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# A/B Test Analysis Report

**Overview**

This analysis evaluates the impact of a product change using an A/B testing approach. Users are randomly assigned to either a **control** or **variant** group. The analysis examines whether the variant leads to a statistically significant improvement in the **primary metric (conversion rate)** while monitoring a **guardrail metric (time to booking)** to ensure user experience is not negatively impacted.

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**Dataset Description**

The dataset `sessions_x_users` includes the following columns:

- `session_id`: Unique identifier for each session.

- `user_id`: Unique identifier for each user.

- `session_start_timestamp`: Timestamp of when the session began.

- `booking_timestamp`: Timestamp of booking completion (if any).

- `time_to_booking`: Time difference between booking and session start.

- `experiment_group`: Indicates whether the user is in the `control` or `variant` group.

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**1. Sample Ratio Mismatch (SRM) Check**

Before analyzing metrics, we checked for SRM to ensure randomization integrity.

- **Control Group Size**: 7630

- **Variant Group Size**: 7653

- **SRM p-value**: 0.8524

**Conclusion**: No sample ratio mismatch detected ($p > \alpha$). Randomization is valid.

## 2. Primary Metric – Conversion Rate

We used a **Z-test for proportions** to compare conversion rates between groups and calculated the **relative effect size**:

$$\text{Relative Effect} = \frac{\text{Mean}_{\text{Variant}}}{\text{Mean}_{\text{Control}}} - 1$$

- **α (Significance Level)**: 0.10

- **p-value**: 0.0002

- **Effect Size**: +14.22%

**Conclusion**: The conversion rate increase in the variant group is statistically significant and positive.

## 3. Guardrail Metric – Time to Booking

A **two-sided t-test** was used for the continuous guardrail metric:

- **p-value**: 0.5365

- **Effect Size**: -0.79% (slightly faster but statistically insignificant)

**Conclusion**: The variant did not negatively affect the time to booking.

## 4. Final Decision Logic

Decision criteria:

- Primary metric must be statistically significant and show improvement.

- Guardrail must be statistically insignificant or show improvement.

**Result**:
 All criteria met.
   **Decision: Launch the Variant (Full Rollout Recommended)**