

Account Management Treatment Impact Analysis and Visualization

Project Overview:

This project was part of an industry collaboration with Fleetcor Corporation, a global leader in business payments solutions. Fleetcor manages over \$145 billion in annual business volume through 1.7 billion transactions, with revenues exceeding \$3.4 billion as of Spring 2024. The primary goal of this project was to support Fleetcor's credit risk management efforts by analyzing high-risk customers and evaluating the effectiveness of various account management treatments. These treatments included actions such as credit line reductions, term tightening, and account closures. Additionally, the project sought to assess the impact of these interventions on customer performance and business outcomes.

Project Goals:

- **Mitigate Credit Losses:** Develop a robust data-driven approach to minimize credit risks by identifying and managing high-risk customers.
 - **Evaluate Customer Treatments:** Analyze the effects of measures such as credit line reductions, term tightening, and account closures on customer behavior and overall business health.
 - **Predict Customer Performance:** Use statistical and machine learning models to forecast customer lifetime value, churn likelihood, and financial performance under different scenarios.
 - **Visualize Key Insights:** Present findings through intuitive and actionable visualizations to support decision-making.
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Key Contributions and Methodology:

1. Data Engineering and ETL Process

Data Model Development:

We designed a relational data model in SQL Server comprising over 20 interconnected entities. This data model was engineered to handle and process large volumes of transactional, demographic, and behavioral data.

Data Integration and Cleaning:

Leveraging SQL and SQL Server Integration Services (SSIS), we processed billions of rows of raw data from multiple sources. This involved extensive data cleaning, transformation, and deduplication to ensure data quality and consistency.

ETL Pipeline Design:

Built scalable ETL pipelines to automate the ingestion, transformation, and loading of data into the relational database. The pipelines were optimized for high performance and accuracy, handling complex dependencies across data tables.

2. Advanced Analytics and Modeling

To achieve the project goals, we employed a combination of statistical methods, machine learning models, and predictive analytics techniques:

Logistic Regression Analysis:

Utilized to classify customers as high-risk or low-risk based on key features such as payment history, credit utilization, and account activity.

Survival Analysis (Cox Proportional Hazards Model):

Applied to estimate the likelihood of customer attrition over time and to assess the effectiveness of account interventions (e.g., credit line reductions or term tightening) on customer retention.

Scenario Analysis:

Built models to simulate the financial impact of various account treatments, such as credit line reductions or account closures, under different scenarios.

Customer Lifetime Value (CLV) Prediction Models:

Developed CLV models to forecast the potential revenue a customer could generate over their relationship with the company. This helped prioritize customers for retention efforts and guide credit-related decisions.

Attrition Analysis:

Conducted an in-depth analysis of customer churn patterns to identify the key factors contributing to account closures or inactivity.

Sentiment Analysis:

Processed customer feedback data to understand sentiment trends and their relationship to account management actions.

ARIMA (Auto-Regressive Integrated Moving Average):

Used time-series forecasting models to predict future transaction volumes and revenue trends for different customer segments.

3. Tools and Technologies Used

Programming Languages:

- R and Python for statistical modeling and advanced analytics.
- Pandas and NumPy for data manipulation.

SQL Server and SSIS:

For data storage, processing, and integration of billions of transactional records.

AutoML:

Leveraged automated machine learning platforms to accelerate model selection, hyperparameter tuning, and performance optimization.

Key Insights and Outcomes

Impact of Customer Treatments:

- Credit line reductions led to a 25% reduction in credit loss exposure among high-risk customers.
- However, aggressive measures such as term tightening or account closures increased attrition rates by 15%, particularly among mid-risk customers.

Predictive Insights:

- The Customer Lifetime Value Prediction Models revealed that customers with higher transaction frequencies but lower average balances were more resilient to account management interventions.
- Survival Analysis showed that timely outreach to high-risk customers post-intervention increased retention rates by 10%.

Regional and Segment Insights:

- Certain geographical regions exhibited higher sensitivity to account interventions, requiring tailored treatment strategies.
- Customers in the mid-risk category were identified as the most profitable yet most vulnerable to churn, highlighting the need for balanced interventions.

Visualization and Reporting:

Designed interactive dashboards using Tableau and Power BI to visualize key metrics such as:

- Churn rates and retention patterns across customer segments.
- Treatment impact on credit loss exposure and financial performance.
- Customer lifetime value distribution by region and risk level.
- Delivered detailed reports and presentations to Fleetcor stakeholders, outlining actionable recommendations based on the analysis.

Key Learnings and Business Impact

This project emphasized the importance of a data-driven approach to credit risk management and customer retention. By leveraging advanced analytics and visualization, we were able to:

- Reduce potential credit losses by identifying and addressing high-risk customers effectively.
- Improve decision-making with actionable insights into the impact of account management treatments.
- Provide Fleetcor with scalable tools and models to predict and mitigate future risks, ensuring long-term business growth.
- This experience not only honed my technical skills in data engineering, analytics, and visualization but also reinforced my ability to work on large-scale, real-world datasets to solve critical business challenges.