Interactive, Dynamic, and Automated SEMs for Maximal Productivity

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“There is no delight in owning anything unshared”

Lucius Annaeus Seneca the Younger, Roman Stoic Philosopher
Outline
SEM in JMP Pro

• Preliminary info
• Design of SEM platform
• Demo
  – Confirmatory Factor Analysis
  – Path Analysis with Latent Variables
  – Longitudinal Analysis
• Resources and Q&A

Highlight prez/pub prep
Preliminaries

Lead Developer of SEM in JMP Pro

I’m in R&D --- very, very removed from sales
Preliminaries

[Very likely] You already have JMP Pro

https://www.jmp.com/en_us/academic/university-list.html
Preliminaries

What and who is JMP?

• SAS != JMP (two versions: JMP and JMP Pro – SEM is in the latter)

• Stats software for scientists and engineers (since 1989)

• Outstanding SEM team
  – Christopher Gotwalt, Ph.D., Chief Data Science Officer
  – James Koepfler, Ph.D., Senior Research Stat Tester
  – Eric Russo, Research Developer
  – and others

Really difficult stuff
Testing
Path diagram algorithms
Design of SEM Platform

SAS/JMP
Opportunity to revamp SEM software based on first-hand experience

10 Years Applied SEM Experience

Cal State Fullerton
UNC-Chapel Hill
UC Davis
Design of SEM Platform

What are the pain points of fitting SEMs?

• Creating path diagrams is a separate, time-consuming endeavor
• PowerPoint deck with common path diagrams are often passed down

• High-quality, prez-ready, fully customizable path diagrams are created for you
Design of SEM Platform

What are the pain points of fitting SEMs?

- Creating path diagrams is a separate, time-consuming endeavor
- PowerPoint deck with common path diagrams are often passed down

High-quality, prez ready, fully customizable path diagrams are created for you.

Shading = proportion of variance explained.

Can be pasted as vectorized image.
Design of SEM Platform

What are the pain points of fitting SEMs?

- Compelled to come up with shortcuts (code, algorithms, ‘tricks’) for time-consuming tasks
  - Specifying models
  - Comparing models with likelihood ratio or chi-square diff tests
  - Creating tables for reports
  - Collapsing information across many fitted models
Design of SEM Platform

What are the pain points of fitting SEMs?

- Compelled to come up with shortcuts (code, algorithms, ‘tricks’) for time-consuming tasks

All those tasks are done for you, saving lots of time

Interactive model comparison

Tables ready to copy/paste with relevant info (or customize)
Design of SEM Platform

What are the pain points of fitting SEMs?

• Reverse-engineer issues that arise upon fitting a model
• Dictionary of common warnings and their possible meaning
  – Non-positive definite
  – Model might not be identified
  – And many more...
Design of SEM Platform

What are the pain points of fitting SEMs?

• Reverse-engineer issues that arise upon fitting a model

Identification rules are examined with every change to the model specification

Interactive UI provides description of rules

Useful model/data details

• Status tab provides dynamic feedback at every step of model specification
Design of SEM Platform

What are the pain points of fitting SEMs?
DEMO

- Measuring factors that influence achievement
- Testing a theory of motivation and achievement
- Characterizing achievement trajectories over time
Confirmatory Factor Analysis
Measuring factors that influence achievement

Red triangles display menus with all model output options

Shading highlights good/bad indicators
Assess Measurement Model
One-Stop Shop for Reliability and Validity

Evidence of construct validity when diagonal rectangles are larger than those above and to the right.
Path Analysis with Latent Variables

Testing a Theory of Motivation and Achievement

Visualizations throughout to facilitate interpretation of results

Prediction profiler enables deeper understanding of model implications

Facilitate assessment of local fit
Longitudinal Analysis
Characterizing Trajectories Over Time

Model Shortcuts menu enables simple specification of common models
Predicted Values Plot
Model-Implied Trajectories

Paths in table of parameter estimates are interactively linked to paths in path diagram

Visualizations are interactive and linked to data and other visualizations
Multiple-Group Analysis
Optional Side-by-Side Display of Results

*A bit outdated, we have many more features now*
FAQs

• SEM in JMP Pro is new
• Lots of work ahead to add more features

But...

what we do, we do very well
"There is no delight in owning anything unshared"

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Resources
There are a LOT

2-5 min videos on a variety of topics to get started:

Academic Team (course prep & faculty support):
https://www.jmp.com/en_us/academic.html
Director: Curt.Hinrichs@jmp.com

Online documentation:
Thank you!

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