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Genomics; Does it really work?



DairyCo

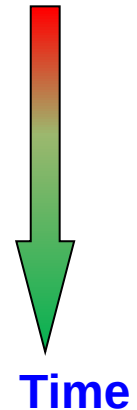
Marco Winters

Presentation outline

- Quick recap on Genomics; What and Why?
- Implementation in UK
- Results on prediction accuracy

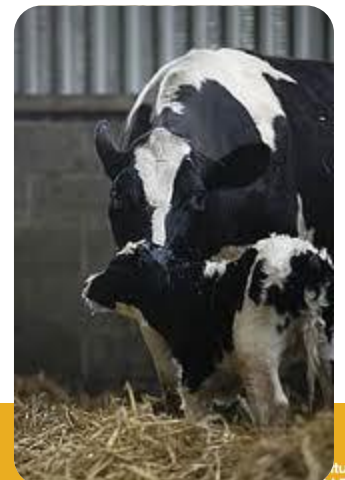
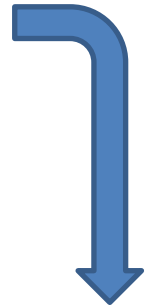
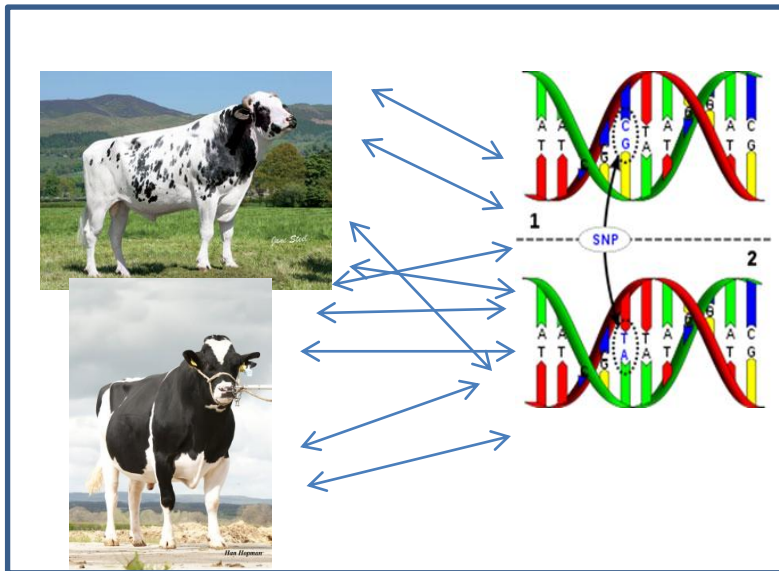
Genomics Evaluations

- Refinement of existing evaluations
 - Pedigree information
 - Genomic information
 - Performance recording (e.g. Milk, SCC, Type)
 - Progeny performance
- Builds on current proven system of evaluation
 - PTA's look identical
 - and should be used in the same way



‘Unlocking’ the DNA code

- Using reference group for calibration;
 - Daughter proven bulls + their Genotypes



UK implementation (Holstein)

- (inter)national collaboration through DairyCo
 - UK, ITA, CAN, USA
 - ~23,000 daughter proven bull genotypes
- Bespoke UK Genomic evaluations
 - DairyCo (Production and Fitness) & Holstein UK (Type)
 - Males – April 2012
 - Females – April 2013



Validation of Genomic evaluations

- Prior to publication
 - Validation internally of prediction equations
 - EGENES team at SRUC
 - Internationally; Independent validation by Interbull
- Estimated reliability gains from Genomic data;



<u>Trait</u>	<u>PA</u>	<u>GPTA</u>	<u>gain</u>	<u>(dtr Eq.)</u>
SCC	0.28	0.69	0.41	120
Production	0.28	0.68	0.40	18
C.I.	0.24	0.61	0.37	300
LS	0.24	0.56	0.32	90

Reduction of Generation interval



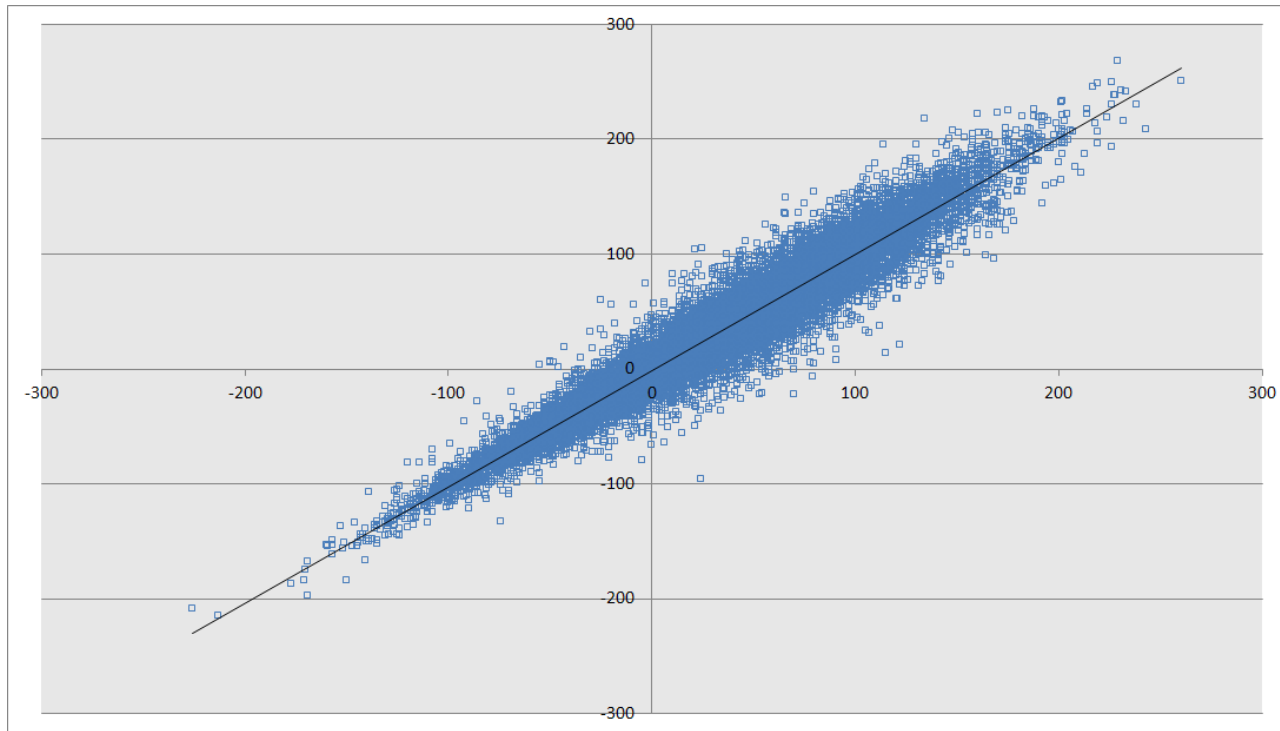
Does it really work?

- Using the official UK published evaluations
- Comparing
 - April 2012 Young bull genomic indexes
 - December 2013 indexes for the same bulls, but now with daughter performance information
- 3001 bulls in the analysis

All dtrs proven bulls change in PLI

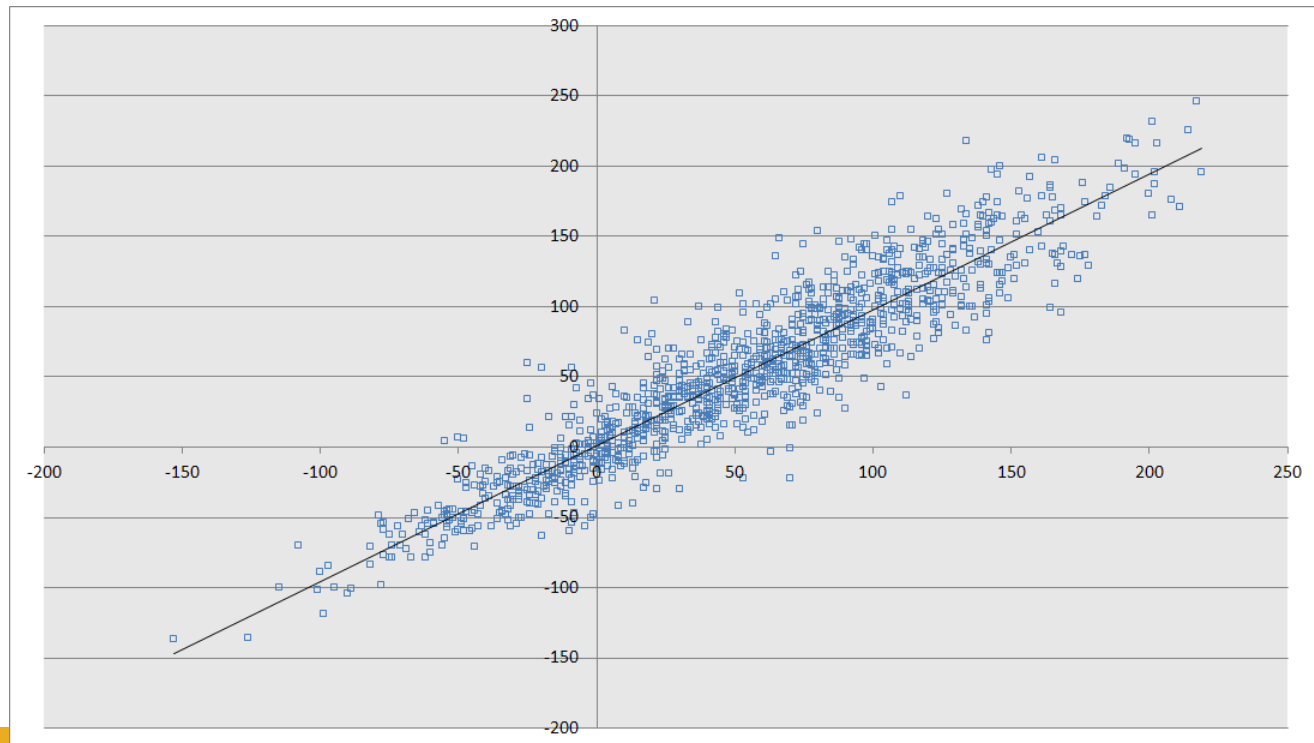
(Apr-12 vs. Dec-13)

- Year of birth; 2000 onwards (>38,000 bulls)
- April 2012 (rlb = 77.7), December 2013 (rlb = 78.3)



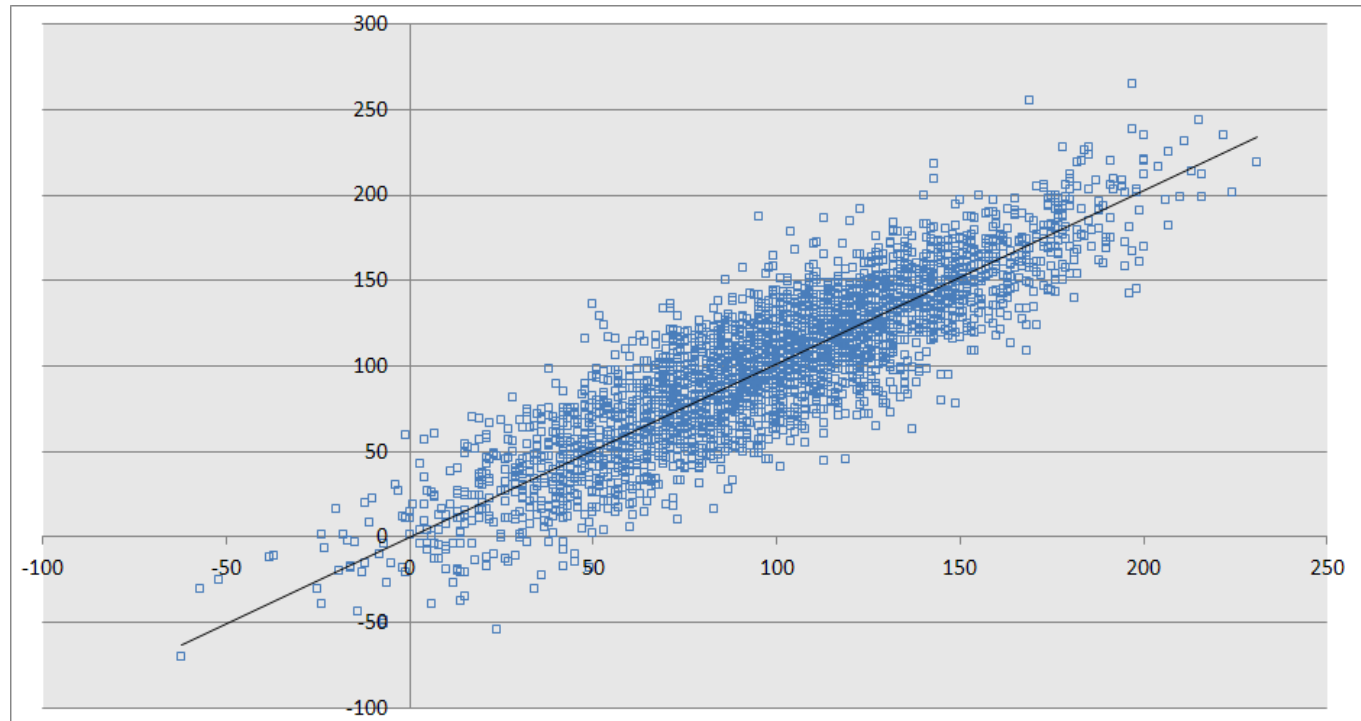
Daughter proven (changing >5% rlb)

- Correlation = 0.93
- Average April 2012 = £54 PLI (rlb. 77%)
- Average Dec 2013 = £54 PLI (rlb. 85%) (+8% rlb increase)



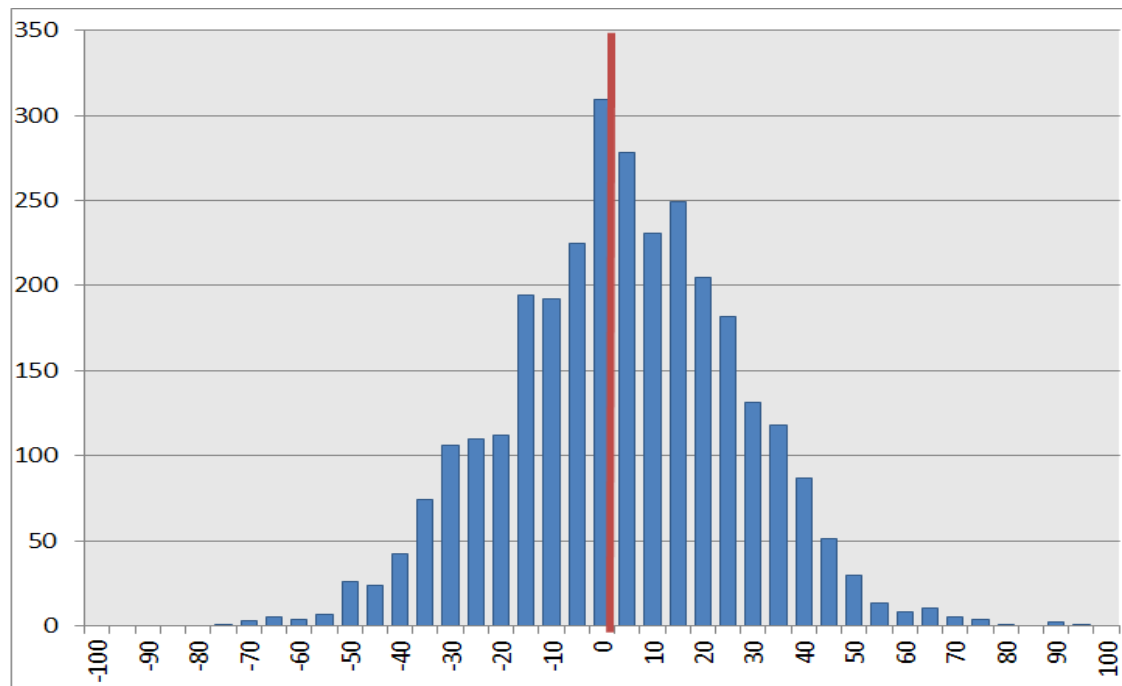
Genomic → Dtr proven (Apr-12 to Dec-13)

- Correlation = 0.88
- Average April 2012 = £100 PLI (rlb. 69%)
- Average Dec 2013 = £101 PLI (rlb. 81%) (+12% rlb increase)



Distribution of changes

- 90% are within +/- £37 points
- 5% go up by £38 or more
- 5% go down by £ -38 or more



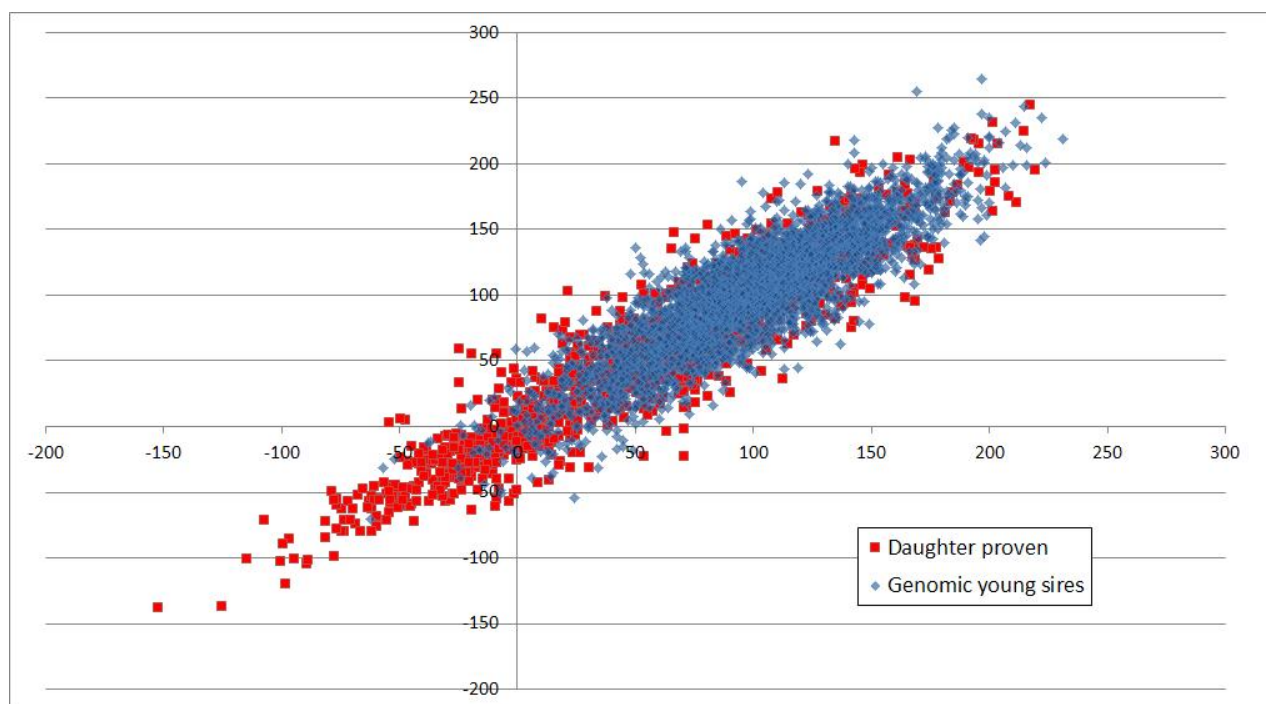
Dtrs proven and Genomic combined

- Correlation = 0.93
- Average Apr12 = £54 (rlb. 77%)
- Average Dec13 = £54 (rlb. 85%) (+8%)

Correlation = 0.88

Avg. Apr12 = £100 (rlb 69%)

Avg. Dec13 = £101 (rlb 81%) (+12%)



Genomic proof stability

- for the major traits

Trait	Apr-12	Dec-13	Ay. Change	Gain.rlb	Corr
Milk	469	473	4	12	84
Fat	14.6	14.9	0.3	12	86
Prot	12.5	12.3	-0.2	12	85
Fat%	-0.04	-0.04	0.00	12	91
Prot%	-0.03	-0.04	-0.01	12	91
SCC	-9	-9	0	10	85
Lifespan	0.2	0.2	0	3	89
Fertility	-1.0	-1.0	0.0	16	87
Type Merit (Holstein UK)	1.45	1.47	0.02	12	84

Should young sires be used?



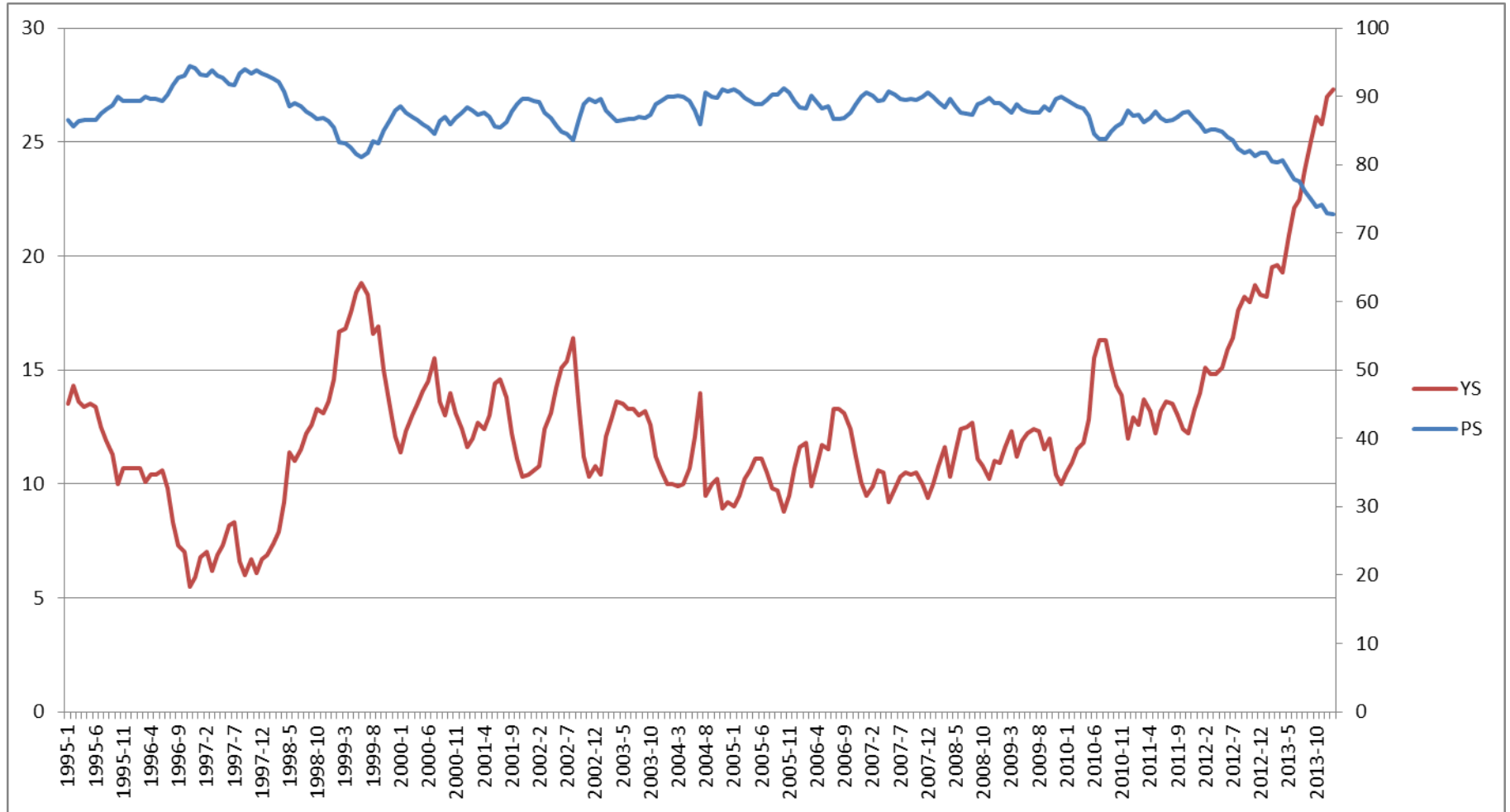
- High quality young bulls on offer
 - And getter better quick



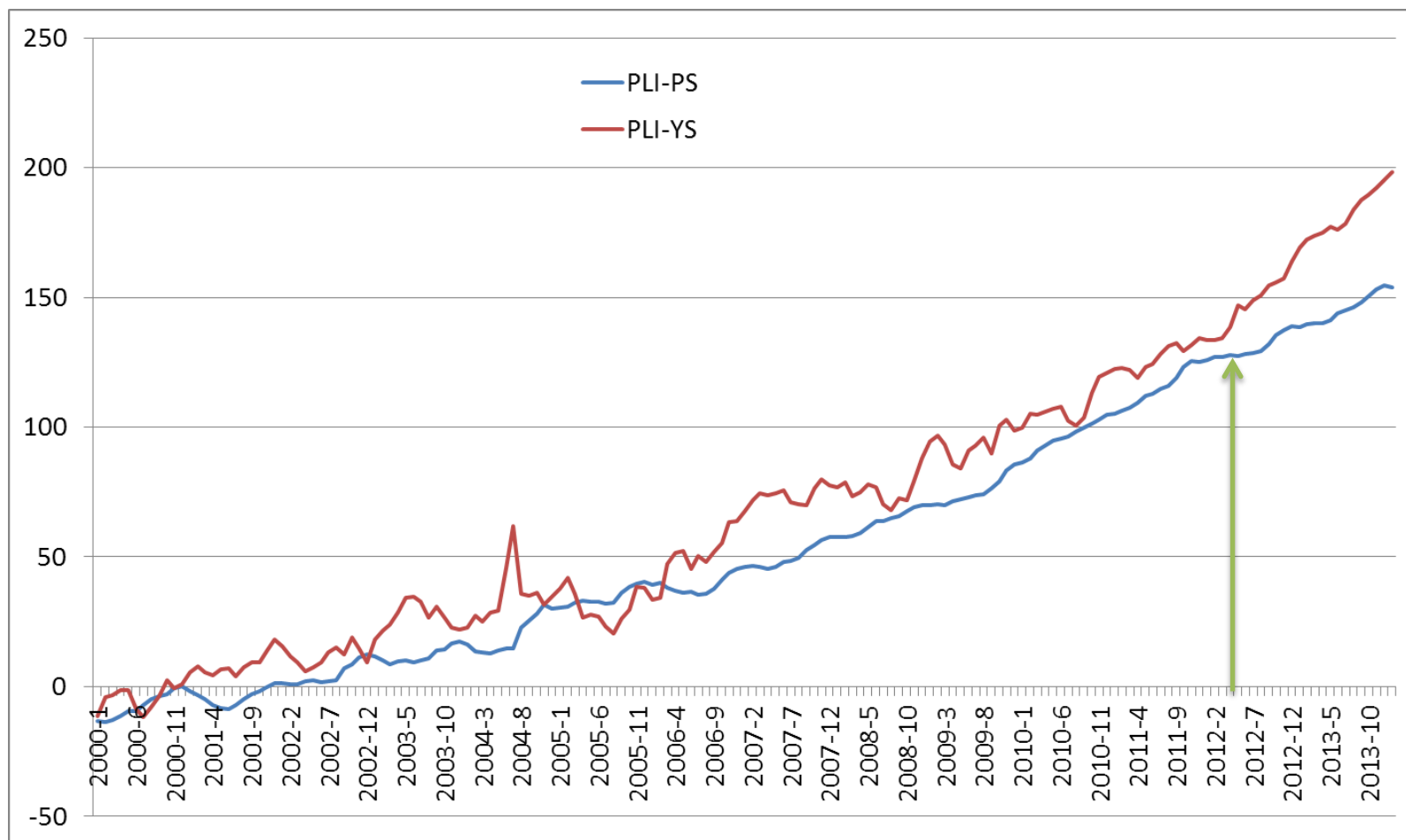
- Averages £PLI of Top 100 available

<u>Top 100</u>	<u>Apr-12</u>	<u>Apr-13</u>	<u>Apr-14</u>
Young	197	230	256
Proven	182	197	205
Difference	15	33	51

Genomics use



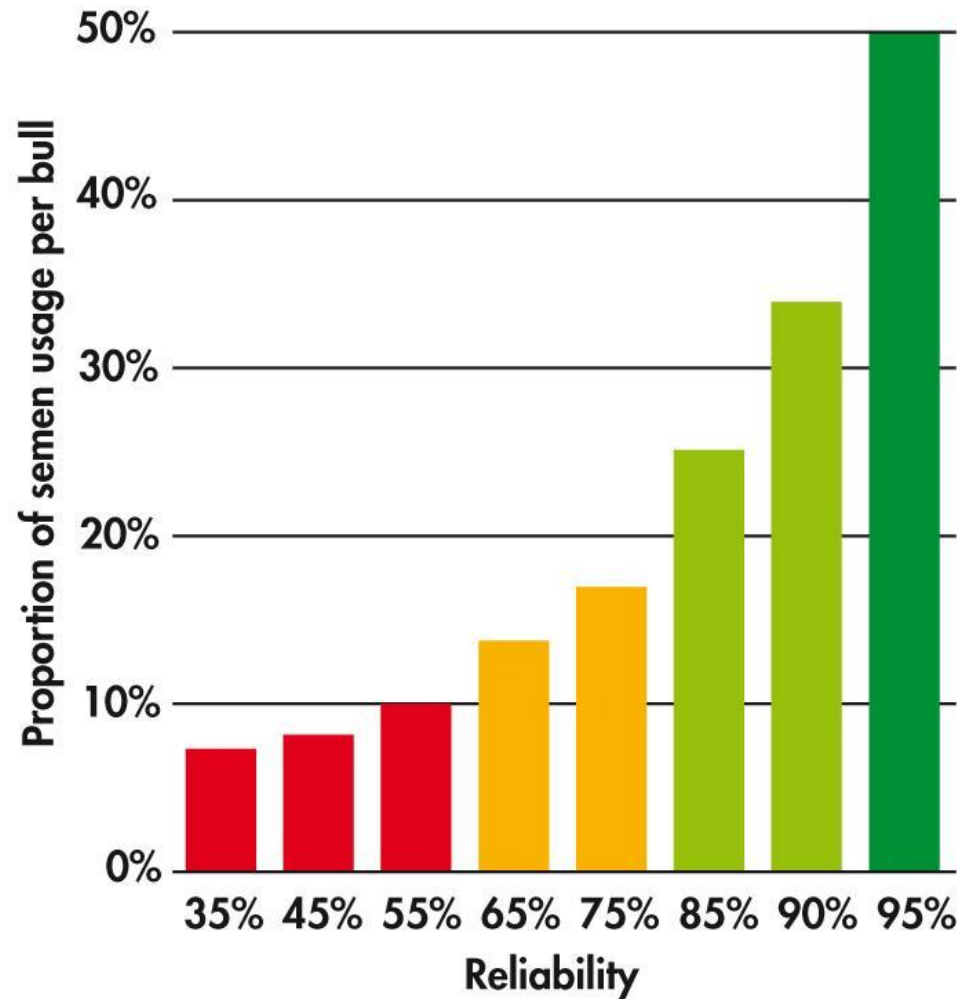
Average £PLI (based on Insemination data)



How much use is justified?

- Balance Risk and Reward
- Only pick bulls of high genetic merit
 - Use the same criteria as you apply to proven bulls
- If Young bulls >20 point PLI higher than the proven bulls used
 - always worth the risk
- Use a team of bulls to minimise risk
 - Don't gamble on one 'hot' bull
- Use Reliability as a guide for how much semen to use per bull

Reliability vs. Bull usage



Summary

- Exciting times !!
- Genomic applications only just starting
 - Accuracy living up to expectation
 - Quality of young bull genetics ever increasing
 - Don't loose out !
- We need to ensure we capitalise on its future potential
 - Data recording and collaboration essential

