

Correlation vs Covariance matrices for rank reduction in test-day models ?

Session 15

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Models

Fixed effects = Herd x test-day (HTD)

+ Lactation curves (sum of splines) by region x parity for calving age, calving month, length of dry period, gestation

Random effects (full rank = reference)

- **Genetic (G)** rank = 6
- **Permanent env^t (P)** rank = 6
- **Herd x calving year (H)** rank = 9

VS

(reduced rank)

- **G** rank = 4
- **P** rank = 4
- **H** rank = 6

Residual = heterogeneous variance f(DIM)

Materials

Subset of 2.4 million TD data (Milk, Fat, Protein yields)
recorded between 1988 and 2004

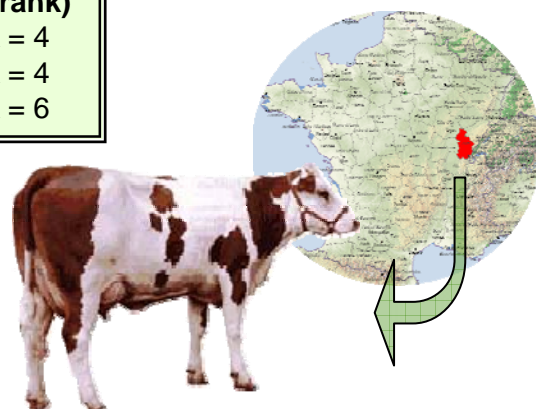
135 743 Montbéliarde cows from Jura (East of France).

194 214 animals in pedigree file

Context

Genetic evaluation based on Test-Day (TD) model presents many advantages, particularly in terms of modeling of lactation curves but it constitutes a major computing challenge in large dairy countries, due to:

- the number of parameters in the model,
- the number of records to analyse (> 100 millions)



Objectives

To reduce computer requirements using a reduced rank approach

1/ **Impact of rank reduction** by 1/3 on estimated random effects ?

2/ Reduction approach based on covariance (**COV**) vs correlation (**COR**) matrix ?

Methods

1/ **Correlations** between random effects obtained with **reduced rank model vs reference model** (full rank)

2/ Analysis of differences between **COV** and **COR** estimated random effects

Conclusion

1/ **Low impact of rank reduction** on genetic evaluation ⇒ possible to use rank reduction to decrease computing requirements

2/ Better relevance of the approach based on the **covariance matrix (COV)**

Results

Reduced rank approaches imply changes in genetic correlations between Days In Milk (DIM) (Fig) .

- within lactation changes are negligible (not shown) .
- between lactations changes are larger between 1st and later lactations (A, B) than between 2nd and 3rd (C) and vary depending on the approach (+ 0.05 with COR, + 0.01 with COV).

Table. Correlation between random effects estimated with full rank matrix and with reduced rank matrix (COR or COV)

Approach	Genetic		Permanent Env ^t		Herd-Year	
	COR	COV	COR	COV	COR	COV
Milk	0.974	0.999	0.948	0.999	0.901	0.987
Fat	0.997	0.999	0.989	0.999	0.946	0.995
Protein	0.985	0.999	0.971	0.999	0.915	0.992

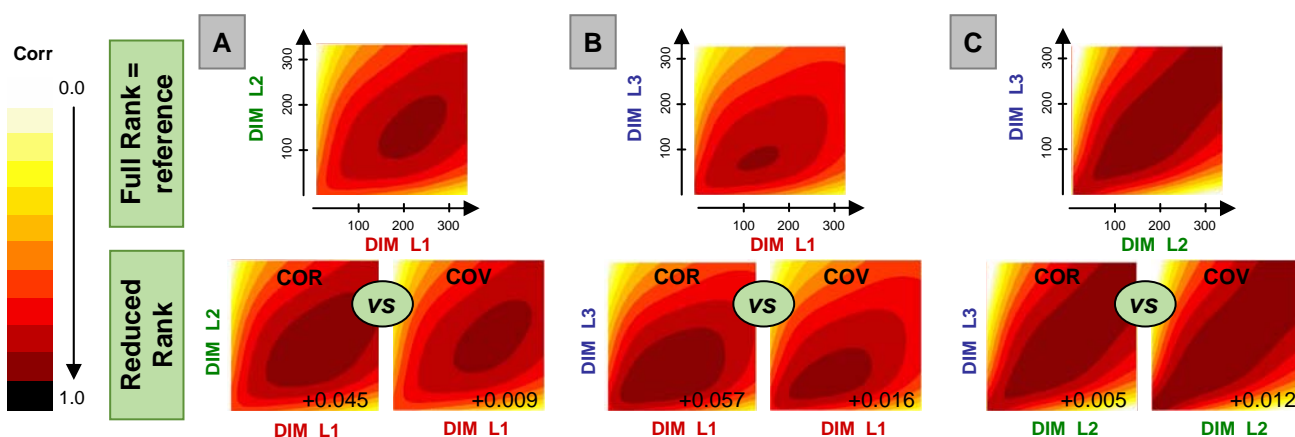


Figure. Correlation between DIM in 1st (L1), 2nd (L2) and 3rd (L3) lactation for genetic effects on Milk (using full rank matrix or reduced rank matrix based on **COR** and **COV**).

This study was performed within the framework of the UMT on cattle genetic evaluation