



**GHENT  
UNIVERSITY**

# MODELING LONGITUDINAL DYADIC DATA IN THE SEM FRAMEWORK

FIEN GISTELINCK  
PROMOTER: TOM LOEYS

## CONTENT

- Longitudinal dyadic data
- Modeling framework

# LONGITUDINAL DYADIC DATA

# CROSS-SECTIONAL APIM

What is the effect of **positive relational feelings** on the **perceived intimacy** in heterosexual *couples*?

PosRel<sub>M</sub>

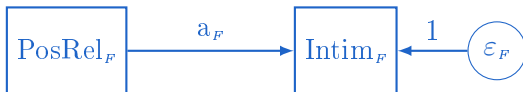
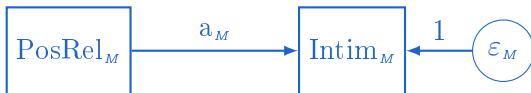
Intim<sub>M</sub>

PosRel<sub>F</sub>

Intim<sub>F</sub>

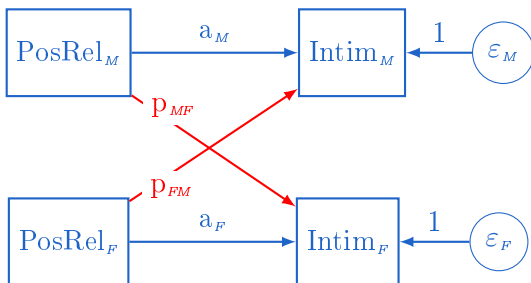
# CROSS-SECTIONAL APIM

What is the effect of **positive relational feelings** on the **perceived intimacy** in heterosexual *couples*?



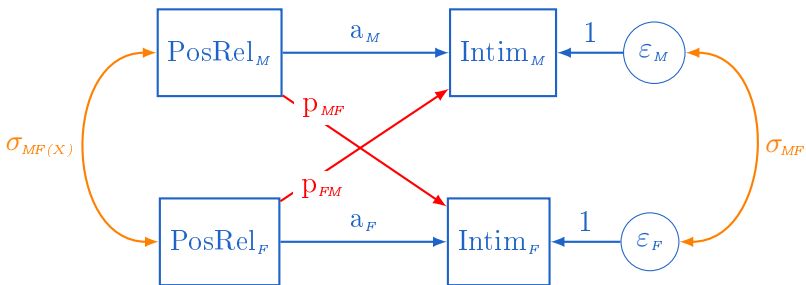
# CROSS-SECTIONAL APIM

What is the effect of **positive relational feelings** on the **perceived intimacy** in heterosexual *couples*?



# CROSS-SECTIONAL APIM

What is the effect of **positive relational feelings** on the **perceived intimacy** in heterosexual *couples*?

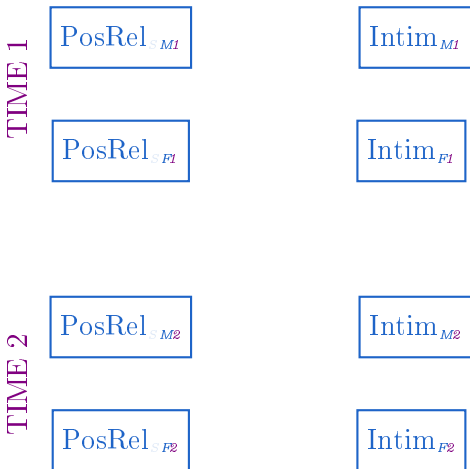




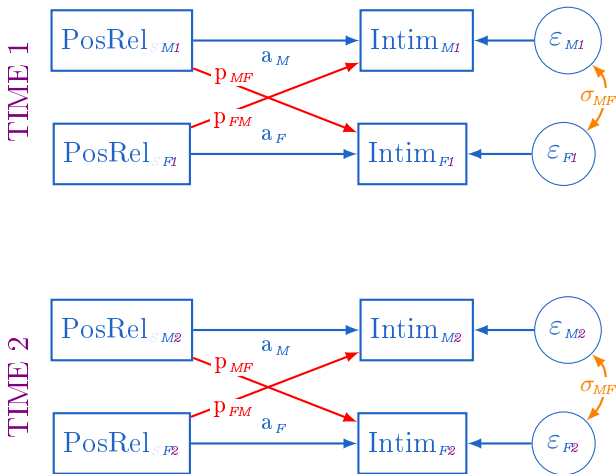
## RESEARCH QUESTIONS

- How does an **increase** in positive relational feelings of one's partner on a particular day (as compared to his/her partner's average positive relational feelings) affect one's own perceived intimacy?
- To what extent is the perceived intimacy of one dyad member **related to** the perceived intimacy of the partner? **On a particular day? On average?**
- How strong is the association between the perceived intimacy on one day with the amount of perceived intimacy **on the next day** within a given person?

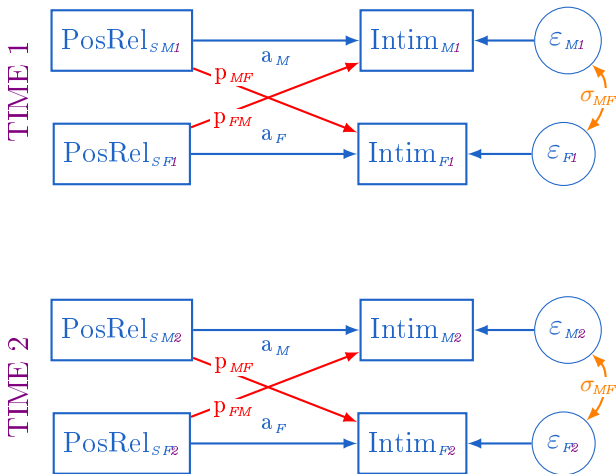
# LONGITUDINAL APIM



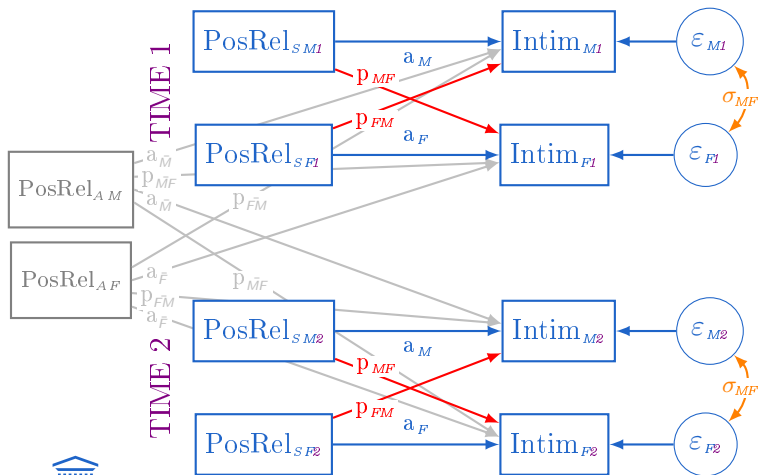
# LONGITUDINAL APIM



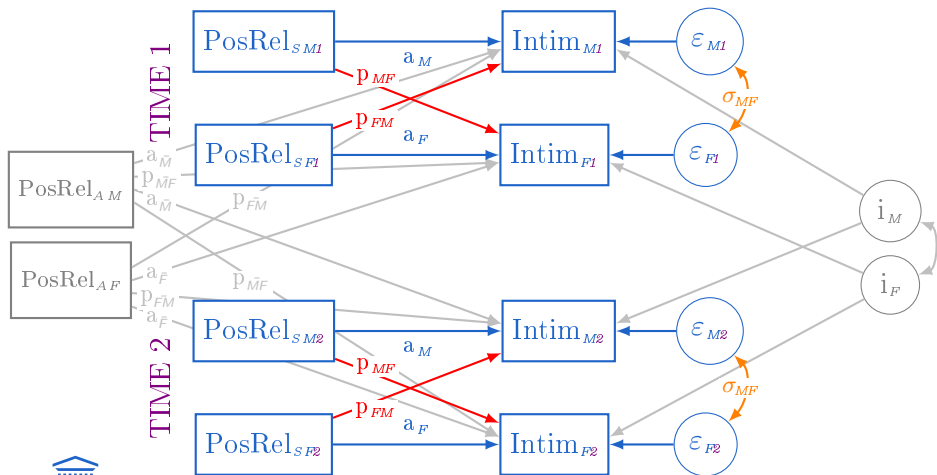
# LONGITUDINAL APIM



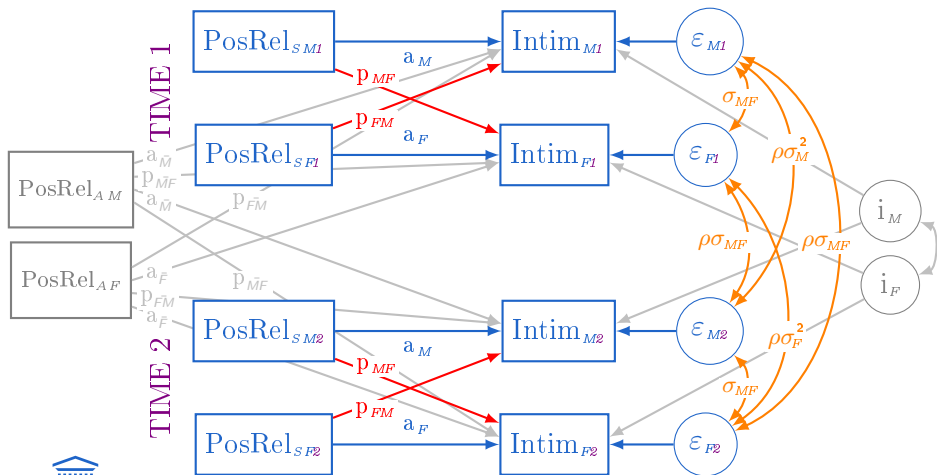
# LONGITUDINAL APIM



# LONGITUDINAL APIM



# LONGITUDINAL APIM



# RESIDUAL COVARIANCE STRUCTURE

$$\text{Cov}\left(\begin{array}{c} \varepsilon_{M1} \\ \varepsilon_{M2} \\ \vdots \\ \varepsilon_{MT} \\ \varepsilon_{F1} \\ \varepsilon_{F2} \\ \vdots \\ \varepsilon_{FT} \end{array}\right) = \begin{pmatrix} \sigma_M^2 & \sigma_{MF} \\ \sigma_{MF} & \sigma_F^2 \end{pmatrix} \otimes \begin{pmatrix} 1 & \rho & \cdots & \rho^{T-1} \\ \rho & 1 & \cdots & \rho^{T-2} \\ \vdots & \vdots & \ddots & \vdots \\ \rho^{T-1} & \rho^{T-2} & \cdots & 1 \end{pmatrix}$$



# STATISTICAL CHALLENGES

- 1 The correlation between dyad members
- 2 The autocorrelation
- 3 The effect of actor and partner characteristics
- 4 The partitioning into time-specific and time-averaged effects

⇒ L-APIM takes up all these challenges

⇒ Implementation?

# MODELING FRAMEWORK

# MULTILEVEL MODELING

</> Software:

nlme, lme4, SAS, HLM, ...



Between-dyad variation:

Using random effects



Residual covariance structure

✘ Standard packages fail



SAS: UN@AR(1), UN@CS, UN@UN



! Indistinguishable dyads

# STRUCTURAL EQUATION MODELING

</> Software:

lavaan, Mplus, EQS, LISREL, ...

✓ Between-dyad variation:

Using latent variables

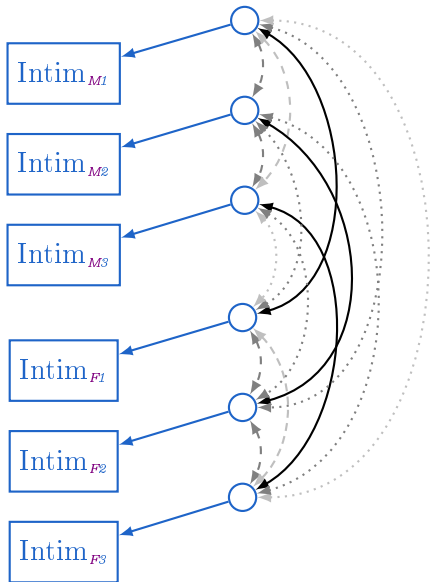
❓ Residual covariance structure

✘ MSEM fails

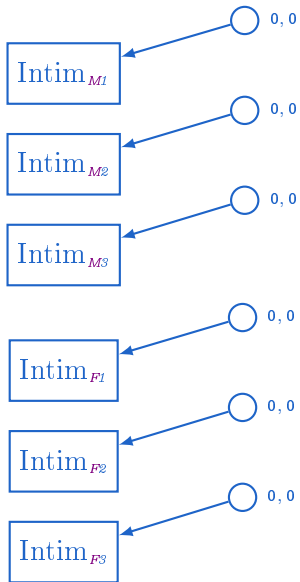
✍ Standard SEM: use constraints

! Computational intensive

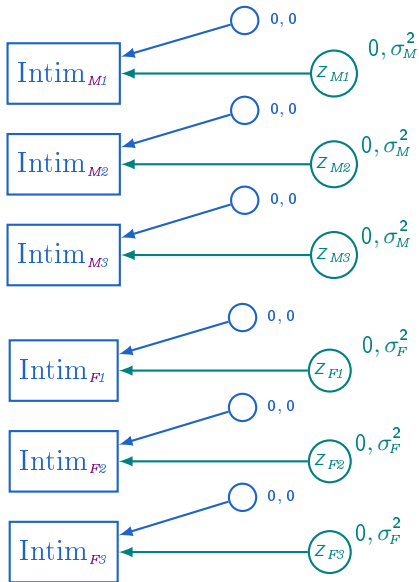
# MOVING AVERAGE APPROACH



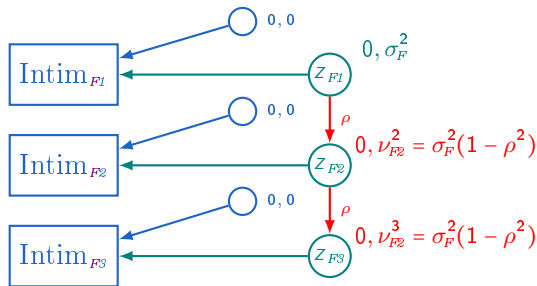
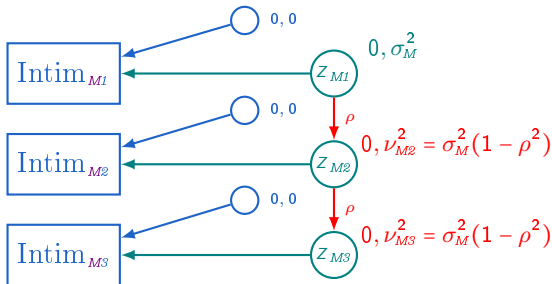
# MOVING AVERAGE APPROACH



# MOVING AVERAGE APPROACH

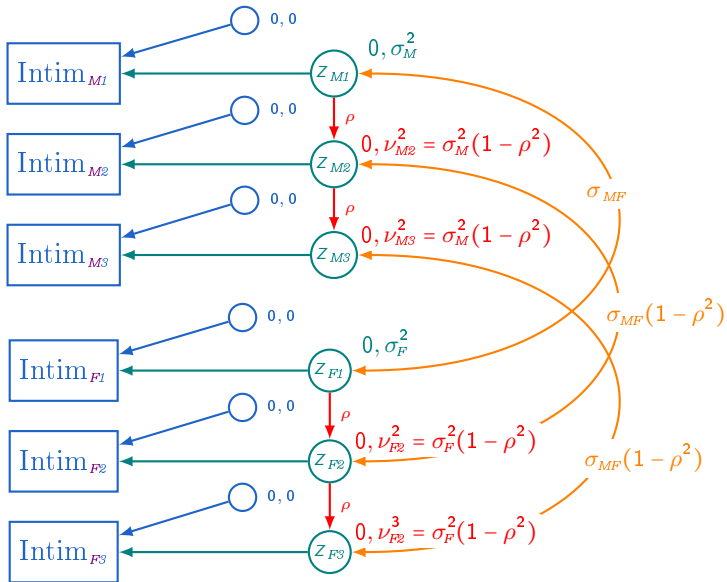


# MOVING AVERAGE APPROACH





# MOVING AVERAGE APPROACH



# ADVANTAGES SEM

- +
  - +
  - +
  - +
  - !
- ⇒ Incorporates measurement error
- ⇒ No imposed manifest approach
- ⇒ Easily relaxes the assumptions of the L-APIM
- ⇒ Applies FIML to deal with missingness
- ☹ Multi-equation coding

# R-SHINY APPLICATION

LDD in SEM L-APIM Info Contact

## The L-APIM for Longitudinal Dyadic Data

Data Print More info

### Reading in the data

Upload your data file (\*)

In which format is your data set displayed?

Wide format  
 Long format

(\*) Please make sure your uploaded data file is in one of the following extensions: .sav, .txt, .csv or .xpt  
You can check your uploaded data file by clicking on the 'Print' button.

If you would like to experiment with the application, please select one of the following exemplary data sets.  
The 'Example1.sav' data file is uploaded by default and will be ignored once you upload your own data file.

Load example data

1. Data specifics

[Column name specifics](#)

2. Variable specifics

[Variable types](#)

[Variable centering](#)

3. Model specifics

[\(In\)distinguishable effects](#)

[Random effect covariance structure](#)

[Residual covariance structure](#)

# CONCLUSION

## The L-APIM

- extends the cross-sectional APIM
- allows researchers to model longitudinal dyadic data
- tackles the statistical challenges
- within the SEM framework
- can be fitted using the R-Shiny app:

[http://fgisteli.shinyapps.io/Shiny\\_LDD](http://fgisteli.shinyapps.io/Shiny_LDD)

# Any Questions?

A Shiny-what?



Fien Gistelinck  
PhD Student

DEPARTMENT OF DATA ANALYSIS

P Tom Loeyts

E [fien.gistelinck@ugent.be](mailto:fien.gistelinck@ugent.be)

T +32 9 331 01 01

 Ghent University

 @ugent

 Ghent University

[www.ugent.be](http://www.ugent.be)

