85	62	44	43	58	73	97	99	54	81	20	20	61	0	56	59	46	97
IRL	356	358	383	324	378	410	375	396	723	450	564	482	262	271	219	174	281	29	0	181	87	358
KOR	197	156	528	166	223	254	293	215	327	446	267	827	297	315	169	196	295	24	129	0	83	396
SVN	78	114	118	81	218	155	114	106	138	184	177	143	90	155	50	56	133	27	66	52	0	136
PRT	355	485	845	377	590	641	679	575	744	868	844	1091	525	675	290	247	558	61	308	331	109	0

HOL  
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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
AUS	0	448	804	428	780	720	579	760	804	686	826	981	430	503	476	297	519	494	80	390	283	108	471
BEL	390	0	574	477	786	611	531	690	657	647	909	678	372	491	263	236	385	482	76	370	223	137	483
CAN	719	543	0	780	1744	1088	1185	1217	1385	1587	1179	2800	810	967	351	372	1084	962	127	402	596	160	844
CHE	365	476	621	0	877	574	521	557	643	689	764	847	360	489	237	216	375	467	69	330	239	111	437
DEU	401	663	617	582	0	1932	1284	1986	1581	2149	2239	2532	923	1435	427	371	1112	1467	182	535	485	246	884
DFS	468	533	775	484	868	0	892	1378	1267	1341	1544	1592	689	1036	443	380	761	1013	136	515	397	192	754
ESP	437	513	695	413	584	612	0	1030	990	1216	972	1405	653	810	308	364	792	788	112	391	429	157	722
FRA	453	636	662	456	698	576	664	0	1333	1492	1690	2155	755	1219	469	351	1048	1071	124	505	438	156	733
GBR	662	665	1374	616	773	848	792	716	0	1467	1493	1890	718	988	457	389	829	939	129	671	446	178	816
ITA	534	623	1238	609	1056	980	881	696	1198	0	1514	2310	870	1222	385	371	987	1178	156	489	547	213	917
NLD	674	1010	1002	719	1225	1103	814	835	1209	1205	0	2020	743	1162	568	376	852	1244	165	620	413	202	857
USA	793	584	2712	737	882	965	867	948	1667	1636	1544	0	1058	1403	520	460	1596	1406	171	519	743	186	1076
HUN	299	301	700	282	530	480	487	430	577	697	533	939	0	651	263	293	555	774	95	310	378	120	550
POL	319	392	674	341	725	647	498	607	716	853	843	1112	484	0	296	281	676	969	150	368	435	192	737
NZL	379	207	298	196	246	280	250	225	355	297	503	435	199	182	0	206	306	313	38	327	169	57	281
ZAF	272	202	342	184	252	294	329	242	357	323	334	481	244	202	183	0	304	295	47	233	218	70	308
JPN	256	203	345	192	230	275	269	240	307	316	290	398	217	208	138	186	0	688	94	309	441	118	530
CZE	307	360	633	325	856	573	530	603	650	826	1033	1010	651	645	204	216	195	0	115	371	426	180	678
EST	38	46	54	32	85	62	45	43	58	73	97	99	54	81	16	20	20	61	0	56	59	45	97
IRL	356	359	383	324	378	410	377	396	726	450	564	482	262	271	268	219	174	281	29	0	181	86	358
KOR	197	156	528	166	223	254	293	215	327	446	267	827	297	315	115	169	196	295	24	129	0	82	396
SVN	78	113	118	81	217	155	116	106	138	183	176	142	89	154	42	50	56	133	27	66	52	0	135
PRT	355	486	845	377	590	641	682	575	744	868	844	1091	525	675	217	290	247	558	61	308	331	109	0

HOL  
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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
AUS	0	455	804	428	780	719	576	760	804	686	826	981	417	503	297	511	494	80	389	285	108	471
BEL	391	0	579	478	792	615	530	701	663	650	940	693	368	494	238	390	484	76	372	224	137	483
CAN	719	543	0	780	1744	1088	1183	1217	1385	1587	1179	2800	796	967	372	1076	961	127	402	598	160	844
CHE	365	477	621	0	877	574	519	557	643	689	764	847	354	489	216	375	467	69	330	240	111	437
DEU	401	664	617	582	0	1932	1277	1986	1581	2149	2239	2532	905	1435	371	1109	1467	182	535	487	246	884
DFS	468	534	775	484	868	0	887	1378	1267	1341	1544	1592	674	1036	380	755	1013	136	515	398	192	754
ESP	435	509	694	411	577	607	0	1025	985	1212	967	1401	642	807	362	781	786	111	390	431	156	720
FRA	453	637	662	456	698	576	657	0	1333	1492	1690	2155	737	1219	351	1035	1071	124	505	440	156	733
GBR	662	665	1374	616	773	848	787	716	0	1467	1493	1890	703	988	389	823	939	129	668	447	178	816
ITA	534	623	1238	609	1056	980	876	696	1198	0	1514	2310	866	1222	371	982	1178	156	489	549	213	917
NLD	674	1034	1002	719	1225	1103	809	835	1209	1205	0	2020	725	1162	376	845	1244	165	620	414	202	857
USA	792	585	2712	737	882	966	864	948	1667	1636	1544	0	1028	1403	460	1576	1405	171	519	745	186	1076
HUN	287	292	686	278	521	471	471	422	561	690	520	913	0	645	284	545	761	95	303	377	120	548
POL	319	392	674	341	725	647	495	607	716	853	843	1112	480	0	281	674	969	150	368	436	192	737
ZAF	272	202	342	184	252	294	327	242	357	323	334	481	233	202	0	301	295	47	233	219	70	308
JPN	256	203	345	192	230	275	269	240	307	316	290	398	211	208	186	0	687	93	307	443	118	530
CZE	307	360	633	325	856	573	527	603	650	826	1033	1010	639	645	216	195	0	115	371	427	180	678
EST	38	46	54	32	85	62	44	43	58	73	97	99	54	81	20	20	61	0	56	59	45	97
IRL	356	359	383	324	378	410	376	396	723	450	564	482	254	271	219	174	281	29	0	182	86	358
KOR	198	156	529	166	223	254	294	216	327	447	267	831	296	316	169	197	296	24	129	0	83	397
SVN	78	113	118	81	217	155	114	106	138	183	176	142	89	154	50	56	133	27	66	53	0	135
PRT	355	486	845	377	590	641	680	575	744	868	844	1091	522	675	290	247	558	61	308	332	109	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
AUS	0	404	657	386	637	547	502	611	629	621	614	644	375	390	305	354	74	312	163	105	366	156	266
BEL	380	0	565	452	749	553	532	675	576	639	792	572	406	258	282	398	76	310	142	137	411	136	260
CAN	619	538	0	744	1675	930	1186	1215	1204	1583	1025	2387	861	345	780	831	125	336	416	160	725	220	638
CHE	354	452	591	0	766	510	516	543	589	663	636	734	401	231	291	375	68	282	162	109	369	128	266
DEU	375	641	605	516	0	1688	1259	1882	1364	2121	1953	2075	1271	397	830	1226	178	436	342	246	758	208	685
DFS	422	495	744	442	813	0	788	1146	1022	1264	1322	1194	877	354	520	797	129	400	251	188	627	208	483
ESP	409	517	697	411	578	564	0	1036	880	1219	876	1235	713	309	611	683	111	322	299	158	626	213	493
FRA	417	633	662	447	629	537	675	0	1048	1484	1291	1459	1056	459	711	890	121	391	292	156	608	185	551
GBR	563	598	1216	560	700	744	684	608	0	1367	1193	1513	843	348	571	757	118	477	294	176	670	215	504
ITA	514	622	1236	589	1047	932	887	696	1118	0	1436	2089	1124	376	821	1054	155	430	388	213	809	235	692
NLD	551	864	886	605	1099	1004	738	718	975	1149	0	1408	1001	443	596	1056	159	482	267	199	704	205	529
USA	603	545	2440	656	787	865	761	682	1446	1562	1098	0	1206	346	1036	1146	161	393	501	183	870	250	759
POL	264	328	615	276	628	567	407	521	622	779	735	991	0	217	549	833	138	284	334	182	635	178	508
NZL	323	205	296	193	239	249	252	225	287	295	404	306	138	0	190	222	37	262	100	56	212	102	143
JPN	216	175	305	173	204	244	227	210	259	289	248	340	185	114	0	518	81	204	284	106	394	159	382
CZE	247	304	555	260	725	488	435	474	531	740	915	842	569	154	173	0	106	277	298	173	568	194	573
EST	38	46	54	32	84	59	45	43	55	73	93	96	72	16	20	55	0	49	50	45	89	39	83
IRL	308	320	340	287	337	348	325	330	496	406	467	407	219	225	150	223	29	0	100	84	285	122	200
KOR	124	113	372	122	160	176	190	161	208	319	174	566	258	74	139	209	21	77	0	70	271	115	253
SVN	77	113	118	80	217	153	117	106	136	183	175	142	144	42	52	129	27	66	47	0	128	61	111
PRT	293	409	702	311	509	528	561	477	599	757	686	884	589	164	204	469	56	248	234	102	0	197	402
ZAF	149	123	199	104	140	179	180	143	187	197	173	248	145	89	114	144	18	113	79	43	185	0	163
HUN	204	207	560	209	387	351	334	321	399	536	372	687	390	108	165	481	47	177	196	82	392	138	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	455	804	428	780	720	576	637	804	686	826	978	430	502	476	519	494	80	390	285	84	471
BEL	391	0	577	476	791	613	534	644	661	648	938	688	375	493	267	391	484	76	371	224	108	482
CAN	719	543	0	780	1744	1088	1176	1058	1385	1587	1179	2785	810	966	351	1084	962	127	402	600	137	844
CHE	365	477	621	0	877	574	522	519	643	689	764	843	360	487	237	375	467	69	330	240	88	437
DEU	401	664	617	582	0	1932	1286	1803	1581	2149	2239	2522	923	1430	427	1112	1467	182	535	487	213	883
DFS	468	534	775	484	868	0	891	1213	1267	1341	1544	1590	689	1033	443	761	1013	136	514	399	160	753
ESP	439	519	697	414	592	617	0	957	992	1222	979	1402	657	815	313	789	793	112	396	433	130	729
FRA	436	611	629	442	604	568	667	0	1196	1426	1408	1730	710	1136	390	894	1027	120	460	411	134	693
GBR	662	665	1374	616	773	848	800	704	0	1467	1493	1884	718	987	457	829	939	129	670	447	147	814
ITA	534	623	1238	609	1056	980	888	687	1198	0	1514	2304	870	1222	385	987	1178	156	489	550	181	917
NLD	674	1034	1002	719	1225	1103	824	766	1209	1205	0	2014	743	1160	568	852	1244	165	620	414	164	857
USA	790	583	2689	732	875	963	867	790	1659	1630	1537	0	1055	1398	519	1592	1401	170	516	747	157	1073
HUN	299	301	700	282	530	480	489	427	577	697	533	937	0	650	263	555	774	95	310	379	105	550
POL	319	392	674	341	725	647	502	575	716	853	843	1108	484	0	296	675	969	150	368	436	169	737
NZL	379	207	298	196	246	280	253	219	355	297	503	433	199	182	0	306	313	38	327	171	47	281
JPN	256	202	344	192	231	275	269	240	307	316	290	398	217	208	138	0	688	94	309	444	96	530
CZE	307	360	633	325	856	573	536	587	650	826	1033	1005	651	645	204	196	0	115	371	427	153	677
EST	38	46	54	32	85	62	45	43	58	73	97	99	54	81	16	20	61	0	56	59	42	97
IRL	356	359	383	324	378	410	383	392	726	450	564	481	262	271	268	174	281	29	0	182	65	358
KOR	198	156	529	166	223	254	296	213	327	447	267	831	298	316	115	197	296	24	129	0	71	397
SVN	61	87	101	66	191	128	95	90	112	154	143	121	76	135	35	41	112	23	52	46	0	110
PRT	355	486	845	377	590	641	688	566	744	868	844	1084	525	675	217	246	558	61	308	332	89	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	455	804	428	780	720	582	760	804	686	826	981	430	503	476	519	494	80	377	84	471

BEL	391	0	579	478	792	615	538	701	663	650	940	693	375	494	267	392	484	76	360	108	483
CAN	719	543	0	780	1744	1088	1187	1217	1385	1587	1179	2800	810	967	351	1084	962	127	388	137	844
CHE	365	477	621	0	877	574	523	557	643	689	764	847	360	489	237	375	467	69	321	89	437
DEU	401	664	617	582	0	1932	1290	1986	1581	2149	2239	2531	923	1435	427	1112	1467	182	517	214	884
DFS	468	534	775	484	868	0	898	1378	1267	1341	1544	1592	689	1036	443	761	1013	136	491	161	754
ESP	439	519	697	414	592	617	0	1038	998	1222	982	1411	657	817	314	795	794	112	383	130	729
FRA	453	637	662	456	698	576	675	0	1333	1492	1690	2155	755	1219	469	1048	1071	124	476	134	733
GBR	662	663	1373	616	771	847	797	715	0	1467	1493	1890	718	988	457	829	939	129	633	148	816
ITA	534	623	1238	609	1056	980	888	696	1196	0	1514	2309	870	1222	385	987	1178	156	480	182	917
NLD	674	1034	1002	719	1225	1103	824	835	1207	1205	0	2019	743	1162	568	852	1244	165	584	165	857
USA	793	585	2712	737	881	966	873	948	1667	1636	1543	0	1058	1402	520	1596	1405	171	493	157	1076
HUN	299	301	700	282	530	480	489	430	577	697	533	939	0	651	263	555	774	95	299	105	550
POL	319	392	674	341	725	647	502	607	716	853	843	1112	484	0	296	676	969	150	357	170	737
NZL	379	207	298	196	246	280	254	225	355	297	503	435	199	182	0	306	313	38	313	47	281
JPN	256	202	344	192	231	275	269	241	307	316	290	398	217	208	138	0	688	94	295	96	530
CZE	307	360	633	325	856	573	536	603	649	826	1033	1010	651	645	204	196	0	115	356	154	678
EST	38	46	54	32	85	62	45	43	58	73	97	99	54	81	16	20	61	0	55	42	97
IRL	354	358	382	322	376	409	380	391	702	448	556	476	260	271	264	174	280	29	0	65	347
SVN	61	87	101	66	191	128	95	90	112	155	144	120	76	135	35	41	112	23	52	0	110
PRT	355	487	845	377	590	641	689	575	744	868	845	1091	526	675	217	246	558	61	308	89	0

HOL

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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	414	742	395	734	672	525	581	739	634	747	908	393	466	478	467	71	356	72	443
BEL	341	0	571	473	782	608	535	624	654	644	891	671	364	488	377	481	76	357	108	484
CAN	650	542	0	780	1744	1088	1188	1041	1385	1587	1148	2792	796	966	1067	961	127	388	137	851
CHE	318	474	621	0	877	574	524	503	643	689	753	844	354	487	373	467	69	321	88	442
DEU	348	661	617	582	0	1932	1293	1777	1581	2149	2201	2526	905	1429	1104	1467	182	517	213	892
DFS	406	532	775	484	868	0	901	1191	1267	1341	1517	1578	674	1033	750	1013	136	491	160	761
ESP	377	524	698	416	597	621	0	939	999	1225	967	1410	647	818	784	795	113	384	130	737
FRA	365	590	603	417	571	543	638	0	1173	1409	1362	1701	695	1126	874	1016	120	435	134	693
GBR	577	662	1373	616	771	847	802	661	0	1467	1469	1883	703	987	816	939	129	630	147	820
ITA	453	623	1238	609	1056	980	893	662	1196	0	1499	2307	866	1222	980	1178	156	480	181	921
NLD	562	974	955	697	1195	1080	800	705	1169	1182	0	1910	718	1149	813	1234	164	579	164	853
USA	687	580	2712	737	880	966	873	745	1666	1636	1334	0	1028	1400	1543	1403	171	491	157	1083
HUN	253	292	686	278	521	471	476	409	561	690	504	913	0	644	544	761	95	294	105	551
POL	276	391	674	341	725	647	504	564	716	853	835	1112	480	0	673	969	150	357	169	742
JPN	233	202	344	191	230	275	270	233	305	316	286	396	211	208	0	685	93	291	96	534
CZE	271	359	633	325	856	573	538	568	649	826	1017	1009	639	645	195	0	115	356	153	680
EST	32	46	54	32	85	62	46	43	58	73	96	99	54	81	20	61	0	55	42	97
IRL	324	358	382	322	376	409	382	363	699	448	546	476	253	271	174	280	29	0	65	349
SVN	52	87	101	66	191	128	95	90	112	154	143	121	76	135	41	112	23	52	0	110
PRT	319	490	848	381	595	647	698	567	751	871	836	1097	527	680	246	562	61	309	89	0

HOL

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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
BEL	0	524	379	593	559	477	584	598	482	734	611	384	332	129	88	398	44	258
CAN	522	0	632	1337	991	1075	1011	1288	1289	958	2603	810	372	353	115	710	75	635
CHE	385	512	0	614	455	421	432	523	523	550	668	344	255	139	71	340	45	257
DEU	530	537	426	0	1380	1034	1365	1170	1415	1587	1846	1086	378	280	162	648	114	645
DFS	516	772	396	738	0	810	1186	1254	918	1282	1569	805	488	218	130	622	82	488
ESP	473	629	320	465	572	0	885	897	938	827	1283	671	346	257	109	608	69	490
FRA	572	601	353	478	543	612	0	1170	962	1167	1700	860	434	252	109	589	73	549
GBR	625	1300	485	618	845	697	662	0	1065	1201	1871	766	625	251	120	676	80	511
ITA	490	1066	464	711	755	657	548	912	0	1012	1654	836	330	319	139	671	98	623
NLD	802	854	517	942	999	674	663	977	884	0	1431	1023	499	231	129	677	100	522
USA	560	2597	575	702	965	739	745	1664	1309	1070	0	1163	490	420	132	887	96	772
CZE	301	543	241	666	479	433	459	523	613	887	829	0	280	246	122	546	63	569

IRL	344	379	248	295	409	340	363	693	333	478	476	218	0	90	50	283	29	202
KOR	103	327	108	138	157	170	145	179	274	154	482	174	71	0	55	232	26	216
SVN	72	88	54	147	108	82	75	97	121	111	102	90	42	39	0	95	24	85
PRT	400	696	290	479	524	545	473	591	645	660	881	451	245	203	75	0	51	397
EST	26	30	19	45	37	24	27	37	43	56	40	33	16	11	11	31	0	53
HUN	206	555	201	377	352	332	319	396	506	368	685	475	176	170	62	386	27	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
BEL	0	436	583	300	435	600	499	795	610	351	225	305	140	425	285	485	107	57	217
CHE	442	0	693	261	393	603	586	700	799	350	237	277	162	599	266	486	87	57	229
DEU	519	486	0	775	1154	1175	1552	1639	1854	1024	638	334	325	1185	517	1041	208	142	562
DFS	240	205	323	0	425	627	527	788	686	436	220	275	132	323	262	414	83	60	224
FRA	408	325	432	173	0	761	937	906	1101	668	516	259	254	733	402	706	127	91	453
GBR	626	577	621	352	473	0	1150	1349	1836	699	462	561	294	983	481	927	146	103	443
ITA	503	513	736	359	508	963	0	1125	1812	863	628	330	376	1230	551	1011	169	124	583
NLD	870	665	970	504	552	1098	945	0	1642	980	463	490	263	813	489	876	164	130	449
USA	550	706	704	343	520	1654	1377	1214	0	1072	840	446	499	1972	650	1335	156	125	685
CZE	276	247	638	231	377	482	628	854	778	0	419	230	289	682	412	617	150	86	487
JPN	142	143	169	107	172	217	244	208	288	150	0	142	261	592	275	511	86	61	319
IRL	319	281	273	205	236	625	326	467	439	179	110	0	89	263	172	331	60	35	153
KOR	111	122	160	77	157	207	312	171	566	203	138	69	0	383	243	293	67	44	238
CAN	448	521	523	248	469	1041	1047	801	2166	498	259	291	356	0	500	884	133	91	537
PRT	285	225	378	192	349	420	525	459	674	340	161	150	207	504	0	441	103	69	309
ESP	489	386	460	272	491	749	701	734	815	386	192	337	187	568	379	0	129	89	435
SVN	85	66	192	58	88	112	148	144	121	112	40	48	44	101	82	95	0	39	99
EST	37	26	63	25	36	48	61	79	63	47	18	21	21	47	49	38	22	0	70
HUN	173	174	327	146	274	348	457	312	610	407	140	131	186	505	311	290	74	41	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	135	74	89	44	145	228	123	16	11
CAN	139	0	63	116	48	71	371	137	13	15
DFS	48	47	0	85	52	75	124	104	16	28
GBR	87	120	76	0	50	71	147	100	13	29
ITA	43	46	49	50	0	36	64	57	14	16
NZL	146	72	52	72	32	0	143	97	16	13
USA	224	369	88	154	68	150	0	241	29	27
ZAF	125	135	83	97	57	93	246	0	25	21
NLD	12	8	11	11	11	13	30	20	0	3
CHE	9	13	27	27	17	11	27	21	2	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	135	74	89	44	145	228	116	16	19
CAN	139	0	63	116	48	71	371	126	13	21
DFS	48	47	0	85	52	75	124	95	16	39
GBR	87	120	76	0	50	71	147	95	13	37
ITA	43	46	49	50	0	36	64	57	14	24
NZL	146	72	52	72	32	0	143	88	16	20
USA	224	369	88	154	68	150	0	221	29	35
ZAF	119	126	77	93	57	85	228	0	25	34
NLD	12	8	11	11	11	13	30	20	0	7
CHE	16	19	37	35	24	17	35	33	5	0



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	134	74	89	44	145	116	15	227	23
CAN	138	0	63	116	48	71	126	12	371	25
DFS	48	47	0	85	52	75	95	16	124	41
GBR	87	120	76	0	50	71	95	13	147	40
ITA	43	46	49	50	0	36	57	14	64	27
NZL	146	72	52	72	32	0	88	15	143	24
ZAF	119	126	77	93	57	85	0	24	221	38
NLD	12	8	11	11	11	13	20	0	28	9
USA	223	369	88	154	68	150	228	29	0	39
CHE	19	21	39	38	26	21	36	6	39	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	USA	ZAF	NLD	CHE
AUS	0	135	71	88	44	228	122	3	23
CAN	139	0	63	116	48	371	137	4	25
DFS	46	47	0	83	52	124	103	6	41
GBR	86	120	74	0	50	147	100	7	40
ITA	43	46	49	50	0	64	57	5	27
USA	224	369	88	154	68	0	240	11	39
ZAF	124	135	82	97	57	245	0	9	38
NLD	1	3	6	6	4	10	8	0	4
CHE	19	21	39	38	26	39	36	4	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	135	74	89	44	145	228	123	16	23
CAN	139	0	63	116	48	71	371	137	13	25
DFS	48	47	0	85	52	75	124	104	16	41
GBR	87	120	76	0	50	71	147	100	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	52	72	32	0	143	97	16	24
USA	224	369	88	154	68	150	0	241	29	39
ZAF	125	135	83	97	57	93	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9
CHE	19	21	39	38	26	21	39	36	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	USA	ZAF	NLD	CHE
AUS	0	135	74	89	44	145	228	123	16	23
CAN	139	0	63	116	48	71	371	137	13	25
DFS	48	47	0	85	52	75	124	104	16	41
GBR	87	120	76	0	50	71	147	100	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	52	72	32	0	143	97	16	24
USA	224	369	88	154	68	150	0	241	29	39
ZAF	125	135	83	97	57	93	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9

CHE 19 21 39 38 26 21 39 36 6 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	135	74	89	44	145	228	123	16	23
CAN	139	0	63	116	48	71	371	137	13	25
DFS	48	47	0	85	52	75	124	104	16	41
GBR	87	120	76	0	50	71	147	100	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	52	72	32	0	143	97	16	24
USA	224	369	88	154	68	150	0	241	29	39
ZAF	125	135	83	97	57	93	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9
CHE	19	21	39	38	26	21	39	36	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	ITA	ZAF	NLD	USA	CHE
AUS	0	121	62	42	95	16	192	23
CAN	124	0	63	48	112	13	371	25
DFS	43	47	0	52	74	16	124	41
ITA	41	46	49	0	51	14	64	27
ZAF	94	106	59	49	0	22	187	38
NLD	11	8	11	11	15	0	29	9
USA	185	369	88	68	182	30	0	39
CHE	19	21	39	26	36	6	39	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	USA	ZAF	NLD	CHE
AUS	0	135	71	88	44	228	122	16	23
CAN	139	0	63	116	48	371	137	13	25
DFS	46	47	0	83	52	124	103	16	41
GBR	86	120	74	0	50	147	100	13	40
ITA	43	46	49	50	0	64	57	14	27
USA	224	369	88	154	68	0	240	29	39
ZAF	124	135	82	97	57	245	0	25	38
NLD	12	8	11	11	11	30	20	0	9
CHE	19	21	39	38	26	39	36	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	USA	ZAF	NLD	CHE
AUS	0	135	74	89	44	145	228	123	16	23
CAN	139	0	63	116	48	71	371	137	13	25
DFS	48	47	0	85	52	75	124	104	16	41
GBR	87	120	76	0	50	71	147	100	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	52	72	32	0	143	97	16	24
USA	224	369	88	154	68	150	0	241	29	39
ZAF	125	135	83	97	57	93	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9
CHE	19	21	39	38	26	21	39	36	6	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	135	71	89	44	145	228	123	16	23
CAN	139	0	57	116	48	71	371	137	13	25
DFS	46	45	0	76	52	68	117	97	16	41
GBR	87	120	71	0	50	70	147	99	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	46	71	32	0	143	96	16	24
USA	224	369	83	154	68	150	0	241	29	39
ZAF	125	135	80	96	57	92	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9
CHE	19	21	39	38	26	21	39	36	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	USA	ZAF	NLD	CHE
AUS	0	135	74	89	44	145	228	123	16	23
CAN	139	0	63	116	48	71	371	137	13	25
DFS	48	47	0	85	52	75	124	104	16	41
GBR	87	120	76	0	50	71	147	100	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	52	72	32	0	143	97	16	24
USA	224	369	88	154	68	150	0	241	29	39
ZAF	125	135	83	97	57	93	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9
CHE	19	21	39	38	26	21	39	36	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	USA	ZAF	NLD	CHE
AUS	0	135	71	88	44	228	122	16	23
CAN	139	0	63	116	48	368	137	13	25
DFS	46	47	0	83	52	124	103	16	41
GBR	86	119	74	0	50	147	100	13	40
ITA	43	46	49	50	0	64	57	14	27
USA	224	367	88	154	68	0	240	29	39
ZAF	124	135	82	97	57	245	0	25	38
NLD	12	8	11	11	11	30	20	0	9
CHE	19	21	39	38	26	39	36	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	USA	ZAF	NLD	CHE
AUS	0	135	74	89	44	145	228	123	16	23
CAN	139	0	63	116	48	71	371	137	13	25
DFS	48	47	0	85	52	75	124	104	16	41
GBR	87	120	76	0	50	71	147	100	13	40
ITA	43	46	49	50	0	36	64	57	14	27
NZL	146	72	52	72	32	0	143	97	16	24
USA	224	369	88	154	68	150	0	241	29	39
ZAF	125	135	83	97	57	93	246	0	25	38
NLD	12	8	11	11	11	13	30	20	0	9

CHE 19 21 39 38 26 21 39 36 6 0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	135	71	88	44	228	115	16	23
CAN	139	0	63	116	48	371	126	13	25
DFS	46	47	0	83	52	124	94	16	41
GBR	86	120	74	0	50	147	95	13	40
ITA	43	46	49	50	0	64	57	14	27
USA	224	369	88	154	68	0	220	29	39
ZAF	118	126	76	93	57	227	0	25	38
NLD	12	8	11	11	11	30	20	0	9
CHE	19	21	39	38	26	39	36	6	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE
AUS	0	116	56	113	102	14	172	23
CAN	117	0	53	71	123	13	371	25
DFS	39	42	0	61	86	16	110	41
NZL	107	72	42	0	83	16	143	24
ZAF	105	120	69	76	0	25	216	38
NLD	10	8	11	13	20	0	29	9
USA	173	369	78	150	215	30	0	39
CHE	19	21	39	21	36	6	39	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0	135	74	35	44	145	228	16	19
CAN	139	0	63	37	48	71	371	13	21
DFS	48	47	0	30	52	75	124	16	39
GBR	40	43	28	0	14	37	37	4	3
ITA	43	46	49	15	0	36	64	14	24
NZL	146	72	52	41	32	0	143	16	20
USA	224	369	88	40	68	150	0	29	35
NLD	12	8	11	5	11	13	30	0	7
CHE	16	19	37	4	24	17	35	5	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE
AUS	0	135	71	89	145	228	16	19
CAN	139	0	57	116	71	368	13	21
DFS	46	45	0	76	68	117	16	39
GBR	87	119	71	0	68	147	13	37
NZL	146	72	46	69	0	143	16	20
USA	224	367	83	154	150	0	29	35
NLD	12	8	11	11	13	30	0	7
CHE	16	19	37	35	17	35	5	0

JER

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common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	0	125	64	82	40	211	15	18
CAN	129	0	63	116	48	371	13	21
DFS	41	47	0	83	52	124	16	39
GBR	80	119	74	0	50	147	13	37
ITA	38	46	49	50	0	64	14	24
USA	201	369	88	154	68	0	29	35
NLD	11	8	11	11	11	30	0	7
CHE	16	19	37	35	24	35	5	0

JER

JER

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	9	39	9	12	20	13	7	1
CAN	23	0	8	117	61	4	33	136	3	0
DEU	9	8	0	35	1	8	4	1	11	0
DFS	28	116	24	0	43	69	56	66	29	0
GBR	8	59	1	40	0	0	24	48	1	0
NOR	8	4	7	47	0	0	7	0	19	0
NZL	19	31	4	53	21	6	0	21	2	2
USA	13	130	1	62	43	0	20	0	2	0
NLD	7	3	11	28	1	19	2	2	0	0
CAM	1	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	NZL	USA	NLD	CAM	NOR
AUS	0	23	9	39	9	20	13	7	2	4
CAN	23	0	8	117	61	33	136	3	0	1
DEU	9	8	0	35	1	4	1	9	0	3
DFS	28	116	24	0	43	54	66	27	0	27
GBR	8	59	1	40	0	24	48	1	0	0
NZL	19	31	4	51	21	0	21	2	3	2
USA	13	130	1	62	43	20	0	2	0	0
NLD	7	3	9	26	1	2	2	0	0	8
CAM	2	0	0	0	0	3	0	0	0	0
NOR	3	1	2	13	0	2	0	8	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	9	39	9	4	20	13	7	2
CAN	23	0	8	117	61	1	33	134	3	0
DEU	9	8	0	35	1	3	4	1	10	0
DFS	28	116	24	0	43	43	54	66	27	0
GBR	8	59	1	40	0	0	24	47	1	0
NOR	3	1	2	25	0	0	3	0	14	0
NZL	19	31	4	51	21	3	0	21	2	3
USA	13	129	1	62	42	0	20	0	2	0
NLD	7	3	10	26	1	14	2	2	0	0

CAM 2 0 0 0 0 0 3 0 0 0

RDC

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	USA	NLD	CAM
AUS	0	23	9	39	9	13	7	2
CAN	23	0	8	117	61	136	3	0
DEU	9	8	0	35	1	1	9	0
DFS	28	116	24	0	43	66	24	0
GBR	8	59	1	40	0	48	1	0
USA	13	130	1	62	43	0	2	0
NLD	7	3	9	24	1	2	0	0
CAM	2	0	0	0	0	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	9	39	9	12	20	13	7	2
CAN	23	0	8	117	61	4	33	136	3	0
DEU	9	8	0	35	1	9	4	1	11	0
DFS	28	116	24	0	43	78	53	66	28	0
GBR	8	59	1	40	0	0	24	48	1	0
NOR	8	4	8	54	0	0	7	0	19	0
NZL	19	31	4	48	21	6	0	21	2	3
USA	13	130	1	62	43	0	20	0	2	0
NLD	7	3	11	27	1	19	2	2	0	0
CAM	2	0	0	0	0	0	3	0	0	0

RDC

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR
AUS	0	23	9	39	9	20	13	7	2	4
CAN	23	0	8	117	61	33	136	3	0	1
DEU	9	8	0	35	1	4	1	11	0	3
DFS	28	116	24	0	43	54	66	28	0	27
GBR	8	59	1	40	0	24	48	1	0	0
NZL	19	31	4	51	21	0	21	2	3	2
USA	13	130	1	62	43	20	0	2	0	0
NLD	7	3	11	27	1	2	2	0	0	8
CAM	2	0	0	0	0	3	0	0	0	0
NOR	3	1	2	13	0	2	0	8	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	9	39	9	12	20	13	7	2
CAN	23	0	8	117	61	4	33	136	3	0
DEU	9	8	0	35	1	9	4	1	11	0
DFS	28	116	24	0	43	81	56	66	29	0
GBR	8	59	1	40	0	0	24	48	1	0
NOR	8	4	8	56	0	0	7	0	19	0
NZL	19	31	4	53	21	6	0	21	2	3
USA	13	130	1	62	43	0	20	0	2	0
NLD	7	3	11	28	1	19	2	2	0	0

CAM 2 0 0 0 0 0 3 0 0 0

RDC

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM
AUS	0	20	9	38	12	7	11	2
CAN	20	0	8	116	4	3	136	0
DEU	9	8	0	35	9	9	1	0
DFS	27	115	24	0	78	26	66	0
NOR	8	4	8	54	0	19	0	0
NLD	7	3	9	25	19	0	2	0
USA	11	130	1	62	0	2	0	0
CAM	2	0	0	0	0	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	6	39	9	12	13	7	2
CAN	23	0	5	117	61	4	136	3	0
DEU	6	5	0	23	1	7	1	9	0
DFS	28	116	16	0	43	78	66	27	0
GBR	8	59	1	40	0	0	48	1	0
NOR	8	4	6	54	0	0	0	19	0
USA	13	130	1	62	43	0	0	2	0
NLD	7	3	9	26	1	19	2	0	0
CAM	2	0	0	0	0	0	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	9	39	9	12	20	13	7	2
CAN	23	0	8	117	61	4	33	136	3	0
DEU	9	8	0	35	1	9	4	1	9	0
DFS	28	116	24	0	43	81	56	66	27	0
GBR	8	59	1	40	0	0	24	48	1	0
NOR	8	4	8	56	0	0	7	0	19	0
NZL	19	31	4	53	21	6	0	21	2	3
USA	13	130	1	62	43	0	20	0	2	0
NLD	7	3	9	26	1	19	2	2	0	0
CAM	2	0	0	0	0	0	3	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	9	39	9	12	20	13	7	2
CAN	23	0	8	117	61	4	33	136	3	0
DEU	9	8	0	35	1	9	4	1	10	0
DFS	28	116	24	0	43	78	54	66	27	0
GBR	8	59	1	40	0	0	24	48	1	0
NOR	8	4	8	54	0	0	7	0	19	0
NZL	19	31	4	50	21	6	0	21	2	3
USA	13	130	1	62	43	0	20	0	2	0
NLD	7	3	10	26	1	19	2	2	0	0
CAM	2	0	0	0	0	0	3	0	0	0







