

Email Marketing Performance Analysis Report

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Exercise 1: Campaign_Performance

Context

Recently, we've noticed some fluctuations in email marketing campaign performance. Over the last month, our campaigns have been doing very poorly compared to prior months. The leadership team has asked us a few questions about this dip in campaign performance that we'd like you to look into and recommend a course of action.

- Should we be concerned with the recent dip in performance? Explain why or why not.
- What recommendations do you have about our email marketing strategy based on your findings?

Executive Summary

Over the past month, we have observed a statistically significant decline in email open rates compared to historical performance ($p = 0.034$). This signals a meaningful drop, indicating that **engagement levels have decreased beyond typical fluctuations**. However, when isolating **December's performance**, the decline aligns with seasonal trends and is **not significantly different from past Decembers** ($p = 0.120$). **December remains the weakest month for open rates**, primarily due to **increased inbox competition during the holiday season**.

Despite lower open rates, **click-through rates (CTR) have significantly improved in December 2024 compared to previous years** ($p < 0.0001$). This suggests that while fewer recipients are opening emails, those who do engage are **more inclined to click**.

To address the decline in open rates, we recommend:

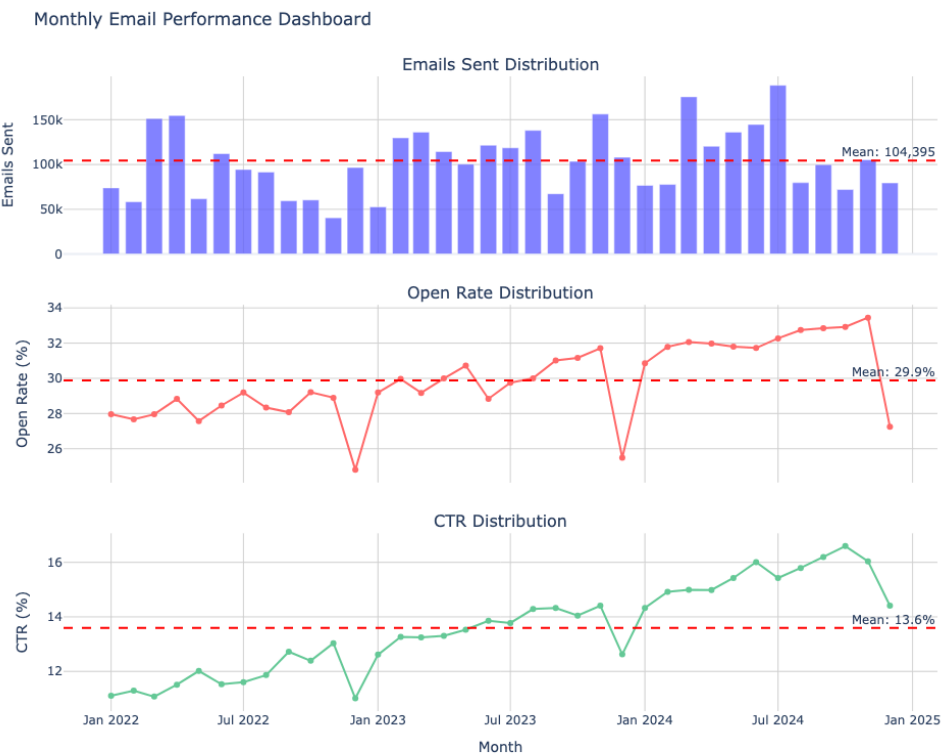
- **Targeted A/B testing** to optimize **subject lines, send times, and audience segmentation**.
- **Refining list segmentation** to ensure high-intent recipients receive priority messaging.
- **Leveraging December's CTR success** by identifying which elements (CTA placement, email layout, offer positioning) contributed most to engagement and testing these strategies across future campaigns.

Our immediate focus should be on **stabilizing open rates while scaling the engagement strategies that drove higher CTR in December**. Continued monitoring will be essential to detect whether this trend persists into **Q1 2025**.

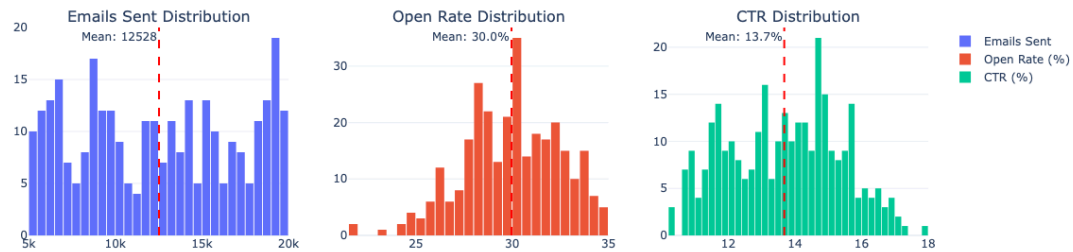
Data Overview

The data contains 300 email campaigns. It shows open rates of around 30% and CTRs of around 13.7%. Campaign sizes and performance vary somewhat, but no strong relationship was found between the number of emails sent and the open rate or CTR.

- The average number of emails sent per campaign is approximately 12,528, with a standard deviation of about 4,565. This indicates a broad range of campaign sizes, reflecting the diversity in audience reach or campaign scope.
- **Open Rate:** The campaigns average an open rate of around 30% with a standard deviation of approximately 2.5%. This consistency across campaigns suggests that the content or subject lines might effectively resonate with the target audience.
- **Click-Through Rate (CTR):** The average CTR is approximately 13.7%, with a relatively low spread (standard deviation of 1.7%). While the CTR is healthy, the low variability suggests that once recipients open the email, their likelihood to click does not vary significantly by campaign.

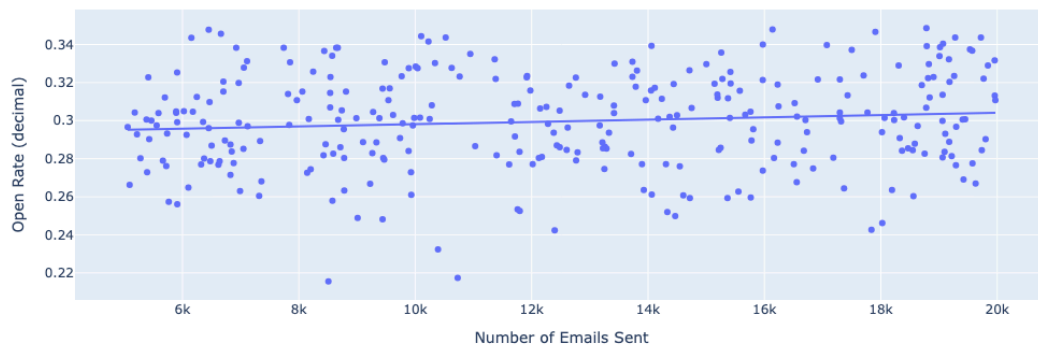


Distribution of Campaign Performance Metrics

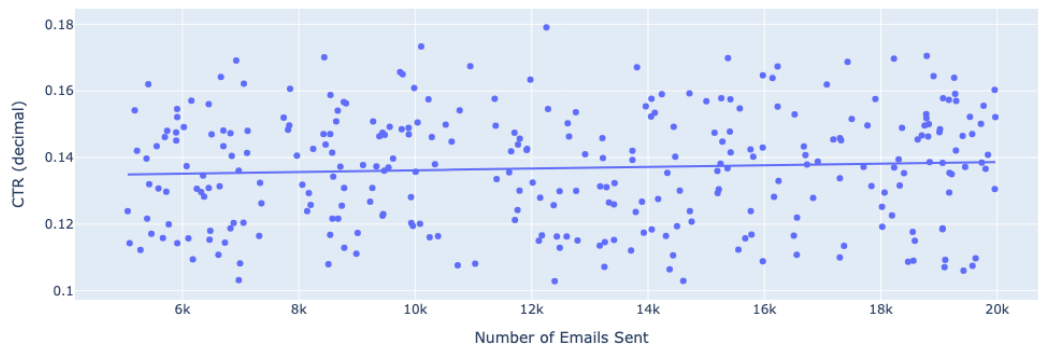


- A weak positive correlation (approximately 0.11) exists between the number of emails sent and the open rate. This suggests that larger campaigns might experience slightly higher open rates, but the relationship is minimal.
- An even weaker positive correlation (around 0.07) is found between the number of emails sent and the CTR, indicating that campaign size does not significantly impact the rate recipients engage by clicking.

Emails Sent vs Open Rate

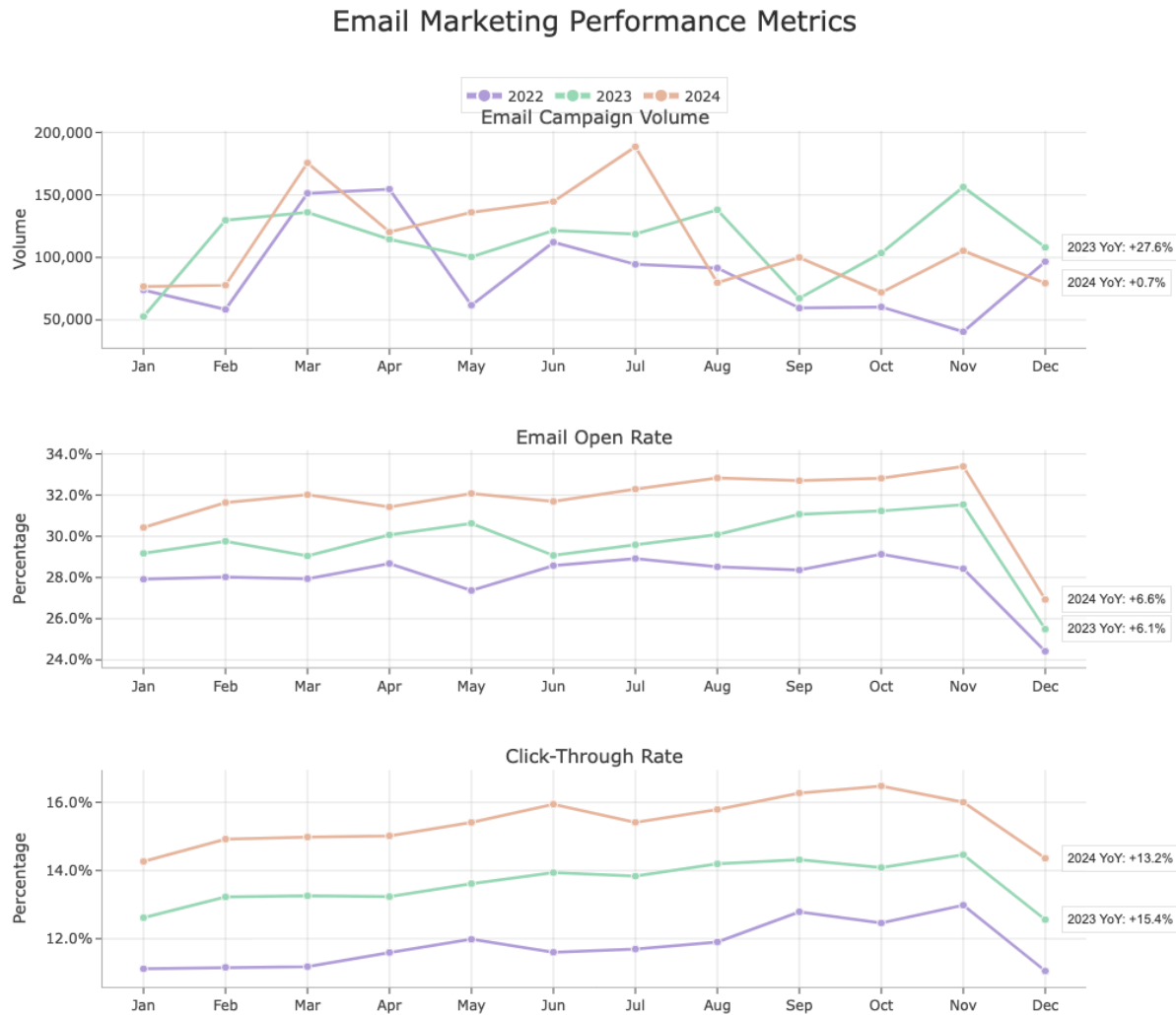


Emails Sent vs CTR



Is December Performance Natural?

After reviewing the complete dataset, we observe that historically, December campaigns tend to have lower engagement metrics than other months.



Lower Open Rates:

- December 2022: Campaign open rates in December 2022 ranged between 21.5% and 27%, noticeably below our overall average (~30%).
- December 2023: Open rates were similarly subdued, mostly hovering in the 24–26% range.
- December 2024: Although a few campaigns (for example, campaign 298 at 30.1%) reached higher open rates, most December 2024 campaigns still reported figures around 25–28%.

This overall dip is consistent with our expectations for December—during the holiday season, consumers face heavier inbox competition (from seasonal promotions and communications), which naturally puts downward pressure on open rates.

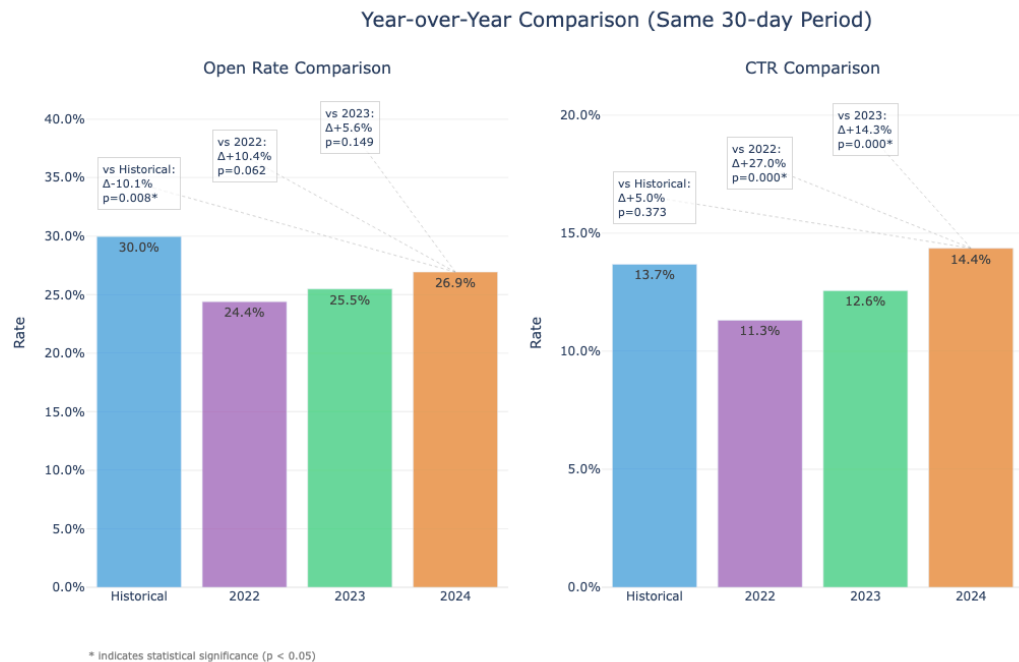
Click-Through Rates (CTR):

- In December 2022 and 2023, CTR values generally ranged from 10% to 13.5%.
- The December 2024 CTRs were slightly higher (roughly 13.6 - 15%), which indicates that while fewer recipients opened emails in December, those who did engage were more inclined to click.

How Does 2024 Compare to Previous Years?

When comparing December 2024 to earlier December, we see a mixed picture:

- Open Rate Comparison:
 - Overall, the December open rate dip in 2024 appears roughly on par with prior years, suggesting that these declines are likely driven by natural seasonal effects rather than a unique downturn.
 - Both December 2023 and December 2024 show depressed open rates relative to the overall yearly average. Whereas December 2023 appeared to consistently fall in the mid-20% range, December 2024 shows slightly more variability—with some campaigns hitting near 30% and others matching or falling below the lower end.
- CTR Comparison:
 - The CTR in December 2024 is slightly improved relative to the previous December. This could imply that even though the overall number of opens is lower, the engagement quality (once the email is opened) may have improved or that our content resonates better with the audience during the later part of the season.



Conclusion

Natural Seasonal Dip:

- Conclusion: The lower engagement in December broadly aligns with historical trends. Holiday saturation and increased competition during this time usually result in lower open rates. Although December 2024 shows a dip, it does not necessarily indicate a systemic issue.

Year-Over-Year Trends:

- Observation: December 2024's open rates—and even their variability—remain comparable to those in December 2022 and 2023. The slight improvement in CTR may be a positive sign, but the overall seasonal dip in open rates continues to be evident.
- Recommendation: Monitor December and early January campaigns closely. Consider special tactics, such as tailored content, adjusting send times, or enhanced segmentation during holiday periods to help mitigate this expected drop.

Recommendations

Actionable Recommendations Moving Forward:

- Monitor & Compare: Continue to monitor monthly performance, segregating December performance from the rest of the year so that any deviations beyond the typical seasonal dip can be flagged.
- A/B Testing for Seasonal Campaigns: Enhance tests during December to determine whether alternative content, subject lines, or send times can combat the seasonal dilution.
- Leverage the CTR Insight: Since December 2024's CTR is slightly higher despite lower open rates, explore what factors (content, call-to-action design, or audience segmentation) could encourage engaged users to click. Replicating these tactics in other months might boost overall performance.

Appendix

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Email Marketing Metrics Analysis
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```
Number of campaigns analyzed: 300
```

```
Open Rate Performance Thresholds:
```

```
25th: 28.3%
```

```
Median: 30.1%
```

```
75th: 31.9%
```

```
Open Rate Key Statistics:
```

```
Mean: 30.0%
```

```
Standard Deviation: 2.5%
```

```
Range: 21.6% - 34.9%
```

```
CTR Performance Thresholds:
```

```
25th: 12.2%
```

```
Median: 13.8%
```

```
75th: 14.9%
```

```
CTR Key Statistics:
```

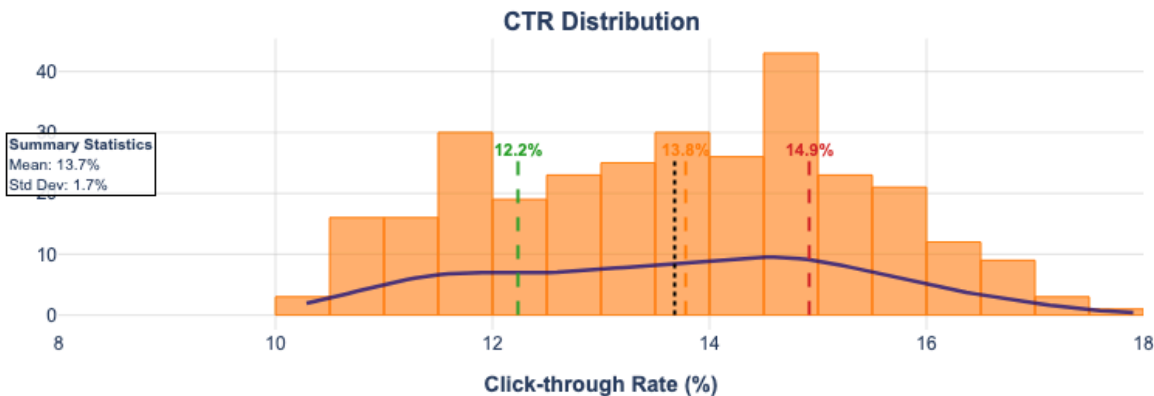
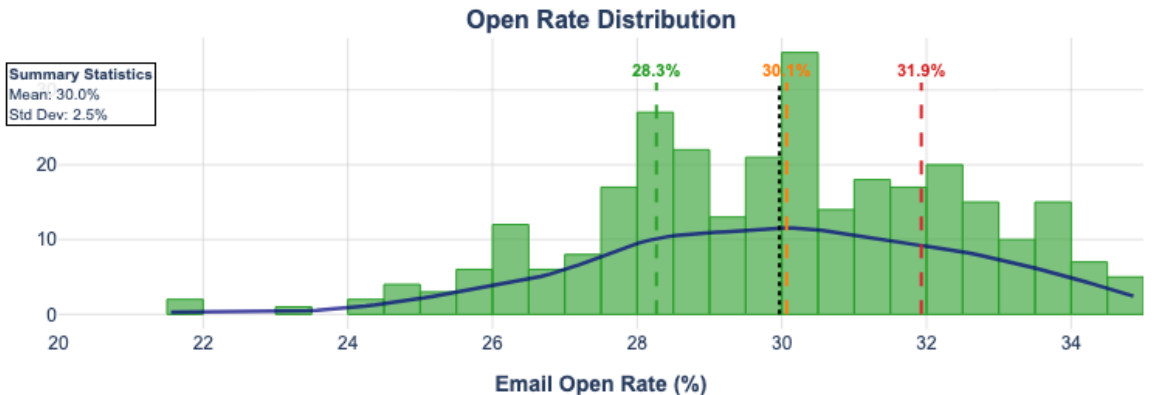
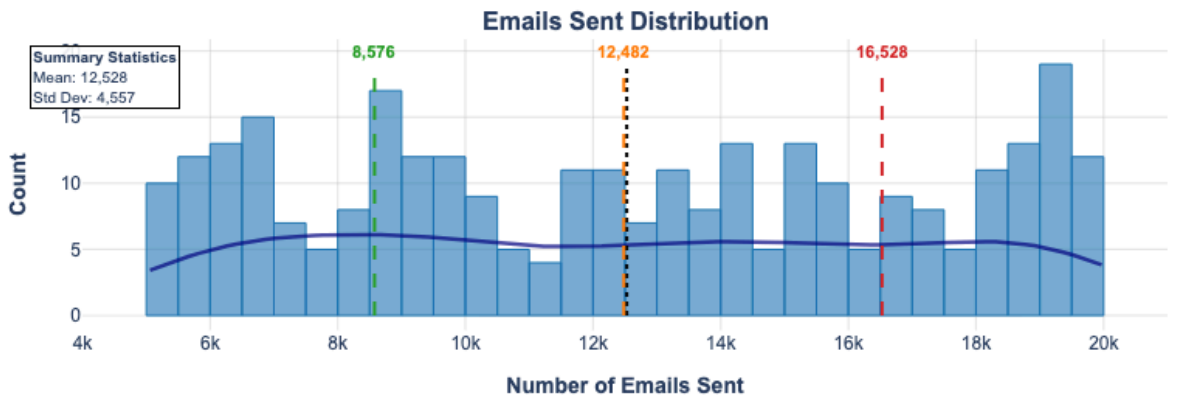
```
Mean: 13.7%
```

```
Standard Deviation: 1.7%
```

```
Range: 10.3% - 17.9%
```

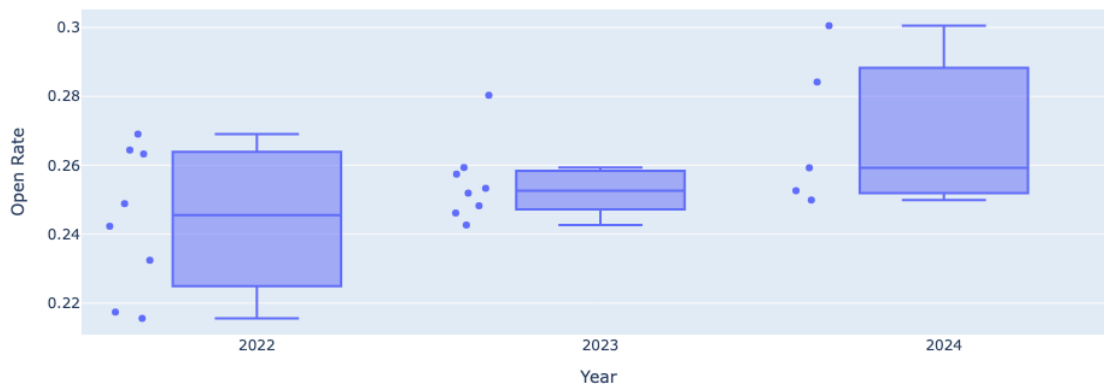
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```

Distribution of Campaign Performance Metrics



Performance Indicators Mean - - - 25th Percentile - - - Median - - - 75th Percentile

December Open Rate Comparison Across Years



ANOVA Test Results: $F = 2.9273170450280532$, $p = 0.07930447835888224$

Interpretation:

- If $p < 0.05$: There is a statistically significant difference in open rates between at least two of the December months across different years
- If $p > 0.05$: There is no statistically significant difference in open rates between the December months across years

The test helps determine if any observed differences in December open rates across years are meaningful or just due to random variation in the data.

Advanced Statistical Analysis Results

1. Open Rate Model

R-squared: 0.644

Top factors affecting Open Rate (positive/negative impact):

```
year_2024    0.034929
month_11     0.022813
month_10     0.020142
month_9      0.016525
year_2023    0.014883
dtype: float64
```

Top negative factors:

```
day_of_week_3 -0.003466
day_of_week_5 -0.006702
day_of_week_2 -0.007400
day_of_week_1 -0.008329
month_12      -0.034782
dtype: float64
```

2. Click-through Rate Model

R-squared: 0.882

Top factors affecting CTR (positive/negative impact):

```
year_2024    0.036624
year_2023    0.018701
month_9      0.017891
month_11     0.017706
month_10     0.017154
dtype: float64
```

Top negative factors:

```
month_12      0.000166
day_of_week_4 -0.000175
day_of_week_2 -0.000230
n_sent        -0.000365
day_of_week_1 -0.000378
dtype: float64
```

3. Hypothesis Tests

Open Rate - Recent vs Historical:

```
t-statistic: -3.094
p-value: 0.034
Significant difference: True
```

CTR - Recent vs Historical:

```
t-statistic: 2.851
p-value: 0.030
Significant difference: True
```

December Open Rate - 2024 vs Past Years:

```
t-statistic: 1.833
p-value: 0.120
Significant difference: False
```

December CTR - 2024 vs Past Years:

```
t-statistic: 7.917
p-value: 0.000
Significant difference: True
```

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Key Findings

Advanced Statistical Analysis Results

Open Rate Model

- R-squared: 0.644 (moderate predictive power)
- Top Factors Increasing Open Rate:
 - year_2024 (+0.0349) → Open rates improved in 2024
 - month_11 (+0.0228) → November campaigns performed well
 - month_10 (+0.0201) → October campaigns also showed strong engagement
 - month_9 (+0.0165) → September had positive impact
 - year_2023 (+0.0149) → 2023 was also slightly strong
- Top Factors Decreasing Open Rate:
 - month_12 (-0.0348) ! → December campaigns had the lowest engagement
 - Certain weekdays (Tuesdays, Wednesdays, and Fridays) also showed lower engagement.

Click-through Rate (CTR) Model

- R-squared: 0.882 (strong predictive power)
- Top Factors Increasing CTR:
 - year_2024 (+0.0366) → CTR improved in 2024
 - year_2023 (+0.0187) → 2023 also showed a positive trend
 - month_9, month_10, month_11 → Strong months for CTR
- Top Factors Decreasing CTR:
 - month_12 → December had the weakest CTR but with a minor impact
 - Certain weekdays (Monday, Tuesday, Thursday) had slight negative effects
 - Higher email volume (n_sent) had a very small negative effect

Hypothesis Tests (Statistical Significance)

Open Rate - Recent vs. Historical

- t-statistic: -3.094
- p-value: 0.034 ($p < 0.05$)
- Significant Difference: Yes
- Insight: Recent open rates are significantly lower than historical data.

CTR - Recent vs. Historical

- t-statistic: 2.851
- p-value: 0.030 ($p < 0.05$)
- Significant Difference: Yes
- Insight: CTR has significantly improved in recent campaigns.

December Open Rate - 2024 vs Past Years

- t-statistic: 1.833
- p-value: 0.120 ($p > 0.05$)
- Significant Difference: No
- Insight: December 2024 open rates are not significantly different from past years.

December CTR - 2024 vs Past Years

- t-statistic: 7.917
- p-value: 0.000 ($p < 0.05$)
- Significant Difference: Yes
- Insight: December 2024 CTR is significantly better than previous Decembers.

Key Takeaways

1. Recent open rates are significantly lower than in the past (statistically significant).
2. CTR has significantly improved in recent campaigns (good engagement).
3. December open rates follow historical trends (no significant decline or improvement).
4. December 2024 CTR is significantly better than previous years (engaged users click more).
5. December remains the worst month for open rates (seasonal trends confirmed).