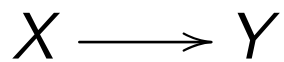
PLSC 502 – Autumn 2016
Multivariate Statistics...

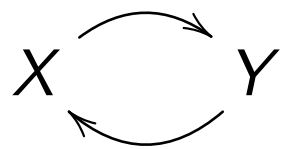
December 6, 2016

Two-Variable Relationships

Bivariate Recursive:

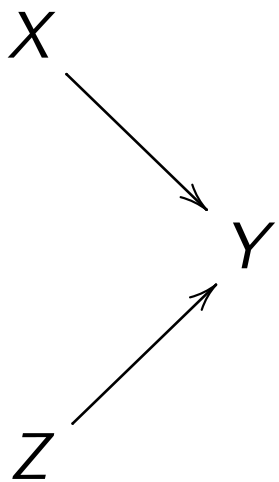


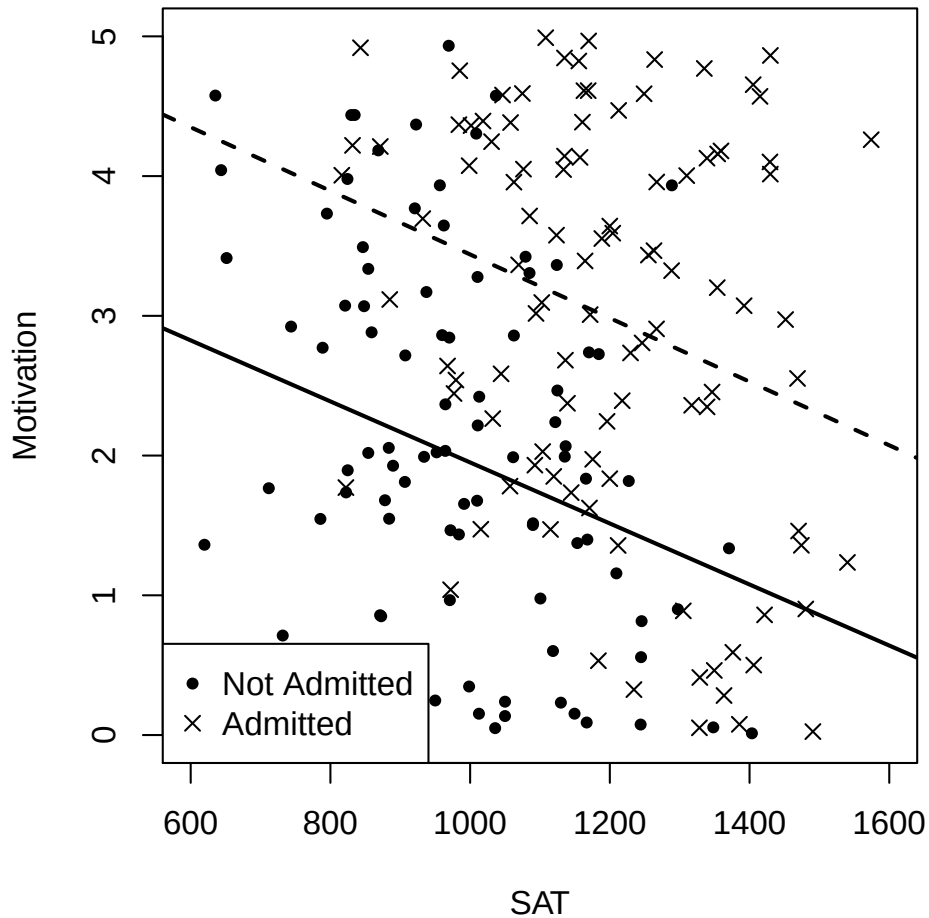
Bivariate Nonrecursive:



Multivariate Relationships: "Colliders"

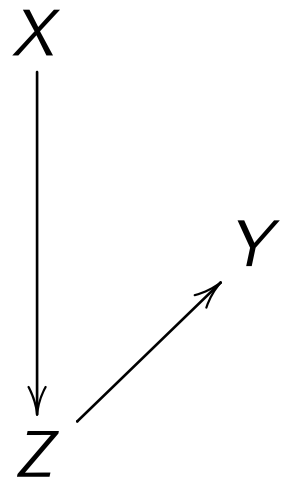
"Collider":



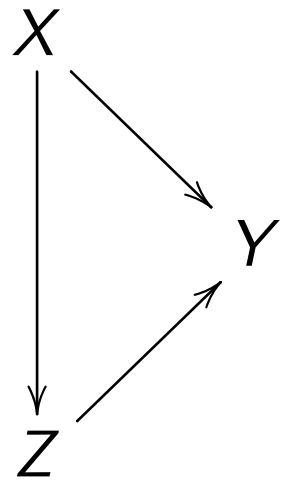


Mediated Relationships

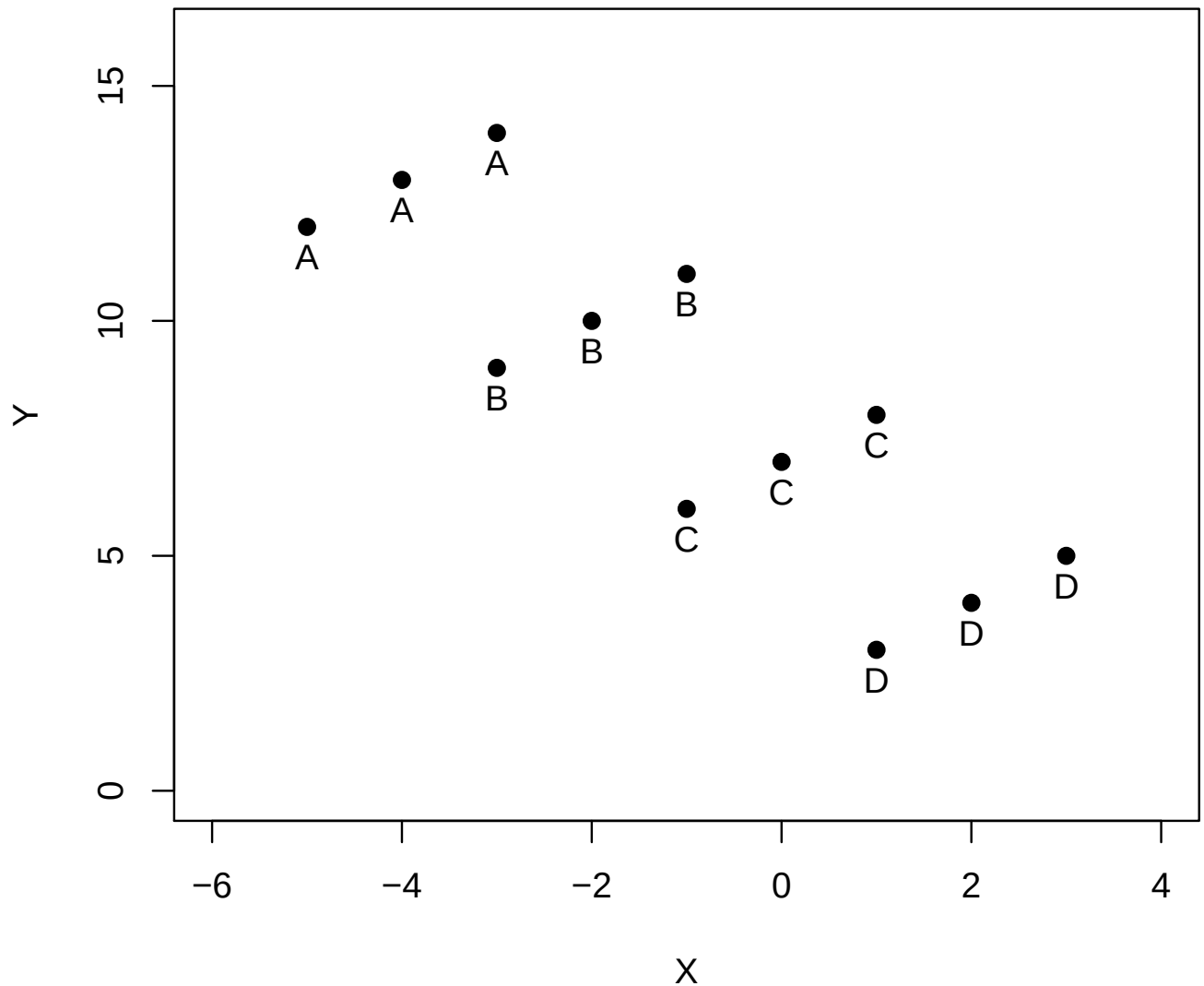
"Completely mediated":



"Partially mediated":

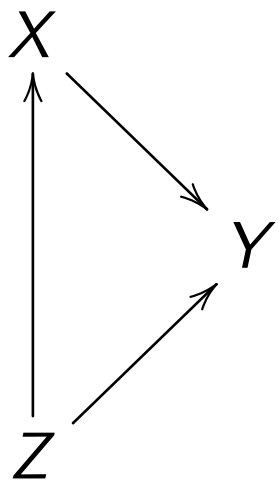


Extreme Mediation: Simpson's "Paradox"

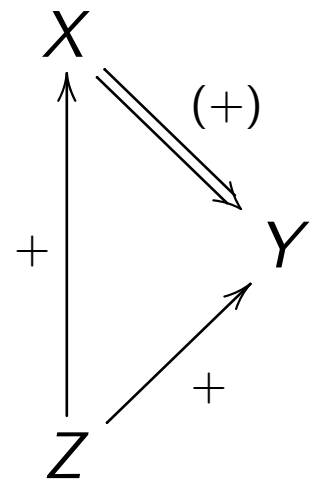


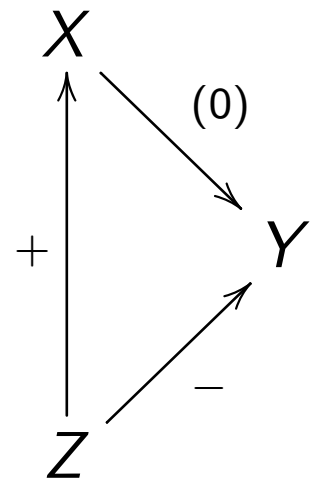
Confounding

In general:

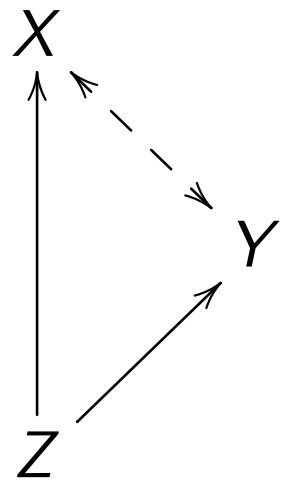


Examples:

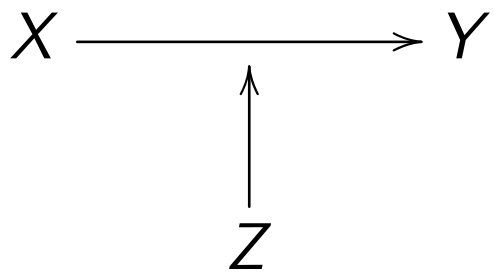




"Spurious" Relationships



Interactive Relationships



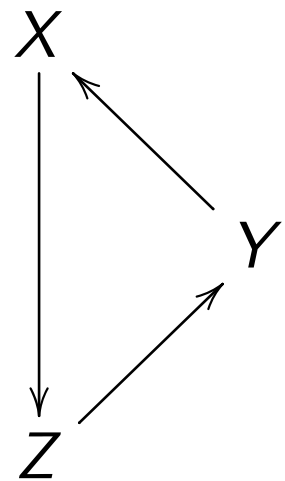
Example: Quadratic Utility:

$$\Pr(\text{Yea}) = f[-(V - A)^2]$$

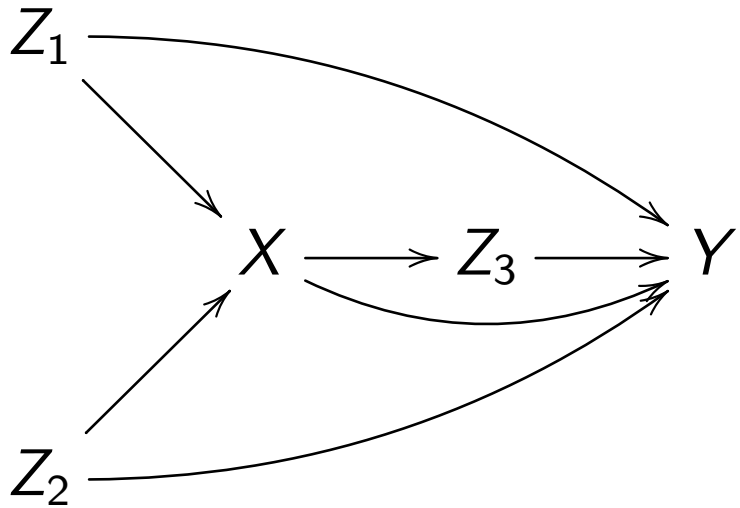
$$\Pr(\text{Yea}) = f[-(V^2 + A^2 - 2AV)]$$

$$\frac{\partial A}{\partial \Pr(\text{Yea})} = f'[-(2A - 2V)]$$

Cyclic Relationships



Complex Multivariate Relationships



Causality...

- **Association**
- **Temporal Order**
- **Elimination of Alternative Explanations**

Multivariate Tools

X, Z, And Y Observed

- *Multivariate Regression* analysis...
- *Instrumental Variables* approaches...
- Models for *Causal Inference* (matching, differences-in-differences, etc.).

X and Y Observed, Z Unobserved

- Models for *Unobserved Heterogeneity*
    - Errors-In-Variables Models
    - Fixed/Random Effects ("Frailty") Models

X and Z Observed, Y Unobserved

- Factor Analysis / Principal Components
- Item Response Theory / Measurement Models
- Latent Class Analysis