

アクティビティパターンに着目した 道後温泉の混雑緩和シミュレーション

Focused on activity patterns

Simulation of congestion relief at Dogo Onsen Honkan

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1. 背景・目的 Background and Objective

道後温泉本館の入浴客が昼間～夕方に集中

Number of customers at Dogo Onsen Honkan are concentrated in the daytime and evening.



本館の改修工事が始まり，容量が減少
Renovation work has begun and reducing capacity



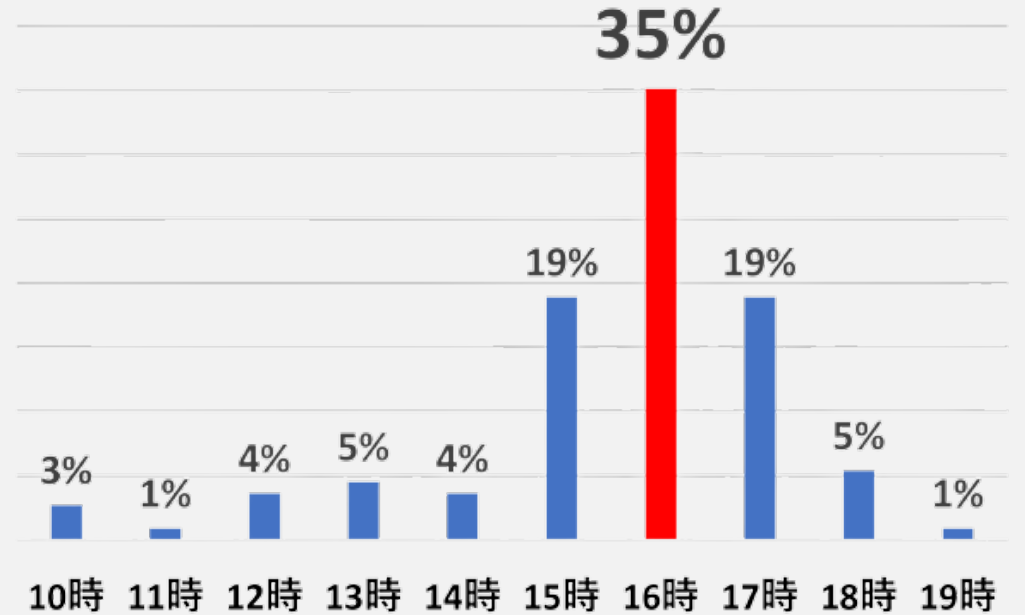
混雑により入浴できない人もいる

Some people cannot bath due to crowding.

時間帯別入浴料金を導入し混雑を緩和
Ease congestion by offering different bathing fees at different times of the day.

入湯時間帯の分布

Distribution of bath time



使用データ：道後2017 Dogo2017

宿泊客のうち、道後温泉本館を訪問しているTripから
7つのアクティビティパターンに分類 ($N = 72$)

Limited to only those Trips visiting Dogo Onsen Honkan,
and Categorized into 7 activity patterns.

	1st	2nd	3rd	4th
①	check-in	bath	sightseeing	sightseeing
②	sightseeing	bath	check-in	sightseeing
③	bath	check-in	bath	sightseeing
④	sightseeing	sightseeing	bath	check-in
⑤	sightseeing	check-in	bath	sightseeing
⑥	sightseeing	bath	sightseeing	check-in
⑦	check-in	sightseeing	bath	sightseeing

1st :Activity from 12:00 to 14:00

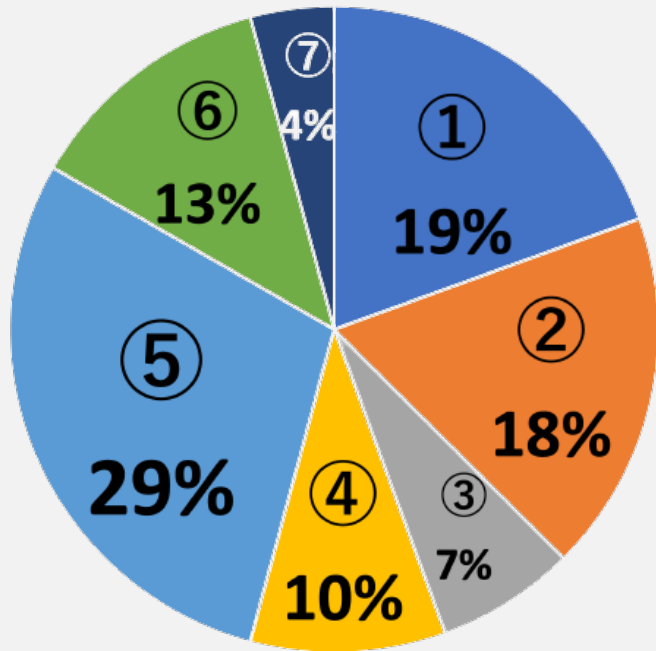
2nd:Activity from 14:00 to 16:00

3rd :Activity from 16:00 to 18:00

4th :Activity from 18:00 to 20:00

4. 基礎集計 Basic Analysis

アクティビティパターン割合 percentage of activity patterns



	1st	2nd	3rd	4th
①	check-in	bath	sightseeing	sightseeing
②	sightseeing	bath	check-in	sightseeing
③	bath	check-in	bath	sightseeing
④	sightseeing	sightseeing	bath	check-in
⑤	sightseeing	check-in	bath	sightseeing
⑥	sightseeing	bath	sightseeing	check-in
⑦	check-in	sightseeing	bath	sightseeing

・チェックイン直後に入浴を行うパターン①・③・⑤が半数以上

More than half of the pattern 1, 3, and 5 use baths immediately after check-in.

・入浴後の観光行動が多くみられる

Many sightseeing activities are observed after bathing.

Activity pattern choice model (**MNL**)

アクティビティパターン n の効用関数 Utility function of activity pattern n

$$U_{in} = ASC_n + \beta_{fee} * fee * num_i + \beta_{after_4pm_sight} * after_4_pm * after_sight$$

説明変数 Explanatory variables

fee : 入浴料金 (420JPY) Bathing fee

num _{i} : 入浴回数 Number of times individual i bathed

after_4_pm : 16時以降入浴ダミー (0or1) Bathing after 4pm (dummy)

after_sight : 入浴後観光ダミー (0or1) Sightseeing after bathing (dummy)

Pamameters	Estimated
ASC_pattern2	2.93 *
ASC_pattern3	2.99 *
ASC_pattern4	2.31 *
ASC_pattern5	3.41 *
ASC_pattern6	2.56 *
ASC_pattern7	1.46 *
B_after_4pm_sight	-1.81 *
B_fee	-0.24 *
Samples	72
Init log likelihood	-287.6
Final log likelihood	-128.9
Likelihood ratio	0.552

* p < 0.05

考察 Consideration

- 16時以降に入浴を選択する人ほどそのアクティビティパターンを選びにくい
- 入浴料金が低いほどそのアクティビティパターンを選択しにくい

The more people choose to bathe after 4 p.m., the less likely they are to choose that activity pattern.

The higher the price of bathing, the less likely you are to choose that activity pattern.

現状：入浴客が昼間～夕方に集中

Situation：Bathers are concentrated during the day and in the evening

→入浴料金による**選択確率の変化**に着目

Note the change in the probability of selection according to the price of bathing.

目的：アクティビティパターン別入浴料金を導入し混雑を緩和

Purpose：Introduced activity pattern-based bathing fees to ease congestion

政策：アクティビティパターン1,2,6の入浴料に1~500円課金

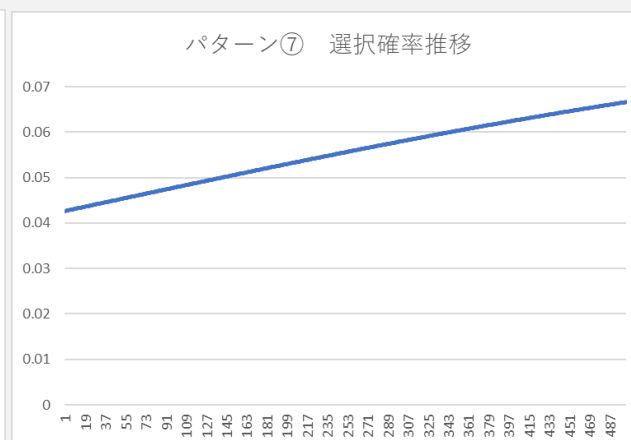
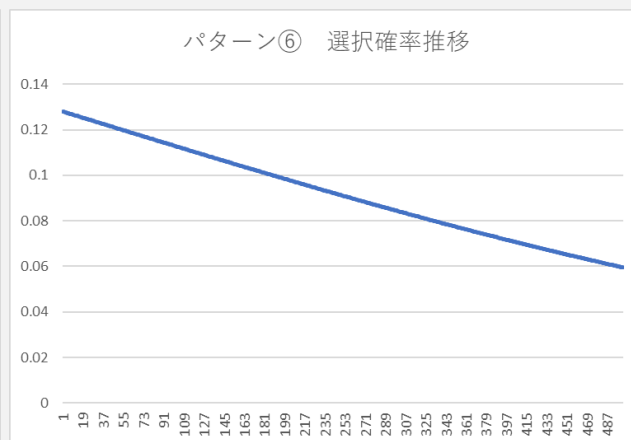
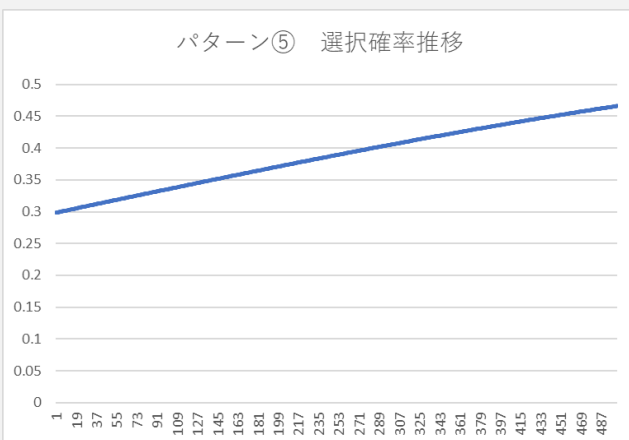
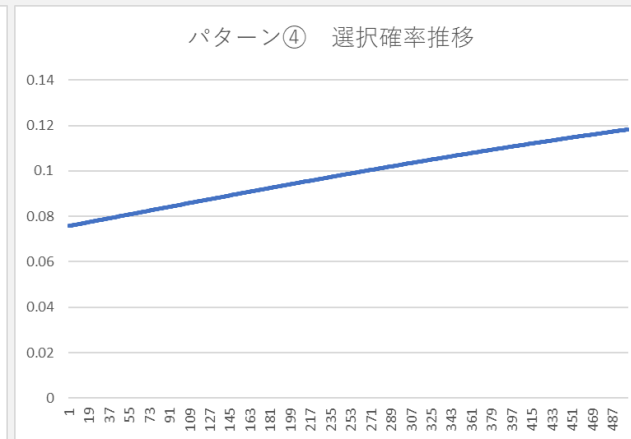
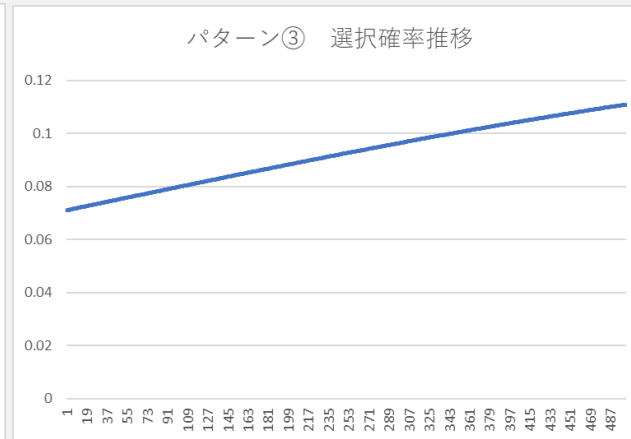
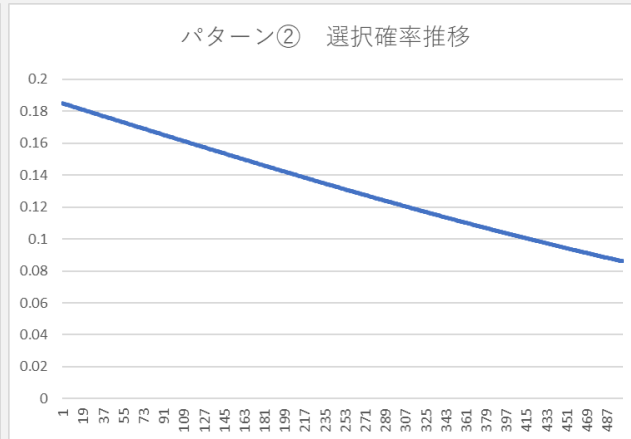
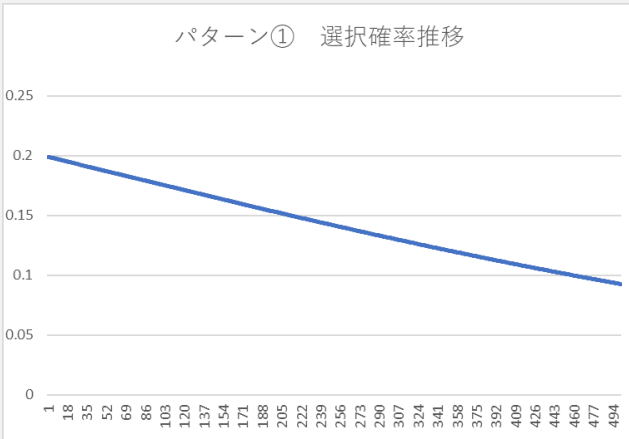
Policy：1~500 charged for bathing in activity patterns 1, 2, 6

評価：課金額と選択確率の推移

Evaluation：Charges and choice probabilities

6. 政策シミュレーション Policy simulation

Scenario : アクティビティパターン1,2,6の入浴料に1~500円課金
1~500 charged for bathing in activity patterns 1, 2, 6



- アクティビティパターン1,2,6の入浴料に1~500円課金による
選択確率の検証

Activity Patterns 1, 2, and 6 by charging 1~500 JPY for bathing Verification of choice probability

- 課金をしたことにより夕方に入浴するアクティビティの
選択確率が減少

Charges reduce the probability of choose an activity to bathe in the evening.

ご清聴ありがとうございました
