

Regularized Continuous Time Structural Equation Models: A Network Perspective -
Supplement

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Supplement for the Panel Data Example

Regularized continuous time depression networks were estimated using publicly available data from the National Longitudinal Survey of Youth 1979 Children and Young Adults sample (NLSCYA; Bureau of Labor Statistics, U.S. Department of Labor, & National Institute for Child Health and Human Development, 2021). As outlined in the main text, the data set was split in three subsets which were subsequently analyzed separately. The results reported in the main text are those of the second sample. In the following, the results for all samples will be shown. In all three subsets, the model was given by Equation 1.

$$\begin{aligned}
 d \begin{bmatrix} \eta_1(t) \\ \eta_2(t) \\ \vdots \\ \eta_7(t) \end{bmatrix} &= \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{17} \\ a_{21} & a_{22} & \cdots & a_{27} \\ \vdots & \vdots & \ddots & \vdots \\ a_{71} & a_{72} & a_{73} & a_{77} \end{bmatrix} \begin{bmatrix} \eta_1(t) \\ \eta_2(t) \\ \vdots \\ \eta_7(t) \end{bmatrix} dt + \begin{bmatrix} g_{11} & 0 & 0 & \cdots & 0 \\ g_{21} & g_{22} & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ g_{71} & g_{72} & g_{73} & \cdots & g_{77} \end{bmatrix} d\mathbf{W}(t) \\
 \begin{bmatrix} \text{eating}_{t_u} \\ \text{mind}_{t_u} \\ \text{depressed}_{t_u} \\ \text{effort}_{t_u} \\ \text{sleep}_{t_u} \\ \text{sad}_{t_u} \\ \text{going}_{t_u} \end{bmatrix} &= \begin{bmatrix} d_1 \\ d_2 \\ d_3 \\ d_4 \\ d_5 \\ d_6 \\ d_7 \end{bmatrix} + \begin{bmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1 \end{bmatrix} \begin{bmatrix} \eta_1(t) \\ \eta_2(t) \\ \vdots \\ \eta_7(t) \end{bmatrix}
 \end{aligned} \tag{1}$$

First Sample

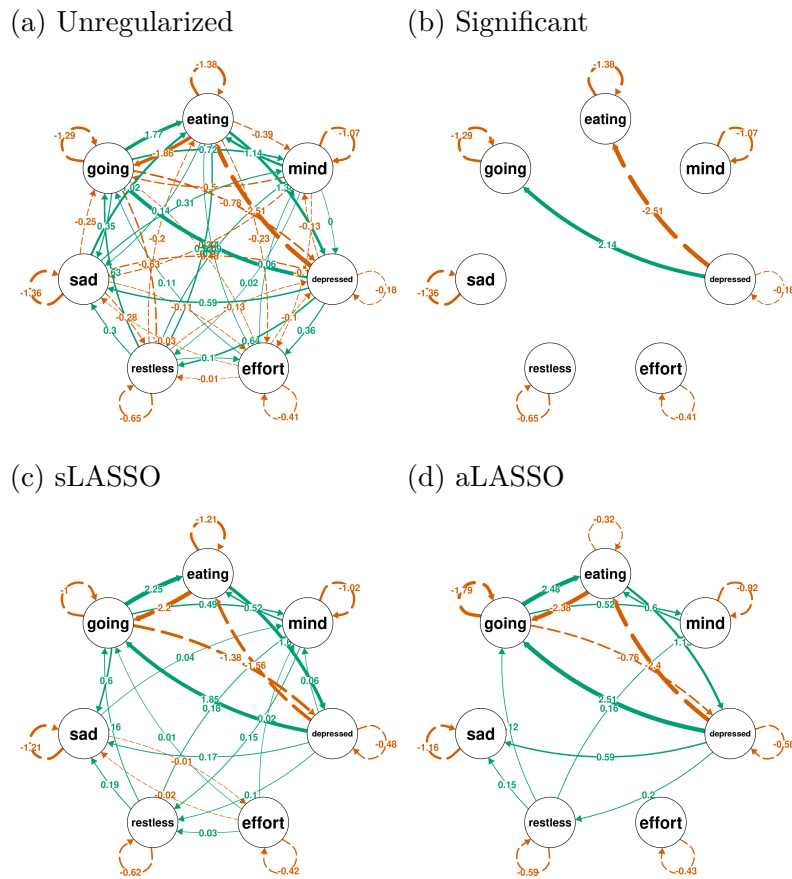


Figure 1. Network plots of continuous time parameters for the unregularized model (a), when thresholding with confidence intervals (b), the sLASSO (c), and the aLASSO (d) in the first sample of the panel data. Positive parameters are depicted with green (solid) arrows, negative parameters are shown as orange (dashed) arrows. The line thickness indicates the parameter size.

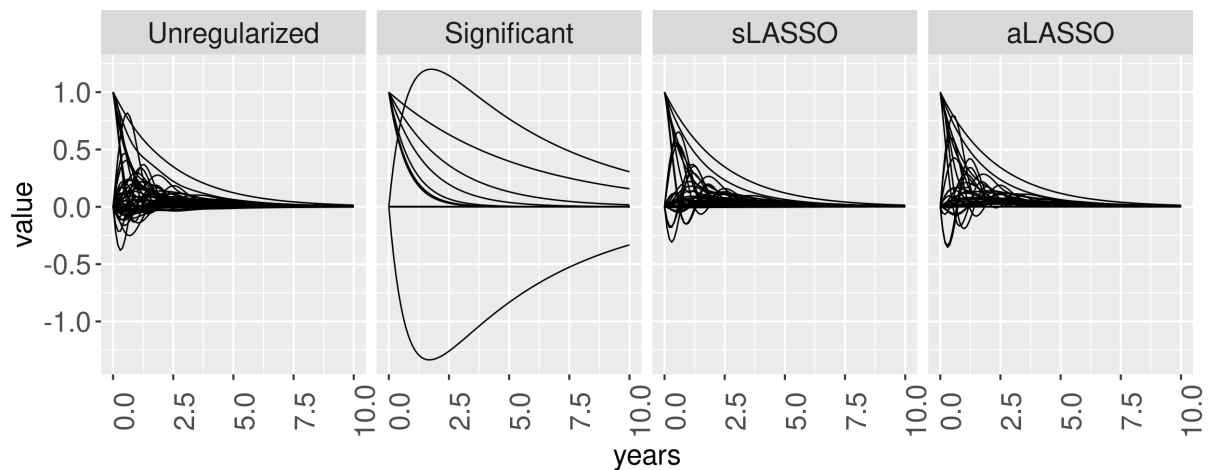


Figure 2. Autoregressive and cross-lagged parameters implied by the drift matrix of the unregularized model, when thresholding with confidence intervals, the sLASSO, and the aLASSO in the first sample of the panel data.

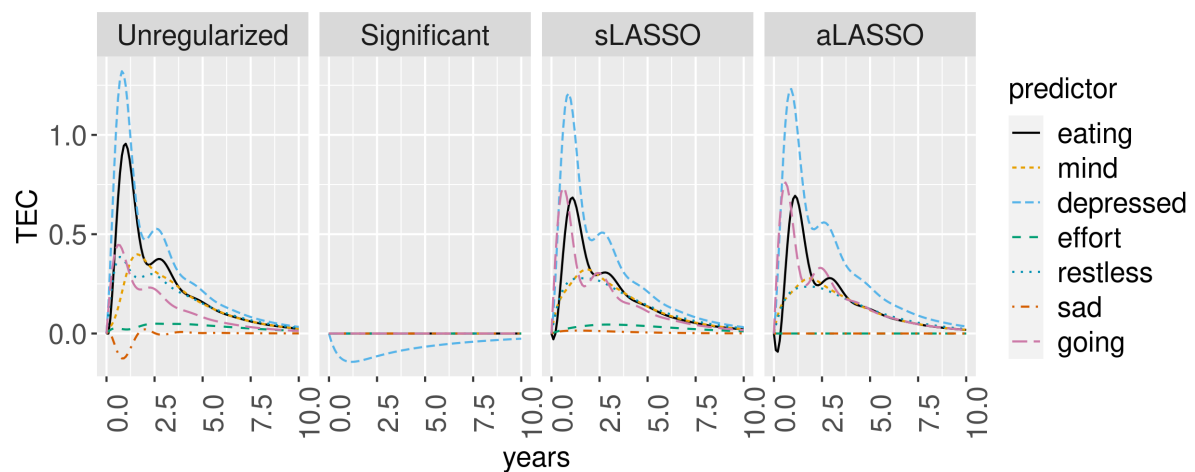


Figure 3. Total effect centrality measures for the panel data example of the unregularized model, when thresholding with confidence intervals, the sLASSO, and the aLASSO in the first sample of the panel data.

Second Sample

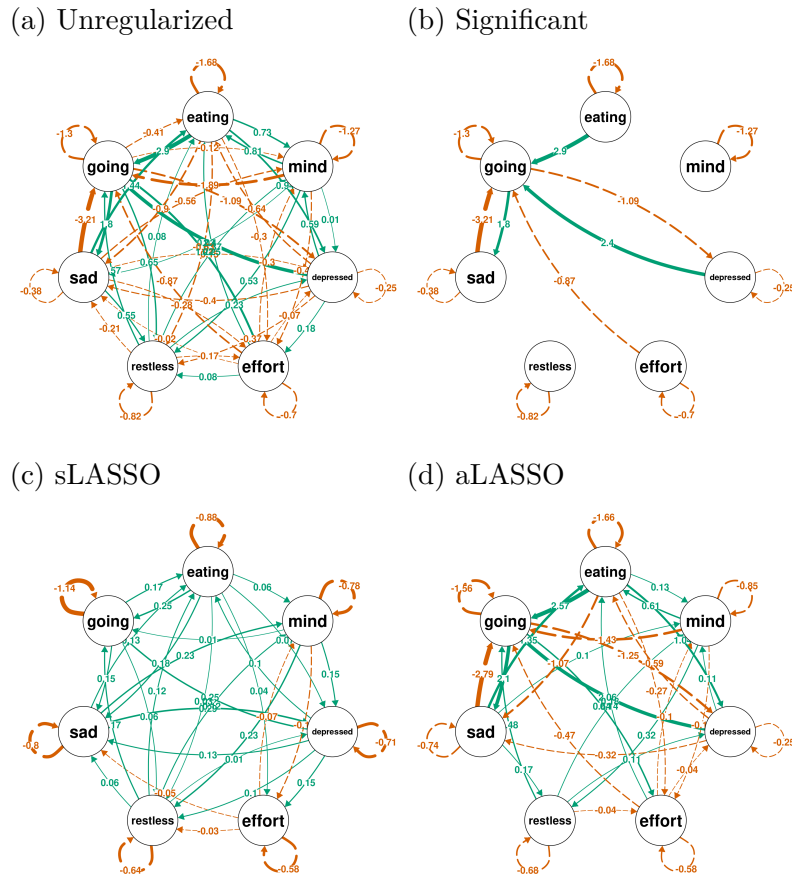


Figure 4. Network plots of continuous time parameters for the unregularized model (a), when thresholding with confidence intervals (b), the sLASSO (c), and the aLASSO (d) in the second sample of the panel data. Positive parameters are depicted with green (solid) arrows, negative parameters are shown as orange (dashed) arrows. The line thickness indicates the parameter size.

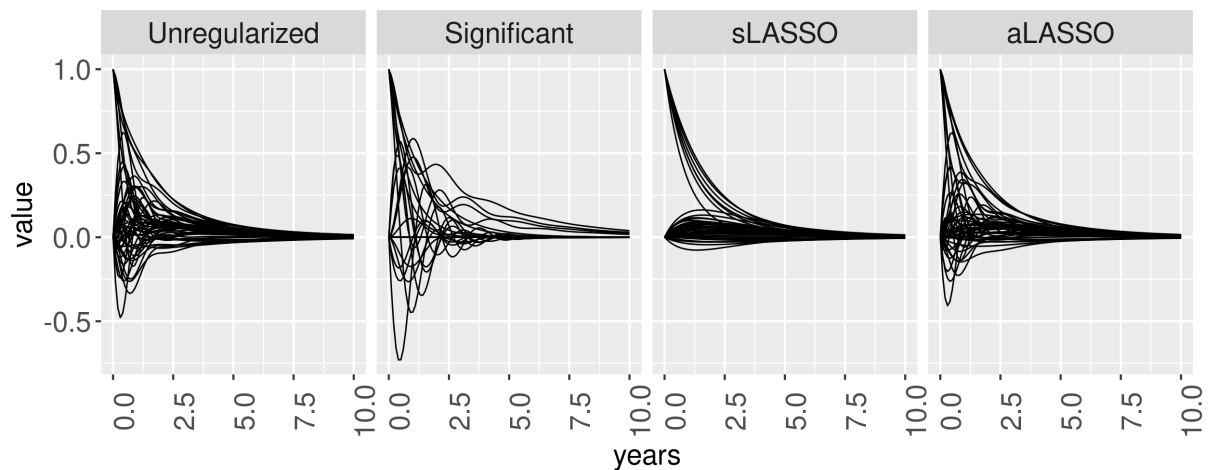


Figure 5. Autoregressive and cross-lagged parameters implied by the drift matrix of the unregularized model, when thresholding with confidence intervals, the sLASSO, and the aLASSO in the second sample of the panel data.

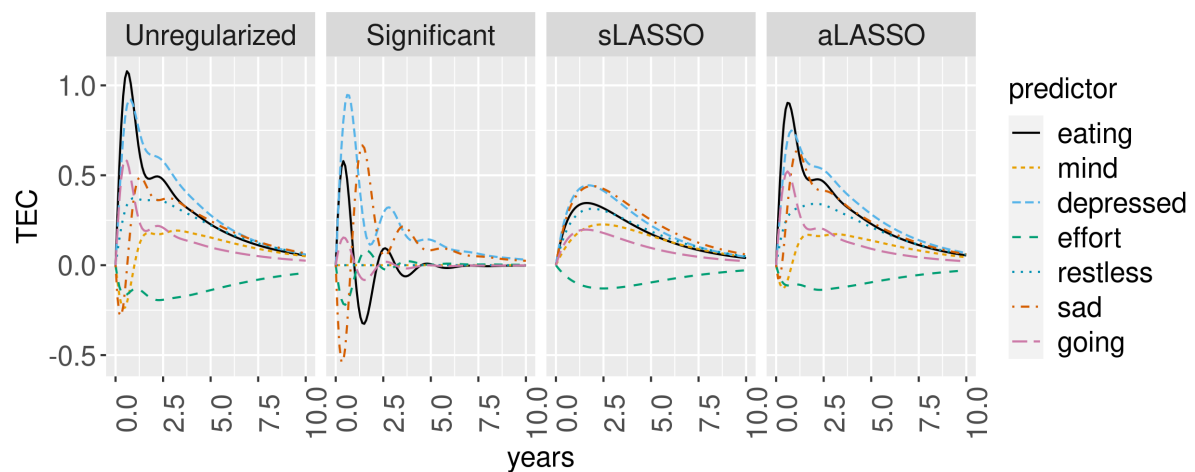
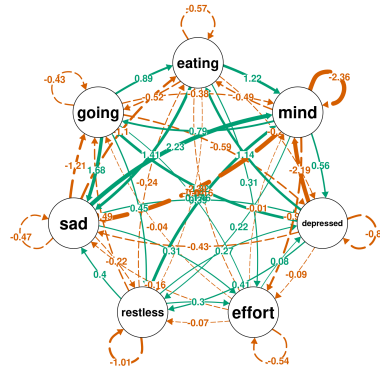


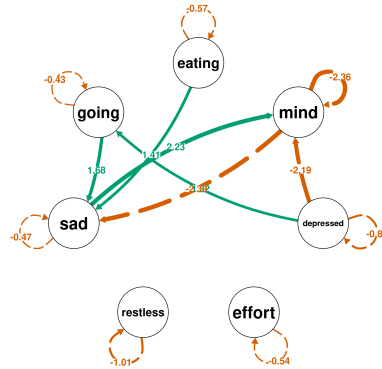
Figure 6. Total effect centrality measures for the panel data example of the unregularized model, when thresholding with confidence intervals, the sLASSO, and the aLASSO in the second sample of the panel data.

Third Sample

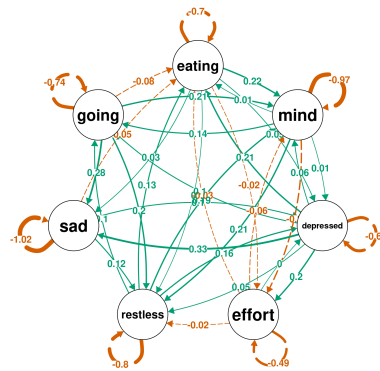
(a) Unregularized



(b) Significant



(c) sLASSO



(d) aLASSO

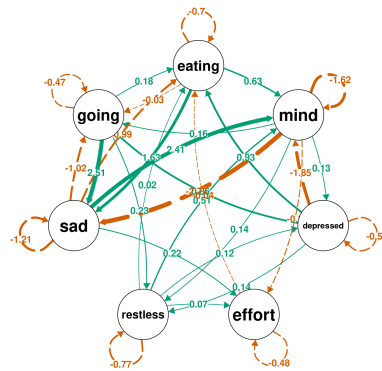


Figure 7. Network plots of continuous time parameters for the unregularized model (a), when thresholding with confidence intervals (b), the sLASSO (c), and the aLASSO (d) in the third sample of the panel data. Positive parameters are depicted with green (solid) arrows, negative parameters are shown as orange (dashed) arrows. The line thickness indicates the parameter size.

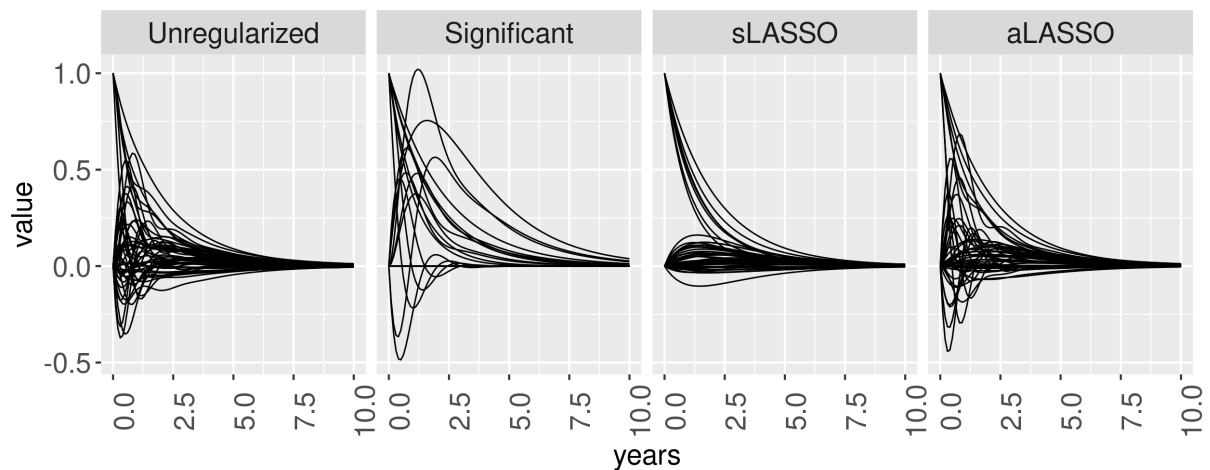


Figure 8. Autoregressive and cross-lagged parameters implied by the drift matrix of the unregularized model, when thresholding with confidence intervals, the sLASSO, and the aLASSO in the third sample of the panel data.

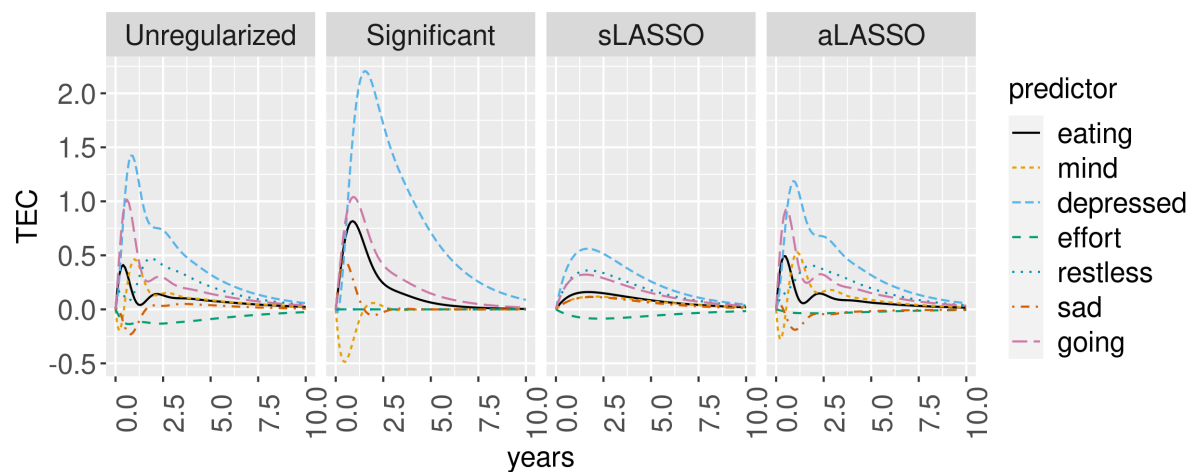


Figure 9. Total effect centrality measures for the panel data example of the unregularized model, when thresholding with confidence intervals, the sLASSO, and the aLASSO in the third sample of the panel data.

References

Bureau of Labor Statistics, U.S. Department of Labor, & National Institute for Child Health and Human Development. (2021). *Children of the NLSY79, 1979-2016*. Produced and distributed by the Center for Human Resource Research (CHRR), The Ohio State University. Columbus, OH: 2019.