

Wald-type tests for two hypotheses concerning parallel mean profiles of several groups

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ABSTRACT. This paper is concerned with profile analysis in two extended growth curve models. The first is a growth curve model with parallel mean profiles, which has a random-effects covariance structure based on a single response variable; the second is a multivariate growth curve model with parallel mean profiles, which has a multivariate random-effects covariance structure based on several response variables. For testing “no condition variation” and “level” hypotheses concerning parallel mean profiles of several groups, we obtain the criteria proposed by Wald [8] along with their asymptotic null distributions. We give a numerical example of these asymptotic results.

1. Introduction

Let X be an $N \times p$ observation matrix of repeated measurements on p occasions for each of N individuals. As an extension of the mean structure in the growth curve model for X proposed by Potthoff and Roy [1], we consider

$$(1.1) \quad E(X) = A_1 \Xi_1 B + A_2 \Xi_2,$$

where A_1 and A_2 are $N \times k_1$ and $N \times k_2$ design matrices, respectively, Ξ_1 and Ξ_2 are unknown $k_1 \times q$ and $k_2 \times p$ parameter matrices, respectively, B is a $q \times p$ design matrix. It may be noted (Verbyla and Venables [7]) that an important application of the mean structure (1.1) arises in analysis of growth curves with parallel profiles.

In this paper we are interested in analyzing growth curves with parallel profiles under random-effects covariance structures. In Section 2 we consider a growth curve model with parallel mean profiles, which has a random-effects covariance structure based on a single response variable. As an alternative of the likelihood ratio (= LR) criteria, Wald's criteria (Wald [8]) for two hypotheses concerning parallel mean profiles are obtained under the random-effects covariance structure. In Section 3 we consider a multivariate growth curve model with parallel mean profiles, which is useful in analyzing multiple-

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