Technical Report for 2.5.1 TOD Model for Work Tour

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Model Description

Time of day model at tour level jointly predicts the arrival time and departure time for primary activity in a tour. To model time of day choice in the context of discrete choice model, time is divided into blocks.

Choice Set

48 time blocks of 30 minutes will be used as alternatives, 3:00 to 3:29 a.m., 3:30 to 3:59 a.m., ... 2:00 to 2:29 a.m., 2:30 a.m. to 2:59 a.m. Since the departure time from primary activity should be later than arrival time, a total of $48 \times 49/2 = 1176$ alternatives are used. Availability is determined after adjusting for the time periods used by all previously simulated tours. The model will be estimated as a multinomial logit model.

The choice set:

(300 - 329,300 - 329)	(300 - 329,330 - 359)	...	(300 - 329,2630 - 2659)
	(330 - 359,330 - 359)	...	...
		...	(2600 - 2629, 2630 - 2659)

can be indexed as

1	2	...	48
	49	...	...
		...	1176

Model Structure

The TOD model is a MNL. In the utility function, we use trigonometric series alone as time-dependent constant and trigonometric series times dummy variables to reflect a time-depdent effect of that dummy variables. A trigonometric series is defined as: $\sum_{i=1}^{k} \sin(2i\pi t/24) + \cos(2i\pi t/24)$

Please refer to model python files for specification.

Variables

There are three covariates, `worktime`, `gender`, `person_type` in the specification. `gender` is the same as `female_dummy` and equals 1 if the gender is female. `worktime equals 1 if work fixed hour, 2 for flexible hour and can be get in population table` (worktime_flex').

Availability of Alternatives

Availibility of an alternative is constrained by:

- Previous modeled tour
- Public transportation available period (from 5 am to 2am next day).