

Introduction

The latest international evaluation for dairy production traits took place as scheduled at the Interbull Centre. Data from thirty-two (32) countries were included in this evaluation.

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

Changes in national procedures

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

IRL (ALL)	Decrease in information due to pedigree verification
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.
NOR (RDC)	Changes in the data extraction pipeline caused many bulls to loose from 1 to 10 daughters, depending on size of the progeny group.The National Herd Recording System is introducing new farmer reporting tools and central storage system. Data extraction pipeline is being modified to cope with this change
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.
ISR (HOL)	Decrease in information due to data editings and pedigree verification
POL (HOL)	Decrease in information due to data editings and pedigree verification
DEA (SIM, 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 (ALL)	Decrease in information due to pedigree validation and daughterâ\200\223herdâ\200\223year minimum 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 verificatiion and herd records being updated
ITA (HOL)	Cut off of data causing drops in information and bulls missing in this submission.
CZE (HOL)	Dropping in reliability due to current software update (AACF90gs1/ACCF90rr to new ACCF90gs3).

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 dairy production traits (August Routine Evaluation 2026).
Number of records for milk yield by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS	239	156	9244	1973	899	
BEL			2525			
CAN	306	117	14766	975	919	
CHE	3380		3632	110		3884
CZE			4894			
DEA	6718					29497
DEU			25648	354	329	
DFS			15125	2472	8238	
ESP			4999			
EST			1703		521	
FRA	557		19272			537
FRM						5528
GBR	215	391	8884	1076	797	123
HUN			3425			
IRL			3651	163	63	106
ISR			1962			
ITA	2612		9208	171		
JPN			7448			
KOR			1955			
LTU			1056		395	
LVA			1561		686	
NLD	286		17930	325	119	599
NOR					4493	
NZL	100	68	9834	5969	1630	
POL			14773			
PRT			3790			
SVK			1269			
SVN	385		741			681
URY			1266			
USA	1290	860	44738	5863	869	129
ZAF			1318	766	145	
CAM					51	
=====						
No.Records	16088	1592	236617	20217	20154	41084
Pub. Proofs	12562	1251	163761	15816	17590	37432

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

BSW mil

	CAN	USA	AUS	GBR	NZL
CAN	24.05				
USA	0.89	21.10			
AUS	0.65	0.61	13.86		
GBR	0.84	0.78	0.63	7.62	
NZL	0.62	0.59	0.79	0.63	13.28

HOL mil

	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	GBR	NZL	AUS	BEL	IRL	ESP	CZE	SVN	EST	ISR	HUN	POL	ZAF	JPN	LVA	SVK	LTU	PRT	KOR	URY
CAN	805.00																											
DEU	0.94	647.53																										
DFS	0.92	0.93	11.21																									
FRA	0.92	0.92	0.90	617.72																								
ITA	0.88	0.87	0.86	0.87	598.00																							
NLD	0.91	0.94	0.90	0.89	0.86	669.56																						
USA	0.92	0.91	0.88	0.91	0.87	0.89	714.50																					
CHE	0.90	0.92	0.88	0.94	0.86	0.90	0.88	582.24																				
GBR	0.85	0.84	0.82	0.85	0.81	0.84	0.83	0.88	277.10																			
NZL	0.71	0.69	0.69	0.77	0.67	0.72	0.71	0.76	0.71	391.31																		
AUS	0.77	0.74	0.70	0.79	0.69	0.74	0.74	0.77	0.73	0.82	430.67																	
BEL	0.87	0.87	0.81	0.83	0.77	0.84	0.81	0.82	0.76	0.66	0.78	512.63																
IRL	0.83	0.84	0.82	0.90	0.79	0.84	0.81	0.87	0.80	0.82	0.81	0.78	185.38															
ESP	0.93	0.92	0.89	0.92	0.89	0.89	0.90	0.90	0.81	0.67	0.76	0.85	0.82	520.25														
CZE	0.91	0.93	0.88	0.88	0.90	0.89	0.91	0.87	0.81	0.68	0.68	0.78	0.78	0.89	719.89													
SVN	0.82	0.81	0.81	0.83	0.74	0.78	0.79	0.77	0.69	0.63	0.67	0.72	0.69	0.81	0.76	11.96												
EST	0.87	0.87	0.88	0.84	0.83	0.85	0.87	0.84	0.78	0.67	0.72	0.78	0.76	0.84	0.90	0.71	590.46											
ISR	0.80	0.80	0.81	0.81	0.83	0.79	0.85	0.81	0.79	0.64	0.63	0.78	0.68	0.80	0.81	0.78	0.79	405.24										
HUN	0.86	0.87	0.84	0.87	0.86	0.83	0.89	0.82	0.78	0.67	0.69	0.77	0.74	0.86	0.91	0.75	0.84	0.82	650.76									
POL	0.90	0.91	0.87	0.90	0.85	0.87	0.89	0.86	0.80	0.68	0.78	0.83	0.80	0.89	0.89	0.78	0.86	0.79	0.89	496.88								
ZAF	0.83	0.77	0.76	0.82	0.81	0.74	0.82	0.79	0.74	0.67	0.77	0.74	0.75	0.81	0.76	0.67	0.71	0.78	0.80	0.83	540.30							
JPN	0.93	0.91	0.91	0.91	0.89	0.90	0.91	0.89	0.82	0.68	0.76	0.84	0.82	0.91	0.89	0.87	0.84	0.82	0.86	0.90	0.83	624.57						
LVA	0.75	0.75	0.73	0.75	0.69	0.70	0.76	0.74	0.68	0.65	0.66	0.68	0.71	0.73	0.68	0.69	0.76	0.78	0.78	0.77	0.71	0.73	538.57					
SVK	0.77	0.78	0.78	0.79	0.74	0.70	0.78	0.75	0.70	0.62	0.64	0.76	0.69	0.78	0.80	0.77	0.74	0.77	0.85	0.81	0.70	0.80	0.70	387.78				
LTU	0.73	0.74	0.71	0.75	0.65	0.68	0.70	0.72	0.64	0.59	0.64	0.73	0.62	0.73	0.71	0.80	0.65	0.78	0.71	0.70	0.63	0.73	0.65	0.72	403.58			
PRT	0.75	0.75	0.76	0.76	0.72	0.74	0.76	0.75	0.68	0.61	0.59	0.64	0.71	0.76	0.73	0.71	0.67	0.78	0.73	0.73	0.60	0.74	0.67	0.67	0.62	600.23		
KOR	0.84	0.80	0.78	0.79	0.78	0.77	0.86	0.78	0.70	0.67	0.75	0.82	0.71	0.83	0.77	0.78	0.76	0.79	0.79	0.79	0.76	0.86	0.74	0.76	0.68	0.66	485.82	
URY	0.71	0.68	0.66	0.74	0.67	0.67	0.70	0.71	0.62	0.76	0.73	0.69	0.70	0.69	0.65	0.68	0.67	0.77	0.69	0.73	0.74	0.67	0.71	0.61	0.63	0.60	0.68	169.65

HOL fat

	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	GBR	NZL	AUS	BEL	IRL	ESP	CZE	SVN	EST	ISR	HUN	POL	ZAF	JPN	LVA	SVK	LTU	PRT	KOR	URY
CAN	32.39																											
DEU	0.93	24.35																										
DFS	0.90	0.91	10.92																									
FRA	0.91	0.92	0.90	25.12																								
ITA	0.87	0.87	0.84	0.89	25.89																							
NLD	0.89	0.93	0.88	0.88	0.84	25.62																						
USA	0.92	0.92	0.87	0.91	0.88	0.86	27.56																					
CHE	0.88	0.90	0.86	0.91	0.83	0.88	0.85	23.08																				
GBR	0.85	0.87	0.83	0.87	0.82	0.85	0.84	0.87	9.57																			
NZL	0.67	0.68	0.68	0.74	0.66	0.68	0.72	0.74	0.71	15.39																		
AUS	0.73	0.72	0.66	0.75	0.71	0.69	0.74	0.70	0.70	0.79	15.10																	
BEL	0.86	0.86	0.80	0.84	0.80	0.83	0.82	0.80	0.79	0.68	0.74	20.64																
IRL	0.81	0.80	0.82	0.84	0.73	0.82	0.78	0.83	0.77	0.79	0.78	0.81	6.76															
ESP	0.90	0.90	0.86	0.90	0.89	0.86	0.91	0.85	0.81	0.63	0.72	0.82	0.77	20.62														
CZE	0.86	0.90	0.86	0.87	0.86	0.84	0.89	0.82	0.80	0.61	0.62	0.76	0.69	0.86	22.06													
SVN	0.79	0.77	0.81	0.79	0.76	0.75	0.74	0.74	0.69	0.63	0.62	0.77	0.67	0.78	0.69	12.41												
EST	0.86	0.89	0.87	0.86	0.85	0.86	0.88	0.84	0.78	0.66	0.75	0.84	0.79	0.84	0.87	0.77	24.75											
ISR	0.77	0.79	0.69	0.75	0.79	0.74	0.80	0.73	0.68	0.62	0.59	0.62	0.58	0.74	0.76	0.61	0.73	15.29										
HUN	0.85	0.86	0.80	0.86	0.87	0.78	0.90	0.76	0.77	0.63	0.68	0.79	0.67	0.87	0.89	0.73	0.82	0.76	26.03									
POL	0.86	0.88	0.81	0.86	0.84	0.81	0.87	0.78	0.78	0.64	0.70	0.82	0.73	0.88	0.84	0.79	0.87	0.76	0.89	22.22								
ZAF	0.70	0.67	0.60	0.72	0.72	0.66	0.74	0.69	0.66	0.56	0.64	0.63	0.63	0.73	0.68	0.62	0.72	0.69	0.73	0.73	19.25							
JPN	0.92	0.91	0.91	0.90	0.88	0.89	0.89	0.87	0.83	0.68	0.68	0.83	0.80	0.87	0.84	0.85	0.86	0.72	0.81	0.84	0.65	24.12						
LVA	0.76	0.78	0.73	0.77	0.75	0.71	0.80	0.73	0.69	0.67	0.67	0.75	0.60	0.78	0.71	0.66	0.80	0.76	0.79	0.78	0.70	0.75	21.52					
SVK	0.72	0.71	0.69	0.72	0.77	0.63	0.75	0.65	0.66	0.56	0.60	0.70	0.57	0.74	0.75	0.74	0.76	0.65	0.82	0.80	0.62	0.70	0.68	15.45				
LTU	0.73	0.72	0.70	0.74	0.67	0.63	0.70	0.71	0.63	0.57	0.56	0.73	0.58	0.68	0.68	0.76	0.68	0.62	0.72	0.69	0.63	0.71	0.70	0.72	16.75			

	0.73	0.75	0.70	0.75	0.73	0.70	0.76	0.72	0.71	0.60	0.58	0.62	0.61	0.74	0.70	0.66	0.67	0.60	0.72	0.70	0.59	0.73	0.67	0.60	0.62	23.53																
KOR	0.83	0.80	0.76	0.80	0.79	0.76	0.86	0.77	0.76	0.69	0.75	0.82	0.68	0.81	0.73	0.78	0.77	0.73	0.81	0.80	0.67	0.84	0.78	0.72	0.72	0.66	19.96															
URY	0.72	0.70	0.68	0.76	0.69	0.65	0.73	0.67	0.65	0.73	0.68	0.68	0.69	0.69	0.64	0.68	0.74	0.62	0.71	0.72	0.68	0.68	0.77	0.61	0.61	0.60	0.67	6.47														

HOL	pro																																									
	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	GBR	NZL	AUS	BEL	IRL	ESP	CZE	SVN	EST	ISR	HUN	POL	ZAF	JPN	LVA	SVK	LTU	PRT	KOR	URY														
CAN	22.71																																									
DEU	0.91	17.94																																								
DFS	0.89	0.92	10.60																																							
FRA	0.87	0.88	0.88	16.92																																						
ITA	0.84	0.84	0.83	0.82	18.56																																					
NLD	0.87	0.92	0.86	0.83	0.81	19.20																																				
USA	0.89	0.89	0.86	0.87	0.83	0.84	18.38																																			
CHE	0.85	0.88	0.83	0.90	0.81	0.85	0.84	16.65																																		
GBR	0.84	0.84	0.81	0.83	0.79	0.83	0.81	0.85	7.47																																	
NZL	0.60	0.60	0.60	0.67	0.56	0.61	0.62	0.65	0.63	11.55																																
AUS	0.66	0.63	0.62	0.68	0.58	0.63	0.64	0.65	0.65	0.78	11.06																															
BEL	0.82	0.81	0.74	0.73	0.72	0.78	0.74	0.74	0.74	0.57	0.68	15.06																														
IRL	0.75	0.76	0.76	0.81	0.70	0.77	0.74	0.79	0.75	0.76	0.75	0.71	5.47																													
ESP	0.90	0.89	0.87	0.87	0.86	0.84	0.87	0.84	0.80	0.56	0.66	0.78	0.76	15.11																												
CZE	0.86	0.89	0.85	0.82	0.85	0.82	0.86	0.80	0.77	0.54	0.54	0.72	0.67	0.83	17.46																											
SVN	0.77	0.78	0.78	0.79	0.70	0.71	0.72	0.72	0.65	0.54	0.58	0.68	0.61	0.80	0.69	11.49																										
EST	0.81	0.83	0.83	0.77	0.77	0.80	0.82	0.80	0.73	0.55	0.61	0.72	0.65	0.77	0.87	0.66	18.05																									
ISR	0.76	0.76	0.75	0.76	0.79	0.75	0.81	0.78	0.71	0.50	0.49	0.58	0.56	0.74	0.78	0.66	0.70	10.76																								
HUN	0.83	0.85	0.81	0.84	0.82	0.78	0.87	0.77	0.75	0.56	0.54	0.70	0.64	0.81	0.87	0.70	0.80	0.77	18.81																							
POL	0.85	0.85	0.82	0.83	0.79	0.80	0.83	0.78	0.75	0.55	0.63	0.76	0.72	0.84	0.83	0.75	0.80	0.73	0.84	13.60																						
ZAF	0.77	0.69	0.67	0.75	0.69	0.67	0.74	0.71	0.71	0.61	0.70	0.65	0.67	0.72	0.65	0.61	0.64	0.76	0.73	0.76	14.79																					
JPN	0.90	0.88	0.89	0.87	0.87	0.85	0.88	0.84	0.80	0.59	0.65	0.77	0.75	0.89	0.84	0.85	0.78	0.76	0.82	0.84	0.73	17.02																				
LVA	0.73	0.73	0.69	0.72	0.66	0.66	0.74	0.69	0.66	0.61	0.56	0.67	0.61	0.72	0.65	0.65	0.72	0.70	0.74	0.74	0.68	0.70	15.51																			
SVK	0.72	0.70	0.72	0.72	0.70	0.62	0.69	0.66	0.64	0.49	0.54	0.69	0.57	0.72	0.75	0.71	0.65	0.68	0.81	0.74	0.63	0.73	0.68	10.60																		
LTU	0.70	0.69	0.67	0.73	0.62	0.61	0.66	0.67	0.59	0.48	0.53	0.69	0.51	0.69	0.63	0.76	0.60	0.60	0.67	0.66	0.64	0.69	0.66	0.67	11.76																	
PRT	0.70	0.70	0.72	0.73	0.67	0.67	0.71	0.68	0.65	0.51	0.50	0.57	0.64	0.71	0.67	0.69	0.61	0.64	0.70	0.66	0.57	0.70	0.65	0.60	0.58	18.28																
KOR	0.81	0.75	0.75	0.73	0.75	0.72	0.81	0.72	0.67	0.56	0.62	0.79	0.62	0.80	0.70	0.76	0.67	0.74	0.76	0.76	0.66	0.81	0.69	0.71	0.68	0.61	13.48															
URY	0.63	0.62	0.61	0.71	0.59	0.58	0.62	0.62	0.57	0.71	0.66	0.59	0.63	0.63	0.59	0.64	0.59	0.60	0.61	0.62	0.68	0.58	0.71	0.59	0.59	0.57	0.59	5.22														

JER	mil																																									
	CAN	DFS	USA	NZL	AUS	GBR	NLD	ZAF	ITA	DEU	IRL	CHE																														
CAN	600.57																																									
DFS	0.91	9.18																																								
USA	0.91	0.88	620.93																																							
NZL	0.74	0.76	0.75	305.27																																						
AUS	0.80	0.72	0.75	0.81	391.68																																					
GBR	0.83	0.80	0.76	0.68	0.70	221.92																																				
NLD	0.90	0.90	0.88	0.71	0.74	0.80	593.41																																			
ZAF	0.87	0.82	0.84	0.77	0.81	0.74	0.76	373.77																																		
ITA	0.88	0.86	0.87	0.76	0.79	0.79	0.84	0.89	504.03																																	
DEU	0.91	0.93	0.89	0.68	0.70	0.82	0.93	0.78	0.85	589.19																																
IRL	0.81	0.80	0.79	0.90	0.82	0.72	0.81	0.76	0.79	0.80	173.72																															
CHE	0.88	0.88	0.83	0.75	0.75	0.85	0.88	0.79	0.83	0.91	0.83	389.60																														

JER	fat																																									
	CAN	DFS	USA	NZL	AUS	GBR	NLD	ZAF	ITA	DEU	IRL	CHE																														
CAN	28.03																																									
DFS	0.86	11.10																																								
USA	0.89	0.86	22.88																																							
NZL	0.68	0.68	0.72	14.31																																						
AUS	0.77	0.67	0.76	0.80	13.99																																					
GBR	0.80	0.77	0.78	0.67	0.71	9.25																																				
NLD	0.85	0.84	0.82	0.67	0.67	0.77	26.45																																			
ZAF	0.74	0.73	0.74	0.65	0.69	0.63	0.66	14.75																																		
ITA	0.86	0.82	0.85	0.69	0.72	0.74	0.79	0.75	23.89																																	
DEU	0.91	0.90	0.88	0.68	0.71	0.83	0.89	0.73	0.85	23.31																																
IRL	0.77	0.76	0.74	0.82	0.80	0.73	0.78	0.61	0.69	0.76	6.08																															

CHE	0.85	0.82	0.81	0.75	0.69	0.81	0.80	0.68	0.80	0.89	0.77	19.82
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JER pro

	CAN	DFS	USA	NZL	AUS	GBR	NLD	ZAF	ITA	DEU	IRL	CHE
CAN	19.69											
DFS	0.87	10.53										
USA	0.88	0.87	17.25									
NZL	0.64	0.67	0.67	10.22								
AUS	0.69	0.63	0.66	0.76	10.74							
GBR	0.82	0.80	0.75	0.66	0.67	7.13						
NLD	0.86	0.86	0.82	0.64	0.65	0.78	19.76					
ZAF	0.79	0.76	0.77	0.68	0.69	0.69	0.69	11.59				
ITA	0.84	0.82	0.84	0.63	0.67	0.77	0.80	0.84	18.03			
DEU	0.88	0.91	0.86	0.60	0.61	0.82	0.90	0.70	0.82	18.46		
IRL	0.74	0.75	0.72	0.84	0.78	0.72	0.75	0.68	0.70	0.74	5.47	
CHE	0.79	0.82	0.74	0.67	0.59	0.80	0.81	0.64	0.72	0.88	0.77	13.78

RDC mil

	CAN	NOR	USA	NZL	AUS	GBR	DFS	DEU	ZAF	EST	LVA	LTU	IRL	NLD	CAM
CAN	619.43														
NOR	0.84	12.86													
USA	0.91	0.89	748.62												
NZL	0.68	0.73	0.69	369.32											
AUS	0.74	0.70	0.71	0.82	421.01										
GBR	0.83	0.81	0.80	0.71	0.75	266.51									
DFS	0.89	0.92	0.86	0.71	0.71	0.80	10.11								
DEU	0.93	0.82	0.89	0.71	0.70	0.83	0.91	660.37							
ZAF	0.82	0.78	0.82	0.72	0.78	0.70	0.78	0.77	622.37						
EST	0.86	0.84	0.83	0.71	0.72	0.77	0.85	0.81	0.72	541.56					
LVA	0.74	0.74	0.75	0.65	0.68	0.72	0.73	0.74	0.72	0.81	332.82				
LTU	0.74	0.74	0.75	0.65	0.71	0.72	0.74	0.73	0.69	0.70	0.76	363.92			
IRL	0.83	0.76	0.80	0.84	0.82	0.78	0.80	0.83	0.75	0.76	0.71	0.69	178.38		
NLD	0.91	0.91	0.87	0.71	0.72	0.83	0.91	0.93	0.75	0.82	0.73	0.70	0.83	743.12	
CAM	0.80	0.80	0.93	0.71	0.73	0.78	0.78	0.79	0.79	0.79	0.78	0.78	0.78	0.78	414.15

RDC fat

	CAN	NOR	USA	NZL	AUS	GBR	DFS	DEU	ZAF	EST	LVA	LTU	IRL	NLD	CAM
CAN	23.75														
NOR	0.83	12.40													
USA	0.89	0.81	26.42												
NZL	0.66	0.73	0.70	15.99											
AUS	0.69	0.61	0.73	0.80	15.82										
GBR	0.82	0.73	0.81	0.69	0.72	9.04									
DFS	0.89	0.89	0.85	0.72	0.68	0.78	10.69								
DEU	0.92	0.83	0.91	0.71	0.71	0.86	0.91	27.35							
ZAF	0.75	0.78	0.80	0.63	0.63	0.64	0.71	0.68	20.52						
EST	0.86	0.75	0.86	0.69	0.72	0.78	0.83	0.86	0.73	21.63					
LVA	0.74	0.65	0.77	0.64	0.63	0.70	0.68	0.78	0.72	0.82	15.09				
LTU	0.69	0.64	0.74	0.60	0.65	0.63	0.69	0.72	0.69	0.72	0.73	18.52			
IRL	0.81	0.73	0.78	0.81	0.79	0.76	0.80	0.80	0.64	0.78	0.63	0.63	7.34		
NLD	0.89	0.85	0.86	0.67	0.69	0.84	0.89	0.92	0.67	0.80	0.71	0.67	0.80	30.48	
CAM	0.80	0.79	0.93	0.68	0.67	0.78	0.79	0.79	0.80	0.79	0.77	0.78	0.76	0.79	21.48

RDC pro[illegible]

DFS	0.87	0.88	0.84	0.65	0.61	0.75	10.59											
DEU	0.90	0.80	0.88	0.63	0.62	0.83	0.91	20.43										
ZAF	0.76	0.77	0.78	0.66	0.73	0.64	0.70	0.69	17.45									
EST	0.80	0.79	0.78	0.62	0.62	0.72	0.79	0.79	0.66	17.06								
LVA	0.72	0.67	0.74	0.58	0.56	0.68	0.64	0.72	0.69	0.73	10.00							
LTU	0.66	0.62	0.68	0.52	0.58	0.61	0.60	0.68	0.68	0.62	0.66	11.75						
IRL	0.75	0.74	0.74	0.79	0.77	0.74	0.74	0.76	0.67	0.66	0.62	0.56	5.39					
NLD	0.87	0.90	0.83	0.60	0.61	0.80	0.87	0.90	0.68	0.75	0.67	0.63	0.75	25.30				
CAM	0.78	0.78	0.90	0.71	0.68	0.77	0.77	0.78	0.78	0.77	0.76	0.76	0.73	0.76	10.09			

SIM	mil								
	CHE	DEA	FRM	SVN	FRA	NLD	IRL	GBR	USA
CHE	571.05								
DEA	0.87	498.88							
FRM	0.94	0.86	617.51						
SVN	0.76	0.80	0.79	10.12					
FRA	0.90	0.92	0.84	0.76	694.20				
NLD	0.88	0.92	0.88	0.77	0.89	761.90			
IRL	0.84	0.71	0.85	0.74	0.87	0.80	184.20		
GBR	0.86	0.85	0.85	0.69	0.85	0.84	0.77	246.81	
USA	0.87	0.84	0.85	0.78	0.90	0.88	0.81	0.82	646.88

SIM	fat								
	CHE	DEA	FRM	SVN	FRA	NLD	IRL	GBR	USA
CHE	22.75								
DEA	0.88	18.74							
FRM	0.93	0.89	24.07						
SVN	0.73	0.80	0.79	10.13					
FRA	0.89	0.93	0.84	0.76	28.42				
NLD	0.86	0.91	0.89	0.78	0.88	29.36			
IRL	0.79	0.67	0.79	0.71	0.82	0.77	7.65		
GBR	0.88	0.83	0.83	0.69	0.87	0.84	0.74	8.72	
USA	0.84	0.82	0.84	0.74	0.90	0.86	0.78	0.84	22.29

SIM	pro								
	CHE	DEA	FRM	SVN	FRA	NLD	IRL	GBR	USA
CHE	17.10								
DEA	0.86	15.29							
FRM	0.93	0.85	19.93						
SVN	0.74	0.74	0.80	10.01					
FRA	0.88	0.90	0.78	0.67	22.66				
NLD	0.83	0.90	0.86	0.74	0.84	24.36			
IRL	0.79	0.67	0.80	0.70	0.79	0.74	6.32		
GBR	0.83	0.81	0.81	0.66	0.83	0.82	0.72	7.55	
USA	0.83	0.78	0.79	0.73	0.87	0.83	0.74	0.80	18.68

^LAPPENDIX II. Number of common bulls

BSW mil

common bulls below diagonal											
common three quarter sib group above diagonal											
	CAN	FRA	USA	CHE	ITA	DEA	NLD	SVN	NZL	GBR	AUS
CAN	0	109	217	166	163	181	66	41	43	92	112
FRA	101	0	151	221	264	297	117	64	42	98	85
USA	214	114	0	349	281	379	110	49	57	130	144
CHE	144	179	327	0	582	726	138	99	50	109	134
ITA	147	223	208	523	0	905	174	118	59	123	142
DEA	160	244	348	617	797	0	200	133	72	126	152
NLD	61	102	102	127	151	190	0	59	44	72	77
SVN	36	62	39	94	110	120	59	0	18	40	30

NZL	42	33	49	37	49	65	37	16	0	39	47
GBR	86	93	121	86	95	89	64	33	35	0	82
AUS	114	71	135	94	107	114	60	22	37	72	0

BSW fat

common bulls below diagonal											
common three quarter sib group above diagonal											
	CAN	FRA	USA	CHE	ITA	DEA	NLD	SVN	NZL	GBR	AUS
CAN	0	109	217	166	163	181	66	41	43	92	112
FRA	101	0	151	221	264	297	117	64	42	98	85
USA	214	114	0	349	281	379	110	49	57	130	144
CHE	144	179	327	0	582	727	138	99	50	109	134
ITA	147	223	208	523	0	907	174	118	59	123	142
DEA	160	244	348	617	799	0	200	133	72	126	152
NLD	61	102	102	127	151	190	0	59	44	72	77
SVN	36	62	39	94	110	120	59	0	18	40	30
NZL	42	33	49	37	49	65	37	16	0	39	47
GBR	86	93	121	86	95	89	64	33	35	0	82
AUS	114	71	135	94	107	114	60	22	37	72	0

BSW pro

common bulls below diagonal											
common three quarter sib group above diagonal											
	CAN	FRA	USA	CHE	ITA	DEA	NLD	SVN	NZL	GBR	AUS
CAN	0	109	217	166	163	181	66	41	43	92	112
FRA	101	0	151	221	264	297	117	64	42	98	85
USA	214	114	0	349	281	379	110	49	57	130	144
CHE	144	179	327	0	582	727	138	99	50	109	134
ITA	147	223	208	523	0	906	174	118	59	123	142
DEA	160	244	348	617	798	0	200	133	72	126	152
NLD	61	102	102	127	151	190	0	59	44	72	77
SVN	36	62	39	94	110	120	59	0	18	40	30
NZL	42	33	49	37	49	65	37	16	0	39	47
GBR	86	93	121	86	95	89	64	33	35	0	82
AUS	114	71	135	94	107	114	60	22	37	72	0

GUE mil

common bulls below diagonal					
common three quarter sib group above diagonal					
	CAN	USA	AUS	GBR	NZL
CAN	0	85	59	42	16
USA	77	0	78	105	35
AUS	56	75	0	50	27
GBR	36	106	43	0	18
NZL	13	32	27	15	0

GUE fat

common bulls below diagonal					
common three quarter sib group above diagonal					
	CAN	USA	AUS	GBR	NZL
CAN	0	85	59	42	16
USA	77	0	78	105	35
AUS	56	75	0	50	27
GBR	36	106	43	0	18
NZL	13	32	27	15	0

GUE pro

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

CAN	0	85	59	42	16
USA	77	0	78	105	35
AUS	56	75	0	50	27
GBR	36	106	43	0	18
NZL	13	32	27	15	0

HOL mil

common bulls below diagonal																												
common three quarter sib group above diagonal																												
	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	GBR	NZL	AUS	BEL	IRL	ESP	CZE	SVN	EST	ISR	HUN	POL	ZAF	JPN	LVA	SVK	LTU	PRT	KOR	URY
CAN	0	2956	1999	1845	2105	2100	4526	1052	2171	972	1786	1017	693	1587	1344	230	451	210	1279	2145	517	1593	627	498	361	1520	922	565
DEU	2450	0	3362	2963	2821	4177	4219	1347	2550	1213	1963	1522	1008	1853	2135	402	687	226	1524	3881	562	1626	916	768	657	1815	799	539
DFS	1838	2708	0	2074	1803	2795	2766	883	1944	1056	1571	1121	862	1322	1474	289	524	207	1145	2583	517	1188	603	476	437	1425	655	473
FRA	1427	1930	1378	0	1670	2472	2882	864	1855	960	1510	1207	834	1512	1391	225	368	158	1117	2468	520	1364	524	494	321	1379	683	467
ITA	1922	2232	1608	1179	0	1960	2992	792	1697	683	1191	877	564	1388	1402	291	432	186	1209	2394	330	1176	612	401	401	1275	689	387
NLD	2087	4043	2568	1831	1822	0	3202	1089	2231	1341	1750	1586	1041	1427	1764	303	586	221	1208	2861	526	1290	638	616	452	1578	667	493
USA	5235	3370	2343	1790	2657	2956	0	1176	2887	1392	2363	1202	957	1875	2000	266	580	358	1647	3284	649	2262	865	636	488	1940	1118	789
CHE	979	1287	841	813	727	1091	1111	0	872	501	739	714	464	656	541	146	233	77	492	891	259	548	293	259	152	669	343	237
GBR	2449	2058	1564	1330	1454	2036	2727	837	0	1181	1730	1062	1229	1278	1201	211	419	203	1041	2039	521	1216	533	425	384	1311	646	520
NZL	959	957	783	644	552	1230	1346	423	1037	0	1427	627	871	652	676	128	217	152	574	968	379	676	307	287	219	762	396	440
AUS	1831	1550	1202	1104	989	1562	2453	660	1542	1434	0	886	834	1056	917	168	318	152	844	1473	488	1044	466	346	296	1103	585	509
BEL	1022	1578	1067	1257	891	1812	1098	728	1058	517	790	0	592	819	728	176	273	108	638	1194	342	649	346	337	218	921	394	282
IRL	651	884	715	711	497	981	878	470	1260	763	720	575	0	566	516	106	178	133	481	833	333	497	241	230	176	639	292	313
ESP	1132	1264	1064	1280	1050	1300	1336	550	1015	500	779	806	531	0	964	196	289	136	922	1609	455	1048	440	358	276	1176	618	403
CZE	1032	1703	1056	932	1128	1571	1656	382	820	471	608	565	363	653	0	226	387	170	1056	1831	345	943	499	487	361	1041	570	374
SVN	179	398	237	175	260	268	215	109	155	90	120	141	82	142	164	0	108	51	175	341	54	163	117	79	88	186	113	55
EST	331	544	385	216	297	453	465	145	273	119	182	181	91	147	254	64	0	83	302	586	115	279	220	151	135	310	168	137
ISR	149	172	154	96	133	174	358	44	151	120	98	68	103	83	134	34	45	0	146	250	68	153	100	63	76	153	87	87
HUN	1229	1276	971	856	1101	1050	1659	409	899	433	644	556	405	752	945	132	189	99	0	1394	379	829	449	360	309	993	562	395
POL	2007	3981	2370	2015	2225	2884	3392	811	1917	796	1210	1189	744	1344	1640	308	465	210	1332	0	473	1308	845	577	540	1713	787	511
ZAF	480	440	397	414	260	447	636	221	456	313	430	294	298	409	222	38	57	43	304	387	0	433	168	184	106	477	279	281
JPN	896	811	704	565	675	750	1141	373	666	373	612	437	317	539	477	92	121	75	475	771	284	0	437	338	260	928	687	430
LVA	409	750	387	289	395	442	770	156	308	172	240	210	135	239	328	68	121	66	332	729	94	195	0	179	230	541	302	215
SVK	348	578	264	282	252	442	440	133	248	170	174	208	112	184	386	37	65	26	253	440	101	125	86	0	117	404	231	197
LTU	228	615	280	149	236	301	364	68	229	114	147	115	93	121	245	41	69	41	204	443	41	98	153	53	0	297	180	140
PRT	1568	1761	1351	1352	1240	1630	2056	620	1219	627	943	956	574	1191	881	146	213	102	993	1860	428	574	440	273	194	0	637	453
KOR	891	573	492	436	567	496	1270	245	476	287	949	295	205	456	410	74	82	46	446	666	209	426	182	138	84	547	0	336
URY	563	414	349	323	304	401	979	189	447	364	410	220	259	326	278	34	81	50	334	451	242	269	127	124	79	409	271	0

HOL fat

common bulls below diagonal																												
common three quarter sib group above diagonal																												
	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	GBR	NZL	AUS	BEL	IRL	ESP	CZE	SVN	EST	ISR	HUN	POL	ZAF	JPN	LVA	SVK	LTU	PRT	KOR	URY
CAN	0	2956	1998	1845	2106	2100	4524	1052	2171	972	1786	1017	693	1586	1344	230	451	210	1279	2145	516	1589	627	498	361	1518	922	565
DEU	2450	0	3362	2963	2824	4177	4217	1347	2550	1213	1963	1522	1008	1853	2135	402	687	226	1524	3881	561	1622	916	768	657	1812	799	539
DFS	1838	2708	0	2074	1804	2795	2764	883	1944	1056	1571	1121	861	1321	1473	289	524	207	1144	2582	516	1186	603	476	437	1423	655	473
FRA	1427	1930	1378	0	1672	2472	2881	864	1855	960	1510	1207	835	1512	1391	225	368	158	1117	2468	519	1361	524	494	321	1376	683	467
ITA	1923	2234	1608	1179	0	1963	2993	793	1700	685	1193	879	564	1388	1403	291	432	187	1210	2396	330	1174	612	401	403	1275	691	387
NLD	2087	4043	2568	1831	1823	0	3200	1089	2231	1341	1750	1586	1043	1427	1764	303	586	221	1208	2861	525	1286	638	616	452	1576	667	493
USA	5233	3367	2341	1789	2658	2955	0	1176	2886	1391	2363	1201	956	1873	1999	266	579	358	1646	3282	648	2258	864	636	488	1935	1118	789
CHE	979	1287	841	813	728	1091	1111	0	872	501	739	714	464	656	541	146	233	77	492	891	258	545	293	259	152	669	343	237
GBR	2449	2058	1564	1330	1456	2036	2726	837	0	1181	1730	1062	1230	1278	1201	211	419	203	1041	2039	520	1212	533	425	384	1310	646	520
NZL	959	957	783	644	554	1230	1345	423	1037	0	1427	627	872	652	676	128	217	152	574	968	378	676	307	287	219	762	396	440
AUS	1831	1550	1202	1104	990	1562	2452	660	1542	1434	0	886	834	1056	917	168	318	152	844	1473	487	1041	466	346	296	1103	585	509
BEL	1022	1578	1067	1257	891	1812	1097	728	1058	517	790	0	592	819	728	176	273	108	638	1194	341	648	346	337	218	920	394	282
IRL	651	884	715	711	497	983	878	470	1261	764	720	575	0	565	516	106	178	133	481	834	333	495	241	230	176	639	292	313
ESP	1132	1264	1063	1280	1050	1300	1333	550	1015	500	779	806	531	0	963	196	289	136	921	1608	454	1046	440	358	276	1175	618	403
CZE	1032	1703	1056	932	1128	1571	1655	382	820	471	608	565	363	653	0	226	387	170	1056	1831	344	942	499	487	361	1038	570	374
SVN	179	398	237	175	260	268	215	109	155	90	120	141	82	142	164	0	108	51	175	341	53	163	117	79	88	186	113	55
EST	331	544	385	216	297	453	464	145	273	119	182	181	91	147	254	64	0	83	302	586	115	276	220	151	135	309	168	137
ISR	149	172	154	96	133	174	358	44	151	120	98	68	103	83	134	34	45	0	146	250	67	152	100	63	76	153	87	87
HUN	1229	1276	970	856	1101	1050	1657	409	899	433	644	556	405	751	945	132	189	99	0	1394	378	827	449	360	309	992	562	395
POL	2007	3981	2370	2015	2227	2884	3388	811	1917	796	1210	1189	744	1344	1640	308	465	210	1332	0	472	1303	845	577	540	1711	787	511
ZAF	479	439	396	413	260	446	635	220	455	313	429	294	298	408	221	37	57	43	303	386	0	431	167	183	105	476	278	280

JPN	891	807	702	561	673	746	1134	370	661	372	607	435	315	536	476	92	118	74	473	766	283	0	436	337	260	922	686	429
LVA	409	750	387	289	395	442	769	156	308	172	240	210	135	239	328	68	121	66	332	729	94	194	0	179	230	541	302	215
SVK	348	578	264	282	252	442	440	133	248	170	174	208	112	184	386	37	65	26	253	440	101	124	86	0	117	404	231	197
LTU	228	615	280	149	238	301	364	68	229	114	147	115	93	121	245	41	69	41	204	443	40	98	153	53	0	297	180	140
PRT	1566	1760	1349	1350	1240	1628	2053	620	1218	627	943	955	574	1190	879	146	213	102	993	1859	427	569	440	273	194	0	636	453
KOR	891	573	492	436	568	496	1268	245	476	287	429	295	205	456	410	74	82	46	446	666	209	424	182	138	84	547	0	336
URY	563	414	349	323	304	401	979	189	447	364	410	220	259	326	278	34	81	50	334	451	242	266	127	124	79	409	271	0

HOL pro

common bulls below diagonal																												
common three quarter sib group above diagonal																												
	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	GBR	NZL	AUS	BEL	IRL	ESP	CZE	SVN	EST	ISR	HUN	POL	ZAF	JPN	LVA	SVK	LTU	PRT	KOR	URY
CAN	0	2956	1998	1845	2106	2100	4518	1052	2171	972	1786	1017	693	1586	1344	230	451	210	1279	2145	516	1587	627	498	361	1519	922	565
DEU	2450	0	3362	2963	2822	4177	4214	1347	2550	1213	1963	1522	1008	1853	2135	402	687	226	1524	3881	561	1621	916	768	657	1815	799	539
DFS	1838	2708	0	2074	1803	2794	2762	883	1945	1056	1571	1121	861	1321	1473	289	524	207	1144	2582	516	1185	603	476	437	1425	655	473
FRA	1427	1930	1378	0	1671	2472	2880	864	1856	960	1510	1207	835	1512	1391	225	368	158	1117	2468	519	1361	524	494	321	1379	683	467
ITA	1923	2232	1608	1179	0	1960	2992	792	1699	684	1192	878	564	1387	1402	291	432	187	1209	2395	329	1174	612	401	402	1276	690	387
NLD	2087	4043	2567	1831	1821	0	3199	1089	2232	1341	1750	1586	1043	1427	1764	303	586	221	1208	2861	525	1284	638	616	452	1578	667	493
USA	5230	3367	2341	1789	2656	2955	0	1176	2885	1391	2360	1200	956	1872	1999	266	579	358	1646	3282	648	2254	864	635	488	1938	1119	789
CHE	979	1287	841	813	727	1091	1110	0	872	501	739	714	464	656	541	146	233	77	492	891	258	544	293	259	152	669	343	237
GBR	2449	2060	1566	1332	1455	2038	2726	837	0	1182	1730	1063	1231	1279	1201	211	419	203	1041	2040	520	1212	533	425	384	1311	646	520
NZL	959	957	783	644	553	1230	1345	423	1037	0	1427	627	872	652	676	128	217	152	574	968	378	676	307	287	219	762	396	440
AUS	1831	1550	1202	1104	989	1562	2451	660	1542	1434	0	886	834	1056	917	168	318	152	844	1473	487	1041	466	346	296	1103	585	509
BEL	1022	1578	1067	1257	891	1812	1096	728	1059	517	790	0	592	819	728	176	273	108	638	1194	341	648	346	337	218	921	394	282
IRL	651	884	715	711	497	983	878	470	1263	764	720	575	0	565	516	106	178	133	481	834	333	495	241	230	176	639	292	313
ESP	1132	1264	1063	1280	1050	1300	1333	550	1016	500	779	806	531	0	963	196	289	136	921	1608	454	1046	440	358	276	1176	618	403
CZE	1032	1703	1056	932	1128	1571	1655	382	821	471	608	565	363	653	0	226	387	170	1056	1831	344	942	499	487	361	1041	570	374
SVN	179	398	237	175	260	268	215	109	155	90	120	141	82	142	164	0	108	51	175	341	53	163	117	79	88	186	113	55
EST	331	544	385	216	297	453	464	145	273	119	182	181	91	147	254	64	0	83	302	586	115	275	220	151	135	310	168	137
ISR	149	172	154	96	133	174	358	44	151	120	98	68	103	83	134	34	45	0	146	250	67	152	100	63	76	153	87	87
HUN	1229	1276	970	856	1101	1050	1657	409	899	433	644	556	405	751	945	132	189	99	0	1394	378	827	449	360	309	993	562	395
POL	2007	3981	2370	2015	2225	2884	3388	811	1919	796	1210	1189	744	1344	1640	308	465	210	1332	0	472	1302	845	577	540	1713	787	511
ZAF	479	439	396	413	259	446	635	220	455	313	429	294	298	408	221	37	57	43	303	386	0	431	167	183	105	476	278	280
JPN	889	806	702	561	673	744	1132	370	662	372	607	435	315	536	476	92	117	74	473	766	283	0	435	337	259	924	686	429
LVA	409	750	387	289	395	442	769	156	309	172	240	210	135	239	328	68	121	66	332	729	94	193	0	179	230	541	302	215
SVK	348	578	264	282	252	442	439	133	248	170	174	208	112	184	386	37	65	26	253	440	101	124	86	0	117	404	231	197
LTU	228	615	280	149	237	301	364	68	230	114	147	115	93	121	245	41	69	41	204	443	40	97	153	53	0	297	180	140
PRT	1567	1760	1350	1351	1240	1629	2054	620	1220	627	942	955	574	1191	880	146	213	102	992	1859	427	569	439	273	194	0	637	453
KOR	891	573	492	436	567	496	1270	245	476	287	429	295	205	456	410	74	82	46	446	666	209	424	182	138	84	547	0	336
URY	563	414	349	323	304	401	979	189	447	364	410	220	259	326	278	34	81	50	334	451	242	266	127	124	79	409	271	0

JER mil

common bulls below diagonal												
common three quarter sib group above diagonal												
	CAN	DFS	USA	NZL	AUS	GBR	NLD	ZAF	ITA	DEU	IRL	CHE
CAN	0	179	573	243	318	218	73	175	70	125	9	49
DFS	177	0	278	219	194	232	213	174	109	228	37	66
USA	607	266	0	474	580	305	146	333	99	207	39	82
NZL	252	200	551	0	538	289	123	231	85	131	106	62
AUS	324	167	625	594	0	275	94	264	84	118	53	64
GBR	212	220	325	290	268	0	128	188	103	146	68	80
NLD	66	217	151	118	84	120	0	92	56	161	27	46
ZAF	171	156	346	237	247	187	88	0	90	102	34	60
ITA	67	110	106	85	79	104	57	83	0	60	19	45
DEU	122	227	206	123	109	139	158	99	61	0	21	56
IRL	6	33	40	118	50	72	25	34	18	21	0	18
CHE	43	66	83	53	54	75	39	53	44	52	13	0

JER fat

common bulls below diagonal												
common three quarter sib group above diagonal												
	CAN	DFS	USA	NZL	AUS	GBR	NLD	ZAF	ITA	DEU	IRL	CHE
CAN	0	179	573	243	318	218	73	175	70	125	9	49

DFS	177	0	278	219	194	232	213	174	109	228	37	66
USA	606	266	0	474	580	304	146	331	99	207	39	82
NZL	252	200	551	0	538	289	123	231	85	131	106	63
AUS	324	167	625	594	0	275	94	264	84	118	53	64
GBR	212	220	324	290	268	0	128	188	103	146	68	80
NLD	66	217	151	118	84	120	0	92	56	161	27	46
ZAF	171	156	344	237	247	187	88	0	90	102	34	60
ITA	67	110	106	85	79	104	57	83	0	60	19	45
DEU	122	227	206	123	109	139	158	99	61	0	21	56
IRL	6	33	40	118	50	72	25	34	18	21	0	18
CHE	43	66	83	53	54	75	39	53	44	52	13	0

JER pro

common bulls below diagonal												
common three quarter sib group above diagonal												
	CAN	DFS	USA	NZL	AUS	GBR	NLD	ZAF	ITA	DEU	IRL	CHE
CAN	0	179	573	243	318	218	73	175	70	125	9	49
DFS	177	0	278	219	194	232	213	174	109	228	37	66
USA	606	266	0	474	580	306	146	331	99	207	39	82
NZL	252	200	551	0	538	290	123	231	85	131	106	62
AUS	324	167	625	594	0	276	94	264	84	118	53	64
GBR	213	221	327	292	269	0	128	188	103	146	68	80
NLD	66	217	151	118	84	120	0	92	56	161	27	46
ZAF	171	156	344	237	247	187	88	0	90	102	34	60
ITA	67	110	106	85	79	104	57	83	0	60	19	45
DEU	122	227	206	123	109	139	158	99	61	0	21	56
IRL	6	33	40	118	50	72	25	34	18	21	0	18
CHE	43	66	83	53	54	75	39	53	44	52	13	0

RDC mil

common bulls below diagonal															
common three quarter sib group above diagonal															
	CAN	NOR	USA	NZL	AUS	GBR	DFS	DEU	ZAF	EST	LVA	LTU	IRL	NLD	CAM
CAN	0	8	241	107	116	109	221	14	75	3	10	22	3	7	0
NOR	7	0	93	65	90	100	160	22	0	41	23	29	49	62	0
USA	228	94	0	152	167	151	245	32	64	34	28	45	25	56	32
NZL	108	64	151	0	188	113	233	27	39	27	23	33	11	36	13
AUS	116	79	169	188	0	118	236	49	38	56	42	50	15	52	15
GBR	106	104	142	109	115	0	150	16	43	19	17	31	19	52	0
DFS	229	135	242	229	209	143	0	78	53	167	137	115	15	70	0
DEU	13	21	30	26	48	16	69	0	1	37	40	28	5	24	0
ZAF	77	0	58	34	39	37	50	1	0	0	2	5	2	2	0
EST	2	40	32	25	50	17	153	36	0	0	56	29	0	34	0
LVA	10	21	25	19	38	16	95	33	2	48	0	48	3	19	0
LTU	21	26	40	31	47	29	102	28	5	28	43	0	6	22	0
IRL	3	48	25	11	14	18	12	5	2	0	3	6	0	10	0
NLD	7	61	55	35	50	51	67	23	2	33	18	21	10	0	0
CAM	0	0	32	13	15	0	0	0	0	0	0	0	0	0	0

RDC fat

common bulls below diagonal															
common three quarter sib group above diagonal															
	CAN	NOR	USA	NZL	AUS	GBR	DFS	DEU	ZAF	EST	LVA	LTU	IRL	NLD	CAM
CAN	0	8	241	107	116	109	221	14	75	3	10	22	3	7	0
NOR	7	0	92	65	90	100	160	22	0	41	23	29	49	62	0
USA	228	93	0	152	167	149	243	32	64	34	28	45	25	56	32
NZL	108	64	151	0	188	113	233	27	39	27	23	33	11	36	13
AUS	116	79	169	188	0	118	236	49	38	56	42	50	15	52	15
GBR	106	104	140	109	115	0	150	16	43	19	17	31	19	52	0
DFS	229	135	240	229	209	143	0	78	53	167	137	115	15	70	0
DEU	13	21	30	26	48	16	69	0	1	37	40	28	5	24	0
ZAF	77	0	58	34	39	37	50	1	0	0	2	5	2	2	0
EST	2	40	32	25	50	17	153	36	0	0	56	29	0	34	0

LVA	10	21	25	19	38	16	95	33	2	48	0	48	3	19	0
LTU	21	26	40	31	47	29	102	28	5	28	43	0	6	22	0
IRL	3	48	25	11	14	18	12	5	2	0	3	6	0	10	0
NLD	7	61	55	35	50	51	67	23	2	33	18	21	10	0	0
CAM	0	0	32	13	15	0	0	0	0	0	0	0	0	0	0

RDC pro

common bulls below diagonal															
common three quarter sib group above diagonal															
	CAN	NOR	USA	NZL	AUS	GBR	DFS	DEU	ZAF	EST	LVA	LTU	IRL	NLD	CAM
CAN	0	8	241	107	116	109	221	14	75	3	10	22	3	7	0
NOR	7	0	92	65	90	100	160	22	0	41	23	29	49	62	0
USA	228	93	0	152	167	150	243	32	64	34	28	45	25	56	32
NZL	108	64	151	0	188	113	233	27	39	27	23	33	11	36	13
AUS	116	79	169	188	0	118	236	49	38	56	42	50	15	52	15
GBR	106	104	141	109	115	0	150	16	43	19	17	31	19	52	0
DFS	229	135	240	229	209	143	0	78	53	167	137	115	15	70	0
DEU	13	21	30	26	48	16	69	0	1	37	40	28	5	24	0
ZAF	77	0	58	34	39	37	50	1	0	0	2	5	2	2	0
EST	2	40	32	25	50	17	153	36	0	0	56	29	0	34	0
LVA	10	21	25	19	38	16	95	33	2	48	0	48	3	19	0
LTU	21	26	40	31	47	29	102	28	5	28	43	0	6	22	0
IRL	3	48	25	11	14	18	12	5	2	0	3	6	0	10	0
NLD	7	61	55	35	50	51	67	23	2	33	18	21	10	0	0
CAM	0	0	32	13	15	0	0	0	0	0	0	0	0	0	0

SIM mil

common bulls below diagonal									
common three quarter sib group above diagonal									
	CHE	DEA	FRM	SVN	FRA	NLD	IRL	GBR	USA
CHE	0	436	279	1	15	99	57	57	35
DEA	405	0	352	307	292	486	76	67	50
FRM	331	386	0	4	2	145	72	74	105
SVN	1	290	4	0	57	95	5	0	2
FRA	12	249	1	54	0	94	6	0	3
NLD	100	508	167	88	89	0	59	54	35
IRL	54	73	77	5	6	53	0	41	18
GBR	65	78	95	0	0	55	35	0	20
USA	34	54	119	2	3	36	17	28	0

SIM fat

common bulls below diagonal									
common three quarter sib group above diagonal									
	CHE	DEA	FRM	SVN	FRA	NLD	IRL	GBR	USA
CHE	0	435	279	1	15	99	57	57	35
DEA	405	0	352	307	292	486	76	67	50
FRM	331	386	0	4	2	145	72	74	104
SVN	1	290	4	0	57	95	5	0	2
FRA	12	249	1	54	0	94	6	0	3
NLD	100	508	167	88	89	0	59	54	35
IRL	54	73	77	5	6	53	0	41	18
GBR	65	78	95	0	0	55	35	0	20
USA	34	54	118	2	3	36	17	28	0

SIM pro

common bulls below diagonal									
common three quarter sib group above diagonal									
	CHE	DEA	FRM	SVN	FRA	NLD	IRL	GBR	USA
CHE	0	435	279	1	15	99	57	57	35
DEA	405	0	352	307	292	486	76	67	50
FRM	331	386	0	4	2	145	72	74	104

SVN	1	290	4	0	57	95	5	0	2
FRA	12	249	1	54	0	94	6	0	3
NLD	100	508	167	88	89	0	59	54	35
IRL	54	73	77	5	6	53	0	41	18
GBR	65	78	95	0	0	55	35	0	20
USA	34	54	118	2	3	36	17	28	0