



IRISH CATTLE BREEDING FEDERATION

Estimation of genetic parameters for test day records of dairy traits in a seasonal calving system

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Session 18: Free communications: parameter estimation and molecular genetics

Background

- Usually seasonality is included as fixed (or random) effect in a model
- Implies just change in mean
- Instead of fixed effect, allow genetic parameters change according to season

Background

- Ireland has primarily pasture-based dairy production system
- Calving coincides with grass availability
- 2/3 of dairy calvings in Feb/Mar/Apr
- Are there benefits to using certain bulls at specific times in breeding season?
 - Late in the season, short gestation EBV bulls combined with favourable seasonal production traits would be highly economically desirable from farmer viewpoint

Objective

The objective of the study was:-

to investigate the variance components of milk production as affected by both stage of lactation and month of production, and determine the scale of any differences that may exist.

Data

- Irish primiparous Holstein / Friesian animals
- Calved between 2003 and 2009
- Date set reduced by random selection of herds
- 56,734 animals from 513 sires
- 357,869 test day records (kg of milk/day)
- 1,034 herds
- Average number of animals/herd/year = 13.6

Model (1/2)

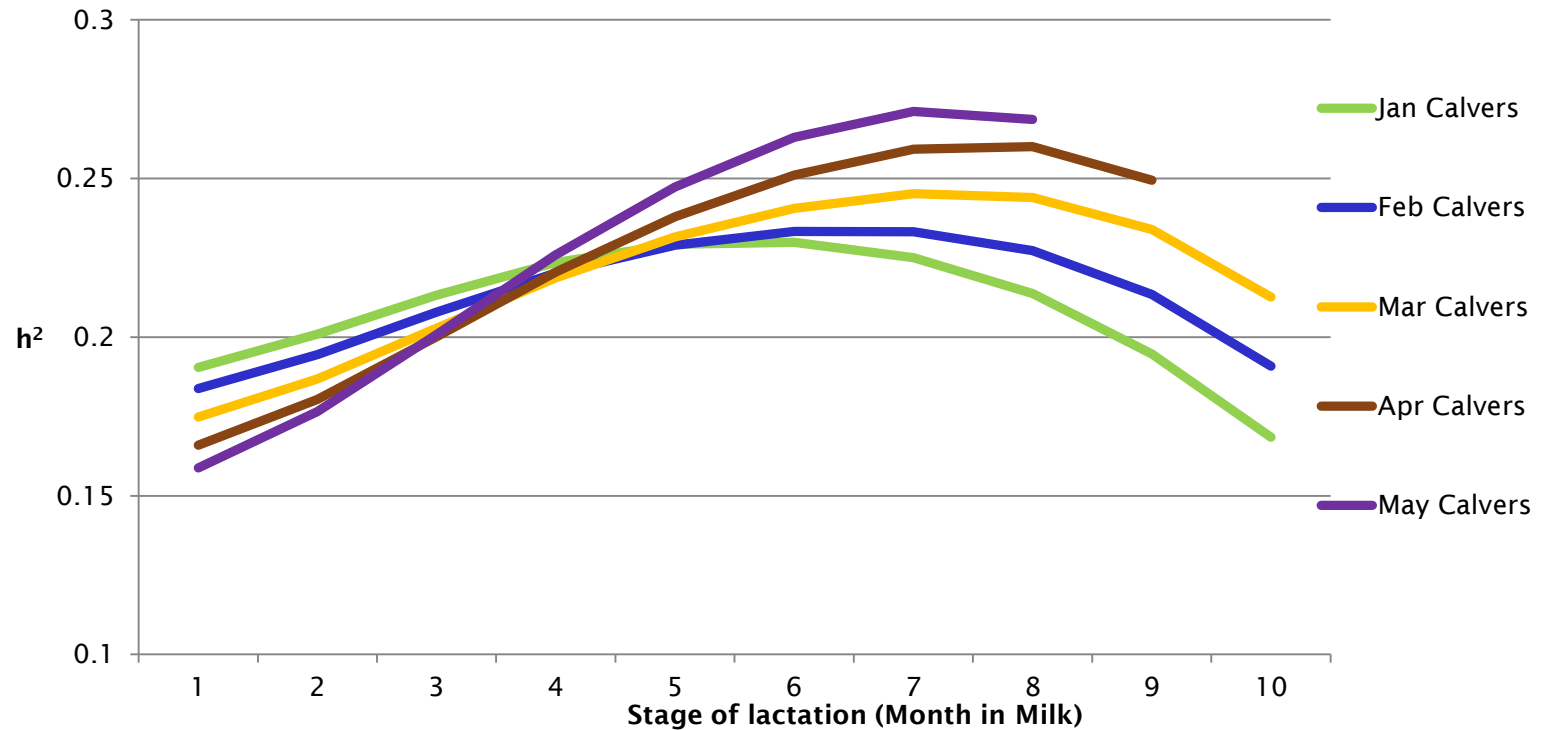
- ASReml
- Sire-Maternal Grand Sire
- Fixed class effects
 - Herd/Year/Season
 - Age First Calving
- Fixed regression
 - Days Carried Calf
 - Day in milk (**DIM**)

Model (2/2)

- Random effects (additive and permanent environment)
 - Month in Milk (**MIM**) – Stage of lactation
 - Test Month (**TM**) – month of year
 - Combination of MIM & TM allowed seasonality be captured
- Based on Legendre polynomials of order 2 on both MIM and TM – total of 5 components.
- Intercept fitted for MIM only

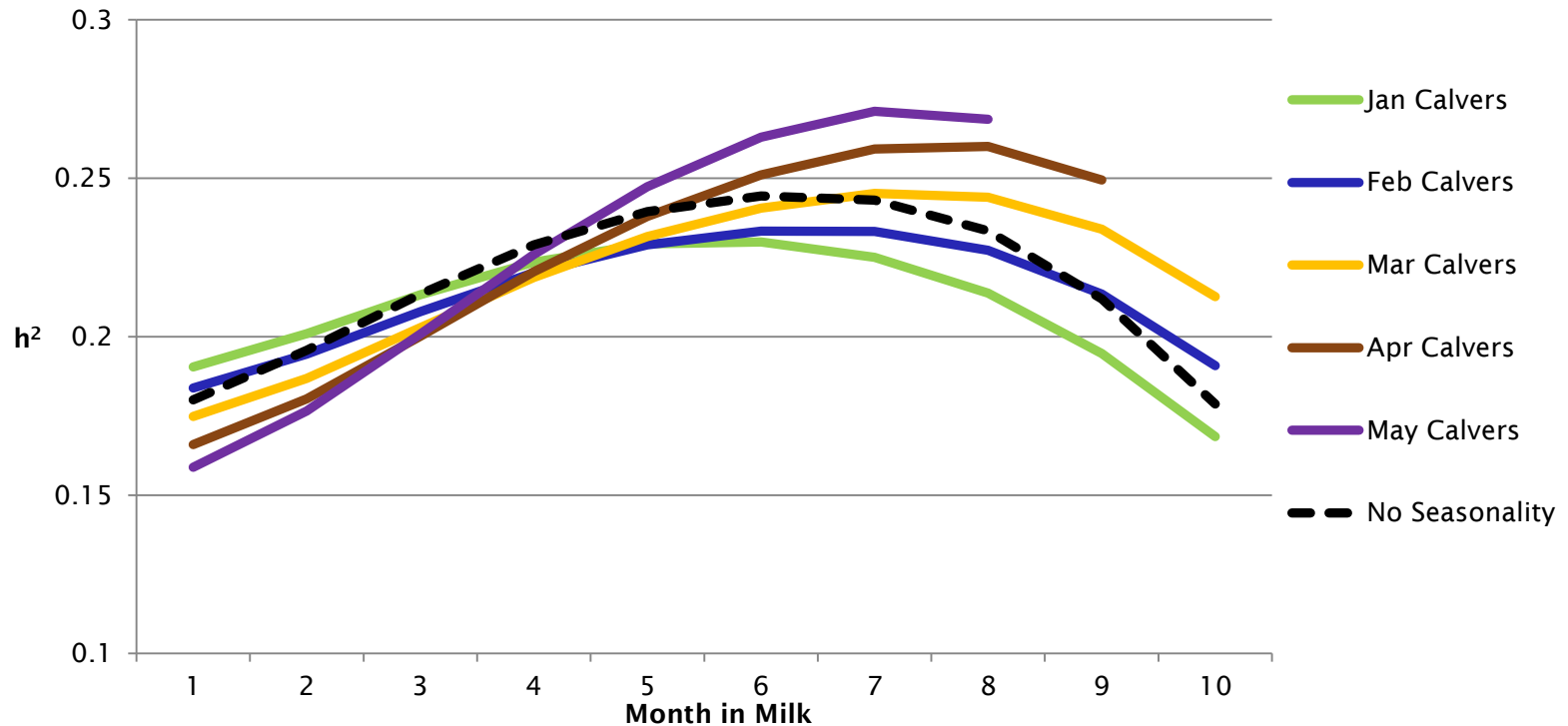
Results

h^2 of test-day milk yield for Spring Calvers



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Results: Split variances across MIM and TM

Genetic Variance of test day milk yield for MIM
(on diagonal)

Genetic correlations between MIM *(above diagonal)*

	Early lactation (MIM=2)	Mid lactation (MIM=5)	Late lactation (MIM=8)
Early lactation (MIM=2)	2.28	0.88	0.73
Mid lactation (MIM=5)		2.25	0.95
Late lactation (MIM=8)			1.79

Results: Split variances across MIM and TM

Variance of test day milk yield for TM (*on diagonal*)
Genetic correlations between TM (*above diagonal*)

	April Milk test (TM=4)	June Milk test (TM=6)	Sept Milk test (TM=9)
April Milk test (TM=4)	0.01	0.46	-0.71
June Milk test (TM=6)		0.02	0.30
Sept Milk test (TM=9)			0.02

Results: Genetic Correlations of 305 day milk yield

- Compare predicted 305 milk yield from this model with “standard” test day model for AI bulls with >20 progeny

	No Seasonality	Jan Calver	Mar Calver	May Calver
No Seasonality		0.999	0.999	0.996
Jan Calver			0.999	0.998
Mar Calver				0.998
May Calver				

Results: Genetic Correlations for Persistency

- Compare predicted 305 milk yield from this model with “standard” test day model for AI bulls with >20 progeny

	No Seasonality	Jan Calver	Mar Calver	May Calver
No Seasonality		0.988	0.993	0.964
Jan Calver			0.989	0.939
Mar Calver				0.998
May Calver				

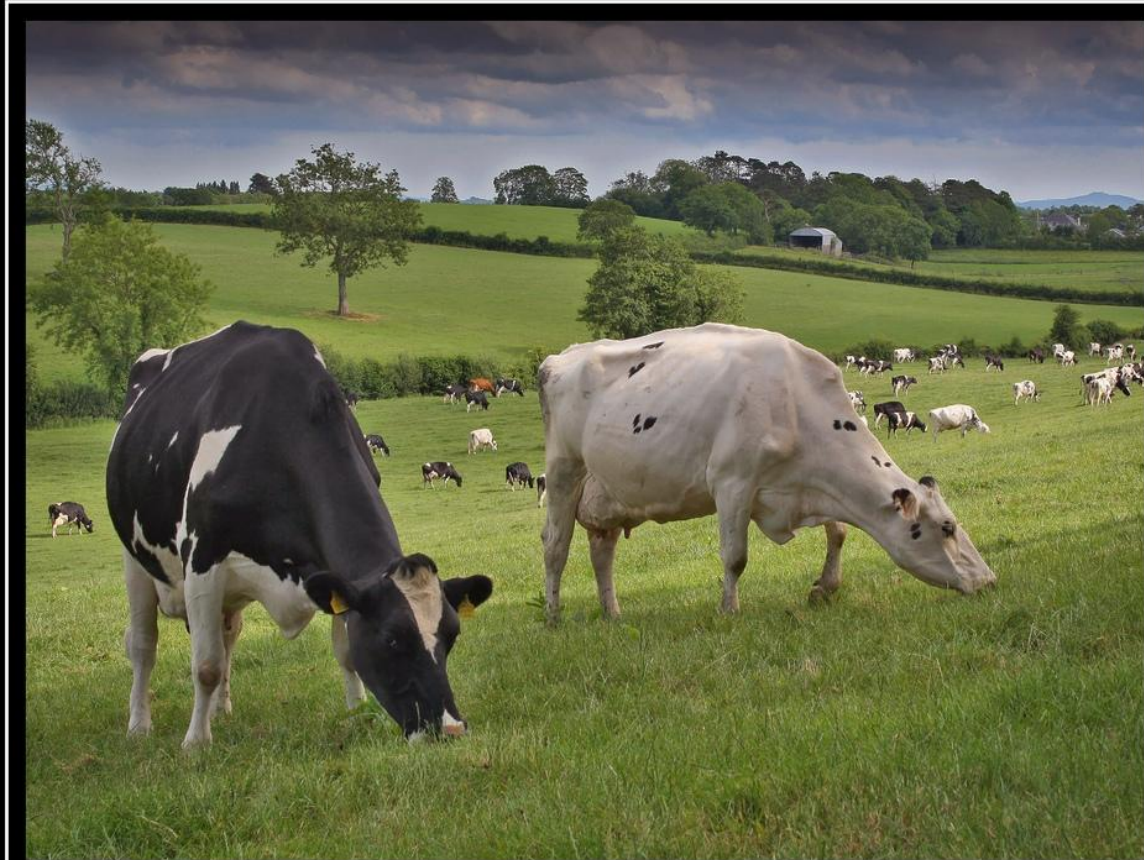
Conclusion

- No apparent benefit found to the inclusion of seasonality on genetic variances in estimation of parameters for test day milk yield
- However possibly benefit in estimation of persistency

More research required

- Polynomials not providing continuity across year end (i.e. TM 12 to TM 1)
- Residual variance assumed homogeneous
 - this may be restricting the variance unduly
- Fitting interaction term would allow lactation curve per calving month

Thank you



got milk?