NYC Food Orders

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Abstract

A 150 word abstract.

The number of restaurants in New York is steadily increasing, reflecting the city's fast-paced lifestyle and the growing reliance on dining out or ordering in. With so many options available, understanding what factors influence meal preparation time is essential for both restaurant efficiency and customer satisfaction. Our project aims to explore how specific restaurant characteristics contribute to the time it takes to prepare an order.

To investigate this, we are using a multilevel dataset titled "NYC Restaurants Data - Food Ordering and Delivery." This dataset contains variables such as order_id, restaurant, cuisine_type, WeekendOrWeekday, cost, rating, and prep_time. The dataset is structured into two levels: level 2 variables include cost, prep_time, and order_id, while level 1 variables include rating, restaurant, WeekendOrWeekday, and cuisine type.

Background and Significance

Type background and significance section here.

Data

Key Variables Considered

Response Variable

- **cost**: Total price of the order.

Predictors

- **prep_time**: Time taken to prepare the order (numeric).
- **rating**: Customer rating of the restaurant (numeric).
- **cuisine_type**: Type of cuisine (categorical: Italian, Chinese, etc.).
- **WeekendOrWeekday**: Whether the order was placed on a weekday or weekend (binary).
- **restaurant**: Random effect to account for differences across restaurants (factor)

Type data section here. Include captions with tables and graphs. Examples:

Table 1: The First 10 observations

order_id	restaurant	cuisine_type	cost	WeekendOrWeekday	rating	prep_time	delivery_time
1476547	Bareburger	American	6.84	Weekend	5	22	24
1476583	Bareburger	American	17.03	Weekend	5	35	21
1476715	Bareburger	American	16.30	Weekday	NA	20	28
1476821	Bareburger	American	12.18	Weekend	NA	33	18
1476911	Bareburger	American	8.63	Weekend	4	21	22
1477003	Bareburger	American	32.93	Weekend	NA	29	24
1477172	Bareburger	American	19.35	Weekday	4	33	27
1477708	Bareburger	American	6.07	Weekend	4	23	15
1477823	Bareburger	American	5.63	Weekend	4	32	30
1477836	Bareburger	American	12.08	Weekend	NA	29	20

First 10 Observations in our dataset

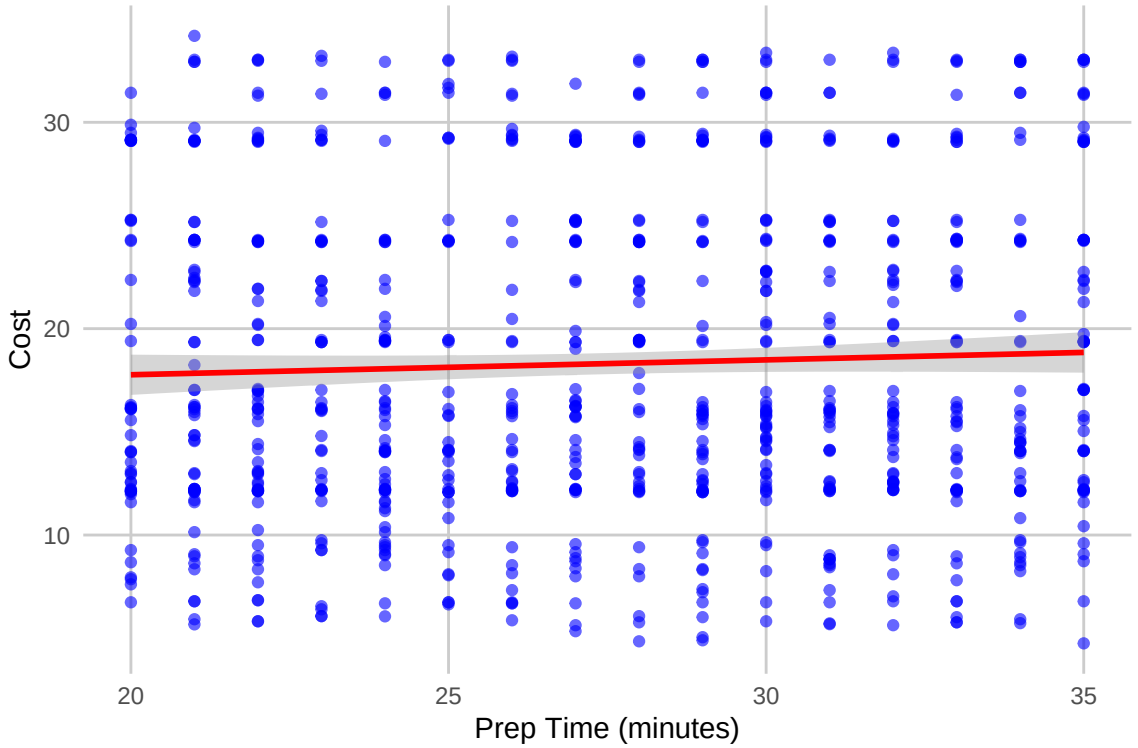
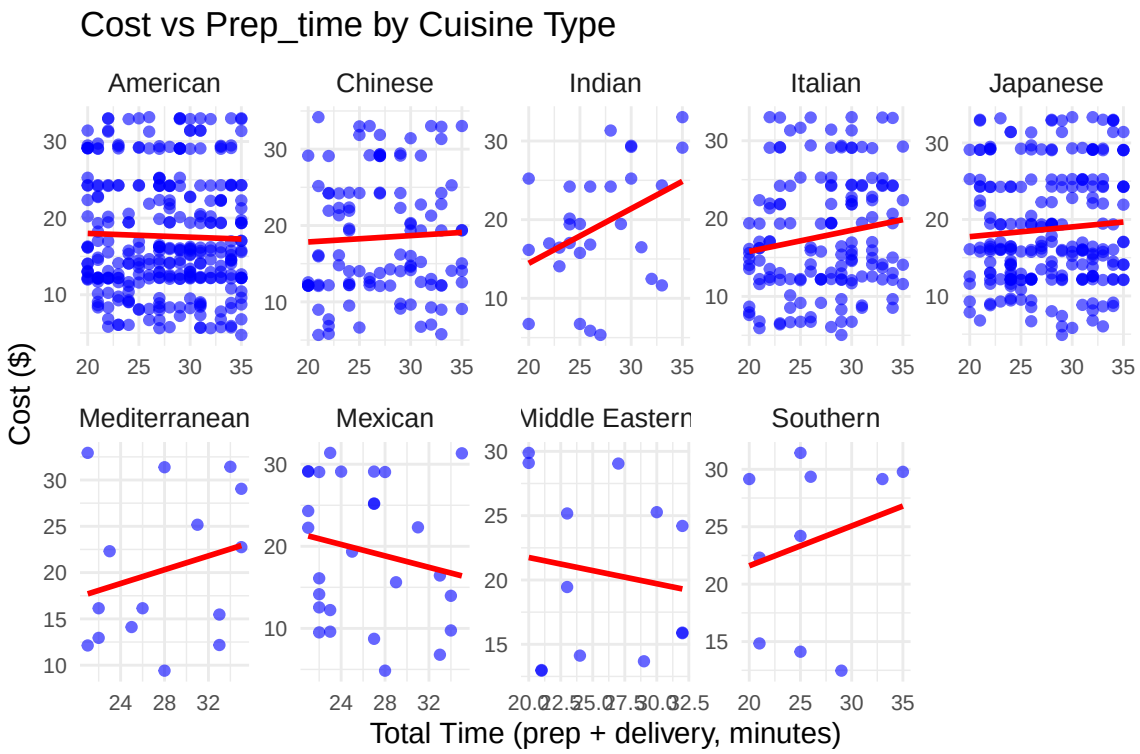
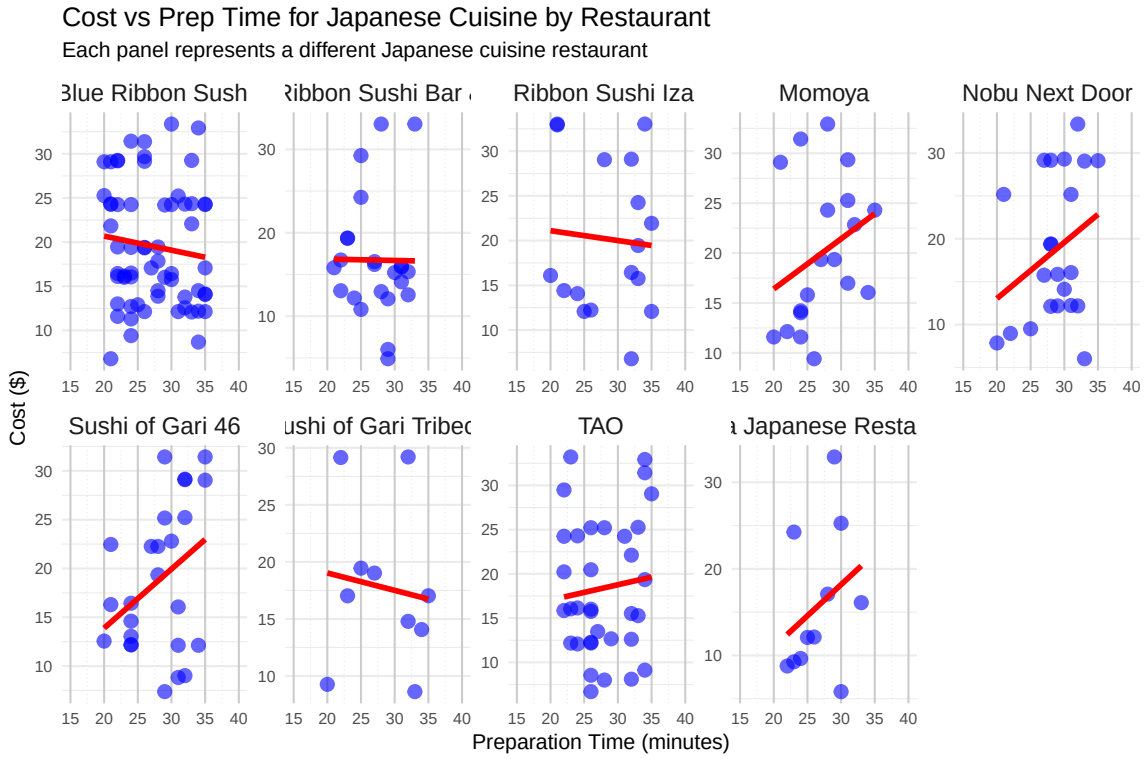


Figure 1: Cost vs. Prep Time





Methods

Consider Y_{ij} to be the cost of the j-th order, in the i-th restaurant.

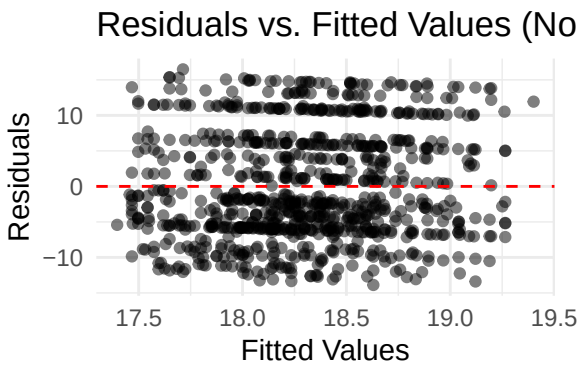
$$

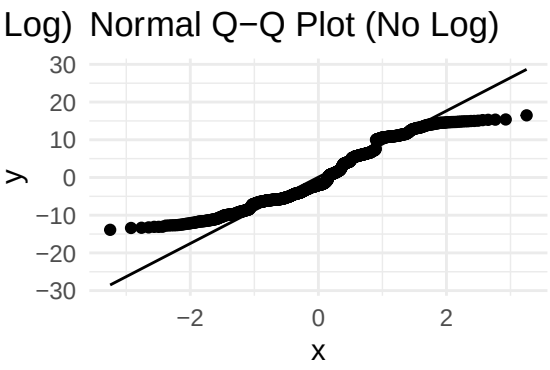
Y_{ij} = \{0\} + \{1\} \text{cuisineType}\{i\} + \{2\} \text{prepTime}\{ij\} + u\{i\} + _\{ij\}

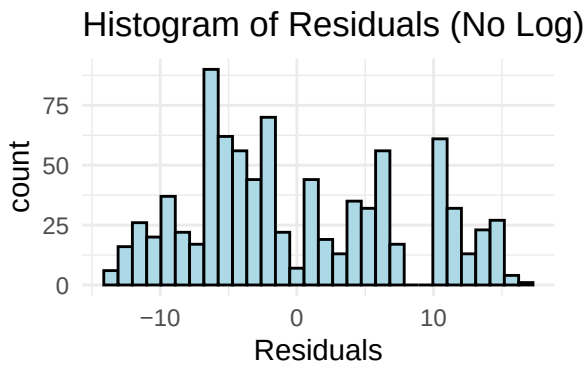
$$

$$u_i \sim N\left(0,\sigma_u^2\right) \epsilon_i \sim N\left(0,\sigma\right)$$

```
#
# Linear mixed model fit by REML. t-tests use Satterthwaite's method ['lmerModLmerTest']
# Formula: cost ~ prep_time + (1 | restaurant)
#    Data: FoodOrdersNYC
#
# REML criterion at convergence: 6036.9
#
# Scaled residuals:
#     Min      1Q  Median      3Q     Max
# -1.8081 -0.7616 -0.2614  0.7832  2.1464
#
# Random effects:
#  Groups     Name        Variance Std.Dev.
#  restaurant (Intercept)  0.4086  0.6392
#  Residual               58.9305  7.6766
# Number of obs: 872, groups:  restaurant, 30
#
# Fixed effects:
#             Estimate Std. Error        df t value Pr(>|t|)
# (Intercept)  16.26660    1.57969 821.48717  10.297   <2e-16 ***
# prep_time     0.07546    0.05654 866.93661   1.335    0.182
# ---
# Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
#
# Correlation of Fixed Effects:
#           (Intr)
# prep_time -0.982
```







Type methods section here. Write your final model in equation form, like this:

$$
\begin{aligned}
Y_{ij} = &[\alpha_0 + \alpha_1 \text{Orch}_i + \beta_0 \text{LargeEns}_{ij} + \beta_1 \text{Orch}_i \text{LargeEns}_{ij}] \\
&+ [u_i + v_i \text{LargeEns}_{ij} + \epsilon_{ij}]
\end{aligned}
$$

where,

$$
\begin{bmatrix} u_i \\ v_i \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_u^2 & \rho_{uv}\sigma_u\sigma_v \\ \rho_{uv}\sigma_u\sigma_v & \sigma_v^2 \end{bmatrix} \right)
$$

and $\epsilon_{ij} \sim N(0, \sigma^2)$.

Results

Write your results section here. Include the fixed and random effects tables, as below.

From the model output, most variables are not statistically significant. However, the p-value for food preparation time (0.057) is very close to the conventional significance threshold, suggesting a potential relationship between preparation time and cost. Specifically, for every additional minute of preparation time, the cost is expected to increase by 0.072, assuming all other factors remain constant. While this result is not definitively significant at the 0.05 level, it indicates a possible trend that longer preparation times may contribute to higher order costs. More analysis will be added.

Discussion and Conclusions

Type discussion section.

Conclusion

1. what does the result indicate about the restaurants in NYC
2. What customers and owners can learn
3. The limitations of the model

References

References in APA format. For example:

Sadler, M. E., & Miller, C. J. (2010). Performance anxiety: A longitudinal study of the roles of personality and experience in musicians. Social Psychological and Personality Science, 1(3), 280-287.

Lin, M. C. (2019). An Investigation Of Music Performance Anxiety In Taiwanese Pianists, Vocalists, String And Wind Instrumentalists At The College Level.

Stoeber, J., & Eismann, U. (2007). Perfectionism in young musicians: Relations with motivation, effort, achievement, and distress. Personality and Individual Differences, 43(8), 2182-2192.

Roback, P., & Legler, J. (2021). Beyond Multiple Linear Regression: Applied Generalized Linear Models And Multilevel Models in R. CRC Press.

Appendix (optional)