Email Subject Line A/B Testing for E-commerce Campaigns

Analyzing the impact of Personalized vs. Urgency-based subject lines on Open Rate, CTR, and Conversions.

Project Overview

• This project analyzes the impact of two subject line strategies: **Personalized** and **Urgency-Based**.

• Key metrics: **Open Rate** , **Click-Through Rate (CTR)** , and **Conversion Rate**.

• Goal: Identify the most effective subject line strategy to engage users and drive conversions.

Problem Statement

- Many e-commerce businesses face challenges with low engagement in email marketing.

- Users often ignore or delete promotional emails without opening them.

- This project investigates whether **Personalized** or **Urgency-Based** subject lines perform better.

Subject Line Variants and Examples

1. Personalized Subject Lines

Tailored to the recipient's name, past behavior, or preferences.

- Example: *"John, your exclusive offer is waiting! 🎉"*
- Expected Outcome: Increased engagement by making the email feel relevant.

2. Urgency-Based Subject Lines

Creates a sense of urgency or scarcity.

- Example: *"Hurry! Your 50% discount expires in 3 hours! ⏳"*
- Expected Outcome: Drives immediate action due to FOMO (Fear of Missing Out).

Hypothesis Statement

Metric	Null Hypothesis (H_0)	Alternative Hypothesis (H_1)
Open Rate	There is no significant difference in open rates between variants.	Personalized subject lines result in higher open rates.
CTR (Click-Through Rate)	There is no significant difference in CTR between variants.	Urgency-based subject lines result in higher CTR.
Conversion Rate	There is no significant difference in conversion rates between variants.	Urgency-based subject lines result in higher conversion rates.

Metrics And Sample Size

Key Metrics:

- Open Rate = (Emails Opened / Emails Sent) ✗ 100%
- CTR = (Clicks / Opened Emails) ✗ 100%
- Conversion Rate = (Purchases / Clicks) ✗ 100%

Sample Sizes:

Total emails sent: $N = 500,000$

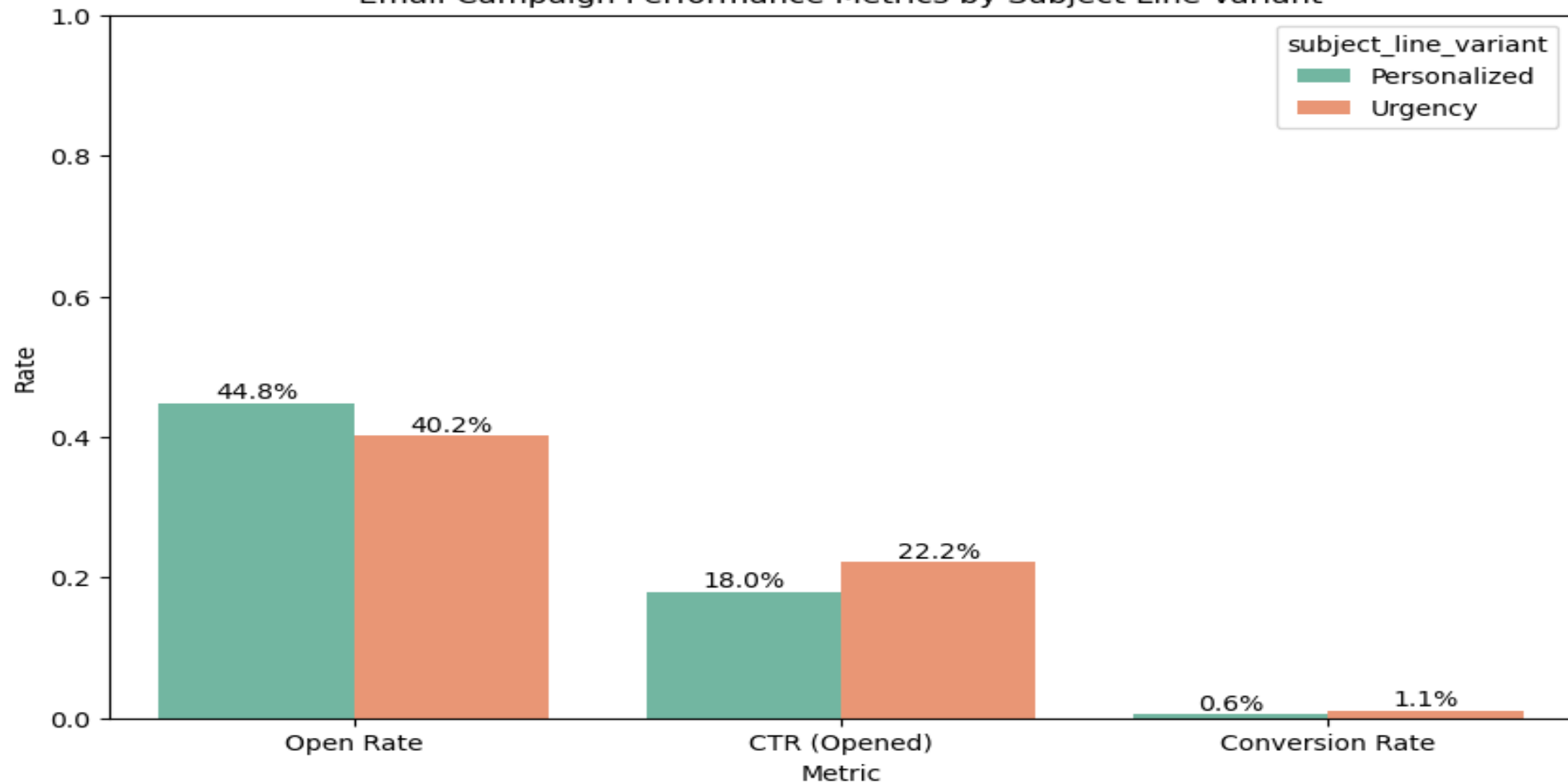Split evenly between groups:

$$N_{personalized} = 250,000$$
$$N_{Urgency} = 250,000$$

Email Performance Comparison by Subject Line Variants

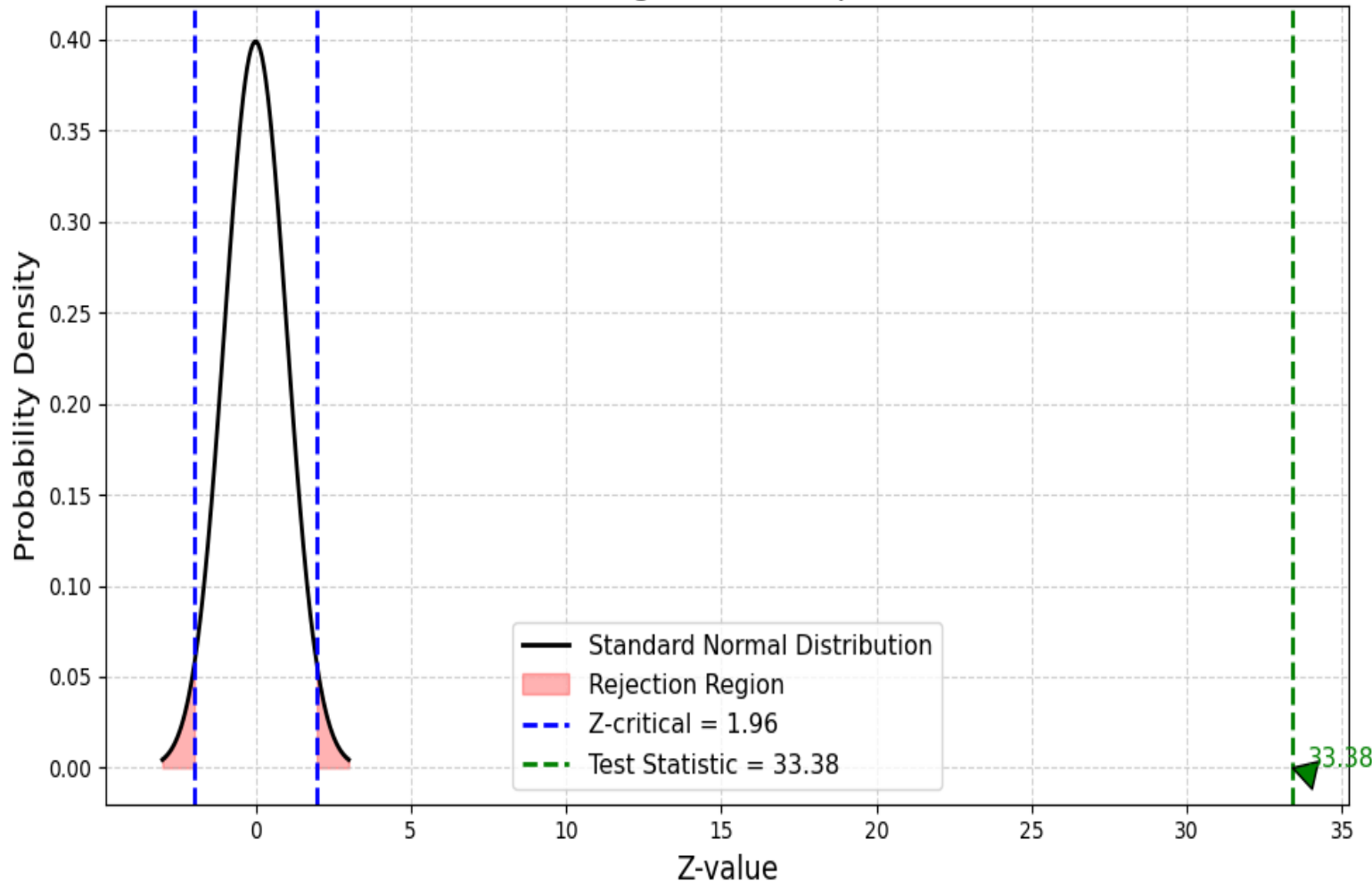| Metric	Personalized (%)	Urgency (%)	Winner
Open Rate	44.8	40.2	🟩 Personalized
CTR	18.0	22.2	🟩 Urgency
Conversion Rate	0.6	1.1	🟩 Urgency

Email Campaign Performance Metrics by Subject Line Variant
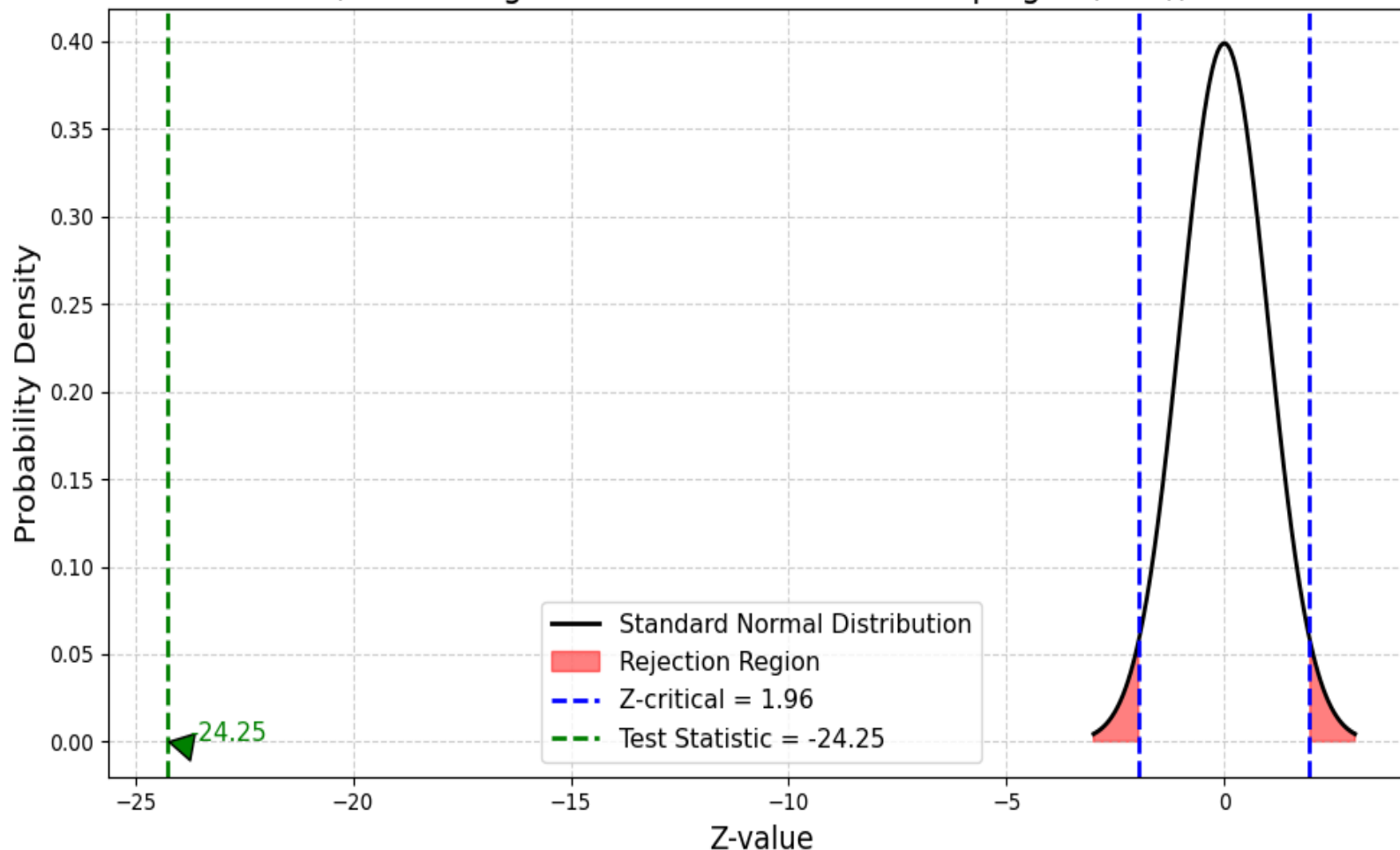
Statistical Significance – Open Rate

Standard Normal Distribution with Rejection Regions
(A/B Testing for Email Open Rate)

- Z-score: 33.38

- Interpretation: The Z-score is far beyond the critical threshold (±1.96).

- The difference in open rates is statistically significant.

- Personalized subject lines are significantly better for driving email opens.

Statistical Significance − CTR

Standard Normal Distribution with Rejection Region
(A/B Testing for E-commerce Email Campaigns (CTR))

- Z-score: -24.25
- Interpretation: The Z-score is far beyond the rejection region.
- Urgency-based subject lines drive significantly higher CTR.

Statistical Significance − Conversion Rate

Standard Normal Distribution with Rejection Regions
(A/B Testing for E-commerce Email Campaigns - Conversion Rate)
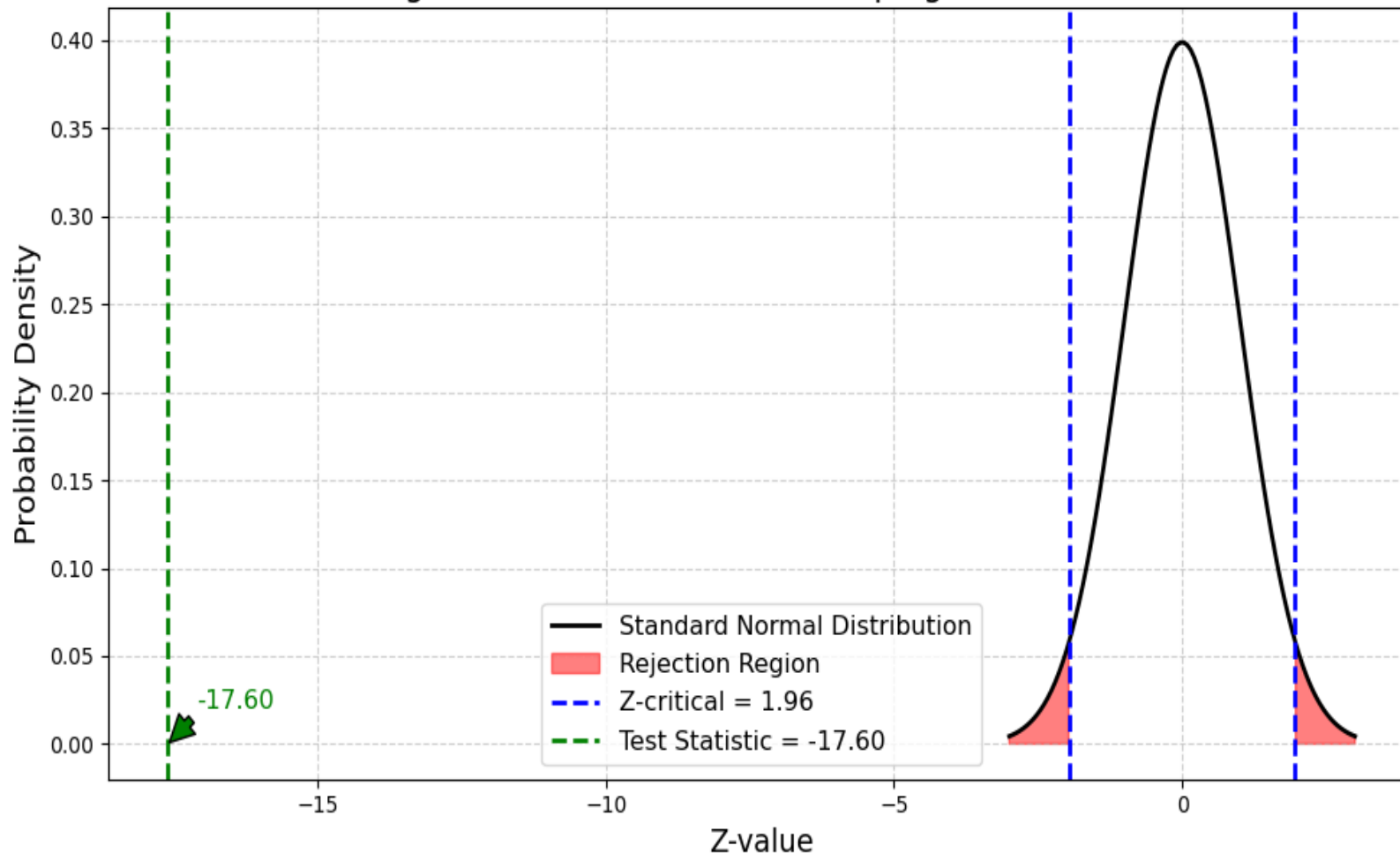
- Z-score: -17.60

- Interpretation: The Z-score is far beyond the rejection region.

- Urgency-based subject lines drive significantly higher Conversions.

Key Insights

- Personalized subject lines excel in Open Rates, meaning users find them more engaging.

- Urgency-based subject lines drive higher CTR and conversions, leading to more sales.

- Statistical testing confirms that these differences are significant and not due to randomness.

Actionable Recommendations

- ✅ Use **Personalized Subject Lines** to maximize email opens.
  - Example: *"Sarah, your exclusive deal is inside!"*

- ✅ Incorporate **Urgency** in follow-up emails to drive clicks and purchases.
  - Example: *"Only 2 hours left to claim your 50% discount!"*

- ✅ Combine both strategies for maximum impact!
  - Example: *"Mark, your VIP deal expires in 1 hour! ⏳"*

- ✅ Test different subject lines regularly to continuously optimize campaigns.

Conclusion

- This A/B testing project provides actionable insights into optimizing email marketing campaigns.

- Personalization boosts open rates, while urgency drives conversions.

- By leveraging these findings, businesses can enhance engagement and boost sales.

Thanks !