Power analysis for the random intercept cross-lagged panel using the powRICLPM R-package

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The random intercept cross-lagged panel model (RI-CLPM) is a popular model among psychologists for studying reciprocal effects in longitudinal panel data. It extends the traditional cross-lagged panel model (CLPM) by separating stable (for the duration of the study), between-unit variance from fluctuating, within-unit variance. Autoregressive effects can then be interpreted as purely within-unit effects and carry-over (rather than estimates of stability of the rank-order of units, as is the case in the CLPM), and cross-lagged effects can then be interpreted as the within-unit effect or "spillover" of one domain into another.

A frequently asked question by substantive researchers in relation to the RI-CLPM, is about the required sample size for detecting hypothesized effects. Although various texts and software packages have been published concerning power analyses for structural equation models (SEM) generally, none have proposed a power analysis strategy that is tailored to the particularities of the RI-CLPM. This can be problematic because mismatches between the power analysis design, the model, and reality, can negatively impact the validity of the recommended sample size and number of repeated measures.

As power analyses play an increasingly important role in the preparation phase of research projects, this presentation proposes and demonstrates a 6-step Monte Carlo power analysis strategy that is tailored to the RI-CLPM. The strategy is created with usability for applied researchers in mind and is implemented in the R-package powRICLPM. The presentation focuses on the (basic) bivariate RI-CLPM, as well as extensions to include various (stationarity) constraints over time, measurement error (leading to the stable trait autoregressive trait state model), and non-normal data, and the usage of bounded estimation to prevent non-convergence.