Environmental sensitivity of genetic merit for milk, fat and protein yield estimated by a random regression model

Mario Calus

Roel Veerkamp

ANIMAL SCIENCES GROUP
WAGENINGEN UR

Introduction

- International evaluation and health traits interests in GxE interaction

- Environmental sensitivity (GxE):
  - Re-ranking
    - (unimportant?)
  - Heterogeneity of variances (scaling)
    - (important but adjusted for in statistical model)

- Combining different traits in total merit index can cause re-ranking

Objectives

- Investigate environmental sensitivity of milk yields for a range of herd environments

- Investigate effects of environmental sensitivity on ranking of animals on an index combining milk, fat and protein yield

Environmental parameters

- Fourteen environmental parameters were defined as an average characteristic per herd
- E.g. protein production, age at first calving, body condition score
- Applied in covariance functions to model sire variances and EBVs

Data

- 151,696 heifers in 6780 herds
- 14 heifers on average per herd-year
- 4769 sires with on average 32 daughters

Model

- Fixed effects for HYS
- Age at calving
- Fixed polynomial regression on EP
- Random polynomial regression on EP for each sire (up to third order polynomials)
- Ten groups for residual variance

Economic index: INET

- Scaling effects of underlying traits can cause re-ranking in an economic index

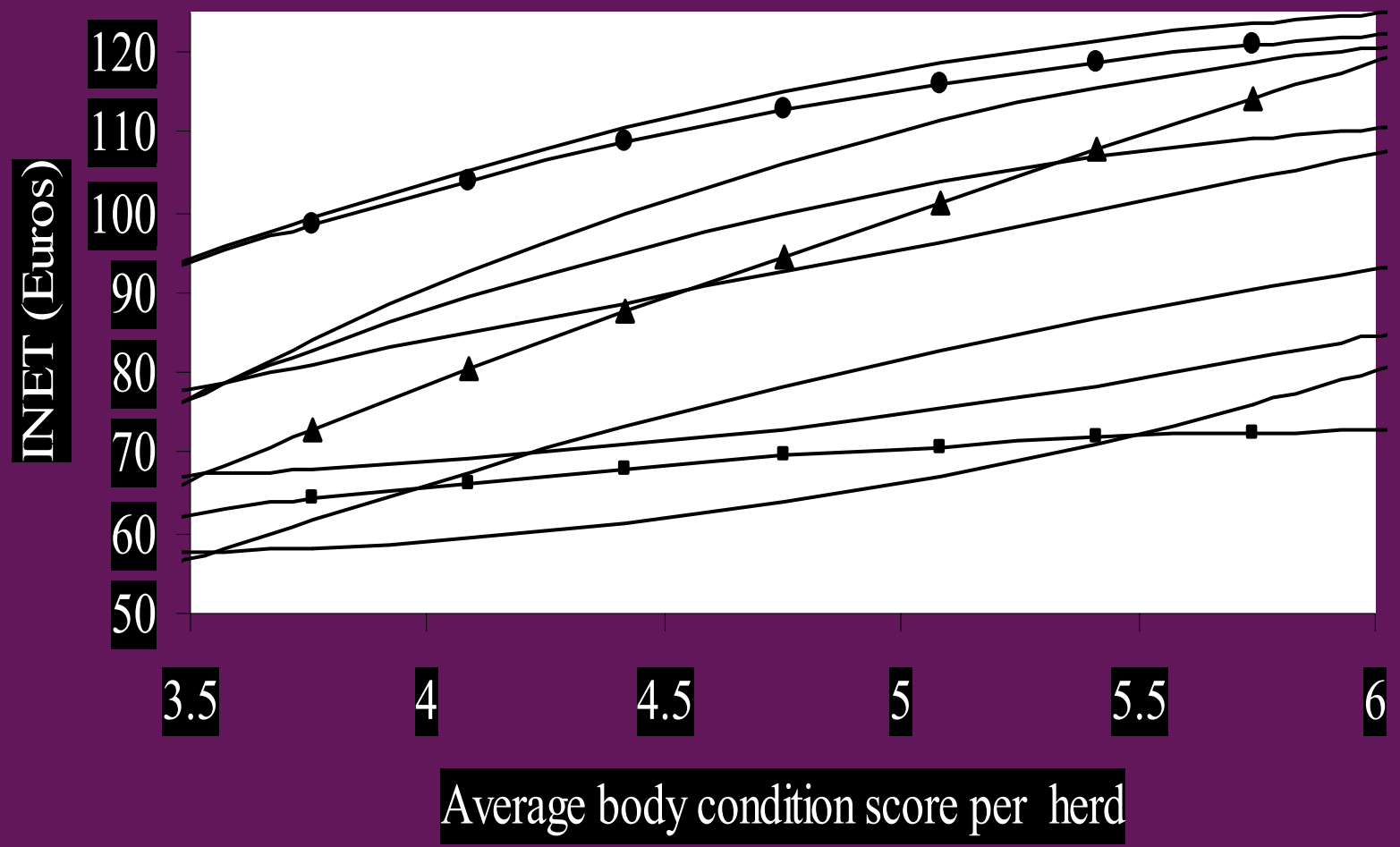
- INET = -0.08*EBV(milk yield) + 1*EBV(fat yield) + 6*EBV(protein yield)

Results

Yields were most sensitive to:

- Protein production
- Persistency
- Age at first calving
- Body condition score
- Calving interval
- Peak date of calving

Inet of 10 bulls



Conclusions

- Several environmental parameters can be defined that explain heterogeneity of variance
- Average protein was most important environmental parameter

Conclusions

- Re-ranking for individual traits and INET was limited

- Heterogeneity of variances is likely to cause re-ranking when other traits are included in index

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