Making (methodological) Research Contributions

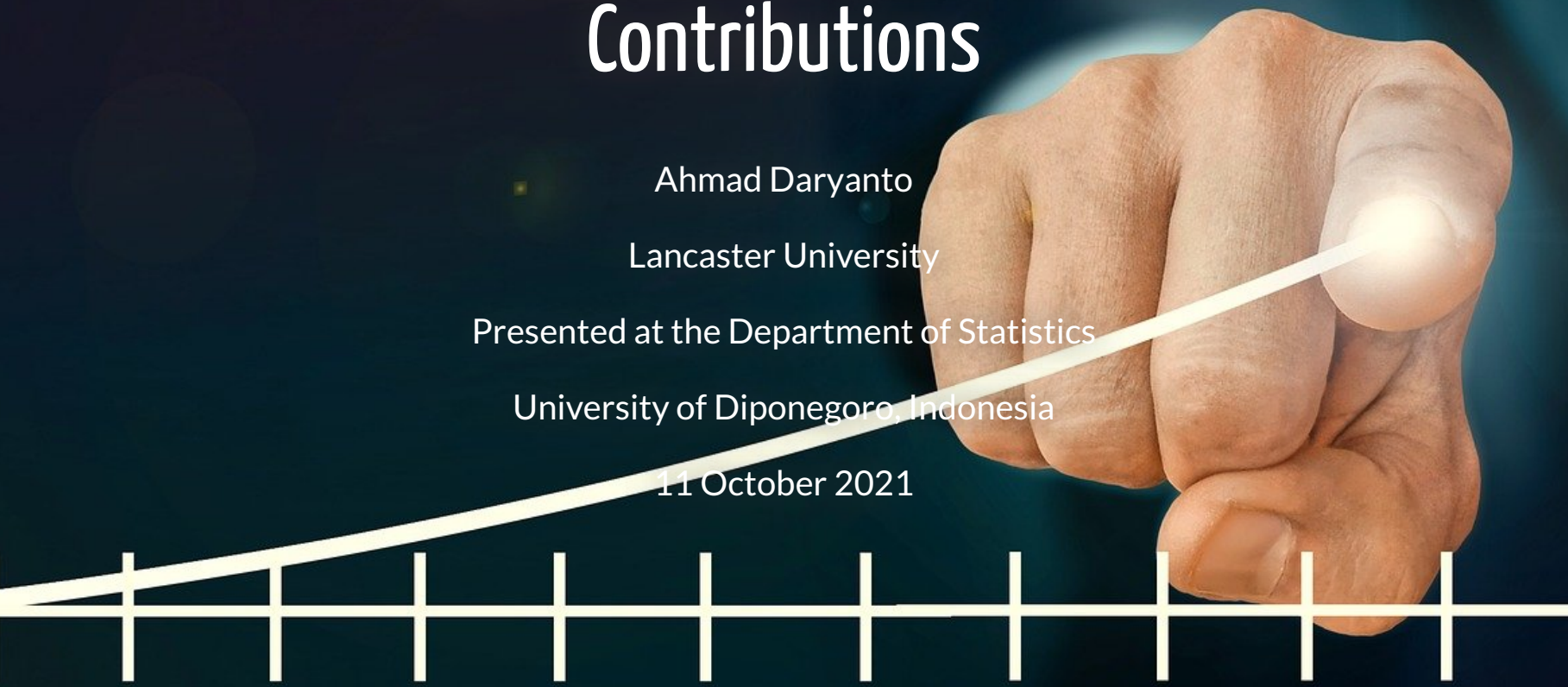
Ahmad Daryanto

Lancaster University

Presented at the Department of Statistics

University of Diponegoro, Indonesia

11 October 2021



Types of research articles

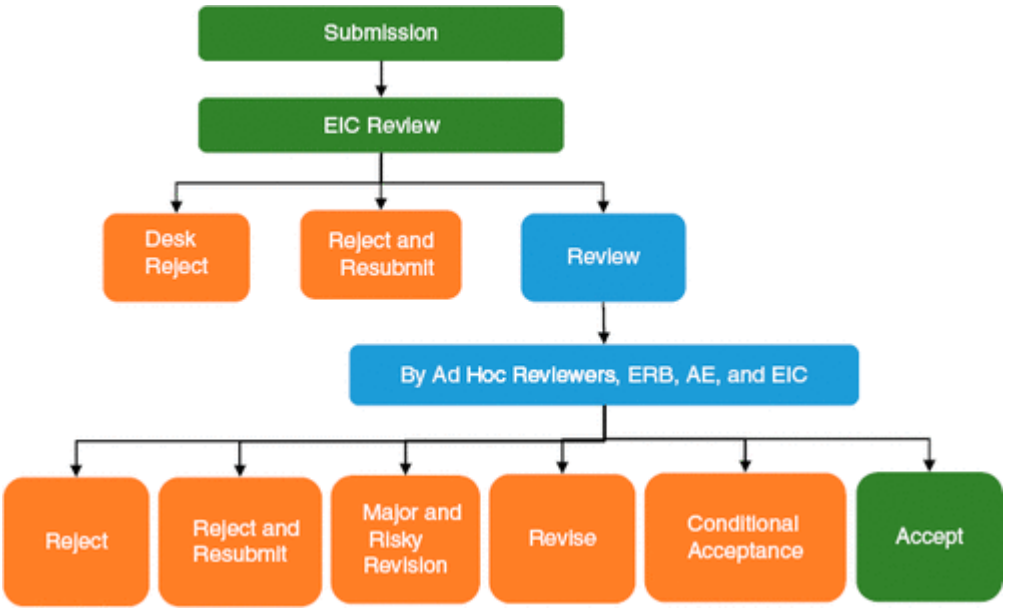
- Conceptual: theory, methodology (a review)
- Review: narrative (qual), meta-analysis
- Empirical: survey, experiment, econometric modelling
- Methodological (but not a review): methodological procedures, codes

What is contribution?

- **Discover** new knowledge
  - Good example: Concept of Market orientation (Kohli and Jaworski, 1990)
  - Extend existing knowledge
  - Extending the meaning of a construct, e.g., multidimensional constructs
  - Discovering boundary conditions, e.g., X --> Y depends on another variable.
  - Explaining a process, e.g., X --> M --> Y
  - Improving past results, e.g., X --> Y suffers from Endogeneity problems (and you find an instrument).
- **A**pply knowledge into a new setting
  - Why new settings?

Are we making contributions?

- Academic
- Managerial/practical/policy



source: Kumar(2016)

Why contributions?

Your turn...

Tips

Learning

Attempt to:

- replicate previous studies
  - re-derived mathematical formulations
  - replicate past simulations
  - https://osf.io (good resources for original data and codes of published papers)
- read seminal papers (first-hand exposure)

Engagement

- Stay on the same topic
- Build research vocabularies
- Follow the conversation
- Try to publish
- Leave your footprint: move to another domain after publising 2-3 articles
- Thinking of comeback

Tips..

Writing a paper

- Articulate research contribution(s) e.g, We contribute to literature by demonstrating that Markov chain can not be used to lock burglars.

For ignoring the MCMC diagnostics, he was sentenced to the Markov chain gang.

- Choose good journal
  - Academic Journal Guide (AJG) list
  - Open source for impact e.g., TQMP

Illustrations

A. Moderated multiple regression (MMR) model

$$Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta XZ + \varepsilon, \varepsilon \sim N(0,1)$$

Contribution: Information-based theory technique in avoiding *spurious moderation*

spurious moderation: e.g, If X --> Y is nonlinear in a population, estimating parameters of the MMR above will produce a significant β_3.

Spurious - demo

Putting our demo into a context

X = Place attachment; Z = Trust toward government program; Y = Pro-environmental behaviour

see: Song, Zening, Ahmad Daryanto and Didier Soopramanien. (2019). Place Attachment, Trust and Mobility: Three-way Interaction Effect on Urban Residents' Environmental Citizenship Behaviour. Journal of Business Research, 105, 168-177.

```
# Data generation
set.seed(5)       # set a random seed
library(MASS)     # to use mvrnorm function
nobs <- 1000

rxz = 0.1          # set correlation between x and z
mu=c(0,0)          # set means for x and z
sigma=matrix(c(1, rxz, rxz,1), 2, 2) # set covariance matrix

population_data=mvrnorm(nobs,mu,sigma) # population data
x = population_data[,1]     # extract x
z = population_data[,2]     # extract z

e <- rnorm(nobs, 0, 1)  # generate error term
y <- x + x**2 + e       # generate y, nonlinearly related to x
```

Spurious - demo

Apply MMR model

Now, using the generated data, let us apply the moderated regression model:

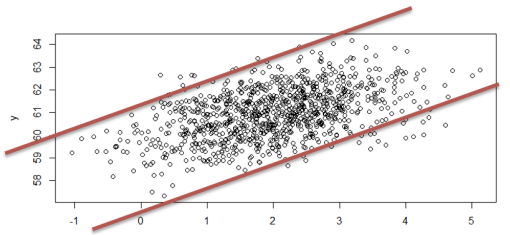
```
# Applying MMR model

 fit <- lm(y ~ x + z + x:z)
 summary(fit)
```

```
##
## Call:
## lm(formula = y ~ x + z + x:z)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4.5022 -1.1537 -0.2615  0.8507  9.0675
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.95339    0.05564  17.135  < 2e-16 ***
## x            0.83948    0.05586  15.029  < 2e-16 ***
## z           -0.02655    0.05489  -0.484    0.629
## x:z          0.25727    0.05397   4.767 2.15e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

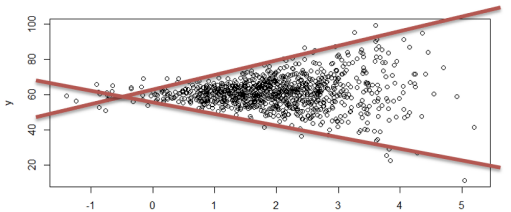
Illustrations...

B. Heteroskedasticity problem in multiple linear regression

Homoskedasticity assumption in linear regression = constant variance at every value of x



Homoskedasticity:
Constant spread at any value of *X*



Heteroskedasticity:
Non-constant spread at any value of *X*

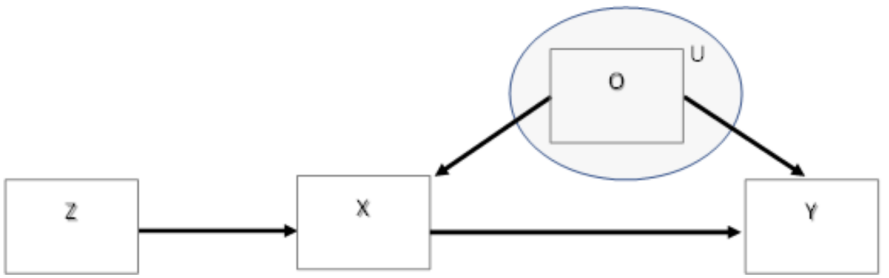
- HeteroskedasticityV3
- 22k+ views https://www.youtube.com/watch?v=dJFAkPLrbx4&t=28s
- 6k+ views https://www.youtube.com/watch?v=uFI3QwBqSs8&t=8s

Illustrations...

C. Endogeneity problem in multiple linear regression

Endogeneity = X is correlated with error term.

Common cause = important variable is missing.



- EndoS

Article Full-text available

EndoS: An SPSS macro to assess endogeneity

February 2020 · The Quantitative Methods for Psychology 16(1):56-70

DOI: 10.20982/tqmp.16.1.p056

License · CC BY

Ahmad Daryanto

Research Interest 19.3

Citations 7

Recommendations 0 new 2

Reads · 2 new 829

See details

Reflection

- Single-author is rewarding, accept the reality that:
  - more hard work
  - high commitment
  - takes time
- Personal website, e.g., Google site, github pages
  - Insemination
- Publish in a journal

Questions?