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A STUDY OF THE VARIABILITY OF ESTIMATES OF HERITABILITY AND THEIR STANDARD ERRORS DERIVED BY PATERNAL HALF-SIB TECHNIQUES USING SIMULATED DATA

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ABSTRACT

Data sets were generated that varied in the number of sires (20, 50, 100, 150 and 200) and progeny per sire (a mean of 20, 50, 70 and 100). These data sets were generated for balanced data and, in an effort to approximate actual flock data, unbalanced data based on a normal distribution of progeny per sire with standard deviations of 2, 5 and 7. In addition, data sets were generated with a standard deviation of 14, 25 and 29 progeny per sire, but for data set size of 100 sires with a mean of 100 progeny per sire, only. Also, numbers of progeny per sire and numbers of sires from 6 actual flocks were used to generate data sets. The sets were generated to conform with a 1-way random model with the sire variance set at 0.6783 and error variance at 11.0106, giving a paternal half-sib heritability of 0.2321. Each combination of number of sire and progeny per sire was generated 100 times (i.e. 100 replicates) at each level of unbalance. Sire and error variances and heritabilities were estimated, as well as their standard errors, for each replicate using Henderson’s Method 1 (HM), Maximum Likelihood (ML) and Restricted Maximum Likelihood (REML).

There was good agreement between the population heritabilities and sire and error variances, and the corresponding mean of the replicates that made up each data set. There was also little difference between the results of the 3 methods of estimating the variance components. The Mean Squared Error (MSE) was similar for each method except for the data sets based on the flocks where the MSE of the sire variances for HM was larger than those for ML and REML. The MSE was largest for data sets consisting of 20 sires and 50 sires with a mean of 20 progeny per sire.

The standard errors of the heritability and sire and error variances appear to be good indicators of the variation of estimates within data sets regardless of the level of unbalance or method of estimation.

The differences between heritability estimates from 31 flocks for weaning weight of Coopworth lambs was shown to be greater than that estimated by the standard error. The implications of this are discussed with respect to the problems of pooling estimates from various sources.
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To those who contributed to the thesis and my well being during the time of study, but are uncited in the acknowledgements, I offer the following:

“We are a tired, nerve shaken, over-civilised people, finding out that going to the mountains is going home, that wildness is a necessity, that parks are fountains of life.”

(John Muir, 1838-1914)
# Table of Contents

ABSTRACT ii
ACKNOWLEDGEMENTS iii
TABLE OF CONTENTS iv
LIST OF TABLES vi
LIST OF FIGURES xviii
CHAPTER ONE: INTRODUCTION 1
CHAPTER TWO: REVIEW OF LITERATURE 3
  2.1 Introduction 3
  2.2 Estimation of Variance Components 3
    2.2.1 Balanced Data 3
    2.2.2 Unbalanced Data 4
    2.2.2.1 Henderson's Methods 4
    2.2.2.2 Maximum Likelihood Techniques 6
  2.3 Estimation of Standard Error of Variance Components 7
    2.3.1 ANOVA Type Methods 7
    2.3.2 ML Methods 19
  2.4 Estimation of Heritabilities 20
    2.4.1 Sampling Variance of Heritability Estimated by Paternal Half-sib 21
CHAPTER THREE: MATERIAL AND METHODS 24
CHAPTER FOUR: RESULTS AND DISCUSSION 32
  4.1 Heritabilities 32
    4.1.1 Heritability Estimates 41
    4.1.2 Standard Errors of the Heritability Estimates 41
  4.2 Sire Variances 50
    4.2.1 Variance Estimates 50
    4.2.2 Standard Errors of the Sire Variance Estimates 58
  4.3 Error Variances 66
    4.3.1 Variance Estimates 66
    4.3.2 Standard Errors of the Error Variance Estimates 75
  4.4 General Discussion 81
CHAPTER FIVE: CONCLUSION 85
APPENDICES 86
  Appendix 1: Computer Programmes Used to Generate Data 86
  Appendix 2: Raw Data Summaries 89
List of Tables

3.1 The minimum and maximum number of progeny per sire, actual standard deviation and estimate of unbalance (γ) for data sets from data type SD2. 25
3.2 The minimum and maximum number of progeny per sire, actual standard deviation and estimate of unbalance (γ) for data sets from data type SD5. 25
3.3 The minimum and maximum number of progeny per sire, actual standard deviation and estimate of unbalance (γ) for data sets from data type SD7. 26
3.4 The minimum and maximum number of progeny per sire, actual standard deviation and estimate of unbalance (γ) for data types SD15, SD25 and SD29. 26
3.5 The number of sires (SIRES), mean number of progeny per sire (MEAN), minimum (MIN) and maximum (MAX) number of progeny per sire, standard deviation of progeny per sire (SD) and estimate of unbalance (γ) for flocks A to F. 34
4.1 Number of replicates from HM heritability estimates that have the population heritability falling above and below the 90% confidence intervals for data type SD0. 35
4.2 The mean of the data set heritabilities, estimated using HM, ML and REML, for data types SD14, SD25 and SD29. 35
4.3 The mean of the data set heritabilities, estimated using HM, ML and REML, for flocks A, B, C, D, E and F. 39
4.4 Mean squared errors (×10³) of HM heritability estimates for data sets from data types SD0, SD2, SD5 and SD7. 40
4.5 Mean squared errors (×10³) of ML heritability estimates for data sets from data types SD0, SD2, SD5 and SD7. 40
4.6 Mean squared errors (×10³) of REML heritability estimates for data sets from data types SD0, SD2, SD5 and SD7. 40
4.7 Mean squared errors (×10³) of HM, ML and REML heritability estimates for data types SD14, SD25 and SD29. 40
4.8 Mean squared errors (×10³) of HM, ML and REML heritability estimates for flocks A, B, C, D, E and F. 40
4.9 Mean squared errors (×10⁴) of HM heritability approximate standard errors for data sets from data types SD0, SD2, SD5 and SD7. 47
4.10 Mean squared errors (×10⁴) of ML heritability approximate standard errors for data sets from data types SD0, SD2, SD5 and SD7. 48
4.11 Mean squared errors (×10⁴) of REML heritability approximate standard errors for data sets from data types SD0, SD2, SD5 and SD7. 48
4.12 Mean squared errors \((\times 10^4)\) of HM, ML and REML heritability approximate standard errors for the data types SD14, SD25 and SD29.

4.13 Mean squared errors \((\times 10^3)\) of HM, ML and REML heritability approximate standard errors for flocks A, B, C, D, E and F.

4.14 Number of replicates from HM sire variance estimates that have the population sire variance falling above and below the 90% confidence intervals for data type SD0.

4.15 The mean of the data set sire variances, estimated using HM, ML and REML, for data types SD14, SD25 and SD29.

4.16 The mean of the data set sire variances, estimated using HM, ML and REML, for flocks A, B, C, D, E and F.

4.17 Mean squared errors \((\times 10^2)\) of HM sire variances for data sets from data types SD0, SD2, SD5 and SD7.

4.18 Mean squared errors \((\times 10^2)\) of ML sire variances for data sets from data types SD0, SD2, SD5 and SD7.

4.19 Mean squared errors \((\times 10^2)\) of REML sire variances for data sets from data types SD0, SD2, SD5 and SD7.

4.20 Mean squared errors \((\times 10^2)\) of HM, ML and REML sire variances for the data types SD14, SD25 and SD29.

4.21 Mean squared errors \((\times 10^2)\) of HM, ML and REML sire variances for flocks A, B, C, D, E and F.

4.22 Mean squared errors \((\times 10^3)\) of HM sire variance standard errors for data sets from data types SD0, SD2, SD5 and SD7.

4.23 Mean squared errors \((\times 10^3)\) of ML sire variance standard errors for data sets from data types SD0, SD2, SD5 and SD7.

4.24 Mean squared errors \((\times 10^3)\) of REML sire variance standard errors for data sets from data types SD0, SD2, SD5 and SD7.

4.25 Mean squared errors \((\times 10^3)\) of HM, ML and REML sire variance approximate standard errors for the data types SD14, SD25 and SD29.

4.26 Mean squared errors \((\times 10^3)\) of HM, ML and REML sire variance approximate standard errors for flocks A, B, C, D, E and F.

4.27 Number of replicates from HM error variance estimates that have the population error variance falling above and below the 90% confidence intervals for data types SD0, SD2, SD5 and SD7.

4.28 The mean of the data set error variances, estimated using HM, ML and REML, for data types SD14, SD25 and SD29.

4.29 The mean of the data set error variances, estimated using HM, ML and REML, for flocks A, B, C, D, E and F.
4.30 Mean squared errors ($\times 10^1$) of HM error variances for data sets from data types SD0, SD2, SD5 and SD7.

4.31 Mean squared errors ($\times 10^1$) of ML error variances for data sets from data types SD0, SD2, SD5 and SD7.

4.32 Mean squared errors ($\times 10^1$) of REML error variances for data sets from data types SD0, SD2, SD5 and SD7.

4.33 Mean squared errors ($\times 10^1$) of HM, ML and REML error variances for the data types SD14, SD25 and SD29.

4.34 Mean squared errors ($\times 10^1$) of HM, ML and REML error variances for flocks A, B, C, D, E and F.

4.35 Mean squared errors ($\times 10^3$) of HM error variance standard errors for data sets from data types SD0, SD2, SD5 and SD7.

4.36 Mean squared errors ($\times 10^3$) of ML error variance standard errors for data sets from data types SD0, SD2, SD5 and SD7.

4.37 Mean squared errors ($\times 10^3$) of REML error variance standard errors for data sets from data types SD0, SD2, SD5 and SD7.

4.38 Mean squared errors ($\times 10^3$) of HM, ML and REML error variance standard errors for the data types SD14, SD25 and SD29.

4.39 Mean squared errors ($\times 10^3$) of HM, ML and REML error variance standard errors for flocks A, B, C, D, E and F.

4.40 Within-flock heritability estimates, standard errors of heritability estimates, number of observations and sires nested within-years for weaning weight (from Rendel, 1985).

A.2.1 The mean, minimum, maximum and standard deviation of HM heritability estimates from data sets with a population heritability of 0.2321, each with 100 replicates, for balanced data (SD0).

A.2.2 The mean, minimum, maximum and standard deviation of ML heritability estimates from data sets with a population heritability of 0.2321, each with 100 replicates, for balanced data (SD0).

A.2.3 The mean, minimum, maximum and standard deviation of REML heritability estimates from data sets with a population heritability of 0.2321, each with 100 replicates, for balanced data (SD0).

A.2.4 The mean, minimum, maximum and standard deviation of HM heritability approximate standard errors from data sets with a population heritability of 0.2321, each with 100 replicates, for balanced data (SD0).

A.2.5 The mean, minimum, maximum and standard deviation of ML heritability approximate standard errors from data sets with a population heritability of 0.2321, each with 100 replicates, for balanced data (SD0).

A.2.6 The mean, minimum, maximum and standard deviation of REML heritability approximate standard errors from data sets with a population heritability of 0.2321, each with 100 replicates, for balanced data (SD0).
| A.2.7 | The mean, minimum, maximum and standard deviation of HM sire variance estimates from data sets with a population sire variance of 0.6783, each with 100 replicates, for balanced data (SD0). |
| A.2.8 | The mean, minimum, maximum and standard deviation of ML sire variance estimates from data sets with a population sire variance of 0.6783, each with 100 replicates, for balanced data (SD0). |
| A.2.9 | The mean, minimum, maximum and standard deviation of REML sire variance estimates from data sets with a population sire variance of 0.6783, each with 100 replicates, for balanced data (SD0). |
| A.2.10 | The mean, minimum, maximum and standard deviation of HM sire variance large sample standard errors from data sets with a population sire variance of 0.6783, each with 100 replicates, for balanced data (SD0). |
| A.2.11 | The mean, minimum, maximum and standard deviation of ML sire variance large sample standard errors from data sets with a population sire variance of 0.6783, each with 100 replicates, for balanced data (SD0). |
| A.2.12 | The mean, minimum, maximum and standard deviation of REML sire variance large sample standard errors from data sets with a population sire variance of 0.6783, each with 100 replicates, for balanced data (SD0). |
| A.2.13 | The mean, minimum, maximum and standard deviation of HM error variance estimates from data sets with a population error variance of 11.0106, each with 100 replicates, for balanced data (SD0). |
| A.2.14 | The mean, minimum, maximum and standard deviation of ML error variance estimates from data sets with a population error variance of 11.0106, each with 100 replicates, for balanced data (SD0). |
| A.2.15 | The mean, minimum, maximum and standard deviation of REML error variance estimates from data sets with a population error variance of 11.0106, each with 100 replicates, for balanced data (SD0). |
| A.2.16 | The mean, minimum, maximum and standard deviation of HM error variance large sample standard errors from data sets with a population error variance of 11.0106, each with 100 replicates, for balanced data (SD0). |
| A.2.17 | The mean, minimum, maximum and standard deviation of ML error variance large sample standard errors from data sets with a population error variance of 11.0106, each with 100 replicates, for balanced data (SD0). |
| A.2.18 | The mean, minimum, maximum and standard deviation of REML error variance large sample standard errors from data sets with a population error variance of 11.0106, each with 100 replicates, for balanced data (SD0). |
| A.2.19 | The mean, minimum, maximum and standard deviation of HM heritability estimates from data sets with a population heritability of 0.2321, each with 100 replicates, for data type SD2. |
| A.2.20 | The mean, minimum, maximum and standard deviation of ML heritability estimates from data sets with a population heritability of 0.2321, each with 100 replicates, for data type SD2. |
A.2.21 The mean, minimum, maximum and standard deviation of REML heritability estimates from data sets with a population heritability of 0.2321, each with 100 replicates, for data type SD2.

A.2.22 The mean, minimum, maximum and standard deviation of HM heritability approximate standard errors from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD2.

A.2.23 The mean, minimum, maximum and standard deviation of ML heritability approximate standard errors from data sets with a population heritability of 0.2321, each with 100 replicates, for data type SD2.

A.2.24 The mean, minimum, maximum and standard deviation of REML heritability approximate standard errors from data sets with a population heritability of 0.2321, each with 100 replicates, for data type SD2.

A.2.25 The mean, minimum, maximum and standard deviation of HM sire variance estimates from data sets with a population sire variance of 0.6783, each with 100 replicates, for data type SD2.

A.2.26 The mean, minimum, maximum and standard deviation of ML sire variance estimates from data sets with a population sire variance of 0.6783, each with 100 replicates, for data type SD2.

A.2.27 The mean, minimum, maximum and standard deviation of REML sire variance estimates from data sets with a population sire variance of 0.6783, each with 100 replicates, for data type SD2.

A.2.28 The mean, minimum, maximum and standard deviation of HM sire variance large sample standard errors from data sets with a population sire variance of 0.6783, each with 100 replicates, for data type SD2.

A.2.29 The mean, minimum, maximum and standard deviation of ML sire variance large sample standard errors from data sets with a population sire variance of 0.6783, each with 100 replicates, for data type SD2.

A.2.30 The mean, minimum, maximum and standard deviation of REML sire variance large sample standard errors from data sets with a population sire variance of 0.6783, each with 100 replicates, for data type SD2.

A.2.31 The mean, minimum, maximum and standard deviation of HM error variance estimates from data sets with a population error variance of 11.0106, each with 100 replicates, for data type SD2.

A.2.32 The mean, minimum, maximum and standard deviation of ML error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD2.

A.2.33 The mean, minimum, maximum and standard deviation of REML error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD2.

A.2.34 The mean, minimum, maximum and standard deviation of HM error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD2.
A.2.35 The mean, minimum, maximum and standard deviation of ML error variance
large sample standard errors from data sets, with a population error variance
of 11.0106, each with 100 replicates, for data type SD2.

A.2.36 The mean, minimum, maximum and standard deviation of REML error variance
large sample standard errors from data sets, with a population error variance
of 11.0106, each with 100 replicates, for data type SD2.

A.2.37 The mean, minimum, maximum and standard deviation of HM heritability
estimates from data sets, with a population heritability of 0.2321, each with
100 replicates, for data type SD5.

A.2.38 The mean, minimum, maximum and standard deviation of ML heritability
estimates from data sets, with a population heritability of 0.2321, each with
100 replicates, for data type SD5.

A.2.39 The mean, minimum, maximum and standard deviation of REML heritability
estimates from data sets, with a population heritability of 0.2321, each with 100
replicates, for data type SD5.

A.2.40 The mean, minimum, maximum and standard deviation of HM heritability
approximate standard errors from data sets, with a population heritability of
0.2321, each with 100 replicates, for data type SD5.

A.2.41 The mean, minimum, maximum and standard deviation of ML heritability
approximate standard errors from data sets, with a population heritability of
0.2321, each with 100 replicates, for data type SD5.

A.2.42 The mean, minimum, maximum and standard deviation of REML heritability
approximate standard errors from data sets, with a population heritability of
0.2321, each with 100 replicates, for data type SD5.

A.2.43 The mean, minimum, maximum and standard deviation of HM sire variance
estimates from data sets, with a population sire variance of 0.6783, each with
100 replicates, for data type SD5.

A.2.44 The mean, minimum, maximum and standard deviation of ML sire variance
estimates from data sets, with a population sire variance of 0.6783, each with
100 replicates, for data type SD5.

A.2.45 The mean, minimum, maximum and standard deviation of REML sire variance
estimates from data sets, with a population sire variance of 0.6783, each with 100
replicates, for data type SD5.

A.2.46 The mean, minimum, maximum and standard deviation of HM sire variance
large sample standard errors from data sets, with a population sire variance
of 0.6783, each with 100 replicates, for data type SD5.

A.2.47 The mean, minimum, maximum and standard deviation of ML sire variance
large sample standard errors from data sets, with a population sire variance
of 0.6783, each with 100 replicates, for data type SD5.

A.2.48 The mean, minimum, maximum and standard deviation of ML sire variance
large sample standard errors from data sets, with a population sire variance
of 0.6783, each with 100 replicates, for data type SD5.
A.2.49 The mean, minimum, maximum and standard deviation of HM error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD5.

A.2.50 The mean, minimum, maximum and standard deviation of ML error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD5.

A.2.51 The mean, minimum, maximum and standard deviation of REML error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD5.

A.2.52 The mean, minimum, maximum and standard deviation of HM error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD5.

A.2.53 The mean, minimum, maximum and standard deviation of ML error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD5.

A.2.54 The mean, minimum, maximum and standard deviation of REML error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD5.

A.2.55 The mean, minimum, maximum and standard deviation of HM heritability estimates from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD7.

A.2.56 The mean, minimum, maximum and standard deviation of ML heritability estimates from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD7.

A.2.57 The mean, minimum, maximum and standard deviation of REML heritability estimates from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD7.

A.2.58 The mean, minimum, maximum and standard deviation of HM heritability approximate standard errors from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD7.

A.2.59 The mean, minimum, maximum and standard deviation of ML heritability approximate standard errors from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD7.

A.2.60 The mean, minimum, maximum and standard deviation of REML heritability approximate standard errors from data sets, with a population heritability of 0.2321, each with 100 replicates, for data type SD7.

A.2.61 The mean, minimum, maximum and standard deviation of HM sire variance estimates from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data type SD7.

A.2.62 The mean, minimum, maximum and standard deviation of ML sire variance estimates from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data type SD7.
A.2.63 The mean, minimum, maximum and standard deviation of REML sire variance estimates from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data type SD7.

A.2.64 The mean, minimum, maximum and standard deviation of HM sire variance large sample standard errors from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data type SD7.

A.2.65 The mean, minimum, maximum and standard deviation of ML sire variance large sample standard errors from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data type SD7.

A.2.66 The mean, minimum, maximum and standard deviation of REML sire variance large sample standard errors from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data type SD7.

A.2.67 The mean, minimum, maximum and standard deviation of HM error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD7.

A.2.68 The mean, minimum, maximum and standard deviation of ML error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD7.

A.2.69 The mean, minimum, maximum and standard deviation of REML error variance estimates from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD7.

A.2.70 The mean, minimum, maximum and standard deviation of HM error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD7.

A.2.71 The mean, minimum, maximum and standard deviation of ML error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD7.

A.2.72 The mean, minimum, maximum and standard deviation of REML error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data type SD7.

A.2.73 The mean, minimum, maximum and standard deviation of HM, ML and REML heritability estimates from data sets, with a population heritability of 0.2321, each with 100 replicates, for data types SD14, SD25 and SD29.

A.2.74 The mean, minimum, maximum and standard deviation of HM, ML and REML heritability approximate standard errors from data sets, with a population heritability of 0.2321, each with 100 replicates, for data types SD14, SD25 and SD29.

A.2.75 The mean, minimum, maximum and standard deviation of HM, ML and REML sire variance estimates from data sets, with a population sire variance of 0.6783 with 100 replicates, for data types SD14, SD25 and SD29.

A.2.76 The mean, minimum, maximum and standard deviation of HM, ML and REML sire variance large sample standard errors from data sets, with a population sire variance of 0.6783, each with 100 replicates, for data types SD14, SD25 and SD29.
A.2.77 The mean, minimum, maximum and standard deviation of HM, ML and REML error variance estimates from data sets, with a population error variance of 11.0106 with 100 replicates, for data types SD14, SD25 and SD29.

A.2.78 The mean, minimum, maximum and standard deviation of HM, ML and REML error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for data types SD14, SD25 and SD29.

A.2.79 The mean, minimum, maximum and standard deviation of HM, ML and REML heritability estimates from data sets, with a population heritability of 0.2321, each with 100 replicates, for flocks A, B, C, D, E and F.

A.2.80 The mean, minimum, maximum and standard deviation of HM, ML and REML heritability approximate standard errors from data sets, with a population heritability of 0.2321, each with 100 replicates, for flocks A, B, C, D, E, and F.

A.2.81 The mean, minimum, maximum and standard deviation of HM, ML and REML sire variance estimates from data sets, with a population sire variance of 0.6783 with 100 replicates, for flocks A, B, C, D, E, and F.

A.2.82 The mean, minimum, maximum and standard deviation of HM, ML and REML sire variance large sample standard errors from data sets, with a population sire variance of 0.6783, each with 100 replicates, for flocks A, B, C, D, E and F.

A.2.83 The mean, minimum, maximum and standard deviation of HM, ML and REML error variance estimates from data sets, with a population error variance of 11.0106 with 100 replicates, for flocks A, B, C, D, E and F.

A.2.84 The mean, minimum, maximum and standard deviation of HM, ML and REML error variance large sample standard errors from data sets, with a population error variance of 11.0106, each with 100 replicates, for flocks A, B, C, D, E and F.

A.3.1 Differences between the mean of the heritabilities, estimated using HM, ML and REML, and the population value (0.2321) for data sets from data type SD0.

A.3.2 Differences between the mean of the heritabilities, estimated using HM, ML and REML, and the population value (0.2321) for data sets from data type SD2.

A.3.3 Differences between the mean of the heritabilities, estimated using HM, ML and REML, and the population value (0.2321) for data sets from data type SD5.

A.3.4 Differences between the mean of the heritabilities, estimated using HM, ML and REML, and the population value (0.2321) for data sets from data type SD7.

A.3.5 Differences between the mean of the heritability standard error, estimated using HM, ML and REML, and the standard deviation of the heritability estimates for data sets from data type SD0.

A.3.6 Differences between the mean of the heritability standard error, estimated using HM, ML and REML, and the standard deviation of the heritability estimates for data sets from data type SD2.
A.3.7 Differences between the mean of the heritability standard error, estimated using HM, ML and REML, and the standard deviation of the heritability estimates for data sets from data type SD5.

A.3.8 Differences between the mean of the heritability standard error, estimated using HM, ML and REML, and the standard deviation of the heritability estimates for data sets from data type SD7.

A.3.9 Differences between the mean of the sire variances, estimated using HM, ML and REML, and the population value (0.6783) for data sets from data type SD0.

A.3.10 Differences between the mean of the sire variances, estimated using HM, ML and REML, and the population value (0.6783) for data sets from data type SD2.

A.3.11 Differences between the mean of the sire variances, estimated using HM, ML and REML, and the population value (0.6783) for data sets from data type SD5.

A.3.12 Differences between the mean of the sire variances, estimated using HM, ML and REML, and the population value (0.6783) for data sets from data type SD7.

A.3.13 Differences between the mean of the sire variance standard errors, estimated using HM, ML and REML, and the standard deviation of the sire variance estimates for data sets from data type SD0.

A.3.14 Differences between the mean of the sire variance standard errors, estimated using HM, ML and REML, and the standard deviation of the sire variance estimates for data sets from data type SD2.

A.3.15 Differences between the mean of the sire variance standard errors, estimated using HM, ML and REML, and the standard deviation of the sire variance estimates for data sets consisting from data type SD5.

A.3.16 Differences between the mean of the sire variance standard errors, estimated using HM, ML and REML, and the standard deviation of the sire variance estimates for data from data type SD7.

A.3.17 Differences between the mean of the error variances, estimated using HM, ML and REML, and the population value (11.0106) for data sets from data type SD0.

A.3.18 Differences between the mean of the error variances, estimated using HM, ML and REML, and the population value (11.0106) for data sets from data type SD2.

A.3.19 Differences between the mean of the error variances, estimated using HM, ML and REML, and the population value (11.0106) for data sets from data type SD5.

A.3.20 Differences between the mean of the error variances, estimated using HM, ML and REML, and the population value (11.0106) for data sets from data type SD7.

A.3.21 Differences between the mean of the error variance standard errors, estimated using HM, ML and REML, and the standard deviation of the error variance estimates for data sets consisting from data type SD0.
A.3.22 Differences between the mean of the error variance standard errors, estimated using HM, ML and REML, and the standard deviation of the error variance estimates for data sets from data type SD2.

A.3.23 Differences between the mean of the error variance standard errors, estimated using HM, ML and REML, and the standard deviation of the error variance estimates for data sets from data type SD5.

A.3.24 Differences between the mean of the error variance standard errors, estimated using HM, ML and REML, and the standard deviation of the error variance estimates for data sets from data type SD7.
### List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Distribution of the number of progeny per sire of the data sets based on the six commercial flocks.</td>
<td>27</td>
</tr>
<tr>
<td>4.1</td>
<td>Mean heritability estimated by HM for data sets from data types SD0, SD2, SD5 and SD7 and with population heritability of 0.2321.</td>
<td>33</td>
</tr>
<tr>
<td>4.2</td>
<td>Mean heritability estimated by ML for data sets from data types SD0, SD2, SD5 and SD7 and with population heritability of 0.2321.</td>
<td>36</td>
</tr>
<tr>
<td>4.3</td>
<td>Mean heritability estimated by REML for data sets from data types SD0, SD2, SD5 and SD7 and with population heritability of 0.2321.</td>
<td>37</td>
</tr>
<tr>
<td>4.4</td>
<td>Mean HM heritability approximate sample standard error and standard deviation of the replicate HM heritability estimates from data sets of the data type SD0.</td>
<td>42</td>
</tr>
<tr>
<td>4.5</td>
<td>Mean heritability standard error and standard deviation of the replicate heritability estimates from data types SD14, SD25 and SD29.</td>
<td>45</td>
</tr>
<tr>
<td>4.6</td>
<td>Mean heritability standard error and standard deviation of the replicate heritability estimates from flocks A to F plotted against gamma.</td>
<td>46</td>
</tr>
<tr>
<td>4.7</td>
<td>Mean sire variances estimated by HM for data sets from data types SD0, SD2, SD5 and SD7 and with population sire variance 0.6783.</td>
<td>51</td>
</tr>
<tr>
<td>4.8</td>
<td>Mean sire variances estimated by ML for data sets from data types SD0, SD2, SD5 and SD7 and with population sire variance 0.6783.</td>
<td>52</td>
</tr>
<tr>
<td>4.9</td>
<td>Mean sire variances estimated by REML for data sets from data types SD0, SD2, SD5 and SD7 and with population sire variance 0.6783.</td>
<td>53</td>
</tr>
<tr>
<td>4.10</td>
<td>Mean HM sire variance large sample standard error and standard deviation of the replicate HM sire variance estimates from data sets of the type SD0.</td>
<td>59</td>
</tr>
<tr>
<td>4.11</td>
<td>Mean HM sire variance large sample standard error and standard deviation of the replicate HM sire variance estimates from data sets of the type SD7.</td>
<td>60</td>
</tr>
<tr>
<td>4.12</td>
<td>Mean sire variance standard error and standard deviation of the replicate sire variance estimates from data types SD14, SD25 and SD29.</td>
<td>62</td>
</tr>
<tr>
<td>4.13</td>
<td>Mean sire variance standard error and standard deviation of the replicate sire variance estimates from flocks A to F plotted against gamma.</td>
<td>63</td>
</tr>
<tr>
<td>4.14</td>
<td>Mean error variances estimated by HM for data sets from data types SD0, SD2, SD5 and SD7 and population sire variance 11.0106.</td>
<td>67</td>
</tr>
<tr>
<td>4.15</td>
<td>Mean error variances estimated by ML for data sets from data types SD0, SD2, SD5 and SD7 and population sire variance 11.0106.</td>
<td>68</td>
</tr>
<tr>
<td>4.16</td>
<td>Mean error variances estimated by REML for data sets from data types SD0, SD2, SD5 and SD7 and population sire variance 11.0106.</td>
<td>69</td>
</tr>
</tbody>
</table>
4.17 Mean HM error variance large sample standard error and standard deviation of the replicate HM error variance estimates from data sets of the data type SD0.

4.18 Mean error variance standard error and standard deviation of the replicate error variance estimates from data types SD14, SD25 and SD29.

4.19 Mean error variance standard error and standard deviation of the replicate error variance estimates from flocks A to F plotted against gamma.