Yokohama.. Future Compact City

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Compact city:

✓ High residential density with mixed land use
✓ Better mobility
✓ Less impact on environment

What is Compact City?

Compact City model in Toyama

- Renovation of public transportation to reduce auto-dependency
- Incentives to concentrate activities in the target areas
Why Compact City in Yokohama?

• **Population**: Over 3.7 million

• **Area**: over 168 square miles,

• **Density**: 22,103 people per square mile

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Mode Share in Yokohama City

- Bike: 34.69%
- Car: 33.64%
- Walk: 15.11%
- Bus: 13.86%
- Rail: 2.69%
Mode Estimation

- **Model 1**: Less than 10 km
- **Model 2**: More than 10 km
- **Aim**: To investigate how the distance would affect mode choice
Model Estimation

\[ V_R = \beta_1 + \beta_3 Ac_R + \epsilon_R \]
\[ V_B = \beta_2 + \beta_4 Ac_B + \epsilon_B \]
\[ V_C = \beta_4 Ac_B + \beta_5 Td + \epsilon_C \]

- R: rail
- B: bus
- C: car
- Ac: Acess time
- Td: Trip duration
```r
> Data <- read.table("C:/Users/Phan Thu Trang/Downloads/Summer school 2019/Long distance.txt")
> ## Count the number of data rows
> hh <- nrow(Data)
> ## Set the initial values of the parameters (the number in parenthesis corresponds to the number of parameters to be estimated)
> b0 <- numeric(6)
> b0 <- c(1,1,1,1)
> ## Recall that we estimate parameters by maximizing the log-likelihood function, hence we first need to define that function
> 
> #### Define the log-likelihood function of the logit model####
> 
> fr <- function(x) {
+   ## declare the log-likelihood variable, set value to 0
+   LL = 0
+   
+   ## For this choice problem, we consider the following 3 modes
+   ## rail
+   ## bus
+   ## car
+   
+   ## calculate the utility function: introduce the desired explanatory variables in the function
+   train <- Data$Avail_R * exp(x[1] * matrix(1,nrow = hh,ncol = 1) + x[3] * Data$Access_R)
+   bus <- Data$Avail_B * exp(x[2] * matrix(1,nrow = hh,ncol = 1) + x[3] * Data$Access_B)
+   
+   ## Calculate the choice probabilities
+   ## calculate the Inclusive Value (the denominator of the choice probabilities equation)
+   deno <- (car + train + bus)
+   
+   ## Calculate individual choice probabilities
+   Ptrain <- Data$Avail_B * (train / deno)
+   Pbus <- Data$Avail_B * (bus / deno)
+   Pcar <- 1 * (car / deno)
+   
+   ## Avoid problems stemming from choice probabilities becoming zero.
+   Ptrain <- (Ptrain != 0) * Ptrain + (Ptrain == 0)
+   Pbus <- (Pbus != 0) * Pbus + (Pbus == 0)
+   Pcar <- (Pcar != 0) * Pcar + (Pcar == 0)
+   
+   ## Choice results
```
Estimation Result

```r
## Choice results
Ctrain <- Data$Mode_choice == 200
Cbus <- Data$Mode_choice == 240
Ccar <- Data$Mode_choice == 100

## Calculate the Log-likelihood function
LL <- colSums(Ctrain * log(Ptrain) + Cbus * log(Pbus) + Ccar * log(Pcar))
return(LL)

## Maximize the Log-likelihood function

## Parameter optimization
res <- optim(b0, fr, gr=NULL, method = "Nelder-Mead", hessian = TRUE, control=list(fnscaler=-1))

## Parameters and Hessian matrix calculation
b <- res$par
Error: object 'res' not found
hhh <- res$hessian
Error: object 'res' not found

tval <- b/sqrt(diag(solve(hhh)))
Error: object 'b' not found

## L(0), Log-Likelihood when all parameters are 0
L0 <- fr(b0)
## LL, maximum likelihood
LL <- res$value
Error: object 'res' not found

## Output
print(res)
Error in print(res) : object 'res' not found

## t-statistic
print(tval)
Error in print(tval) : object 'tval' not found

## L(0)
print(L0)
[1] NA
```
• Compact City policies:

➢ Public-Private Partnership
➢ Urban growth boundary (contain outward growth)
➢ Polycentric compact city pattern