

# E-commerce Return Rate Reduction Analysis

## Introduction

This project focuses on analyzing customer return behavior in an e-commerce business. High return rates directly impact profitability, customer satisfaction, and supply chain efficiency. The objective was to identify why customers return products, analyze return rate patterns across categories, suppliers, geographies, and marketing channels, and predict the probability of product returns using data-driven techniques.

## Abstract

The project integrates Python, SQL, Excel, and Power BI to create a comprehensive framework for return rate analysis. Python was used for data preprocessing and predictive modeling (logistic regression). SQL/Excel supported structured data cleaning and aggregation. Power BI was employed for interactive dashboards, enabling stakeholders to drill through product-level details, identify high-risk products, and take actionable insights to reduce return rates.

## Tools Used

- Python: Data cleaning, feature engineering, and logistic regression model for prediction.
- SQL/Excel: Data aggregation, return percentage calculations, and exporting summaries.
- Power BI: Interactive dashboard with KPIs, category/supplier/channel comparisons, and drill-through product analysis.

## Steps Involved

1. Cleaned and prepared the order and return dataset.
2. Analyzed return percentage across product categories and suppliers.
3. Built a logistic regression model in Python to predict the probability of product returns.
4. Exported high-risk product list into CSV for monitoring.
5. Created a Power BI dashboard with the following pages:
  - Overview Dashboard (KPIs, category/supplier/channel analysis, geography map).
  - Product Risk Dashboard (high-risk product table, top risky products, supplier impact).
  - Drill-through Product Detail (KPIs, trends, supplier/channel breakdown, customer table).
6. Validated the model and dashboard with test scenarios to ensure insights were actionable.

## Conclusion

The project successfully delivered a predictive and analytical framework to reduce return rates in e-commerce. By combining statistical modeling with business intelligence dashboards, stakeholders can proactively identify high-risk products, optimize supplier performance, and improve customer satisfaction. This holistic approach ensures data-driven decision-making to minimize financial losses and strengthen customer trust in the platform.