

## Sire model

### Model description

In sire model, records are associated with sire of the animal having record. This example is from Mrode: Linear Models for the Prediction of Animal Breeding Values (CAB International, 1996, p. 49-51).

The model is:

$$\mathbf{y} = \mathbf{X}\mathbf{b} + \mathbf{Z}\mathbf{s} + \mathbf{e},$$

where

$\mathbf{y}$  is vector of pre-weaning gain observations,

$\mathbf{b}$  is vector of fixed sex effects,

$\mathbf{X}$  is design matrix to link observations to appropriate fixed effects,

$\mathbf{s}$  is vector of random additive genetic sire effects,

$\mathbf{Z}$  is design matrix to link observations to appropriate random effects, and

$\mathbf{e}$  is random residual vector.

It is assumed that  $\text{var}(\mathbf{s}) = \mathbf{A}\sigma_s^2 = \mathbf{G}$ ,  $\text{var}(\mathbf{e}) = \mathbf{I}\sigma_e^2 = \mathbf{R}$  and  $\text{cov}(\mathbf{s}, \mathbf{e}) = \text{cov}(\mathbf{e}, \mathbf{s}) = \mathbf{0}$ , where  $\mathbf{A}$  is the numerator relationship matrix for sires.

The variance components are  $\sigma_s^2 = 5.0$  and  $\sigma_e^2 = 55$ .

### Input files

#### Datafile:

The data file contains information on the data to be analyzed together with class and regression variables for the model. The data file can be in free format (columns are separated by at least one space) or in binary format.

Each record, i.e., line in a free format file, has been divided to two parts: 1) Integer number columns and 2) real number columns. Columns of real numbers are always after the integer number columns.

SM.dat

1	1	4.5
4	1	3.5
3	1	5.0
3	2	2.9
1	2	3.9

Column 1: Sire ID (integer)

Column 2: Sex of progeny (integer)

Column 3: Pre-weaning gain (real)

#### Pedigree file:

All the pedigree information must be given in the pedigree file. Each animal in the pedigree must have a record with four integers of which the fourth integer is optional.

SM.ped

1	0	0
3	0	0
4	1	0

Column 1: Animal ID

Column 2: Sire ID

Column 3: Maternal grand sire ID

### Variance component file:

The variance components file has variances and covariances for all the random effects in the model. The variance component file has a line for each (co)variance. Order of lines in the file is irrelevant.

SM.var

1	1	1	5.0
2	1	1	55.0

Column 1: Random effect number (integer)

Column 2: Row index (integer)

Column 3: Column index (integer)

Column 4: (Co)variance value (real)

### Command file:

CLIM instructions for a simple sire model analysis. Everything beyond '#' sign is considered as a comment.

SM.clm

```
TITLE Sire model; (R. Mrode, example 3.2)

DATAFILE data/SM.dat # Data file
INTEGER sire sex # Integer column names
REAL WWG # Real column names

DATASORT PEDIGREECODE=sire

PEDFILE data/SM.ped # Pedigree file
PEDIGREE sire sm # Genetics associated with animal code: am=animal model

PARFILE data/SM.var # Variance component file

PRECON b f # Preconditioner: b=block diagonal, f=full block

MODEL # The model
  WWG = sex sire
```

## Solution files

Structure of the formatted solution files depends on the model. Therefore, explanation of the content of those files is given in the printout of the particular run of the program.

MiX99-solver program has been run by command `mix99s -s`, meaning that in all parts of the program default values are used.

"Solfix"-File contains solutions for fixed effects.

Fact.	Trt	Level	N-Obs	Solution	Factor	Trait
1	1	1	3	4.3357	sex	WWG
1	1	2	2	3.3820	sex	WWG

Column 1: Factor number

Column 2: Trait number

Column 3: Level code

Column 4: Number of observations

Column 5: Solution

Column 6: Name of factor

Column 7: Name of trait

"Solani"-File contains solutions for genetic animal effect.

1	1	2	0.22002E-01
3	0	2	0.14026E-01
4	0	1	-.43042E-01

Column 1: Animal ID

Column 2: Number of descendants

Column 3: Number of observations

Column 4: Solution for trait 1 WWG and factor sire