

## Hamlett and Lam

Lam et al. (1999) used ML estimation to estimate the true correlation between the variables when the measurements are linked over time. The methodology relies on the assumption that the two variables with repeated measures follow a multivariate normal distribution. The methodology currently does not extend to any more than two cases. The MLE of the correlation takes into account the dependency among repeated measures.

The true correlation  $\rho_{xy}$  is repeated measurements can be considered as having two components: between subject and within-subject correlation. The usefulness of estimating repeated measure correlation coefficients is the calculation of between-method and within-method variabilities are produced as by-products.

### 0.1 Hamlett

Hamlett re-analyses the data of Lam et al. (1999) to generalize their model to cover other settings not covered by the Lam method.

In many cases, repeated observation are collected from each subject in sequence and/or longitudinally.

$$y_i = \alpha + \mu_i + \epsilon$$

The classical model is based on measurements  $y_{mi}$  by method  $m = 1, 2$  on item  $i = 1, 2, \dots$

$$y_{mi} = \alpha_m + \mu_i + e_{mi}$$

$$e_{mi} \sim \mathcal{N}(0, \sigma_m^2)$$

Even though the separate variances can not be identified, their sum can be estimated by the empirical variance of the differences.

Like wise the separate  $\alpha$  can not be estimated, only their difference can be estimated as  $\bar{D}$

## 0.2 Hamlett and Lam

The methodology proposed by ? is largely based on Hamlett et al. (2004), which in turn follows on from ?.

# Bibliography

Hamlett, A., L. Ryan, and R. Wolfinger (2004). On the use of PROC MIXED to estimate correlation in the presence of repeated measures. *Proceedings of the Statistics and Data Analysis Section, SAS Users Group International 198-229*, 1–7.

Lam, M., K. Webb, and D. O'Donnell (1999). Correlation between two variables in repeated measurements. *American Statistical Association, Proceedings of the Biometric Session*, 213–218.