Preliminary results on de-regressed proof in single-step GBLUP

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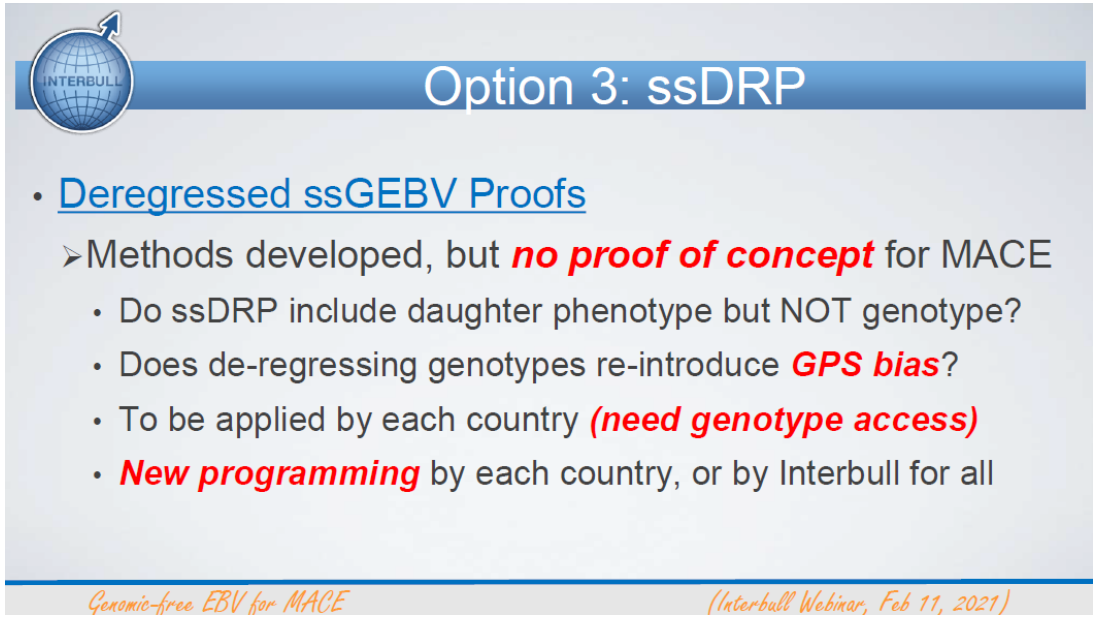
“Genomic-free” de-regression

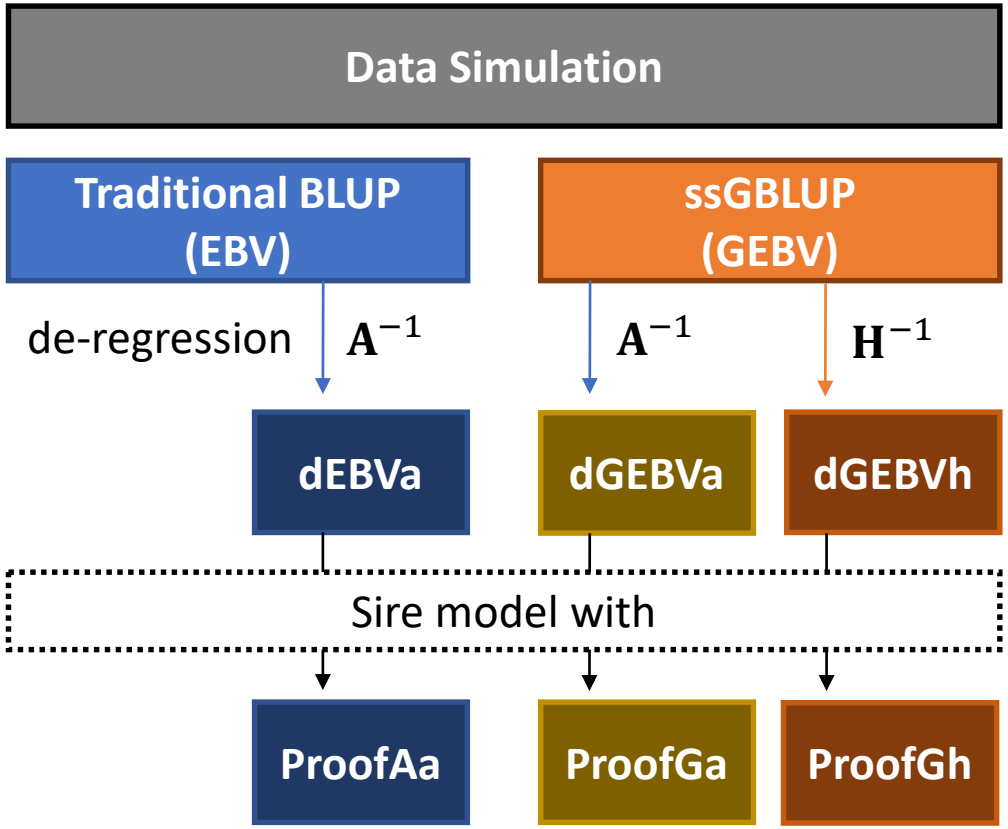


- What if using as

in each country

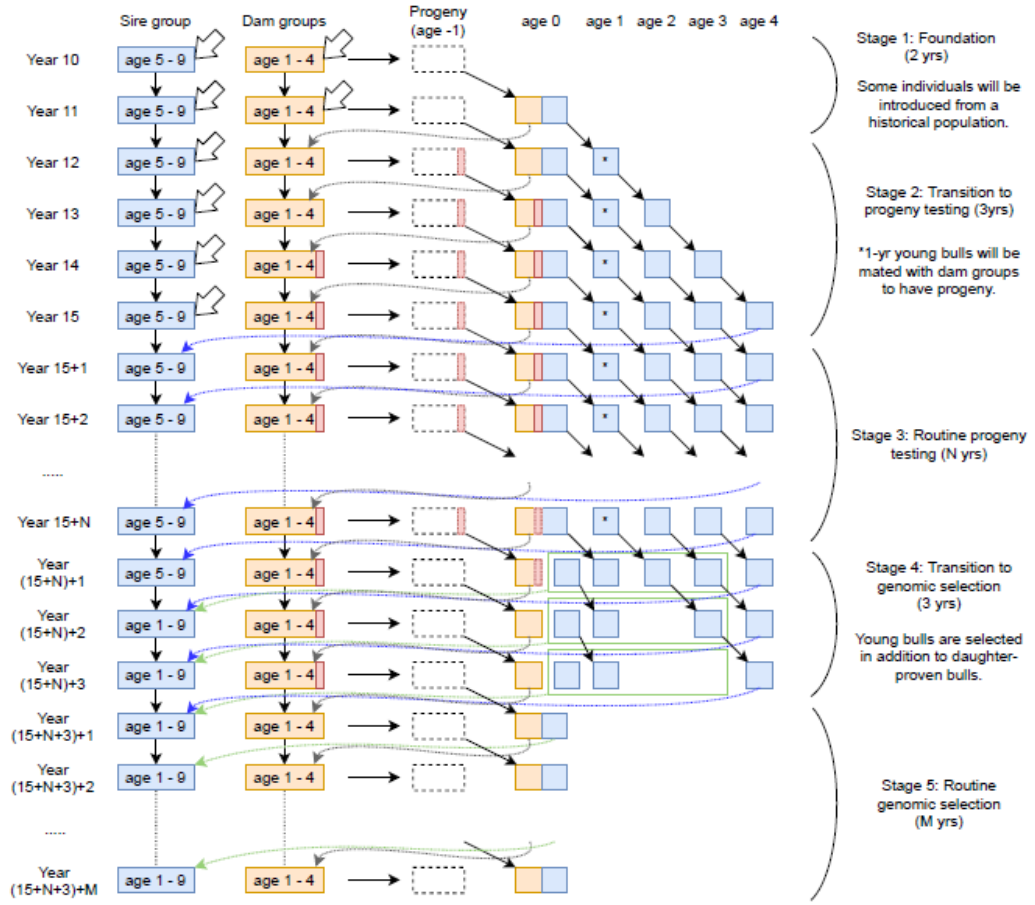
- Zengting has suggested but never published it in public.
  - What kind of animals should we use for de-regression?
  - What is the computing cost?
  - How does

Objectives



- Examine if
  - De-regressed proofs with reflect GEBV well.
  - De-regressed proofs account for the pre-selection bias in a sire model with
- Target: proven bulls
  - Genetic trend of EBV/GEBV
  - Genetic trend of re-evaluated proofs with sire model

Simulation



- Mimicking a dairy-cattle breeding program
  - Yrs 10-11: foundation
  - Yrs 12-15: transition to **progeny testing** (20 selected bulls out of 200 candidates; 40 active bulls)
  - Yrs 16-30: **progeny testing**
  - Yrs 31-33: transition to **genomic selection** (25 selected young-bulls out of 500 candidates; 50 active)
  - Yrs 34-42:

Data and model

Data	N	Description
Phenotypes	284,783	• One phenotype per cow • PT bull with at least 50 daughters • Selected bulls with 100 daughters on average per year (Gamma dist.)
Pedigree	1,541,288	• No missing parents • Dam pedigree traced back within a herd
Genotypes	6,900	• Bulls born after generation 20 • 1989 proven bulls • 4911 young bulls

- Genetic evaluation
  - and
  - Progeny testing: animal model BLUP:
  - Genomic selection: TBV + noise with reliability = REL_G (equivalent to DE=15) + REL_PA
  - Simplified EDC based on Interbull Method (Fikse and Banos, 2001)

De-regression methods

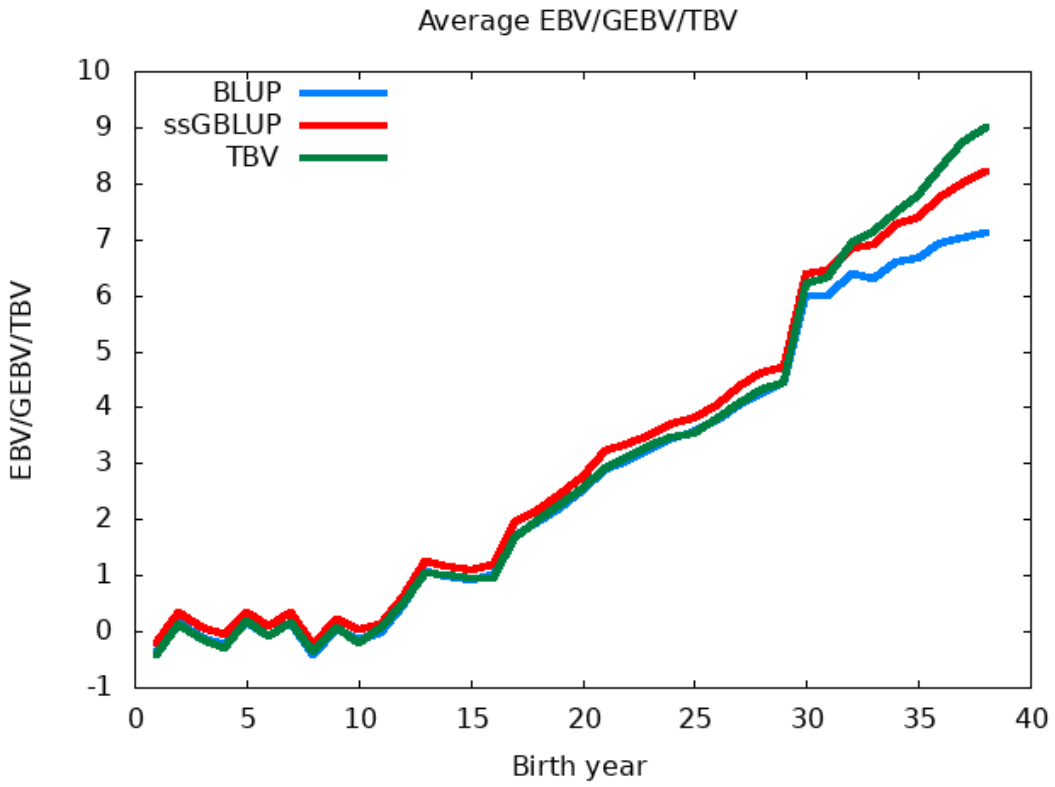
- Method 1: based on
  - Based on Jairath et al. (1998) but no UPG
  - : sire EBV, : sires' ancestor EBV,
    : diagonal matrix of EDC,
    : de-regressed proof
- Method 2: based on
  - Same as Method 1 except for replacing with
  - With all animals i.e., genotyped (both proven and young bulls) and non-genotyped animals
  - Thanks to Zengting's

Re-evaluation of de-regressed proof

- Mimicking “MACE” with de-regressed proofs
  -
    (= fixed birth-year group effect)
    It is close to the MACE model.
- Single-trait sire model with MGS pedigree

- Confirm if
  - reproduces the original GEBV.
  - Pre-selection bias in disappears.
- Thanks to Peter’s suggestion

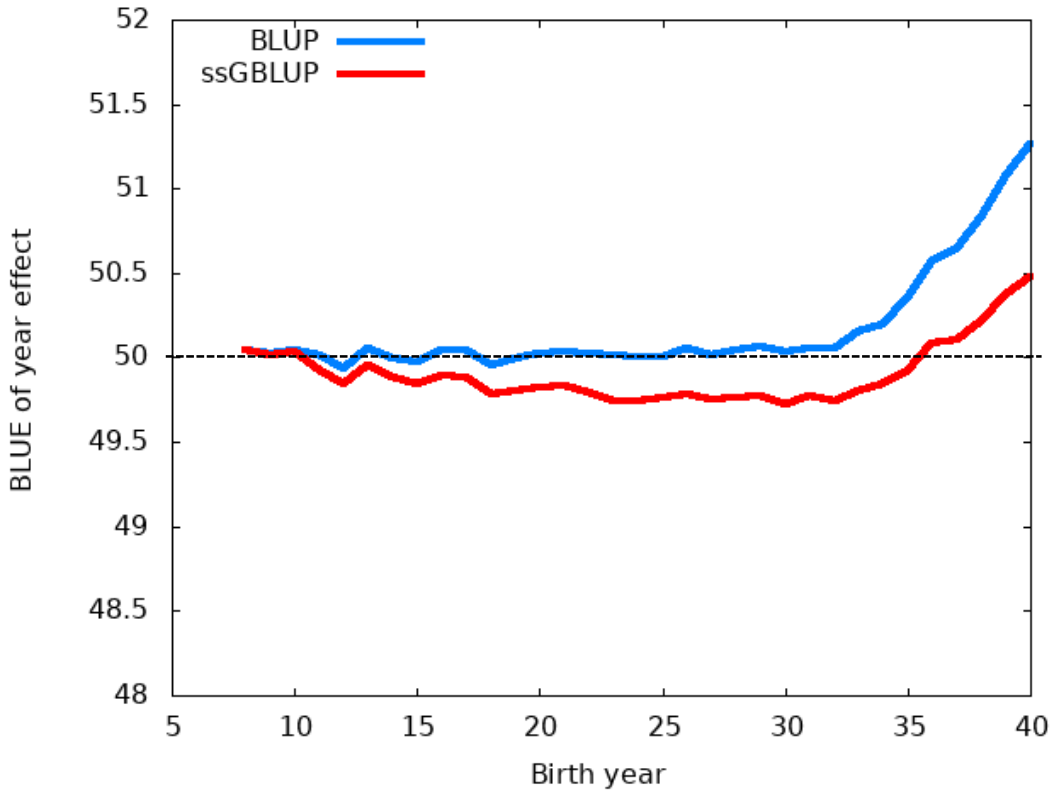
Genetic trend of TBV/EBV/GEBV



For bulls with daughters

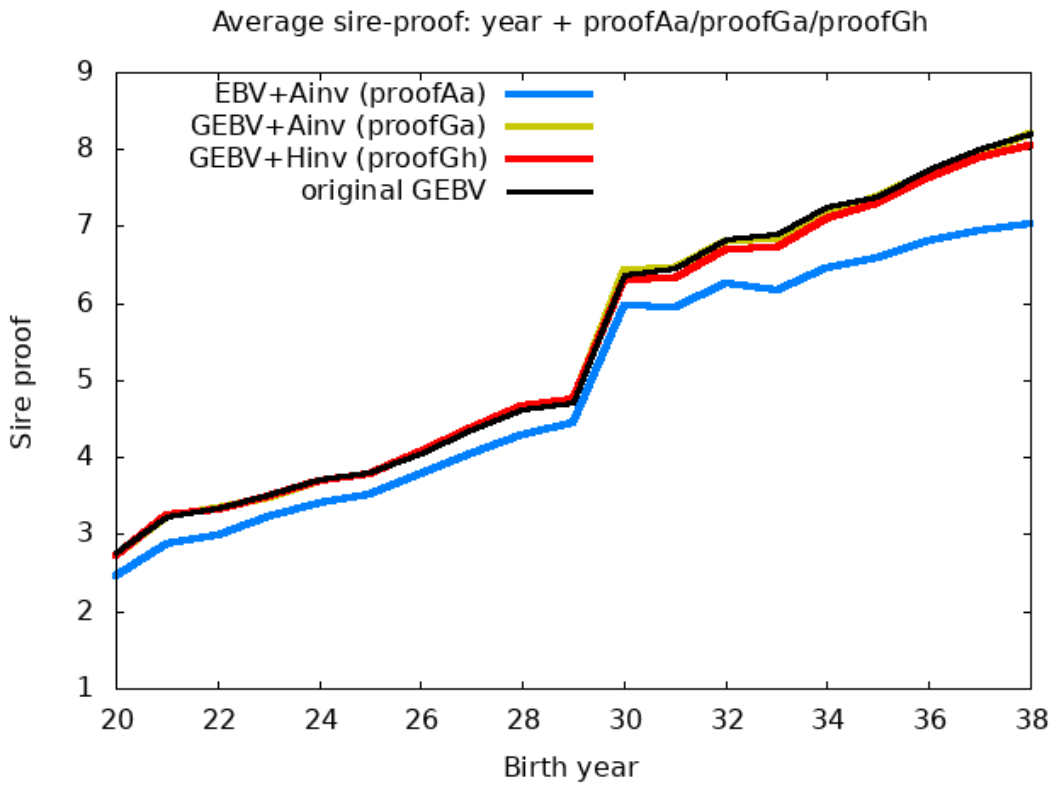
- Clear change of genetic trends after year 30
  - **EBV**: highly biased
  - **GEBV**: less but still biased
- Missing information in G
  - Selection based on pseudo GEBV (TBV + noise)
  - Only proven bulls (and young genotypes) in G
  - Small size of data

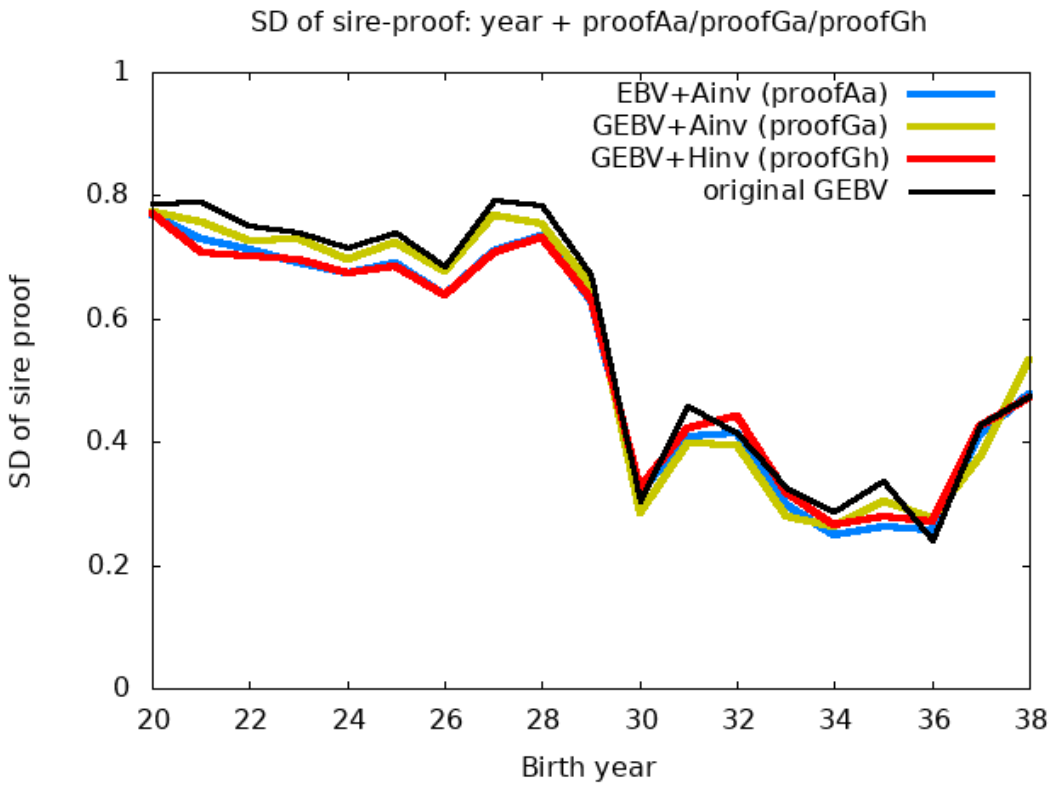
Where the bias goes?



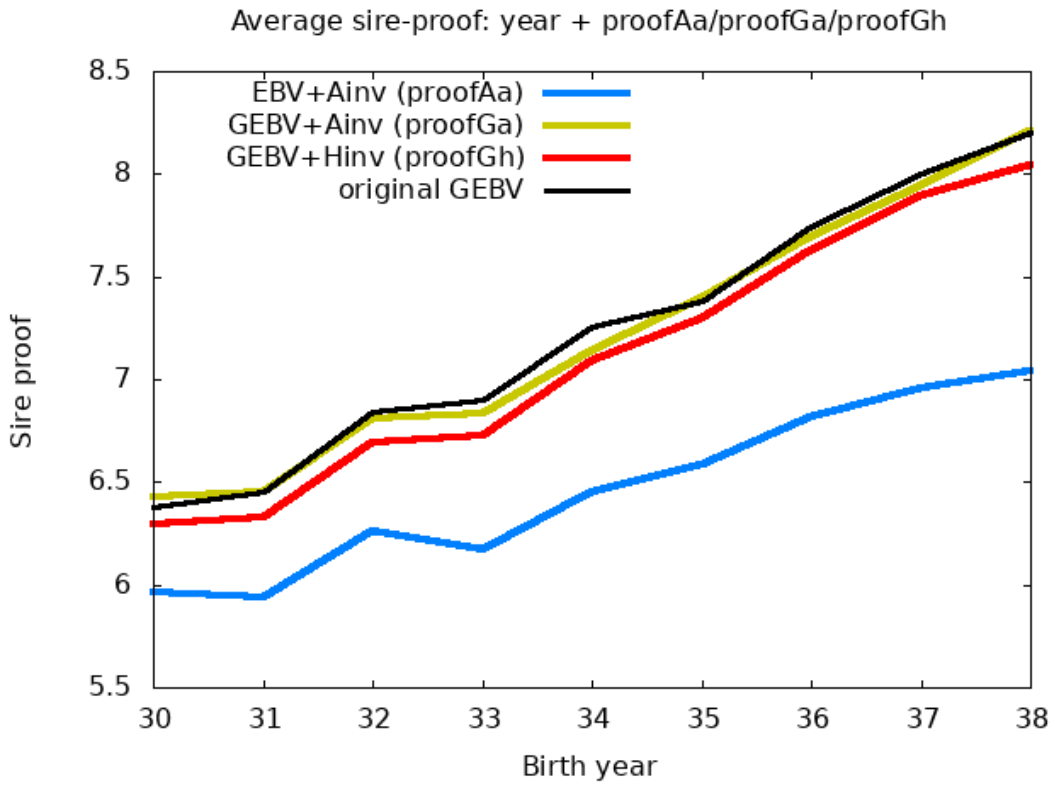
- Pre-selection bias merged to the year effect
  - Pointed out by Esa.
  - In practice, it will be confounding with herd-year or the other contemporary effects.
  - And possibly, it could be merged to UPG effects.

Sire-model proof with year effect ()





Years ≥30 ()



proof	Ga	Gh	TBV	EBV	GEBV
Aa	0.99	>0.99	0.97	0.90	0.97
Ga		>0.99	0.97	0.84	0.95
Gh			0.98	0.86	0.95
TBV				0.83	0.94
EBV					0.96

Summary

- De-regressed proofs from ssGBLUP can work.
  - Deregressed with or .
  - Able to reproduce GEBV by MACE-style sire model.
  - No pre-selection bias in reproduced sire proofs.
- … with simulated data
  - Correct validation method?
  -

- Very preliminary results: many concerns
  - Real data?
  - Genotyped daughters
  - Multiple-country data
  - Missing pedigree
  - Foreign (external) information
  - General de-regressed method: single-step GBLUP/SNPBLUP