Theoretical foundations

Ingredients of choice theory

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Introduction to choice models

Ingredients of choice theory

Choice theory

Theory of behavior that is

- descriptive: how people behave and not how they should
- abstract: not too specific
- operational: can be used in practice for forecasting

Building the theory

Define

1. who (or what) is the decision maker,
2. what are the characteristics of the decision maker,
3. what are the alternatives available for the choice,
4. what are the attributes of the alternatives, and
5. what is the decision rule that the decision maker uses to make a choice.

Decision maker

Individual

- a person
- a group of persons (internal interactions are ignored)
  - household, family
  - firm
  - government agency
- notation: n

Characteristics of the decision maker

Disaggregate models

Individuals

- face different choice situations
- have different tastes

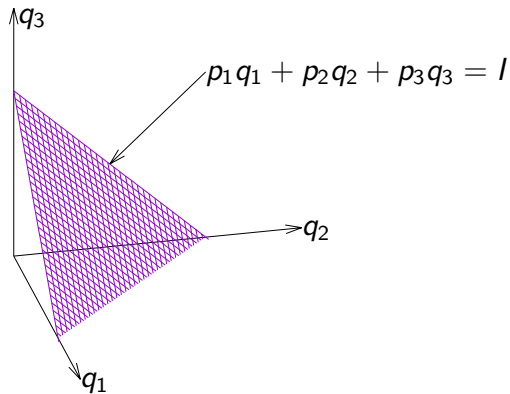
Characteristics

- income
- sex
- age
- level of education
- household/firm size
- etc.

Alternatives: continuous choice set

Commodity bundle

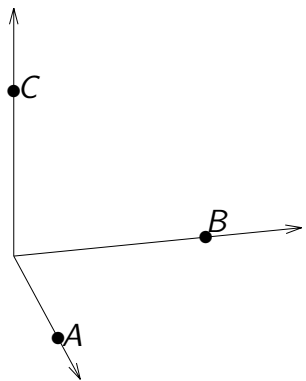
- q_1: quantity of milk
- q_2: quantity of bread
- q_3: quantity of butter
- Unit price: p_i
- Budget: I



Alternatives: discrete choice set

List of alternatives

- Brand A
- Brand B
- Brand C



Alternatives: discrete choice set

Choice set

- Non empty finite and countable set of alternatives
- Universal: $\mathcal{C}$
- Individual specific: $\mathcal{C}_n \subseteq \mathcal{C}$
- Availability, awareness

Example

Choice of a transportation mode

- $\mathcal{C} = \{\text{car, bus, metro, walking }\}$
- If decision maker n has no driver license, and the trip is 12km long

$$\mathcal{C}_n = \{\text{bus}, \text{metro}\}$$

Alternative attributes

Characterize each alternative i for each individual n

- price
- travel time
- frequency
- comfort
- color
- size
- etc.

Nature of the variables

- Discrete and continuous
- Generic and specific

Decision rule

Homo economicus

Rational and narrowly self-interested economic actor who is optimizing her outcome

Preferences

- $i \succ j$: i is preferred to j,
- $i \sim j$: indifference between i and j,
- $i \succsim j$: i is at least as preferred as j.

Decision rule

Rationality

- Completeness: for all alternatives i and j,

$$i \succ j \text{ or } i \prec j \text{ or } i \sim j.$$

- Transitivity: for all bundles i, j and k,

$$\text{if } i \succsim j \text{ and } j \succsim k \text{ then } i \succsim k.$$

- "Continuity": if i is preferred to j and k is arbitrarily "close" to i, then k is preferred to j.

Utility

$$U_n : \mathcal{C}_n \longrightarrow \mathbb{R} : i \rightsquigarrow U_n(i)$$

Consistent with the preferences

$$U_n(i) \geq U_n(j) \Longleftrightarrow i \succsim j.$$

- Unique up to an order-preserving transformation.
- Captures the attractiveness of an alternative.
- Measure that the decision maker wants to optimize.

Behavioral assumptions

- the preference structure of the decision maker is fully characterized by a utility associated with each alternative
- the decision maker is a perfect optimizer
- the alternative with the highest utility is chosen