Lessons from a Revealed Preference Study of Air Passengers in the New York/New Jersey Metropolitan Region

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Background Issues
- Lack of recognized standards or best practices in airport ground access modeling
- Several differentiating factors from trip data traditionally represented in travel demand models

Utility Theory of Choice
- Utility = ASC (g) + Time (t) + (b + Headway) + (c + Cost) + ...
- ASC = alternative specific constant (model constant)
- \( \beta \) = coefficient quantifying impact of variable on utility function

Airport Ground Access Modeling Considerations
- Data sources: revealed preferences (RP) / stated preferences (SP)
- Market segmentation by trip purpose and residency status
  - Resident Business (RB)
  - Resident Non-Business (RNB)
  - Non-Resident Business (NRB)
  - Non-Resident Non-Business (NRNB)
- Functional form: multinomial logit (MNL) is traditional format but nested logit provides more advanced and realistic behavioral structure
  - Value of time (VOT)

Research Study Background and Objectives
- Explore existing and alternative approaches to ground access modeling
- Based on 2005 FAA survey data covering the three major regional airports
  - Other key data sources:
    - 2005 New York Best Practice Model (NYBPM) travel data
    - 2005 New York City Transit and Lincoln MTA database
    - 2009 RP survey data from PATH-EWR Study (limited to NYC and NJ Urban Core)

Key Mode Choice Modeling Considerations
- Parametric model specification for future integration with regional model frameworks
- Focus on policy analysis/investment variables (e.g. time and cost)
- Additional segmentation by reported household income

Summary of Base Model Estimation Findings
- Income segmented cost intervals provide the most plausible model results
  - Trend formulation overestimates price sensitivity across the entire range of incomes
  - Coefficient interaction generates extreme price sensitivity results at both extremes of the income range
  - Cost/income results in relatively indistinguishable sensitivity at higher income levels
  - Income segmented cost also generates the most plausible travel time sensitivity

Market Segmentation

Summary of Market Segmentation Findings
- Initial segmentation using separate samples for each ground access market resulted in inconsistent coefficient magnitudes comparatively
  - Probably due to sample size reduction
  - RNB & NRNB samples were largest and may explain why better results obtained in those segments
  - Pooled data models used dummy variables as means of segmentation applied to policy analysis/investment variables
    - Greater consistency across travel markets obtained
    - Further confirms similarity in travel demand access markets with widely differing income profiles
  - Additional cost segmentation by income level improves model performance
    - Nudges travel time consistently towards desired target (PATH-EWR SP survey)
    - Provides greater detail and anticipated pattern of cost sensitivity by both reported segment and income level
    - Cost-to-income interaction with trip origin
      - Provides greater consistency across travel markets
      - Positive correlation between willingness-to-pay (WTP) and household income corroborated by PATH-EWR survey data on travel reimbursement by income level
      - WTP variation appears to be primarily driven by need cost rather than by income level due to meaningful interaction with trip origin

Model Application: LaGuardia Airport (LGA) Alternatives Analysis
- Evaluation of several new and improved bus service alternatives to LGA
  - Travel improvements analyzed with mode-choice model integrated with NYSDOT assignment process
  - Model output (VOT = -1.2) suggests meaningful interaction with trip origin

Final Model Structure

No Build Condition

Q70 Build Condition

Base Mode Estimation
- General evaluation of RP data quality
- Preliminary determination of most promising modeling structure carried forward

Market & Income Segment Cost

No Build Condition

Q70 Build Condition

Base Mode Estimation Summary (ASC Coefficients Excluded from Table)

No Build Condition

Q70 Build Condition

Base Model Estimation Summary (ASC Coefficients Excluded from Table)

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Market Segmentation

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