Credit Risk Management
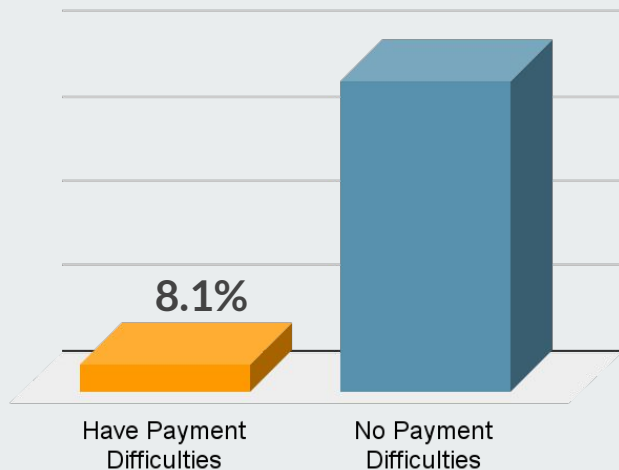
Maximizing Profitability Through the Scorecard Model

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BUSINESS PROBLEM

Percentage of Applicants

8.1%

Have Payment Difficulties

No Payment Difficulties

The company lost $ 13,847M due to 8.1% default credits

Market Expansion

High Risk, High Reward
Credit score - Low

Profit Maximization

Credit score - Optimum

"**Customer-centric** companies are **60% more profitable.**" – Deloitte

Risk Minimization

Low Risk, Low Reward
Credit score - High

FEATURE ENGINEERING

HOME CREDIT
Kamu Bisa!

DATASET

Application Train

Previous Application

Bureau

Pos Cash Balance

1 Application Train

- ANNUITY_PER_INCOME
- AGE
- YEARS_EMPLOYED
- YEARS_REGISTRATION

2 Previous Application

- P_AVG_REFUSED_AMT_CREDIT
- P_PREV_APP_COUNT
- P_REFUSED_COUNT
- P_REFUSED_INTEREST_RATE

3 Bureau

- B_AVG_AMT_CREDIT_SUM
- B_BUREAU_COUNT
- B_BAD_DEBT_COUNT

4 Pos Cash Balance
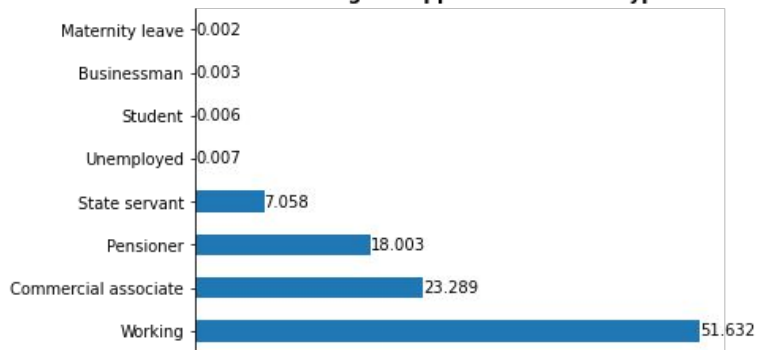
- PCB_SUM_CNT_INSTALLMENT_FUTURE
- PCB_PREV_CREDIT_COUNT

❖ **Description:** Each row represent client demographics, current and previous application, credit bureau record, and installment history.

❖ **Dataset shape:** 307,511 unique clients' ID and 135 features (after feature engineering)
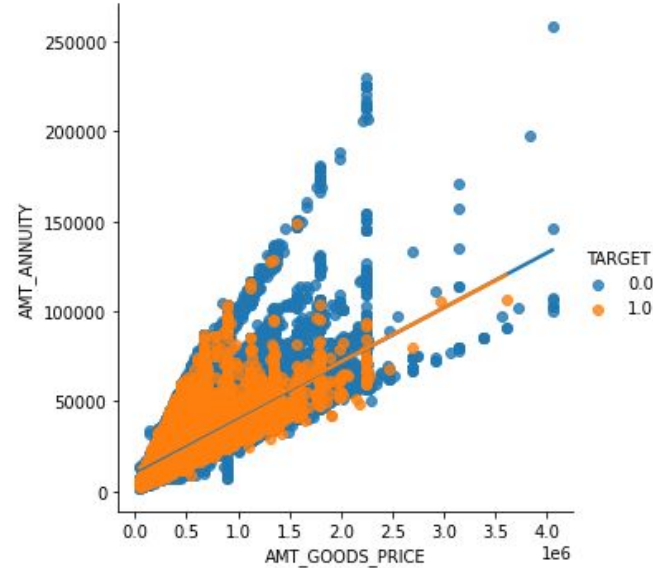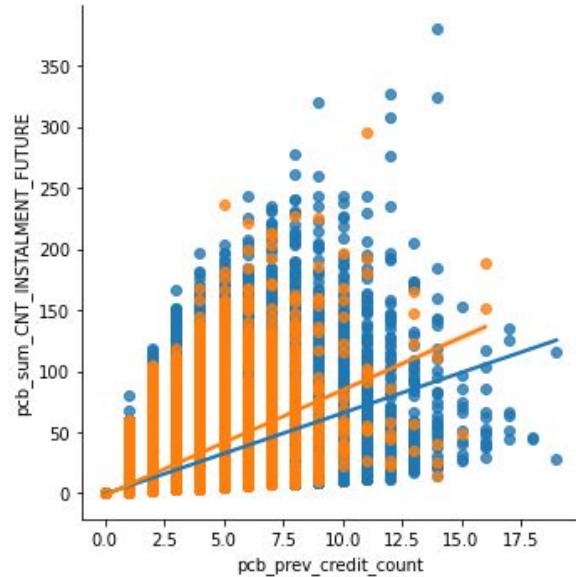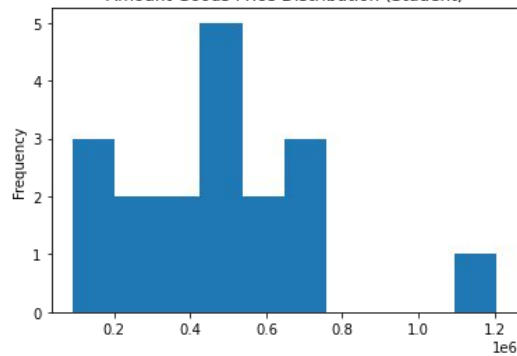
As the amount of goods price increase, the amount of annuity becomes higher. With the same number of credit, the **clients with loan repayment difficulties** have the **higher number of installment** in the future. They tend to choose a longer loan payment duration so the **amount of annuity becomes easier to pay off**.

Action: We need to provide a longer loan payment duration option for the potential default credit application.
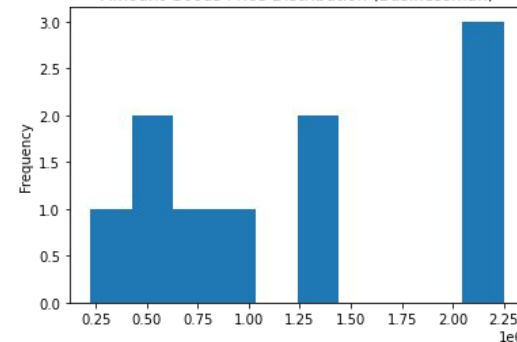
The client with income type **student and businessman** have no loan repayment difficulties. These segment have **accepted application rate 100%**, means they're actually a **promising clients**. However there are only 0.006% and 0.003% of application come from these segments respectively.

Action: We need to create **new loan product** that **targeting student and businessman** segment specifically. According to the amount of goods price distribution, we know that these segments **have a different kind of products they are interested in**.

- **Student** : This segment interested in **low-valued products**. **50% of clients** used credit loan for goods at least **$ 452,250** in price. The average goods price is $ 458,250.
- **Businessman** : This segment interested in **high-valued products**. **50% of clients** used credit loan for goods at least **$ 1,125,000** in price or **2.5x higher than student segment**. The average goods price is $ 1,228,500.
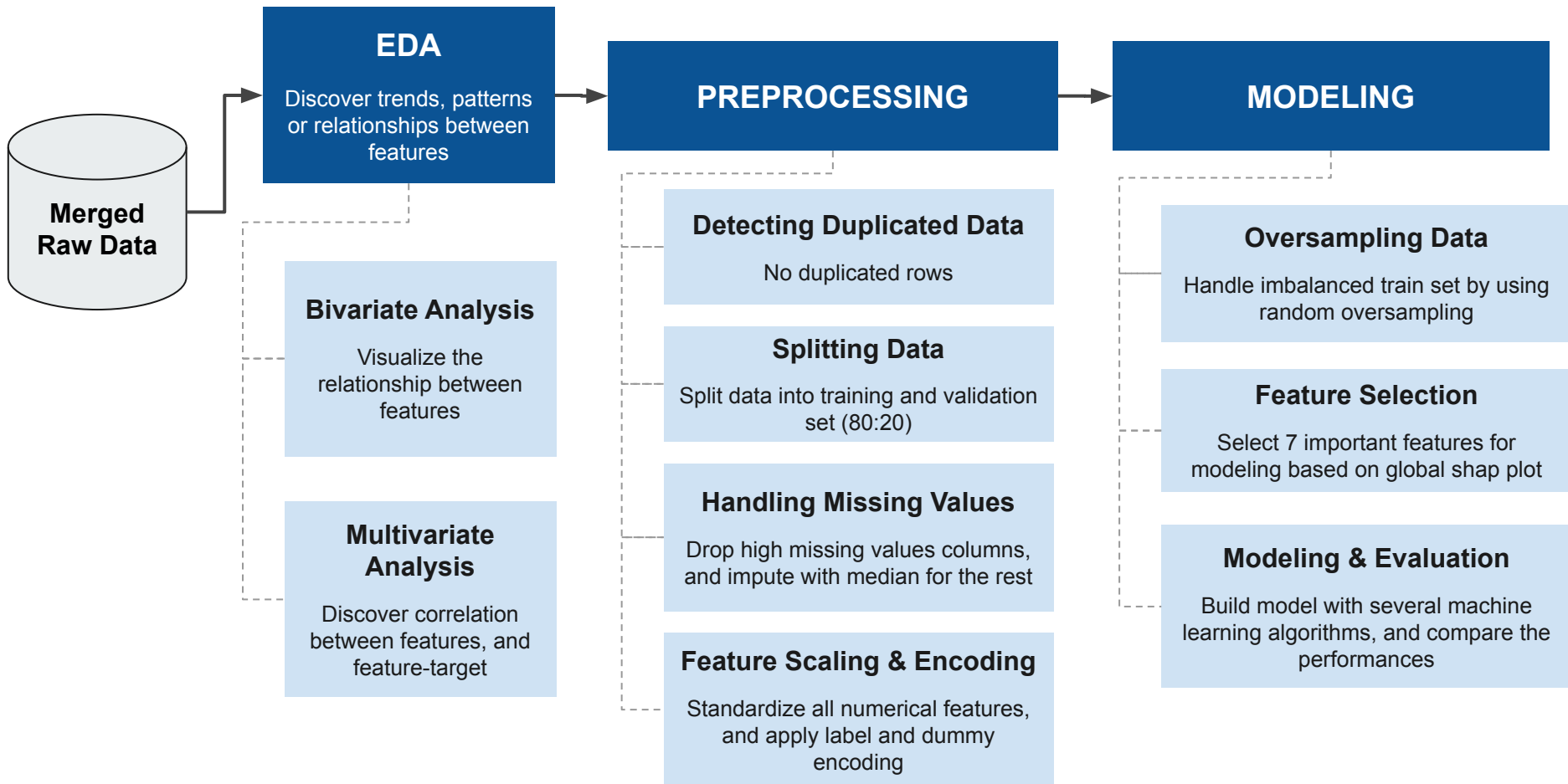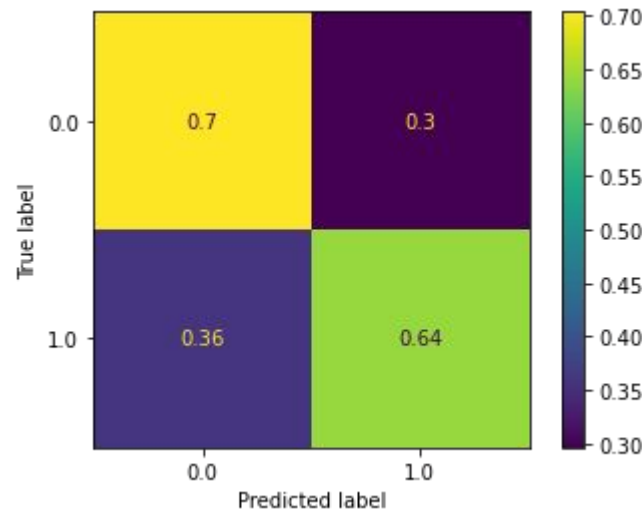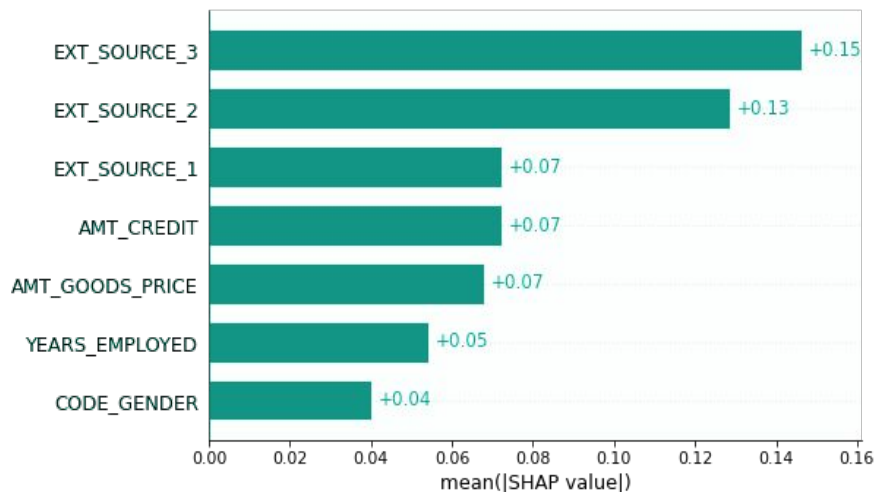
Performance Model

With classification threshold 0.5, the model is able to predict up to **64% of the existing potential default credits**, with the risk of losing promising credit applications due to predicting errors of 30%. It means for every 20 applications which are predicted as a potential default credit, there are 17 which are actually not potential default credits.

Accuracy (Train)	**: 73%**
Accuracy (Validation)	**: 70%**
Validation Recall (Class 0)	**: 70%**
Validation Recall (Class 1)	**: 64%**

CREDIT RISK MANAGEMENT STRATEGY

	Profit Maximization	Market Expansion
% of Good Credit predicted correctly	92%	100%
% of Bad Credit predicted correctly	41%	0%
Probability Threshold for Approvals	0.2989	0.0105

SCORECARD

|		Sensitivity	Specificity	
Decile	Probability_Threshold	Cumm. Good %	Cumm. Bad Avoided %	Profit to Business
1	87.60%	11%	95%	805219015
2	80.18%	21%	89%	1583746297
3	74.04%	32%	86%	2402515261
4	68.07%	42%	82%	3208061520
5	62.14%	53%	76%	3965966786
6	55.34%	63%	70%	4725916293
7	48.24%	73%	65%	5474501170
8	40.03%	83%	56%	6148340180
9	29.89%	92%	41%	6720781697
10	1.05%	100%	0%	6814752557

*) Model simulation is applied to validation set

Assumptions

Loss from 1 bad credit $ 557,778
**Profit** from 1 good credit   : $ 144,636

ROC Curve
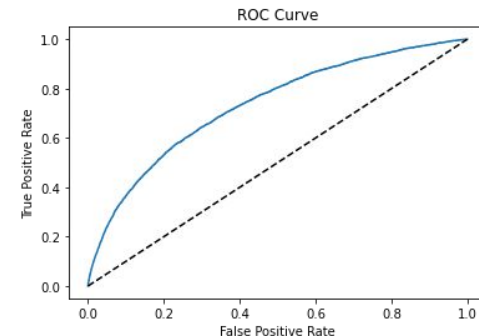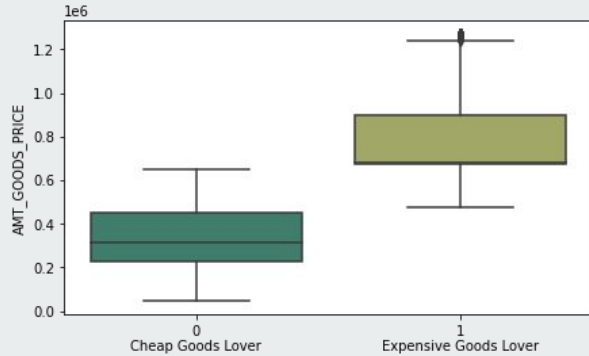
In average, Cheap Goods Lover segment (71.6%) applied for $ 322,396 credit, meanwhile **Expensive Goods Lover** segment (28.4%) applied for $ 818,797 credit or **2.5x higher**. It will cause default risk higher, since the credit annuity the clients must pay off periodically will also increase.
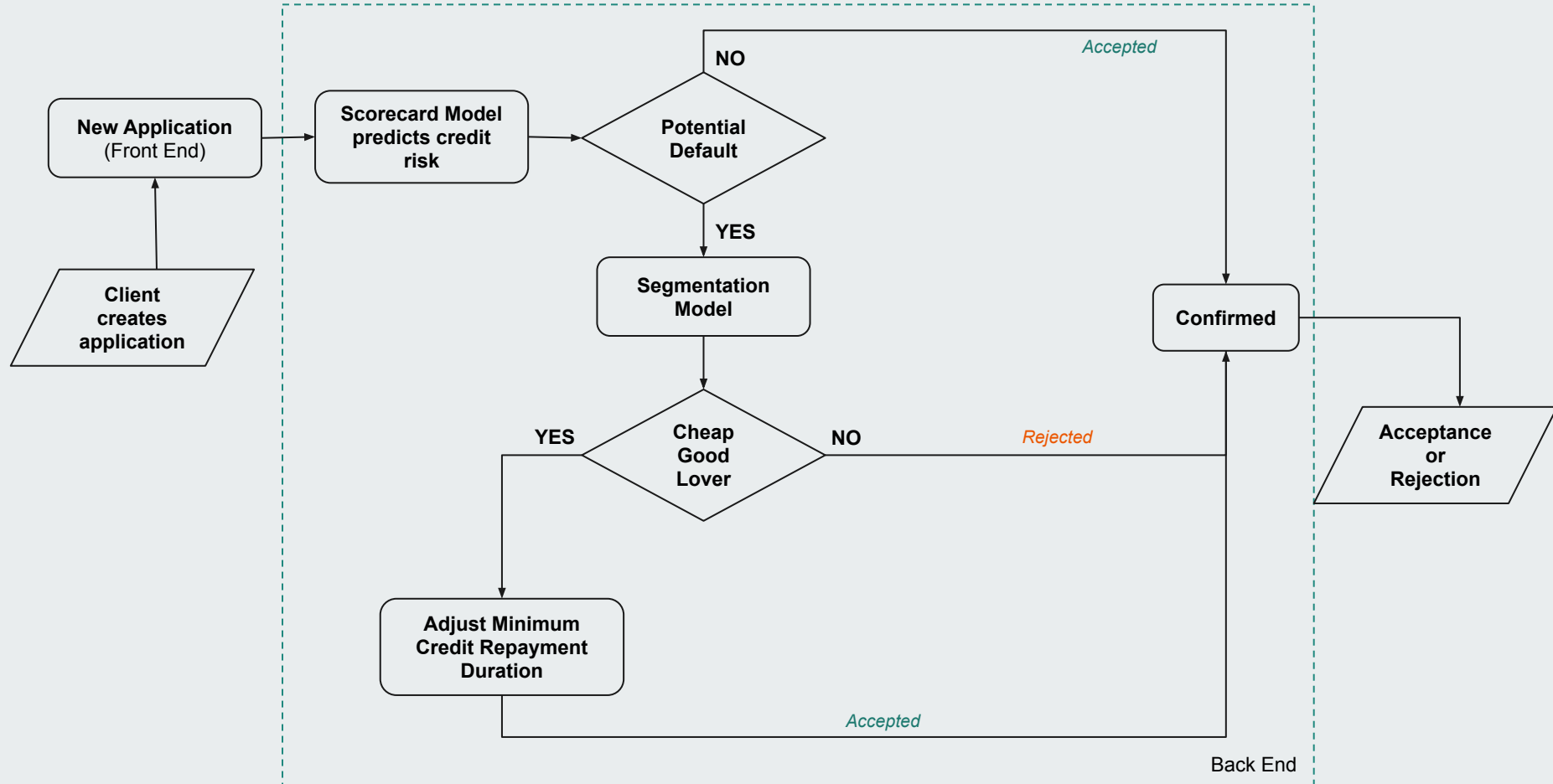
Actions:

1. Consider to **reject** credit application from clients who belong to **Expensive good lover** segment.
2. **Adjust** minimum credit **repayment duration** for clients who belong to **Cheap goods lover** segment, so they still can get credit and capable to repay it with light-amount annuity per period.

3-D Visualization of Potential Default Credit Clusters
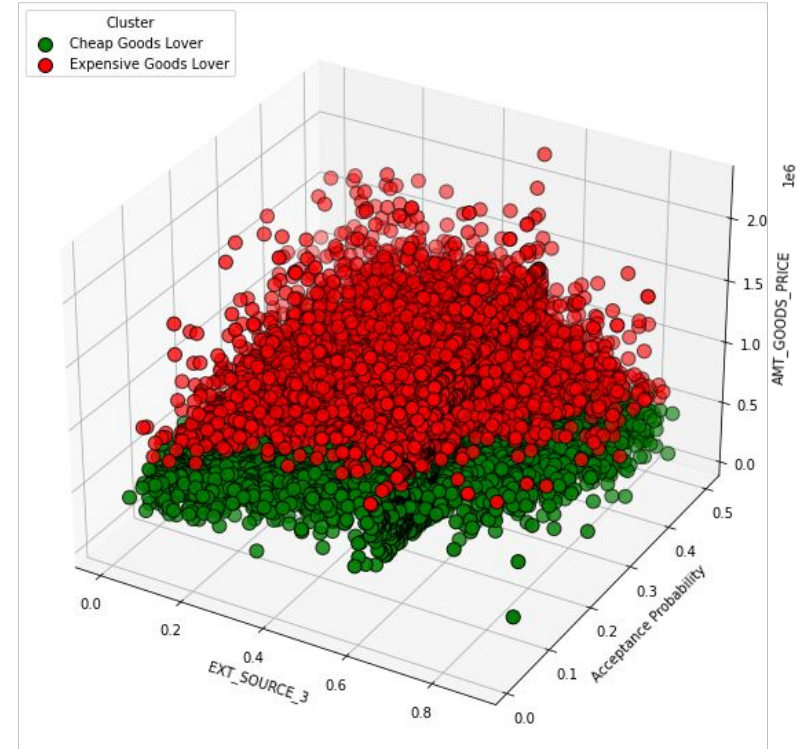
FLOWCHART

POTENTIAL IMPACT

	Before	After	% Change
Loss From Default Credit	13,846,850,000	3,932,488,132	**-71.6%**

THANK YOU

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Project Documentation

https://github.com/dinachoir/credit-risk-management