

Supplementary Material for “Sales in Commercial Alleys and Their Association with Air Pollution: Case Study in South Korea”

Detailed Description of Variables

This supplementary document provides an in-depth explanation of the 70 variables utilized in the study, focusing on the sales in commercial alleys across Seoul. These variables are intricately divided into one target variable and a comprehensive set of predictor variables, offering a granular view of the factors influencing commercial sales.

Target Variable:

1. **Sales:** This is the target variable of our study. It represents the aggregate sales of all businesses in each commercial alley within Seoul, thereby capturing the economic vibrancy and activity of these areas.

Predictor Variables:

2. **Stores:** Reflects the total number of businesses present in each commercial alley. This variable is crucial for understanding the density and diversity of commercial activities in each area.
3. **Household by Area of Apartment:** This variable is categorized into distinct segments based on the size of apartments in each area, with categories including:
 - a. Under 66 square meters
 - b. 66-99 square meters
 - c. 99-132 square meters
 - d. 132-165 square meters
 - e. Over 165 square meters

Significance: Each size category is an individual predictor, shedding light on how the residential area sizes influence commercial sales.

4. **Household by Price of Apartment:** This predictor categorizes households based on their apartment pricing, with distinct categories such as:
 - a. Under \$100,000
 - b. \$100,000-under \$200,000
 - c. \$200,000- under \$300,000
 - d. \$300,000- under \$400,000
 - e. \$400,000- under \$500,000
 - f. \$500,000- under \$600,000
 - g. Equal and above \$600,000

Significance: Each pricing bracket is a separate predictor, indicating the economic status of residents and its potential impact on alley sales.

5. **Income:** Represents the average monthly income.

Significance: Serves as a singular predictor, highlighting the economic capabilities of the residents.

6. **Facility:** Includes various types of facilities:
 - a. Total facilities
 - b. Public facilities

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- c. Banks
- d. Hospitals
- e. Clinics
- f. Pharmacies
- g. Kindergartens
- h. Elementary Schools
- i. Middle Schools
- j. High Schools
- k. Colleges
- l. Department Stores
- m. Supermarkets
- n. Theaters
- o. Accommodations
- p. Airports
- q. Railway Stations
- r. Bus Terminals
- s. Subway Stations
- t. Bus Stops

Significance: Each facility type is an independent predictor, illustrating the role of local amenities in commercial activity.

7. Dynamic Population: A complex variable that includes:

- a. Total population
- b. Male
- c. Female
- d. Ages 10s
- e. Ages 20s
- f. Ages 30s
- g. Ages 40s
- h. Ages 50s
- i. Over 60s
- j. Monday
- k. Tuesday
- l. Wednesday
- m. Thursday
- n. Friday
- o. Saturday
- p. Sunday

Significance: Each demographic segment and each day are a unique predictor, offering insights into daily and demographic variations in alley traffic and sales. The days of the week in the "Dynamic Population" predictor variable are likely used to analyze and understand how the population in the commercial alleys of Seoul varies on different days.

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- 8. Resident Population:** Focuses on the total resident population along with breakdowns by gender and age groups.
- a. Total population
 - b. Male
 - c. Female
 - d. Ages 10s
 - e. Ages 20s
 - f. Ages 30s
 - g. Ages 40s
 - h. Ages 50s
 - i. Over 60s

Significance: Each category serves as a separate predictor, aiding in understanding the resident demographics' influence on sales.

- 9. Worker Population:** Similar in structure to the resident population, this variable includes the total worker population, segmented by gender and age groups.
- a. Total population
 - b. Male
 - c. Female
 - d. Ages 10s
 - e. Ages 20s
 - f. Ages 30s
 - g. Ages 40s
 - h. Ages 50s
 - i. Over 60s

Significance: Each demographic category is counted as an individual predictor, reflecting the working population's impact on sales.

- 10. Quarter:** Quarter of the year to capture seasonal variations in sales without breaking down the analysis by each specific quarter.

Significance: Allows for the examination of seasonal variations in sales patterns.

- 11. Air Pollution:** Includes the PM10 concentration as a single predictor.

Significance: Links environmental factors to commercial sales dynamics.