Case Study Report: Five Guys Pricing and Beef Consumption Analysis

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Executive Summary

This report explores two critical considerations for Five Guys: regional pricing and evolving consumer consumption trends. We first analyzed whether hamburger prices significantly differ between San Diego and Chicago. Although the average price in San Diego ($8.60) was slightly higher than in Chicago ($8.41), this difference was found to be not statistically significant. This indicates that regional pricing adjustments are unnecessary at this time. Additionally, we examined the concerning trend of declining beef consumption across the U.S over a time frame of six years. our analysis revealed a significant decrease in beef consumption, suggesting a shift in consumer preferences that could impact long-term business strategies. These findings highlight the importance of maintaining uniform pricing while also adapting menu offerings to align with changing dietary habits.

Background/Introduction

In an increasingly competitive market, Five Guys faces two key challenges: evaluating potential regional pricing differences and understanding shifts in consumer consumption trends. To address these challenges, we investigated whether hamburger prices significantly vary between San Diego and Chicago, which could inform regional pricing strategies. We also explored the broader trend of declining beef consumption in the U.S., which poses a potential concern for companies reliant on beef-based products. The objective of this analysis is to deliver actionable insights that empower Five Guys to make informed decisions about pricing and menu adaptations in response to evolving market dynamics. By understanding these factors, Five Guys can better position itself for future success.

Methodology

The methodology section will guide the reader through the two key analyses in this case study: comparing hamburger prices between San Diego and Chicago and analyzing the change in beef consumption over time. By following these steps, a reader will be able to replicate the analysis, using the provided formulas and data.

Part I: Hamburger Prices Between San Diego and Chicago

To assess the difference in hamburger prices between San Diego and Chicago, we followed a systematic hypothesis testing process using a Z-test for independent samples.

1. **Establishing the Null and Alternative Hypotheses**

   Null Hypothesis (H_0): $\mu_{SanDiego} - \mu_{Chicago} = 0$; There is no significant difference in the average hamburger price between San Diego and Chicago.

   Alternative Hypothesis (H_1)**:** H_A: $\mu_{SanDiego} - \mu_{Chicago} \neq 0$; There is a significant difference in the average hamburger price between San Diego and Chicago.

2. **Determining the Appropriate Statistical Test** For comparing the average hamburger prices in San Diego and Chicago, we used a Z-test for two independent samples since the population standard deviation is known.
3. **Setting the Value of Alpha (Type I Error Rate)** We set the significance level $\alpha = 0.05$, indicating that we would reject the null hypothesis if the p-value was less than 0.05.
4. **Establishing the Decision Rule** If the p-value from the Z-test is less than 0.05, we will reject the null hypothesis H_0. If the p-value is greater than 0.05, we will fail to reject H_0.

5. **Gathering Sample Data**

San Diego: Sample Size $(n_1) = 15$; Mean Price $(\overline{X}_{San\ Diego}) = \$8.60$

Chicago: Sample Size $(n_2) = 18$; Mean Price $(\overline{X}_{Chicago}) = \$8.41$

Population Standard Deviation $(\sigma) = \$0.64$ (both cities)

6. **Analyzing the Data**

To assess whether there is a difference in the average price of hamburgers between San Diego and Chicago, data were collected from 15 restaurants in San Diego and 18 in Chicago. The average price in San Diego was $8.60, while in Chicago, it was $8.41, with a known population standard deviation of $0.64. The analysis is conducted at a significance level of α=0.05.

We performed a Z-test for independent samples since the population standard deviation is known, and the data are approximately normally distributed. The goal was to determine if the price difference between the cities is statistically significant.

We use the following equations to perform the hypothesis test:

- **Calculate the Standard Error (SE):**

$$SE = \sqrt{\frac{\sigma^2}{n_1} + \frac{\sigma^2}{n_2}} \qquad (1.1)$$

Where:

$\sigma = \$0.64$; $n_1 = 15\ restaurants$; $n_2 = 18\ restaurants$; Using Excel =SQRT((0.64^2 / 15) + (0.64^2 / 18))

Below is our calculation using equation (1.1) and the **Standard Error** (SE):

$$SE = \sqrt{(\frac{0.64^2}{15}) + (\frac{0.64^2}{18})}$$

$$SE = 0.2237$$

- **Calculate the Z-Statistic:**

$$Z = \frac{\overline{X}_{San\ Diego} - \overline{X}_{Chicago}}{SE} \qquad (1.2)$$

Where:

$\overline{X}_{San\ Diego} = \$8.60$; $\overline{X}_{Chicago} = \$8.41$; $SE = 0.2237$; Using Excel =(8.60 - 8.41) / 0.2237

Below is our calculation using equation (1.2) and the **Z-statistic**:

$$Z = \frac{8.60 - 8.41}{0.2237}$$

$$Z = 0.8492$$

- **FInding the P-value:**

To find the one-tailed p-value associated with the Z-statistic, we use the following formula in Excel:

=1 - NORM.S.DIST(z-statistic, TRUE)

Where:

$Z = 0.8492$

Below is our calculation and the **p-value**:

$p - value$ =1 - NORM.S.DIST(0.8492, TRUE)

$$p - value = 0.1979$$

7. **Reaching a Statistical Conclusion** The p-value for the Z-test is 0.1979, which is greater than the significance level α=0.05. Therefore, we fail to reject the null hypothesis, indicating that there is no statistically significant difference in hamburger prices between San Diego and Chicago.
8. **Making a Business Decision** Since there is no significant difference in prices, Five Guys does not need to adjust its regional pricing strategy based on this data.

Part II: Beef Consumption Trend Between Two Regions

To analyze the difference in beef consumption at two different points in time among a group of adults, a paired t-test is employed to determine whether the observed decline in consumption is statistically significant.

1. **Establishing the Null and Alternative Hypotheses**

   Null Hypothesis (H_0)**:** H_0: $\mu_{early} - \mu_{late} = 0$; There is no significant difference in beef consumption between the early year and the late year.

   Alternative Hypothesis (H_1)**:** H_A: $\mu_{early} - \mu_{late} \neq 0$; There is a significant difference in beef consumption between the two periods.

2. **Determining the Appropriate Statistical Test** Since we are comparing beef consumption between two time periods for the same group of individuals (paired data), the appropriate test is a paired t-test. This test evaluates whether the mean difference in beef consumption is significantly different from zero.
3. **Setting the Value of Alpha (Type I Error Rate)** We set the significance level (α) at 0.05, indicating that we would reject the null hypothesis if the p-value was less than 0.05.
4. **Establishing the Decision Rule** If the p-value from the t-test is less than 0.05, we will reject the null hypothesis H_0. If the p-value is greater than 0.05, we will fail to reject H_0.

5. **Gathering Sample Data**

The following statistics are obtained from the Minitab output:

Early Year Mean $(\overline{X}_{Early}) = 59.58\, pounds$

Late Year Mean $(\overline{X}_{late}) = 58.60\, pounds$

Mean of Differences $(\overline{D}) = 0.986\, pounds$

Standard Deviation of Differences $= 1.619\, pounds$

Sample Size $(n) = 18$

Standard Error Mean of Difference $= 0.381\, pounds$

6. **Analyzing the Data**

To analyze changes in beef consumption over time, a paired t-test was conducted using data from 18 American adults measured six years ago and a matched group measured five years later. The average beef consumption in the early year was 59.58 pounds, while it decreased to 58.60 pounds in the late year.

According to the Minitab output:

- The Standard Error Mean of Difference was 0.381 pounds.
- The t-value was 2.59.
- The p-value was 0.019.

Since the p-value is less than the significance level of 0.05, we reject the null hypothesis and conclude that the observed decline in beef consumption is statistically significant.

7. **Reaching a statistical conclusion:** The p-value from the paired t-test is 0.019 , which is less than the significance level $\alpha = 0.05$. Therefore, we reject the null hypothesis, indicating a statistically significant decline in beef consumption over time.
8. **Making a Business Decision:** Since there is a significant decline in beef consumption, Five Guys should consider diversifying its menu to adapt to changing consumer preferences.

Analysis and Findings

We conducted a Z-test to determine if the average price of a hamburger in San Diego ($8.60) is significantly higher than in Chicago ($8.41). The calculated Z-statistic was 0.8492, resulting in a p-value of 0.1979. Since the p-value exceeds the significance level of 0.05, we fail to reject the null hypothesis, concluding no statistically significant price difference between the two cities. Therefore, Five Guys and other fast-food chains need not implement region-specific pricing strategies.

In the beef consumption analysis, a paired t-test revealed a mean difference of 0.986 pounds, with early-year consumption averaging 59.58 pounds and late-year consumption at 58.60 pounds. The t-statistic was 2.59, and the p-value was 0.019. Given that the p-value is less than 0.05, we reject the null hypothesis, indicating a statistically significant decline in beef consumption over time, likely influenced by changing consumer preferences and health concerns.

However, this analysis has limitations. The sample sizes for the price comparison are relatively small (15 in San Diego and 18 in Chicago), which may restrict generalizability. Additionally, both tests assume normality, potentially impacting reliability if the data deviates significantly from this assumption. Finally, the beef consumption study does not account for external factors like pricing changes or economic conditions, which may also affect consumer behavior. Future research should consider these factors for a more comprehensive analysis.

Conclusion

This report highlights two important areas for Five Guys: regional pricing and beef consumption trends. Our analysis found no significant difference in hamburger prices between San Diego and Chicago, indicating that a uniform pricing strategy can be maintained across regions without risk of a competitive disadvantage. However, the significant decline in beef consumption over the past six years reflects a shift in consumer preferences, likely driven by health, environmental, and economic factors. Based on these findings, we recommend that Five Guys maintain consistent pricing across regions to simplify operations. Additionally, expanding the menu with more non-beef options, such as plant-based or chicken items, could cater to changing consumer demands. Finally, focusing on the quality and sustainability of beef offerings in marketing efforts and continuously monitoring consumption trends will help the company remain adaptable to future market shifts.