Session 15, paper 4657

Relationship between milk fat to protein ratio from EBVs and the fertility evaluations of Nordic Red dairy sires

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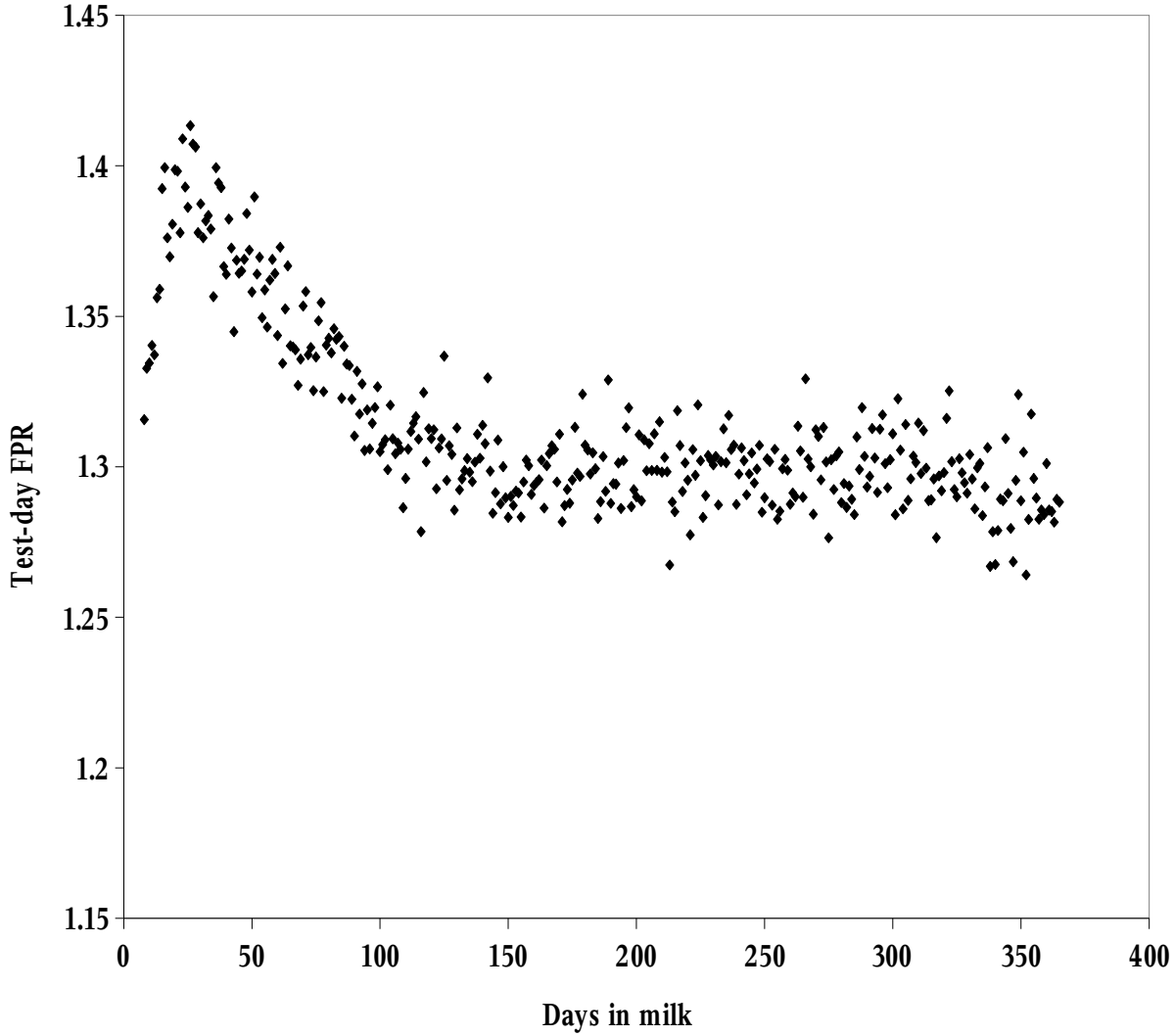
Milk fat to protein ratio (FPR)

- In early lactating cows changes in their production, energy requirements and body reserve mobilisation lead to changes in milk composition
  - Lack of dietary energy → impairment of milk protein synthesis
  - Excess of fatty acids in blood stream → increase in milk fat synthesis
  - Together: increased milk fat to protein ratio
- Milk fat to protein ratio has been shown to be an indicator of body reserve mobilisation and energy balance status in lactating dairy cows
  - Higher fat/protein ratio → deeper negative energy balance
  - *Deeper negative energy balance → more fertility and health problems*

Phenotypic fat to protein ratio over lactation



Genetics of FPR

- Earlier study estimated genetic parameters for FPR and fertility traits from Finnish Ayrshire test day data
- Heritability of FPR varied between 0.08 – 0.17 during lactation
  - Heritabilities of fertility traits were between 0.06 – 0.01
- Genetic correlations between FPR and fertility traits were highest in early lactation
  - FPR test day 30 and days to first insemination r_g = 0.28
  - FPR test day 30 and days open r_g = 0.24

Motivation behind this paper

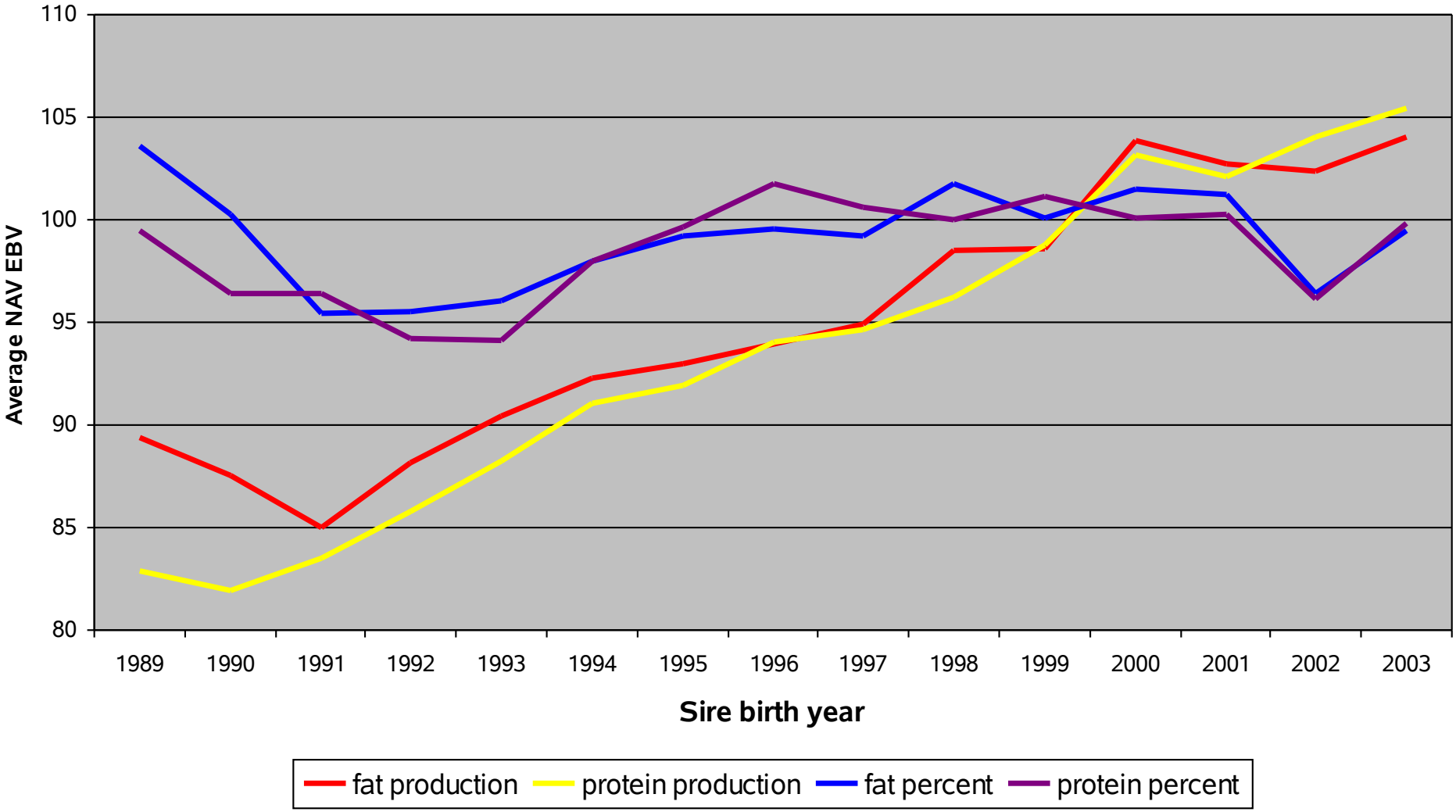
- Conclusion from previous study:
  - EBVs for FPR could be used to identify sires & cow families which experience severe energy deficiency and have poor fertility in early lactation
- But: EBVs are already routinely estimated for milk production traits from test day data

- Could the currently estimated milk trait EBVs be used directly in a similar way?
  - ”Fat to protein ratio” = Fat EBV/Protein EBV = **EBV-FPR**

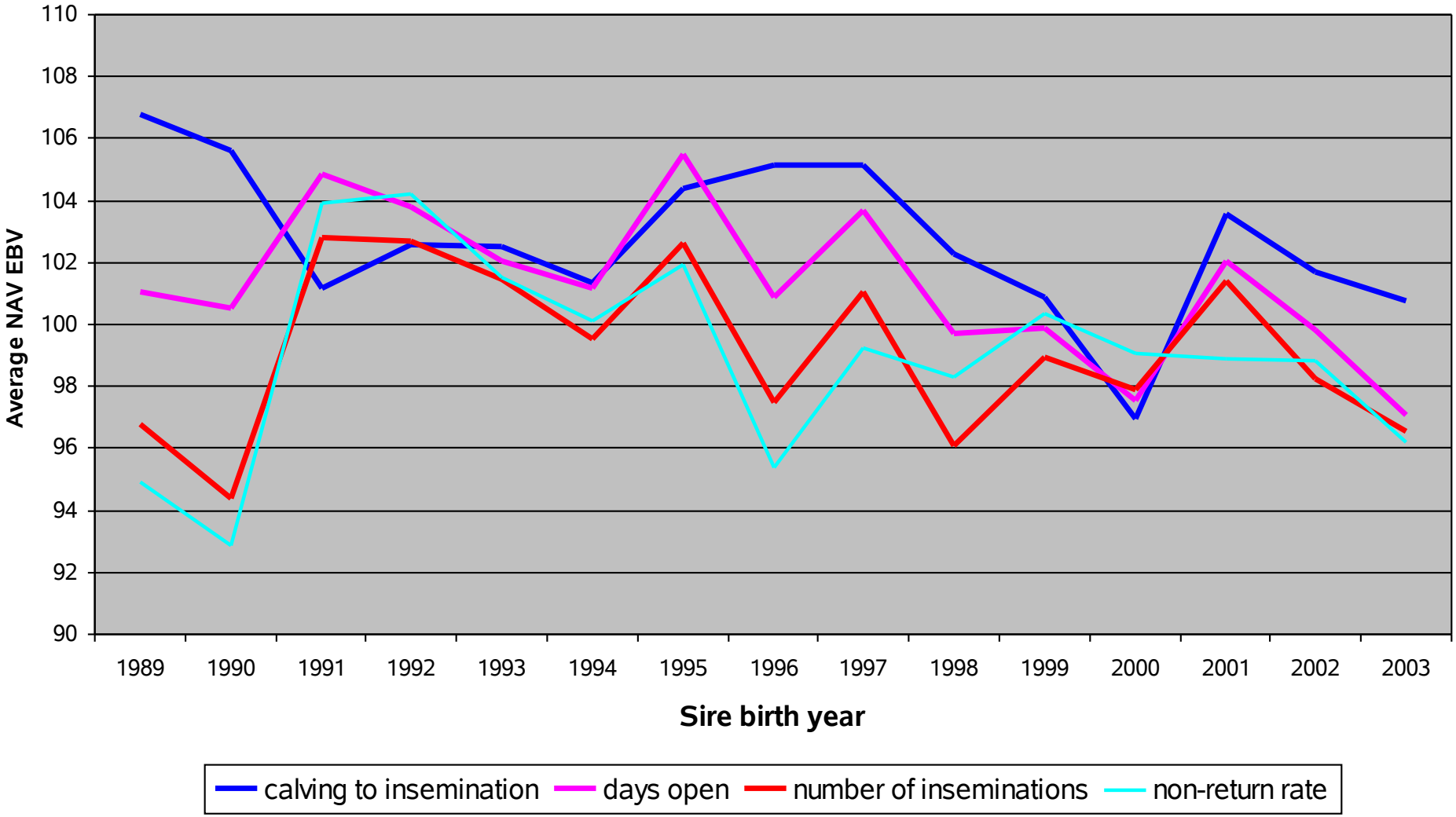
Data

- Production EBVs:
  - Milk, fat and protein production in test days 15 to 300
  - Nordic Red Cattle bulls born in 1999-2003
  - August 2008 joint Nordic breeding value estimation (NAV)
  - 516 sires with at least 100 daughters in milk evaluation
- Fertility EBVs:
  - Interval from calving to first insemination, interval from first to last insemination, number of inseminations and non-return rate
  - August 2008 joint NAV evaluation
  - The same sires as for milk EBVs
- Note: EBVs were *standardised* with mean 100 and sd 10

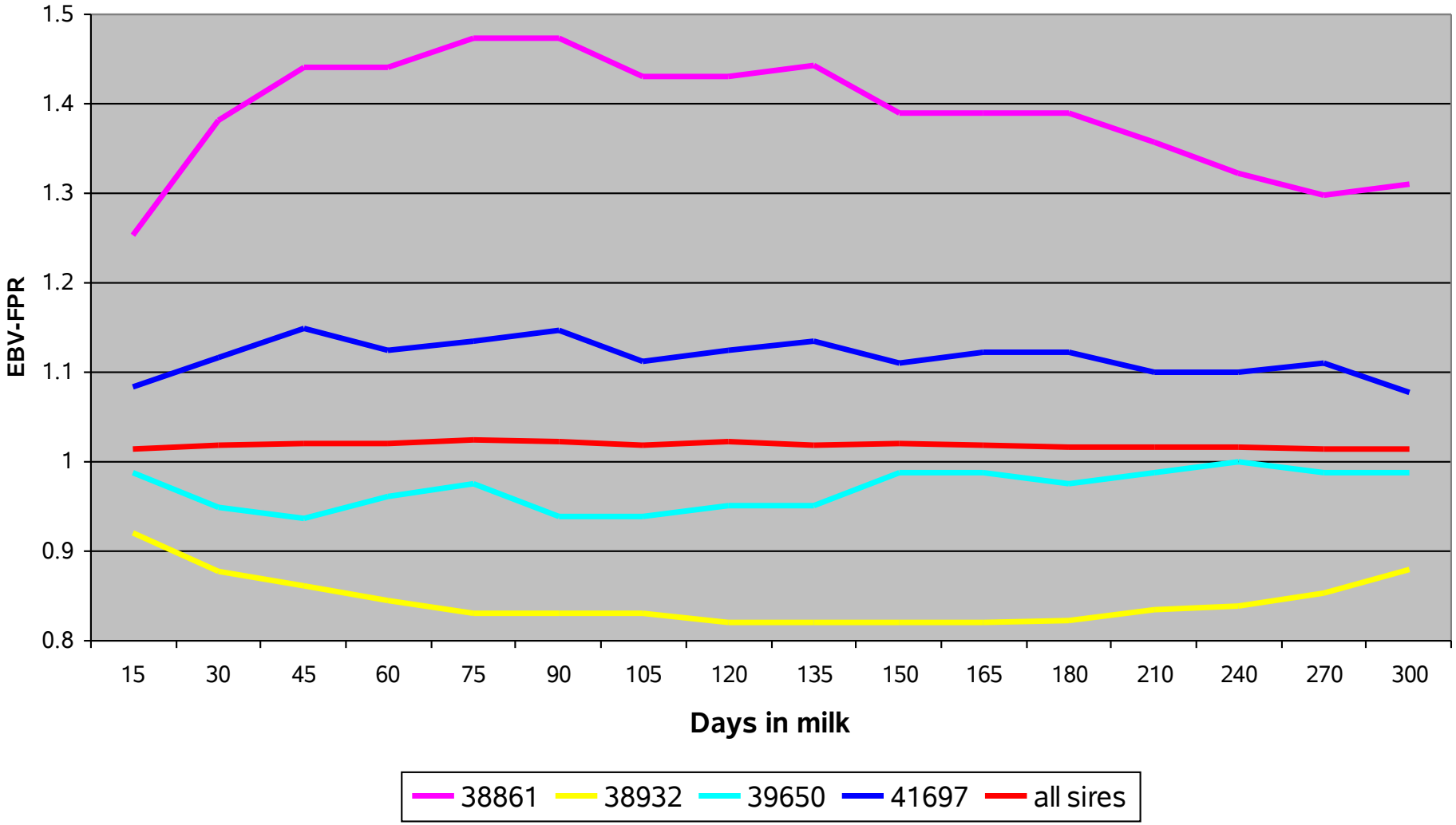
Genetic trends in milk production



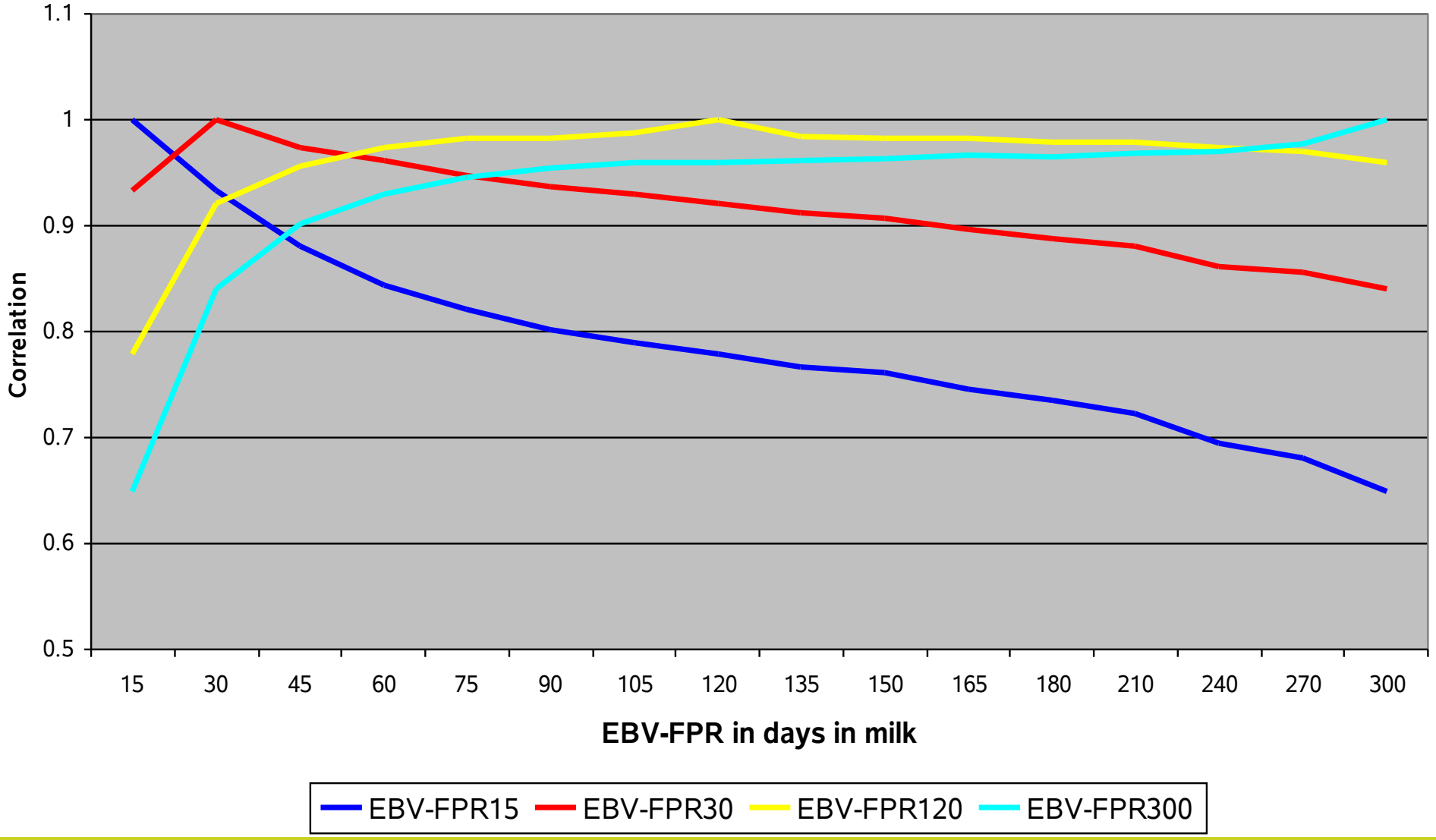
Genetic trends in fertility



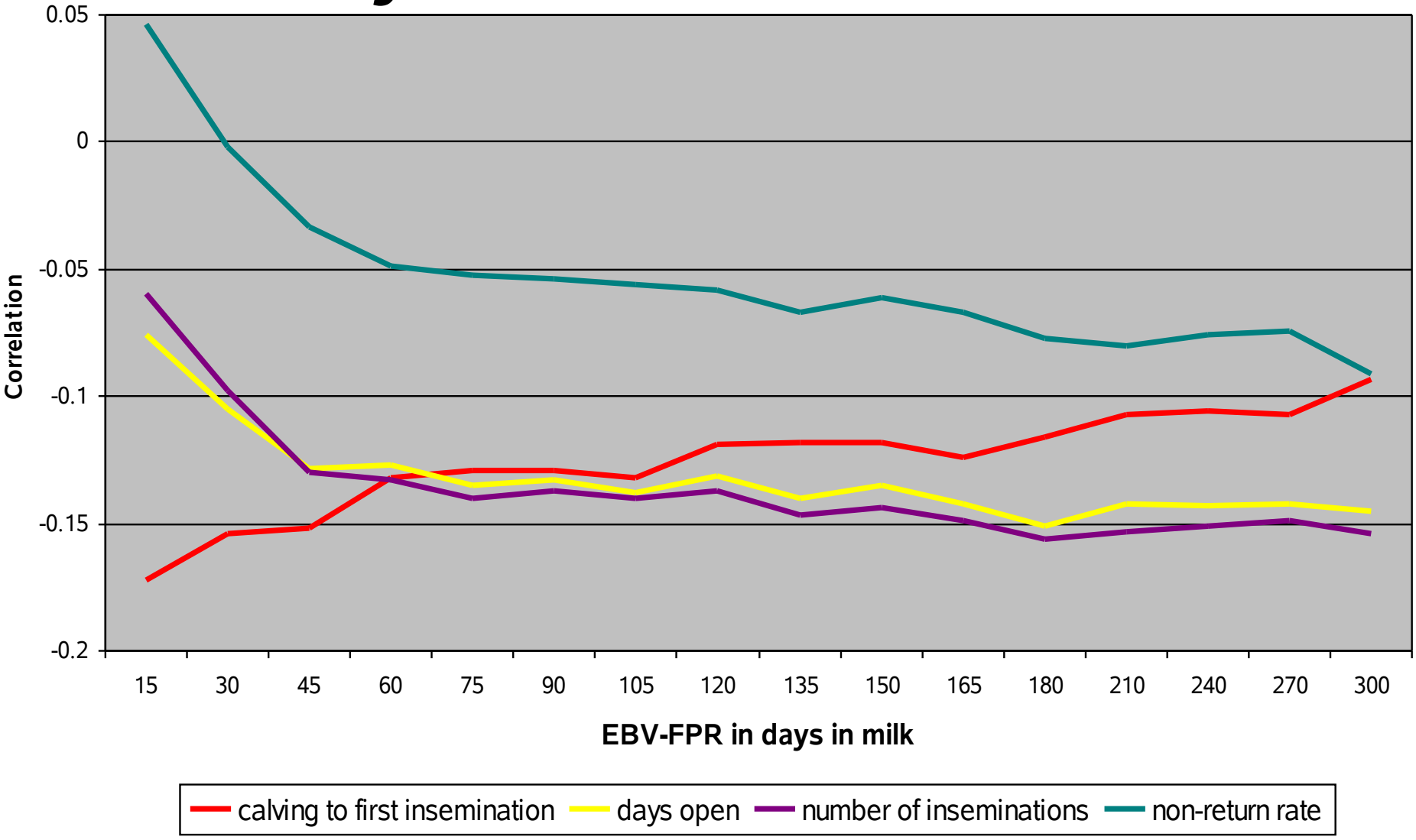
EBV-FPR of individual sires



Correlations between EBV-FPR over lactation



Correlations between EBV-FPR and fertility EBVs



Conclusions

- Correlations between EBV-FPR and fertility EBVs were negative and significant for:
  - Days from calving to first insemination
  - Days open
  - Number of inseminations
- Highest correlation was –0.17 for EBV-FPR in day 15 and days from calving to first insemination
  - Similar pattern but lower in magnitude than in the previous study on Finnish Ayrshire test day data

Implications

- Correlations between FPR and fertility traits are low, but observations on FPR can be used as an additional information when selecting bulls for fertility traits
- Potential of EBV-FPR for sire selection on fertility still requires more study