



Into the Multiverse:

Conducting and Visualizing Multiverse Analysis in Stata

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Do kids make people happy?

















Gelman & Loken (2014)



Analytical uncertainty is pervasive in empirical research. But:

1. Does analytical uncertainty lead to different analyses?

Yes (Silberzahn et al. 2018, Breznau et al. 2022, Nick Huntington-Klein 2021, etc.)

Do different analyses lead to different conclusions?
Potentially (Simonsohn et al. 2020, Young & Cumberworth 2025)

Multiverse analysis: Run and report all reasonable model specifications!



	"Multiverse Analysis"* "Universe Analysi		
N _{analysis}	all	one	
Robustness Checks	comprehensive	selective	
Information	symmetric (full)	asymmetric	

*<u>synonyms</u>: multiverse analysis (Steegen et al. 2016), multimodel analysis (Young & Holsteen 2017), specification curve analysis (Simonsohn et al. 2020), vibration of effects (Patel et al. 2015)







Implementation

Visualization





The problem:

Running thousands/millions of models (Muñoz & Young 2018)

The principled solution: Nested loops

The user-friendly way: multivrs, mrobust (Young & Holsteen 2017)





multivrs example 1: controls



16 model specifications





multivrs example 2: controls + functional form



24 model specifications



Implementing Multiverse Analysis in Stata



Output:

- 1) Significance statistics
- 2) Result dataset (option saveas (...))
- 3) Influence estimates
- 4) Density distribution

Caveat: Limited support for interaction effects, weights, estimation methods, etc.

Variable of interest Outcome variable Possible control terms Number of models Number of observations	race union 3 24 1,851			
Significance Testing:				
Estimation Command:	all models	logit	probit	regress
Number of Models:	24	8	8	8
Sign Stability	100%	100%	100%	100%
Significance Rate	100%	100%	100%	100%
Positive	100%	100%	100%	100%
Positive and Sig	100%	100%	100%	100%
Negative	0%	0%	0%	6%
Negative and Sig	0%	0%	0%	0%





The problem: Visualizing thousands/millions of estimates (example: 2¹¹, i.e. 2,048)







Specification curves:







The tradeoff:







Multiverse Plots:





Visualizing Multiverse Analysis in Stata



Multiverse Plots:

- Effectively communicate the range of possible results and the modeling decisions driving them.
- Can accommodate arbitrarily large multiverses.
- Integrate numerical influence estimates from a meta-regression analysis (Young & Holsteen 2017, Stanley & Doucouliagos 2012)





1. Multiverse analysis is a **useful tool**.

2. We currently **lack the means** to visualize multiverse results comprehensively.

3. Multiverse plots aim to **close this gap.** They combine the best features of both density plots and specification curves.





"Garbage in, Garbage out", i.e. the Mülltiverse (Rohrer 2021)



Illusion of certainty



Misuse for p-hacking



Static vs. interactive visualizations

THANKS!

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Credits (Images & Icons): <u>xkcd</u>, <u>FlatIcon</u>



