Bland Altman Methodologies

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Chapter 1

Bland and Altman's approach to MCS

Overview

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1.1 Difference Plot

Altman and Bland (1983) recommended the use of graphical techniques to assess agreement. Principally their method is calculating, for each pair of corresponding two methods of measurement of some underlying quantity, with no replicate measurements, the difference and mean.

Differences are then plotted against the mean. Hopkins argued that the bias in a subsequent Bland-Altman plot was due, in part, to using least-squares regression at the calibration phase.

1.1.1 Model Specification

The model underpinning the Bland-Altman approach can be presented as follows:

The case-wise means

The case-wise differences $d_i = x_i - y_i$

$$\Sigma = \begin{pmatrix} \sigma_1^2 + \sigma_2^2 & \frac{1}{2}(\sigma_1^2 - \sigma_2^2) \\ \frac{1}{2}(\sigma_1^2 - \sigma_2^2) & \sigma_b^2 + \frac{1}{4}(\sigma_1^2 + \sigma_2^2) \end{pmatrix}$$

1.1.2 Pitman-Morgan Testing

Pitman (1939) and Morgan (1939) separately developed a test for the equality of two variances. Bland and Altman demonstrate how a regression based test is equivalent to the pitman-Morgan test.

1.2 Limits of Agreement

Bland and Altman (1986) introduces

1.3 Further Approaches

Bland and Altman (1999) provides a regression-based approach for dealing with the scenario of non-constancy.

1.4 Criticisms

Dunn (2002) criticises the over-reliance of analysts on the Bland-Altman methodology.

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