Structural Equation Models

STA431: Spring 2013

An extension of multiple regression. Can incorporate measurement error, and more

Measurement Error

- What you see is not what you really want.

- **Latent variable**: A random variable whose values cannot be directly observed.

- Contrast with **Observable variable**

- Usually, interest is in relationships between latent variables.

- But all you can see are the observable variables.

Measurement Error in Nonlinear Models: Carroll et al., 2006, p. 8
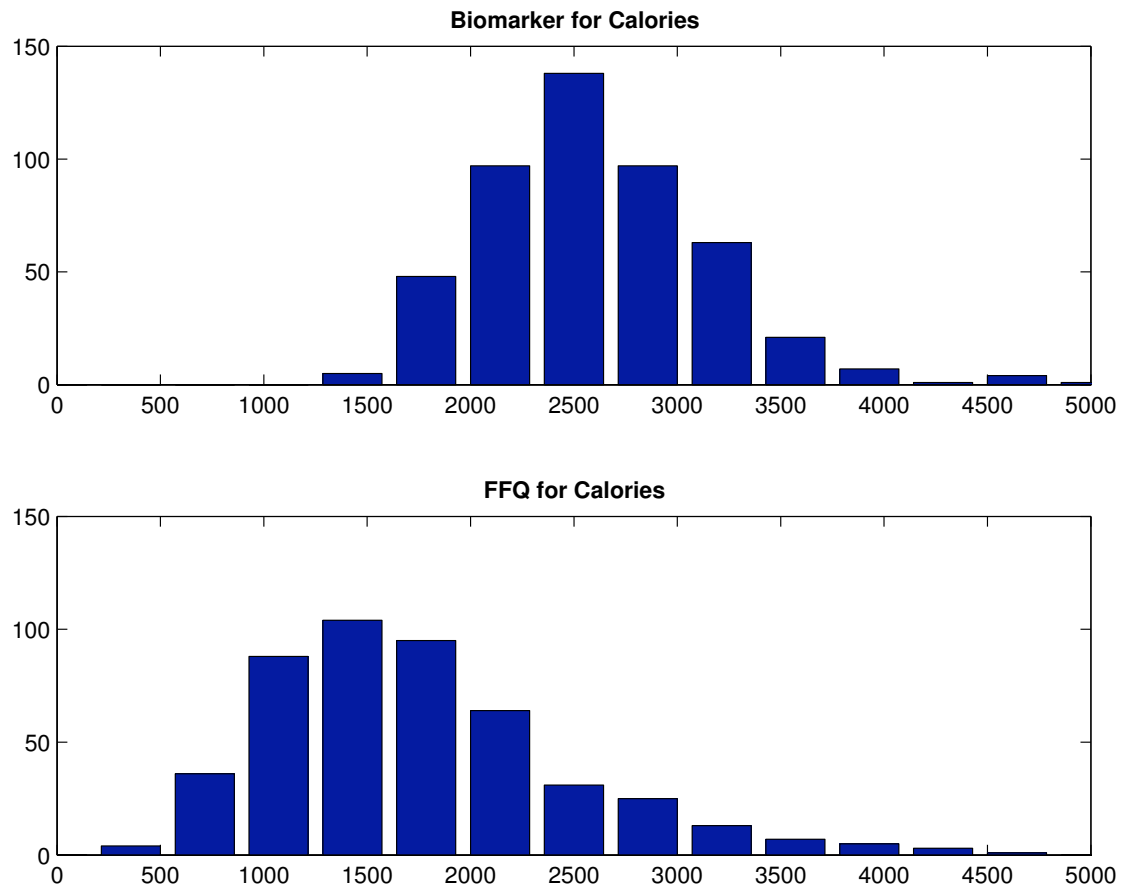

Figure 1.5 *OPEN Study data, histograms of energy (calories) using a biomarker (top panel) and a food frequency questionnaire (bottom panel). Note how individuals report far fewer calories than they actually consume.*

Let's stop pretending

- Most statistical models assume the random variables of interest are observable.

- But really the observable variables are latent variables measured with error.

- Building measurement error into the statistical model is a lot of trouble.

- Is it worth it?

- Yes! Pretending there is no measurement error can easily produce incorrect results.

Roadmap

- Regression with random explanatory variables.

- Regression with latent variables and measurement error.

- Extension to regression-like models in which variables can be both response and explanatory.
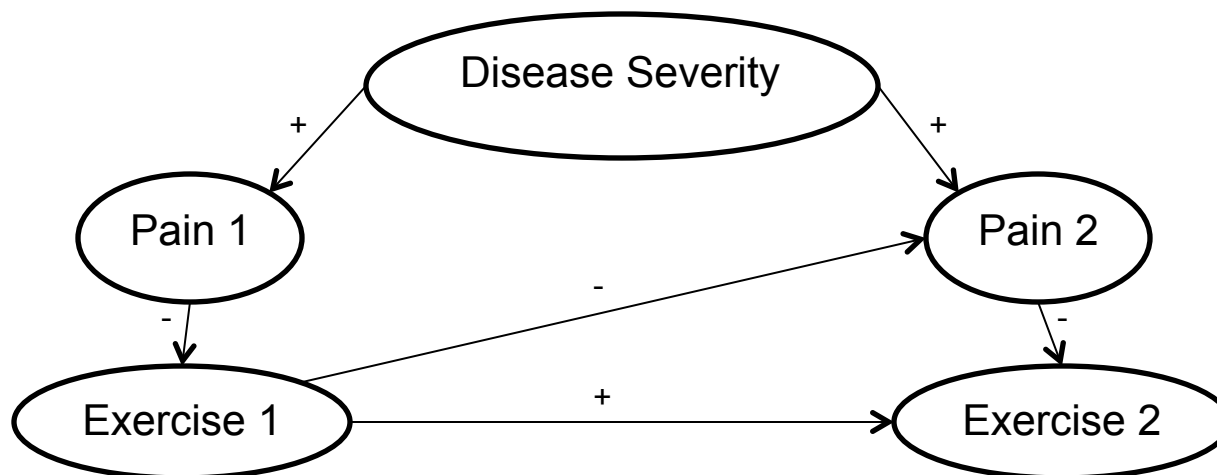
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