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Laura Bringmann, Emilio Ferrer, Ellen Hamaker, Denny Borsboom & Francis Tuerlinckx

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Modeling Nonstationary Emotion Dynamics in Dyads Using a Semiparametric Time-Varying Vector Autoregressive Model

Laura Bringmann
Department of Quantitative Psychology and Individual Differences, University of Leuven

Emilio Ferrer
Department of Psychology, University of California, Davis

Ellen Hamaker
Methodology and Statistics, Utrecht University

Denny Borsboom
Psychological Methods, University of Amsterdam

Francis Tuerlinckx
Department of Quantitative Psychology and Individual Differences, University of Leuven

Emotion dynamics often arise in an interpersonal context, such as a romantic relationship. As time passes, emotion dynamics are prone to change, leading to nonstationarity (e.g., time-lagged relations that differ across periods). Several models have been developed to account for nonstationarity in dynamics; for example, a time-varying dynamic factor model (Chow, Zu, Shifren, & Zhang, 2011). The use of such models, however, is limited because they are not implemented in standard software. We present a statistical data-driven model, the semiparametric time-varying vector autoregressive (TV-VAR) model. The TV-VAR model is based on well-studied generalized additive models (GAM; Wood, 2006), implemented in the software R, and has well-functioning default settings, making it very user friendly. The TV-VAR can explicitly model changes in temporal dependency—for example, between individuals in a dyad—without preexisting knowledge about the nature of change. A simulation study is presented, showing that it is possible to recover the underlying dynamics under a range of scenarios. Next, the TV-VAR model is applied to empirical data on daily feelings of positive affect (PA) from a single heterosexual couple (Ferrer, Steele, & Hsieh, 2012). We analyze (a) how PA changed over time for each individual in the dyad and (b) whether each person's PA was affected by the partner's emotions. Our analyses indicate reliable changes in the male's emotion dynamics over time, but not in the female's—which were not predicted by her own affect or that of her partner (see Figure 1). This application shows the importance of using a TV-VAR model to identify changes in the dynamics in a system.

Correspondence concerning this article should be addressed to Laura Bringmann, Department of Quantitative Psychology and Individual Differences, University of Leuven, Tiensestraat 102 - box 3713, 3000 Leuven, Belgium. E-mail: laura.bringmann@ppw.kuleuven.be

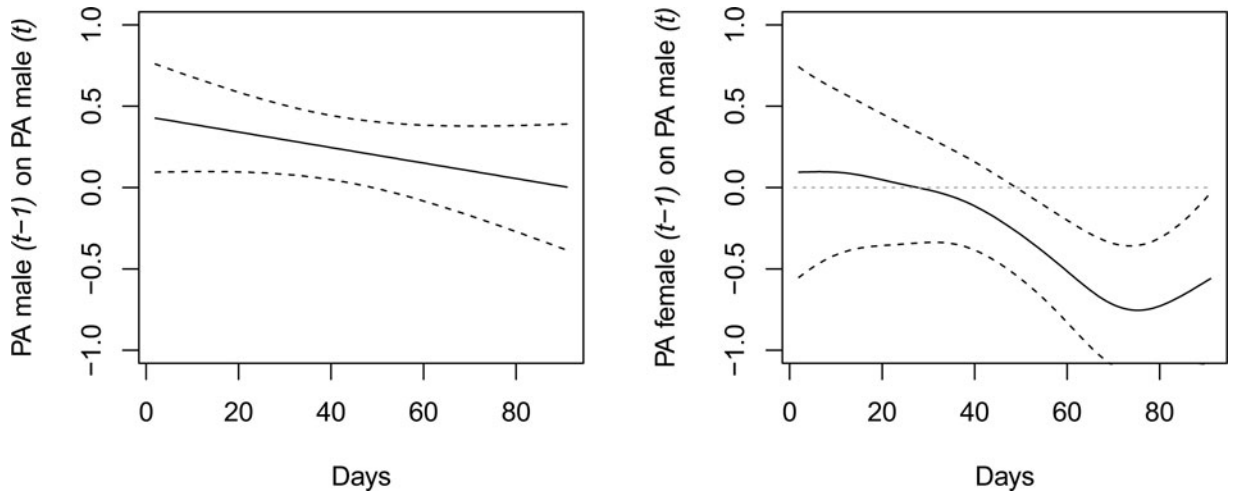

FIGURE 1 The TV-VAR functions for positive affect (PA) of the male over 91 days. The left figure indicates the autoregressive function or inertia function of PA of the male; the right figure shows the cross-regressive function, which is the effect PA of the female partner had on PA of the male partner. The PA of the female could not be significantly predicted by her PA or the PA of her partner and is therefore not shown. Dashed lines represent 95% credible intervals; t = time.

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