

## Introduction

The latest routine international evaluation for conformation traits took place as scheduled at the Interbull Centre. Data from twenty five (26) countries were included in this evaluation.

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

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

For a full list of trait definitions applied by countries please refer to the file confdoc\_DEFINITION{runid}.itb  
Changes in national procedures

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

FRA (HOL, BSW)	Base change. HOL: French Holstein breeding organisations have made the choice to suspend the publication of EBVs for bulls that entered progeny testing and produced daughters but were not subsequently placed on the market as public breeding bulls based on their progeny test results. As consequence, around 1000 bulls are now missing or their publication status have changed from official to unofficial
ITA (HOL, JER)	Base change. HOL: changed the publication rules causing bulls to not be submitted any longer
IRL (ALL)	Pedigree verification
POL (HOL)	New definition of UPG groups, pedigree pruning, new genetic base, applied new coding for status and type of proof for MACE according to new recommendation from the ITB.
AUS (ALL)	Pedigree verification. JER: OCS, OUS: update in the calculation of the linears that go into the composite traits. the calculation of the Jersey composite involved: 1. Linears are adjusted to reflect mainly optimal traits. 2. Raw composites are calculated using weights on adjusted linears 3. Raw composites are adjusted for scale (number of linears included) and scaled. 4. ocs (Overall conformation score) is calculated from adjusted composites JER OFL: first time
DFS (ALL)	Drops in information due to editing
CAN (ALL)	Base change
EST (HOL)	New genetic base: cows born in years 2018-2022, updated definition of herd (dairy groups within big cowbarns of some owners have different herd code), causing drops in EDC due to daughters of bull having smaller number of herdmates in the new herds
DEU (ALL)	Base change
JPN (HOL)	Base change
CHE (ALL)	Base change, drops in information due to manual edits
GBR (ALL)	Base change
SVN (HOL, BSW)	Base change. Re-estimated variance components and heritability. HOL: Time period for data inclusion has been shifted forward by five years (data from 2015 to 2025 are used).
BEL (HOL)	Slight drops in information due to pedigree verification.
ITA (BSW)	Base change
NZL (ALL)	Pedigree verification
ESP (HOL)	Base change
NLD (ALL)	Base change
PRT (HOL)	Pedigree verification. Applied the new classification of type of proofs and status of bulls according to new recommendation from Interbull Centre.

## INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

A new document called confdoc\_DEFINITION{runid}.itb has been introduced reporting all the trait definitions applied by countries as reported in the PREP.

Direct Gestation Length (ges) has been added as the fifth trait in the calving evaluation starting from the August 2025 MACE routine evaluation, and therefore added in the calv{BRD}{RUNID}.itb and calv{BRD}{RUNID}.ipr.

During 2023-2024, Interbull Centre and the Interbull Technical Committee (ITC) have worked on developing a new procedures for adjusting of the international correlations after a given test run in case countries would decide NOT TO implement the changes tested in the next routine run. Until now, the relative difference between the previous routine's and test run's correlations, for each pair of countries, was assessed and the average value of the two was used whenever such difference did

exceed a threshold of 0.01. Otherwise, correlations from the latest test run were used. However, in some cases, the difference in correlations between routine/test runs were way above a 1% difference so that by using the average value the newly derived correlations would still be greatly affected by the changes tested but not implemented. This remark has been made in few occasions by some participating countries. A new approach proposed by Peter Sullivan, was developed and extensively tested. The new approach is based on first identifying the relative impact of the changes tested by a country during the test run (but not implemented in a routine run) and then correcting the whole correlation matrix detracting such estimated impact. This new approach would assure that the new correlations would be free from any effect from any changes tested but not implemented. The new procedure has been fully developed during 2023 and extensively tested during 2024 and introduced officially in the April 2025 routine evaluation.

#### 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

#### NEXT ROUTINE INTERNATIONAL EVALUATION

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

NEXT TEST INTERNATIONAL EVALUATION

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

From 2025 an extra MACE test run has been scheduled in May, data submissions' deadline and target for distribution of results are all reported in the above link.

PUBLICATION OF INTERBULL ROUTINE RUN

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

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

PUBLICATION OF INTERBULL TEST RUN

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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 (April Routine Evaluation 2026).  
Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		50	4096	794	268	
BEL			1833			
CAN	269	110	13313	903	937	
CHE	1700		3311	59		
CZE			4702			
DEA	3940					
DEU			22242		295	
DFS			12646	2173	6596	
ESP			4841			
EST			1048			
FRA	470		15503			
FRM						
GBR	26	237	6813	481	357	
HUN			2753			
IRL			2154			
ISR						
ITA	2360		8355	74		
JPN			6653			
KOR			1713			
LTU						
LVA			1604		632	
NLD	160		16014	65	64	
NOR					2644	
NZL			7502	4516	624	
POL			10029			
PRT			3155			
SVK						
SVN	280		567			
URY						



CHE	0.94	10.53							
FRA	0.97	0.96	0.92						
ITA	0.93	0.93	0.93	23.08					
NLD	0.95	0.91	0.95	0.91	4.53				
USA	0.97	0.94	0.97	0.91	0.94	1.58			
DEA	0.97	0.94	0.96	0.93	0.90	0.97	11.69		
SVN	0.90	0.88	0.89	0.89	0.90	0.90	0.88	21.78	
GBR	0.96	0.94	0.97	0.93	0.96	0.96	0.91	0.92	1.97

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BSW	rw1								
	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	7.36								
CHE	0.89	10.18							
FRA	0.96	0.87	0.96						
NLD	0.93	0.85	0.93	4.32					
USA	0.91	0.86	0.86	0.80	1.00				
DEA	0.90	0.88	0.92	0.77	0.89	13.23			
GBR	0.92	0.84	0.90	0.88	0.93	0.80	1.17		
SVN	0.89	0.79	0.93	0.86	0.81	0.88	0.86	24.83	
ITA	0.88	0.79	0.90	0.78	0.88	0.87	0.86	0.90	19.01

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BSW	rls								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.81								
CHE	0.92	12.71							
FRA	0.92	0.93	0.97						
ITA	0.91	0.85	0.92	23.63					
NLD	0.87	0.84	0.88	0.83	5.01				
USA	0.95	0.90	0.91	0.86	0.84	1.05			
DEA	0.91	0.91	0.93	0.89	0.79	0.90	12.06		
SVN	0.86	0.82	0.89	0.84	0.79	0.87	0.90	22.49	
GBR	0.85	0.85	0.90	0.83	0.86	0.82	0.87	0.79	1.50

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BSW	fan								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.59								
CHE	0.68	13.87							
FRA	0.74	0.75	1.04						
ITA	0.69	0.84	0.81	21.09					
NLD	0.72	0.67	0.82	0.70	5.06				
USA	0.80	0.73	0.81	0.86	0.80	0.95			
DEA	0.62	0.86	0.69	0.87	0.65	0.63	11.52		
SVN	0.68	0.77	0.71	0.78	0.67	0.74	0.79	24.26	
GBR	0.79	0.71	0.84	0.72	0.87	0.82	0.67	0.75	1.26

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BSW	hde								
	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA	
CAN	8.23								
CHE	0.83	12.00							
FRA	0.80	0.81	1.07						
ITA	0.79	0.83	0.82	20.68					
NLD	0.74	0.73	0.81	0.72	5.06				
DEA	0.74	0.87	0.85	0.92	0.76	11.89			
SVN	0.80	0.86	0.86	0.88	0.74	0.91	31.41		
USA	0.83	0.72	0.80	0.89	0.80	0.80	0.81	0.95	

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BSW	fua								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.89								

CHE	0.84	12.30							
FRA	0.89	0.87	0.84						
ITA	0.88	0.85	0.86	19.03					
NLD	0.88	0.83	0.86	0.86	4.74				
USA	0.93	0.84	0.86	0.92	0.87	1.52			
DEA	0.81	0.84	0.90	0.82	0.75	0.83	11.00		
SVN	0.73	0.70	0.78	0.81	0.79	0.74	0.88	20.85	
GBR	0.91	0.85	0.87	0.87	0.90	0.90	0.76	0.61	1.48

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BSW      ruh

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.57								
CHE	0.90	11.97							
FRA	0.85	0.83	0.87						
ITA	0.75	0.84	0.87	12.83					
NLD	0.75	0.80	0.87	0.82	4.16				
USA	0.82	0.79	0.88	0.84	0.89	1.14			
DEA	0.85	0.84	0.91	0.92	0.81	0.80	11.64		
SVN	0.77	0.75	0.81	0.84	0.87	0.82	0.87	19.86	
GBR	0.71	0.78	0.86	0.80	0.86	0.90	0.75	0.77	1.77

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BSW      ruw

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	
CAN	8.40								
CHE	0.91	11.73							
FRA	0.84	0.88	0.83						
ITA	0.78	0.88	0.79	14.13					
NLD	0.70	0.66	0.79	0.68	4.16				
USA	0.86	0.90	0.87	0.88	0.79	1.08			
DEA	0.84	0.89	0.76	0.95	0.54	0.89	12.06		
SVN	0.82	0.80	0.76	0.83	0.63	0.83	0.85	20.92	

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BSW      usu

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.75								
CHE	0.90	11.86							
FRA	0.83	0.91	0.87						
ITA	0.87	0.90	0.88	19.05					
NLD	0.80	0.81	0.86	0.80	4.26				
USA	0.83	0.89	0.86	0.86	0.90	1.25			
DEA	0.92	0.93	0.90	0.92	0.73	0.84	11.32		
SVN	0.84	0.85	0.73	0.80	0.65	0.75	0.86	20.13	
GBR	0.78	0.78	0.84	0.83	0.91	0.92	0.73	0.65	2.70

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BSW      ude

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.16								
CHE	0.95	12.16							
FRA	0.95	0.96	0.97						
ITA	0.94	0.96	0.97	19.67					
NLD	0.95	0.94	0.95	0.93	4.37				
USA	0.96	0.94	0.96	0.95	0.94	1.41			
DEA	0.92	0.96	0.95	0.97	0.94	0.92	12.17		
SVN	0.91	0.94	0.92	0.95	0.95	0.93	0.95	22.39	
GBR	0.96	0.93	0.95	0.94	0.96	0.95	0.89	0.93	2.14

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BSW      ftp

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	7.26								

CHE	0.97	13.91							
FRA	0.97	0.96	0.89						
NLD	0.96	0.95	0.96	5.48					
USA	0.91	0.89	0.87	0.92	1.39				
DEA	0.95	0.98	0.95	0.95	0.90	10.93			
SVN	0.93	0.94	0.93	0.96	0.90	0.96	17.64		
GBR	0.94	0.91	0.89	0.93	0.94	0.91	0.92	1.41	
ITA	0.87	0.86	0.86	0.86	0.87	0.86	0.87	0.87	20.70

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BSW ftl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.60								
CHE	0.90	14.59							
FRA	0.95	0.95	0.97						
ITA	0.94	0.94	0.95	17.89					
NLD	0.92	0.96	0.92	0.92	5.15				
USA	0.93	0.96	0.96	0.94	0.96	1.98			
DEA	0.90	0.98	0.98	0.95	0.94	0.96	11.00		
SVN	0.90	0.91	0.90	0.90	0.92	0.90	0.92	18.39	
GBR	0.95	0.95	0.93	0.94	0.97	0.97	0.92	0.93	1.56

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BSW rtp

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA	
CAN	7.00								
CHE	0.98	14.39							
FRA	0.97	0.98	0.88						
ITA	0.92	0.95	0.94	19.68					
NLD	0.96	0.94	0.95	0.91	5.31				
DEA	0.96	0.99	0.97	0.96	0.93	11.85			
SVN	0.93	0.92	0.93	0.91	0.95	0.93	17.43		
USA	0.95	0.94	0.94	0.92	0.96	0.96	0.94	1.41	

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BSW ocs

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.92								
CHE	0.77	8.97							
FRA	0.72	0.79	0.98						
ITA	0.67	0.78	0.82	7.00					
NLD	0.73	0.69	0.77	0.69	3.86				
USA	0.80	0.69	0.79	0.67	0.82	0.55			
DEA	0.75	0.88	0.83	0.76	0.61	0.64	10.33		
SVN	0.60	0.67	0.63	0.59	0.60	0.62	0.77	19.20	
GBR	0.74	0.81	0.84	0.78	0.85	0.85	0.66	0.71	1.76

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BSW ous

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.30								
CHE	0.80	13.64							
FRA	0.88	0.82	0.91						
ITA	0.82	0.88	0.87	7.84					
NLD	0.89	0.83	0.88	0.83	5.00				
USA	0.89	0.77	0.80	0.79	0.87	0.89			
DEA	0.81	0.92	0.77	0.87	0.79	0.75	12.40		
SVN	0.75	0.79	0.71	0.76	0.80	0.74	0.90	18.94	
GBR	0.77	0.82	0.74	0.81	0.77	0.85	0.74	0.76	1.59

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BSW ofl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.45								

CHE	0.81	11.14											
FRA	0.63	0.63	1.65										
ITA	0.59	0.62	0.65	11.71									
NLD	0.65	0.65	0.73	0.63	4.33								
USA	0.59	0.61	0.64	0.67	0.65	0.89							
DEA	0.61	0.79	0.61	0.58	0.58	0.57	10.96						
SVN	0.71	0.83	0.62	0.60	0.63	0.64	0.87	25.77					
GBR	0.66	0.75	0.80	0.67	0.72	0.71	0.64	0.63	1.47				

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BSW ofr  
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	CAN	CHE	DEA	ITA	SVN	USA	FRA						
CAN	6.93												
CHE	0.80	11.35											
DEA	0.80	0.87	11.31										
ITA	0.74	0.90	0.86	15.97									
SVN	0.75	0.81	0.79	0.81	21.46								
USA	0.75	0.79	0.89	0.84	0.81	1.84							
FRA	0.74	0.89	0.90	0.89	0.85	0.88	0.84						

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BSW tpl  
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	CAN	CHE	DEA	ITA	SVN	FRA							
CAN	7.37												
CHE	0.87	12.17											
DEA	0.87	0.88	11.75										
ITA	0.91	0.91	0.87	23.46									
SVN	0.88	0.87	0.84	0.87	24.37								
FRA	0.95	0.91	0.92	0.89	0.86	1.25							

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BSW oru  
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	CAN	CHE	DEA	ITA	SVN	USA	FRA						
CAN	7.85												
CHE	0.75	15.86											
DEA	0.76	0.86	12.43										
ITA	0.79	0.76	0.72	13.50									
SVN	0.75	0.56	0.72	0.78	24.49								
USA	0.89	0.57	0.50	0.75	0.65	1.00							
FRA	0.85	0.87	0.83	0.89	0.72	0.83	1.22						

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BSW rle  
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	CHE	DEA	ITA	SVN	USA	FRA							
CHE	11.66												
DEA	0.94	12.16											
ITA	0.82	0.85	19.01										
SVN	0.79	0.77	0.83	23.78									
USA	0.55	0.51	0.77	0.70	1.00								
FRA	0.93	0.94	0.87	0.79	0.73	1.03							

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BSW thp  
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	CAN	CHE	DEA	ITA	SVN	USA	FRA						
CAN	7.59												
CHE	0.84	10.85											
DEA	0.81	0.81	11.96										
ITA	0.87	0.90	0.84	29.94									
SVN	0.74	0.83	0.85	0.88	30.18								
USA	0.89	0.86	0.71	0.82	0.72	1.58							
FRA	0.88	0.83	0.86	0.82	0.75	0.78	0.97						

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BSW hoq  
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	CAN	CHE	DEA	ITA	SVN	FRA
CAN	7.04					
CHE	0.91	12.11				
DEA	0.91	0.89	12.61			
ITA	0.90	0.85	0.85	19.28		
SVN	0.93	0.89	0.92	0.88	21.59	
FRA	0.91	0.85	0.88	0.87	0.88	1.00

BSW ful

	CHE	DEA	ITA	SVN	FRA
CHE	11.64				
DEA	0.92	12.08			
ITA	0.92	0.95	13.38		
SVN	0.84	0.91	0.86	21.59	
FRA	0.76	0.86	0.78	0.74	0.86

BSW udb

	CHE	DEA	ITA	SVN	FRA
CHE	12.15				
DEA	0.95	13.37			
ITA	0.92	0.95	26.08		
SVN	0.84	0.86	0.85	23.88	
FRA	0.92	0.89	0.86	0.84	0.89

BSW tdi

	CHE	DEA	ITA	SVN	FRA
CHE	15.70				
DEA	0.96	11.27			
ITA	0.94	0.94	20.20		
SVN	0.91	0.94	0.91	18.28	
FRA	0.97	0.98	0.91	0.93	0.86

BSW tth

	CHE	DEA	ITA	SVN	FRA
CHE	14.24				
DEA	0.98	12.84			
ITA	0.93	0.95	23.09		
SVN	0.87	0.87	0.88	20.40	
FRA	0.93	0.94	0.95	0.87	0.90

GUE sta

	CAN	GBR	USA	AUS
CAN	6.81			
GBR	0.97	1.22		
USA	0.98	0.96	2.78	
AUS	0.89	0.92	0.90	0.79

GUE cwi

	CAN	GBR	USA	AUS
CAN	7.00			
GBR	0.92	1.87		
USA	0.85	0.84	1.60	
AUS	0.72	0.81	0.64	0.37

GUE bde

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	CAN	GBR	USA	AUS
CAN	6.47			
GBR	0.88	1.58		
USA	0.75	0.88	1.73	
AUS	0.81	0.78	0.69	0.43

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GUE ang

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	CAN	GBR	USA	AUS
CAN	8.02			
GBR	0.88	1.67		
USA	0.87	0.91	1.99	
AUS	0.67	0.78	0.68	0.40

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GUE ran

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	CAN	GBR	USA	AUS
CAN	6.47			
GBR	0.97	1.70		
USA	0.97	0.97	2.33	
AUS	0.91	0.94	0.90	0.73

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GUE rwi

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	CAN	GBR	USA	AUS
CAN	7.17			
GBR	0.93	1.63		
USA	0.92	0.92	1.89	
AUS	0.85	0.85	0.77	0.63

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GUE rls

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	CAN	GBR	USA	AUS
CAN	8.58			
GBR	0.81	1.86		
USA	0.93	0.79	1.07	
AUS	0.72	0.80	0.72	0.30

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GUE rlr

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	CAN	USA	AUS
CAN	7.00		
USA	0.84	0.93	
AUS	0.59	0.52	0.15

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GUE fan

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	CAN	GBR	USA	AUS
CAN	9.13			
GBR	0.78	1.76		
USA	0.84	0.75	1.01	
AUS	0.62	0.75	0.65	0.27

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GUE fua

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	CAN	GBR	USA	AUS
CAN	7.22			
GBR	0.94	1.44		
USA	0.92	0.92	2.20	
AUS	0.79	0.78	0.76	0.35

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GUE ruh				
	CAN	GBR	USA	AUS
CAN	7.01			
GBR	0.71	2.03		
USA	0.80	0.91	1.83	
AUS	0.76	0.76	0.75	0.39

GUE usu				
	CAN	GBR	USA	AUS
CAN	6.98			
GBR	0.78	1.63		
USA	0.79	0.86	1.58	
AUS	0.76	0.79	0.76	0.31

GUE ude				
	CAN	GBR	USA	AUS
CAN	6.33			
GBR	0.97	1.46		
USA	0.95	0.95	2.26	
AUS	0.90	0.91	0.89	0.54

GUE ftp				
	CAN	GBR	USA	AUS
CAN	5.96			
GBR	0.95	1.28		
USA	0.92	0.92	1.91	
AUS	0.93	0.92	0.86	0.39

GUE ftl				
	CAN	GBR	USA	AUS
CAN	4.97			
GBR	0.94	1.95		
USA	0.94	0.97	2.07	
AUS	0.94	0.94	0.93	0.78

GUE rtp			
	CAN	AUS	USA
CAN	5.41		
AUS	0.89	0.32	
USA	0.93	0.89	1.91

GUE ocs				
	CAN	GBR	USA	AUS
CAN	7.69			
GBR	0.77	2.19		
USA	0.74	0.86	0.90	
AUS	0.58	0.63	0.56	0.72

GUE ous				
	CAN	GBR	USA	AUS
CAN	8.01			
GBR	0.79	1.62		
USA	0.87	0.83	1.00	















GBR	0.65	0.69	0.76	0.89	0.86	0.86	0.84	0.88	1.00													
ITA	0.52	0.71	0.69	0.80	0.76	0.80	0.86	0.88	0.81	0.79												
NLD	0.54	0.64	0.71	0.82	0.87	0.89	0.85	0.87	0.87	0.81	2.99											
USA	0.59	0.63	0.74	0.86	0.81	0.86	0.84	0.86	0.88	0.85	0.86	0.87										
HUN	0.56	0.71	0.70	0.81	0.81	0.71	0.77	0.77	0.81	0.79	0.72	0.76	1.10									
POL	0.56	0.81	0.68	0.80	0.78	0.71	0.75	0.79	0.79	0.80	0.74	0.76	0.75	15.03								
NZL	0.76	0.49	0.68	0.66	0.66	0.62	0.63	0.58	0.72	0.54	0.66	0.70	0.61	0.54	0.30							
JPN	0.57	0.79	0.75	0.91	0.71	0.72	0.79	0.81	0.77	0.81	0.76	0.81	0.74	0.83	0.55	0.57						
CZE	0.58	0.67	0.78	0.82	0.85	0.75	0.77	0.78	0.80	0.73	0.77	0.76	0.83	0.74	0.65	0.70	12.96					
EST	0.46	0.57	0.61	0.58	0.63	0.56	0.55	0.58	0.56	0.55	0.59	0.55	0.62	0.56	0.48	0.57	0.66	18.60				
IRL	0.55	0.46	0.63	0.68	0.60	0.64	0.64	0.66	0.81	0.65	0.62	0.66	0.62	0.65	0.59	0.56	0.58	0.48	0.46			
KOR	0.56	0.55	0.54	0.58	0.55	0.56	0.65	0.63	0.55	0.64	0.57	0.60	0.56	0.64	0.50	0.59	0.55	0.58	0.40	6.06		
SVN	0.61	0.76	0.64	0.80	0.72	0.79	0.63	0.76	0.81	0.74	0.68	0.71	0.64	0.84	0.53	0.75	0.66	0.63	0.63	0.58	15.50	
PRT	0.52	0.62	0.62	0.69	0.73	0.73	0.76	0.77	0.80	0.77	0.78	0.76	0.68	0.76	0.51	0.75	0.68	0.56	0.58	0.62	0.65	0.29

HOL ous

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	JPN	CZE	EST	IRL	SVN	PRT	
AUS	1.31																					
BEL	0.68	1.29																				
CAN	0.70	0.81	6.45																			
CHE	0.80	0.84	0.92	11.66																		
DEU	0.72	0.80	0.90	0.91	13.47																	
DFS	0.66	0.83	0.89	0.85	0.85	13.92																
ESP	0.74	0.68	0.76	0.86	0.82	0.69	0.71															
FRA	0.67	0.80	0.88	0.93	0.91	0.88	0.80	0.96														
GBR	0.84	0.68	0.78	0.85	0.80	0.69	0.86	0.74	1.46													
ITA	0.69	0.79	0.85	0.92	0.86	0.84	0.84	0.90	0.82	1.17												
NLD	0.68	0.81	0.89	0.94	0.90	0.84	0.81	0.91	0.77	0.85	4.78											
USA	0.74	0.71	0.87	0.89	0.83	0.72	0.84	0.79	0.87	0.85	0.85	1.16										
HUN	0.73	0.78	0.82	0.86	0.86	0.75	0.81	0.78	0.79	0.77	0.75	0.77	1.21									
POL	0.73	0.82	0.75	0.80	0.80	0.72	0.71	0.76	0.80	0.80	0.75	0.75	0.72	14.53								
NZL	0.81	0.67	0.79	0.88	0.78	0.67	0.78	0.77	0.85	0.73	0.83	0.87	0.77	0.75	0.42							
JPN	0.76	0.81	0.88	0.92	0.87	0.76	0.77	0.83	0.84	0.87	0.85	0.87	0.79	0.86	0.81	0.73						
CZE	0.67	0.86	0.88	0.90	0.91	0.88	0.76	0.90	0.74	0.84	0.85	0.77	0.88	0.76	0.73	0.83	12.85					
EST	0.68	0.82	0.87	0.87	0.85	0.92	0.75	0.88	0.74	0.85	0.83	0.73	0.82	0.69	0.71	0.76	0.88	16.60				
IRL	0.81	0.66	0.67	0.77	0.67	0.65	0.82	0.66	0.94	0.75	0.68	0.82	0.70	0.71	0.81	0.74	0.66	0.69	0.48			
SVN	0.82	0.79	0.76	0.79	0.77	0.73	0.68	0.72	0.82	0.71	0.76	0.77	0.75	0.86	0.73	0.79	0.75	0.69	0.74	15.42		
PRT	0.70	0.68	0.74	0.76	0.74	0.68	0.76	0.71	0.79	0.75	0.76	0.77	0.70	0.75	0.75	0.79	0.70	0.69	0.74	0.69	0.42	

HOL ofl

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	JPN	CZE	EST	IRL	SVN	PRT		
AUS	0.85																					
BEL	0.72	1.74																				
CAN	0.37	0.62	4.75																			
CHE	0.61	0.75	0.83	11.40																		
DEU	0.41	0.76	0.71	0.79	11.58																	
DFS	0.35	0.57	0.78	0.73	0.73	12.56																
ESP	0.43	0.69	0.74	0.77	0.70	0.79	0.76															
FRA	0.59	0.80	0.67	0.77	0.75	0.57	0.75	0.96														
GBR	0.55	0.73	0.66	0.79	0.72	0.67	0.78	0.84	1.62													
ITA	0.55	0.73	0.60	0.71	0.71	0.56	0.73	0.78	0.67	1.56												
NLD	0.51	0.82	0.66	0.74	0.76	0.58	0.65	0.81	0.73	0.67	4.83											
USA	0.55	0.69	0.61	0.78	0.72	0.64	0.75	0.69	0.72	0.79	0.68	1.45										
HUN	0.64	0.75	0.56	0.61	0.68	0.56	0.56	0.76	0.62	0.71	0.67	0.68	1.19									
POL	0.53	0.66	0.56	0.68	0.66	0.56	0.62	0.66	0.56	0.73	0.56	0.77	0.73	18.87								
JPN	0.48	0.63	0.66	0.78	0.77	0.69	0.70	0.58	0.58	0.74	0.59	0.85	0.59	0.76	0.54							
CZE	0.55	0.75	0.61	0.73	0.78	0.57	0.66	0.67	0.62	0.79	0.62	0.82	0.79	0.82	0.79	17.26						
EST	0.51	0.66	0.57	0.60	0.67	0.57	0.59	0.68	0.58	0.59	0.77	0.59	0.68	0.59	0.59	0.65	19.34					
IRL	0.62	0.69	0.61	0.80	0.65	0.63	0.68	0.68	0.81	0.66	0.63	0.67	0.63	0.60	0.67	0.60	0.42	0.66				
SVN	0.44	0.75	0.58	0.67	0.69	0.57	0.59	0.70	0.60	0.66	0.69	0.67	0.82	0.76	0.70	0.71	0.67	0.66	24.64			
PRT	0.35	0.56	0.56	0.56	0.57	0.56	0.60	0.66	0.58	0.67	0.62	0.60	0.64	0.60	0.56	0.59	0.65	0.44	0.61	0.19		

HOL loc

	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CZE	IRL	KOR	SVN	PRT	EST	HUN	POL	
BEL	1.81																			
CAN	0.85	6.56																		
CHE	0.57	0.61	12.49																	
DEU	0.68	0.75	0.69	11.38																
DFS	0.88	0.92	0.51	0.69	13.16															
ESP	0.63	0.74	0.69	0.73	0.75	0.84														
FRA	0.79	0.77	0.74	0.82	0.69	0.76	0.96													
GBR	0.65	0.68	0.89	0.81	0.65	0.79	0.84	1.52												
ITA	0.59	0.68	0.64	0.73	0.60	0.77	0.76	0.73	1.90											
NLD	0.84	0.82	0.71	0.82	0.78	0.70	0.82	0.78	0.64	4.25										
USA	0.65	0.78	0.50	0.77	0.74	0.74	0.72	0.67	0.74	0.68	1.52									
CZE	0.51	0.59	0.56	0.61	0.60	0.65	0.62	0.63	0.70	0.50	0.59	20.23								
IRL	0.57	0.59	0.57	0.65	0.54	0.67	0.70	0.75	0.63	0.65	0.58	0.51	0.76							
KOR	0.55	0.53	0.51	0.50	0.51	0.54	0.56	0.51	0.50	0.51	0.50	0.51	0.51	9.86						
SVN	0.78	0.74	0.56	0.83	0.79	0.74	0.83	0.71	0.68	0.68	0.75	0.65	0.63	0.53	29.07					
PRT	0.50	0.50	0.52	0.56	0.50	0.60	0.53	0.59	0.60	0.51	0.50	0.57	0.50	0.50	0.56	1.74				
EST	0.53	0.51	0.52	0.57	0.52	0.51	0.55	0.54	0.51	0.59	0.51	0.52	0.53	0.61	0.63	0.52	22.28			
HUN	0.68	0.68	0.50	0.65	0.73	0.64	0.75	0.66	0.65	0.63	0.66	0.83	0.52	0.51	0.79	0.55	0.58	1.09		
POL	0.54	0.64	0.54	0.68	0.56	0.58	0.69	0.55	0.68	0.52	0.72	0.73	0.54	0.51	0.79	0.52	0.52	0.66	18.48	

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HOL	bcs																			
BEL	0.94																			
CHE	0.71	11.62																		
DEU	0.71	0.91	14.08																	
FRA	0.71	0.93	0.95	0.94																
GBR	0.74	0.90	0.90	0.92	1.59															
ITA	0.71	0.90	0.95	0.96	0.90	6.42														
NLD	0.71	0.94	0.96	0.95	0.91	0.93	5.01													
USA	0.76	0.71	0.81	0.81	0.75	0.78	0.75	1.35												
CZE	0.72	0.88	0.96	0.92	0.89	0.94	0.93	0.77	13.85											
JPN	0.75	0.92	0.97	0.97	0.91	0.96	0.95	0.84	0.95	1.69										
IRL	0.71	0.86	0.79	0.87	0.95	0.83	0.85	0.71	0.78	0.86	0.46									
KOR	0.71	0.75	0.83	0.85	0.79	0.83	0.79	0.72	0.81	0.87	0.72	2.32								
CAN	0.72	0.93	0.97	0.95	0.93	0.94	0.95	0.82	0.94	0.98	0.87	0.83	5.76							
PRT	0.71	0.82	0.87	0.87	0.86	0.84	0.85	0.72	0.84	0.86	0.76	0.79	0.87	1.60						
ESP	0.74	0.87	0.93	0.94	0.92	0.92	0.91	0.75	0.92	0.94	0.83	0.83	0.94	0.88	1.02					
SVN	0.72	0.87	0.93	0.88	0.82	0.90	0.91	0.72	0.92	0.90	0.73	0.81	0.87	0.75	0.83	20.24				
EST	0.72	0.83	0.91	0.88	0.78	0.89	0.89	0.81	0.88	0.90	0.72	0.73	0.90	0.78	0.83	0.84	16.81			
HUN	0.71	0.86	0.93	0.92	0.86	0.94	0.90	0.76	0.95	0.93	0.77	0.82	0.93	0.84	0.91	0.90	0.84	0.98		
NZL	0.71	0.90	0.91	0.92	0.90	0.90	0.87	0.71	0.86	0.91	0.87	0.82	0.91	0.83	0.86	0.85	0.82	0.88	0.16	
POL	0.72	0.86	0.91	0.89	0.89	0.90	0.87	0.75	0.91	0.92	0.81	0.79	0.90	0.81	0.87	0.87	0.83	0.91	0.85	13.42

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JER	sta									
AUS	0.52									
CAN	0.89	6.95								
DFS	0.89	0.97	11.68							
GBR	0.90	0.96	0.94	1.16						
ITA	0.87	0.95	0.93	0.95	1.78					
NZL	0.86	0.84	0.86	0.90	0.88	0.37				
USA	0.88	0.97	0.95	0.96	0.95	0.89	1.38			
ZAF	0.86	0.86	0.84	0.92	0.88	0.89	0.85	8.60		
NLD	0.87	0.95	0.96	0.94	0.92	0.85	0.94	0.87	5.02	
CHE	0.89	0.96	0.95	0.95	0.92	0.85	0.94	0.86	0.97	11.49

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JER	cwi									
AUS	0.30									
CAN	0.75	6.55								
DFS	0.74	0.79	15.52							
GBR	0.82	0.91	0.84	1.83						

ITA	0.65	0.76	0.69	0.72	1.56					
NZL	0.82	0.72	0.66	0.74	0.66	0.37				
USA	0.74	0.89	0.79	0.84	0.90	0.68	0.89			
ZAF	0.66	0.76	0.75	0.78	0.73	0.75	0.75	8.41		
NLD	0.72	0.90	0.88	0.89	0.71	0.68	0.82	0.78	4.76	
CHE	0.68	0.86	0.85	0.83	0.81	0.68	0.84	0.71	0.88	12.16

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JER      bde  
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	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0.32									
CAN	0.78	5.70								
DFS	0.76	0.86	13.79							
GBR	0.74	0.87	0.86	1.58						
ITA	0.70	0.73	0.78	0.84	1.56					
NZL	0.79	0.69	0.70	0.69	0.70	0.37				
ZAF	0.80	0.72	0.81	0.79	0.71	0.74	8.55			
NLD	0.70	0.81	0.83	0.88	0.87	0.70	0.78	4.41		
USA	0.68	0.70	0.73	0.76	0.90	0.69	0.71	0.86	0.89	
CHE	0.74	0.87	0.92	0.89	0.83	0.71	0.78	0.89	0.81	13.08

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JER      ang  
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	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.33								
CAN	0.68	7.16							
DFS	0.69	0.69	11.64						
GBR	0.81	0.83	0.70	1.40					
ITA	0.74	0.84	0.83	0.84	1.78				
USA	0.70	0.83	0.69	0.83	0.79	0.90			
ZAF	0.62	0.63	0.66	0.79	0.82	0.67	8.47		
NLD	0.72	0.83	0.76	0.81	0.80	0.75	0.65	5.50	
CHE	0.66	0.78	0.75	0.72	0.75	0.73	0.65	0.78	10.14

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JER      ran  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.35									
CAN	0.88	5.72								
DFS	0.89	0.96	11.47							
GBR	0.94	0.95	0.95	1.33						
ITA	0.88	0.95	0.94	0.95	1.63					
NZL	0.89	0.89	0.88	0.92	0.90	0.31				
USA	0.89	0.95	0.96	0.97	0.94	0.91	1.14			
ZAF	0.88	0.88	0.88	0.89	0.88	0.88	0.88	8.79		
NLD	0.91	0.97	0.95	0.96	0.94	0.89	0.94	0.91	4.86	
CHE	0.91	0.96	0.95	0.95	0.94	0.91	0.94	0.89	0.95	13.56

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JER      rwi  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.32									
CAN	0.81	6.24								
DFS	0.80	0.91	12.00							
GBR	0.80	0.92	0.85	1.38						
ITA	0.77	0.85	0.81	0.84	1.55					
NZL	0.87	0.82	0.79	0.80	0.80	0.31				
USA	0.76	0.81	0.80	0.84	0.87	0.78	0.86			
ZAF	0.77	0.78	0.78	0.80	0.79	0.77	0.78	9.00		
NLD	0.85	0.93	0.91	0.87	0.79	0.84	0.81	0.79	5.03	
CHE	0.83	0.92	0.82	0.85	0.79	0.81	0.79	0.78	0.92	13.36

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JER      rls  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.19									
CAN	0.68	6.35								
DFS	0.68	0.90	12.53							
GBR	0.72	0.84	0.74	1.65						
ITA	0.68	0.85	0.81	0.79	1.89					
NZL	0.66	0.66	0.67	0.67	0.68	0.12				
USA	0.67	0.95	0.86	0.86	0.84	0.66	0.83			
ZAF	0.69	0.68	0.67	0.72	0.67	0.77	0.69	11.70		
NLD	0.73	0.91	0.90	0.84	0.84	0.67	0.87	0.73	3.92	
CHE	0.74	0.92	0.87	0.79	0.79	0.68	0.85	0.70	0.91	9.82

JER rlr

	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE
AUS	0.19							
CAN	0.52	6.36						
DFS	0.53	0.81	13.71					
ITA	0.55	0.82	0.72	1.38				
ZAF	0.51	0.51	0.52	0.55	11.91			
NLD	0.57	0.86	0.89	0.74	0.60	5.36		
USA	0.49	0.69	0.61	0.83	0.51	0.73	0.83	
CHE	0.60	0.68	0.62	0.61	0.54	0.70	0.57	12.35

JER fan

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0.22								
CAN	0.61	6.72							
DFS	0.62	0.87	12.71						
GBR	0.70	0.79	0.76	1.50					
ITA	0.62	0.75	0.68	0.70	1.46				
USA	0.61	0.87	0.83	0.85	0.80	0.77			
ZAF	0.65	0.65	0.65	0.81	0.65	0.73	9.41		
NLD	0.68	0.73	0.77	0.85	0.70	0.76	0.69	4.11	
CHE	0.64	0.81	0.81	0.69	0.70	0.76	0.66	0.71	12.44

JER fua

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.39									
CAN	0.73	5.80								
DFS	0.69	0.86	12.70							
GBR	0.75	0.94	0.86	1.72						
ITA	0.68	0.86	0.74	0.87	1.55					
NZL	0.81	0.73	0.72	0.79	0.69	0.42				
USA	0.74	0.93	0.87	0.91	0.90	0.73	1.38			
ZAF	0.70	0.90	0.88	0.92	0.77	0.76	0.88	11.66		
NLD	0.73	0.89	0.85	0.91	0.85	0.79	0.88	0.81	5.62	
CHE	0.76	0.92	0.85	0.87	0.81	0.70	0.87	0.88	0.88	11.66

JER ruh

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.36									
CAN	0.72	6.57								
DFS	0.73	0.82	10.66							
GBR	0.79	0.78	0.83	1.42						
ITA	0.71	0.72	0.79	0.82	1.40					
NZL	0.71	0.73	0.77	0.76	0.79	0.41				
USA	0.77	0.82	0.90	0.90	0.84	0.76	1.11			
ZAF	0.80	0.70	0.78	0.86	0.84	0.75	0.83	9.08		
NLD	0.74	0.75	0.91	0.87	0.81	0.81	0.88	0.75	4.42	
CHE	0.78	0.91	0.85	0.80	0.71	0.76	0.84	0.74	0.82	12.56

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JER	usu									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.40									
CAN	0.75	6.23								
DFS	0.71	0.82	13.40							
GBR	0.79	0.85	0.85	1.75						
ITA	0.68	0.76	0.74	0.83	1.55					
NZL	0.58	0.59	0.59	0.61	0.64	0.40				
USA	0.75	0.82	0.90	0.85	0.83	0.59	0.90			
ZAF	0.73	0.75	0.71	0.79	0.62	0.59	0.73	9.77		
NLD	0.83	0.81	0.88	0.91	0.79	0.60	0.89	0.79	4.73	
CHE	0.79	0.90	0.85	0.81	0.78	0.61	0.83	0.74	0.85	12.70

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JER	ude									
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.36									
CAN	0.93	5.62								
DFS	0.89	0.93	12.22							
GBR	0.91	0.97	0.93	1.48						
ITA	0.92	0.95	0.94	0.94	1.68					
USA	0.89	0.96	0.95	0.94	0.95	1.63				
ZAF	0.88	0.88	0.88	0.89	0.88	0.88	10.19			
NLD	0.90	0.96	0.96	0.95	0.95	0.95	0.90	5.25		
CHE	0.94	0.95	0.93	0.93	0.95	0.95	0.89	0.96	9.53	

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JER	ftp									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.45									
CAN	0.89	6.21								
DFS	0.88	0.92	12.69							
GBR	0.91	0.94	0.88	1.33						
ITA	0.87	0.88	0.87	0.87	1.60					
NZL	0.87	0.92	0.87	0.88	0.87	0.31				
USA	0.86	0.95	0.92	0.93	0.87	0.89	1.16			
ZAF	0.87	0.93	0.87	0.92	0.87	0.89	0.89	9.99		
NLD	0.92	0.97	0.94	0.93	0.87	0.90	0.91	0.90	5.32	
CHE	0.92	0.96	0.93	0.91	0.87	0.88	0.90	0.88	0.96	10.04

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JER	ftl									
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0.31									
CAN	0.91	5.59								
DFS	0.92	0.92	13.87							
GBR	0.91	0.93	0.95	1.44						
ITA	0.90	0.92	0.91	0.93	1.94					
USA	0.90	0.91	0.95	0.97	0.92	0.96				
ZAF	0.90	0.89	0.92	0.95	0.90	0.96	10.68			
NLD	0.92	0.93	0.96	0.97	0.92	0.95	0.92	4.40		
CHE	0.91	0.92	0.94	0.96	0.90	0.93	0.92	0.96	11.55	
NZL	0.91	0.96	0.93	0.95	0.91	0.93	0.92	0.93	0.94	0.51

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JER	rtp									
	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE		
AUS	0.29									
CAN	0.87	6.07								
DFS	0.87	0.93	13.07							
NZL	0.87	0.95	0.90	0.43						
ZAF	0.87	0.87	0.87	0.87	9.15					
NLD	0.90	0.96	0.95	0.91	0.87	5.43				

USA	0.87	0.93	0.96	0.87	0.86	0.93	1.25		
CHE	0.89	0.97	0.94	0.93	0.90	0.96	0.92	11.47	

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 JER      ocs  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0.33								
CAN	0.46	5.12							
DFS	0.47	0.61	15.08						
GBR	0.56	0.76	0.77	2.91					
ITA	0.49	0.70	0.70	0.80	1.29				
NZL	0.59	0.63	0.47	0.56	0.56	0.30			
USA	0.44	0.79	0.65	0.84	0.78	0.61	0.76		
NLD	0.52	0.71	0.84	0.87	0.80	0.61	0.82	3.77	
CHE	0.56	0.83	0.69	0.88	0.79	0.54	0.74	0.82	8.39

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 JER      ous  
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	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE	ITA
AUS	0.57								
CAN	0.68	6.23							
DFS	0.67	0.81	12.77						
GBR	0.74	0.81	0.69	1.52					
NZL	0.81	0.71	0.68	0.76	0.44				
USA	0.69	0.89	0.82	0.84	0.71	0.90			
NLD	0.69	0.89	0.85	0.78	0.80	0.87	5.80		
CHE	0.77	0.87	0.77	0.83	0.77	0.85	0.92	10.76	
ITA	0.70	0.83	0.85	0.79	0.71	0.84	0.85	0.87	1.67

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 JER      ofl  
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	CAN	DFS	GBR	ITA	USA	NLD	CHE	AUS
CAN	5.01							
DFS	0.70	13.54						
GBR	0.63	0.61	1.30					
ITA	0.60	0.67	0.65	2.00				
USA	0.62	0.62	0.64	0.74	1.28			
NLD	0.66	0.58	0.72	0.67	0.66	5.17		
CHE	0.84	0.68	0.71	0.70	0.78	0.73	11.47	
AUS	0.36	0.37	0.56	0.49	0.42	0.51	0.54	0.14

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 RDC      sta  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.67										
CAN	0.88	6.31									
DEU	0.88	0.97	13.07								
DFS	0.86	0.97	0.96	8.66							
GBR	0.91	0.96	0.96	0.93	1.33						
NOR	0.88	0.93	0.94	0.97	0.92	13.66					
NZL	0.89	0.89	0.87	0.91	0.92	0.92	0.49				
USA	0.89	0.97	0.95	0.94	0.97	0.91	0.90	2.31			
NLD	0.86	0.95	0.97	0.97	0.94	0.96	0.84	0.93	4.86		
CAM	0.93	0.90	0.90	0.90	0.90	0.90	0.89	0.90	0.90	6.10	
LVA	0.86	0.85	0.85	0.90	0.84	0.90	0.86	0.84	0.86	0.90	0.55

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 RDC      cwi  
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	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.40										
CAN	0.72	6.66									
DEU	0.71	0.89	11.63								
DFS	0.75	0.82	0.88	13.65							
GBR	0.84	0.87	0.90	0.89	1.63						

NZL	0.76	0.68	0.69	0.67	0.79	0.35					
USA	0.66	0.83	0.81	0.82	0.83	0.71	1.40				
NLD	0.72	0.92	0.92	0.89	0.91	0.68	0.81	5.70			
CAM	0.75	0.79	0.79	0.79	0.79	0.78	0.79	0.79	6.90		
NOR	0.77	0.78	0.81	0.92	0.82	0.80	0.81	0.88	0.79	14.48	
LVA	0.68	0.69	0.66	0.68	0.65	0.70	0.64	0.67	0.79	0.77	0.29

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RDC	bde										
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.49										
CAN	0.81	6.06									
DEU	0.78	0.87	9.99								
DFS	0.82	0.83	0.93	11.89							
GBR	0.79	0.86	0.92	0.91	1.60						
NOR	0.75	0.80	0.82	0.89	0.83	15.52					
NZL	0.79	0.70	0.73	0.73	0.75	0.80	0.35				
USA	0.70	0.76	0.89	0.84	0.89	0.82	0.73	1.32			
NLD	0.70	0.82	0.90	0.85	0.90	0.88	0.70	0.90	4.85		
CAM	0.86	0.82	0.84	0.83	0.83	0.82	0.85	0.83	0.83	5.82	
LVA	0.76	0.76	0.79	0.80	0.78	0.79	0.77	0.69	0.74	0.83	0.35

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RDC	ang										
	AUS	CAN	DEU	DFS	GBR	USA	NLD	CAM	NOR	LVA	
AUS	0.44										
CAN	0.67	6.77									
DEU	0.65	0.61	6.86								
DFS	0.68	0.67	0.65	7.14							
GBR	0.78	0.81	0.61	0.73	1.34						
USA	0.69	0.86	0.61	0.75	0.87	1.26					
NLD	0.72	0.83	0.61	0.76	0.83	0.77	5.16				
CAM	0.84	0.77	0.79	0.77	0.78	0.78	0.79	7.31			
NOR	0.69	0.75	0.79	0.63	0.78	0.78	0.79	0.77	16.50		
LVA	0.65	0.63	0.63	0.67	0.63	0.61	0.64	0.77	0.73	0.31	

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RDC	ran										
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.45										
CAN	0.90	5.60									
DEU	0.91	0.97	9.18								
DFS	0.90	0.95	0.95	9.98							
GBR	0.93	0.97	0.97	0.95	1.56						
NOR	0.89	0.94	0.89	0.92	0.93	12.16					
NZL	0.92	0.90	0.89	0.88	0.91	0.93	0.28				
USA	0.90	0.98	0.96	0.94	0.97	0.93	0.90	1.70			
NLD	0.91	0.97	0.98	0.96	0.97	0.94	0.89	0.96	5.55		
CAM	0.94	0.93	0.92	0.92	0.93	0.93	0.93	0.93	0.92	5.63	
LVA	0.89	0.92	0.92	0.91	0.90	0.89	0.89	0.90	0.91	0.92	0.43

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RDC	rwi										
	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.45										
CAN	0.85	6.59									
DEU	0.81	0.95	9.76								
DFS	0.82	0.93	0.91	10.48							
GBR	0.85	0.92	0.89	0.89	1.47						
NZL	0.84	0.88	0.82	0.87	0.91	0.33					
USA	0.77	0.91	0.86	0.89	0.93	0.88	1.43				
NLD	0.85	0.94	0.95	0.92	0.88	0.83	0.81	6.26			
CAM	0.87	0.86	0.86	0.87	0.86	0.86	0.86	0.86	6.85		
NOR	0.82	0.87	0.82	0.95	0.87	0.88	0.87	0.88	0.86	13.94	
LVA	0.79	0.80	0.80	0.86	0.77	0.81	0.77	0.81	0.86	0.85	0.41





LVA	0.92	0.90	0.90	0.90	0.89	0.92	0.89	0.90	0.93	0.47	
NZL	0.95	0.94	0.93	0.91	0.93	0.92	0.93	0.93	0.93	0.91	0.45

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RDC      rtp  
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	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA
AUS	0.36									
CAN	0.90	5.86								
DEU	0.89	0.96	13.75							
DFS	0.87	0.93	0.96	12.30						
NOR	0.88	0.90	0.88	0.86	13.14					
NZL	0.92	0.95	0.92	0.89	0.89	0.35				
NLD	0.90	0.97	0.97	0.95	0.87	0.93	5.05			
USA	0.89	0.91	0.95	0.91	0.91	0.89	0.96	1.46		
CAM	0.90	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.09	
LVA	0.88	0.89	0.88	0.88	0.88	0.89	0.90	0.87	0.91	0.38

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RDC      ocs  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.92									
CAN	0.63	4.78								
DEU	0.52	0.74	20.36							
DFS	0.57	0.59	0.71	9.11						
GBR	0.65	0.74	0.85	0.73	1.59					
NOR	0.51	0.68	0.64	0.85	0.75	16.25				
NZL	0.72	0.59	0.61	0.54	0.62	0.60	0.28			
USA	0.61	0.76	0.81	0.70	0.85	0.75	0.73	0.57		
NLD	0.58	0.71	0.85	0.86	0.87	0.73	0.66	0.86	3.56	
CAM	0.75	0.75	0.75	0.76	0.75	0.76	0.72	0.77	0.78	6.25

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RDC      ous  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.37									
CAN	0.73	5.42								
DEU	0.74	0.88	17.18							
DFS	0.69	0.76	0.80	10.01						
GBR	0.84	0.78	0.80	0.70	1.55					
NOR	0.72	0.80	0.79	0.78	0.82	13.08				
NZL	0.82	0.82	0.77	0.72	0.81	0.74	0.37			
USA	0.76	0.87	0.83	0.81	0.85	0.82	0.88	1.04		
NLD	0.71	0.89	0.90	0.84	0.77	0.80	0.82	0.85	4.65	
CAM	0.83	0.83	0.82	0.83	0.83	0.82	0.85	0.84	0.83	6.52

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RDC      ofl  
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	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	0.64								
CAN	0.41	4.49							
DEU	0.43	0.72	16.34						
DFS	0.38	0.78	0.77	12.99					
GBR	0.57	0.66	0.72	0.63	1.46				
NOR	0.46	0.69	0.74	0.58	0.74	13.05			
USA	0.60	0.59	0.72	0.61	0.68	0.74	1.42		
NLD	0.51	0.66	0.76	0.61	0.73	0.76	0.68	6.64	
CAM	0.56	0.75	0.75	0.75	0.75	0.75	0.74	0.75	6.89

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^LAPPENDIX II. Number of common bulls  
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BSW sta  
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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	130	89	148	43	175	133	30	24
CHE	115	0	144	377	67	201	391	67	22
FRA	81	115	0	225	66	112	220	46	18
ITA	128	331	188	0	104	235	644	85	23
NLD	35	66	56	84	0	66	98	33	14
USA	167	165	87	176	54	0	250	33	23
DEA	113	328	176	559	85	204	0	80	19
SVN	27	64	45	77	33	27	73	0	8
GBR	21	20	17	21	12	21	17	6	0

BSW cwi

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	142	55	148	36	175	131	31	24
CHE	126	0	127	482	74	267	513	71	22
FRA	49	96	0	141	48	71	150	47	14
ITA	128	424	117	0	96	235	608	86	23
NLD	31	73	44	80	0	52	92	33	14
USA	167	232	51	176	45	0	232	33	23
DEA	112	420	117	522	83	179	0	82	18
SVN	28	67	46	78	33	27	75	0	8
GBR	21	20	13	21	12	21	17	6	0

BSW bde

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	0	150	89	148	36	133	23	24	175
CHE	133	0	195	537	78	576	48	22	296
FRA	81	155	0	225	61	220	37	18	112
ITA	128	478	188	0	96	644	67	23	235
NLD	31	76	53	80	0	93	29	14	52
DEA	113	479	176	559	84	0	60	19	250
SVN	21	46	38	61	28	56	0	8	24
GBR	21	20	17	21	12	17	6	0	23
USA	167	266	87	176	45	204	22	21	0

BSW ang

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	GBR
CAN	0	149	88	25	174	24
CHE	133	0	190	57	294	22
FRA	80	152	0	45	111	18
NLD	22	58	41	0	37	11
USA	166	266	86	33	0	23
GBR	21	20	17	9	21	0

BSW ran

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	150	89	148	43	175	133	30	24
CHE	133	0	195	537	79	296	576	68	22
FRA	81	155	0	225	66	112	220	46	18
ITA	128	478	188	0	104	235	644	85	23
NLD	35	76	56	84	0	66	98	33	14
USA	167	266	87	176	54	0	250	33	23

DEA	113	479	176	559	85	204	0	80	19
SVN	27	64	45	77	33	27	73	0	8
GBR	21	20	17	21	12	21	17	6	0

BSW rwi

common bulls below diagonal  
 common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	0	150	55	43	175	133	24	23	144
CHE	133	0	127	79	296	576	22	48	530
FRA	49	96	0	48	71	150	14	37	141
NLD	35	76	44	0	66	98	14	29	102
USA	167	266	51	54	0	250	23	24	221
DEA	113	479	118	85	204	0	19	60	638
GBR	21	20	13	12	21	17	0	8	23
SVN	21	46	38	28	22	56	6	0	67
ITA	125	472	117	83	162	551	21	61	0

BSW rls

common bulls below diagonal  
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	150	89	148	43	175	133	30	24
CHE	133	0	195	537	79	296	576	68	22
FRA	81	155	0	225	66	112	220	46	18
ITA	128	478	188	0	104	235	644	85	23
NLD	35	76	56	84	0	66	98	33	14
USA	167	266	87	176	54	0	250	33	23
DEA	113	479	176	559	85	204	0	80	19
SVN	27	64	45	77	33	27	73	0	8
GBR	21	20	17	21	12	21	17	6	0

BSW fan

common bulls below diagonal  
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	150	89	148	35	175	133	30	24
CHE	133	0	195	537	77	296	576	68	22
FRA	81	155	0	225	61	112	220	46	18
ITA	128	478	188	0	95	235	644	85	23
NLD	30	75	53	79	0	51	92	33	14
USA	167	266	87	176	43	0	250	33	23
DEA	113	479	176	559	83	204	0	80	19
SVN	27	64	45	77	33	27	73	0	8
GBR	21	20	17	21	12	21	17	6	0

BSW hde

common bulls below diagonal  
 common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	0	150	89	144	35	133	30	175
CHE	133	0	195	531	77	576	68	296
FRA	81	155	0	224	61	220	46	112
ITA	125	473	188	0	94	638	85	221
NLD	30	75	53	78	0	92	33	51
DEA	113	479	176	551	83	0	80	250
SVN	27	64	45	77	33	73	0	33
USA	167	266	87	162	43	204	27	0

BSW fua

```

common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  150  55  105  35  175  100  30  24
CHE  133    0  127  366  78  295  382  70  22
FRA   49   96    0  133  47   71  140  47  14
ITA   93  317  110    0  75  137  361  80  20
NLD   30   76   43   68    0   51   80  33  14
USA  167  266   51  103  44    0  150  33  23
DEA   86  312  110  325  73  111    0  81  16
SVN   27   66   46   73  33   27   74   0   8
GBR   21   20   13   18  12   21   15   6   0
-----

```

BSW ruh

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  150  89  148  36  175  133  31  24
CHE  133    0  195  537  78  296  576  71  22
FRA   81  155    0  225  61  112  220  47  18
ITA  128  478  188    0  96  235  644  86  23
NLD   31   76   53   80    0   52   93  33  14
USA  167  266   87  176  45    0  250  33  23
DEA  113  479  176  559  84  204    0  82  19
SVN   28   67   46   78  33   27   75   0   8
GBR   21   20   17   21  12   21   17   6   0
-----

```

BSW ruw

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN
-----
CAN    0  150  89  148  36  175  133  31
CHE  133    0  195  537  78  296  576  71
FRA   81  155    0  225  61  112  220  47
ITA  128  478  188    0  96  235  644  86
NLD   31   76   53   80    0   52   93  33
USA  167  266   87  176  45    0  250  33
DEA  113  479  176  559  84  204    0  82
SVN   28   67   46   78  33   27   75   0
-----

```

BSW usu

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  150  89  148  43  175  133  30  24
CHE  133    0  195  537  79  296  576  70  22
FRA   81  155    0  225  66  112  220  47  18
ITA  128  478  188    0  104  235  644  86  23
NLD   35   76   56   84    0   66   98  33  14
USA  167  266   87  176  54    0  250  33  23
DEA  113  479  176  559  85  204    0  82  19
SVN   27   66   46   78  33   27   75   0   8
GBR   21   20   17   21  12   21   17   6   0
-----

```

BSW ude

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  CHE  FRA  ITA  NLD  USA  DEA  SVN  GBR
-----
CAN    0  150  89  148  46  173  133  30  24
CHE  133    0  195  537  89  296  576  70  22
-----

```

FRA	81	155	0	225	68	112	220	47	18
ITA	128	478	188	0	111	235	644	86	23
NLD	37	85	57	89	0	70	107	35	14
USA	166	266	87	176	58	0	250	33	23
DEA	113	479	176	559	91	204	0	82	19
SVN	27	66	46	78	34	27	75	0	8
GBR	21	20	17	21	12	21	17	6	0

BSW ftp

common bulls below diagonal									
common three quarter sib group above diagonal									
	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	0	150	89	46	175	122	30	24	136
CHE	133	0	195	89	296	544	70	22	495
FRA	81	155	0	68	112	207	47	18	209
NLD	37	85	57	0	70	101	35	14	101
USA	167	266	87	58	0	225	33	23	191
DEA	105	448	166	89	176	0	82	18	550
SVN	27	66	46	34	27	75	0	8	85
GBR	21	20	17	12	21	17	6	0	23
ITA	118	441	174	84	143	486	77	21	0

BSW ftl

common bulls below diagonal									
common three quarter sib group above diagonal									
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	150	89	148	43	175	133	30	24
CHE	133	0	195	537	79	296	576	70	22
FRA	81	155	0	225	66	112	220	47	18
ITA	128	478	188	0	104	233	644	86	23
NLD	35	76	56	84	0	66	98	33	14
USA	167	266	87	175	54	0	250	33	23
DEA	113	479	176	559	85	204	0	82	19
SVN	27	66	46	78	33	27	75	0	8
GBR	21	20	17	21	12	21	17	6	0

BSW rtp

common bulls below diagonal									
common three quarter sib group above diagonal									
	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA	
CAN	0	140	84	103	34	98	30	60	
CHE	127	0	189	364	84	381	70	54	
FRA	75	149	0	156	60	159	47	18	
ITA	91	315	129	0	81	360	80	47	
NLD	29	83	52	73	0	88	35	20	
DEA	85	311	121	325	79	0	81	47	
SVN	27	66	46	73	34	74	0	16	
USA	59	45	12	35	19	40	12	0	

BSW ocs

common bulls below diagonal									
common three quarter sib group above diagonal									
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	142	78	148	43	175	100	30	24
CHE	126	0	157	481	74	267	377	67	22
FRA	72	123	0	186	58	95	152	45	18
ITA	128	422	157	0	102	232	397	83	23
NLD	35	73	52	84	0	66	80	33	14
USA	167	232	74	176	54	0	150	33	23
DEA	86	308	120	359	73	111	0	78	16
SVN	27	63	44	75	33	27	71	0	8

GBR 21 20 17 21 12 21 15 6 0

BSW ous

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CAN CHE FRA ITA NLD USA DEA SVN GBR  
-----  
CAN 0 142 78 148 43 174 133 30 24  
CHE 126 0 157 482 74 267 521 69 22  
FRA 72 123 0 187 58 95 187 47 18  
ITA 128 424 157 0 104 235 637 85 23  
NLD 35 73 52 84 0 66 98 33 14  
USA 166 232 74 176 54 0 248 33 23  
DEA 112 430 149 555 85 200 0 82 19  
SVN 27 65 46 77 33 27 75 0 8  
GBR 21 20 17 21 12 21 17 6 0  
-----

BSW ofl

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CAN CHE FRA ITA NLD USA DEA SVN GBR  
-----  
CAN 0 142 78 144 43 175 133 30 24  
CHE 126 0 157 481 74 267 521 68 22  
FRA 72 123 0 186 58 95 187 46 18  
ITA 125 423 157 0 102 221 632 85 23  
NLD 35 73 52 83 0 66 98 33 14  
USA 167 232 74 162 54 0 248 33 23  
DEA 112 430 149 548 85 200 0 80 19  
SVN 27 64 45 77 33 27 73 0 8  
GBR 21 20 17 21 12 21 17 6 0  
-----

BSW loc

BSW bcs

BSW ofr

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CAN CHE DEA ITA SVN USA FRA  
-----  
CAN 0 143 133 107 30 177 57  
CHE 127 0 517 366 68 266 127  
DEA 114 428 0 402 79 244 150  
ITA 95 316 350 0 78 137 133  
SVN 28 64 72 71 0 33 45  
USA 168 232 199 103 27 0 71  
FRA 51 96 118 110 44 51 0  
-----

BSW tpl

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CAN CHE DEA ITA SVN FRA  
-----  
CAN 0 150 135 150 32 91  
CHE 134 0 576 536 70 195  
DEA 114 479 0 642 81 220  
ITA 130 478 558 0 85 224  
SVN 29 67 75 78 0 47  
FRA 83 155 176 187 46 0  
-----

BSW oru

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

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	143	112	107	30	177	57
CHE	127	0	413	366	68	266	127
DEA	98	340	0	369	78	181	142
ITA	95	316	332	0	78	137	133
SVN	28	64	71	71	0	33	45
USA	168	232	138	103	27	0	71
FRA	51	96	112	110	44	51	0

BSW rle

common bulls below diagonal							
common three quarter				sib group above diagonal			
	CHE	DEA	ITA	SVN	USA	FRA	
CHE	0	558	366	48	295	194	
DEA	464	0	401	59	235	214	
ITA	317	349	0	60	137	157	
SVN	46	55	55	0	24	36	
USA	266	188	103	22	0	112	
FRA	154	173	130	37	87	0	

BSW thp

common bulls below diagonal							
common three quarter				sib group above diagonal			
	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	100	85	88	30	106	45
CHE	88	0	413	366	68	266	127
DEA	72	340	0	369	78	181	142
ITA	78	316	332	0	78	137	133
SVN	28	64	71	71	0	33	45
USA	98	232	138	103	27	0	71
FRA	39	96	112	110	44	51	0

BSW hoq

common bulls below diagonal						
common three quarter				sib group above diagonal		
	CAN	CHE	DEA	ITA	SVN	FRA
CAN	0	150	135	146	31	91
CHE	134	0	576	530	67	195
DEA	114	479	0	636	79	220
ITA	127	473	550	0	84	223
SVN	28	64	73	77	0	46
FRA	83	155	176	187	45	0

BSW ful

common bulls below diagonal					
common three quarter			sib group above diagonal		
	CHE	DEA	ITA	SVN	FRA
CHE	0	575	534	69	191
DEA	478	0	642	81	218
ITA	476	558	0	85	221
SVN	66	75	78	0	47
FRA	152	175	186	46	0

BSW udb

common bulls below diagonal					
common three quarter			sib group above diagonal		
	CHE	DEA	ITA	SVN	FRA
CHE	0	348	340	69	141

DEA	297	0	359	80	159
ITA	301	325	0	80	154
SVN	66	74	73	0	47
FRA	112	121	128	46	0

BSW tdi

common bulls below diagonal  
common three quarter sib group above diagonal

	CHE	DEA	ITA	SVN	FRA
CHE	0	575	527	68	191
DEA	478	0	636	81	218
ITA	470	550	0	84	220
SVN	65	75	77	0	47
FRA	152	175	186	46	0

BSW tth

common bulls below diagonal  
common three quarter sib group above diagonal

	CHE	DEA	ITA	SVN	FRA
CHE	0	381	363	69	122
DEA	311	0	360	80	138
ITA	315	325	0	80	131
SVN	66	74	73	0	47
FRA	94	109	108	46	0

GUE sta

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

GUE cwi

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

GUE bde

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

GUE ang

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	26	74	20

GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

-----  
GUE ran  
-----

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

CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

-----  
GUE rwi  
-----

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

CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

-----  
GUE rls  
-----

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

CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

-----  
GUE rlr  
-----

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

CAN	0	47	20
USA	45	0	9
AUS	21	8	0

-----  
GUE fan  
-----

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

CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

-----  
GUE fua  
-----

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

CAN	0	26	74	20
GBR	23	0	82	12
USA	64	80	0	25
AUS	21	10	23	0

GUE ruh

```
-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
  CAN  GBR  USA  AUS  
-----  
CAN    0   26   74   20  
GBR   23    0   82   12  
USA   64   80    0   25  
AUS   21   10   23    0  
-----
```

GUE usu

```
-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
  CAN  GBR  USA  AUS  
-----  
CAN    0   26   74   20  
GBR   23    0   82   12  
USA   64   80    0   25  
AUS   21   10   23    0  
-----
```

GUE ude

```
-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
  CAN  GBR  USA  AUS  
-----  
CAN    0   26   72   19  
GBR   23    0   82   12  
USA   63   80    0   25  
AUS   20   10   23    0  
-----
```

GUE ftp

```
-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
  CAN  GBR  USA  AUS  
-----  
CAN    0   26   74   20  
GBR   23    0   82   12  
USA   64   80    0   25  
AUS   21   10   23    0  
-----
```

GUE ftl

```
-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
  CAN  GBR  USA  AUS  
-----  
CAN    0   26   74   20  
GBR   23    0   82   12  
USA   64   80    0   25  
AUS   21   10   23    0  
-----
```

GUE rtp

```
-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
  CAN  AUS  USA  
-----  
CAN    0   20   74  
AUS   21    0   25  
USA   64   23    0  
-----
```

GUE ocs

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

	CAN	GBR	USA	AUS
CAN	0	12	74	20
GBR	9	0	34	9
USA	64	32	0	24
AUS	21	8	22	0

GUE ous

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	24	72	19
GBR	21	0	80	11
USA	63	78	0	25
AUS	20	9	23	0

GUE ofl

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	GBR	USA	AUS
CAN	0	24	74	20
GBR	21	0	80	11
USA	64	78	0	25
AUS	21	9	23	0

GUE loc

GUE bcs

HOL sta

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	531	979	498	930	805	682	877	969	630	955	1172	474	633	527	310	600	572	110	460	364	83	627	268
BEL	464	0	751	580	1006	724	658	896	824	678	1147	858	441	666	303	248	462	585	124	445	302	105	681	277
CAN	911	719	0	938	2245	1244	1474	1485	1816	1924	1541	3616	1007	1366	415	376	1252	1219	245	513	788	169	1243	588
CHE	454	574	840	0	1077	623	613	725	793	733	900	991	396	595	267	218	420	517	111	400	304	95	577	282
DEU	651	950	1437	928	0	2212	1606	2302	1991	2237	2802	3009	1138	1993	485	372	1241	1752	327	652	625	286	1340	852
DFS	545	635	940	564	1333	0	1028	1574	1401	1178	1748	1730	754	1242	482	384	830	1118	244	581	483	156	960	459
ESP	531	635	996	511	931	752	0	1311	1179	1323	1227	1705	783	1099	350	366	899	958	171	461	562	147	1028	433
FRA	637	892	1094	688	1294	931	1039	0	1594	1369	1962	2320	856	1608	523	380	1115	1260	189	610	565	150	1082	466
GBR	835	822	1855	791	1384	984	963	1137	0	1542	1818	2337	843	1329	521	395	957	1127	226	833	568	157	1103	514
ITA	548	700	1753	679	1602	991	1019	1036	1380	0	1507	2455	968	1521	294	274	920	1243	265	468	623	220	1135	629
NLD	808	1251	1411	884	2118	1301	1069	1360	1563	1384	0	2378	862	1533	682	382	979	1488	279	742	539	188	1211	561
USA	1006	749	3700	924	1749	1094	1189	1351	2156	2192	1959	0	1275	1850	583	467	1791	1744	297	657	961	187	1555	815
HUN	342	358	907	323	802	554	599	597	682	863	668	1174	0	859	272	279	617	900	162	342	478	111	763	388
POL	421	540	1067	435	1351	820	760	1073	1044	1266	1208	1575	686	0	344	294	824	1260	266	466	566	194	1083	601
NZL	429	237	360	222	340	312	286	312	414	253	611	497	198	217	0	205	340	357	59	371	202	51	351	146
ZAF	287	212	349	192	293	302	339	317	368	240	345	495	236	219	186	0	309	303	54	240	232	30	339	138
JPN	323	264	489	247	389	334	359	357	409	416	403	558	260	303	170	197	0	791	128	358	558	102	695	353
CZE	375	436	868	371	1181	650	676	842	816	1001	1274	1365	768	909	238	225	271	0	201	443	528	160	913	488
EST	52	70	156	61	205	157	74	94	129	168	189	209	88	155	31	22	35	114	0	86	94	44	160	142
IRL	422	422	483	395	529	460	434	531	898	440	679	613	278	346	307	228	208	331	43	0	231	74	465	200
KOR	256	214	724	216	385	316	408	354	430	525	376	1079	372	407	139	179	275	371	40	161	0	84	536	288
SVN	58	81	130	68	279	123	97	113	115	191	161	143	86	154	36	20	45	111	22	55	54	0	121	90
PRT	496	692	1254	531	1142	854	1032	1022	1017	1145	1217	1602	731	1009	267	319	343	766	96	395	465	91	0	511
LVA	124	161	369	154	664	260	225	253	298	420	362	706	269	412	77	83	108	306	73	114	176	49	421	0

HOL cwi

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

AUS	0	524	979	498	929	804	694	768	969	630	900	1172	474	632	527	260	599	572	109	460	363	83	629	243
BEL	463	0	745	577	1000	717	670	846	817	678	1093	841	438	662	299	217	451	583	124	442	301	105	681	257
CAN	911	719	0	938	2243	1244	1482	1352	1816	1924	1467	3616	1007	1366	415	323	1248	1219	245	513	784	169	1244	562
CHE	454	573	840	0	1076	623	621	705	793	733	882	991	396	595	267	197	418	517	111	400	303	95	578	262
DEU	651	950	1437	928	0	2211	1630	2217	1989	2236	2759	3008	1137	1991	484	334	1237	1751	326	651	620	286	1339	823
DFS	545	634	940	564	1334	0	1050	1442	1399	1178	1670	1729	754	1239	481	330	829	1118	243	579	480	156	959	432
ESP	542	659	1004	521	967	776	0	1270	1202	1335	1219	1723	792	1119	361	321	902	978	175	476	565	149	1051	419
FRA	600	857	1041	667	1253	908	1047	0	1478	1358	1706	1995	830	1536	450	305	995	1215	185	568	534	150	1040	438
GBR	835	823	1855	791	1384	984	994	1099	0	1542	1752	2335	843	1328	521	339	954	1127	226	830	565	157	1103	486
ITA	548	700	1753	679	1602	991	1033	1033	1380	0	1502	2455	968	1522	294	267	916	1243	265	468	618	220	1135	621
NLD	774	1191	1354	861	2089	1278	1070	1233	1510	1381	0	2142	853	1509	656	320	906	1469	276	728	518	188	1192	527
USA	1006	748	3700	924	1749	1093	1205	1208	2156	2192	1715	0	1275	1850	583	398	1786	1744	297	655	955	187	1556	784
HUN	342	358	907	323	802	554	608	590	682	863	655	1174	0	859	272	261	617	900	162	342	475	111	764	370
POL	421	540	1067	435	1351	820	783	1043	1043	1267	1197	1575	686	0	344	268	824	1260	265	466	563	194	1084	577
NZL	429	237	360	222	340	312	294	291	414	253	590	497	198	217	0	168	339	357	59	371	201	51	352	128
ZAF	246	195	307	176	273	278	300	272	317	238	286	410	230	211	149	0	262	282	53	203	212	30	317	122
JPN	318	259	482	244	384	330	356	344	401	411	392	548	258	300	168	182	0	788	128	358	554	102	694	334
CZE	375	436	868	371	1181	650	700	816	816	1001	1257	1365	768	909	238	213	267	0	201	443	526	160	914	472
EST	52	70	156	61	205	157	78	93	129	168	188	209	88	155	31	22	35	114	0	86	93	44	160	136
IRL	422	422	483	395	529	460	453	514	896	440	664	613	278	346	307	197	207	331	43	0	229	74	466	185
KOR	256	214	723	216	384	316	413	345	429	523	365	1072	370	406	139	162	271	370	40	161	0	84	534	276
SVN	58	81	130	68	279	123	100	113	115	191	161	143	86	154	36	20	45	111	22	55	54	0	121	90
PRT	497	693	1255	531	1142	855	1068	1009	1020	1145	1201	1602	732	1011	267	307	338	767	96	396	463	91	0	491
LVA	111	149	354	143	641	246	220	240	279	416	339	684	256	397	67	75	103	298	68	103	173	49	404	0

HOL bde

common bulls below diagonal																								
common			three quarter			sib			group			above diagonal												
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA	
AUS	0	531	979	498	930	804	684	877	969	630	929	1172	474	633	527	310	600	572	110	460	363	629	83	268
BEL	464	0	751	580	1006	723	660	896	824	678	1123	858	441	666	303	248	461	585	124	445	301	682	105	277
CAN	911	719	0	938	2245	1244	1477	1485	1816	1924	1510	3616	1007	1366	415	376	1250	1219	245	513	786	1244	169	588
CHE	454	574	840	0	1077	623	614	726	793	733	894	991	396	595	267	218	419	517	111	400	303	578	95	282
DEU	651	950	1437	928	0	2212	1611	2303	1991	2237	2789	3009	1138	1993	485	372	1240	1752	327	652	623	1340	286	852
DFS	545	635	940	564	1333	0	1031	1573	1400	1178	1706	1729	754	1241	481	384	830	1118	244	580	481	960	156	459
ESP	532	637	997	513	938	755	0	1316	1182	1326	1217	1708	785	1103	352	366	898	962	173	462	561	1034	147	435
FRA	637	892	1093	689	1295	931	1045	0	1594	1369	1888	2320	856	1608	523	380	1114	1260	189	610	563	1084	150	466
GBR	835	822	1855	791	1384	984	967	1137	0	1542	1789	2336	843	1329	521	395	956	1127	226	831	567	1105	157	514
ITA	548	700	1753	679	1602	991	1020	1036	1380	0	1505	2455	968	1521	294	274	918	1243	265	468	621	1135	220	629
NLD	803	1226	1404	883	2116	1300	1070	1339	1551	1384	0	2250	858	1523	669	373	944	1483	278	735	532	1206	188	556
USA	1006	749	3700	924	1749	1093	1191	1351	2156	2192	1917	0	1275	1850	583	467	1788	1744	297	656	958	1556	187	815
HUN	342	358	907	323	802	554	601	597	682	863	668	1174	0	859	272	279	617	900	162	342	477	764	111	388
POL	421	540	1067	435	1351	820	763	1073	1044	1266	1207	1575	686	0	344	294	824	1260	266	466	565	1084	194	601
NZL	429	237	360	222	340	312	287	312	414	253	609	497	198	217	0	205	339	357	59	371	201	352	51	146
ZAF	287	212	349	192	293	302	340	317	368	240	343	495	236	219	186	0	309	303	54	240	231	339	30	138
JPN	320	262	485	246	386	332	356	353	405	413	398	552	258	301	168	196	0	789	128	358	556	695	102	353
CZE	375	436	868	371	1181	650	680	842	816	1001	1273	1365	768	909	238	225	267	0	201	443	528	915	160	488
EST	52	70	156	61	205	157	75	94	129	168	189	209	88	155	31	22	35	114	0	86	94	160	44	142
IRL	422	422	483	395	529	460	435	531	896	440	676	613	278	346	307	228	207	331	43	0	230	466	74	200
KOR	256	214	724	216	385	316	409	354	430	525	373	1075	372	407	139	178	273	371	40	161	0	536	84	288
PRT	497	693	1255	531	1142	855	1043	1024	1020	1145	1215	1602	732	1011	267	319	341	767	96	396	465	0	121	511
SVN	58	81	130	68	279	123	97	113	115	191	161	143	86	154	36	20	45	111	22	55	54	91	0	90
LVA	124	161	369	154	664	260	227	253	298	420	361	706	269	412	77	83	107	306	73	114	176	421	49	0

HOL ang

common bulls below diagonal																								
common			three quarter			sib			group			above diagonal												
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA		
AUS	0	514	979	481	202	131	697	765	965	629	530	1169	471	630	306	599	572	108	458	363	619	79	268	
BEL	461	0	731	547	271	157	664	837	800	673	742	822	430	648	236	444	576	122	433	297	672	98	274	
CAN	911	714	0	901	584	275	1484	1348	1814	1922	1087	3616	1004	1362	371	1248	1219	243	511	784	1229	158	588	
CHE	449	547	810	0	310	154	613	695	778	726	637	935	388	572	214	416	492	107	396	301	560	89	277	
DEU	169	261	550	276	0	367	406	468	478	717	719	606	286	570	27	197	341	141	139	141	313	173	316	
DFS	116	150	295	141	342	0	219	242	228	339	317	265	160	259	23	125	168	113	85	105	161	73	105	

ESP	544	662	1005	518	279	201	0	1276	1205	1336	872	1727	789	1125	368	905	982	176	477	565	1047	139	443
FRA	599	855	1041	659	413	235	1061	0	1474	1350	1067	1986	823	1525	341	992	1214	181	566	533	1021	140	456
GBR	835	814	1855	781	427	228	1002	1097	0	1538	1116	2329	836	1322	388	953	1125	223	822	565	1083	146	514
ITA	548	699	1753	675	668	329	1037	1031	1380	0	1316	2451	962	1512	270	914	1239	261	464	618	1121	208	627
NLD	507	803	1118	611	741	312	795	962	1093	1273	0	1286	595	1156	207	535	1060	237	443	379	845	179	452
USA	1005	740	3700	871	553	255	1207	1206	2154	2192	1203	0	1269	1842	461	1786	1743	296	652	954	1526	175	815
HUN	342	357	907	320	225	126	612	588	681	862	489	1172	0	854	275	617	896	162	338	474	752	106	385
POL	421	536	1067	415	475	211	792	1043	1042	1260	1021	1574	683	0	290	821	1251	264	462	562	1066	182	599
ZAF	284	209	346	188	21	22	339	295	365	236	186	490	234	216	0	305	298	52	237	228	330	27	136
JPN	318	259	482	244	119	88	356	344	401	411	319	548	258	300	193	0	788	128	356	554	690	97	353
CZE	375	436	868	359	259	119	705	816	816	1001	1027	1365	768	909	221	267	0	199	441	526	903	152	488
EST	52	69	156	61	98	91	80	93	129	168	171	209	88	155	22	35	114	0	84	93	155	44	141
IRL	421	419	483	391	117	69	456	514	889	437	439	613	278	344	226	207	331	43	0	229	458	71	200
KOR	256	214	723	215	106	83	413	345	429	523	289	1071	370	406	177	271	370	40	161	0	533	80	287
PRT	497	687	1255	519	293	150	1082	1008	1016	1136	866	1601	731	1002	315	338	767	95	395	463	0	115	507
SVN	58	81	130	67	164	56	99	111	115	189	160	143	86	153	18	45	111	22	54	54	90	0	85
LVA	124	161	369	152	254	48	243	251	298	420	302	706	269	412	82	107	306	73	114	175	421	49	0

HOL ran

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	
AUS	0	531	979	498	930	805	681	877	969	630	955	1172	474	633	527	310	600	572	110	460	364	83	629	268
BEL	464	0	751	580	1006	724	652	896	824	678	1147	858	441	666	303	248	461	585	124	445	302	105	682	277
CAN	911	719	0	938	2245	1244	1469	1485	1816	1924	1541	3616	1007	1366	415	376	1250	1219	245	513	788	169	1244	588
CHE	454	574	840	0	1077	623	610	725	793	733	900	991	396	595	267	218	419	517	111	400	304	95	578	282
DEU	651	950	1437	928	0	2212	1595	2302	1991	2237	2802	3009	1138	1993	485	372	1240	1752	327	652	625	286	1340	852
DFS	545	635	940	564	1333	0	1020	1574	1401	1178	1748	1730	754	1242	482	384	830	1118	244	581	483	156	961	459
ESP	530	629	991	508	920	744	0	1304	1172	1317	1219	1697	782	1095	348	366	894	955	171	459	561	147	1024	432
FRA	637	892	1093	688	1294	930	1030	0	1594	1369	1962	2320	856	1608	523	380	1114	1260	189	610	565	150	1084	466
GBR	835	822	1855	791	1384	984	955	1137	0	1542	1818	2337	843	1329	521	395	956	1127	226	833	568	157	1105	514
ITA	548	700	1753	679	1602	991	1011	1036	1380	0	1507	2455	968	1521	294	274	918	1243	265	468	623	220	1135	629
NLD	808	1251	1411	884	2118	1301	1061	1360	1563	1384	0	2378	862	1533	682	382	978	1488	279	742	539	188	1212	561
USA	1006	749	3700	924	1749	1093	1181	1351	2156	2192	1959	0	1275	1850	583	467	1788	1744	297	657	961	187	1556	815
HUN	342	358	907	323	802	554	598	597	682	863	668	1174	0	859	272	279	617	900	162	342	478	111	764	388
POL	421	540	1067	435	1351	820	754	1073	1044	1266	1208	1575	686	0	344	294	824	1260	266	466	566	194	1084	601
NZL	429	237	360	222	340	312	284	312	414	253	611	497	198	217	0	205	339	357	59	371	202	51	352	146
ZAF	287	212	349	192	293	302	339	317	368	240	345	495	236	219	186	0	309	303	54	240	232	30	339	138
JPN	322	262	486	246	387	333	357	355	407	414	401	554	259	302	168	196	0	789	128	358	557	102	695	353
CZE	375	436	868	371	1181	650	674	842	816	1001	1274	1365	768	909	238	225	269	0	201	443	528	160	915	488
EST	52	70	156	61	205	157	74	94	129	168	189	209	88	155	31	22	35	114	0	86	94	44	160	142
IRL	422	422	483	395	529	460	433	531	898	440	679	613	278	346	307	228	207	331	43	0	231	74	466	200
KOR	256	214	724	216	385	316	406	354	430	525	376	1079	372	407	139	179	274	371	40	161	0	84	536	288
SVN	58	81	130	68	279	123	97	113	115	191	161	143	86	154	36	20	45	111	22	55	54	0	121	90
PRT	497	692	1255	531	1142	855	1026	1024	1019	1145	1218	1602	732	1011	267	319	342	767	96	396	465	91	0	511
LVA	124	161	369	154	664	260	223	253	298	420	362	706	269	412	77	83	107	306	73	114	176	49	421	0

HOL rwi

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA	
AUS	0	506	979	498	930	805	681	877	969	630	953	1172	474	633	527	310	406	572	110	460	362	629	83	268
BEL	461	0	731	573	984	703	637	854	793	677	1058	811	431	654	288	236	351	571	124	429	292	672	105	276
CAN	911	709	0	938	2245	1244	1472	1485	1816	1924	1538	3616	1007	1366	415	376	948	1219	245	513	785	1244	169	588
CHE	454	570	840	0	1077	623	611	726	793	733	900	991	396	595	267	218	357	517	111	400	302	578	95	282
DEU	651	944	1437	928	0	2212	1600	2303	1991	2237	2800	3009	1138	1993	485	372	1001	1752	327	652	622	1340	286	852
DFS	545	630	940	564	1333	0	1024	1574	1401	1178	1740	1730	754	1242	482	384	602	1118	244	581	480	961	156	459
ESP	530	625	995	508	925	748	0	1307	1176	1321	1219	1701	783	1096	349	366	715	956	171	460	559	1027	147	432
FRA	637	879	1093	689	1295	931	1035	0	1594	1369	1957	2320	856	1608	523	380	806	1260	189	610	562	1084	150	466
GBR	835	805	1855	791	1384	984	960	1137	0	1542	1815	2337	843	1329	521	395	715	1127	226	833	566	1105	157	514
ITA	548	700	1753	679	1602	991	1016	1036	1380	0	1507	2455	968	1521	294	274	861	1243	265	468	620	1135	220	629
NLD	808	1154	1411	884	2117	1301	1063	1361	1562	1384	0	2371	862	1532	681	382	732	1488	278	741	534	1211	188	560
USA	1006	734	3700	924	1749	1093	1186	1351	2156	2192	1956	0	1275	1850	583	467	1267	1744	297	657	956	1556	187	815
HUN	342	357	907	323	802	554	599	597	682	863	668	1174	0	859	272	279	522	900	162	342	476	764	111	388
POL	421	537	1067	435	1351	820	757	1073	1044	1266	1208	1575	686	0	344	294	716	1260	266	466	564	1084	194	601

NZL	429	231	360	222	340	312	286	312	414	253	611	497	198	217	0	205	226	357	59	371	200	352	51	146
ZAF	286	209	348	191	292	301	338	316	367	239	344	494	235	218	186	0	211	303	54	240	230	339	30	138
JPN	280	234	446	227	359	303	314	317	358	403	358	495	242	290	144	151	0	646	116	270	470	559	102	313
CZE	375	433	868	371	1181	650	675	842	816	1001	1274	1365	768	909	238	225	250	0	201	443	527	915	160	488
EST	52	70	156	61	205	157	74	94	129	168	189	209	88	155	31	22	35	114	0	86	94	160	44	142
IRL	422	416	483	395	529	460	433	531	898	440	679	613	278	346	307	227	183	331	43	0	229	466	74	200
KOR	256	214	724	216	385	316	408	354	430	525	376	1075	372	407	139	178	258	371	40	161	0	535	84	287
PRT	497	688	1255	531	1142	855	1031	1024	1019	1145	1217	1602	732	1011	267	318	312	767	96	396	465	0	121	511
SVN	58	81	130	68	279	123	97	113	115	191	161	143	86	154	36	20	45	111	22	55	54	91	0	90
LVA	124	161	369	154	664	260	223	253	298	420	362	706	269	412	77	83	103	306	73	114	176	421	49	0

HOL rls

common bulls below diagonal															common three quarter sib group above diagonal														
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA					
AUS	0	531	979	498	930	805	685	877	969	630	955	1172	474	633	527	310	599	572	110	460	362	83	629	268					
BEL	464	0	751	580	1006	724	660	896	824	678	1147	858	441	666	303	248	459	585	124	444	300	105	682	277					
CAN	911	719	0	938	2245	1244	1477	1485	1816	1924	1541	3616	1007	1366	415	376	1248	1219	245	511	782	169	1244	588					
CHE	454	574	840	0	1077	623	614	725	793	733	900	991	396	595	267	218	418	517	111	398	302	95	578	282					
DEU	651	950	1437	928	0	2212	1613	2302	1991	2237	2802	3009	1138	1993	485	372	1238	1752	327	651	619	286	1340	852					
DFS	545	635	940	564	1333	0	1034	1574	1401	1178	1748	1730	754	1242	482	384	829	1118	244	580	479	156	961	459					
ESP	533	638	997	514	941	757	0	1318	1184	1326	1232	1708	785	1104	353	367	897	963	173	462	559	147	1035	436					
FRA	637	892	1093	688	1294	931	1048	0	1594	1369	1962	2320	856	1608	523	380	1112	1260	189	609	560	150	1084	466					
GBR	835	822	1855	791	1384	984	969	1137	0	1542	1818	2337	843	1329	521	395	954	1127	226	831	563	157	1105	514					
ITA	548	700	1753	679	1602	991	1021	1036	1380	0	1507	2455	968	1521	294	274	916	1243	265	467	616	220	1135	629					
NLD	808	1251	1411	884	2118	1301	1074	1360	1563	1384	0	2378	862	1533	682	382	976	1488	279	741	531	188	1212	561					
USA	1006	749	3700	924	1749	1094	1192	1351	2156	2192	1959	0	1275	1850	583	467	1786	1744	297	656	952	187	1556	815					
HUN	342	358	907	323	802	554	602	597	682	863	668	1174	0	859	272	279	617	900	162	342	474	111	764	388					
POL	421	540	1067	435	1351	820	764	1073	1044	1266	1208	1575	686	0	344	294	824	1260	266	466	562	194	1084	601					
NZL	429	237	360	222	340	312	288	312	414	253	611	497	198	217	0	205	339	357	59	369	199	51	352	146					
ZAF	287	212	349	192	293	302	341	317	368	240	345	495	236	219	186	0	308	303	54	240	231	30	339	138					
JPN	318	259	482	244	384	330	353	349	401	411	395	548	258	300	168	194	0	788	128	358	553	102	694	353					
CZE	375	436	868	371	1181	650	682	842	816	1001	1274	1365	768	909	238	225	267	0	201	443	524	160	915	488					
EST	52	70	156	61	205	157	75	94	129	168	189	209	88	155	31	22	35	114	0	86	93	44	160	142					
IRL	422	421	481	393	528	459	436	530	896	439	678	611	278	346	305	228	207	331	43	0	228	74	465	200					
KOR	255	213	722	215	383	316	407	351	428	522	373	1069	370	406	138	178	270	369	40	160	0	83	532	287					
SVN	58	81	130	68	279	123	97	113	115	191	161	143	86	154	36	20	45	111	22	55	53	0	121	90					
PRT	497	694	1255	532	1142	856	1046	1026	1022	1145	1220	1603	733	1012	267	319	338	769	96	396	462	91	0	511					
LVA	124	161	369	154	664	260	228	253	298	420	362	706	269	412	77	83	107	306	73	114	175	49	421	0					

HOL rlr

common bulls below diagonal															common three quarter sib group above diagonal														
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA						
AUS	0	486	898	498	927	804	683	647	966	630	861	1171	471	595	262	561	454	109	458	277	83	627	243						
BEL	454	0	702	562	957	674	628	755	764	676	1001	780	422	621	208	416	494	121	412	245	105	660	255						
CAN	856	698	0	915	2180	1148	1409	1212	1722	1919	1403	3422	992	1314	313	1126	1085	242	490	680	169	1218	560						
CHE	454	560	825	0	1076	622	616	672	793	733	873	991	393	578	198	411	451	111	398	255	95	575	262						
DEU	651	927	1434	928	0	2210	1615	1986	1987	2236	2736	3006	1134	1956	336	1209	1547	326	649	545	286	1337	824						
DFS	545	621	937	564	1333	0	1030	1229	1395	1178	1633	1728	750	1189	332	786	928	243	577	391	156	956	432						
ESP	535	627	986	515	949	763	0	1141	1184	1330	1183	1708	784	1077	322	863	859	172	466	481	148	1041	417						
FRA	535	766	969	625	1188	840	934	0	1267	1333	1496	1651	772	1449	268	846	1029	177	485	452	150	964	421						
GBR	834	786	1782	790	1383	982	977	963	0	1541	1703	2329	838	1284	341	907	971	225	819	476	157	1100	487						
ITA	548	699	1753	679	1602	991	1026	1024	1380	0	1501	2454	968	1517	268	914	1212	265	467	584	220	1136	621						
NLD	746	1094	1334	856	2094	1273	1041	1147	1486	1381	0	2047	840	1457	316	874	1317	276	703	444	188	1181	527						
USA	1006	724	3587	924	1749	1093	1195	1041	2155	2192	1682	0	1270	1799	401	1654	1534	297	652	820	187	1551	784						
HUN	342	351	905	323	802	554	603	554	682	863	659	1174	0	842	261	606	806	162	338	426	111	762	370						
POL	406	522	1046	422	1334	796	743	1012	1021	1264	1172	1545	677	0	254	787	1155	264	440	515	194	1054	578						
ZAF	249	194	306	177	274	279	301	242	320	239	287	413	231	203	0	255	241	53	204	166	30	317	122						
JPN	313	258	480	244	384	329	349	329	397	411	389	541	258	294	182	0	677	126	344	466	102	683	332						
CZE	319	380	792	315	1064	570	586	686	704	983	1162	1212	676	852	177	252	0	194	367	452	159	824	458						
EST	52	69	156	61	205	157	75	90	129	168	188	209	88	154	22	35	109	0	85	88	44	159	136						
IRL	420	407	478	392	528	458	442	439	881	439	652	611	278	332	199	206	275	43	0	173	74	462	185						
KOR	194	188	633	188	345	272	343	313	352	502	316	916	328	384	120	237	323	38	125	0	83	469	261						
SVN	58	81	130	68	279	123	99	113	115	191	161	143	86	154	20	45	111	22	55	53	0	121	90						

PRT	497	682	1235	529	1141	854	1052	959	1020	1145	1195	1601	733	996	308	337	694	95	394	412	91	0	491
LVA	111	149	354	143	642	246	216	237	279	416	340	684	256	397	75	103	293	68	103	164	49	404	0

HOL fan

common bulls below diagonal																							
common	three	quarter	sib	group	above	diagonal																	
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	504	979	498	666	804	694	874	969	630	919	1172	473	633	310	599	572	110	459	362	83	633	268
BEL	461	0	729	571	810	699	654	853	792	677	1052	810	431	653	236	437	571	124	427	293	105	673	275
CAN	911	709	0	938	1861	1244	1482	1476	1816	1924	1496	3616	1006	1365	376	1248	1219	245	511	784	169	1245	588
CHE	454	569	840	0	918	623	621	725	793	733	890	991	396	594	218	418	516	111	398	303	95	578	282
DEU	539	794	1315	787	0	1613	1358	1714	1543	2127	2198	2305	925	1721	252	925	1387	301	479	527	284	1095	792
DFS	545	630	940	564	1151	0	1050	1555	1399	1177	1693	1728	752	1240	384	829	1118	244	579	481	156	963	459
ESP	542	651	1004	521	799	776	0	1332	1202	1335	1232	1723	791	1118	371	901	977	176	475	564	149	1053	440
FRA	637	880	1093	688	1096	930	1081	0	1586	1369	1847	2301	853	1604	379	1107	1255	189	603	558	150	1083	465
GBR	835	806	1855	791	1175	984	994	1138	0	1542	1774	2334	842	1326	394	953	1127	226	825	566	157	1106	514
ITA	548	700	1753	679	1543	991	1033	1036	1380	0	1502	2455	968	1521	274	916	1243	265	467	618	220	1135	629
NLD	798	1152	1398	882	1812	1299	1095	1323	1543	1384	0	2207	852	1510	371	935	1478	278	727	528	188	1202	555
USA	1006	734	3700	924	1492	1093	1205	1344	2156	2192	1901	0	1274	1848	467	1785	1744	297	654	953	187	1556	815
HUN	342	357	907	323	666	553	608	597	682	863	666	1174	0	858	278	617	899	162	341	473	111	763	388
POL	421	537	1067	434	1236	819	781	1073	1043	1266	1200	1575	685	0	293	824	1258	266	465	563	194	1084	601
ZAF	287	210	349	192	202	302	343	317	368	240	339	495	236	219	0	307	303	54	240	231	30	341	138
JPN	318	259	482	244	340	330	355	348	400	411	392	547	258	300	193	0	788	128	358	554	102	696	353
CZE	375	433	868	371	982	650	699	842	816	1001	1272	1365	768	909	225	267	0	201	443	526	160	916	488
EST	52	70	156	61	191	157	78	94	129	168	189	209	88	155	22	35	114	0	86	94	44	160	142
IRL	421	415	481	393	417	459	453	530	890	439	674	611	278	346	228	207	331	43	0	229	74	465	200
KOR	255	214	722	216	346	316	410	350	429	523	370	1065	369	405	178	270	370	40	161	0	83	535	287
SVN	58	81	130	68	279	123	100	113	115	191	161	143	86	154	20	45	111	22	55	53	0	121	90
PRT	498	691	1256	532	988	856	1070	1026	1024	1145	1215	1605	734	1014	319	338	769	96	396	463	91	0	511
LVA	124	161	369	154	635	260	235	253	298	420	361	706	269	412	83	107	306	73	114	175	49	421	0

HOL fua

common bulls below diagonal																								
common	three	quarter	sib	group	above	diagonal																		
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	524	979	498	930	804	694	846	969	630	900	1172	474	632	527	310	599	572	110	460	363	82	629	268
BEL	463	0	747	579	1002	719	672	883	819	678	1095	843	438	663	299	246	452	583	124	443	301	104	682	277
CAN	911	719	0	938	2244	1244	1482	1438	1816	1924	1467	3616	1007	1366	415	376	1248	1219	245	513	787	168	1244	588
CHE	454	573	840	0	1077	623	621	724	793	733	882	991	396	595	267	218	418	517	111	400	303	94	578	282
DEU	651	950	1437	928	0	2212	1631	2290	1991	2237	2761	3009	1138	1993	485	372	1238	1752	327	652	624	284	1340	852
DFS	545	634	940	564	1334	0	1050	1529	1400	1178	1670	1729	754	1241	481	384	829	1118	244	580	482	155	960	459
ESP	542	659	1004	521	967	776	0	1319	1203	1335	1219	1723	792	1119	361	371	902	977	176	476	566	148	1051	440
FRA	636	889	1089	687	1294	929	1079	0	1565	1368	1815	2212	852	1600	503	372	1073	1252	188	599	554	148	1077	463
GBR	835	823	1855	791	1384	984	994	1133	0	1542	1753	2336	843	1329	521	395	954	1127	226	831	567	155	1105	514
ITA	548	700	1753	679	1602	991	1033	1036	1380	0	1502	2455	968	1522	294	274	916	1243	265	468	622	218	1135	629
NLD	774	1191	1355	861	2089	1278	1069	1298	1511	1381	0	2144	853	1510	656	364	906	1469	276	728	521	186	1192	552
USA	1006	748	3700	924	1749	1094	1205	1328	2156	2192	1715	0	1275	1851	583	467	1786	1744	297	656	959	186	1556	815
HUN	342	358	907	323	802	554	608	597	682	863	655	1174	0	859	272	279	617	900	162	342	478	111	764	388
POL	421	540	1067	435	1351	820	782	1072	1044	1267	1199	1575	686	0	344	294	824	1260	266	466	566	192	1084	601
NZL	429	237	360	222	340	312	294	312	414	253	590	497	198	217	0	205	339	357	59	371	201	51	352	146
ZAF	287	212	349	192	293	302	343	317	368	240	325	495	236	219	186	0	308	303	54	240	231	30	339	138
JPN	318	259	482	244	384	330	356	349	401	411	392	548	258	300	168	194	0	788	128	358	555	102	694	353
CZE	375	436	868	371	1181	650	699	840	816	1001	1257	1365	768	909	238	225	267	0	201	443	528	160	915	488
EST	52	70	156	61	205	157	78	94	129	168	188	209	88	155	31	22	35	114	0	86	94	44	160	142
IRL	422	422	483	395	529	460	453	528	896	440	664	613	278	346	307	228	207	331	43	0	230	74	466	200
KOR	256	214	724	216	385	316	413	354	430	525	366	1075	372	407	139	178	271	371	40	161	0	84	536	288
SVN	58	81	130	67	276	122	99	112	115	189	160	143	86	153	36	20	45	111	22	55	54	0	120	90
PRT	497	693	1255	531	1142	855	1069	1024	1021	1145	1201	1603	733	1011	267	319	338	768	96	396	465	91	0	511
LVA	124	161	369	154	664	260	235	253	298	420	358	706	269	412	77	83	107	306	73	114	176	49	421	0

HOL ruh

common bulls below diagonal																								
common	three	quarter	sib	group	above	diagonal																		
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA

AUS	0	524	979	498	930	758	686	874	969	630	929	1172	474	633	527	310	600	572	110	460	363	83	628	268
BEL	463	0	747	579	1002	708	659	886	818	678	1108	843	438	663	299	246	453	583	124	443	301	105	681	277
CAN	911	719	0	938	2245	1166	1478	1476	1816	1924	1510	3616	1007	1366	415	376	1249	1219	245	513	787	169	1243	588
CHE	454	573	840	0	1077	619	616	725	793	733	894	991	396	595	267	218	418	517	111	400	303	95	578	282
DEU	651	950	1437	928	0	2158	1615	2297	1991	2237	2789	3009	1138	1993	485	372	1239	1752	327	652	624	286	1339	852
DFS	545	634	940	564	1333	0	993	1489	1341	1177	1672	1636	746	1221	454	357	776	1084	242	563	469	156	951	455
ESP	533	639	998	515	942	758	0	1313	1186	1327	1220	1710	786	1106	354	369	899	964	173	464	563	147	1035	437
FRA	637	891	1093	688	1294	931	1050	0	1587	1369	1882	2301	854	1606	520	379	1109	1255	189	605	562	150	1081	465
GBR	835	821	1854	791	1383	983	968	1135	0	1542	1789	2336	843	1329	521	395	955	1127	226	831	567	157	1104	514
ITA	548	700	1753	679	1602	990	1022	1036	1379	0	1505	2455	968	1521	294	274	917	1243	265	468	622	220	1135	629
NLD	803	1221	1404	883	2116	1300	1073	1338	1550	1384	0	2250	858	1523	669	373	943	1483	278	735	533	188	1205	556
USA	1006	748	3700	924	1749	1093	1193	1344	2156	2192	1917	0	1275	1850	583	467	1787	1744	297	656	960	187	1555	815
HUN	342	358	907	323	802	554	603	597	682	863	668	1174	0	859	272	279	617	900	162	342	478	111	764	388
POL	421	540	1067	435	1351	820	766	1073	1044	1266	1207	1575	686	0	344	294	824	1260	266	466	566	194	1083	601
NZL	429	237	360	222	340	312	288	312	414	253	609	497	198	217	0	205	339	357	59	371	201	51	352	146
ZAF	287	212	349	192	293	302	342	317	368	240	343	495	236	219	186	0	309	303	54	240	231	30	339	138
JPN	318	260	483	244	385	331	355	350	402	412	395	549	258	300	168	195	0	789	128	358	556	102	695	353
CZE	375	436	868	371	1181	650	683	842	816	1001	1273	1365	768	909	238	225	267	0	201	443	528	160	915	488
EST	52	70	156	61	205	157	75	94	129	168	189	209	88	155	31	22	35	114	0	86	94	44	159	142
IRL	422	422	483	395	529	460	437	531	896	440	676	613	278	346	307	228	207	331	43	0	230	74	466	200
KOR	256	214	724	216	385	316	410	354	430	525	373	1076	372	407	139	179	272	371	40	161	0	84	536	288
SVN	58	81	130	68	279	123	97	113	115	191	161	143	86	154	36	20	45	111	22	55	54	0	121	90
PRT	497	693	1255	531	1142	852	1045	1024	1020	1145	1215	1602	732	1011	267	319	339	767	96	396	465	91	0	511
LVA	124	161	369	154	664	260	229	253	298	420	361	706	269	412	77	83	107	306	73	114	176	49	421	0

HOL usu

common bulls below diagonal																																							
common			three quarter			sib			group			above diagonal																											
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA															
AUS	0	524	979	498	930	805	697	877	969	630	955	1172	474	633	527	310	599	572	110	460	362	83	629	268															
BEL	463	0	747	579	1002	720	674	889	819	678	1117	843	438	663	299	246	452	583	124	443	300	105	682	277															
CAN	911	719	0	938	2245	1244	1484	1485	1816	1924	1541	3616	1007	1366	415	376	1248	1219	245	513	782	169	1244	588															
CHE	454	573	840	0	1077	623	621	725	793	733	900	991	396	595	267	218	418	517	111	400	302	95	578	282															
DEU	651	950	1437	928	0	2212	1640	2302	1991	2237	2802	3009	1138	1993	485	372	1238	1752	327	652	619	286	1340	852															
DFS	545	634	941	564	1334	0	1056	1574	1401	1178	1748	1730	754	1242	482	384	829	1118	244	581	479	156	961	459															
ESP	543	663	1005	521	982	783	0	1347	1208	1338	1264	1728	793	1127	364	371	905	982	177	478	563	149	1059	443															
FRA	637	892	1093	688	1294	931	1097	0	1595	1369	1963	2320	856	1608	523	380	1112	1260	189	610	560	150	1084	466															
GBR	835	823	1855	791	1384	984	1002	1138	0	1542	1819	2337	843	1329	521	395	954	1127	226	833	563	157	1105	514															
ITA	548	700	1753	679	1602	991	1037	1036	1380	0	1507	2455	968	1521	294	274	916	1243	265	468	616	220	1135	629															
NLD	808	1229	1411	884	2118	1302	1113	1361	1564	1384	0	2378	862	1533	682	382	976	1488	279	742	531	188	1212	561															
USA	1006	748	3700	924	1749	1095	1207	1351	2156	2192	1959	0	1275	1850	583	467	1786	1744	297	657	951	187	1556	815															
HUN	342	358	907	323	802	554	611	597	682	863	668	1174	0	859	272	279	617	900	162	342	474	111	764	388															
POL	421	540	1067	435	1351	820	791	1073	1044	1266	1208	1575	686	0	344	294	824	1260	266	466	562	194	1084	601															
NZL	429	237	360	222	340	312	296	312	414	253	611	497	198	217	0	205	339	357	59	371	199	51	352	146															
ZAF	287	212	349	192	293	303	343	317	368	240	345	495	236	219	186	0	308	303	54	240	231	30	339	138															
JPN	318	259	482	244	384	330	356	349	401	411	395	548	258	300	168	194	0	788	128	358	553	102	694	353															
CZE	375	436	868	371	1181	650	703	842	816	1001	1274	1365	768	909	238	225	267	0	201	443	524	160	915	488															
EST	52	70	156	61	205	157	79	94	129	168	189	209	88	155	31	22	35	114	0	86	93	44	160	142															
IRL	422	422	483	395	529	460	455	531	898	440	679	613	278	346	307	228	207	331	43	0	228	74	466	200															
KOR	255	213	722	215	383	316	411	351	428	522	373	1068	370	406	138	178	270	369	40	160	0	83	532	287															
SVN	58	81	130	68	279	123	100	113	115	191	161	143	86	154	36	20	45	111	22	55	53	0	121	90															
PRT	497	694	1255	532	1142	856	1084	1026	1022	1145	1220	1603	733	1012	267	319	338	769	96	397	462	91	0	511															
LVA	124	161	369	154	664	260	243	253	298	420	362	706	269	412	77	83	107	306	73	114	175	49	421	0															

HOL ude

common bulls below diagonal																																							
common			three quarter			sib			group			above diagonal																											
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA																
AUS	0	528	979	498	930	805	683	877	969	630	964	1172	474	633	310	600	572	110	459	363	83	629	268																
BEL	462	0	748	578	1001	720	658	890	819	678	1151	853	440	664	245	458	584	124	440	299	105	682	277																
CAN	911	715	0	938	2246	1244	1476	1485	1816	1924	1647	3616	1007	1366	376	1250	1219	245	513	786	169	1244	588																
CHE	454	572	840	0	1077	623	613	725	793	733	929	991	396	595	218	419	517	111	400	303	95	578	282																
DEU	651	949	1437	928	0	2213	1608	2302	1992	2237	2908	3009	1138	1993	372	1240	1752	327	652	623	287	1340	852																
DFS	545	634	941	564	1334	0	1030	1574	1401	1178	1772	1730	754	1242	384	830	1118	244	581	481	157	961	459																

ESP	531	634	996	511	933	753	0	1314	1181	1325	1259	1706	784	1102	366	898	961	173	462	560	147	1032	435
FRA	637	890	1093	688	1294	931	1041	0	1594	1369	1999	2320	856	1608	380	1114	1260	189	610	563	150	1084	466
GBR	835	818	1855	791	1384	984	964	1137	0	1542	1878	2337	843	1329	395	956	1127	226	830	567	157	1105	514
ITA	548	700	1753	679	1602	991	1019	1036	1380	0	1601	2456	969	1522	274	918	1243	265	468	621	220	1135	629
NLD	818	1255	1525	910	2235	1322	1089	1391	1627	1483	0	2488	886	1594	383	986	1529	292	748	545	198	1241	586
USA	1006	745	3700	924	1749	1095	1189	1351	2156	2192	2071	0	1275	1851	467	1788	1744	297	657	958	187	1556	815
HUN	342	358	907	323	802	554	600	597	682	863	685	1174	0	860	279	617	900	162	342	477	111	764	388
POL	421	540	1067	435	1351	820	762	1073	1044	1267	1264	1575	686	0	294	824	1260	266	466	565	194	1084	601
ZAF	287	212	349	192	293	303	339	317	368	240	346	495	236	219	0	309	303	54	240	231	30	339	138
JPN	322	262	486	246	387	333	357	355	407	414	406	554	259	302	196	0	789	128	358	556	102	695	353
CZE	375	436	868	371	1181	650	678	842	816	1001	1307	1365	768	909	225	269	0	201	443	528	160	915	488
EST	52	70	156	61	205	157	75	94	129	168	197	209	88	155	22	35	114	0	86	94	44	160	142
IRL	421	421	483	395	529	460	434	531	895	440	684	613	278	346	228	207	331	43	0	230	74	466	200
KOR	256	214	724	216	385	316	408	354	430	525	384	1076	372	407	179	274	371	40	161	0	84	536	288
SVN	58	81	130	68	280	124	97	113	115	191	171	143	86	154	20	45	111	22	55	54	0	121	90
PRT	497	692	1255	531	1142	855	1038	1024	1019	1145	1241	1602	732	1011	319	342	767	96	396	465	91	0	511
LVA	124	161	369	154	664	260	226	253	298	420	380	706	269	412	83	107	306	73	114	176	49	421	0

HOL ftp

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	
AUS	0	524	979	498	930	805	686	877	969	630	964	1172	474	633	527	310	600	572	109	460	363	82	629	243
BEL	463	0	747	579	1002	720	659	888	818	678	1127	843	438	663	299	246	454	583	124	443	301	104	682	257
CAN	911	719	0	938	2246	1244	1477	1485	1816	1924	1647	3616	1007	1366	415	376	1250	1219	245	513	787	167	1244	562
CHE	454	573	840	0	1077	623	615	725	793	733	929	991	396	595	267	218	419	517	111	400	303	93	578	262
DEU	651	950	1437	928	0	2213	1614	2302	1992	2237	2908	3009	1138	1994	485	372	1240	1752	326	652	624	284	1340	823
DFS	545	634	941	564	1334	0	1034	1574	1401	1178	1772	1730	754	1242	482	384	830	1118	243	581	482	155	961	433
ESP	533	639	997	514	941	757	0	1319	1185	1326	1263	1709	785	1105	354	368	898	963	172	463	562	146	1035	415
FRA	637	891	1093	688	1294	931	1049	0	1594	1369	1999	2320	856	1608	523	380	1114	1260	188	610	564	147	1084	443
GBR	835	822	1855	791	1384	984	969	1137	0	1542	1878	2337	843	1329	521	395	956	1127	226	833	567	154	1105	486
ITA	548	700	1753	679	1602	991	1021	1036	1380	0	1601	2456	969	1523	294	274	918	1243	265	468	622	218	1135	621
NLD	818	1242	1525	910	2235	1322	1093	1391	1627	1483	0	2488	886	1594	685	383	986	1529	291	748	547	195	1241	554
USA	1006	748	3700	924	1749	1094	1192	1351	2156	2192	2071	0	1275	1852	583	467	1788	1744	297	657	960	185	1556	784
HUN	342	358	907	323	802	554	602	597	682	863	685	1174	0	860	272	279	617	900	162	342	478	111	764	370
POL	421	540	1067	435	1351	820	765	1073	1044	1268	1264	1575	686	0	344	294	824	1260	265	466	566	192	1084	577
NZL	429	237	360	222	340	312	288	312	414	253	614	497	198	217	0	205	339	357	59	371	201	51	352	128
ZAF	287	212	349	192	293	303	341	317	368	240	346	495	236	219	186	0	309	303	54	240	231	30	339	124
JPN	320	262	485	246	386	332	356	353	405	413	404	552	258	301	168	196	0	789	128	358	556	102	695	334
CZE	375	436	868	371	1181	650	682	842	816	1001	1307	1365	768	909	238	225	267	0	201	443	528	159	915	472
EST	52	70	156	61	205	157	75	94	129	168	197	209	88	155	31	22	35	114	0	86	94	44	160	136
IRL	422	422	483	395	529	460	436	531	898	440	684	613	278	346	307	228	207	331	43	0	230	74	466	185
KOR	256	214	724	216	385	316	409	354	430	525	384	1076	372	407	139	179	273	371	40	161	0	84	536	277
SVN	58	81	130	67	276	122	96	111	115	189	170	143	86	153	36	20	45	111	22	55	54	0	120	90
PRT	497	692	1255	531	1142	855	1043	1024	1019	1145	1241	1602	732	1011	267	319	341	767	96	396	465	91	0	491
LVA	111	149	354	143	641	246	214	241	279	416	358	684	256	397	67	75	103	298	68	103	174	49	404	0

HOL ft1

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	NZL	
AUS	0	531	979	498	930	805	683	877	969	630	955	1172	474	633	310	592	572	110	459	364	82	629	268	79
BEL	464	0	751	580	1006	724	660	896	824	678	1147	858	441	666	248	460	585	124	445	302	104	682	277	63
CAN	911	719	0	938	2245	1244	1476	1485	1816	1924	1541	3616	1007	1366	376	1243	1219	245	513	788	167	1244	588	102
CHE	454	574	840	0	1077	623	613	725	793	733	900	991	396	595	218	419	517	111	400	304	93	578	282	65
DEU	651	950	1437	928	0	2212	1608	2302	1991	2237	2802	3009	1138	1994	372	1238	1752	327	652	625	283	1340	852	104
DFS	545	635	941	564	1333	0	1030	1574	1401	1178	1748	1730	754	1242	384	824	1118	244	581	483	154	961	459	70
ESP	531	636	996	511	934	753	0	1314	1181	1325	1229	1706	784	1102	366	888	961	173	462	562	146	1032	435	79
FRA	637	892	1093	688	1294	931	1041	0	1594	1369	1962	2320	856	1608	380	1107	1260	189	610	565	147	1084	466	70
GBR	835	822	1855	791	1384	984	965	1137	0	1542	1818	2337	843	1329	395	951	1127	226	830	568	154	1105	514	96
ITA	548	700	1753	679	1602	991	1019	1036	1380	0	1507	2455	968	1522	274	918	1243	265	468	623	218	1135	629	95
NLD	808	1251	1411	884	2118	1301	1071	1360	1563	1384	0	2378	862	1533	382	972	1488	279	742	539	185	1212	561	148
USA	1006	749	3700	924	1749	1095	1189	1351	2156	2192	1959	0	1275	1851	467	1768	1744	297	657	961	185	1556	815	100
HUN	342	358	907	323	802	554	600	597	682	863	668	1174	0	859	279	616	900	162	342	478	111	764	388	58
POL	421	540	1067	435	1351	820	762	1073	1044	1267	1208	1575	686	0	294	822	1260	266	466	566	192	1084	601	74

ZAF	287	212	349	192	293	303	339	317	368	240	345	495	236	219	0	306	303	54	240	232	30	339	138	20
JPN	320	262	485	246	386	332	356	353	405	413	399	552	258	301	196	0	788	127	356	557	102	695	353	63
CZE	375	436	868	371	1181	650	679	842	816	1001	1274	1365	768	909	225	267	0	201	443	528	159	915	488	72
EST	52	70	156	61	205	157	75	94	129	168	189	209	88	155	22	35	114	0	86	94	44	160	142	25
IRL	421	422	483	395	529	460	435	531	895	440	679	613	278	346	228	207	331	43	0	231	74	466	200	66
KOR	256	214	724	216	385	316	408	354	430	525	376	1079	372	407	179	273	371	40	161	0	84	536	288	55
SVN	58	81	130	67	275	121	96	111	115	189	160	143	86	153	20	45	111	22	55	54	0	120	90	33
PRT	497	692	1255	531	1142	855	1039	1024	1019	1145	1218	1602	732	1011	319	341	767	96	396	465	91	0	511	65
LVA	124	161	369	154	664	260	227	253	298	420	362	706	269	412	83	107	306	73	114	176	49	421	0	33
NZL	83	57	102	55	94	61	71	64	91	85	142	102	42	55	21	57	58	13	61	46	21	62	17	0

HOL rtp

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	POL	NZL	JPN	CZE	EST	IRL	KOR	SVN	PRT	ZAF	HUN	LVA
AUS	0	518	978	480	925	680	688	875	833	630	809	892	528	520	405	453	109	459	241	82	536	169	348	268
BEL	462	0	740	553	991	664	661	877	739	678	1016	739	576	295	352	499	124	438	219	104	592	145	345	277
CAN	910	714	0	901	2238	1088	1478	1485	1637	1923	1497	3202	1262	410	948	1089	244	513	607	167	1117	227	867	588
CHE	449	549	810	0	987	581	609	711	748	726	811	904	519	262	356	437	110	396	229	93	504	133	322	277
DEU	650	948	1436	872	0	2064	1616	2294	1830	2235	2758	2681	1857	475	1000	1544	326	648	486	284	1186	223	934	852
DFS	506	596	911	524	1289	0	930	1369	1155	1164	1553	1333	1082	393	589	903	237	513	334	155	806	212	583	446
ESP	534	644	999	512	947	711	0	1327	1076	1330	1168	1538	1008	355	717	858	172	470	431	147	919	218	647	438
FRA	637	888	1093	674	1292	875	1062	0	1325	1368	1659	1713	1447	514	806	1074	187	607	416	147	921	211	683	465
GBR	747	757	1699	735	1324	880	861	1009	0	1526	1580	1962	1180	414	699	944	214	675	416	154	939	221	665	498
ITA	548	700	1753	675	1602	981	1026	1036	1375	0	1590	2424	1498	293	861	1212	264	468	536	218	1106	221	920	629
NLD	724	1101	1411	801	2169	1225	1018	1254	1397	1477	0	1877	1430	561	732	1341	285	663	400	195	1054	213	710	570
USA	835	709	3428	845	1667	995	1086	1113	1935	2187	1625	0	1653	409	1227	1484	287	573	716	185	1319	257	1034	794
POL	361	473	1009	371	1254	738	673	975	946	1245	1151	1453	0	265	694	1122	253	395	467	192	948	190	732	573
NZL	426	235	358	219	339	281	290	311	346	253	516	369	172	0	224	267	58	368	130	51	271	101	175	145
JPN	279	234	445	227	358	301	314	316	357	402	362	494	276	144	0	619	115	270	399	102	540	165	470	313
CZE	319	380	792	306	1063	566	586	700	697	983	1189	1196	831	188	245	0	193	367	399	158	786	203	725	466
EST	52	70	156	61	205	154	75	94	126	168	193	206	146	31	35	109	0	85	85	44	153	46	150	142
IRL	421	420	483	391	527	420	443	530	695	440	627	572	292	306	183	275	43	0	149	74	389	128	251	200
KOR	180	169	568	171	314	237	304	282	309	457	290	812	350	97	216	283	37	109	0	84	403	128	361	240
SVN	58	81	130	67	276	122	98	111	115	189	170	143	153	36	45	111	22	55	54	0	120	30	111	90
PRT	430	593	1108	455	1013	701	899	856	853	1113	1036	1381	896	211	299	654	89	325	360	91	0	215	613	487
ZAF	161	132	211	111	182	187	192	187	196	195	185	262	162	92	124	154	20	119	89	20	207	0	170	105
HUN	268	282	798	262	665	446	480	483	540	821	555	977	600	132	218	618	81	212	277	86	593	151	0	354
LVA	124	161	369	152	664	259	231	252	294	420	374	695	395	77	103	296	73	114	151	49	395	65	242	0

HOL ocs

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	531	979	498	928	805	683	772	969	630	955	1168	474	633	527	600	572	109	460	364	83	629
BEL	464	0	749	578	1004	722	663	852	823	678	1146	853	441	665	303	460	585	124	444	302	104	681
CAN	911	719	0	938	2244	1244	1468	1357	1816	1923	1541	3596	1007	1366	415	1250	1219	245	513	790	168	1243
CHE	454	574	840	0	1075	623	616	710	793	733	900	986	396	595	267	419	517	111	400	304	94	578
DEU	651	949	1437	928	0	2211	1616	2223	1990	2236	2801	2998	1137	1993	483	1239	1751	326	651	624	284	1338
DFS	545	635	941	564	1333	0	1033	1447	1401	1177	1748	1727	754	1241	482	830	1118	243	580	484	154	960
ESP	535	646	999	515	949	763	0	1263	1188	1330	1241	1704	788	1111	359	895	969	172	469	565	148	1043
FRA	607	861	1052	676	1260	910	1035	0	1484	1359	1756	1998	832	1539	452	1001	1216	185	571	539	148	1040
GBR	835	823	1855	791	1384	984	978	1110	0	1542	1819	2331	843	1329	521	956	1127	226	832	568	156	1103
ITA	548	700	1753	679	1602	991	1026	1034	1380	0	1507	2450	968	1522	294	918	1242	265	468	624	219	1134
NLD	808	1252	1411	884	2118	1301	1086	1271	1564	1384	0	2371	862	1532	682	978	1488	278	742	539	186	1212
USA	1001	747	3666	918	1739	1090	1192	1224	2148	2186	1951	0	1272	1847	582	1784	1738	296	654	963	186	1552
HUN	342	358	907	323	802	554	603	594	682	863	668	1172	0	859	272	617	900	162	342	478	111	763
POL	421	540	1067	435	1351	820	771	1044	1044	1267	1208	1571	686	0	344	824	1260	265	466	566	194	1084
NZL	429	237	360	222	340	312	291	296	414	253	611	495	198	217	0	339	357	59	371	203	51	352
JPN	321	261	485	246	387	333	357	351	406	414	400	553	259	302	168	0	789	128	358	558	102	695
CZE	375	436	868	371	1181	650	688	820	816	1001	1274	1359	768	909	238	269	0	201	443	528	158	914
EST	52	70	156	61	205	157	75	93	129	168	189	209	88	155	31	35	114	0	86	94	44	160
IRL	422	422	483	395	529	460	443	518	898	440	679	612	278	346	307	207	331	43	0	231	74	466
KOR	256	214	724	216	385	316	411	346	430	525	376	1077	372	407	139	274	371	40	161	0	84	536
SVN	58	80	130	68	277	121	99	111	115	190	160	143	86	154	36	45	110	22	55	54	0	121

PRT 497 693 1255 531 1142 855 1053 1009 1020 1145 1219 1593 732 1011 267 341 767 96 396 465 91 0

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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	JPN	CZE	EST	IRL	SVN	PRT
AUS	0	531	979	498	929	805	689	877	969	630	955	1172	474	633	527	600	572	109	460	82	629
BEL	464	0	751	580	1006	724	667	897	825	678	1148	858	441	666	303	461	585	124	445	103	682
CAN	911	719	0	938	2245	1244	1479	1485	1816	1924	1541	3616	1007	1366	415	1250	1219	245	513	167	1243
CHE	454	574	840	0	1076	623	617	725	793	733	900	991	396	595	267	419	517	111	400	93	578
DEU	651	950	1437	928	0	2212	1620	2302	1991	2237	2802	3009	1138	1993	484	1240	1752	326	652	282	1339
DFS	545	635	941	564	1333	0	1040	1574	1401	1178	1748	1730	754	1242	482	830	1118	243	581	153	961
ESP	535	646	999	515	949	763	0	1329	1194	1330	1244	1716	788	1113	360	901	970	172	470	147	1043
FRA	637	893	1094	688	1294	931	1062	0	1595	1369	1963	2320	856	1608	523	1114	1260	188	610	146	1084
GBR	835	821	1854	791	1382	983	975	1136	0	1542	1819	2337	843	1329	521	956	1127	226	833	154	1105
ITA	548	700	1753	679	1602	991	1026	1036	1379	0	1507	2455	968	1521	294	918	1243	265	468	217	1134
NLD	808	1252	1411	884	2118	1301	1086	1361	1562	1384	0	2378	862	1533	682	978	1488	278	742	184	1212
USA	1006	749	3700	924	1749	1095	1198	1351	2156	2192	1959	0	1275	1850	583	1788	1744	297	657	185	1555
HUN	342	358	907	323	802	554	603	597	682	863	668	1174	0	859	272	617	900	162	342	111	763
POL	421	540	1067	435	1351	820	771	1073	1044	1266	1208	1575	686	0	344	824	1260	265	466	192	1084
NZL	429	237	360	222	340	312	292	312	414	253	611	497	198	217	0	339	357	59	371	51	352
JPN	321	261	485	246	387	333	357	354	406	414	400	553	259	302	168	0	789	128	358	102	695
CZE	375	436	868	371	1181	650	688	842	815	1001	1274	1365	768	909	238	269	0	201	443	158	915
EST	52	70	156	61	205	157	75	94	129	168	189	209	88	155	31	35	114	0	86	44	160
IRL	422	422	483	395	529	460	443	531	897	440	679	613	278	346	307	207	331	43	0	74	466
SVN	58	80	130	67	274	120	98	110	115	188	159	143	86	153	36	45	110	22	55	0	120
PRT	497	693	1255	531	1142	855	1053	1024	1019	1145	1219	1602	732	1011	267	341	767	96	396	91	0

HOL of1

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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	523	979	498	928	805	691	768	969	630	935	1170	474	632	591	572	109	459	83	633
BEL	463	0	744	575	998	717	665	846	816	678	1100	836	437	660	447	582	124	441	104	680
CAN	911	718	0	938	2244	1244	1481	1352	1816	1924	1510	3608	1007	1366	1234	1219	245	513	168	1247
CHE	454	571	840	0	1075	623	619	705	793	733	891	989	396	595	417	517	111	400	94	579
DEU	651	949	1437	928	0	2211	1623	2217	1990	2236	2776	3008	1137	1991	1234	1751	326	651	284	1342
DFS	545	633	941	564	1333	0	1044	1443	1401	1178	1720	1716	754	1241	819	1118	243	580	154	966
ESP	537	653	1001	518	955	768	0	1261	1196	1332	1230	1714	789	1115	890	972	174	471	148	1051
FRA	600	857	1041	667	1253	908	1033	0	1479	1358	1730	1988	830	1537	989	1215	185	568	148	1042
GBR	835	820	1854	791	1382	983	981	1097	0	1542	1794	2330	843	1329	944	1127	226	829	156	1107
ITA	548	700	1753	679	1602	991	1029	1033	1379	0	1504	2454	968	1521	917	1243	265	468	219	1135
NLD	782	1194	1364	863	2091	1280	1064	1237	1524	1381	0	2268	857	1521	940	1477	277	735	186	1203
USA	1002	744	3700	924	1748	1095	1199	1208	2155	2192	1749	0	1275	1847	1735	1742	297	654	186	1558
HUN	342	358	907	323	802	554	605	590	682	863	655	1174	0	859	616	900	162	342	111	764
POL	421	539	1067	435	1351	820	774	1043	1044	1266	1200	1575	686	0	822	1260	265	466	194	1085
JPN	318	260	483	244	385	331	356	345	402	412	394	549	258	300	0	786	127	354	102	696
CZE	375	435	868	371	1181	650	691	816	815	1001	1257	1364	768	909	267	0	201	443	158	916
EST	52	70	156	61	205	157	77	93	129	168	188	209	88	155	35	114	0	86	44	160
IRL	421	422	483	395	529	460	445	514	894	440	669	613	278	346	207	331	43	0	74	467
SVN	58	80	130	68	277	121	99	111	115	190	160	143	86	154	45	110	22	55	0	121
PRT	498	694	1257	532	1145	858	1064	1013	1025	1145	1206	1604	734	1014	339	769	96	397	91	0

HOL loc

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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	POL
BEL	0	700	487	835	670	607	802	761	663	946	778	486	408	204	83	576	94	343	407
CAN	698	0	826	1915	1148	1365	1320	1721	1886	1323	3420	1070	490	541	142	1103	193	866	887
CHE	483	734	0	871	534	527	625	692	697	708	847	413	330	205	75	480	89	313	361
DEU	809	1316	748	0	1758	1396	1813	1630	2089	2271	2444	1406	519	428	217	1070	249	896	1234
DFS	617	938	477	1185	0	954	1439	1390	1137	1489	1710	910	577	303	118	802	191	588	750
ESP	602	932	423	810	721	0	1201	1095	1296	1089	1583	846	425	388	122	903	135	641	740

FRA	831	1037	574	1101	907	982	0	1476	1318	1512	1986	1046	566	372	115	901	138	682	1006
GBR	784	1782	662	1190	981	878	1098	0	1504	1528	2321	955	818	371	128	950	174	671	842
ITA	686	1733	642	1511	970	1010	1020	1359	0	1446	2394	1177	450	480	177	1076	223	907	1089
NLD	1024	1265	685	1828	1200	936	1154	1334	1349	0	1792	1263	625	353	146	992	208	678	928
USA	724	3586	765	1518	1094	1063	1208	2153	2156	1485	0	1503	651	632	157	1344	219	1046	1151
CZE	377	781	288	992	556	587	687	690	948	1127	1186	0	357	348	134	762	147	719	815
IRL	407	478	316	435	459	400	513	884	430	593	611	267	0	136	60	380	61	251	276
KOR	160	522	156	291	222	282	261	283	418	264	726	249	102	0	68	362	63	326	339
SVN	64	112	53	204	90	81	85	95	152	124	124	90	41	44	0	100	37	95	143
PRT	582	1099	432	950	693	888	840	844	1080	979	1378	626	317	327	72	0	115	609	686
EST	54	131	47	154	131	57	72	102	140	144	145	81	30	28	14	64	0	119	173
HUN	280	792	254	648	446	477	480	535	809	533	971	608	210	250	71	585	60	0	571
POL	319	698	252	812	500	482	657	667	874	708	920	568	218	235	107	613	88	467	0

HOL bcs

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common bulls below diagonal  
common three quarter sib group above diagonal

	BEL	CHE	DEU	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	NZL	POL
BEL	0	530	802	644	745	644	985	765	443	289	411	211	589	432	605	101	101	295	226	496
CHE	530	0	954	611	764	727	847	961	419	308	383	228	805	401	587	95	99	288	216	469
DEU	776	820	0	1620	1637	2131	2330	2462	1343	810	522	470	1771	901	1403	285	287	810	306	1607
FRA	650	565	1075	0	1065	1258	1262	1385	872	616	414	386	1041	670	1031	149	155	590	238	1206
GBR	765	753	1206	858	0	1526	1675	2285	886	591	812	414	1419	735	1124	157	199	601	378	1069
ITA	662	672	1522	987	1369	0	1471	2428	1160	777	461	531	1805	935	1309	218	250	841	265	1393
NLD	1067	831	1874	1036	1455	1359	0	2003	1225	590	693	386	1180	771	1139	188	243	604	504	1217
USA	699	894	1539	942	2142	2167	1629	0	1408	1032	651	715	2791	1087	1640	187	251	959	379	1521
CZE	341	293	968	613	648	945	1093	1131	0	520	329	389	939	610	790	159	172	636	215	1003
JPN	194	196	319	277	314	373	316	441	222	0	208	376	761	418	619	101	95	407	160	590
IRL	403	376	440	389	868	436	641	613	247	151	0	148	401	272	439	74	71	216	300	328
KOR	159	170	312	280	308	454	280	813	277	213	108	0	574	376	427	83	78	347	124	453
CAN	608	743	1318	893	1527	1696	1214	3157	735	398	420	553	0	879	1179	169	210	768	253	1107
PRT	428	355	803	638	655	942	742	1161	504	253	227	332	904	0	705	121	130	515	185	779
ESP	609	487	808	856	927	1014	997	1142	538	278	420	303	876	671	0	147	149	586	261	900
SVN	77	68	279	113	115	188	161	143	111	45	55	53	130	90	97	0	44	111	49	193
EST	58	55	183	83	119	160	171	173	100	33	37	37	149	80	68	22	0	137	47	232
HUN	240	227	595	434	488	759	477	900	543	193	180	269	743	505	436	86	75	0	144	664
NZL	192	190	259	200	320	238	465	335	161	122	251	96	255	158	224	34	27	113	0	188
POL	409	343	1143	880	879	1170	993	1378	755	253	265	343	976	739	611	154	138	561	145	0

JER sta

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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	166	96	107	35	160	272	139	19	19
CAN	172	0	119	152	37	85	505	152	18	27
DFS	73	108	0	119	47	102	184	131	27	37
GBR	105	156	115	0	42	80	188	115	19	35
ITA	35	35	46	40	0	33	47	47	10	17
NZL	161	85	81	82	30	0	171	109	22	22
USA	267	510	154	195	50	175	0	267	42	42
ZAF	144	153	114	114	48	106	275	0	31	26
NLD	15	13	21	16	7	19	41	26	0	4
CHE	17	25	36	33	18	20	42	26	3	0

JER cwi

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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	166	96	107	35	160	272	132	19	26
CAN	172	0	119	152	37	85	505	141	18	32
DFS	73	108	0	119	47	102	184	122	27	47
GBR	105	156	115	0	42	80	188	110	19	42
ITA	35	35	46	40	0	33	47	47	10	24

NZL	161	85	81	82	30	0	171	100	22	28
USA	267	510	154	195	50	175	0	245	42	49
ZAF	138	144	108	110	48	98	255	0	31	38
NLD	15	13	21	16	7	19	41	26	0	8
CHE	24	31	46	41	25	26	50	38	6	0

JER bde

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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	166	96	107	35	160	132	19	272	30
CAN	172	0	119	152	37	85	141	18	505	36
DFS	73	108	0	119	47	102	122	27	184	50
GBR	105	156	115	0	42	80	110	19	188	45
ITA	35	35	46	40	0	33	47	10	47	27
NZL	161	85	81	82	30	0	100	22	171	32
ZAF	138	144	108	110	48	98	0	31	245	42
NLD	15	13	21	16	7	19	26	0	42	10
USA	267	510	154	195	50	175	255	41	0	53
CHE	27	33	49	44	27	30	41	7	54	0

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JER ang

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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	166	14	106	35	271	139	7	30
CAN	172	0	43	152	37	505	152	10	36
DFS	14	44	0	36	2	49	24	11	12
GBR	104	156	36	0	41	186	112	13	43
ITA	35	35	2	39	0	46	46	5	27
USA	266	510	49	193	49	0	264	25	53
ZAF	144	153	24	111	48	272	0	16	41
NLD	4	8	11	11	4	22	14	0	5
CHE	27	33	12	42	27	54	40	5	0

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JER ran

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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	166	96	107	35	160	272	139	19	30
CAN	172	0	119	152	37	85	505	152	18	36
DFS	73	108	0	119	47	102	184	131	27	50
GBR	105	156	115	0	42	80	188	115	19	45
ITA	35	35	46	40	0	33	47	47	10	27
NZL	161	85	81	82	30	0	171	109	22	32
USA	267	510	154	195	50	175	0	267	42	53
ZAF	144	153	114	114	48	106	275	0	31	42
NLD	15	13	21	16	7	19	41	26	0	10
CHE	27	33	49	44	27	30	54	41	7	0

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JER rwi

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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	166	91	107	35	160	272	139	19	30
CAN	172	0	108	152	37	85	505	152	18	36
DFS	65	94	0	115	44	95	173	124	25	49
GBR	105	156	108	0	42	80	188	115	19	45
ITA	35	35	41	40	0	33	47	47	10	27
NZL	161	85	73	82	30	0	171	109	22	32
USA	267	510	140	195	50	175	0	267	42	53

ZAF	144	153	104	114	48	106	275	0	31	42
NLD	15	13	19	16	7	19	41	26	0	10
CHE	27	33	48	44	27	30	54	41	7	0

JER rls

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	166	96	107	35	160	272	139	19	30
CAN	172	0	119	152	37	85	505	152	18	36
DFS	73	108	0	119	47	102	184	131	27	50
GBR	105	156	115	0	42	80	188	115	19	45
ITA	35	35	46	40	0	33	47	47	10	27
NZL	161	85	81	82	30	0	171	109	22	32
USA	267	510	154	195	50	175	0	267	42	53
ZAF	144	153	114	114	48	106	275	0	31	42
NLD	15	13	21	16	7	19	41	26	0	10
CHE	27	33	49	44	27	30	54	41	7	0

JER rlr

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE
AUS	0	166	89	35	110	19	271	30
CAN	172	0	108	37	127	18	505	36
DFS	64	94	0	44	94	25	172	49
ITA	35	35	41	0	44	10	47	27
ZAF	113	124	80	44	0	28	209	42
NLD	15	13	19	7	21	0	42	10
USA	266	510	139	50	208	41	0	53
CHE	27	33	48	27	41	7	54	0

JER fan

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	166	94	106	35	271	139	19	30
CAN	172	0	119	152	37	505	152	18	36
DFS	72	108	0	117	47	183	131	27	50
GBR	104	156	113	0	42	187	115	19	45
ITA	35	35	46	40	0	47	47	10	27
USA	266	510	153	194	50	0	266	42	53
ZAF	144	153	114	114	48	274	0	31	42
NLD	15	13	21	16	7	41	26	0	10
CHE	27	33	49	44	27	54	41	7	0

JER fua

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	166	96	107	35	160	272	139	19	30
CAN	172	0	119	152	37	85	505	152	18	36
DFS	73	108	0	119	47	102	184	131	27	50
GBR	105	156	115	0	42	80	188	115	19	45
ITA	35	35	46	40	0	33	47	47	10	27
NZL	161	85	81	82	30	0	171	109	22	32
USA	267	510	154	195	50	175	0	267	42	53
ZAF	144	153	114	114	48	106	275	0	31	42
NLD	15	13	21	16	7	19	41	26	0	10
CHE	27	33	49	44	27	30	54	41	7	0

## JER ruh

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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  166   88  107  35  160  272  139   19   30
CAN   172    0  102  152  37   85  505  152   18   36
DFS    63   92    0  106  44   88  165  119   25   49
GBR   105  156  104    0  42   80  188  115   19   45
ITA    35   35   41   40    0  33   47   47   10   27
NZL   161   85   68   82   30    0  171  109   22   32
USA   267  510  134  195   50  175    0  267   42   53
ZAF   144  153  102  114   48  106  275    0   31   42
NLD    15   13   19   16    7   19   41   26    0   10
CHE    27   33   48   44   27   30   54   41    7    0
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## JER usu

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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  166   96  107  35  160  272  139   19   30
CAN   172    0  119  152  37   85  505  152   18   36
DFS    73  108    0  119  47  102  184  131   27   50
GBR   105  156  115    0  42   80  188  115   19   45
ITA    35   35   46   40    0  33   47   47   10   27
NZL   161   85   81   82   30    0  171  109   22   32
USA   267  510  154  195   50  175    0  267   42   53
ZAF   144  153  114  114   48  106  275    0   31   42
NLD    15   13   21   16    7   19   41   26    0   10
CHE    27   33   49   44   27   30   54   41    7    0
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## JER ude

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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  166   94  106  35  271  139   20   30
CAN   172    0  119  152  37  502  152   19   36
DFS    72  108    0  117  47  183  131   48   50
GBR   104  156  113    0  42  187  115   24   45
ITA    35   35   46   40    0  47   47   10   27
USA   266  508  153  194   50    0  266   49   53
ZAF   144  153  114  114   48  274    0   37   42
NLD    16   14   41   21    7   48   31    0   12
CHE    27   33   49   44   27   54   41    9    0
-----

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## JER ftp

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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  166   96  107  35  160  272  139   20   30
CAN   172    0  119  152  37   85  505  152   19   36
DFS    73  108    0  119  46  102  184  131   48   50
GBR   105  156  115    0  42   80  188  115   24   45
ITA    35   35   45   40    0  33   46   47   10   27
NZL   161   85   81   82   30    0  171  109   24   32
USA   267  510  154  195   49  175    0  267   49   53
ZAF   144  153  114  114   48  106  275    0   37   42
NLD    16   14   41   21    7   21   48   31    0   12
CHE    27   33   49   44   27   30   54   41    9    0
-----

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## JER ftl

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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  USA  ZAF  NLD  CHE  NZL
-----
AUS   0  166   94  106   35  271  132   19   30   26
CAN  172   0  119  152   37  505  141   18   36   22
DFS   72  108   0  117   47  183  122   27   50   25
GBR  104  156  113   0  42  187  110   19   45   17
ITA   35   35   46   40   0   47   47   10   27   3
USA  266  510  153  194   50   0  245  42   53   33
ZAF  138  144  108  110  48  255   0   31  42  20
NLD   15   13   21   16   7   41   26   0   10   8
CHE   27   33   49   44  27   54  41   7    0   8
NZL   26   20   24   16   1  29  19   6    7   0
-----

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JER rtp
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  NZL  ZAF  NLD  USA  CHE
-----
AUS   0  166   80  160  129  20  272  30
CAN  172   0   97   85  138  19  505  36
DFS   58   89   0   81  106  46  155  49
NZL  161   85   63   0   96  24  170  32
ZAF  133  138   90   90   0   37  240  42
NLD   16   14   39  21  31   0   49  12
USA  267  510  126  174  242  48   0   53
CHE   27   33   48   30  41   9   54   0
-----

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JER ocs
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  NLD  CHE
-----
AUS   0  166   96  35  35  160  272  19  26
CAN  172   0  119  37  37   85  505  18  32
DFS   73  108   0  32  47  102  184  27  47
GBR   40  42  30   0  12  35  40   4   3
ITA   35   35   46  13   0  33  47  10  24
NZL  161  85  81  39  30   0  171  22  28
USA  267  510  154  43  50  175   0  42  49
NLD   15  13  21   5   7  19  41   0   8
CHE   24  31  46   4  25  26  50   6   0
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JER ous
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  NZL  USA  NLD  CHE  ITA
-----
AUS   0  166   92  107  160  272  19  26  35
CAN  172   0  113  152  85  502  18  32  37
DFS   70  106   0  109  93  175  27  47  46
GBR  105  156  110   0  77  187  19  42  42
NZL  161  85  74   79   0  170  22  28  33
USA  267  508  147  194  174   0  42  49  46
NLD   15  13  21  16  19  41   0   8  10
CHE   24  31  46  41  26  50   6   0  24
ITA   35  35  45  40  30  49   7  25  0
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JER ofl
-----
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  DFS  GBR  ITA  USA  NLD  CHE  AUS
-----
CAN   0  119  152  37  505  18  32  166
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DFS	108	0	117	47	183	27	47	94
GBR	156	113	0	42	187	19	42	106
ITA	35	46	40	0	47	10	24	35
USA	510	153	194	50	0	42	49	270
NLD	13	21	16	7	41	0	8	19
CHE	31	46	41	25	50	6	0	26
AUS	172	72	104	35	265	15	24	0

JER loc

JER bcs

RDC sta

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	27	14	57	12	18	26	16	12	5	19
CAN	27	0	11	159	80	5	38	162	4	0	10
DEU	14	11	0	62	4	13	14	4	14	0	33
DFS	45	160	53	0	62	90	67	87	37	0	132
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	14	5	12	70	0	0	8	0	27	0	13
NZL	25	36	13	65	27	7	0	28	5	2	8
USA	16	157	4	84	62	0	27	0	2	0	4
NLD	12	4	13	36	1	26	5	2	0	0	12
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	18	10	26	93	3	11	8	4	11	0	0

RDC cwi

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0	27	14	57	12	26	16	12	5	12	18
CAN	27	0	11	159	80	38	162	4	0	3	10
DEU	14	11	0	62	4	14	4	14	0	8	31
DFS	45	160	53	0	62	65	87	35	0	60	113
GBR	10	79	4	57	0	30	66	1	0	0	3
NZL	25	36	13	63	27	0	28	5	2	6	7
USA	16	157	4	84	62	27	0	2	0	0	4
NLD	12	4	13	34	1	5	2	0	0	17	11
CAM	5	0	0	0	0	2	0	0	0	0	0
NOR	11	2	7	47	0	6	0	16	0	0	4
LVA	17	10	24	78	3	7	4	10	0	3	0

RDC bde

common bulls below diagonal

common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	27	14	57	12	11	26	16	12	5	19
CAN	27	0	11	159	80	2	38	160	4	0	10
DEU	14	11	0	62	4	8	14	4	14	0	33
DFS	45	160	53	0	62	66	65	87	35	0	132
GBR	10	79	4	57	0	0	30	65	1	0	3
NOR	10	2	7	50	0	0	5	0	22	0	4
NZL	25	36	13	63	27	5	0	28	5	2	8
USA	16	156	4	84	61	0	27	0	2	0	4
NLD	12	4	13	34	1	21	5	2	0	0	12
CAM	5	0	0	0	0	0	2	0	0	0	0
LVA	18	10	26	93	3	3	8	4	11	0	0

RDC ang

common bulls below diagonal

```

common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  USA  NLD  CAM  NOR  LVA
-----
AUS   0   27   4   20   12   16   12   5   12   19
CAN  27   0   0   59   80  162   4   0   4   10
DEU   4   0   0   20   0   0   2   0   6   5
DFS  20  61  20   0   23  21  16   0  53  19
GBR  10  79   0   21   0  66   1   0   0   3
USA  16 157   0   21  62   0   2   0   0   4
NLD  12   4   2  16   1   2   0   0  17  11
CAM   5   0   0   0   0   0   0   0   0   0
NOR  11   3   6  54   0   0  16   0   0   6
LVA  18  10   3  17   3   4  10   0   5   0
-----

```

RDC ran

```

common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   27  14  57  12  20  26  16  12  5  19
CAN  27   0  11 159  80  5  38 162  4  0  10
DEU  14  11   0  62  4  13  14  4  14  0  33
DFS  45 160  53  0  62 100  64  87  36  0 132
GBR  10  79  4  57  0  0  30  66  1  0  3
NOR  16  5  12  78  0  0  9  0  27  0  14
NZL  25  36  13  60  27  8  0  28  5  2  8
USA  16 157  4  84  62  0  27  0  2  0  4
NLD  12  4  13  35  1  26  5  2  0  0  12
CAM   5  0  0  0  0  0  2  0  0  0  0
LVA  18  10  26  93  3  12  8  4  11  0  0
-----

```

RDC rwi

```

common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NZL  USA  NLD  CAM  NOR  LVA
-----
AUS   0   27  14  57  12  26  16  12  5  11  19
CAN  27   0  11 159  80  38 162  4  0  2  10
DEU  14  11   0  62  4  14  4  14  0  7  33
DFS  45 160  53  0  62  65  87  36  0  54 132
GBR  10  79  4  57  0  30  66  1  0  0  3
NZL  25  36  13  63  27  0  28  5  2  5  8
USA  16 157  4  84  62  27  0  2  0  0  4
NLD  12  4  13  35  1  5  2  0  0  17  12
CAM   5  0  0  0  0  2  0  0  0  0  0
NOR  10  2  6  41  0  5  0  16  0  0  3
LVA  18  10  26  93  3  8  4  11  0  2  0
-----

```

RDC rls

```

common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   27  14  57  12  20  26  16  12  5  19
CAN  27   0  11 159  80  5  38 162  4  0  10
DEU  14  11   0  62  4  13  14  4  14  0  33
DFS  45 160  53  0  62 103  67  87  37  0 132
GBR  10  79  4  57  0  0  30  66  1  0  3
NOR  16  5  12  80  0  0  9  0  27  0  14
NZL  25  36  13  65  27  8  0  28  5  2  8
USA  16 157  4  84  62  0  27  0  2  0  4
NLD  12  4  13  36  1  26  5  2  0  0  12
CAM   5  0  0  0  0  0  2  0  0  0  0
LVA  18  10  26  93  3  12  8  4  11  0  0
-----

```

RDC rlr

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  NOR  NLD  USA  CAM  LVA
-----
AUS   0   27   14   57   20   12   16   5   18
CAN   27   0   11  158   5   4  162   0   10
DEU   14   11   0   62   13   14   4   0   31
DFS   45  159   53   0  100   34   87   0  113
NOR   16   5   12   78   0   27   0   0   12
NLD   12   4   13   33   26   0   2   0   11
USA   16  157   4   84   0   2   0   0   4
CAM   5   0   0   0   0   0   0   0   0
LVA   17   10   24   78   10   10   4   0   0
-----

```

```

RDC fan
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  USA  NLD  CAM  LVA
-----
AUS   0   27   11   57   12   20   16   12   5   19
CAN   27   0   9  159   80   5  162   4   0   10
DEU   11   9   0   53   4   12   4   14   0   20
DFS   45  160   47   0   62  100   87   35   0  132
GBR   10   79   4   57   0   0   66   1   0   3
NOR   16   5   11   78   0   0   0   27   0   14
USA   16  157   4   84   62   0   0   2   0   4
NLD   12   4   13   34   1  26   2   0   0  12
CAM   5   0   0   0   0   0   0   0   0   0
LVA   18   10   16   93   3  12   4  11   0   0
-----

```

```

RDC fua
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   27   14   57   12   20   26   16   12   5   19
CAN   27   0   11  159   80   5  38  162   4   0  10
DEU   14   11   0   62   4  13   14   4   14   0  33
DFS   45  160   53   0   62  103   67   87   35   0  132
GBR   10   79   4   57   0   0   30   66   1   0   3
NOR   16   5   12   80   0   0   9   0   27   0  14
NZL   25  36  13  65  27   8   0  28   5   2   8
USA   16  157   4   84   62   0  27   0   2   0   4
NLD   12   4   13   34   1  26   5   2   0   0  12
CAM   5   0   0   0   0   0   2   0   0   0   0
LVA   18   10   26   93   3  12   8   4  11   0   0
-----

```

```

RDC ruh
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   27   14   57   12   20   26   16   12   5   19
CAN   27   0   11  159   80   5  38  162   4   0  10
DEU   14   11   0   62   4  13   14   4   14   0  33
DFS   45  160   53   0   62  100   65   87   35   0  126
GBR   10   79   4   57   0   0   30   66   1   0   3
NOR   16   5   12   78   0   0   9   0   27   0  14
NZL   25  36  13  62  27   8   0  28   5   2   8
USA   16  157   4   84   62   0  27   0   2   0   4
NLD   12   4   13   34   1  26   5   2   0   0  12
CAM   5   0   0   0   0   0   2   0   0   0   0
LVA   18   10   26  89   3  12   8   4  11   0   0
-----

```

```

RDC usu
-----

```

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   27   14   57   12   20   26   16   12   5   19
CAN   27   0   11  159   80   5   38  162   4   0   10
DEU   14   11   0   62   4   14   14   4   14   0   33
DFS   45  160   53   0   62   95   67   87   37   0  132
GBR   10   79   4   57   0   0   30   66   1   0   3
NOR   16   5   13   75   0   0   9   0   27   0   14
NZL   25   36   13   65   27   8   0   28   5   2   8
USA   16  157   4   84   62   0   27   0   2   0   4
NLD   12   4   13   36   1  26   5   2   0   0   12
CAM    5   0   0   0   0   0   2   0   0   0   0
LVA   18   10   26   93   3  12   8   4   11   0   0
-----

```

RDC ude

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  USA  NLD  CAM  LVA
-----
AUS   0   27   14   57   12   20   16   15   5   19
CAN   27   0   11  159   80   5  159   4   0   10
DEU   14   11   0   62   4   13   4   16   0   33
DFS   45  160   53   0   62  103   87   46   0  132
GBR   10   79   4   57   0   0   66   1   0   3
NOR   16   5   12   80   0   0   0   37   0   14
USA   16  156   4   84   62   0   0   2   0   4
NLD   15   4   15   45   1  36   2   0   0   15
CAM    5   0   0   0   0   0   0   0   0   0
LVA   18   10   26   93   3  12   4  14   0   0
-----

```

RDC ftp

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   27   14   57   12   20   26   16   15   5   18
CAN   27   0   11  159   80   5   38  162   4   0   10
DEU   14   11   0   62   4   14   14   4   16   0   31
DFS   45  160   53   0   62  102   65   87   45   0  113
GBR   10   79   4   57   0   0   30   66   1   0   3
NOR   16   5   13   80   0   0   9   0   37   0   13
NZL   25   36   13   63   27   8   0   28   7   2   7
USA   16  157   4   84   62   0   27   0   2   0   4
NLD   15   4   15   44   1  36   7   2   0   0   14
CAM    5   0   0   0   0   0   2   0   0   0   0
LVA   17   10   24   78   3  11   7   4  13   0   0
-----

```

RDC ftl

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  USA  NLD  CAM  LVA  NZL
-----
AUS   0   27   14   57   12   20   16   12   5   19   6
CAN   27   0   11  159   80   5  160   4   0   10   6
DEU   14   11   0   62   4   13   4   14   0   33   7
DFS   45  160   53   0   62   97   87   37   0  132  16
GBR   10   79   4   57   0   0   65   1   0   3   6
NOR   16   5   12   75   0   0   0   27   0  14   3
USA   16  156   4   84   61   0   0   2   0   4   6
NLD   12   4   13   36   1  26   2   0   0  12   3
CAM    5   0   0   0   0   0   0   0   0   0   0
LVA   18   10   26   93   3  12   4  11   0   0   2
NZL    6   6   6   16   6   3   6   3   0   2   0
-----

```

## RDC rtp

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  NOR  NZL  NLD  USA  CAM  LVA
-----
AUS   0   27   14   52   20   26   15   16   5   19
CAN  27   0   11  153   5   38   4  162   0   10
DEU  14   11   0   59   14   14   16   4   0   33
DFS  42  153   53   0   94   60  43   82   0  115
NOR  16   5   13   75   0   9   37   0   0   14
NZL  25  36   13   59   8   0   6   28   2   8
NLD  15   4   15  42   36   6   0   2   0  14
USA  16  157   4   80   0   27   2   0   0   4
CAM   5   0   0   0   0   2   0   0   0   0
LVA  18  10   26   81  12   8  13   4   0   0
-----

```

## RDC ocs

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM
-----
AUS   0   27   14   57   11   22   26   16   12   5
CAN  27   0   11  159   77   7   38  162   4   0
DEU  14   11   0   62   4   18  14   4   14   0
DFS  45  160   53   0   62  129   67   87   37   0
GBR   9   76   4   57   0   0   27   64   1   0
NOR  18   6   17  108   0   0   12   0   28   0
NZL  25  36   13   65  24   11   0   28   5   2
USA  16  157   4   84   60   0   27   0   2   0
NLD  12   4   13   36   1   27   5   2   0   0
CAM   5   0   0   0   0   0   2   0   0   0
-----

```

## RDC ous

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM
-----
AUS   0   27   14   57   11   20   26   16   12   5
CAN  27   0   11  159   77   5   38  159   4   0
DEU  14   11   0   62   4   13  14   4   14   0
DFS  45  160   53   0   62  103   67   87   37   0
GBR   9   76   4   57   0   0   27   64   1   0
NOR  16   5   12   80   0   0   9   0   27   0
NZL  25  36   13   65  24   8   0   28   5   2
USA  16  156   4   84   60   0   27   0   2   0
NLD  12   4   13   36   1   26   5   2   0   0
CAM   5   0   0   0   0   0   2   0   0   0
-----

```

## RDC ofl

```

-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  USA  NLD  CAM
-----
AUS   0   27   14   57   11   20   16   12   5
CAN  27   0   11  159   77   5  162   4   0
DEU  14   11   0   62   4   13   4   14   0
DFS  45  160   53   0   62  103   87   37   0
GBR   9   76   4   57   0   0   64   1   0
NOR  16   5   12   80   0   0   0   27   0
USA  16  157   4   84   60   0   0   2   0
NLD  12   4   13   36   1   26   2   0   0
CAM   5   0   0   0   0   0   0   0   0
-----

```

## RDC loc

-----  
RDC bcs  
-----  
SIM sta  
-----  
SIM cwi  
-----  
SIM bde  
-----  
SIM ang  
-----  
SIM ran  
-----  
SIM rwi  
-----  
SIM rls  
-----  
SIM rlr  
-----  
SIM fan  
-----  
SIM fua  
-----  
SIM ruh  
-----  
SIM usu  
-----  
SIM ude  
-----  
SIM ftp  
-----  
SIM ftl  
-----  
SIM rtp  
-----  
SIM ocs  
-----  
SIM ous  
-----  
SIM ofl  
-----  
SIM loc  
-----  
SIM bcs  
-----