

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

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:

JPN (HOL)	Small changes in proofs caused by additional records and in EDCs caused by modification of pedigree.
FRA (ALL)	Applied new MACE coding according to Interbull recommendations. Optimized data processing. Number of daughters, herds and EDC are now calculated directly from the pipeline based on the univariate model without permanent environment effects on single-step preadjusted performances in genomic-free EBVs computation. Before they were still computed from the traditional polygenic approach. Pedigree corrections. HOL FAN: decrease in reliability. It is because now, to be consistent with the official evaluation in France, only phenotypes for FAN trait are taken into account in the evaluation. As consequence, old bulls, which have several daughters without phenotypic information for FAN, lose part of information with an impact on reliability. BSW: correction of the heritability value used for sta, rls and ruh has been made in the parameter file used in the internal pipeline used to compute EDC. The correction led to a decrease in EDC for these traits
NLD (ALL)	Decrease in information due to data edits
CHE (ALL)	Breeding organizations have recently put more emphasis on correcting data, which contributes to some higher variation in data. This increased activity is related to the merge of two databases planned, which took place by the end of June 2026 which caused some decrease in information.
POL (HOL)	Decrease in information due to data edits and pedigree verification
DEA (BSW)	Small changes in information due to pedigree verification
AUS (ALL)	Updated type of proofs according to the latest interbull recommendation. Drops in information due to pedigree verification and changes in status of bulls that are no longer qualifying for the evaluation.
USA (BSW,RDC,JER,GUE)	Decrease in information due to pedigree validation and daughterâ\200\223herdâ\200\223year minimum edits.
USA (HOL)	Decrease in information due to data edits
DEU (ALL)	Overall base change, some drops in information due to data edits
BEL (HOL)	Drops in information due to pedigree verification, causing some bulls to no longer qualifying for inclusion.
NZL (ALL)	Decrease in infromation due to continuous pedigree verification and herds records being updated
ITA (BSW)	Improvements in data editing procedures and quality control checks. In addition, the identification of the correct calving date associated with each phenotypic records has been optimized to ensure greater consistency and accuracy of the data. FTP: an error in the editing procedure has been corrected causing higher variation for this trait.
IRL (ALL)	Drops in information due to pedigree correction
ITA (HOL)	Cut off of data causing drops in information and bulls missing in this submission.

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 routineâ\200\231s and test runâ\200\231s 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

Data were national genetic evaluations of AI sampled bulls with at least 10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least 50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at least 10 herds. Table 1 presents the amount of data included in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed jointly with a linear model including the effects of evaluation country, genetic group of bull and bull merit. Heritability estimates used in both the de-regression and international evaluation were as in each country's national evaluation.

Table 2 presents the date of evaluation as supplied by each country

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I and the corresponding number of common bulls are listed in APPENDIX II.

SCIENTIFIC LITERATURE

The international genetic evaluation procedure is based on international work described in the following scientific publications:

International genetic evaluation computation:
Schaeffer. 1994. J. Dairy Sci. 77:2671-2678
Klei, 1998. Interbull Bulletin 17:3-7

Verification and Genetic trend validation:
Klei et al., 2002. Interbull Bulletin 29:178-182.
Boichard et al., 1995. J. Dairy Sci. 78:431-437

Weighting factors:
Fikse and Banos, 2001. J. Dairy Sci. 84:1759-1767

De-regression:
Sigurdsson and G. Banos. 1995. Acta Agric. Scand. 45:207-219
Jairath et al. 1998. J. Dairy Sci. Vol. 81:550-562

Genetic parameter estimation:
Klei and Weigel, 1998, Interbull Bulletin 17:8-14
Sullivan, 1999. Interbull Bulletin 22:146-148

Post-processing of estimated genetic correlations:
Mark et al., 2003, Interbull Bulletin 30:126-135
Jorjani et al., 2003. J. Dairy Sci. 86:677-679
<https://wiki.interbull.org/public/rG%20procedure?action=print>

Time edits
Weigel and Banos. 1997. J. Dairy Sci. 80:3425-3430

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

NEXT ROUTINE INTERNATIONAL EVALUATION

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

NEXT TEST INTERNATIONAL EVALUATION

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

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

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

PUBLICATION OF INTERBULL TEST RUN

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

^LTable 1. National evaluation data considered in the Interbull evaluation for conformation traits (August Routine Evaluation 2026). Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		50	4111	795	272	
BEL			1842			
CAN	273	110	13420	913	939	
CHE	1718		3334	59		
CZE			4748			
DEA	3959					
DEU			22367		299	
DFS			13122	2182	6610	
ESP			4840			
EST			1060			
FRA	482		15564			
FRM						
GBR	26	237	6856	481	357	
HUN			2775			
IRL			2180			
ISR						
ITA	2456		8333	74		
JPN			6726			
KOR			1713			
LTU						
LVA			1604		632	
NLD	161		16096	66	64	
NOR					2659	
NZL			7503	4519	624	
POL			10085			
PRT			3154			
SVK						
SVN	285		591			
URY						
USA	1000	761	35275	4837	296	
ZAF			851	569		
CAM					41	
No.Records	10360	1158	188150	14495	12793	
Pub. Proofs	9263	978	142663	12515	13305	0

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal

BSW	sta								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.02								
CHE	0.95	12.84							
FRA	0.98	0.97	0.92						
ITA	0.96	0.95	0.95	13.40					
NLD	0.94	0.96	0.96	0.91	4.41				
USA	0.98	0.95	0.97	0.95	0.93	1.84			
DEA	0.96	0.98	0.98	0.95	0.95	0.96	11.12		
SVN	0.93	0.92	0.92	0.95	0.90	0.91	0.92	16.02	
GBR	0.96	0.93	0.95	0.93	0.93	0.96	0.90	0.90	0.86

BSW	cwi								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.43								
CHE	0.89	9.77							
FRA	0.87	0.89	0.81						
ITA	0.79	0.83	0.84	20.73					
NLD	0.92	0.83	0.88	0.70	4.81				
USA	0.88	0.87	0.91	0.86	0.84	1.07			
DEA	0.84	0.80	0.86	0.70	0.72	0.77	11.35		
SVN	0.90	0.90	0.92	0.82	0.85	0.86	0.88	23.82	
GBR	0.92	0.84	0.82	0.69	0.90	0.80	0.83	0.84	1.50

BSW	bde								
	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	7.15								
CHE	0.82	10.16							
FRA	0.72	0.88	0.89						
ITA	0.79	0.91	0.90	17.61					
NLD	0.80	0.85	0.85	0.83	4.72				
DEA	0.80	0.88	0.91	0.87	0.77	10.95			
SVN	0.77	0.72	0.78	0.79	0.77	0.70	24.08		
GBR	0.88	0.89	0.81	0.83	0.89	0.88	0.83	1.75	
USA	0.73	0.75	0.85	0.78	0.86	0.81	0.78	0.86	0.99

BSW	ang					
	CAN	CHE	FRA	NLD	USA	GBR
CAN	8.90					
CHE	0.69	10.83				
FRA	0.85	0.67	0.80			
NLD	0.79	0.69	0.69	3.90		
USA	0.85	0.68	0.75	0.78	1.21	
GBR	0.87	0.77	0.76	0.82	0.90	0.73

BSW	ran								
	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.29								
CHE	0.94	10.53							
FRA	0.97	0.96	0.91						
ITA	0.93	0.93	0.93	22.80					
NLD	0.95	0.91	0.95	0.91	4.57				
USA	0.97	0.94	0.97	0.91	0.94	1.58			
DEA	0.97	0.94	0.96	0.94	0.90	0.97	11.67		
SVN	0.90	0.88	0.89	0.88	0.90	0.90	0.88	21.72	

GBR	0.96	0.94	0.97	0.93	0.96	0.96	0.91	0.91	1.97
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BSW	rwi
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	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	7.38								
CHE	0.89	10.23							
FRA	0.96	0.87	0.95						
NLD	0.93	0.85	0.93	4.34					
USA	0.91	0.86	0.87	0.80	1.00				
DEA	0.90	0.88	0.91	0.77	0.88	13.22			
GBR	0.92	0.84	0.91	0.88	0.93	0.80	1.17		
SVN	0.88	0.79	0.93	0.86	0.81	0.88	0.86	24.85	
ITA	0.88	0.79	0.90	0.79	0.88	0.87	0.86	0.90	18.75

BSW	rls
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.90								
CHE	0.91	12.70							
FRA	0.92	0.93	0.96						
ITA	0.91	0.85	0.92	23.45					
NLD	0.87	0.84	0.87	0.82	4.99				
USA	0.95	0.90	0.91	0.86	0.84	1.05			
DEA	0.91	0.91	0.93	0.89	0.80	0.90	12.06		
SVN	0.86	0.83	0.89	0.84	0.79	0.86	0.90	22.27	
GBR	0.84	0.85	0.90	0.83	0.86	0.82	0.87	0.79	1.50

BSW	fan
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.65								
CHE	0.68	13.93							
FRA	0.76	0.76	1.03						
ITA	0.69	0.84	0.81	19.92					
NLD	0.72	0.67	0.83	0.70	5.04				
USA	0.80	0.73	0.83	0.86	0.80	0.95			
DEA	0.62	0.86	0.69	0.87	0.66	0.63	11.50		
SVN	0.68	0.78	0.72	0.79	0.68	0.74	0.79	24.12	
GBR	0.79	0.72	0.85	0.72	0.88	0.82	0.67	0.75	1.26

BSW	hde
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	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	8.28							
CHE	0.82	11.98						
FRA	0.82	0.81	1.07					
ITA	0.79	0.83	0.83	19.94				
NLD	0.74	0.73	0.82	0.72	5.04			
DEA	0.74	0.87	0.85	0.92	0.77	11.88		
SVN	0.80	0.86	0.87	0.89	0.74	0.91	31.19	
USA	0.83	0.73	0.82	0.89	0.80	0.80	0.82	0.95

BSW	fua
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.88								
CHE	0.84	12.32							
FRA	0.89	0.87	0.83						
ITA	0.89	0.85	0.86	17.93					
NLD	0.88	0.82	0.86	0.86	4.70				
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	10.98		
SVN	0.74	0.69	0.77	0.81	0.79	0.75	0.88	20.72	

GBR	0.91	0.85	0.87	0.87	0.90	0.90	0.77	0.61	1.48
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BSW	ruh
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.46								
CHE	0.90	11.98							
FRA	0.85	0.82	0.87						
ITA	0.75	0.84	0.87	11.78					
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	0.83	0.91	0.92	0.81	0.81	11.63		
SVN	0.77	0.75	0.80	0.84	0.87	0.82	0.86	19.75	
GBR	0.71	0.78	0.86	0.80	0.86	0.90	0.75	0.77	1.77

BSW	ruw
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	8.51							
CHE	0.91	11.73						
FRA	0.84	0.88	0.82					
ITA	0.79	0.88	0.79	12.64				
NLD	0.70	0.66	0.79	0.67	4.16			
USA	0.86	0.90	0.86	0.88	0.79	1.09		
DEA	0.85	0.89	0.76	0.95	0.54	0.88	12.04	
SVN	0.82	0.80	0.76	0.84	0.63	0.83	0.85	21.08

BSW	usu
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.88								
CHE	0.91	11.88							
FRA	0.83	0.91	0.86						
ITA	0.87	0.90	0.88	16.90					
NLD	0.80	0.81	0.86	0.80	4.28				
USA	0.83	0.88	0.86	0.86	0.90	1.24			
DEA	0.93	0.93	0.90	0.92	0.72	0.84	11.31		
SVN	0.85	0.85	0.74	0.81	0.66	0.75	0.86	20.14	
GBR	0.78	0.78	0.84	0.83	0.91	0.92	0.73	0.66	2.70

BSW	ude
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.05								
CHE	0.94	12.17							
FRA	0.95	0.96	0.97						
ITA	0.94	0.96	0.97	18.62					
NLD	0.95	0.94	0.94	0.93	4.37				
USA	0.95	0.94	0.96	0.95	0.94	1.41			
DEA	0.92	0.96	0.94	0.97	0.94	0.92	12.14		
SVN	0.91	0.94	0.92	0.95	0.95	0.93	0.95	22.24	
GBR	0.96	0.93	0.95	0.94	0.96	0.95	0.89	0.93	2.14

BSW	ftp
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	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	7.20								
CHE	0.97	13.90							
FRA	0.97	0.96	0.89						
NLD	0.96	0.95	0.96	5.45					
USA	0.91	0.89	0.87	0.91	1.39				
DEA	0.95	0.98	0.94	0.95	0.91	10.93			
SVN	0.93	0.94	0.93	0.96	0.90	0.96	17.62		
GBR	0.94	0.91	0.89	0.93	0.94	0.91	0.92	1.41	

ITA	0.90	0.90	0.88	0.88	0.88	0.90	0.90	0.87	19.33
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BSW	ft1
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.56								
CHE	0.90	14.59							
FRA	0.95	0.95	0.96						
ITA	0.94	0.94	0.95	17.57					
NLD	0.92	0.96	0.92	0.92	5.13				
USA	0.93	0.96	0.96	0.94	0.96	1.98			
DEA	0.90	0.98	0.97	0.95	0.94	0.96	10.99		
SVN	0.90	0.91	0.90	0.90	0.91	0.90	0.92	18.26	
GBR	0.94	0.95	0.93	0.94	0.97	0.97	0.93	0.93	1.56

BSW	rtp
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	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	6.97							
CHE	0.97	14.38						
FRA	0.97	0.98	0.88					
ITA	0.93	0.95	0.94	19.46				
NLD	0.95	0.94	0.95	0.91	5.26			
DEA	0.96	0.99	0.97	0.96	0.92	11.81		
SVN	0.93	0.92	0.94	0.92	0.95	0.93	17.42	
USA	0.95	0.94	0.94	0.92	0.95	0.96	0.94	1.39

BSW	ocs
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.01								
CHE	0.76	8.95							
FRA	0.70	0.77	0.90						
ITA	0.67	0.78	0.81	6.72					
NLD	0.73	0.70	0.76	0.69	3.93				
USA	0.80	0.69	0.78	0.68	0.82	0.55			
DEA	0.74	0.88	0.81	0.76	0.62	0.64	10.29		
SVN	0.60	0.68	0.63	0.59	0.61	0.62	0.78	18.99	
GBR	0.75	0.81	0.83	0.78	0.85	0.85	0.65	0.72	1.76

BSW	ous
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.40								
CHE	0.80	13.65							
FRA	0.86	0.80	0.87						
ITA	0.82	0.88	0.86	7.51					
NLD	0.89	0.83	0.87	0.83	5.06				
USA	0.89	0.78	0.80	0.79	0.87	0.90			
DEA	0.80	0.93	0.75	0.88	0.79	0.76	12.31		
SVN	0.76	0.79	0.71	0.76	0.81	0.74	0.89	18.76	
GBR	0.77	0.82	0.74	0.81	0.77	0.85	0.74	0.78	1.59

BSW	of1
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.45								
CHE	0.81	11.10							
FRA	0.62	0.62	1.49						
ITA	0.59	0.61	0.62	11.40					
NLD	0.65	0.65	0.72	0.63	4.36				
USA	0.59	0.61	0.62	0.67	0.65	0.88			
DEA	0.60	0.78	0.57	0.59	0.58	0.57	10.93		
SVN	0.70	0.82	0.61	0.61	0.63	0.63	0.88	25.53	

GBR	0.66	0.75	0.79	0.67	0.73	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	7.15						
CHE	0.80	11.33					
DEA	0.79	0.87	11.30				
ITA	0.73	0.90	0.86	15.34			
SVN	0.75	0.80	0.78	0.82	21.38		
USA	0.75	0.79	0.89	0.84	0.82	1.84	
FRA	0.74	0.86	0.88	0.88	0.82	0.86	0.80

BSW	tpl
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	CAN	CHE	DEA	ITA	SVN	FRA
CAN	7.30					
CHE	0.87	12.16				
DEA	0.88	0.88	11.74			
ITA	0.91	0.91	0.88	23.18		
SVN	0.88	0.87	0.85	0.87	24.27	
FRA	0.95	0.91	0.93	0.89	0.86	1.25

BSW	oru
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	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.73						
CHE	0.74	15.91					
DEA	0.76	0.86	12.44				
ITA	0.79	0.76	0.73	13.20			
SVN	0.74	0.56	0.72	0.78	24.35		
USA	0.89	0.57	0.52	0.75	0.65	1.00	
FRA	0.83	0.86	0.84	0.89	0.75	0.81	1.15

BSW	rle
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	CHE	DEA	ITA	SVN	USA	FRA
CHE	11.65					
DEA	0.94	12.14				
ITA	0.82	0.86	18.35			
SVN	0.78	0.77	0.82	23.73		
USA	0.55	0.51	0.77	0.70	1.00	
FRA	0.93	0.94	0.88	0.79	0.73	1.02

BSW	thp
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	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.62						
CHE	0.84	10.84					
DEA	0.81	0.81	11.92				
ITA	0.86	0.90	0.85	27.75			
SVN	0.75	0.84	0.84	0.88	29.88		
USA	0.89	0.86	0.71	0.82	0.73	1.58	
FRA	0.88	0.83	0.86	0.82	0.76	0.78	0.97

BSW	hoq
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	CAN	CHE	DEA	ITA	SVN	FRA
CAN	7.09					
CHE	0.91	12.14				
DEA	0.91	0.88	12.60			
ITA	0.90	0.85	0.85	18.36		
SVN	0.93	0.89	0.92	0.88	21.44	

FRA	0.91	0.85	0.88	0.87	0.88	1.00
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BSW	ful
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	CHE	DEA	ITA	SVN	FRA
CHE	11.61				
DEA	0.92	12.04			
ITA	0.93	0.95	11.71		
SVN	0.85	0.92	0.87	21.51	
FRA	0.75	0.86	0.78	0.73	0.85

BSW	udb
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	CHE	DEA	ITA	SVN	FRA
CHE	12.18				
DEA	0.95	13.37			
ITA	0.92	0.95	25.48		
SVN	0.84	0.85	0.85	23.98	
FRA	0.92	0.88	0.86	0.84	0.88

BSW	tdi
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	CHE	DEA	ITA	SVN	FRA
CHE	15.69				
DEA	0.96	11.27			
ITA	0.94	0.95	19.67		
SVN	0.91	0.94	0.92	18.18	
FRA	0.97	0.98	0.91	0.93	0.85

BSW	tth
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	CHE	DEA	ITA	SVN	FRA
CHE	14.20				
DEA	0.98	12.83			
ITA	0.94	0.95	23.07		
SVN	0.87	0.87	0.88	20.45	
FRA	0.92	0.94	0.95	0.87	0.91

GUE	sta
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	CAN	GBR	USA	AUS
CAN	6.84			
GBR	0.97	1.23		
USA	0.98	0.96	2.78	
AUS	0.89	0.92	0.90	0.79

GUE	cwi
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	CAN	GBR	USA	AUS
CAN	7.06			
GBR	0.92	1.86		
USA	0.84	0.84	1.60	
AUS	0.72	0.81	0.64	0.37

GUE	bde
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	CAN	GBR	USA	AUS
CAN	6.45			
GBR	0.89	1.58		
USA	0.76	0.88	1.73	
AUS	0.81	0.78	0.69	0.43

GUE	ang			

	CAN	GBR	USA	AUS
CAN	8.02			
GBR	0.88	1.68		
USA	0.87	0.91	2.00	
AUS	0.67	0.78	0.68	0.40

GUE	ran			
	CAN	GBR	USA	AUS
CAN	6.48			
GBR	0.97	1.70		
USA	0.97	0.97	2.32	
AUS	0.91	0.94	0.90	0.73

GUE	rwi			

	CAN	GBR	USA	AUS
CAN	7.23			
GBR	0.93	1.64		
USA	0.92	0.92	1.88	
AUS	0.85	0.85	0.78	0.63

GUE	rls			
	CAN	GBR	USA	AUS
CAN	8.51			
GBR	0.81	1.86		
USA	0.93	0.79	1.07	
AUS	0.73	0.81	0.72	0.30

GUE	rlr		
	CAN	USA	AUS
CAN	7.07		
USA	0.84	0.93	
AUS	0.59	0.52	0.15

GUE	fan			
	CAN	GBR	USA	AUS
CAN	9.09			
GBR	0.78	1.76		
USA	0.84	0.75	1.01	
AUS	0.62	0.76	0.65	0.27

GUE	fua			

	CAN	GBR	USA	AUS
CAN	7.27			
GBR	0.94	1.44		
USA	0.92	0.92	2.19	
AUS	0.80	0.79	0.77	0.35

GUE	ruh			
	CAN	GBR	USA	AUS
CAN	7.14			
GBR	0.71	2.03		
USA	0.80	0.91	1.82	

AUS 0.77 0.77 0.75 0.39

GUE usu

	CAN	GBR	USA	AUS
CAN	6.98			
GBR	0.78	1.63		
USA	0.78	0.86	1.57	
AUS	0.76	0.79	0.76	0.31

GUE ude

	CAN	GBR	USA	AUS
CAN	6.34			
GBR	0.97	1.46		
USA	0.95	0.95	2.25	
AUS	0.91	0.92	0.90	0.54

GUE ftp

	CAN	GBR	USA	AUS
CAN	6.05			
GBR	0.95	1.29		
USA	0.92	0.92	1.90	
AUS	0.93	0.92	0.86	0.39

GUE ftl

	CAN	GBR	USA	AUS
CAN	5.00			
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	5.43		
AUS	0.89	0.32	
USA	0.93	0.89	1.90

GUE ocs

	CAN	GBR	USA	AUS
CAN	7.85			
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	8.06			
GBR	0.79	1.62		
USA	0.86	0.83	1.00	
AUS	0.70	0.83	0.74	1.14

GUE ofl

	CAN	GBR	USA	AUS
CAN	7.43			

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rls																								
	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	0.31																							
BEL	0.81	1.62																						
CAN	0.74	0.95	5.87																					
CHE	0.79	0.91	0.93	11.86																				
DEU	0.75	0.94	0.95	0.93	11.91																			
DFS	0.72	0.94	0.97	0.92	0.97	13.37																		
ESP	0.76	0.95	0.95	0.91	0.95	0.95	1.16																	
FRA	0.80	0.92	0.90	0.90	0.91	0.89	0.91	0.99																
GBR	0.82	0.86	0.84	0.84	0.85	0.82	0.82	0.89	1.39															
ITA	0.69	0.91	0.89	0.85	0.89	0.90	0.89	0.88	0.81	1.40														
NLD	0.74	0.90	0.92	0.92	0.94	0.92	0.91	0.90	0.86	0.84	5.25													
USA	0.72	0.95	0.96	0.89	0.93	0.96	0.95	0.88	0.82	0.88	0.90	1.59												
HUN	0.79	0.92	0.91	0.86	0.92	0.92	0.94	0.90	0.82	0.89	0.86	0.92	0.94											
POL	0.76	0.93	0.94	0.89	0.94	0.93	0.94	0.93	0.83	0.90	0.87	0.92	0.95	19.19										
NZL	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.68	0.65	0.65	0.65	0.66	0.65	0.14									
ZAF	0.83	0.79	0.77	0.77	0.74	0.69	0.77	0.82	0.86	0.66	0.74	0.76	0.76	0.79	0.65	0.84								
JPN	0.70	0.91	0.97	0.89	0.94	0.97	0.94	0.88	0.80	0.88	0.88	0.94	0.90	0.95	0.65	0.69	1.67							
CZE	0.73	0.91	0.91	0.84	0.93	0.92	0.90	0.87	0.85	0.85	0.89	0.90	0.92	0.94	0.65	0.76	0.91	15.48						
EST	0.77	0.86	0.85	0.82	0.87	0.88	0.87	0.81	0.70	0.77	0.86	0.85	0.83	0.83	0.67	0.67	0.83	0.81	20.24					
IRL	0.83	0.80	0.74	0.79	0.75	0.72	0.73	0.82	0.92	0.75	0.77	0.72	0.72	0.73	0.65	0.79	0.70	0.75	0.66	0.83				
KOR	0.65	0.82	0.83	0.79	0.82	0.85	0.85	0.82	0.73	0.79	0.81	0.82	0.84	0.82	0.66	0.66	0.85	0.77	0.71	0.66	2.20			
SVN	0.67	0.89	0.91	0.88	0.92	0.91	0.87	0.85	0.75	0.90	0.86	0.87	0.86	0.86	0.67	0.64	0.87	0.86	0.80	0.71	0.79	23.55		
PRT	0.67	0.85	0.83	0.77	0.83	0.85	0.85	0.83	0.75	0.82	0.79	0.84	0.85	0.83	0.65	0.65	0.81	0.78	0.70	0.65	0.78	0.80	2.24	
LVA	0.66	0.68	0.73	0.75	0.79	0.75	0.72	0.76	0.70	0.66	0.79	0.70	0.73	0.76	0.66	0.66	0.74	0.77	0.73	0.66	0.73	0.77	0.70	0.31

HOL	rlr																						
	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0.22																						
BEL	0.62	1.80																					
CAN	0.60	0.85	6.54																				
CHE	0.65	0.85	0.76	12.42																			
DEU	0.58	0.92	0.89	0.76	11.24																		
DFS	0.55	0.89	0.91	0.74	0.94	13.13																	
ESP	0.56	0.88	0.88	0.73	0.87	0.90	1.05																
FRA	0.69	0.92	0.84	0.86	0.88	0.84	0.88	1.01															
GBR	0.48	0.63	0.68	0.53	0.64	0.61	0.68	0.62	1.52														
ITA	0.55	0.79	0.82	0.65	0.77	0.74	0.81	0.82	0.64	1.80													
NLD	0.56	0.87	0.88	0.71	0.91	0.90	0.85	0.83	0.64	0.75	4.40												
USA	0.51	0.78	0.87	0.62	0.77	0.83	0.81	0.76	0.64	0.87	0.81	1.71											
HUN	0.63	0.84	0.77	0.77	0.79	0.79	0.78	0.83	0.53	0.75	0.74	0.79	1.07										
POL	0.50	0.83	0.86	0.71	0.82	0.84	0.79	0.84	0.54	0.82	0.77	0.80	0.75	20.62									
ZAF	0.57	0.70	0.55	0.60	0.54	0.54	0.48	0.61	0.48	0.60	0.51	0.69	0.64	0.64	0.73								
JPN	0.57	0.84	0.89	0.78	0.85	0.92	0.81	0.83	0.48	0.72	0.83	0.79	0.75	0.80	0.57	1.87							
CZE	0.57	0.84	0.81	0.72	0.84	0.81	0.76	0.80	0.55	0.78	0.78	0.79	0.77	0.83	0.67	0.75	16.79						
EST	0.52	0.74	0.69	0.63	0.78	0.84	0.69	0.69	0.49	0.51	0.79	0.60	0.63	0.70	0.53	0.82	0.59	18.40					
IRL	0.48	0.52	0.58	0.48	0.49	0.49	0.60	0.57	0.74	0.65	0.56	0.55	0.49	0.51	0.49	0.49	0.51	0.50	0.76				
KOR	0.49	0.73	0.70	0.64	0.68	0.72	0.74	0.74	0.49	0.67	0.62	0.67	0.66	0.70	0.52	0.69	0.68	0.58	0.49	1.90			
SVN	0.52	0.83	0.79	0.73	0.79	0.83	0.78	0.84	0.50	0.68	0.79	0.72	0.84	0.76	0.52	0.79	0.63	0.71	0.50	0.62	25.66		
PRT	0.52	0.82	0.73	0.69	0.83	0.76	0.77	0.81	0.57	0.72	0.75	0.69	0.72	0.78	0.51	0.68	0.76	0.67	0.48	0.66	0.73	2.23	
LVA	0.50	0.68	0.65	0.62	0.67	0.72	0.68	0.65	0.49	0.64	0.68	0.62	0.64	0.70	0.49	0.65	0.65	0.62	0.49	0.57	0.59	0.67	0.28

NLD	0.74	0.82	0.91	0.90	0.94	0.87	0.86	0.90	0.92	0.86	4.73														
USA	0.77	0.70	0.94	0.88	0.89	0.84	0.88	0.85	0.93	0.92	0.89	1.37													
HUN	0.79	0.79	0.89	0.87	0.88	0.88	0.85	0.86	0.88	0.79	0.82	0.81	1.02												
POL	0.72	0.80	0.89	0.87	0.93	0.88	0.84	0.89	0.92	0.86	0.88	0.86	0.87	14.53											
NZL	0.79	0.77	0.83	0.80	0.83	0.80	0.80	0.84	0.85	0.77	0.83	0.84	0.75	0.79	0.41										
ZAF	0.76	0.77	0.86	0.81	0.87	0.86	0.82	0.83	0.89	0.71	0.83	0.82	0.84	0.80	0.78	0.85									
JPN	0.77	0.77	0.94	0.91	0.89	0.91	0.86	0.87	0.90	0.85	0.88	0.91	0.88	0.88	0.81	0.81	1.42								
CZE	0.75	0.85	0.87	0.85	0.92	0.90	0.80	0.88	0.89	0.76	0.86	0.78	0.92	0.89	0.76	0.90	0.86	14.31							
EST	0.67	0.78	0.81	0.79	0.81	0.87	0.68	0.81	0.78	0.63	0.77	0.71	0.85	0.82	0.64	0.73	0.74	0.82	19.19						
IRL	0.77	0.72	0.81	0.78	0.80	0.71	0.84	0.79	0.90	0.84	0.81	0.87	0.68	0.78	0.82	0.76	0.75	0.71	0.61	0.56					
KOR	0.71	0.77	0.68	0.73	0.70	0.78	0.76	0.75	0.68	0.58	0.65	0.63	0.79	0.74	0.69	0.79	0.73	0.82	0.66	0.64	3.15				
SVN	0.53	0.70	0.52	0.57	0.68	0.51	0.65	0.57	0.52	0.46	0.67	0.53	0.56	0.60	0.57	0.54	0.55	0.62	0.47	0.52	0.64	18.63			
PRT	0.58	0.72	0.66	0.63	0.62	0.69	0.72	0.66	0.62	0.56	0.63	0.63	0.59	0.62	0.70	0.65	0.68	0.60	0.56	0.63	0.68	0.56	1.24		
LVA	0.67	0.85	0.77	0.73	0.80	0.78	0.69	0.78	0.76	0.63	0.76	0.69	0.80	0.79	0.76	0.73	0.74	0.84	0.75	0.63	0.73	0.61	0.59	0.35	

HOL	ruh																								
	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	0.41																								
BEL	0.84	1.19																							
CAN	0.78	0.90	5.75																						
CHE	0.83	0.90	0.93	11.30																					
DEU	0.80	0.89	0.89	0.90	12.95																				
DFS	0.78	0.91	0.85	0.91	0.95	11.51																			
ESP	0.81	0.87	0.86	0.88	0.91	0.90	0.67																		
FRA	0.78	0.88	0.82	0.86	0.91	0.93	0.88	1.01																	
GBR	0.77	0.82	0.71	0.79	0.83	0.89	0.83	0.88	1.39																
ITA	0.69	0.74	0.69	0.70	0.79	0.83	0.82	0.84	0.81	1.23															
NLD	0.73	0.83	0.74	0.82	0.91	0.92	0.87	0.89	0.87	0.80	4.12														
USA	0.76	0.85	0.81	0.84	0.90	0.93	0.88	0.88	0.92	0.88	0.87	1.45													
HUN	0.80	0.84	0.80	0.79	0.87	0.85	0.88	0.82	0.82	0.80	0.80	0.83	1.05												
POL	0.70	0.83	0.70	0.77	0.84	0.89	0.86	0.88	0.83	0.87	0.85	0.85	0.82	12.55											
NZL	0.80	0.82	0.72	0.82	0.82	0.86	0.82	0.85	0.91	0.78	0.83	0.89	0.81	0.80	0.39										
ZAF	0.69	0.74	0.69	0.79	0.76	0.82	0.79	0.75	0.86	0.75	0.76	0.81	0.78	0.69	0.81	0.79									
JPN	0.81	0.91	0.92	0.92	0.91	0.92	0.93	0.90	0.82	0.80	0.85	0.87	0.86	0.87	0.81	0.78	1.47								
CZE	0.79	0.87	0.88	0.86	0.89	0.85	0.82	0.81	0.71	0.70	0.74	0.77	0.86	0.70	0.75	0.78	0.86	14.38							
EST	0.69	0.74	0.71	0.77	0.80	0.83	0.78	0.83	0.73	0.80	0.77	0.82	0.76	0.84	0.75	0.67	0.81	0.75	17.32						
IRL	0.69	0.76	0.69	0.72	0.75	0.82	0.80	0.81	0.90	0.85	0.83	0.89	0.77	0.79	0.83	0.78	0.76	0.69	0.75	0.52					
KOR	0.71	0.79	0.84	0.80	0.74	0.71	0.77	0.70	0.69	0.69	0.69	0.69	0.72	0.69	0.72	0.70	0.83	0.78	0.68	0.70	3.29				
SVN	0.77	0.90	0.88	0.85	0.88	0.90	0.90	0.87	0.77	0.79	0.81	0.85	0.81	0.82	0.73	0.71	0.90	0.84	0.78	0.76	0.73	15.31			
PRT	0.72	0.78	0.69	0.69	0.77	0.82	0.82	0.81	0.85	0.79	0.80	0.81	0.78	0.80	0.76	0.75	0.78	0.69	0.70	0.79	0.69	0.80	1.07		
LVA	0.69	0.74	0.70	0.70	0.76	0.73	0.72	0.72	0.70	0.69	0.72	0.70	0.71	0.69	0.69	0.69	0.73	0.70	0.69	0.69	0.69	0.75	0.69	0.42	

HOL	usu																								
	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	0.36																								
BEL	0.66	1.58																							
CAN	0.80	0.77	5.33																						
CHE	0.78	0.87	0.91	11.89																					
DEU	0.75	0.81	0.93	0.93	11.49																				
DFS	0.72	0.85	0.81	0.89	0.83	11.53																			
ESP	0.80	0.68	0.82	0.81	0.80	0.79	0.66																		
FRA	0.76	0.86	0.78	0.86	0.77	0.91	0.82	1.01																	
GBR	0.83	0.63	0.78	0.79	0.74	0.82	0.90	0.86	1.35																
ITA	0.71	0.66	0.75	0.76	0.76	0.75	0.87	0.80	0.84	1.38															
NLD	0.82	0.76	0.81	0.86	0.79	0.89	0.89	0.91	0.92	0.79	4.25														
USA	0.81	0.67	0.80	0.79	0.75	0.86	0.91	0.86	0.94	0.85	0.92	1.43													
HUN	0.74	0.90	0.82	0.90	0.84	0.91	0.79	0.91	0.78	0.77	0.83	0.80	1.10												
POL	0.73	0.80	0.89	0.90	0.94	0.82	0.81	0.76	0.72	0.76	0.78	0.76	0.86	16.66											
NZL	0.59	0.58	0.57	0.57	0.57	0.57	0.67	0.57	0.60	0.65	0.57	0.65	0.57	0.58	0.38										
ZAF	0.78	0.60	0.65	0.66	0.58	0.75	0.77	0.73	0.81	0.59	0.78	0.82	0.76	0.64	0.59	0.84									
JPN	0.60	0.95	0.74	0.84	0.76	0.84	0.62	0.88	0.64	0.63	0.74	0.66	0.88	0.77	0.57	0.57	1.67								
CZE	0.60	0.88	0.81	0.85	0.87	0.77	0.66	0.73	0.60	0.67	0.65	0.62	0.87	0.88	0.57	0.57	0.85	13.84							
EST	0.69	0.89	0.81	0.85	0.84	0.85	0.70	0.81	0.68	0.63	0.78	0.68	0.87	0.84	0.56	0.60	0.87	0.85	18.93						
IRL	0.80	0.64	0.79	0.76	0.74	0.74	0.86	0.79	0.91	0.84	0.84	0.87	0.73	0.75	0.70	0.76	0.60	0.62	0.62	0.54					
KOR	0.65	0.72	0.83	0.75	0.82	0.68	0.70	0.63	0.58	0.68	0.65	0.66	0.73	0.84	0.57	0.62	0.66	0.75	0.64	0.65	2.48				

[illegible]

FRA	0.79	0.77	0.74	0.82	0.69	0.76	0.95												
GBR	0.65	0.68	0.88	0.82	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	4.24									
USA	0.66	0.78	0.50	0.77	0.74	0.74	0.72	0.67	0.74	0.68	1.52								
CZE	0.50	0.59	0.55	0.61	0.60	0.65	0.62	0.63	0.70	0.50	0.59	20.17							
IRL	0.57	0.59	0.58	0.66	0.54	0.67	0.70	0.75	0.64	0.66	0.59	0.51	0.76						
KOR	0.54	0.53	0.51	0.50	0.51	0.54	0.56	0.51	0.50	0.51	0.50	0.51	9.86						
SVN	0.78	0.74	0.56	0.83	0.78	0.74	0.84	0.70	0.68	0.68	0.75	0.65	0.63	0.53	28.84				
PRT	0.50	0.50	0.52	0.56	0.50	0.60	0.53	0.59	0.60	0.51	0.50	0.56	0.50	0.50	0.56	1.74			
EST	0.53	0.51	0.52	0.57	0.52	0.51	0.55	0.55	0.51	0.59	0.51	0.51	0.53	22.21					
HUN	0.68	0.69	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	0.59	1.10	
POL	0.54	0.64	0.53	0.67	0.55	0.57	0.69	0.54	0.68	0.51	0.72	0.73	0.54	0.51	0.79	0.53	0.52	0.66	18.21

HOL	bcs																			
	BEL	CHE	DEU	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	NZL	POL
BEL	0.94																			
CHE	0.71	11.66																		
DEU	0.71	0.91	14.07																	
FRA	0.71	0.93	0.95	0.94																
GBR	0.73	0.90	0.90	0.91	1.59															
ITA	0.71	0.90	0.95		0.90	6.38														
NLD	0.71	0.94	0.96	0.95	0.90	0.93	5.01													
USA	0.76	0.71	0.81	0.81	0.75	0.78	0.75	1.34												
CZE	0.72	0.88	0.96	0.92	0.89	0.94	0.94	0.77	13.86											
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	0.86	0.95	0.83	0.85	0.71	0.78	0.85	0.45									
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	0.71	0.93	0.97	0.95	0.93	0.94	0.95	0.82	0.94	0.98	0.87	0.83	5.75							
PRT	0.71	0.82	0.87	0.87	0.85	0.84	0.85	0.72	0.83	0.86	0.75	0.79	0.87	1.60						
ESP	0.74	0.87	0.93	0.94	0.92	0.92	0.91	0.76	0.92	0.94	0.84	0.82	0.94	0.88	1.02					
SVN	0.72	0.86	0.93	0.88	0.82	0.90	0.91	0.72	0.92	0.90	0.73	0.81	0.86	0.74	0.83	20.03				
EST	0.72	0.82	0.91	0.88	0.77	0.89	0.89	0.80	0.88	0.90	0.72	0.73	0.90	0.78	0.83	0.83	16.86			
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	0.89	0.90	0.92	0.90	0.90	0.87	0.71	0.85	0.91	0.87	0.82	0.90	0.82	0.86	0.85	0.81	0.88	0.16	
POL	0.71	0.85	0.91	0.89	0.88	0.90	0.87	0.75	0.91	0.92	0.81	0.78	0.90	0.80	0.87	0.87	0.82	0.90	0.85	13.43

JER	sta									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.52									
CAN	0.88	6.97								
DFS	0.89	0.97	11.68							
GBR	0.90	0.96	0.94	1.16						
ITA	0.87	0.94	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	0.85	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	4.96	
CHE	0.89	0.96	0.95	0.95	0.92	0.85	0.94	0.86	0.97	11.59

JER	cwi									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.30									
CAN	0.75	6.54								
DFS	0.75	0.79	15.52							
GBR	0.83	0.91	0.85	1.82						
ITA	0.65	0.76	0.69	0.72	1.59					
NZL	0.82	0.72	0.66	0.74	0.66	0.37				
USA	0.74	0.89	0.80	0.84	0.90	0.68	0.89			
ZAF	0.65	0.75	0.75	0.78	0.72	0.75	0.75	8.40		
NLD	0.72	0.90	0.88	0.89	0.71	0.67	0.82	0.78	4.80	
CHE	0.68	0.86	0.85	0.83	0.81	0.68	0.84	0.71	0.88	12.42

JER bde										
	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0.32									
CAN	0.78	5.72								
DFS	0.76	0.86	13.79							
GBR	0.74	0.87	0.86	1.57						
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	0.73	8.55			
NLD	0.70	0.81	0.83	0.88	0.88	0.70	0.78	4.52		
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	0.77	0.89	0.81	13.20

JER ang										
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.33									
CAN	0.68	7.12								
DFS	0.69	0.69	11.80							
GBR	0.81	0.83	0.70	1.38						
ITA	0.74	0.84	0.83	0.84	1.74					
USA	0.70	0.84	0.69	0.83	0.79	0.90				
ZAF	0.62	0.63	0.66	0.79	0.82	0.67	8.48			
NLD	0.72	0.83	0.76	0.81	0.75	0.81	0.65	5.44		
CHE	0.65	0.78	0.75	0.72	0.75	0.73	0.65	0.78	10.25	

JER ran										
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.36									
CAN	0.88	5.74								
DFS	0.89	0.96	11.45							
GBR	0.94	0.95	0.95	1.33						
ITA	0.88	0.95	0.94	0.95	1.62					
NZL	0.89	0.89	0.88	0.92	0.89	0.31				
USA	0.88	0.96	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	8.81		
NLD	0.91	0.97	0.95	0.96	0.94	0.88	0.94	0.91	4.92	
CHE	0.92	0.96	0.95	0.95	0.94	0.90	0.94	0.89	0.95	13.57

JER rwi										
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.32									
CAN	0.81	6.23								
DFS	0.81	0.91	12.00							
GBR	0.80	0.91	0.85	1.38						
ITA	0.77	0.85	0.81	0.85	1.58					
NZL	0.87	0.82	0.79	0.80	0.80	0.31				
USA	0.77	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	8.98		
NLD	0.86	0.93	0.91	0.88	0.80	0.84	0.81	0.79	5.02	
CHE	0.83	0.92	0.82	0.85	0.79	0.82	0.79	0.78	0.92	13.38

JER rls										
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.19									
CAN	0.68	6.34								
DFS	0.69	0.90	12.52							
GBR	0.72	0.84	0.74	1.66						
ITA	0.69	0.85	0.81	0.79	1.92					
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	0.76	0.69	11.72		
NLD	0.74	0.91	0.90	0.84	0.84	0.67	0.87	0.72	3.84	
CHE	0.75	0.91	0.87	0.79	0.79	0.68	0.85	0.70	0.91	9.71

JER	rlr
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	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE		
AUS	0.19									
CAN	0.52	6.39								
DFS	0.52	0.81	13.75							
ITA	0.54	0.82	0.72	1.38						
ZAF	0.51	0.51	0.51	0.55	11.85					
NLD	0.56	0.86	0.89	0.74	0.59	5.59				
USA	0.49	0.69	0.61	0.83	0.51	0.73	0.83			
CHE	0.60	0.67	0.62	0.61	0.54	0.70	0.57	12.41		

JER	fan
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	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.22									
CAN	0.61	6.79								
DFS	0.62	0.87	12.69							
GBR	0.71	0.79	0.76	1.49						
ITA	0.62	0.75	0.68	0.71	1.46					
USA	0.61	0.87	0.83	0.85	0.80	0.77				
ZAF	0.64	0.65	0.65	0.81	0.65	0.72	9.41			
NLD	0.68	0.73	0.78	0.85	0.70	0.76	0.69	4.00		
CHE	0.64	0.82	0.81	0.70	0.71	0.77	0.66	0.72	12.44	

JER	fua
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.39									
CAN	0.73	5.81								
DFS	0.70	0.86	12.70							
GBR	0.75	0.94	0.86	1.72						
ITA	0.68	0.86	0.75	0.87	1.55					
NZL	0.82	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	11.68		
NLD	0.73	0.89	0.85	0.91	0.86	0.79	0.88	0.80	5.57	
CHE	0.76	0.92	0.85	0.87	0.81	0.70	0.87	0.88	0.88	11.65

JER	ruh
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.36									
CAN	0.72	6.58								
DFS	0.73	0.82	10.64							
GBR	0.79	0.78	0.83	1.42						
ITA	0.71	0.72	0.79	0.83	1.42					
NZL	0.72	0.73	0.76	0.76	0.80	0.41				
USA	0.77	0.82	0.90	0.90	0.84	0.76	1.12			
ZAF	0.80	0.70	0.78	0.86	0.84	0.75	0.83	9.11		
NLD	0.74	0.75	0.91	0.86	0.80	0.81	0.88	0.75	4.39	
CHE	0.78	0.91	0.85	0.80	0.71	0.76	0.84	0.74	0.82	12.51

JER	usu
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.40									
CAN	0.75	6.28								
DFS	0.72	0.82	13.38							

GBR	0.80	0.85	0.85	1.74						
ITA	0.69	0.76	0.74	0.83	1.55					
NZL	0.58	0.59	0.59	0.61	0.63	0.40				
USA	0.76	0.82	0.90	0.85	0.83	0.59	0.90			
ZAF	0.73	0.75	0.71	0.79	0.61	0.59	0.72	9.76		
NLD	0.83	0.81	0.88	0.91	0.79	0.60	0.89	0.79	4.71	
CHE	0.79	0.90	0.85	0.81	0.78	0.61	0.83	0.73	0.85	12.64

JER ude

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.36									
CAN	0.93	5.61								
DFS	0.89	0.93	12.23							
GBR	0.91	0.97	0.93	1.48						
ITA	0.93	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	10.20			
NLD	0.90	0.96	0.96	0.95	0.95	0.95	0.90	5.08		
CHE	0.94	0.95	0.93	0.93	0.95	0.95	0.89	0.96	9.56	

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	12.70							
GBR	0.91	0.93	0.88	1.32						
ITA	0.87	0.88	0.87	0.87	1.64					
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	0.91	0.87	0.89	0.89	10.00		
NLD	0.92	0.97	0.94	0.93	0.87	0.90	0.91	0.89	5.18	
CHE	0.92	0.96	0.93	0.91	0.87	0.88	0.90	0.88	0.96	10.16

JER ftl

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0.31									
CAN	0.91	5.59								
DFS	0.91	0.92	13.89							
GBR	0.91	0.93	0.95	1.44						
ITA	0.90	0.92	0.91	0.93	1.99					
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	10.67			
NLD	0.92	0.93	0.96	0.97	0.91	0.95	0.92	4.42		
CHE	0.91	0.92	0.94	0.96	0.90	0.93	0.92	0.96	11.47	
NZL	0.91	0.96	0.92	0.95	0.91	0.93	0.92	0.93	0.94	0.51

JER rtp

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE		
AUS	0.29									
CAN	0.87	6.08								
DFS	0.87	0.94	13.08							
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	5.33				
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	11.44		

JER ocs

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE	
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AUS	0.33									
CAN	0.46	5.11								
DFS	0.47	0.61	15.16							
GBR	0.56	0.77	0.77	2.91						
ITA	0.49	0.70	0.70	0.81	1.31					
NZL	0.59	0.63	0.47	0.56	0.57	0.30				
USA	0.44	0.79	0.65	0.84	0.78	0.61	0.76			
NLD	0.52	0.71	0.83	0.87	0.80	0.61	0.82	3.81		
CHE	0.56	0.83	0.68	0.88	0.79	0.54	0.75	0.82	8.31	

JERous

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE	ITA	
AUS	0.57									
CAN	0.68	6.22								
DFS	0.67	0.81	12.77							
GBR	0.74	0.81	0.69	1.51						
NZL	0.81	0.71	0.68	0.76	0.44					
USA	0.68	0.89	0.83	0.84	0.71	0.90				
NLD	0.69	0.89	0.85	0.78	0.79	0.87	5.77			
CHE	0.77	0.87	0.77	0.82	0.77	0.84	0.92	10.55		
ITA	0.70	0.83	0.85	0.79	0.71	0.84	0.85	0.87	1.67	

JERofl

	CAN	DFS	GBR	ITA	USA	NLD	CHE	AUS		
CAN	5.01									
DFS	0.70	13.57								
GBR	0.63	0.61	1.30							
ITA	0.60	0.67	0.65	1.81						
USA	0.62	0.62	0.64	0.74	1.29					
NLD	0.66	0.59	0.72	0.67	0.66	5.21				
CHE	0.84	0.69	0.70	0.70	0.78	0.73	11.32			
AUS	0.36	0.37	0.56	0.49	0.42	0.51	0.54	0.14		

RDCsta

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.67										
CAN	0.88	6.34									
DEU	0.88	0.97	12.96								
DFS	0.86	0.97	0.96	8.67							
GBR	0.91	0.96	0.96	0.93	1.33						
NOR	0.87	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	2.30			
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	6.27	
LVA	0.86	0.85	0.86	0.90	0.84	0.91	0.87	0.84	0.86	0.90	0.54

RDCcwi

	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.40										
CAN	0.72	6.65									
DEU	0.71	0.89	11.60								
DFS	0.75	0.82	0.88	13.64							
GBR	0.84	0.87	0.90	0.89	1.63						
NZL	0.76	0.67	0.68	0.66	0.79	0.35					
USA	0.66	0.83	0.81	0.82	0.83	0.71	1.39				
NLD	0.72	0.92	0.92	0.89	0.91	0.68	0.81	5.62			
CAM	0.75	0.79	0.79	0.79	0.79	0.78	0.79	0.79	7.03		
NOR	0.76	0.78	0.81	0.92	0.82	0.79	0.81	0.88	0.79	14.46	
LVA	0.68	0.69	0.66	0.68	0.65	0.70	0.64	0.67	0.79	0.77	0.29

DEU	0.75	0.95	9.05									
DFS	0.70	0.97	0.95	9.28								
GBR	0.81	0.77	0.85	0.76	1.55							
NOR	0.70	0.87	0.85	0.93	0.78	11.85						
NZL	0.67	0.67	0.68	0.67	0.68	0.72	0.12					
USA	0.72	0.93	0.93	0.93	0.81	0.83	0.67	1.04				
NLD	0.74	0.92	0.92	0.88	0.86	0.80	0.66	0.90	5.32			
CAM	0.75	0.79	0.79	0.78	0.79	0.80	0.79	0.79	0.80	6.93		
LVA	0.69	0.73	0.79	0.70	0.71	0.70	0.71	0.70	0.78	0.79	0.29	

RDC	rlr											
	AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM	LVA			
AUS	0.16											
CAN	0.58	6.50										
DEU	0.58	0.88	10.24									
DFS	0.54	0.83	0.91	10.86								
NOR	0.57	0.78	0.84	0.84	13.42							
NLD	0.57	0.88	0.91	0.88	0.84	4.89						
USA	0.52	0.72	0.77	0.66	0.71	0.80	1.04					
CAM	0.68	0.72	0.72	0.73	0.71	0.72	0.71	6.85				
LVA	0.55	0.66	0.70	0.77	0.61	0.70	0.62	0.73	0.24			

RDC	fan										
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	
AUS	0.24										
CAN	0.64	6.83									
DEU	0.69	0.81	13.38								
DFS	0.62	0.69	0.78	9.32							
GBR	0.76	0.78	0.90	0.72	1.60						
NOR	0.67	0.75	0.86	0.62	0.77	12.88					
USA	0.69	0.81	0.83	0.71	0.84	0.77	1.11				
NLD	0.69	0.74	0.88	0.78	0.88	0.73	0.80	5.12			
CAM	0.73	0.77	0.77	0.77	0.77	0.77	0.77	0.77	7.82		
LVA	0.65	0.64	0.67	0.66	0.63	0.77	0.65	0.68	0.77	0.27	

RDC	fua										
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.38										
CAN	0.80	5.47									
DEU	0.75	0.90	12.63								
DFS	0.74	0.78	0.85	11.65							
GBR	0.78	0.87	0.94	0.86	1.50						
NOR	0.82	0.80	0.78	0.87	0.79	12.15					
NZL	0.77	0.83	0.79	0.70	0.79	0.71	0.36				
USA	0.77	0.92	0.88	0.84	0.92	0.80	0.85	1.62			
NLD	0.74	0.90	0.92	0.81	0.92	0.66	0.82	0.89	4.15		
CAM	0.82	0.81	0.79	0.80	0.80	0.80	0.81	0.81	0.79	6.40	
LVA	0.68	0.75	0.76	0.78	0.77	0.71	0.73	0.70	0.74	0.78	0.36

RDC	ruh										
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.43										
CAN	0.80	5.75									
DEU	0.79	0.87	14.36								
DFS	0.79	0.87	0.88	10.70							
GBR	0.78	0.74	0.83	0.84	1.43						
NOR	0.74	0.84	0.88	0.87	0.82	12.37					
NZL	0.80	0.73	0.80	0.76	0.91	0.76	0.34				
USA	0.77	0.83	0.90	0.93	0.90	0.84	0.84	1.44			
NLD	0.74	0.75	0.90	0.91	0.87	0.90	0.83	0.88	4.08		
CAM	0.79	0.82	0.82	0.82	0.82	0.82	0.81	0.82	0.82	5.99	

LVA	0.77	0.73	0.75	0.78	0.71	0.74	0.74	0.70	0.74	0.82	0.40

RDC	usu										

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.32										
CAN	0.77	6.03									
DEU	0.73	0.90	12.17								
DFS	0.66	0.75	0.80	12.96							
GBR	0.82	0.77	0.74	0.75	1.95						
NOR	0.64	0.70	0.67	0.75	0.76	12.18					
NZL	0.62	0.69	0.61	0.59	0.63	0.67	0.33				
USA	0.80	0.82	0.75	0.85	0.86	0.78	0.69	1.23			
NLD	0.82	0.81	0.78	0.87	0.92	0.75	0.59	0.92	4.33		
CAM	0.78	0.76	0.76	0.76	0.77	0.76	0.75	0.76	0.78	5.63	
LVA	0.63	0.63	0.62	0.60	0.71	0.64	0.66	0.66	0.66	0.76	0.33

RDC	ude										

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	
AUS	0.54										
CAN	0.92	5.71									
DEU	0.91	0.97	12.92								
DFS	0.89	0.95	0.93	10.70							
GBR	0.92	0.96	0.96	0.92	1.76						
NOR	0.89	0.91	0.89	0.87	0.92	14.22					
USA	0.90	0.97	0.95	0.95	0.96	0.92	1.37				
NLD	0.90	0.96	0.97	0.94	0.96	0.88	0.96	4.11			
CAM	0.91	0.92	0.92	0.92	0.92	0.92	0.92	0.92	4.65		
LVA	0.89	0.88	0.88	0.90	0.88	0.89	0.88	0.88	0.92	0.43	

RDC	ftp										

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.50										
CAN	0.93	6.27									
DEU	0.93	0.97	12.90								
DFS	0.88	0.95	0.92	11.90							
GBR	0.92	0.93	0.93	0.89	1.51						
NOR	0.88	0.91	0.88	0.92	0.91	14.19					
NZL	0.91	0.91	0.90	0.87	0.89	0.89	0.26				
USA	0.86	0.92	0.90	0.92	0.92	0.91	0.87	1.46			
NLD	0.93	0.97	0.97	0.95	0.93	0.91	0.91	0.90	4.40		
CAM	0.90	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.46	
LVA	0.88	0.87	0.87	0.87	0.87	0.88	0.88	0.86	0.87	0.91	0.39

RDC	ftl										

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	NZL
AUS	0.55										
CAN	0.93	5.09									
DEU	0.93	0.94	14.00								
DFS	0.92	0.90	0.97	10.58							
GBR	0.94	0.93	0.97	0.93	1.48						
NOR	0.91	0.91	0.91	0.94	0.93	12.57					
USA	0.93	0.93	0.95	0.93	0.97	0.93	1.90				
NLD	0.92	0.93	0.98	0.96	0.97	0.94	0.95	5.01			
CAM	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.93	7.30		
LVA	0.92	0.90	0.90	0.90	0.89	0.92	0.89	0.90	0.93	0.48	
NZL	0.95	0.94	0.93	0.92	0.93	0.92	0.93	0.93	0.93	0.91	0.45

RDC	rtp										

	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA	

AUS	0.36									
CAN	0.90	5.84								
DEU	0.89	0.96	13.67							
DFS	0.87	0.93	0.96	12.31						
NOR	0.88	0.90	0.88	0.86	13.13					
NZL	0.92	0.95	0.91	0.89	0.89	0.35				
NLD	0.90	0.96	0.97	0.95	0.87	0.92	5.02			
USA	0.89	0.91	0.95	0.91	0.91	0.88	0.96	1.46		
CAM	0.90	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.29	
LVA	0.88	0.89	0.88	0.88	0.88	0.89	0.90	0.87	0.91	0.38

RDC	ocs									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0.92									
CAN	0.63	4.78								
DEU	0.51	0.74	20.29							
DFS	0.57	0.59	0.71	9.13						
GBR	0.65	0.74	0.85	0.73	1.59					
NOR	0.52	0.68	0.63	0.85	0.75	16.23				
NZL	0.72	0.59	0.61	0.54	0.62	0.60	0.28			
USA	0.61	0.76	0.80	0.70	0.85	0.75	0.73	0.56		
NLD	0.58	0.71	0.85	0.86	0.87	0.73	0.66	0.86	3.52	
CAM	0.75	0.75	0.75	0.76	0.75	0.76	0.72	0.77	0.78	6.33

RDC	ous									
	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.38									
CAN	0.73	5.42								
DEU	0.73	0.88	17.15							
DFS	0.68	0.76	0.80	9.99						
GBR	0.84	0.78	0.80	0.70	1.55					
NOR	0.72	0.80	0.80	0.78	0.82	13.11				
NZL	0.82	0.82	0.77	0.71	0.81	0.74	0.37			
USA	0.76	0.87	0.82	0.80	0.85	0.82	0.88	1.05		
NLD	0.71	0.89	0.89	0.84	0.77	0.79	0.82	0.85	4.67	
CAM	0.83	0.83	0.82	0.83	0.83	0.82	0.85	0.84	0.82	6.58

RDC	ofl									
	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	
AUS	0.64									
CAN	0.41	4.49								
DEU	0.44	0.72	16.27							
DFS	0.38	0.78	0.77	13.01						
GBR	0.57	0.66	0.72	0.63	1.46					
NOR	0.46	0.69	0.74	0.57	0.74	13.10				
USA	0.60	0.59	0.72	0.61	0.68	0.74	1.43			
NLD	0.51	0.67	0.76	0.61	0.73	0.77	0.68	6.55		
CAM	0.56	0.75	0.75	0.75	0.75	0.75	0.74	0.75	6.85	

^LAPPENDIX II. Number of common bulls

BSW sta

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	132	94	153	43	179	133	30	24
CHE	117	0	152	396	69	202	395	69	22
FRA	86	123	0	232	67	114	226	50	20
ITA	133	349	194	0	104	240	662	86	23
NLD	35	68	57	84	0	66	98	33	14

USA	171	166	89	181	54	0	250	34	23
DEA	113	331	181	575	85	204	0	82	19
SVN	27	66	49	79	33	28	75	0	8
GBR	21	20	19	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	144	62	153	36	179	131	31	24
CHE	128	0	135	501	76	268	517	72	22
FRA	56	104	0	149	49	74	157	50	16
ITA	133	441	125	0	96	240	625	88	23
NLD	31	75	45	80	0	52	92	33	14
USA	171	233	54	181	45	0	232	34	23
DEA	112	423	122	538	83	179	0	84	18
SVN	28	68	49	81	33	28	77	0	8
GBR	21	20	15	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	152	94	153	36	133	23	24	179
CHE	135	0	203	556	80	580	48	22	297
FRA	86	163	0	232	62	226	39	20	114
ITA	133	495	194	0	96	662	67	23	240
NLD	31	78	54	80	0	93	29	14	52
DEA	113	482	181	575	84	0	60	19	250
SVN	21	46	40	61	28	56	0	8	24
GBR	21	20	19	21	12	17	6	0	23
USA	171	267	89	181	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	151	93	25	178	24
CHE	135	0	198	59	295	22
FRA	85	160	0	46	113	20
NLD	22	60	42	0	37	11
USA	170	267	88	33	0	23
GBR	21	20	19	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	152	94	153	43	179	133	30	24
CHE	135	0	203	556	81	297	580	70	22
FRA	86	163	0	232	67	114	226	50	20
ITA	133	495	194	0	104	240	662	86	23
NLD	35	78	57	84	0	66	98	33	14
USA	171	267	89	181	54	0	250	34	23
DEA	113	482	181	575	85	204	0	82	19
SVN	27	66	49	79	33	28	75	0	8
GBR	21	20	19	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	152	62	43	179	133	24	23	148
CHE	135	0	136	81	297	580	22	48	549
FRA	56	105	0	49	74	157	16	39	149
NLD	35	78	45	0	66	98	14	29	102
USA	171	267	54	54	0	250	23	24	226
DEA	113	482	123	85	204	0	19	60	656
GBR	21	20	15	12	21	17	0	8	23
SVN	21	46	40	28	22	56	6	0	67
ITA	129	489	125	83	167	567	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	152	94	153	43	179	133	30	24
CHE	135	0	203	556	81	297	580	70	22
FRA	86	163	0	232	67	114	226	50	20
ITA	133	495	194	0	104	240	662	86	23
NLD	35	78	57	84	0	66	98	33	14
USA	171	267	89	181	54	0	250	34	23
DEA	113	482	181	575	85	204	0	82	19
SVN	27	66	49	79	33	28	75	0	8
GBR	21	20	19	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	152	94	153	35	179	133	30	24
CHE	135	0	203	556	79	297	580	70	22
FRA	86	163	0	232	62	114	226	50	20
ITA	133	495	194	0	95	240	662	86	23
NLD	30	77	54	79	0	51	92	33	14
USA	171	267	89	181	43	0	250	34	23
DEA	113	482	181	575	83	204	0	82	19
SVN	27	66	49	79	33	28	75	0	8
GBR	21	20	19	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	152	94	148	35	133	30	179	
CHE	135	0	203	550	79	580	70	297	
FRA	85	162	0	231	62	226	50	114	
ITA	129	490	194	0	94	656	86	226	
NLD	30	77	54	78	0	92	33	51	
DEA	113	482	181	567	83	0	82	250	
SVN	27	66	49	79	33	75	0	34	
USA	171	267	88	167	43	204	28	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	152	61	109	35	179	100	30	24
CHE	135	0	135	384	79	296	386	71	22
FRA	55	104	0	140	48	73	146	50	16

ITA	97	334	117	0	75	142	378	82	20
NLD	30	77	44	68	0	51	80	33	14
USA	171	267	53	108	44	0	150	34	23
DEA	86	315	115	342	73	111	0	83	16
SVN	27	67	49	76	33	28	76	0	8
GBR	21	20	15	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	152	94	153	36	179	133	31	24
CHE	135	0	203	556	79	297	580	72	22
FRA	86	163	0	232	62	114	226	50	20
ITA	133	495	194	0	96	240	662	88	23
NLD	31	77	54	80	0	52	93	33	14
USA	171	267	89	181	45	0	250	34	23
DEA	113	482	181	575	84	204	0	84	19
SVN	28	68	49	81	33	28	77	0	8
GBR	21	20	19	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	152	94	153	36	179	133	31	
CHE	135	0	203	556	79	297	580	72	
FRA	86	163	0	232	62	114	226	50	
ITA	133	495	194	0	96	240	662	88	
NLD	31	77	54	80	0	52	93	33	
USA	171	267	89	181	45	0	250	34	
DEA	113	482	181	575	84	204	0	84	
SVN	28	68	49	81	33	28	77	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	152	94	153	43	179	133	30	24
CHE	135	0	203	556	80	297	580	71	22
FRA	86	163	0	232	67	114	226	50	20
ITA	133	495	194	0	104	240	662	88	23
NLD	35	77	57	84	0	66	98	33	14
USA	171	267	89	181	54	0	250	34	23
DEA	113	482	181	575	85	204	0	84	19
SVN	27	67	49	81	33	28	77	0	8
GBR	21	20	19	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	152	94	152	46	177	133	30	24
CHE	135	0	203	556	90	297	580	71	22
FRA	86	163	0	232	70	114	226	50	20
ITA	132	495	194	0	113	240	662	88	23
NLD	37	86	59	91	0	70	108	36	14
USA	170	267	89	181	58	0	250	34	23
DEA	113	482	181	575	92	204	0	84	19
SVN	27	67	49	81	35	28	77	0	8
GBR	21	20	19	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

CHE

FRA

NLD

USA

DEA

SVN

GBR

ITA

0

135

86

37

171

105

27

21

122

152

163

86

267

451

67

20

461

94

0

0

59

89

171

49

19

182

46

90

70

0

58

90

35

12

86

179

297

114

70

0

176

28

21

150

122

548

213

102

225

0

77

17

512

30

71

50

36

34

84

0

6

81

24

22

20

14

23

18

8

0

21

140

516

217

103

199

576

88

23

0

BSW ftl

common bulls below diagonal

common three quarter sib group above diagonal

CAN

CHE

FRA

ITA

NLD

USA

DEA

SVN

GBR

CAN

CHE

FRA

ITA

NLD

USA

DEA

SVN

GBR

0

135

86

133

35

171

113

27

21

152

163

495

77

267

482

67

20

94

0

194

57

89

181

49

19

153

556

232

0

180

575

81

21

43

80

67

104

54

85

33

12

179

297

114

238

0

204

28

21

133

580

226

662

98

0

77

17

30

71

50

88

33

84

0

6

24

22

20

23

14

19

8

0

BSW rtp

common bulls below diagonal

common three quarter sib group above diagonal

CAN

CHE

FRA

ITA

NLD

DEA

SVN

USA

CAN

CHE

FRA

ITA

NLD

DEA

SVN

USA

0

129

80

95

29

85

27

63

142

157

332

84

314

67

46

89

0

136

54

126

49

14

107

382

163

0

342

76

40

34

85

62

83

80

35

19

98

385

165

377

0

76

40

30

71

50

82

36

83

13

64

55

20

52

20

47

0

BSW ocs

common bulls below diagonal

common three quarter sib group above diagonal

CAN

CHE

FRA

ITA

NLD

USA

DEA

SVN

GBR

CAN

CHE

FRA

ITA

NLD

USA

DEA

SVN

GBR

0

128

86

133

35

171

86

27

21

144

147

439

75

311

65

20

94

0

194

84

127

48

19

153

500

231

0

376

77

21

43

76

67

102

73

33

12

179

268

114

237

66

111

21

100

381

166

414

80

0

15

30

69

49

84

33

80

6

24

22

20

23

14

16

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	144	94	152	43	178	133	30	24
CHE	128	0	186	501	75	268	525	70	22
FRA	86	147	0	232	67	114	226	50	20
ITA	132	441	194	0	104	240	655	87	23
NLD	35	74	57	84	0	66	98	33	14
USA	170	233	89	181	54	0	248	34	23
DEA	112	433	181	571	85	200	0	84	19
SVN	27	66	49	80	33	28	77	0	8
GBR	21	20	19	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	144	94	148	43	179	133	30	24
CHE	128	0	186	500	76	268	525	70	22
FRA	86	147	0	231	67	114	226	50	20
ITA	129	440	194	0	102	226	650	86	23
NLD	35	75	57	83	0	66	98	33	14
USA	171	233	89	167	54	0	248	34	23
DEA	112	433	181	564	85	200	0	82	19
SVN	27	66	49	79	33	28	75	0	8
GBR	21	20	19	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	145	133	111	30	181	96
CHE	129	0	521	384	70	267	186
DEA	114	431	0	419	81	244	223
ITA	99	333	367	0	79	142	164
SVN	28	66	74	73	0	34	49
USA	172	233	199	108	28	0	114
FRA	88	147	180	137	48	89	0

BSW tpl

common bulls below diagonal						
common three quarter sib group above diagonal						
	CAN	CHE	DEA	ITA	SVN	FRA
CAN	0	152	135	155	32	96
CHE	136	0	580	555	71	203
DEA	114	482	0	660	83	226
ITA	135	495	574	0	87	231
SVN	29	68	77	81	0	50
FRA	88	163	181	193	49	0

BSW oru

common bulls below diagonal							
common three quarter sib group above diagonal							
	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	145	112	111	30	181	96
CHE	129	0	417	384	70	267	186
DEA	98	343	0	386	80	181	181
ITA	99	333	349	0	79	142	164
SVN	28	66	73	73	0	34	49

USA	172	233	138	108	28	0	114
FRA	88	147	143	137	48	89	0

BSW rle

common bulls below diagonal							
common three quarter sib group above diagonal							
	CHE	DEA	ITA	SVN	USA	FRA	
CHE	0	562	384	48	296	203	
DEA	467	0	418	59	235	220	
ITA	334	366	0	60	142	164	
SVN	46	55	55	0	24	38	
USA	267	188	108	22	0	114	
FRA	163	178	137	39	89	0	

BSW thp

common bulls below diagonal							
common three quarter sib group above diagonal							
	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	102	85	92	30	110	50
CHE	90	0	417	384	70	267	135
DEA	72	343	0	386	80	181	148
ITA	82	333	349	0	79	142	140
SVN	28	66	73	73	0	34	49
USA	102	233	138	108	28	0	73
FRA	44	104	117	117	48	53	0

BSW hoq

common bulls below diagonal						
common three quarter sib group above diagonal						
	CAN	CHE	DEA	ITA	SVN	FRA
CAN	0	152	135	150	31	96
CHE	136	0	580	549	69	203
DEA	114	482	0	654	81	226
ITA	131	490	566	0	85	230
SVN	28	66	75	79	0	50
FRA	88	163	181	193	49	0

BSW ful

common bulls below diagonal					
common three quarter sib group above diagonal					
	CHE	DEA	ITA	SVN	FRA
CHE	0	579	553	70	199
DEA	481	0	660	83	224
ITA	493	574	0	87	228
SVN	67	77	81	0	50
FRA	160	180	192	49	0

BSW udb

common bulls below diagonal					
common three quarter sib group above diagonal					
	CHE	DEA	ITA	SVN	FRA
CHE	0	352	358	70	149
DEA	300	0	376	82	165
ITA	318	342	0	82	161
SVN	67	76	76	0	50
FRA	120	126	135	49	0

BSW tdi

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

CHE	0	579	546	69	199
DEA	481	0	654	83	224
ITA	487	566	0	86	227
SVN	66	77	80	0	50
FRA	160	180	192	49	0

BSW tth

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

CHE	0	385	381	70	130
DEA	314	0	377	82	144
ITA	332	342	0	82	138
SVN	67	76	76	0	50
FRA	102	114	115	49	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

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

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

common	bulls below diagonal										above diagonal													
	common			three quarter sib group			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	532	987	501	933	857	685	882	971	624	960	1177	475	634	528	310	604	574	111	461	364	88	629	268
BEL	464	0	756	582	1011	781	659	902	825	680	1152	861	443	671	304	248	465	588	126	446	302	108	681	278
CAN	920	726	0	948	2265	1463	1473	1496	1839	1944	1566	3660	1016	1385	415	376	1267	1236	251	520	788	175	1244	588
CHE	456	578	852	0	1087	693	613	730	798	738	910	997	400	599	268	218	426	521	113	402	305	100	577	283
DEU	654	957	1463	939	0	2415	1609	2323	2008	2233	2833	3031	1145	2014	486	372	1253	1767	334	657	626	297	1341	854
DFS	607	698	1181	640	1547	0	1121	1666	1544	1365	1902	1986	832	1377	499	388	883	1219	275	613	525	186	1058	523
ESP	535	637	995	511	933	851	0	1318	1181	1310	1228	1704	784	1106	350	366	906	962	173	461	562	148	1027	433
FRA	644	901	1107	693	1318	1030	1047	0	1601	1363	1974	2333	863	1623	524	380	1121	1270	191	611	568	152	1089	469
GBR	837	825	1877	796	1402	1134	964	1147	0	1537	1839	2359	852	1336	523	395	966	1140	231	839	568	162	1103	515
ITA	546	702	1781	683	1630	1201	1014	1049	1379	0	1507	2471	968	1530	290	267	917	1257	275	464	615	228	1123	626
NLD	812	1259	1438	896	2155	1472	1071	1378	1582	1400	0	2401	866	1548	684	382	993	1506	287	749	539	195	1213	562
USA	1012	755	3752	931	1775	1396	1188	1367	2176	2230	1983	0	1284	1867	584	467	1808	1763	302	664	961	192	1555	815
HUN	342	361	917	326	811	638	601	604	691	870	672	1183	0	870	273	279	622	905	164	342	478	114	766	388
POL	421	545	1085	436	1370	956	766	1089	1051	1278	1220	1594	700	0	345	294	839	1272	272	468	567	194	1085	606
NZL	430	237	360	223	341	331	286	313	416	250	613	497	199	217	0	205	343	358	59	373	202	51	351	146
ZAF	287	212	349	192	293	308	339	317	368	235	345	495	236	219	186	0	309	303	54	240	232	30	339	138
JPN	327	267	503	253	400	382	366	363	417	428	416	575	264	317	172	197	0	801	132	360	559	104	700	355
CZE	376	438	887	375	1199	742	678	852	826	1022	1295	1385	773	922	238	225	280	0	208	445	529	160	916	490
EST	52	72	161	61	211	172	75	95	132	177	194	214	88	158	31	22	37	12						

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	525	987	501	932	856	697	773	971	624	905	1177	475	633	528	260	603	574	110	461	363	88	631	243
BEL	463	0	750	579	1005	774	671	854	818	680	1098	844	440	667	300	217	455	586	126	443	301	108	681	258
CAN	920	726	0	948	2263	1463	1481	1363	1839	1944	1492	3660	1016	1385	415	323	1264	1236	251	520	784	175	1245	562
CHE	456	577	852	0	1086	693	621	710	798	738	892	997	400	599	268	197	425	521	113	402	304	100	578	263
DEU	654	957	1463	939	0	2414	1633	2237	2006	2232	2790	3030	1144	2012	485	334	1250	1766	333	656	621	297	1340	825
DFS	607	697	1181	640	1548	0	1144	1536	1542	1365	1823	1985	832	1374	498	334	882	1219	274	611	522	186	1057	495

ESP	546	661	1003	521	969	876	0	1277	1204	1321	1220	1722	793	1126	361	321	910	982	177	476	565	150	1050	419
FRA	607	868	1054	672	1275	1008	1055	0	1484	1352	1718	2007	836	1551	452	304	1002	1226	187	568	536	152	1048	441
GBR	837	826	1877	796	1402	1134	995	1108	0	1537	1773	2357	852	1335	523	339	964	1140	231	836	565	162	1103	487
ITA	546	702	1781	683	1630	1201	1028	1045	1379	0	1502	2471	968	1531	290	261	915	1257	275	464	610	228	1123	619
NLD	778	1199	1381	873	2126	1449	1072	1251	1529	1397	0	2165	857	1524	658	320	921	1487	284	735	518	195	1194	528
USA	1012	754	3752	931	1775	1395	1204	1222	2176	2230	1739	0	1284	1867	584	398	1805	1763	302	662	955	192	1556	784
HUN	342	361	917	326	811	638	610	596	691	870	659	1183	0	870	273	261	622	905	164	342	475	114	767	370
POL	421	545	1085	436	1370	956	789	1059	1050	1279	1209	1594	700	0	345	268	839	1272	271	468	564	194	1086	582
NZL	430	237	360	223	341	331	294	293	416	250	592	497	199	217	0	168	343	358	59	373	201	51	352	128
ZAF	246	195	307	176	273	284	300	271	317	233	286	410	230	211	149	0	262	282	53	203	212	30	317	122
JPN	322	263	497	250	396	378	364	350	410	425	406	567	262	314	171	182	0	800	132	360	555	104	700	336
CZE	376	438	887	375	1199	742	702	827	826	1022	1278	1385	773	922	238	213	278	0	208	445	527	160	917	474
EST	52	72	161	61	211	172	79	94	132	177	193	214	88	158	31	22	37	121	0	86	93	47	161	136
IRL	423	423	488	396	531	495	452	514	901	436	671	617	278	347	308	196	208	332	43	0	229	75	467	185
KOR	256	214	723	217	385	359	413	348	429	519	365	1072	370	408	139	162	271	371	40	161	0	84	534	276
SVN	63	85	136	74	291	151	102	115	120	200	168	147	89	155	36	20	48	112	23	56	55	0	122	91
PRT	498	693	1256	531	1144	967	1068	1019	1020	1136	1203	1603	736	1015	267	307	342	769	97	396	463	93	0	491
LVA	111	150	354	144	643	305	220	244	279	416	340	684	256	403	67	75	105	299	68	103	173	50	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	532	987	501	932	856	687	820	971	624	934	1177	475	634	528	310	604	574	111	461	363	631	88	268
BEL	464	0	754	580	1009	778	659	882	823	680	1126	859	443	670	304	247	464	588	126	445	301	681	108	278
CAN	920	726	0	948	2264	1463	1476	1408	1839	1944	1535	3660	1016	1385	415	376	1266	1236	251	520	786	1245	175	588
CHE	456	578	852	0	1086	693	614	727	798	738	904	997	400	599	268	218	426	521	113	402	304	578	100	283
DEU	654	956	1463	939	0	2414	1613	2287	2007	2232	2819	3030	1144	2013	485	371	1252	1766	334	656	623	1340	297	854
DFS	607	698	1181	640	1547	0	1124	1582	1543	1365	1859	1985	832	1375	498	388	883	1219	275	611	523	1057	186	523
ESP	536	639	996	513	940	854	0	1285	1184	1313	1218	1707	786	1110	352	366	906	966	175	462	561	1033	148	435
FRA	632	888	1086	693	1304	1026	1050	0	1536	1358	1822	2120	849	1593	488	360	1043	1254	189	589	551	1068	152	465
GBR	837	825	1877	796	1402	1134	968	1138	0	1537	1810	2358	852	1336	523	395	966	1140	231	836	567	1104	162	515
ITA	546	702	1781	683	1630	1201	1015	1048	1379	0	1505	2471	968	1530	290	267	917	1257	275	464	613	1123	228	626
NLD	807	1234	1431	895	2153	1471	1072	1330	1570	1400	0	2273	862	1538	671	373	959	1501	286	742	532	1208	195	557
USA	1012	755	3752	931	1775	1395	1190	1297	2176	2230	1941	0	1284	1867	584	467	1807	1763	302	662	958	1556	192	815
HUN	342	361	917	326	811	638	603	602	691	870	672	1183	0	870	273	279	622	905	164	342	477	767	114	388
POL	421	545	1085	436	1370	956	769	1081	1051	1278	1219	1594	700	0	345	294	839	1272	272	468	566	1086	194	606
NZL	430	237	360	223	341	331	287	310	416	250	611	497	199	217	0	205	343	358	59	373	201	352	51	146
ZAF	287	212	349	192	293	308	340	314	368	235	343	495	236	219	186	0	309	303	54	239	231	339	30	138
JPN	324	266	500	252	398	380	364	358	414	427	412	571	262	315	171	196	0	801	132	360	557	701	104	355
CZE	376	438	887	375	1199	742	682	844	826	1022	1294	1385	773	922	238	225	278	0	208	445	529	918	160	490
EST	52	72	161	61	211	172	76	95	132	177	194	214	88	158	31	22	37	121	0	86	94	161	47	142
IRL	423	423	488	396	531	495	434	528	901	436	683	617	278	347	308	227	208	332	43	0	230	467	75	200
KOR	256	214	724	217	386	359	409	356	430	521	373	1075	372	409	139	178	273	372	40	161	0	536	84	288
PRT	498	693	1256	531	1144	967	1043	1027	1020	1136	1217	1603	736	1015	267	319	345	769	97	396	465	0	122	511
SVN	63	85	136	74	291	151	99	115	120	200	168	147	89	155	36	20	48	112	23	56	55	93	0	91
LVA	124	162	369	155	666	319	227	257	298	420	362	706	269	418	77	83	109	307	73	114	176	421	50	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	515	987	484	206	182	700	770	967	623	535	1174	472	631	306	603	574	109	459	363	621	84	268	
BEL	461	0	735	549	278	212	664	845	800	674	747	824	432	652	236	448	579	124	434	297	671	101	275	
CAN	920	721	0	911	607	486	1483	1358	1837	1940	1112	3660	1013	1381	371	1264	1236	249	518	784	1230	164	588	
CHE	451	551	822	0	325	217	613	700	783	731	647	941	392	576	214	423	496	109	398	302	560	94	278	
DEU	176	271	581	294	0	526	413	488	499	760	749	632	293	589	27	210	356	147	144	141	316	186	317	
DFS	174	211	524	213	521	0	311	327	368	535	459	511	238	387	28	179	262	143	116	145	260	102	165	
ESP	548	664	1004	518	284	298	0	1283	1207	1321	873	1726	790	1132	368	913	986	178	477	565	1046	141	443	
FRA	606	866	1053	664	436	325	1069	0	1479	1344	1079	1997	829	1540	340	998	1225	183	566	535	1029	142	459	
GBR	837	817	1877	786	451	373	1003	1105	0	1531	1137	2351	845	1329	388	963	1138	228	828	565	1083	151	515	
ITA	546	700	1781	679	715	540	1031	1043	1379	0	1331	2465	962	1519	263	913	1253	271	460	610	1107	216	624	
NLD	511	811	1145	623	779	473	797	979	1112	1294	0	1309	599	1171	207	550	1078	245	450	379	847	186	453	
USA	1011	746	3752	878	585	542	1206	1219	2174	2230	1227	0	1278	1859	461	1805	1762	301	659	954	1526	181	815	
HUN	342	360	917	323	234	209	614	594	690	869	493	1181	0	865	275	622	901	164	338	474	755	109	385	

POL	421	541	1085	416	494	343	798	1059	1049	1272	1033	1593	697	0	290	836	1263	270	464	563	1068	182	604
ZAF	284	209	346	188	21	26	339	294	365	231	186	490	234	216	0	305	298	52	237	228	330	27	136
JPN	322	263	497	250	132	135	364	350	410	425	333	567	262	314	193	0	800	132	358	555	696	99	355
CZE	376	438	887	363	277	208	707	827	826	1022	1048	1385	773	922	221	278	0	206	443	527	906	152	490
EST	52	71	161	61	103	105	81	94	132	177	176	214	88	158	22	37	121	0	84	93	156	47	141
IRL	422	420	488	392	120	103	455	514	894	433	446	617	278	345	225	208	332	43	0	229	459	72	200
KOR	256	214	723	216	107	125	413	348	429	519	289	1071	370	408	177	271	371	40	161	0	533	80	287
PRT	498	687	1256	519	297	257	1082	1018	1016	1127	868	1602	735	1006	315	342	769	96	395	463	0	116	507
SVN	63	85	136	74	180	83	102	114	120	199	168	147	89	155	18	48	112	23	55	55	92	0	86
LVA	124	162	369	153	255	105	243	255	298	420	303	706	269	418	82	109	307	73	114	175	421	50	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	532	987	501	933	857	684	881	971	624	960	1177	475	634	528	310	604	574	111	461	364	88	631	268			
BEL	464	0	756	582	1011	781	653	902	825	680	1152	861	443	671	304	248	465	588	126	446	302	108	682	278			
CAN	920	726	0	948	2265	1463	1468	1496	1839	1944	1566	3660	1016	1385	415	376	1266	1236	251	520	788	175	1245	588			
CHE	456	578	852	0	1087	693	610	730	798	738	910	997	400	599	268	218	426	521	113	402	305	100	578	283			
DEU	654	957	1463	939	0	2415	1598	2322	2008	2233	2833	3031	1145	2014	486	372	1253	1767	334	657	626	297	1341	854			
DFS	607	698	1181	640	1547	0	1113	1666	1544	1365	1902	1986	832	1377	499	388	883	1219	275	613	525	186	1059	523			
ESP	534	631	990	508	922	843	0	1311	1174	1304	1220	1696	783	1102	348	366	902	958	173	459	561	148	1023	432			
FRA	643	901	1106	693	1316	1028	1038	0	1600	1362	1973	2332	862	1622	524	379	1121	1269	191	611	567	152	1090	469			
GBR	837	825	1877	796	1402	1134	956	1145	0	1537	1839	2359	852	1336	523	395	966	1140	231	839	568	162	1105	515			
ITA	546	702	1781	683	1630	1201	1006	1048	1379	0	1507	2471	968	1530	290	267	917	1257	275	464	615	228	1123	626			
NLD	812	1259	1438	896	2155	1472	1063	1376	1582	1400	0	2401	866	1548	684	382	993	1506	287	749	539	195	1214	562			
USA	1012	755	3752	931	1775	1395	1180	1365	2176	2230	1983	0	1284	1867	584	467	1807	1763	302	664	961	192	1556	815			
HUN	342	361	917	326	811	638	600	603	691	870	672	1183	0	870	273	279	622	905	164	342	478	114	767	388			
POL	421	545	1085	436	1370	956	760	1088	1051	1278	1220	1594	700	0	345	294	839	1272	272	468	567	194	1086	606			
NZL	430	237	360	223	341	331	284	313	416	250	613	497	199	217	0	205	343	358	59	373	202	51	352	146			
ZAF	287	212	349	192	293	308	339	316	368	235	345	495	236	219	186	0	309	303	54	240	232	30	339	138			
JPN	326	266	501	252	399	381	365	361	416	428	415	573	263	316	171	196	0	801	132	360	558	104	701	355			
CZE	376	438	887	375	1199	742	676	851	826	1022	1295	1385	773	922	238	225	280	0	208	445	529	160	918	490			
EST	52	72	161	61	211	172	75	95	132	177	194	214	88	158	31	22	37	121	0	86	94	47	161	142			
IRL	423	423	488	396	531	495	432	531	903	436	686	617	278	347	308	227	208	332	43	0	231	75	467	200			
KOR	256	214	724	217	386	359	406	357	430	521	376	1079	372	409	139	179	274	372	40	161	0	84	536	288			
SVN	63	85	136	74	291	151	99	115	120	200	168	147	89	155	36	20	48	112	23	56	55	0	122	91			
PRT	498	692	1256	531	1144	967	1026	1032	1019	1136	1220	1603	736	1015	267	319	346	769	97	396	465	93	0	511			
LVA	124	162	369	155	666	319	223	257	298	420	363	706	269	418	77	83	109	307	73	114	176	50	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	507	987	501	932	857	684	820	971	624	958	1177	475	634	528	310	410	574	111	461	362	631	88	268					
BEL	461	0	734	573	987	758	636	852	792	679	1061	812	433	658	289	235	355	574	126	429	292	671	108	277					
CAN	920	716	0	948	2264	1463	1471	1408	1839	1944	1563	3660	1016	1385	415	376	964	1236	251	520	785	1245	175	588					
CHE	456	574	852	0	1086	693	611	727	798	738	910	997	400	599	268	218	364	521	113	402	303	578	100	283					
DEU	654	950	1463	939	0	2414	1602	2287	2007	2232	2830	3030	1144	2013	485	371	1014	1766	334	656	622	1340	297	854					
DFS	607	693	1181	640	1547	0	1117	1583	1544	1365	1894	1986	832	1376	499	388	655	1219	275	612	522	1058	186	523					
ESP	534	627	994	508	927	847	0	1276	1178	1308	1220	1700	784	1103	349	366	723	960	173	460	559	1026	148	432					
FRA	632	879	1086	693	1304	1026	1040	0	1536	1358	1846	2120	849	1593	488	360	809	1254	189	589	550	1068	152	465					
GBR	837	808	1877	796	1402	1134	961	1138	0	1537	1836	2359	852	1336	523	395	725	1140	231	838	566	1104	162	515					
ITA	546	702	1781	683	1630	1201	1011	1048	1379	0	1507	2471	968	1530	290	267	866	1257	275	464	612	1123	228	626					
NLD	812	1162	1438	896	2154	1472	1065	1334	1581	1400	0	2394	866	1547	683	382	747	1506	286	748	534	1213	195	561					
USA	1012	740	3752	931	1775	1395	1185	1297	2176	2230	1980	0	1284	1867	584	467	1286	1763	302	663	956	1556	192	815					
HUN	342	360	917	326	811	638	601	602	691	870	672	1183	0	870	273	279	527	905	164	342	476	767	114	388					
POL	421	542	1085	436	1370	956	763	1081	1051	1278	1220	1594	700	0	345	294	731	1272	272	468	565	1086	194	606					
NZL	430	231	360	223	341	331	286	310	416	250	613	497	199	217	0	205	230	358	59	373	200	352	51	146					
ZAF	286	209	348	191	292	307	338	313	367	234	344	494	235	218	186	0	211	303	54	239	230	339	30	138					
JPN	284	238	461	233	371	351	322	323	367	418	372	514	246	304	147	151	0	658	120	272	471	565	104	315					
CZE	376	435	887	375	1199	742	677	844	826	1022	1295	1385	773	922	238	225	261	0	208	445	528	918	160	490					
EST	52	72	161	61	211	172	75	95	132	177	194	214	88	158	31	22	37	121	0	86	94	161	47	142					
IRL	423	417	488	396	531	495	432	528	903	436	686	617	278	347	308	226	184	332	43	0	229	467	75	200					
KOR	256	214	724	217	386	359	408	356	430	521	376	1075	372	409	139	178	258	372	40	161	0	535	84	287					

HOL rls

HOL fan

	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	501	987	501	669	856	697	653	971	624	923	1177	474	633	310	603	574	111	459	362	88	634	268
BEL	461	0	729	571	815	749	650	775	786	679	1049	803	433	655	231	436	574	126	425	292	108	672	276
CAN	920	716	0	948	1881	1463	1481	1232	1839	1944	1520	3660	1015	1384	376	1264	1236	251	518	784	175	1246	588
CHE	456	573	852	0	928	692	621	681	798	738	899	997	400	598	218	425	520	113	401	304	100	578	283
DEU	542	801	1341	798	0	1812	1361	1686	1560	2134	2229	2327	932	1742	252	938	1402	308	485	528	295	1097	794
DFS	607	693	1181	640	1364	0	1143	1323	1541	1364	1842	1983	829	1372	388	882	1219	275	610	523	186	1060	523
ESP	546	652	1003	521	801	876	0	1158	1203	1321	1231	1721	792	1125	371	909	981	178	475	564	150	1052	440
FRA	543	785	985	633	1108	942	958	0	1275	1330	1527	1667	781	1482	282	857	1110	179	488	496	152	972	439
GBR	837	806	1877	795	1193	1134	994	975	0	1536	1790	2354	851	1333	394	963	1139	231	828	566	162	1105	515
ITA	546	702	1781	683	1575	1201	1028	1036	1379	0	1503	2470	968	1530	267	915	1257	275	464	610	228	1123	626
NLD	802	1156	1425	894	1849	1470	1096	1172	1560	1400	0	2226	856	1524	369	950	1495	286	732	528	195	1204	556
USA	1012	740	3752	931	1518	1395	1204	1059	2176	2230	1925	0	1283	1864	467	1804	1763	302	659	953	192	1555	815
HUN	342	360	917	326	675	637	610	563	691	870	670	1183	0	869	278	622	904	164	341	473	114	766	388
POL	421	542	1085	435	1255	955	787	1039	1050	1278	1212	1594	699	0	292	838	1270	272	467	564	194	1085	606
ZAF	287	210	349	192	202	308	343	248	368	235	339	495	236	219	0	307	303	54	238	231	30	341	138
JPN	322	263	497	250	352	378	363	335	409	425	406	566	262	314	193	0	800	132	359	555	104	702	355
CZE	376	435	887	375	1000	742	701	753	826	1022	1293	1385	773	922	225	278	0	208	445	527	160	918	490
EST	52	72	161	61	197	172	79	92	132	177	194	214	88	158	22	37	121	0	86	94	47	161	142
IRL	421	417	487	394	420	495	452	442	890	436	681	616	278	347	227	208	332	43	0	228	75	467	200
KOR	255	214	722	217	347	359	410	336	429	519	370	1065	369	407	178	270	371	40	161	0	83	535	287
SVN	63	85	136	74	291	151	102	115	120	200	168	147	89	155	20	48	112	23	56	54	0	122	91
PRT	499	691	1257	532	990	968	1070	971	1024	1136	1217	1606	738	1018	319	342	771	97	397	463	93	0	511
LVA	124	162	369	155	637	319	235	248	298	420	362	706	269	418	83	109	307	73	114	175	50	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	525	987	501	933	856	697	850	971	624	902	1177	475	633	528	310	603	574	111	461	363	87	631	268
BEL	463	0	752	581	1007	776	673	889	820	680	1099	846	440	668	300	246	456	586	126	444	301	107	682	278
CAN	920	726	0	948	2264	1463	1481	1449	1839	1944	1469	3660	1016	1385	415	376	1264	1236	251	520	787	174	1245	588
CHE	456	577	852	0	1087	693	621	729	798	738	884	997	400	599	268	218	425	521	113	402	304	99	578	283
DEU	654	957	1463	939	0	2414	1634	2310	2008	2233	2769	3031	1145	2014	486	372	1251	1767	334	657	625	293	1341	854
DFS	607	697	1181	640	1547	0	1144	1621	1543	1365	1812	1985	832	1376	498	388	882	1219	275	612	524	184	1058	523
ESP	546	661	1003	521	969	876	0	1326	1205	1321	1219	1722	793	1126	361	371	910	981	178	476	566	149	1050	440
FRA	642	898	1102	692	1316	1027	1087	0	1571	1361	1823	2224	858	1614	504	371	1080	1261	190	600	556	150	1083	466
GBR	837	826	1877	796	1402	1134	995	1141	0	1537	1757	2358	852	1336	523	395	964	1140	231	837	567	160	1105	515
ITA	546	702	1781	683	1630	1201	1028	1048	1379	0	1485	2471	968	1531	290	267	915	1257	275	464	614	226	1123	626
NLD	776	1198	1358	864	2101	1437	1069	1310	1516	1380	0	2148	855	1516	656	364	919	1481	281	733	521	190	1192	552
USA	1012	754	3752	931	1775	1396	1204	1342	2176	2230	1720	0	1284	1868	584	467	1805	1763	302	663	959	191	1556	815
HUN	342	361	917	326	811	638	610	603	691	870	657	1183	0	870	273	279	622	905	164	342	478	114	767	388
POL	421	545	1085	436	1370	956	788	1087	1051	1279	1203	1594	700	0	345	294	839	1272	272	468	567	192	1086	606
NZL	430	237	360	223	341	331	294	313	416	250	590	497	199	217	0	205	343	358	59	373	201	51	352	146
ZAF	287	212	349	192	293	308	343	316	368	235	325	495	236	219	186	0	308	303	54	240	231	30	339	138
JPN	322	263	497	250	396	378	364	355	410	425	405	567	262	314	171	194	0	800	132	360	556	104	700	355
CZE	376	438	887	375	1199	742	701	849	826	1022	1270	1385	773	922	238	225	278	0	208	445	529	160	918	490
EST	52	72	161	61	211	172	79	95	132	177	192	214	88	158	31	22	37	121	0	86	94	47	161	142
IRL	423	423	488	396	531	495	452	528	901	436	669	617	278	347	308	227	208	332	43	0	230	75	467	200
KOR	256	214	724	217	386	359	413	357	430	521	366	1075	372	409	139	178	271	372	40	161	0	84	536	288
SVN	63	85	136	74	287	150	102	115	120	199	166	147	89	155	36	20	48	112	23	56	55	0	121	91
PRT	498	693	1256	531	1144	967	1069	1032	1021	1136	1201	1604	737	1015	267	319	342	770	97	396	465	93	0	511
LVA	124	162	369	155	666	319	235	257	298	420	358	706	269	418	77	83	109	307	73	114	176	50	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	525	987	501	933	810	689	878	971	624	931	1177	475	634	528	310	604	574	111	461	363	88	630	268
BEL	463	0	752	581	1007	765	660	892	819	680	1112	846	440	668	300	246	457	586	126	444	301	108	681	278
CAN	920	726	0	948	2265	1385	1477	1487	1839	1944	1512	3660	1016	1385	415	376	1265	1236	251	520	787	175	1244	588
CHE	456	577	852	0	1087	689	616	730	798	738	896	997	400	599	268	218	425	521	113	402	304	100	578	283
DEU	654	957	1463	939	0	2360	1618	2317	2008	2233	2797	3031	1145	2014	486	372	1252	1767	334	657	625	296	1340	854
DFS	607	697	1181	640	1546	0	1086	1581	1484	1364	1814	1892	824	1356	471	361	829	1185	273	595	511	185	1049	519

ESP	537	641	997	515	944	857	0	1320	1188	1314	1220	1709	787	1113	354	369	907	968	175	464	563	148	1034	437
FRA	643	900	1106	693	1316	1029	1058	0	1593	1362	1890	2313	860	1620	521	378	1116	1264	191	606	564	152	1087	468
GBR	837	824	1876	796	1401	1133	969	1143	0	1537	1793	2358	852	1336	523	395	965	1140	231	837	567	162	1104	515
ITA	546	702	1781	683	1630	1200	1017	1048	1378	0	1488	2471	968	1530	290	267	916	1257	275	464	614	228	1123	626
NLD	805	1228	1407	886	2128	1459	1073	1350	1555	1383	0	2254	860	1529	669	373	956	1495	283	740	533	192	1205	556
USA	1012	754	3752	931	1775	1395	1192	1358	2176	2230	1922	0	1284	1867	584	467	1806	1763	302	663	960	192	1555	815
HUN	342	361	917	326	811	638	605	603	691	870	670	1183	0	870	273	279	622	905	164	342	478	114	767	388
POL	421	545	1085	436	1370	956	772	1088	1051	1278	1211	1594	700	0	345	294	839	1272	272	468	567	194	1085	606
NZL	430	237	360	223	341	331	288	313	416	250	609	497	199	217	0	205	343	358	59	373	201	51	352	146
ZAF	287	212	349	192	293	308	342	316	368	235	343	495	236	219	186	0	309	303	54	240	231	30	339	138
JPN	322	264	498	250	397	379	363	356	411	426	408	568	262	314	171	195	0	801	132	360	557	104	701	355
CZE	376	438	887	375	1199	742	685	851	826	1022	1286	1385	773	922	238	225	278	0	208	445	529	160	918	490
EST	52	72	161	61	211	172	76	95	132	177	193	214	88	158	31	22	37	121	0	86	94	47	160	142
IRL	423	423	488	396	531	495	436	531	901	436	681	617	278	347	308	227	208	332	43	0	230	75	467	200
KOR	256	214	724	217	386	359	410	357	430	521	373	1076	372	409	139	179	272	372	40	161	0	84	536	288
SVN	63	85	136	74	290	150	99	115	120	200	166	147	89	155	36	20	48	112	23	56	55	0	122	91
PRT	498	693	1256	531	1144	964	1045	1032	1020	1136	1215	1603	736	1015	267	319	343	769	97	396	465	93	0	511
LVA	124	162	369	155	666	319	229	257	298	420	361	706	269	418	77	83	109	307	73	114	176	50	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	525	987	501	933	857	700	881	971	624	957	1177	475	634	528	310	603	574	111	461	362	88	631	268	
BEL	463	0	752	581	1007	777	675	895	820	680	1121	846	440	668	300	246	456	586	126	444	300	108	682	278	
CAN	920	726	0	948	2265	1463	1483	1496	1839	1944	1543	3660	1016	1385	415	376	1264	1236	251	520	782	175	1245	588	
CHE	456	577	852	0	1087	693	621	730	798	738	902	997	400	599	268	218	425	521	113	402	303	100	578	283	
DEU	654	957	1463	939	0	2414	1643	2322	2008	2233	2810	3031	1145	2014	486	372	1251	1767	334	657	620	296	1341	854	
DFS	607	697	1182	640	1547	0	1150	1666	1544	1365	1891	1986	832	1377	499	388	882	1219	275	613	520	185	1059	523	
ESP	547	665	1004	521	984	883	0	1354	1210	1324	1264	1727	794	1134	364	371	913	986	179	478	563	150	1058	443	
FRA	643	901	1106	693	1316	1029	1105	0	1601	1362	1971	2332	862	1622	524	379	1119	1269	191	611	562	152	1090	469	
GBR	837	826	1877	796	1402	1134	1003	1146	0	1537	1823	2359	852	1336	523	395	964	1140	231	839	563	162	1105	515	
ITA	546	702	1781	683	1630	1201	1031	1048	1379	0	1490	2471	968	1530	290	267	915	1257	275	464	608	228	1123	626	
NLD	810	1236	1414	887	2130	1461	1113	1373	1569	1383	0	2382	864	1539	682	382	989	1500	284	747	531	192	1212	561	
USA	1012	754	3752	931	1775	1397	1206	1365	2176	2230	1964	0	1284	1867	584	467	1805	1763	302	664	951	192	1556	815	
HUN	342	361	917	326	811	638	613	603	691	870	670	1183	0	870	273	279	622	905	164	342	474	114	767	388	
POL	421	545	1085	436	1370	956	797	1088	1051	1278	1212	1594	700	0	345	294	839	1272	272	468	563	194	1086	606	
NZL	430	237	360	223	341	331	296	313	416	250	611	497	199	217	0	205	343	358	59	373	199	51	352	146	
ZAF	287	212	349	192	293	309	343	316	368	235	345	495	236	219	186	0	308	303	54	240	231	30	339	138	
JPN	322	263	497	250	396	378	364	355	410	425	408	567	262	314	171	194	0	800	132	360	553	104	700	355	
CZE	376	438	887	375	1199	742	705	851	826	1022	1287	1385	773	922	238	225	278	0	208	445	525	160	918	490	
EST	52	72	161	61	211	172	80	95	132	177	193	214	88	158	31	22	37	121	0	86	93	47	161	142	
IRL	423	423	488	396	531	495	454	531	903	436	684	617	278	347	308	227	208	332	43	0	228	75	467	200	
KOR	255	213	722	216	384	358	411	354	428	518	373	1068	370	408	138	178	270	370	40	160	0	83	532	287	
SVN	63	85	136	74	290	150	102	115	120	200	166	147	89	155	36	20	48	112	23	56	54	0	122	91	
PRT	498	694	1256	532	1144	968	1084	1034	1022	1136	1220	1604	737	1016	267	319	342	771	97	397	462	93	0	511	
LVA	124	162	369	155	666	319	243	257	298	420	362	706	269	418	77	83	109	307	73	114	175	50	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	529	987	501	933	857	686	881	971	624	968	1177	475	634	310	604	574	111	460	363	88	631	268		
BEL	462	0	753	580	1006	777	659	896	820	680	1155	856	442	669	245	462	587	126	441	299	108	682	278		
CAN	920	722	0	948	2266	1463	1475	1496	1839	1944	1658	3660	1016	1385	376	1266	1236	251	520	786	175	1245	588		
CHE	456	576	852	0	1087	693	613	730	798	738	934	997	400	599	218	426	521	113	402	304	100	578	283		
DEU	654	956	1463	939	0	2415	1611	2322	2009	2233	2931	3031	1145	2014	372	1253	1767	334	657	624	297	1341	854		
DFS	607	697	1182	640	1547	0	1123	1666	1544	1365	1945	1986	832	1377	388	883	1219	275	613	523	186	1059	523		
ESP	535	636	995	511	935	852	0	1321	1183	1312	1261	1705	785	1109	366	906	965	175	462	560	148	1031	435		
FRA	643	899	1106	693	1316	1029	1049	0	1600	1362	2012	2332	862	1622	379	1121	1269	191	611	565	152	1090	469		
GBR	837	821	1877	796	1402	1134	965	1145	0	1537	1892	2359	852	1336	395	966	1140	231	836	567	162	1105	515		
ITA	546	702	1781	683	1630	1201	1014	1048	1379	0	1599	2472	969	1531	267	917	1257	275	464	613	228	1123	626		
NLD	822	1262	1538	916	2261	1511	1091	1407	1640	1498	0	2506	891	1603	383	1001	1547	300	755	547	205	1242	588		
USA	1012	751	3752	931	1775	1397	1188	1365	2176	2230	2086	0	1284	1868	467	1807	1763	302	664	958	192	1556	815		
HUN	342	361	917	326	811	638	602	603	691	870	691	1183	0	871	279	622	905	164	342	477	114	767	388		

POL	421	545	1085	436	1370	956	768	1088	1051	1279	1272	1594	700	0	294	839	1272	272	468	566	194	1086	606
ZAF	287	212	349	192	293	309	339	316	368	235	346	495	236	219	0	309	303	54	240	231	30	339	138
JPN	326	266	501	252	399	381	365	361	416	428	421	573	263	316	196	0	801	132	360	557	104	701	355
CZE	376	438	887	375	1199	742	680	851	826	1022	1325	1385	773	922	225	280	0	208	445	529	160	918	490
EST	52	72	161	61	211	172	76	95	132	177	204	214	88	158	22	37	121	0	86	94	47	161	142
IRL	422	422	488	396	531	495	433	531	900	436	690	617	278	347	227	208	332	43	0	230	75	467	200
KOR	256	214	724	217	386	359	408	357	430	521	386	1076	372	409	179	274	372	40	161	0	84	536	288
SVN	63	85	136	74	291	151	99	115	120	200	178	147	89	155	20	48	112	23	56	55	0	122	91
PRT	498	692	1256	531	1144	967	1038	1032	1019	1136	1242	1603	736	1015	319	346	769	97	396	465	93	0	511
LVA	124	162	369	155	666	319	226	257	298	420	382	706	269	418	83	109	307	73	114	176	50	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	525	987	501	933	857	689	881	971	624	968	1177	475	634	528	310	604	574	110	461	363	87	631	243			
BEL	463	0	752	581	1007	777	660	894	819	680	1131	846	440	668	300	246	458	586	126	444	301	107	682	258			
CAN	920	726	0	948	2266	1463	1476	1496	1839	1944	1658	3660	1016	1385	415	376	1266	1236	251	520	787	173	1245	562			
CHE	456	577	852	0	1087	693	615	730	798	738	934	997	400	599	268	218	426	521	113	402	304	98	578	263			
DEU	654	957	1463	939	0	2415	1617	2322	2009	2233	2931	3031	1145	2015	486	372	1253	1767	333	657	625	293	1341	825			
DFS	607	697	1182	640	1547	0	1127	1666	1544	1365	1945	1986	832	1377	499	388	883	1219	274	613	524	184	1059	496			
ESP	537	641	996	514	943	856	0	1326	1187	1313	1265	1708	786	1112	354	368	906	967	174	463	562	147	1034	415			
FRA	643	900	1106	693	1316	1029	1057	0	1600	1362	2012	2332	862	1622	524	379	1121	1269	190	611	566	149	1090	446			
GBR	837	825	1877	796	1402	1134	970	1145	0	1537	1892	2359	852	1336	523	395	966	1140	231	839	567	159	1105	487			
ITA	546	702	1781	683	1630	1201	1016	1048	1379	0	1599	2472	969	1532	290	267	917	1257	275	464	614	226	1123	619			
NLD	822	1249	1538	916	2261	1511	1095	1407	1640	1498	0	2506	891	1603	686	383	1001	1547	299	755	549	202	1242	556			
USA	1012	754	3752	931	1775	1396	1191	1365	2176	2230	2086	0	1284	1869	584	467	1807	1763	302	664	960	190	1556	784			
HUN	342	361	917	326	811	638	604	603	691	870	691	1183	0	871	273	279	622	905	164	342	478	114	767	370			
POL	421	545	1085	436	1370	956	771	1088	1051	1280	1272	1594	700	0	345	294	839	1272	271	468	567	192	1086	582			
NZL	430	237	360	223	341	331	288	313	416	250	615	497	199	217	0	205	343	358	59	373	201	51	352	128			
ZAF	287	212	349	192	293	309	341	316	368	235	346	495	236	219	186	0	309	303	54	240	231	30	339	124			
JPN	324	266	500	252	398	380	364	359	414	427	419	571	262	315	171	196	0	801	132	360	557	104	701	336			
CZE	376	438	887	375	1199	742	684	851	826	1022	1325	1385	773	922	238	225	278	0	208	445	529	159	918	474			
EST	52	72	161	61	211	172	76	95	132	177	204	214	88	158	31	22	37	121	0	86	94	47	161	136			
IRL	423	423	488	396	531	495	435	531	903	436	690	617	278	347	308	227	208	332	43	0	230	75	467	185			
KOR	256	214	724	217	386	359	409	357	430	521	386	1076	372	409	139	179	273	372	40	161	0	84	536	277			
SVN	63	85	136	74	287	150	99	114	120	199	178	147	89	155	36	20	48	112	23	56	55	0	121	91			
PRT	498	692	1256	531	1144	967	1043	1032	1019	1136	1242	1603	736	1015	267	319	345	769	97	396	465	93	0	491			
LVA	111	150	354	144	643	305	214	245	279	416	360	684	256	403	67	75	105	299	68	103	174	50	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	532	987	501	933	857	686	881	971	624	957	1177	475	634	310	596	574	111	460	364	87	631	268	80			
BEL	464	0	756	582	1011	781	661	902	825	680	1151	861	443	671	248	464	588	126	446	302	107	682	278	64			
CAN	920	726	0	948	2265	1463	1475	1496	1839	1944	1543	3660	1016	1385	376	1259	1236	251	520	788	173	1245	588	102			
CHE	456	578	852	0	1087	693	613	730	798	738	902	997	400	599	218	426	521	113	402	305	98	578	283	66			
DEU	654	957	1463	939	0	2414	1611	2322	2008	2233	2810	3031	1145	2015	372	1251	1767	334	657	626	292	1341	854	105			
DFS	607	698	1182	640	1546	0	1123	1666	1544	1365	1891	1986	832	1377	388	877	1219	275	613	525	183	1059	523	87			
ESP	535	638	995	511	936	852	0	1321	1183	1312	1229	1705	785	1109	366	896	965	175	462	562	147	1031	435	79			
FRA	643	901	1106	693	1316	1029	1049	0	1600	1362	1970	2332	862	1622	379	1114	1269	191	611	567	149	1090	469	71			
GBR	837	825	1877	796	1402	1134	966	1145	0	1537	1822	2359	852	1336	395	961	1140	231	836	568	159	1105	515	98			
ITA	546	702	1781	683	1630	1201	1014	1048	1379	0	1490	2471	968	1531	267	917	1257	275	464	615	226	1123	626	97			
NLD	810	1258	1414	887	2130	1460	1071	1372	1568	1383	0	2382	864	1539	382	985	1500	284	747	539	189	1212	561	148			
USA	1012	755	3752	931	1775	1397	1188	1365	2176	2230	1964	0	1284	1868	467	1787	1763	302	664	961	190	1556	815	101			
HUN	342	361	917	326	811	638	602	603	691	870	670	1183	0	870	279	621	905	164	342	478	114	767	388	59			
POL	421	545	1085	436	1370	956	768	1088	1051	1279	1212	1594	700	0	294	837	1272	272	468	567	192	1086	606	75			
ZAF	287	212	349	192	293	309	339	316	368	235	345	495	236	219	0	306	303	54	240	232	30	339	138	20			
JPN	324	266	500	252	398	380	364	359	414	427	412	571	262	315	196	0	800	131	358	558	104	701	355	67			
CZE	376	438	887	375	1199	742	681	851	826	1022	1287	1385	773	922	225	278	0	208	445	529	159	918	490	73			
EST	52	72	161	61	211	172	76	95	132	177	193	214	88	158	22	37	121	0	86	94	47	161	142	25			
IRL	422	423	488	396	531	495	434	531	900	436	684	617	278	347	227	208	332	43	0	231	75	467	200	67			
KOR	256	214	724	217	386	359	408	357	430	521	376	1079	372	409	179	273	372	40	161	0	84	536	288	55			
SVN	63	85	136	74	286	149	99	114	120	199	166	147	89	155	20	48	112	23	56	55	0	121	91	33			

PRT	498	692	1256	531	1144	967	1039	1032	1019	1136	1218	1603	736	1015	319	345	769	97	396	465	93	0	511	65
LVA	124	162	369	155	666	319	227	257	298	420	362	706	269	418	83	109	307	73	114	176	50	421	0	33
NZL	84	57	102	56	95	80	71	65	93	86	142	102	43	55	21	60	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	519	986	483	928	732	691	876	835	624	813	897	529	521	409	455	110	460	241	87	538	169	349	268
BEL	462	0	745	555	996	721	662	878	740	680	1020	742	581	296	356	502	126	439	219	107	592	145	347	278
CAN	919	721	0	911	2258	1307	1477	1494	1660	1943	1508	3246	1281	410	964	1106	250	520	607	173	1118	227	876	588
CHE	451	553	822	0	997	650	609	714	753	731	816	910	523	263	363	441	112	398	230	98	504	133	326	278
DEU	653	955	1462	883	0	2266	1619	2300	1847	2231	2781	2703	1878	476	1013	1559	333	653	487	293	1187	223	941	854
DFS	568	659	1152	600	1502	0	1024	1459	1298	1353	1725	1588	1217	410	642	1004	268	545	376	184	904	216	661	509
ESP	538	646	998	512	949	811	0	1332	1078	1317	1170	1537	1015	355	725	862	174	470	431	148	918	218	648	438
FRA	642	892	1105	677	1303	971	1070	0	1330	1360	1661	1724	1452	514	812	1081	189	608	417	149	926	210	689	468
GBR	749	760	1721	740	1342	1030	862	1016	0	1523	1594	1984	1187	416	709	957	219	681	416	159	939	221	674	499
ITA	546	702	1781	679	1630	1193	1021	1047	1374	0	1590	2446	1509	289	866	1228	274	464	533	226	1098	220	924	626
NLD	728	1108	1424	807	2195	1414	1020	1260	1410	1493	0	1895	1439	562	747	1359	293	670	402	202	1055	213	715	572
USA	841	715	3480	852	1693	1295	1085	1126	1955	2225	1640	0	1670	410	1246	1503	292	580	716	190	1319	257	1043	794
POL	361	478	1027	372	1273	874	679	980	953	1259	1159	1472	0	266	709	1134	259	397	468	192	950	190	743	578
NZL	427	235	358	220	340	300	290	311	348	250	517	369	172	0	228	268	58	370	130	51	271	101	176	145
JPN	283	238	460	233	370	349	322	322	366	417	377	513	290	147	0	631	119	272	400	104	546	165	475	315
CZE	320	382	811	310	1081	658	588	708	707	1006	1207	1216	844	188	256	0	200	369	400	158	789	203	730	468
EST	52	72	161	61	211	169	76	95	129	177	200	211	149	31	37	116	0	85	85	47	154	46	152	142
IRL	422	421	488	392	529	455	442	530	700	436	633	576	293	307	184	276	43	0	149	75	390	128	251	200
KOR	180	169	568	172	315	280	304	284	309	456	292	812	352	97	216	284	37	109	0	84	403	128	361	240
SVN	63	84	135	74	286	149	100	113	119	198	177	146	154	36	47	111	23	56	54	0	121	30	114	91
PRT	431	593	1109	455	1015	813	899	863	853	1108	1037	1382	900	211	303	656	90	325	360	92	0	215	616	487
ZAF	161	132	211	111	182	193	192	186	196	195	185	262	162	92	124	154	20	118	89	20	207	0	170	105
HUN	268	285	808	265	674	530	482	489	549	832	561	986	614	133	222	623	81	212	277	88	597	151	0	354
LVA	124	162	369	153	666	318	231	256	294	420	376	695	401	77	105	297	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	532	987	501	931	857	686	777	971	624	960	1173	475	633	528	604	574	110	461	364	88	631		
BEL	464	0	754	580	1009	779	664	860	824	680	1151	856	443	670	304	464	588	126	445	302	107	681		
CAN	920	726	0	948	2264	1463	1467	1368	1839	1943	1566	3640	1016	1385	415	1266	1236	251	520	790	174	1244		
CHE	456	578	852	0	1085	693	616	715	798	738	910	992	400	598	268	426	521	113	402	305	99	578		
DEU	654	956	1463	939	0	2414	1619	2243	2007	2232	2832	3020	1144	2013	484	1252	1766	333	656	625	295	1339		
DFS	607	698	1182	640	1547	0	1127	1541	1544	1364	1902	1983	832	1376	499	883	1219	274	612	526	184	1058		
ESP	539	648	998	515	951	863	0	1270	1190	1317	1242	1703	789	1118	359	903	973	174	469	565	149	1042		
FRA	614	872	1064	681	1282	1010	1043	0	1490	1353	1768	2010	838	1554	454	1008	1227	187	571	541	150	1048		
GBR	837	826	1877	796	1402	1134	979	1119	0	1537	1840	2353	852	1336	523	966	1140	231	838	568	161	1103		
ITA	546	702	1781	683	1630	1201	1021	1046	1379	0	1507	2466	968	1531	290	917	1256	275	464	615	227	1122		
NLD	812	1260	1438	896	2155	1472	1088	1289	1583	1400	0	2394	866	1547	684	993	1506	286	749	539	193	1214		
USA	1007	753	3718	925	1765	1391	1191	1238	2168	2224	1975	0	1281	1863	583	1803	1757	301	661	963	191	1552		
HUN	342	361	917	326	811	638	605	600	691	870	672	1181	0	870	273	622	905	164	342	478	114	766		
POL	421	545	1085	436	1369	956	777	1060	1051	1279	1220	1589	700	0	344	839	1272	271	468	567	194	1086		
NZL	430	237	360	223	341	331	291	298	416	250	613	495	199	217	0	343	358	59	373	203	51	352		
JPN	325	265	500	252	399	381	365	357	415	428	414	572	263	316	171	0	801	132	360	559	104	701		
CZE	376	438	887	375	1199	742	690	831	826	1022	1295	1379	773	922	238	280	0	208	445	529	158	917		
EST	52	72	161	61	211	172	76	94	132	177	194	214	88	158	31	37	121	0	86	94	47	161		
IRL	423	423	488	396	531	495	442	518	903	436	686	616	278	347	308	208	332	43	0	231	75	467		
KOR	256	214	724	217	386	359	411	349	430	521	376	1077	372	409	139	274	372	40	161	0	84	536		
SVN	63	84	136	74	289	149	101	113	120	199	167	147	89	155	36	48	111	23	56	55	0	122		
PRT	498	693	1256	531	1144	967	1053	1019	1020	1136	1221	1594	736	1015	267	345	769	97	396	465	93	0		

HOL ous

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	532	987	501	932	857	692	881	971	624	957	1177	475	633	528	604	574	110	461	87	631
BEL	464	0	756	582	1011	781	668	903	826	680	1152	861	443	671	304	465	588	126	446	106	682
CAN	920	726	0	948	2265	1463	1478	1496	1839	1944	1543	3660	1016	1385	415	1266	1236	251	520	173	1244
CHE	456	578	852	0	1086	693	617	730	798	738	902	997	400	598	268	426	521	113	402	98	578
DEU	654	957	1463	939	0	2414	1623	2322	2008	2233	2810	3031	1145	2013	485	1253	1767	333	657	291	1340
DFS	607	698	1182	640	1546	0	1134	1666	1544	1365	1891	1986	832	1377	499	883	1219	274	613	182	1059
ESP	539	648	998	515	951	863	0	1336	1196	1317	1244	1715	789	1120	360	909	974	174	470	148	1042
FRA	643	902	1106	693	1316	1029	1070	0	1601	1362	1971	2332	862	1622	524	1121	1269	190	611	148	1090
GBR	837	824	1876	796	1400	1133	976	1144	0	1537	1823	2359	852	1336	523	966	1140	231	839	159	1105
ITA	546	702	1781	683	1630	1201	1021	1048	1378	0	1490	2471	968	1530	290	917	1257	275	464	225	1122
NLD	810	1259	1414	887	2130	1460	1086	1373	1567	1383	0	2382	864	1539	682	991	1500	283	747	188	1212
USA	1012	755	3752	931	1775	1397	1197	1365	2176	2230	1964	0	1284	1867	584	1807	1763	302	664	190	1555
HUN	342	361	917	326	811	638	605	603	691	870	670	1183	0	870	273	622	905	164	342	114	766
POL	421	545	1085	436	1369	956	777	1088	1051	1278	1212	1594	700	0	344	839	1272	271	468	192	1086
NZL	430	237	360	223	341	331	292	313	416	250	611	497	199	217	0	343	358	59	373	51	352
JPN	325	265	500	252	399	381	365	360	415	428	413	572	263	316	171	0	801	132	360	104	701
CZE	376	438	887	375	1199	742	690	851	825	1022	1287	1385	773	922	238	280	0	208	445	158	918
EST	52	72	161	61	211	172	76	95	132	177	193	214	88	158	31	37	121	0	86	47	161
IRL	423	423	488	396	531	495	442	531	902	436	684	617	278	347	308	208	332	43	0	75	467
SVN	63	84	136	74	285	148	101	113	120	198	165	147	89	155	36	48	111	23	56	0	121
PRT	498	693	1256	531	1144	967	1053	1032	1019	1136	1219	1603	736	1015	267	345	769	97	396	93	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	JPN	CZE	EST	IRL	SVN	PRT	
AUS	0	524	987	501	931	857	694	773	971	624	940	1175	475	632	595	574	110	460	88	635	
BEL	463	0	749	577	1003	774	666	854	817	680	1105	839	439	665	451	585	126	442	107	680	
CAN	920	725	0	948	2264	1463	1480	1363	1839	1944	1535	3652	1016	1385	1250	1236	251	520	174	1248	
CHE	456	575	852	0	1085	693	619	710	798	738	901	995	400	598	424	521	113	402	99	579	
DEU	654	956	1463	939	0	2414	1626	2237	2007	2232	2807	3030	1144	2011	1247	1766	333	656	295	1343	
DFS	607	696	1182	640	1547	0	1138	1537	1544	1365	1874	1972	832	1376	872	1219	274	612	184	1064	
ESP	541	655	1000	518	957	868	0	1268	1198	1318	1231	1713	790	1122	898	976	176	471	149	1050	
FRA	607	868	1054	672	1275	1008	1041	0	1485	1352	1742	2000	836	1552	996	1226	187	568	150	1050	
GBR	837	823	1876	796	1400	1133	982	1106	0	1537	1815	2352	852	1336	954	1140	231	835	161	1107	
ITA	546	702	1781	683	1630	1201	1024	1045	1378	0	1504	2470	968	1530	916	1257	275	464	227	1123	
NLD	786	1202	1391	875	2128	1451	1066	1255	1543	1397	0	2291	861	1536	955	1495	285	742	193	1205	
USA	1008	750	3752	931	1774	1397	1198	1222	2175	2230	1773	0	1284	1864	1754	1761	302	661	191	1558	
HUN	342	361	917	326	811	638	607	596	691	870	659	1183	0	870	621	905	164	342	114	767	
POL	421	544	1085	436	1369	956	780	1059	1051	1278	1212	1594	700	0	837	1272	271	468	194	1087	
JPN	322	264	498	250	397	379	364	351	411	426	408	568	262	314	0	798	131	356	104	702	
CZE	376	437	887	375	1199	742	693	827	825	1022	1278	1384	773	922	278	0	208	445	158	919	
EST	52	72	161	61	211	172	78	94	132	177	193	214	88	158	37	121	0	86	47	161	
IRL	422	423	488	396	531	495	444	514	899	436	676	617	278	347	208	332	43	0	75	468	
SVN	63	84	136	74	289	149	101	113	120	199	167	147	89	155	48	111	23	56	0	122	
PRT	499	694	1258	532	1147	970	1064	1023	1025	1136	1208	1605	738	1018	343	771	97	397	93	0	

HOL loc

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	705	489	840	727	608	810	762	669	951	781	489	410	204	84	576	97	345	408		
CAN	705	0	836	1935	1367	1365	1331	1744	1919	1347	3465	1086	498	541	143	1104	200	874	898		
CHE	487	746	0	882	603	527	630	697	706	717	853	417	333	206	77	480	91	316	362		
DEU	816	1340	760	0	1957	1399	1831	1648	2122	2300	2466	1420	525	429	224	1072	257	902	1246		
DFS	680	1179	553	1393	0	1046	1533	1533	1335	1642	1966	1010	610	343	141	901	221	665	858		
ESP	604	932	423	812	819	0	1207	1097	1293	1090	1583	850	426	388	122	903	137	642	743		
FRA	842	1050	579	1122	1007	989	0	1482	1330	1525	1998	1057	567	373	117	909	141	687	1016		
GBR	787	1804	667	1208	1131	879	1107	0	1513	1548	2343	967	825	371	129	950	180	679	850		
ITA	691	1769	651	1546	1183	1005	1034	1365	0	1463	2432	1200	450	480	180	1078	234	915	1106		
NLD	1032	1291	696	1863	1370	938	1172	1353	1370	0	1814	1281	633	353	150	994	218	682	940		
USA	730	3639	772	1543	1396	1063	1222	2173	2203	1508	0	1521	658	632	158	1345	225	1054	1159		
CZE	379	799	292	1008	648	589	698	700	975	1147	1205	0	359	349	135	765	154	723	825		
IRL	409	484	318	438	495	399	514	890	426	601	616	268	0	136	60	382	61	251	276		

KOR	160	522	157	292	263	282	262	283	418	264	726	250	102	0	68	362	63	326	339
SVN	65	114	56	211	110	81	86	96	155	127	125	91	41	44	0	100	39	98	146
PRT	582	1100	432	952	805	888	849	844	1083	981	1379	628	318	327	72	0	117	611	686
EST	56	138	47	161	144	58	72	106	149	151	150	88	30	28	15	65	0	124	178
HUN	283	801	256	656	529	479	485	542	820	537	979	612	210	250	74	588	62	0	578
POL	321	708	253	823	608	486	670	675	889	719	928	578	217	235	110	613	92	477	0

HOL bcs

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	534	807	652	747	646	990	767	446	293	412	211	593	431	604	104	102	296	226	500
CHE	533	0	964	619	769	732	857	967	423	315	385	229	815	401	587	100	101	292	217	472
DEU	780	831	0	1640	1654	2135	2361	2484	1358	823	527	471	1791	902	1406	296	294	817	308	1627
FRA	660	574	1100	0	1074	1258	1276	1400	882	622	418	388	1054	677	1042	151	157	596	241	1220
GBR	767	758	1224	871	0	1520	1696	2307	899	601	818	414	1442	735	1126	162	204	610	383	1076
ITA	662	677	1556	1004	1365	0	1476	2445	1181	785	455	528	1839	935	1292	225	261	850	264	1410
NLD	1074	843	1911	1057	1474	1377	0	2026	1243	605	700	386	1205	773	1140	195	251	608	507	1232
USA	701	901	1565	960	2162	2204	1653	0	1427	1051	658	715	2835	1087	1639	192	256	968	383	1538
CZE	344	297	986	622	658	970	1114	1151	0	532	331	390	956	613	793	159	179	641	216	1015
JPN	196	202	331	283	323	388	330	460	233	0	210	376	777	424	627	103	99	412	164	605
IRL	403	377	442	394	873	432	648	617	248	152	0	148	408	273	439	75	71	216	303	330
KOR	159	171	313	283	308	453	280	813	278	213	108	0	574	376	427	83	78	347	124	454
CAN	612	755	1344	909	1549	1735	1241	3209	754	413	425	553	0	880	1178	175	216	777	256	1126
PRT	428	355	805	647	655	942	744	1162	506	257	227	332	905	0	704	122	131	518	185	781
ESP	609	487	810	870	928	1004	999	1141	540	286	419	303	875	671	0	148	151	587	261	907
SVN	81	74	291	115	120	196	168	147	112	48	56	54	136	92	99	0	47	114	50	193
EST	60	55	189	85	122	171	176	178	107	35	37	37	154	81	69	23	0	139	47	238
HUN	242	230	604	441	497	773	481	909	548	197	180	269	753	509	438	89	75	0	146	675
NZL	192	191	260	204	324	237	468	337	161	125	253	96	258	158	224	35	27	114	0	188
POL	413	344	1161	896	886	1187	1005	1397	768	267	266	345	994	743	617	155	141	575	145	0

JER sta

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	271	139	20	19
CAN	172	0	123	153	37	84	511	152	19	27
DFS	73	112	0	119	47	102	185	131	28	37
GBR	105	157	115	0	42	79	188	115	20	35
ITA	35	35	46	40	0	33	47	47	10	17
NZL	161	84	81	81	30	0	172	109	23	22
USA	266	515	155	195	50	174	0	267	43	42
ZAF	144	153	114	114	48	105	275	0	32	26
NLD	16	14	22	17	7	20	42	27	0	5
CHE	17	25	36	33	18	20	42	26	4	0

JER cwi

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	271	132	20	26
CAN	172	0	123	153	37	84	511	141	19	32
DFS	73	112	0	119	47	102	185	122	28	47
GBR	105	157	115	0	42	79	188	110	20	42
ITA	35	35	46	40	0	33	47	47	10	24
NZL	161	84	81	81	30	0	172	100	23	28
USA	266	515	155	195	50	174	0	245	43	49
ZAF	138	144	108	110	48	97	255	0	32	38
NLD	16	14	22	17	7	20	42	27	0	9
CHE	24	31	46	41	25	26	50	38	7	0

JER bde

JER ang

JER ran

JER rwi

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	271	139	20	30
CAN	172	0	123	153	37	84	511	152	19	36
DFS	73	112	0	119	47	102	185	131	28	50
GBR	105	157	115	0	42	79	188	115	20	45
ITA	35	35	46	40	0	33	47	47	10	27
NZL	161	84	81	81	30	0	172	109	23	32
USA	266	515	155	195	50	174	0	267	43	53
ZAF	144	153	114	114	48	105	275	0	32	42
NLD	16	14	22	17	7	20	42	27	0	11
CHE	27	33	49	44	27	30	54	41	8	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		35	110	20	270	30		
CAN	172	0	112	37	127	19	511	36		
DFS	64	98	0	44	94	26	173	49		
ITA	35	35	41	0	44	10	47	27		
ZAF	113	124	80	44	0	29	209	42		
NLD	16	14	20	7	22	0	43	11		
USA	265	515	140	50	208	42	0	53		
CHE	27	33	48	27	41	8	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	270	139	20	30	
CAN	172	0	123	153	37	511	152	19	36	
DFS	72	112	0	117	47	184	131	28	50	
GBR	104	157	113	0	42	187	115	20	45	
ITA	35	35	46	40	0	47	47	10	27	
USA	265	515	154	194	50	0	266	43	53	
ZAF	144	153	114	114	48	274	0	32	42	
NLD	16	14	22	17	7	42	27	0	11	
CHE	27	33	49	44	27	54	41	8	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	271	139	19	30
CAN	172	0	123	153	37	84	511	152	18	36
DFS	73	112	0	119	47	102	185	131	27	50
GBR	105	157	115	0	42	79	188	115	19	45
ITA	35	35	46	40	0	33	47	47	10	27
NZL	161	84	81	81	30	0	172	109	22	32
USA	266	515	155	195	50	174	0	267	42	53
ZAF	144	153	114	114	48	105	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

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	271	139	19	30

CAN	172	0	106	153	37	84	511	152	18	36
DFS	63	96	0	106	44	88	166	119	25	49
GBR	105	157	104	0	42	79	188	115	19	45
ITA	35	35	41	40	0	33	47	47	10	27
NZL	161	84	68	81	30	0	172	109	22	32
USA	266	515	135	195	50	174	0	267	42	53
ZAF	144	153	102	114	48	105	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 usu

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	271	139	19	30
CAN	172	0	123	153	37	84	511	152	18	36
DFS	73	112	0	119	47	102	185	131	27	50
GBR	105	157	115	0	42	79	188	115	19	45
ITA	35	35	46	40	0	33	47	47	10	27
NZL	161	84	81	81	30	0	172	109	22	32
USA	266	515	155	195	50	174	0	267	42	53
ZAF	144	153	114	114	48	105	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 ude

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	270	139	20	30	
CAN	172	0	123	153	37	508	152	20	36	
DFS	72	112	0	117	47	184	131	51	50	
GBR	104	157	113	0	42	187	115	24	45	
ITA	35	35	46	40	0	47	47	10	27	
USA	265	513	154	194	50	0	266	49	53	
ZAF	144	153	114	114	48	274	0	37	42	
NLD	16	15	44	21	7	48	31	0	12	
CHE	27	33	49	44	27	54	41	9	0	

JER ftp

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	271	139	20	30
CAN	172	0	123	153	37	84	511	152	20	36
DFS	73	112	0	119	46	102	185	131	51	50
GBR	105	157	115	0	42	79	188	115	24	45
ITA	35	35	45	40	0	33	46	47	10	27
NZL	161	84	81	81	30	0	172	109	24	32
USA	266	515	155	195	49	174	0	267	49	53
ZAF	144	153	114	114	48	105	275	0	37	42
NLD	16	15	44	21	7	21	48	31	0	12
CHE	27	33	49	44	27	30	54	41	9	0

JER ftl

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	270	132	19	30	26
CAN	172	0	123	153	37	511	141	18	36	21
DFS	72	112	0	117	47	184	122	27	50	25

GBR	104	157	113	0	42	187	110	19	45	16
ITA	35	35	46	40	0	47	47	10	27	3
USA	265	515	154	194	50	0	245	42	53	33
ZAF	138	144	108	110	48	255	0	31	42	19
NLD	15	13	21	16	7	41	26	0	10	8
CHE	27	33	49	44	27	54	41	7	0	8
NZL	26	19	24	15	1	28	18	6	7	0

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	271	30	
CAN	172	0	101	84	138	20	511	36	
DFS	58	93	0	81	106	49	156	49	
NZL	161	84	63	0	96	24	171	32	
ZAF	133	138	90	89	0	37	240	42	
NLD	16	15	42	21	31	0	49	12	
USA	266	515	127	173	242	48	0	53	
CHE	27	33	48	30	41	9	54	0	

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	271	20	26
CAN	172	0	123	37	37	84	511	19	32
DFS	73	112	0	32	47	102	185	28	47
GBR	40	42	30	0	12	35	40	4	3
ITA	35	35	46	13	0	33	47	10	24
NZL	161	84	81	39	30	0	172	23	28
USA	266	515	155	43	50	174	0	43	49
NLD	16	14	22	5	7	20	42	0	9
CHE	24	31	46	4	25	26	50	7	0

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	271	19	26	35
CAN	172	0	117	153	84	508	18	32	37
DFS	70	110	0	109	93	176	27	47	46
GBR	105	157	110	0	76	187	19	42	42
NZL	161	84	74	78	0	171	22	28	33
USA	266	513	148	194	173	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

JER ofl

common bulls below diagonal								
common three quarter sib group above diagonal								
	CAN	DFS	GBR	ITA	USA	NLD	CHE	AUS
CAN	0	123	153	37	511	19	32	166
DFS	112	0	117	47	184	28	47	94
GBR	157	113	0	42	187	20	42	106
ITA	35	46	40	0	47	10	24	35
USA	515	154	194	50	0	43	49	269
NLD	14	22	17	7	42	0	9	20
CHE	31	46	41	25	50	7	0	26
AUS	172	72	104	35	264	16	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	20	26	16	12	5	19
CAN	27	0	11	162	80	5	38	162	4	0	10
DEU	14	11	0	64	4	14	14	4	14	0	33
DFS	45	163	55	0	62	91	67	87	37	0	132
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	15	5	13	71	0	0	9	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	14	18
CAN	27	0	11	162	80	38	162	4	0	3	10
DEU	14	11	0	64	4	14	4	14	0	9	31
DFS	45	163	55	0	62	65	87	35	0	61	113
GBR	10	79	4	57	0	30	66	1	0	0	3
NZL	25	36	13	63	27	0	28	5	2	7	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	12	2	8	48	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	13	26	16	12	5	19
CAN	27	0	11	162	80	2	38	160	4	0	10
DEU	14	11	0	64	4	9	14	4	14	0	33
DFS	45	163	55	0	62	67	65	87	35	0	132
GBR	10	79	4	57	0	0	30	65	1	0	3
NOR	11	2	8	51	0	0	6	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	14	19	
CAN	27	0	0	62	80	162	4	0	4	10	
DEU	4	0	0	22	0	0	2	0	6	5	
DFS	20	64	22	0	23	21	16	0	54	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	12	3	6	55	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	22	26	16	12	5	19
CAN	27	0	11	162	80	5	38	162	4	0	10
DEU	14	11	0	64	4	14	14	4	14	0	33
DFS	45	163	55	0	62	101	64	87	36	0	132
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	17	5	13	79	0	0	10	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	13	19
CAN	27	0	11	162	80	38	162	4	0	2	10
DEU	14	11	0	64	4	14	4	14	0	8	33
DFS	45	163	55	0	62	65	87	36	0	55	132
GBR	10	79	4	57	0	30	66	1	0	0	3
NZL	25	36	13	63	27	0	28	5	2	6	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	11	2	7	42	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	22	26	16	12	5	19
CAN	27	0	11	162	80	5	38	162	4	0	10
DEU	14	11	0	64	4	14	14	4	14	0	33
DFS	45	163	55	0	62	104	67	87	37	0	132
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	17	5	13	81	0	0	10	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	22	12	16	5	18	
CAN	27	0	11	161	5	4	162	0	10	

DEU	14	11	0	64	14	14	4	0	31
DFS	45	162	55	0	101	34	87	0	113
NOR	17	5	13	79	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	22	16	12	5	19
CAN	27	0	9	162	80	5	162	4	0	10
DEU	11	9	0	55	4	13	4	14	0	20
DFS	45	163	49	0	62	101	87	35	0	132
GBR	10	79	4	57	0	0	66	1	0	3
NOR	17	5	12	79	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	22	26	16	12	5	19
CAN	27	0	11	162	80	5	38	162	4	0	10
DEU	14	11	0	64	4	14	14	4	14	0	33
DFS	45	163	55	0	62	104	67	87	35	0	132
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	17	5	13	81	0	0	10	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	22	26	16	12	5	19
CAN	27	0	11	162	80	5	38	162	4	0	10
DEU	14	11	0	64	4	14	14	4	14	0	33
DFS	45	163	55	0	62	101	65	87	35	0	126
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	17	5	13	79	0	0	10	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	22	26	16	12	5	19
CAN	27	0	11	162	80	5	38	162	4	0	10

DEU	14	11	0	64	4	15	14	4	14	0	33
DFS	45	163	55	0	62	96	67	87	37	0	132
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	17	5	14	76	0	0	10	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	22	16	15	5	19	
CAN	27	0	11	162	80	5	159	4	0	10	
DEU	14	11	0	64	4	14	4	16	0	33	
DFS	45	163	55	0	62	104	87	46	0	132	
GBR	10	79	4	57	0	0	66	1	0	3	
NOR	17	5	13	81	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	22	26	16	15	5	18
CAN	27	0	11	162	80	5	38	162	4	0	10
DEU	14	11	0	64	4	15	14	4	16	0	31
DFS	45	163	55	0	62	103	65	87	45	0	113
GBR	10	79	4	57	0	0	30	66	1	0	3
NOR	17	5	14	81	0	0	10	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	22	16	12	5	19	6
CAN	27	0	11	162	80	5	160	4	0	10	6
DEU	14	11	0	64	4	14	4	14	0	33	7
DFS	45	163	55	0	62	98	87	37	0	132	16
GBR	10	79	4	57	0	0	65	1	0	3	6
NOR	17	5	13	76	0	0	0	27	0	14	4
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	22	26	15	16	5	19
CAN	27	0	11	156	5	38	4	162	0	10
DEU	14	11	0	61	15	14	16	4	0	33
DFS	42	156	55	0	95	60	43	82	0	115
NOR	17	5	14	76	0	10	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	24	26	16	12	5
CAN	27	0	11	162	77	7	38	162	4	0
DEU	14	11	0	64	4	18	14	4	14	0
DFS	45	163	55	0	62	130	67	87	37	0
GBR	9	76	4	57	0	0	27	64	1	0
NOR	19	6	17	109	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	22	26	16	12	5
CAN	27	0	11	162	77	5	38	159	4	0
DEU	14	11	0	64	4	14	14	4	14	0
DFS	45	163	55	0	62	104	67	87	37	0
GBR	9	76	4	57	0	0	27	64	1	0
NOR	17	5	13	81	0	0	10	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	22	16	12	5	
CAN	27	0	11	162	77	5	162	4	0	
DEU	14	11	0	64	4	14	4	14	0	
DFS	45	163	55	0	62	104	87	37	0	
GBR	9	76	4	57	0	0	64	1	0	
NOR	17	5	13	81	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
