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A Study of Discrete Choice Model with Latent Variables for Apartment Selection

Motivations of the study

- Many researchers have been attempting to develop a variety of logit models in describing housing choice
- Traditional residential choice models depend solely on observed dwelling attributes and household's socio-demographic information
- Logically, people's perceptions on residential neighborhood do have effects on the housing decisions. However, relatively little attention has been directed to integrate latent variables in residential choice models

Objectives

- Introduce latent variables in residential choice models in order to provide a more realistic behavior representation of consumer's housing choice
- To stress the importance of the cognitive processes on choice behavior, specifically the perceptions of residential satisfaction
- Identify the significant factors, such as housing attributes and consumer residential satisfaction, affecting the apartment purchase decision
- Understand consumer's needs in future planning and developing housing estates

Nested Logit Model

- Nested logit model is appropriate when the set of alternatives faced by a decision maker can be partitioned into subsets, called nests
- The choice probability under nested framework presupposes the decision process to have a hierarchical structure
- With the decomposition of utility, the nested logit probability can be expressed in terms of the product of two logit probabilities

$$P_{nj} = P_{nj|B_k} P_{nB_k}$$

where $P_{nj|B_k} = \frac{e^{Y_{nj}}}{\sum_{i \in B_k} e^{Y_{ni}}}$, $P_{nB_k} = \frac{e^{W_k + \lambda_k I_{nk}}}{\sum_{l=1}^{K} e^{W_m + \lambda_l I_{nl}}}$,

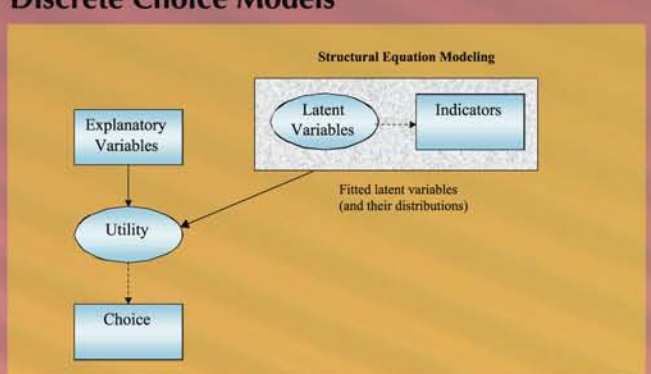
$I_{nk} = \ln \sum_{i \in B_k} e^{Y_{ni}/\lambda_k}$ is the inclusive value

McFadden's Sampling Rule

- When the number of alternative available for consumers to choose is immense, McFadden (1978) proposes a sampling rule for creating a reduced choice set to make data collection and estimation problem practically tractable and can still yield consistent parameter estimates

Reduced Choice Subset = The chosen alternatives + Some randomly selected non-chosen alternatives

Integration of Latent Variables in Discrete Choice Models

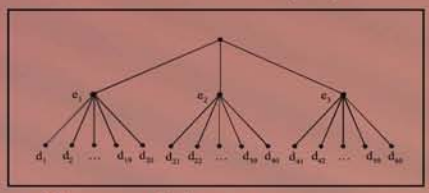


Empirical Application of Residential Choice Model

- Data Description
  - The data is collected by using probability proportional to size (PPS) sampling method from three newly developed estates in Tseung Kwan O
  - 317 decision makers are interviewed

	Estates	*Number of observations*
	Ocean Shore 維景灣畔	122
	Oscar by The Sea 清水灣半島	117
	Park Central 將軍澳中心	78
	Total	**317**

- Estimation of Fitted Latent Variables
  - Perform Principal Axis Factoring on a set of indicators concerning consumer's perception of residential satisfaction
  - Six factors are obtained:
    F1–Transportation Route Coverage
    F2–Estate Planning
    F3–Apartment Interior Design
    F4–Domestic Equipment
    F5–School Network
    F6–Community Facilities
- McFadden's (1978) Sampling Rule
  - The opportunity set composes of the chosen alternatives and 59 randomly selected alternatives with equal probability



- Interpretation of Parameter Estimates
  - Most of the estimates are found to be statistically significant, including the unit price of flat, flat size per person, view from window, floor level etc.
  - The latent variables measuring perception of residential satisfaction are observed having large impact on the residential choice
  - The residential Model with the incorporation of latent variables significantly improves the goodness of fit of the model