Comparative Method

"Mills Methods"

3 main inductive procedures

- Method of Difference – outcome (dependent variable) is not the same for all observations
- Method of Agreement – outcome (dependent variable) is the same for all observations
- Joint Method of Agreement and Difference

Method of Agreement

- Look for a variable that is common to all observations having the same outcome

Method of Agreement (1)

Case	*Accident*	*Car Enters from the Right*	*Driver Speeding*	*Runs a Red Light*
	(Y)	*(X2)*	*(X3)*	*(X4)*
1	Yes	Yes	No	Yes
2	Yes	No	Yes	Yes

Method of Agreement (2)

Case	*Accident*	*Drunk Driving*	*Car Enters from the Right*	*Driver Speeding*	*Runs a Red Light*
	(Y)	*(X1)*	*(X2)*	*(X3)*	*(X4)*
1	Yes	Yes	Yes	No	Yes
2	Yes	Yes	No	Yes	Yes

Method of Agreement (3)

Case	*Accident*	*Drunk Driving*	*Car Enters from the Right*	*Driver Speeding*	*Runs a Red Light*
	(Y)	*(X1)*	*(X2)*	*(X3)*	*(X4)*
1	Yes	Yes	Yes	No	Yes
2	Yes	Yes	No	Yes	Yes
3	Yes	Yes	Yes	No	No

Method of Difference

- Look for a variable that is the only thing that varies systematically with the dependent variable

Method of Difference (1)

Case	*Accident* (Y)	*Drunk Driving* (X1)	*Car Enters from the Right* (X2)	*Driver Speeding* (X3)	*Runs a Red Light* (X4)
1	Yes	Yes	Yes	No	Yes
2	Yes	Yes	No	Yes	Yes
3	Yes	Yes	Yes	No	No
4	No	Yes	No	No	Yes

Conclusions

- X1 is not sufficient for Y
- X2 is not necessary for Y
- X3 is not necessary for Y
- X4 is not sufficient for Y

Assumptions that need to be satisfied for valid inference from Mill's Methods

1. causal factors are independent of each other.
2. there is only one causal path to the outcome.
3. we have identified all of the possible causes.
4. cause can be viewed a deterministic, not probabilistic, factor

Bad news and Good news:Mills methods are not robust

- Bad News: Mills methods are not robust
  - If any of the aforementioned assumptions are not satisfied, valid inference from Mill's Methods is not possible
- Good News: There is an alternative!
  - Statistical methods allow us to cope with the problems of inference in ways that Mill's Methods do not.

Assumption 1 : Causal factors are independent of each other

- causal relations can be effectively evaluated even when
  - X_1 is, in part, determined by X_2
    - path analysis, structural equation models.
  - X_1 effects Y through its influence on X_1 –
    - path analysis, structural equation, selection models.
  - x1's effect on Y varies depending on the value of x2
    - multiplicative interaction models

Assumption 2: There is only one causal path to the outcome.

- Multivariate statistical methods allow us to compare the estimated causal effect of different variables

Assumption 3: We have identified all possible causes.

- a) Stats allow for unbiased inference about identified potential causes even when all causes have not been identified
  - as long as the causal factors omitted from the analysis are not correlated with both the included cause and the dependent variable.
- b) the presence of a large number of cases allows for the examination of a larger number of potential causes.

Assumption 4 Causes is deterministic

- The assumption of deterministic causes, which is inherently untenable for the reasons stated below, is dispensed with entirely in the statistical framework.

Reasons to view cause in probabilistic fashion

- Measurement error
- We may not have identified all the possible causes
- Phenomena being explained may be "inherently" probabilistic