Fixed vs Random CG

L R Schaeffer

University of Guelph

July-Aug 2012

1970

- Cornell introduces NEAISC

$$y_{ijkl} = (HYS)_i + g_j + s_{jk} + e_{ijkl}$$

  - Sires unrelated, later changed to include relationships.
  - Only first lactation records.
  - Records adjusted for age and month of calving.
  - $E(y_{ijk}) = (HYS)_i + g_j$
- Henderson had his selection bias theory published in 1975(?), which he used to make HYS fixed for this sire model, to avoid bias.
- What bias? Sires were not randomly distributed among Herds.
- He thought fixed HYS was needed to overcome bias in sire EBVs - specific for a sire model - according to his selection bias theory.

1985

- Henderson visits Japan, gives course (on video)
- Henderson states that HYS are random, always
- BUT models computed as though HYS are fixed

1990's

- Robin Thompson, Dick Quaas, Daniel Gianola declare Henderson's selection bias theory as untrue, useless.
- Does this invalidate treating random HYS as fixed? Yes. Better theory needed.
- Animal models start to be used. Treating HYS as fixed only needed in sire models, sire effects are no longer in an animal model. Animals are randomly distributed among HYS.
- Treating HYS as fixed is a tradition, no one willing to change back to random CG. Follow the pack (20+ years of literature).

My Choice

- Same as Henderson, CG are random factors, ALWAYS.
- When CG size is large, there is little difference between fixed or random.
- When CG size is small, analyses are more efficient when CG are random - all data are utilized - no bias anyway.
- Simulation studies show random CG give higher correlations between true and estimated breeding values (when modeled correctly).
- Modeled correctly means there should be a time factor, like Year-Months to account for trends.

$$(HYS)_i = (YM)_i + H_{ij}$$