Notes for: Walsh and Lynch. Genetics and Analysis of Quantitative Traits

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Contents

Preface

This is a good book, but if I make it through the whole thing I deserve several medals and some cake.

Chapter 1

An overview of quantitative genetics

BORWANG!!!

This chapter just introduces the book and some simple concepts.

Chapter 2

Properties of distributions

ALSO BORWANG!

You can guess what this chapter was on and also how much of a hoot it was. . .

Chapter 3

Covariance, regression, and correlation

Placeholder

3.1 Covariance

3.1.1 Useful identities for covariance

3.2 Least squares linear regression

3.2.1 Properties of least squares

3.3 Correlation

3.4 Differential selection (brief intro)

3.5 Correlation between genotype and phenotype (brief intro)

3.6 End of chapter questions

Chapter 4

Properties of single loci

Placeholder

4.1 Introduction

4.2 Allele and genotype frequencies

4.3 The transmission of genetic information

4.3.1 The Hardy-Weinberg principle

4.3.2 Sex-linked loci

4.3.3 Polyploidy

4.3.4 Age structure

4.3.5 Testing for Hardy-Weinberg proportions

4.4 Characterising the influence of a locus on the phenotype

4.5 The basis of dominance

4.6 Fisher's decomposition of the genotypic value

4.7 Partioning the genetic variance.

4.8 Additive effects, average excesses and breeding values

4.9 Extensions for multiple alleles and non random mating

4.9.1 Average excess

4.9.2 Additive effects

4.9.3 Additive genetic variance

4.10 End of chapter questions

Chapter 5

Sources of genetic variation for multilocus traits

Placeholder

5.1 Epistasis

5.2 A general least-squares model for genetic effects

5.2.1 Extension to haploids and polyploids

5.3 Linkage

5.4 Effect of disequilibrium of the genetic variance

5.4.1 The evidence

5.5 End of chapter questions

Chapter 6

Sources of Environmental Variation

Placeholder

6.1 Extension of the linear model to phenotypes

6.2 Special environmental effects

6.2.1 Within-individual variation

6.2.2 Developmental homeostasis and homozygosity

6.2.3 Repeatability

6.3 General environmental effects of maternal origin

6.4 Genotype x environment interaction

Chapter 7

Resemblance between relatives

Placeholder

7.1 Measures of relatedness

7.1.1 Coefficients of identity

7.1.2 Coefficients of coancestry and inbreeding

7.1.3 The coefficient of fraternity

7.2 The genetic covariance between relatives

7.3 The effect of linkage and gametic phase disequilibrium

7.3.1 Gametic phase disequilibrium

7.4 Assortative mating

7.5 Polyploidy

7.6 Environmental sources of covariance between relatives

7.7 The heritability concept

7.7.1 Evolvability

Chapter 8

Introduction to Matrix Algebra and Linear Models

8.1 Multiple regression

Simple multiple regression equation:

$$y = \alpha + \beta_1 z_1 + \beta_2 z_2 + ... + \beta_n z_n + e \tag{8.1}$$

y = dependent/response variable, z_1, z_2, z_n = predictors, e = residual error, α is a constant as are $\beta_1, \beta_2, \beta_n$ to be estimated.

Recall from Chapter 3 that the goal of least-squares regression is to find a set of constants (α and the βs) that minimise the squared differences between observed and expected values, with expected values is anything that fits on the "line of best fit". Also, recall equation (**??**), to see the relationship between y, z_n (x in the equation) and b. For multiple regression there are many "b" terms and each of them can be estimated by dividing the covariance of the dependent variable and the predictor ($\sigma(y, z_n)$) by the covariance of the predictor with all other predictors in the model. When $n = 1$, the model reduces to a simple linear regression and we return to equation (**??**). This can be represented in matrix form like so:

$$\begin{pmatrix} \sigma^2(z_1) & \sigma(z_1, z_n) & \dots & \sigma(z_1, z_n) \\ \sigma(z_1, z_1) & \sigma^2(z_2) & \dots & \sigma(z_2, z_n) \\ \vdots & \vdots & \ddots & \vdots \\ \sigma(z_1, z_n) & \sigma(z_2, z_n) & \dots & \sigma^2(z_n) \end{pmatrix} \begin{pmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{pmatrix} = \begin{pmatrix} \sigma(y, z_1) \\ \sigma(y, z_2) \\ \vdots \\ \sigma(y, z_n) \end{pmatrix} \tag{8.2}$$

Questions

Have fun answering these Gib!

Chapter 4

1. What the fuck are they talking about with the molecular basis of dominance? - page 63-64

Chapter 5

1. How do they calculate the variance of a phenotype explained by just the dominance effects? - page 91