Marketing Analytics Report

Introduction

The objective of this analysis is to evaluate the effectiveness of a marketing campaign that involves sending catalogs to customers. The study uses various statistical techniques to determine whether the campaign increases profits and provides actionable recommendations based on the findings.

Problem Statement

The company wants to assess whether sending catalogs to customers leads to a significant increase in profits. Key considerations include understanding treatment effects, evaluating statistical significance, and comparing costs to potential returns.

Methodology

1. **Statistical Analyses:**
    - Pre-treatment and post-treatment profit comparisons.
    - Average Treatment Effect (ATE) estimation.
    - Difference-in-Differences (Diff-in-Diff) analysis.
    - State-level analysis of ATE.
2. **Hypothesis Testing:**
    - T-tests and Chi-square tests to validate randomization and ensure internal validity.
    - Evaluation of statistical significance of treatment effects.

Results

Key Findings

1. **Treatment Effects:**
    - Estimated Treatment Effect: $53.17.
    - Average Treatment Effect (ATE): $17.74 with a p-value of 0.0039, indicating statistical significance.
    - Diff-in-Diff Treatment Effect: $22.31 with a p-value far below 0.05, confirming statistical significance.
2. **State-Level Analysis:**
    - Virginia (VA): $0.96.

    - Ohio (OH): $18.17.
    - Georgia (GA): $31.16.
3. **Expected Gains:**
    - General Campaign: $995,187.35 (preliminary estimate).
    - Targeted Campaign in Georgia: $1,206,790.78.

Statistical Validation

- Randomization was successful, as evidenced by non-significant differences in pre-treatment profits ($p = 0.27$) and state distributions ($p = 0.83$).
- The ATE is statistically significant, suggesting a meaningful impact of the treatment.

Discussion

1. **Profitability Analysis:**
    - The Diff-in-Diff estimate exceeds the ATE, highlighting the importance of controlling for pre-treatment factors.
    - Georgia emerges as the most viable target for a marketing campaign due to the highest ATE, significantly exceeding the cost per catalog.
    - Virginia shows minimal impact, making it an unsuitable candidate for campaign expansion.
2. **Cost-Benefit Considerations:**
    - With an ATE of $17.74 and a catalog cost of $20, a full-scale campaign results in a net loss per catalog.
    - The Diff-in-Diff estimate of $22.31 suggests a profitable campaign if implemented strategically.

Recommendations

1. Launch a targeted marketing campaign in Georgia, where the treatment effect justifies the cost.
2. Consider a cautious expansion to Ohio, depending on strategic priorities and additional analysis.
3. Exclude Virginia due to low profitability.

Conclusion

This analysis provides robust statistical evidence to support targeted marketing strategies. By focusing on high-return regions such as Georgia, the company can optimize its budget and maximize profitability.