Final Submission of :Credit Exploratory Data Analysis: Case Study – Assignment May - 2024

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Business Understanding

This case study aims to identify patterns which indicate if a client has difficulty paying their instalments which may be used for taking actions such as denying the loan, reducing the amount of loan, lending (to risky applicants) at a higher interest rate, etc. This will ensure that the consumers capable of repaying the loan are not rejected. Identification of such applicant's using EDA is the aim of this case study.

Assigned Variables:

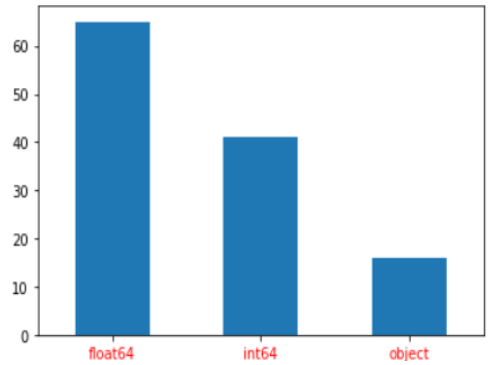
Description	Assigned Variable
Data Set - 1: "Application_data.csv"	ap_dt
Data Set - 2: "previous_application.csv"	pr_ap_dt
For Null values defined as	nulls
To store Null Total Values	mis_val
Null Values in ap_dt> 50%	nul_50
Null Values in ap_dt > 15%	nul_15
Storing Relevant Values	nrel
For Columns Flag	Col_flag
To store all flag columns and Target columns	dt_flg

Data Understanding:

1. Application_data.csv [ap_dt]

- *Number of Columns: 122*
- *Number of Rows: 307511*
- *Data Types: Integer, Float, Strings*
- *Descriptive view of Data file: There were anomalies like negative numbers, Null values, Days and Years were not in proper Format*

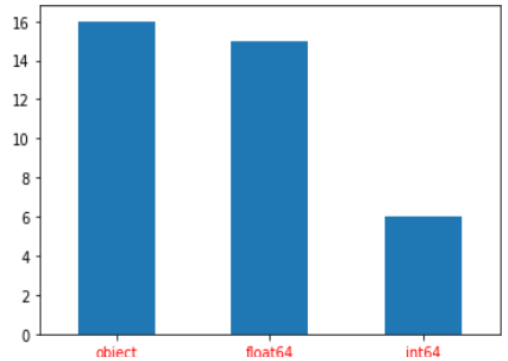
- *Float64: 65*
- *Int64: 41*
- *Object: 16*



2. Previous_Application_data.csv [pr_ap_dt]

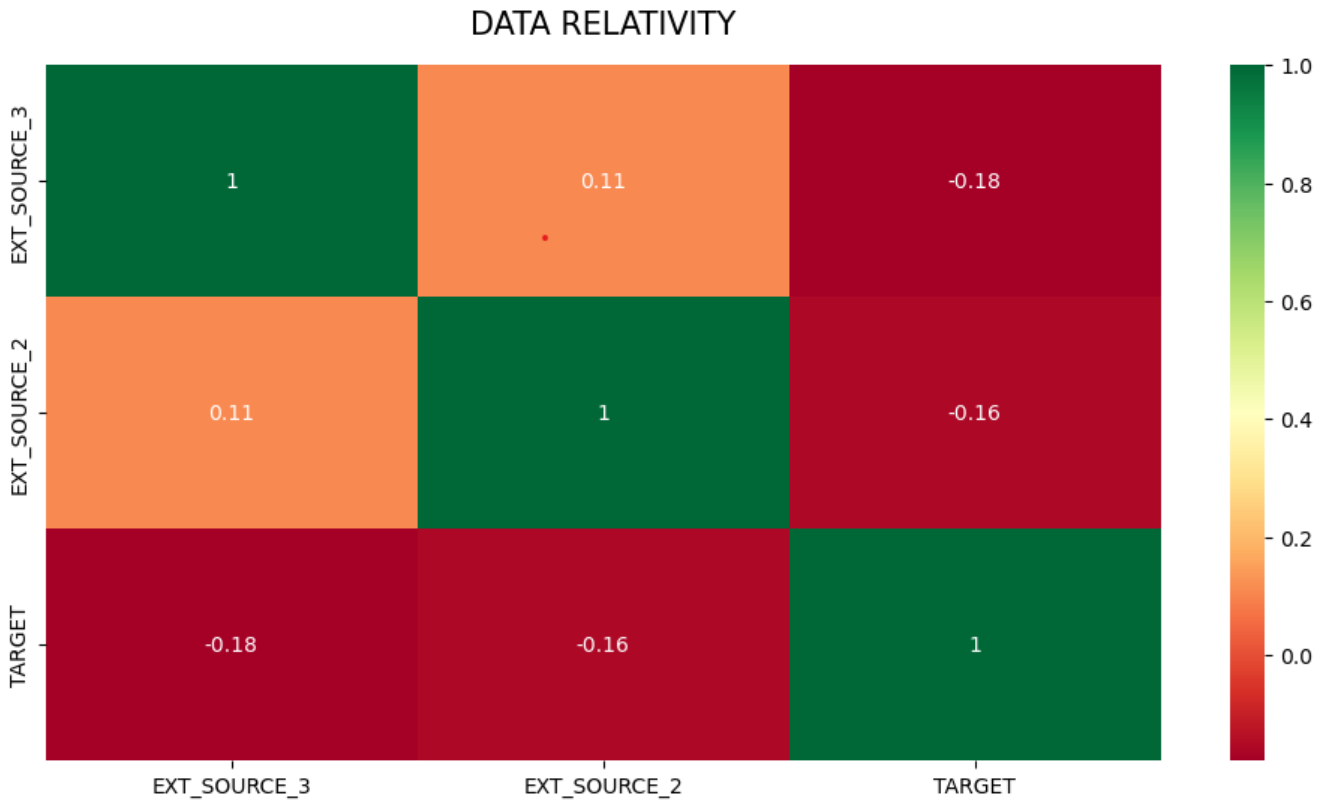
1. *Number of Columns: 37*
2. *Number of Rows: 1670214*
3. *Data Types: Integer, Float, Strings*
4. *Descriptive view of Data file: There were anomalies like negative numbers, Null values, Days and Years were not in proper Format*

Float64: 15
Int64: 06
Object: 16



Data Cleaning & Manipulation for Application Data:

- After double checking the 15% Null Values, There was out-sourced data columns which are provided by externally.
- Source Columns: EXT_SOURCE_2 & EXT_SOURCE_2.



Analysing EXT_SOURCE_2 & EXT_SOURCE_2 Columns, Flag Columns & Target Columns

- By Above mentioned Correlation Heatmap, We found that There is no relation and much contribution
- These data doesn't cause causation.
- So, on this base I have Removed the EXT_SOURCE_2 & EXT_SOURCE_2 columns.
- After Removing All these columns, we left with 71 Columns.
- This 71 Columns includes 28 Flag Columns:
- In which there are Email, phone, Car, work and other important data were stored.
- To analyse the Flag data, I have combined all the flag columns in one variable "col_flag" .
- Includes "Target" Variable, Which has Explains (1 - client with payment difficulties: he/she had late payment more than X days on at least one of the first Y instalments of the loan in our sample, 0 - all other cases)
- For analysis we need to find Payers & Defaulters, for that I have changed data from 1's & 0's to "Defaulter" and "Repayer"

Analyzing Flag columns & Target column:

- **Bar Graph Analysis:**
- • By Observing the Graph:
- • defaulters:
- • (FLAG_OWN_REALTY,
- • FLAG_MOBIL ,
- • FLAG_EMP_PHONE,
- • FLAG_CONT_MOBILE,
- • FLAG_DOCUMENT_3
- **• These columns make relativity thus we can include these below columns:**
- • FLAG_DOCUMENT_3,
- • FLAG_OWN_REALTY,
- • FLAG_MOBIL
- • We can remove all other FLAG columns..

Standardize the Values:

Very high value data columns:

- AMT_INCOME_TOTAL
- AMT_CREDIT
- AMT_GOODS_PRICE

Converting these numerical columns in categorical columns for better understanding.

Negative values Data columns: -

- DAYS_BIRTH
- DAYS_EMPLOYED
- DAYS_REGISTRATION
- DAYS_ID_PUBLISH
- DAYS_LAST_PHONE_CHANGE

Need to Make it correct those values convert DAYS_BIRTH to AGE in years , DAYS_EMPLOYED to YEARS EMPLOYED.

Standardizing AMT_INCOME_TOTAL, AMT_CREDIT, AMT_GOODS_PRICE columns:

- It has pricing from 0 to lakhs. so, make category and divide the pricing.
- Make **Income Range** range from 0 to 10 Lakhs.

bins = [0,1,2,3,4,5,6,7,8,9,10,11]

slot = ['0-1L','1L-2L', '2L-3L','3L-4L','4L-5L','5L-6L','6L-7L','7L-8L','8L-9L','9L-10L','10L Above']

- Make **Credit Range** range from 0 to 10 Lakhs.

bins = [0,1,2,3,4,5,6,7,8,9,10,100]

slots = ['0-1L','1L-2L', '2L-3L','3L-4L','4L-5L','5L-6L','6L-7L','7L-8L','8L-9L','9L-10L','10L Above']

- Make **Price of Goods** range from 0 to 10 Lakhs.

bins = [0,1,2,3,4,5,6,7,8,9,10,100]

slots = ['0-1L','1L-2L', '2L-3L','3L-4L','4L-5L','5L-6L','6L-7L','7L-8L','8L-9L','9L-10L','10L Above']

Summary on Datasets: Application_Data.csv

- States that: Application_Data.csv:
- There are: **3,07,511** Rows & **53** Columns.
- Types of datatypes available:
    - Integers
    - Float values
    - Strings
- Found the Null values, Filled them with "Unknown" variable.
- Removed unwanted columns and other columns.
- We have worked on the negative values and converted them into positive values in some of columns.
- We have converted Values in proper format.
- Now file is neat and clean for further process.

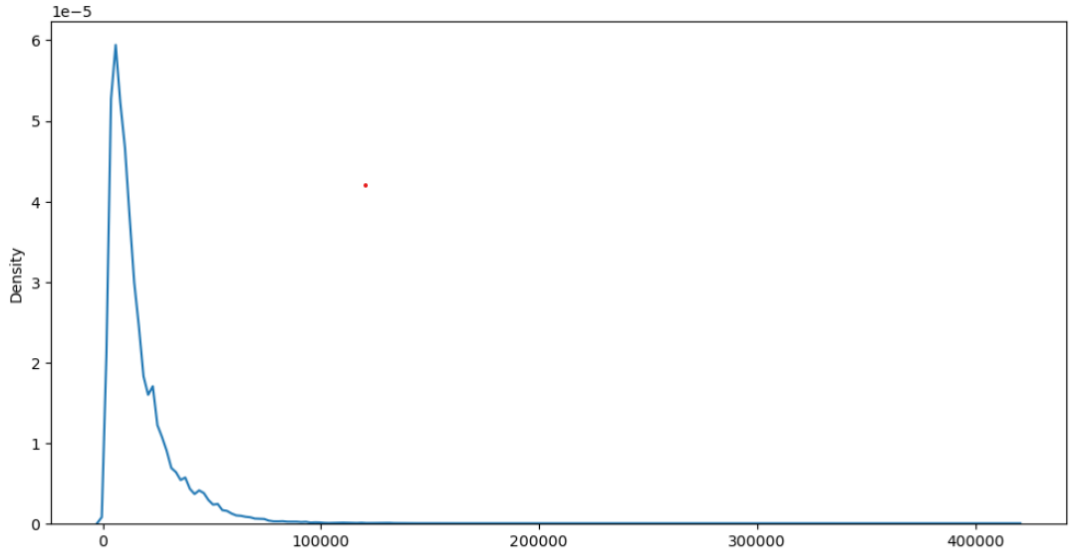
Summary on Datasets: Previous_Application_Data.csv

- States that: Previous_Application_Data.csv:
- There are: 1670214 Rows & 37 Columns.
- Types of datatypes available:
  - Integers
  - Float values
  - Strings
- Found the Null values, Filled them with "Unknown" variable.
- Removed unwanted columns and other columns.
- We have worked on the negative values and converted them into positive values in some of columns.
- We have converted Values in proper format.
- Now file is neat and clean for further process.

Data Set Analyzing using Graphical Representation.

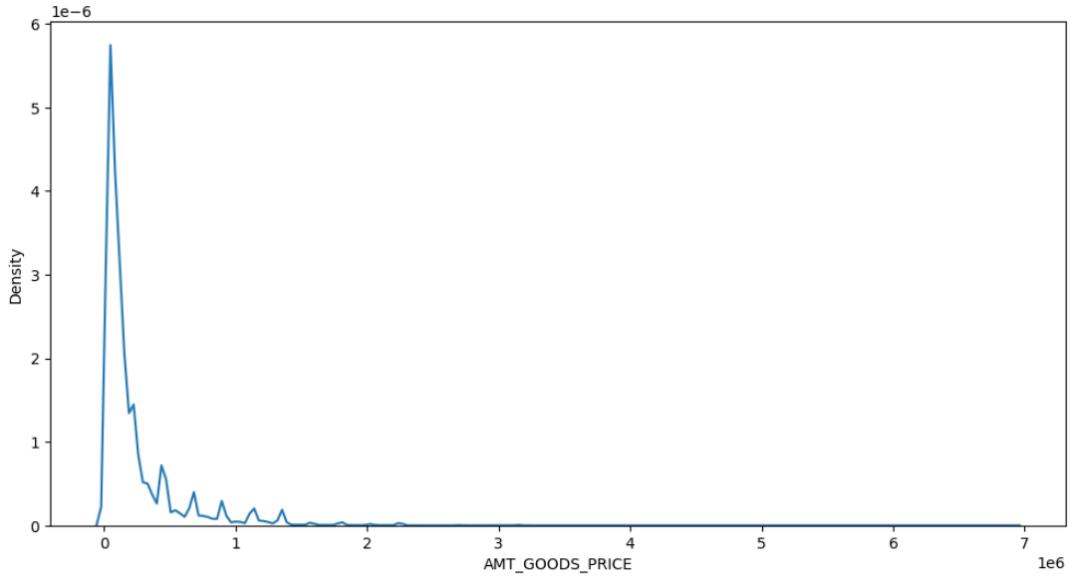
1. Plotting kde plot for "AMT_GOODS_PRICE" to understand the distribution

- -There are several peaks along the distribution. Let's impute using the mode, mean and median and see if the distribution is still about the same.



2. plotting a kdeplotto understand distribution of "AMT_ANNUITY"

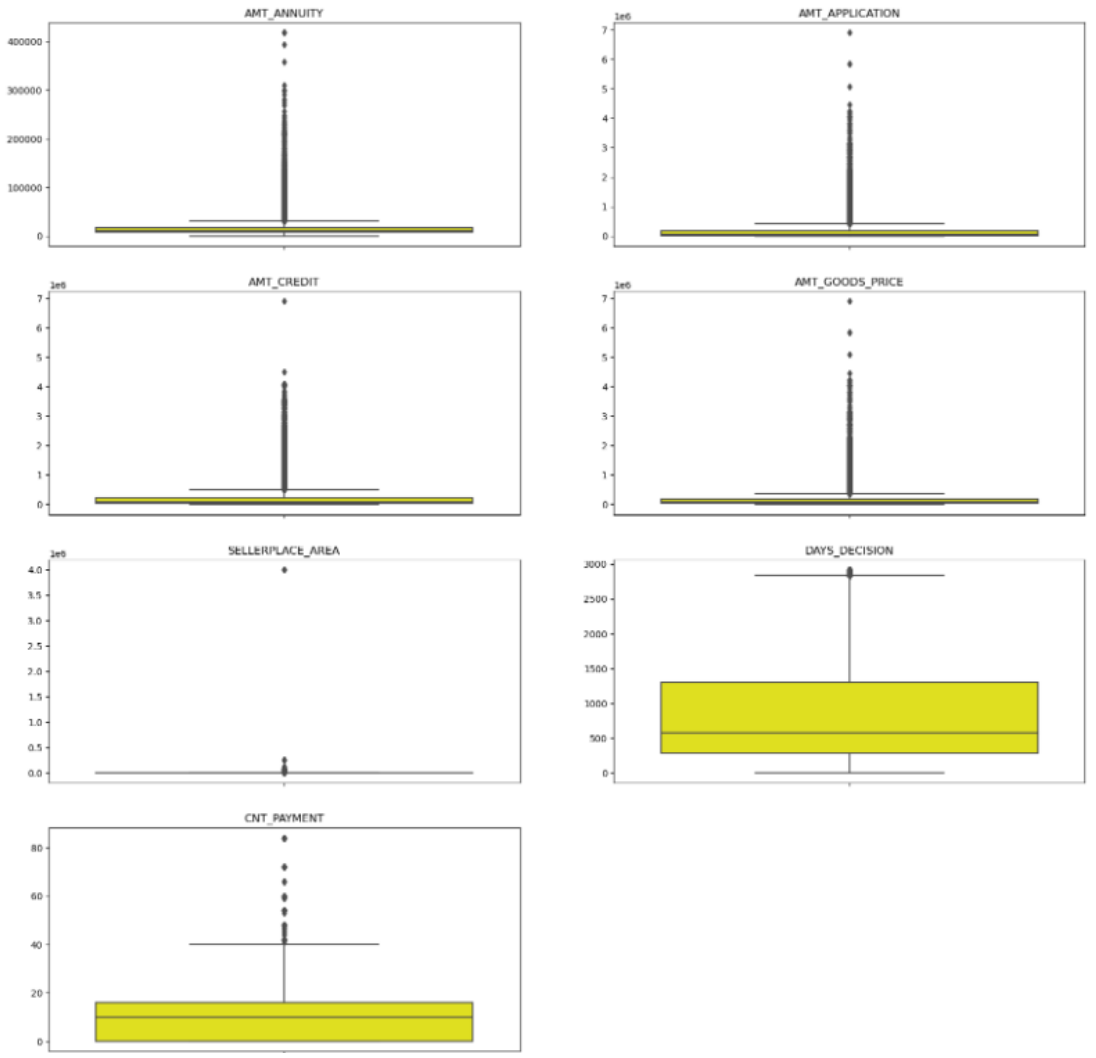
- There is a single peak at the left side of the distribution, and it indicates the presence of outliers and hence imputing with mean would not be the right approach and hence imputing with median.



Finding outliers in: ['amt_annuity','amt_application','amt_credit','amt_goods_price','sellerplace_area','days_decision','cnt_payment']

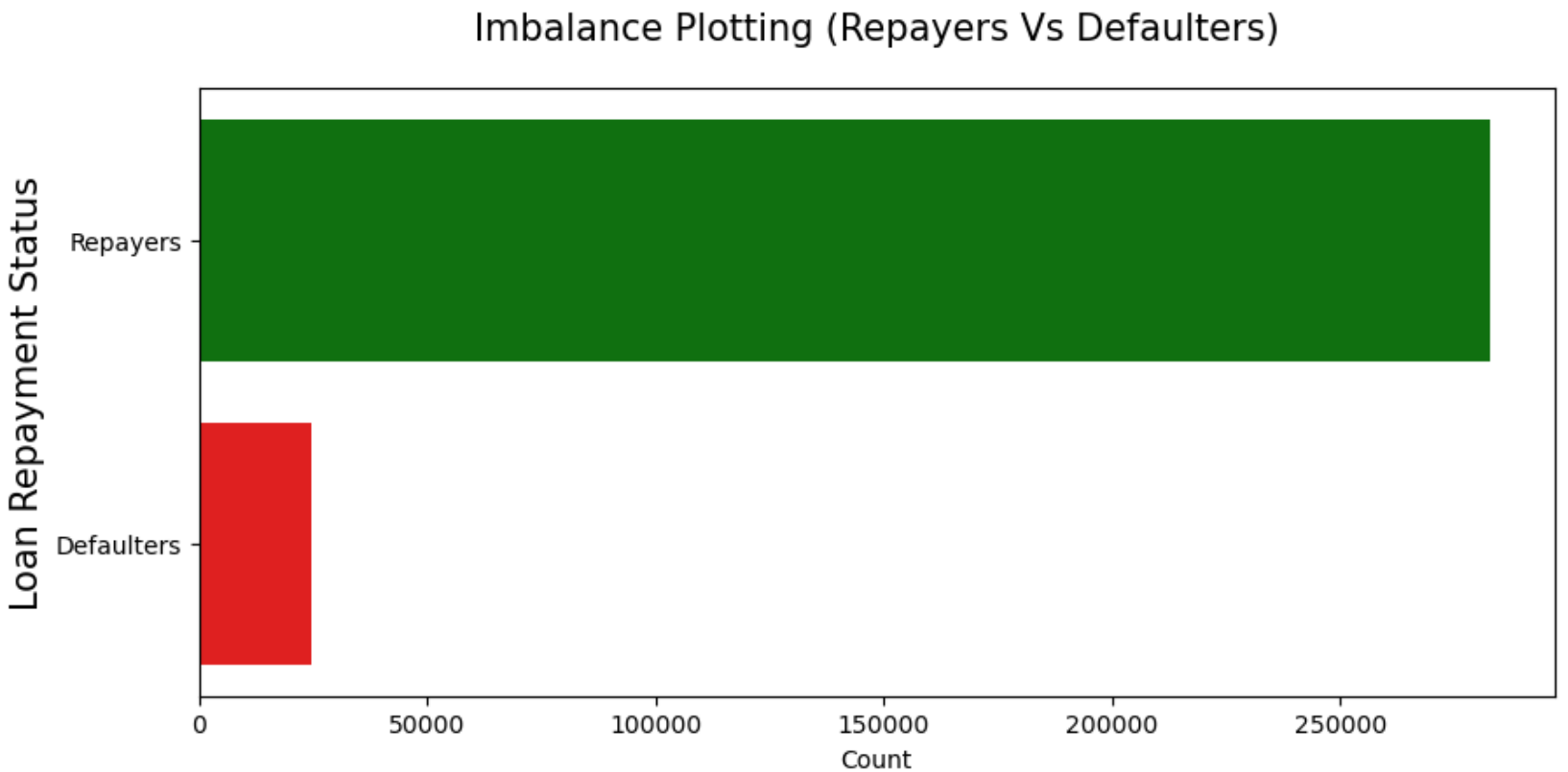
Summary It can be seen that in previous application data

- ➢ AMT_ANNUITY, AMT_APPLICATION, AMT_CREDIT, AMT_GOODS_PRICE, SELLERPLACE_AREA consist max. number of outliers.
- ➢ CNT_PAYMENT consist less outlier values.
- ➢ DAYS_DECISION has little number of outliers indicating that these previous applications decisions.



Repayers & Defaulters

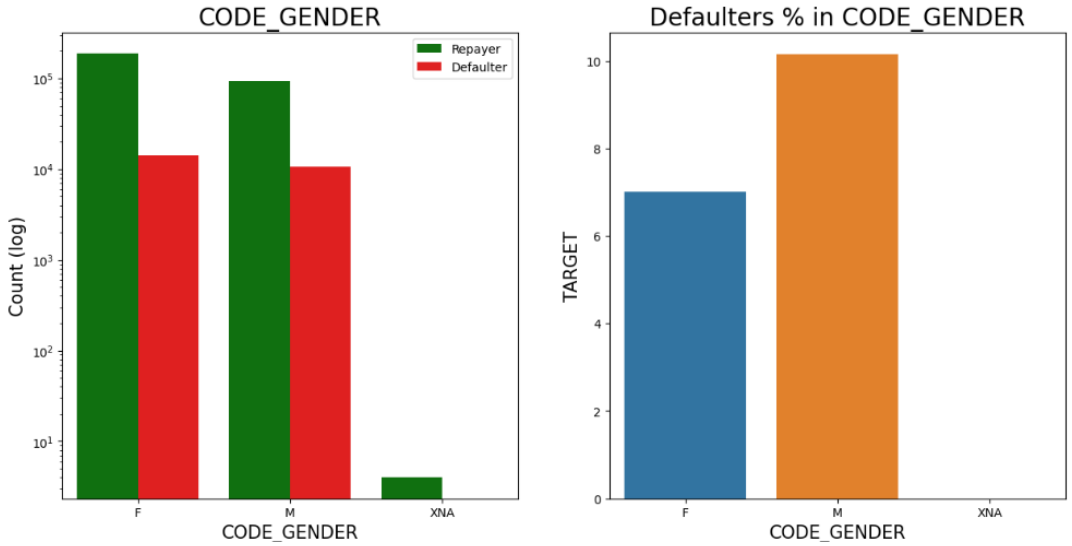
-Repayer Percentage is 91.93%
-Defaulter Percentage is 8.07%
-Imbalance Ratio with respect to
-Repayer and Defaulter is given: 11.39/1 (approx)



Analyzing Univariate, Bivariate, Multivariate :

Gender wise Analysis

Based on the percentage of default credits, males have a higher chance of not returning their loans, comparing with women.

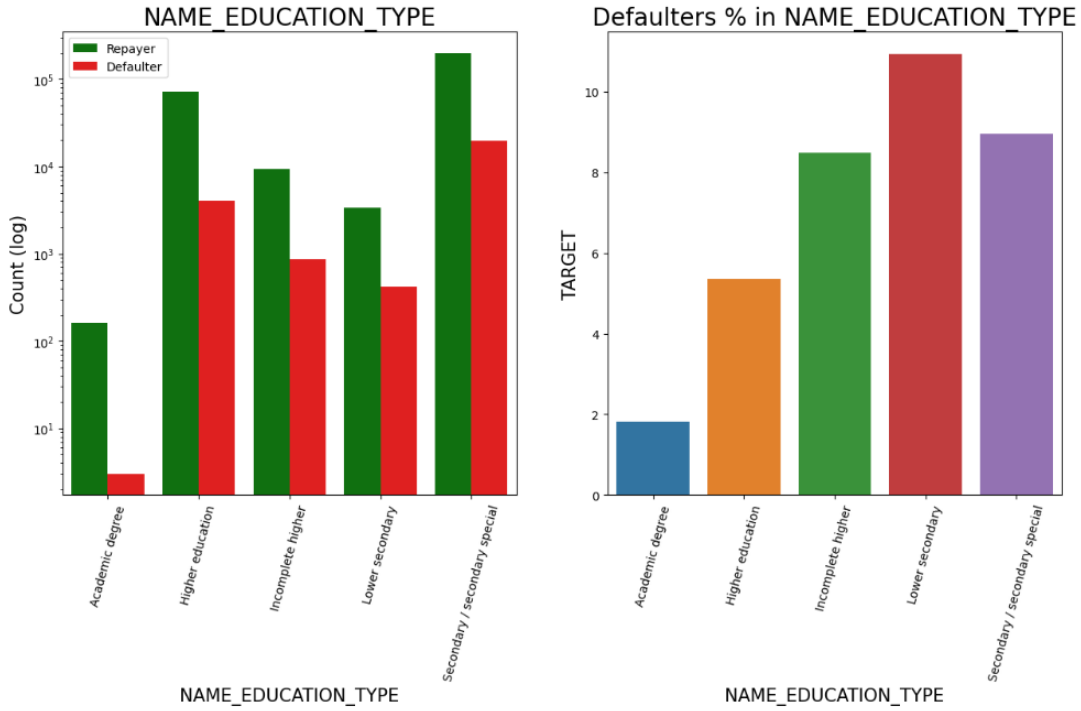


Education wise Analysis

Majority of clients have Secondary/secondary special education, followed by clients with Higher education.

Very few clients have an academic degree Lower secondary category have highest rate of defaulter.

People with Academic degree are least likely to default.



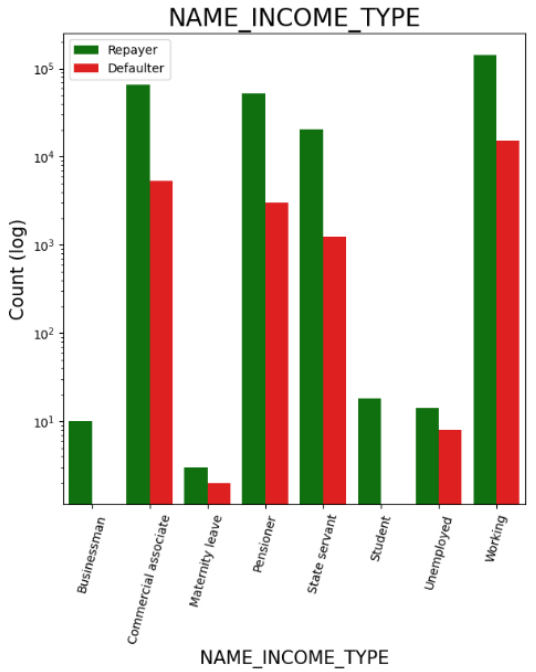
Income wise Analysis

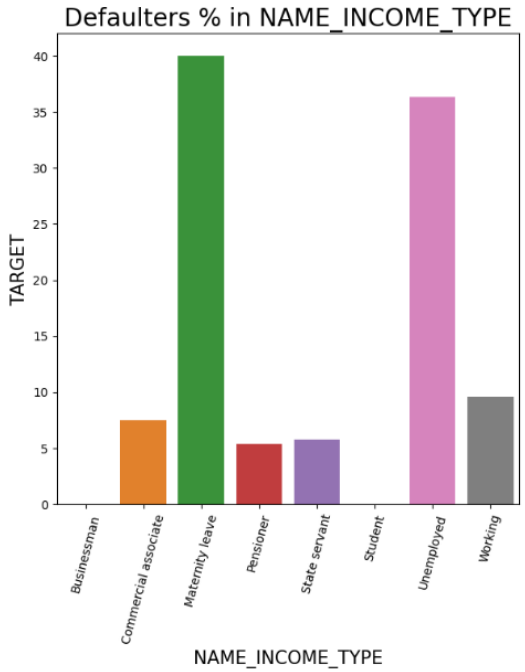
Most of applicants for loans income type is Working, followed by Commercial associate, Pensioner and State servant.

The applicants who are on Maternity leave have defaulting percentage of 40% which is the highest, followed by Unemployed (37%).

The rest under average around 10% defaulters.

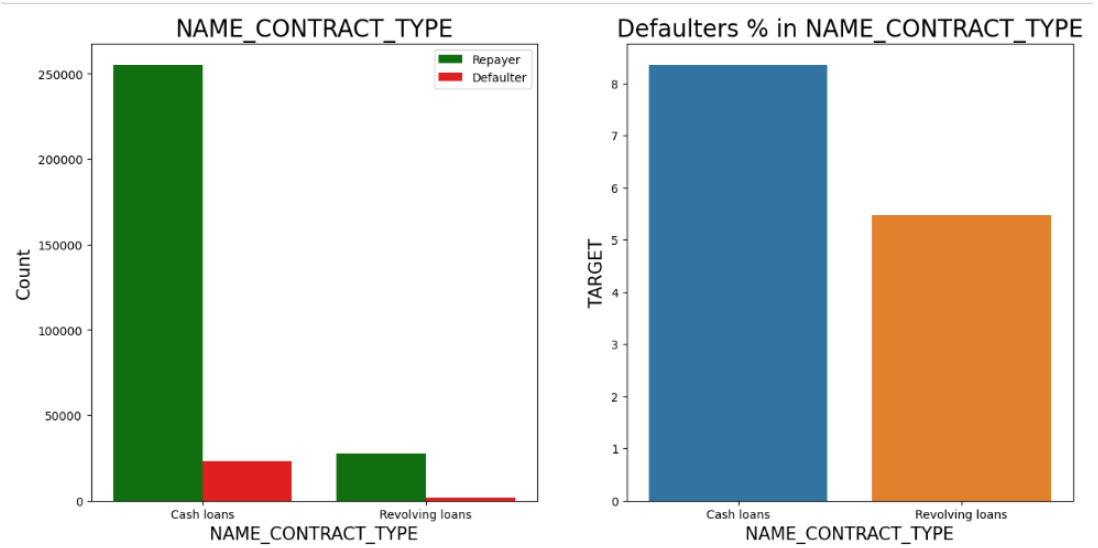
Student and Businessmen though less in numbers, do not have default record. Safest two categories for providing loan..





Contract wise Analysis Contract type:

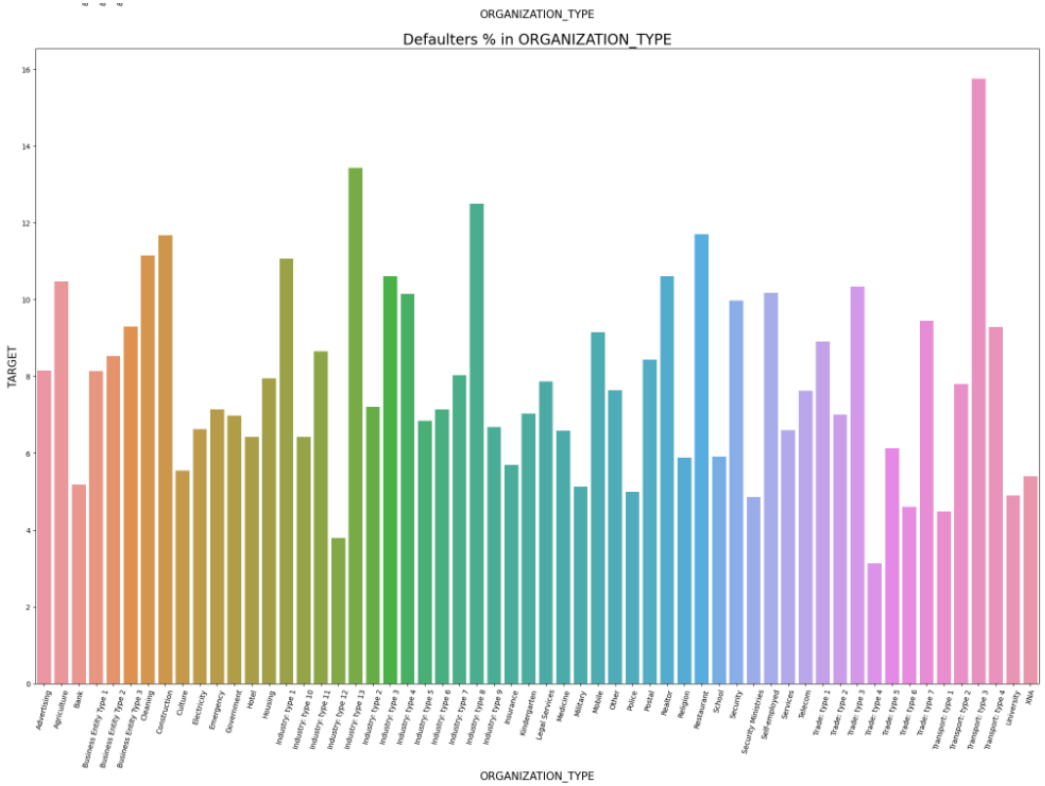
Revolving loans are just a small fraction (10%) from the total number of loans Around 8-9% Cash loan applicants and 5- 6% Revolving loan applicant are in defaulters.

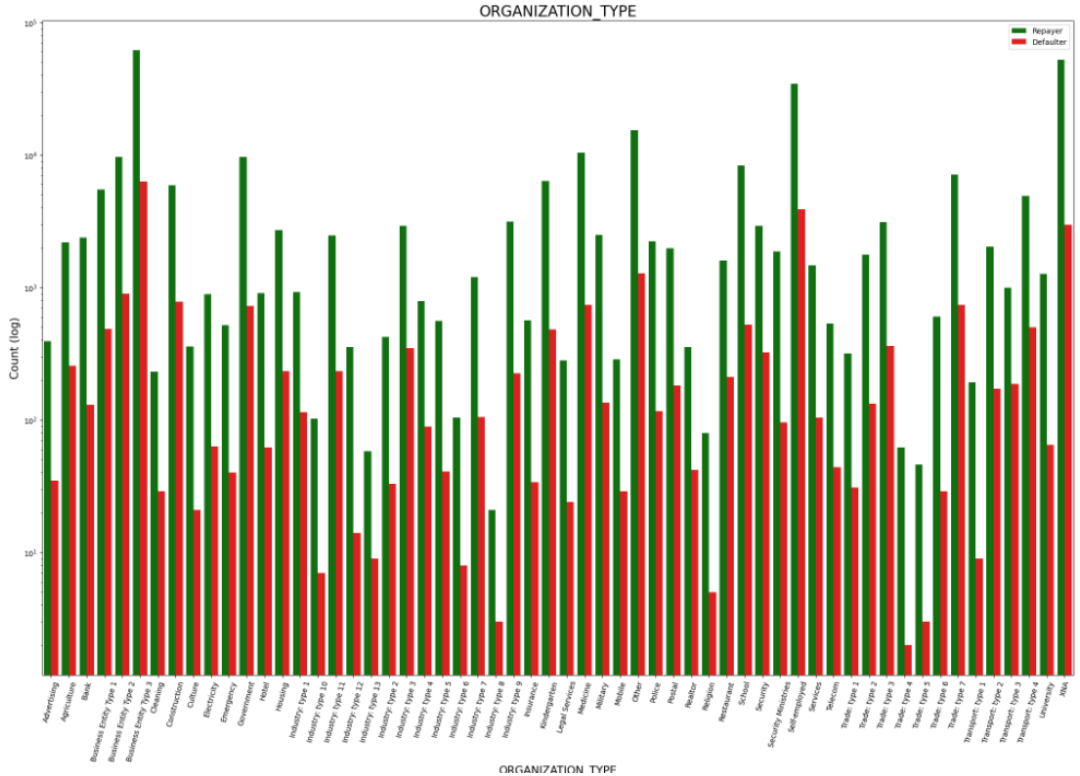


Occupation Analysis

Category with highest percent of defaulters are Low-skill Laborers (above 17%), followed by Drivers and Waiters/barmen staff, Security staff, Laborers and Cooking staff.

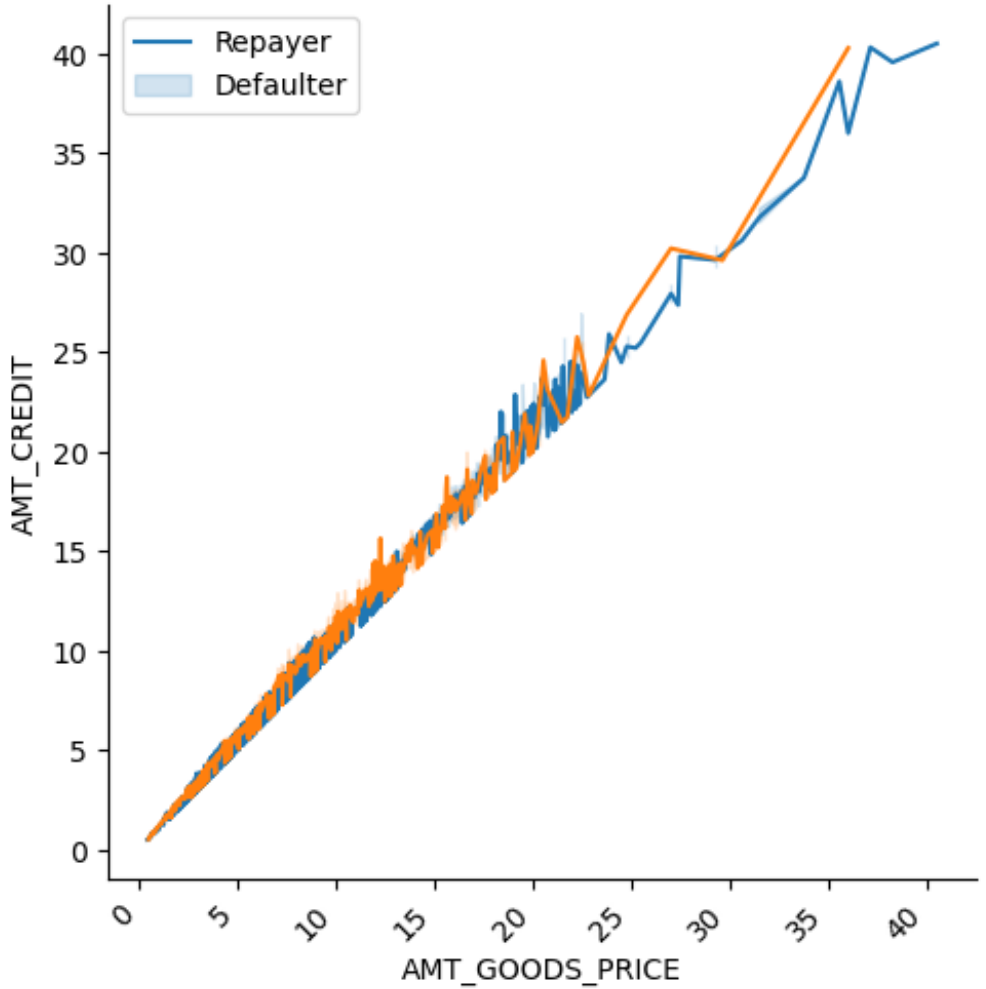
IT staff are less likely to apply for Loan





Numerical Univariate Analysis

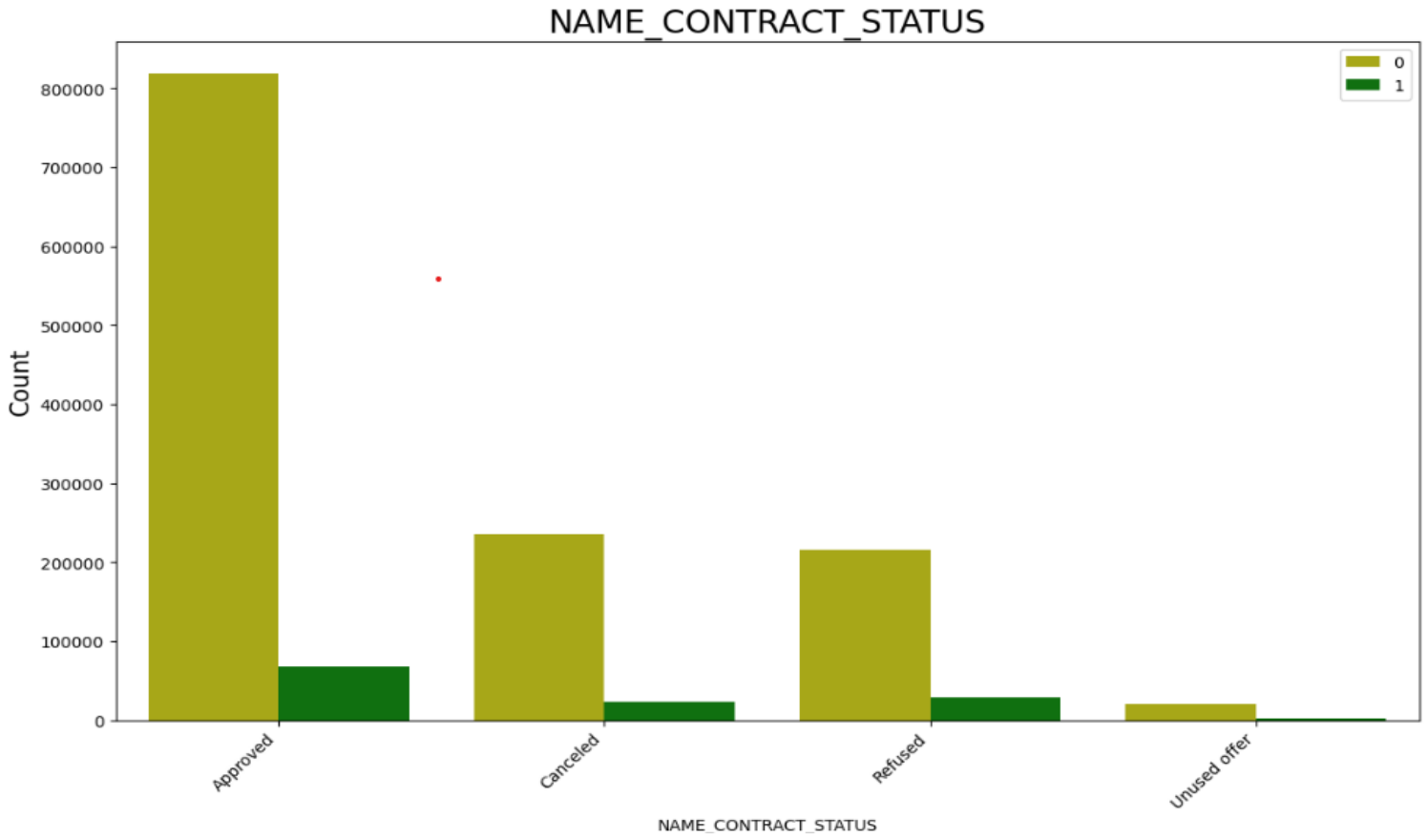
When the credit amount goes beyond 30 Lakhs, there is an increase in defaulters



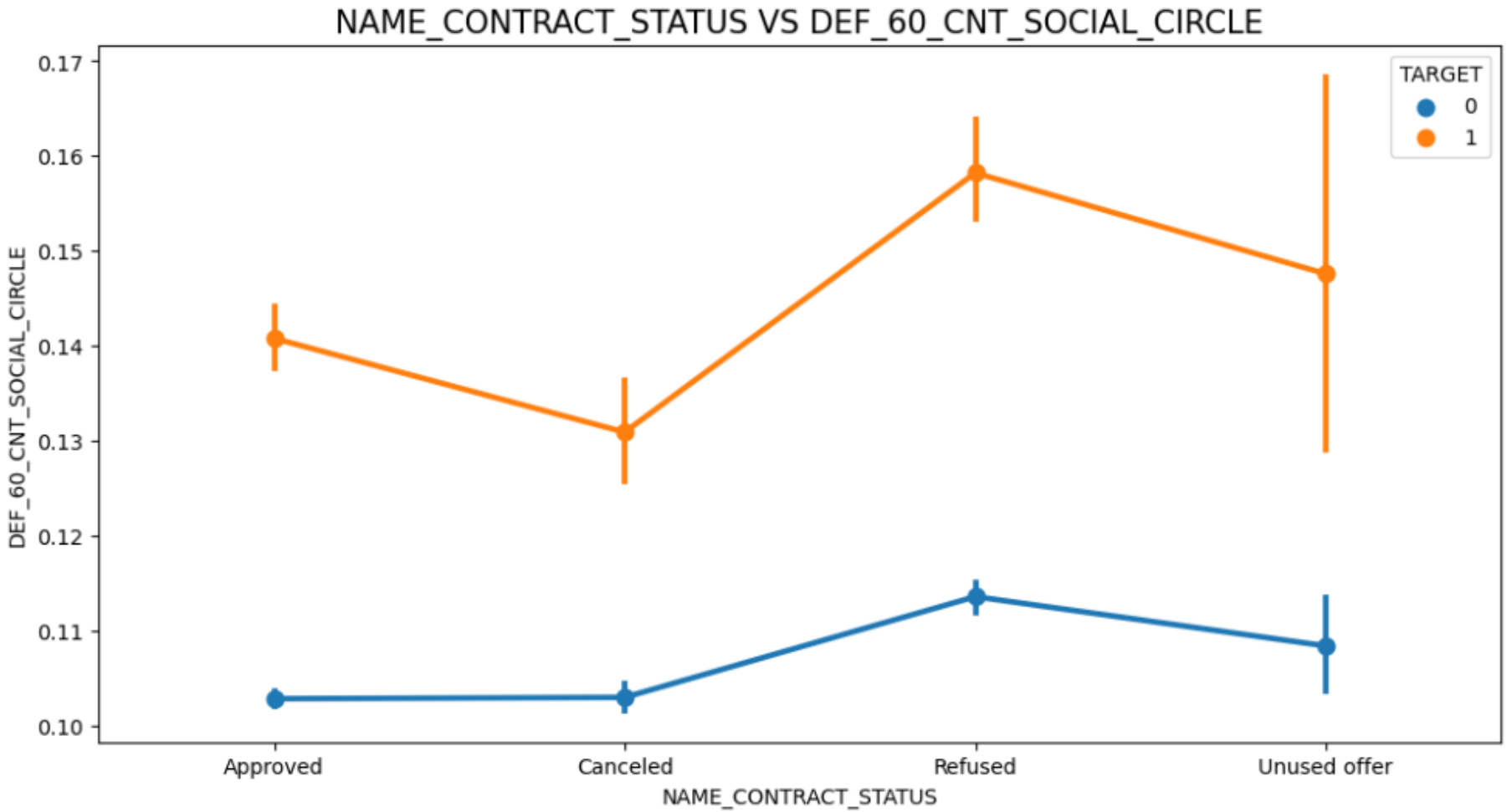
Categorical Univariate Variables Analysis

90% of the previously cancelled client have actually rep the loan. Revising the interest rates would increase business opportunity for these clients88% of the clients who have been previously refused a loan has payer back the loan in current case. Refusal reason should be recorded for further analysis as these clients could turn into potential repaying customer

		Counts	Percentage
NAME_CONTRACT_STATUS	TARGET		
Approved	0	818856	92.41%
	1	67243	7.59%
Canceled	0	235641	90.83%
	1	23800	9.17%
Refused	0	215952	88.0%
	1	29438	12.0%
Unused offer	0	20892	91.75%
	1	1879	8.25%



Clients who have average of 0.13 or higher their DEF_60_CNT_SOCIAL_CIRCLE score tend to default more and thus analyzing client's social circle could help in disbursement of the loan



Thank You