Discrete Choice Model

What Are Discrete Choice Models?

- Suitable statistical models depend upon the nature of the economic behavior governing the response, & the objectives of the analysis
- Discrete Choice Model allows for qualitative variables to be either binomial (yes/no) or multinomial
  - Multinomial responses may be ordered
  - Multinomial responses may be unordered
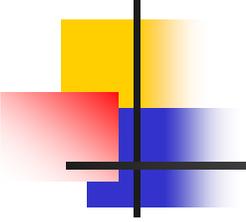
What Are Discrete Choice Models? (Con't)

- Analyzes intrinsically categorical variables & economic behavior
  - E.g.: Choice of occupation, getting married, choice of medical treatment, etc.
  - Continuous response models & continuous scalars cannot effectively analyze these variables
    - A customer's final purchase decision is not based upon continuous scalars
    - Decision is either to buy or not to buy
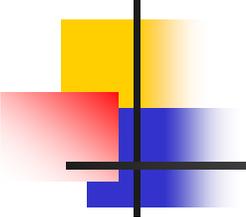
Characteristics of Discrete Choice Models

- The alternatives must be mutually exclusive from the decision maker's point of view
  - E.g. : A customer will either purchase a pharmaceutical or not purchase it
- The choice set must be exhaustive; all possible alternatives must be included
- The number of alternatives must be finite
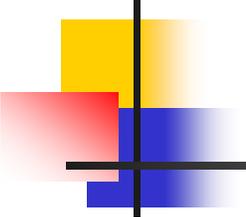
Derivation of Choice Possibilities (3)

- Consumers with different individual characteristics make different choices

  - The aggregate demand system is derived by integrating the choice function over the distribution in population

  - Consumer, I, will choose product, j, if and only if:

$$U(S_i, P_j, X_j, S_j; \beta) \geq U(S_i, P_r, X_r, S_r; \beta)$$
$$\text{for } r = 0, 1, \dots J$$
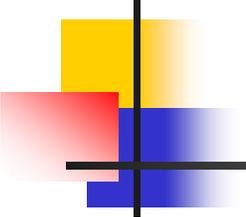
Derivation of Choice Possibilities

- A decision maker is assumed to behave in a utility-maximizing manner
- A decision maker, n, faces a choice among a number of alternatives, j.
  - The decision maker obtains a certain level of utility from each alternative
  - This utility is fully known by the consumer, but **not fully known by researchers and manufacturers**

Derivation of Choice Possibilities (2)

- The level of utility that a consumer derives from a given product is a function of both a vector of individual characteristics, & a vector of product characteristics

$$\text{BLP: } U (S_i , P_j, X_j, S_j; \beta)$$

S_i: Individual characteristics vector

P_j: Price of product

X_j: Observed vector of product attributes

S_j: Unobserved vector of product attributes

β : k-vector of parameters to be estimated
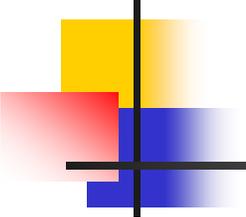
How The Discrete Choice Model Is Helpful

- The model determines the probability that a decision maker will take a certain action based upon several attributes & choices

- It determines the probability that a doctor will prescribe a medication produced by Pfizer, against competitors offerings

- The probability is a function of all products that the decision maker is against, and their attributes
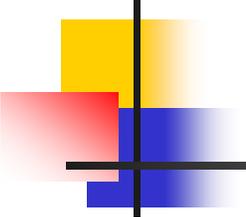
How The Discrete Choice Model Is Helpful (Con't)

- The Discrete Choice Model helps determine which products have higher demand and why
  - Allows the manufacturers and researchers to fully understand the level of utility derived by consumers for a certain product
  - Once the level of utility for each product is known, the demand for the product can be calculated
  - This leads to a maximization of profits!
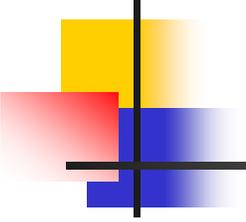
Application of Discrete Choice Model to Memory Loss

- Using the Discrete Choice Model, the probability, P, of a doctor prescribing a certain memory loss medication can be calculated:

P = (Price) + (Effectiveness) + (Side Effects) + (Insurance Approval) + …