Credit Card Segmentation

Problem Statement

To develop a customer segmentation to define marketing strategy.

Business Understanding

Customer segmentation can be defined as the action of grouping similar customers into categories with the objective of customizing offerings and actions based on their profiles. Credit card issuers usually target consumers by using information about their behaviours and demographics. Behaviours are often based on credit card reports on how a person spends and pays over time while demographics are derived from census reports and other non-financial databases and cover facts such as income, age and geography. It is useful to identify segments of customers who may respond in similar way to specific marketing techniques. It gives businesses the ability to tailor marketing strategies and timing to generate better response rates and provide improved consumer experiences.

Data Understanding

Database Understanding

The sample dataset summarizes the usage behaviour of about 9000 active credit card holders during the last 6 months. File is at customer level with 18 behavioural variables. Data provides information related to –

- Monthly average balance
- Total Purchase Amount
- Total Cash Advance Amount
- Frequency of purchases
- Frequency of ONEOFF Purchases
- Frequency of Instalment Purchases
- Average amount per purchase transaction
- Number of months as customer
- Percentage of months with full payment of the due statement balance, etc.

The data provided explains about the behaviour of the customer. So we will perform behavioural customer segmentation on this dataset.

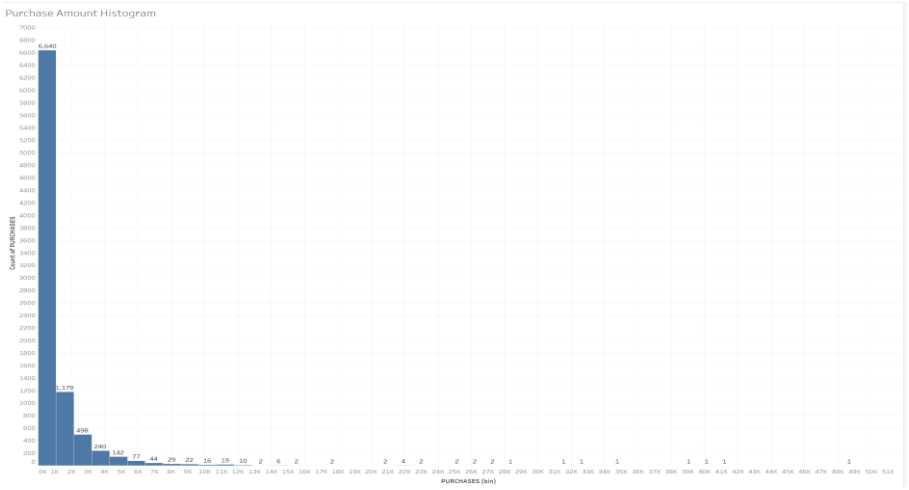
Deriving Intelligent KPI's based on the data

1. Monthly Average Purchase – This KPI explains about the average purchase made by customer monthly.
2. Average Cash Advance Amount – This KPI explains about the average cash advance taken by the customer monthly
3. Purchase by type – This KPI explains type of customer (ONEOFF Type, Instalment Type) ONEOFF Type – Most of the purchases are done by the customer by paying full payment Instalment Type – Most of the purchases are done by the user by paying in instalments
4. Payments to minimum payments ratio – Lower value of this ratio implies that user is returning the payments time to time. Lower value means good credit score.

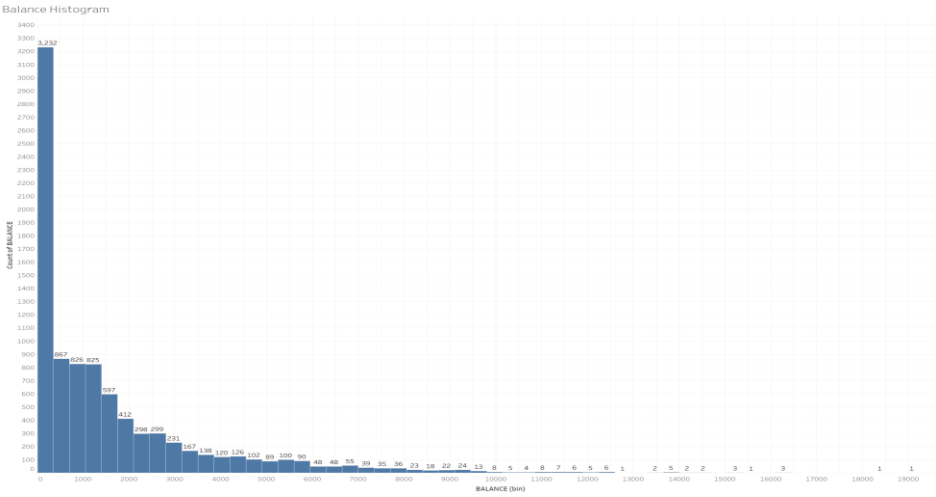
5. Balance to Credit Limit Ratio – Higher value of remaining balance to credit limit ratio implies customers are maintaining their balance properly/ user is not using to full limit.

Data Visualisation and Insights from Data

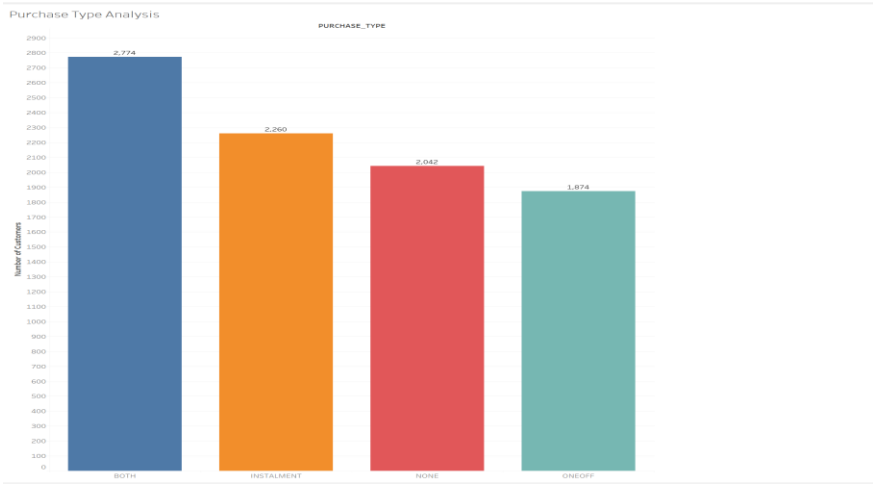
1. Purchase Amount Insights
   Purchase amount of most of the users is very low (87% users are purchasing in the range of 0 – 2k)



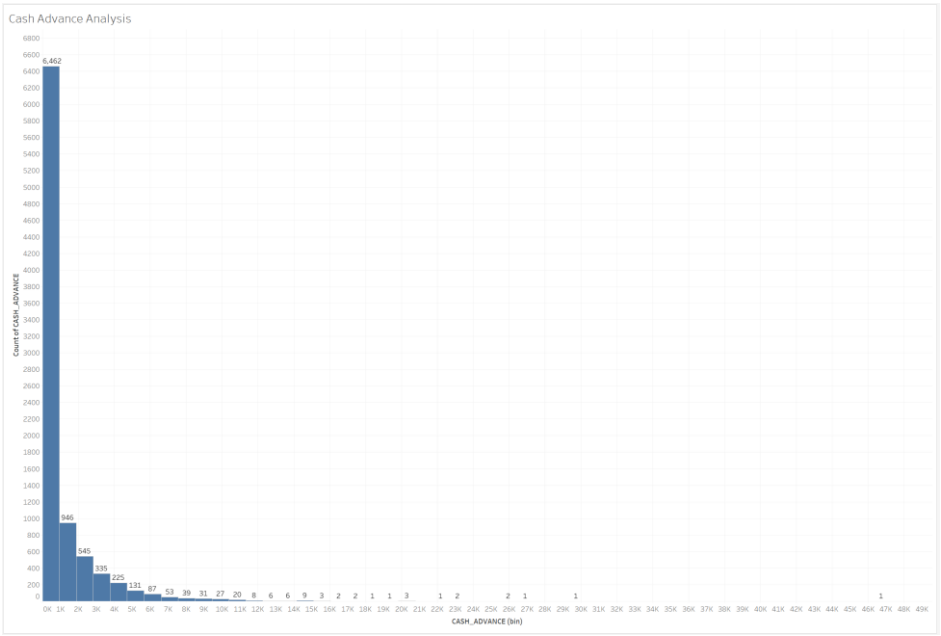
2. Balance Histogram
   Balance of the most of the users is very low



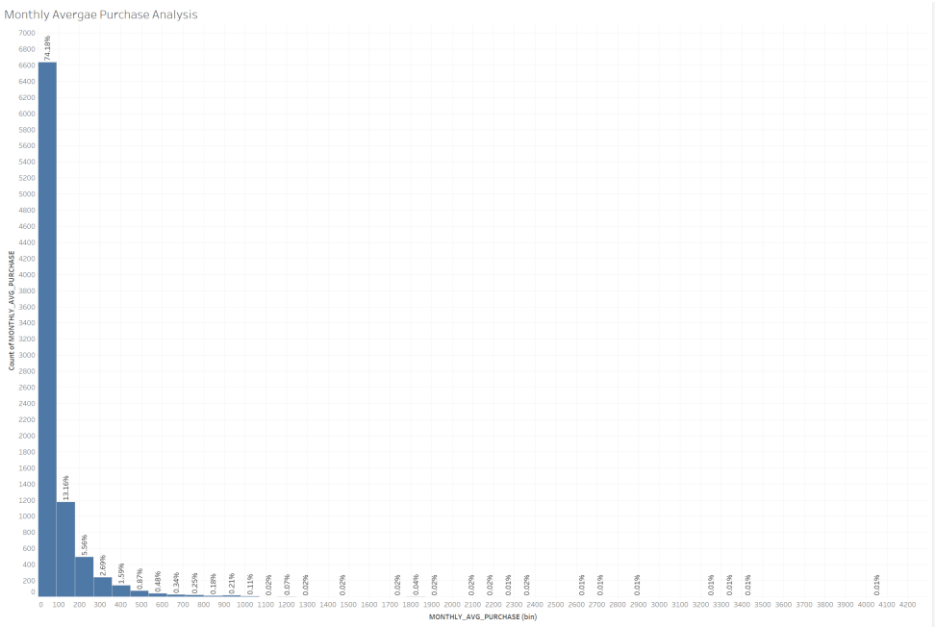
3. Purchase Type Analysis
   There are 2274 customers which use both type of purchasing. There are 2260 customers who purchases products using instalment option and 1874 customers, purchases the product by selecting ONEOFF payment option. Credit card insurer can think of ways for marketing based on this classes.



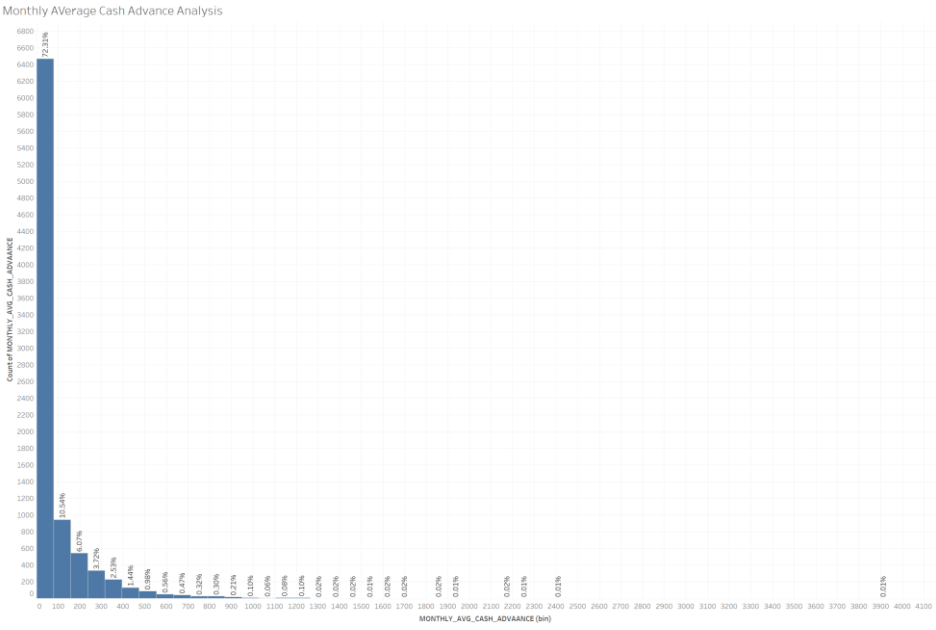
4. Cash Advance Analysis
   72% of customers are not using cash advance or taking very less cash in advance.



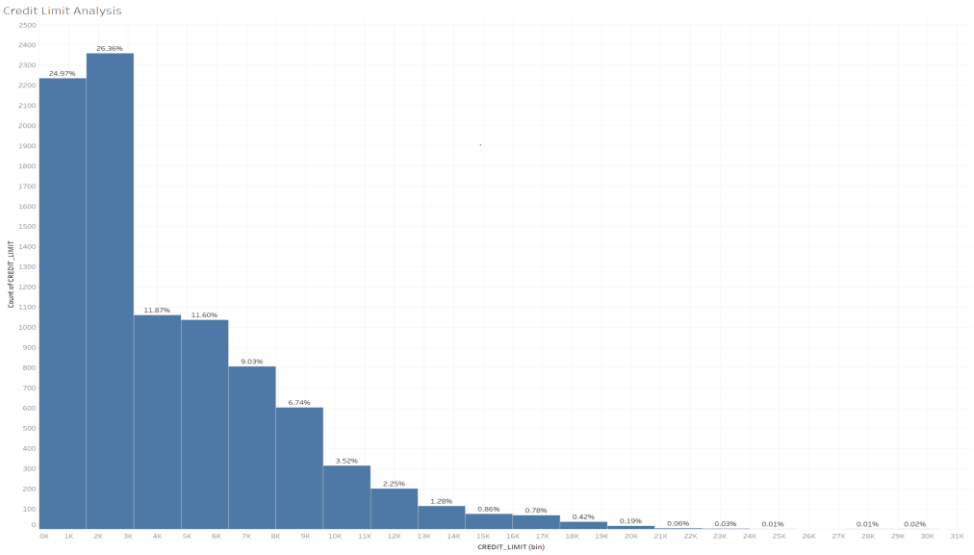
5. Monthly Average Purchase Analysis
   87% customers monthly purchase is in between 0-200. There are very few (4%) customers who spends more than 500 per month.



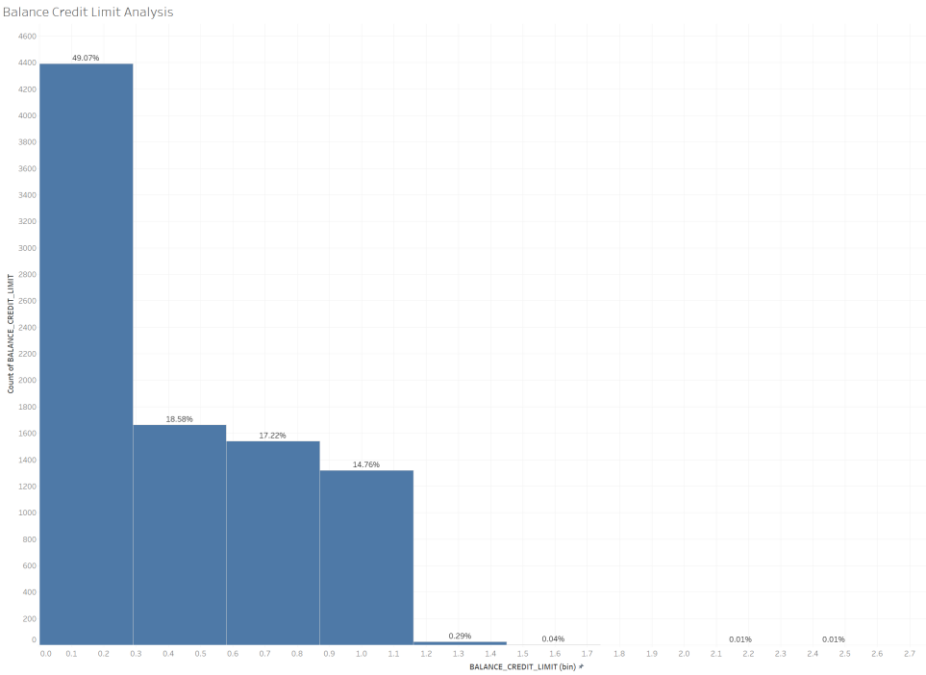
6. Monthly Average Cash Advance Analysis
   82% of the users monthly cash advance value is very less.



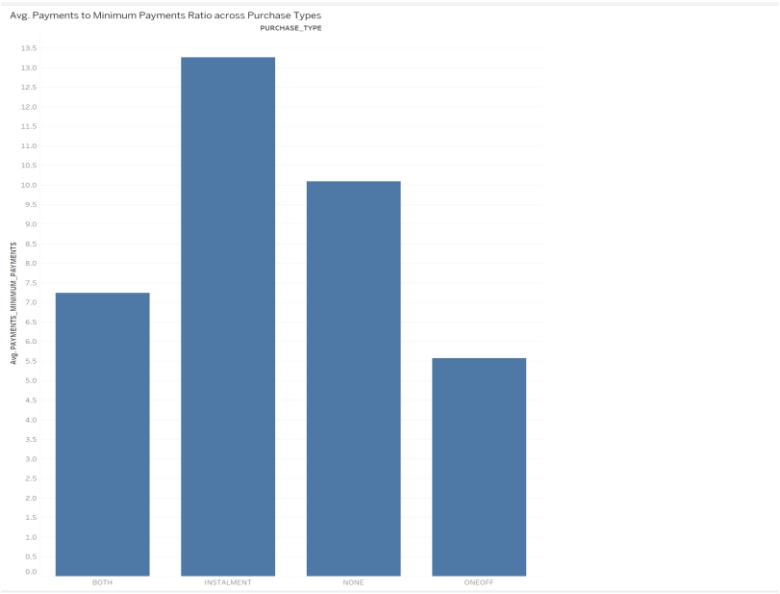
7. Credit Limit Analysis
   50 % of user have credit limit below 3000. 38-40% users have credit limit between 3000-10000. Only 10% of the users have credit limit more than 10,000.



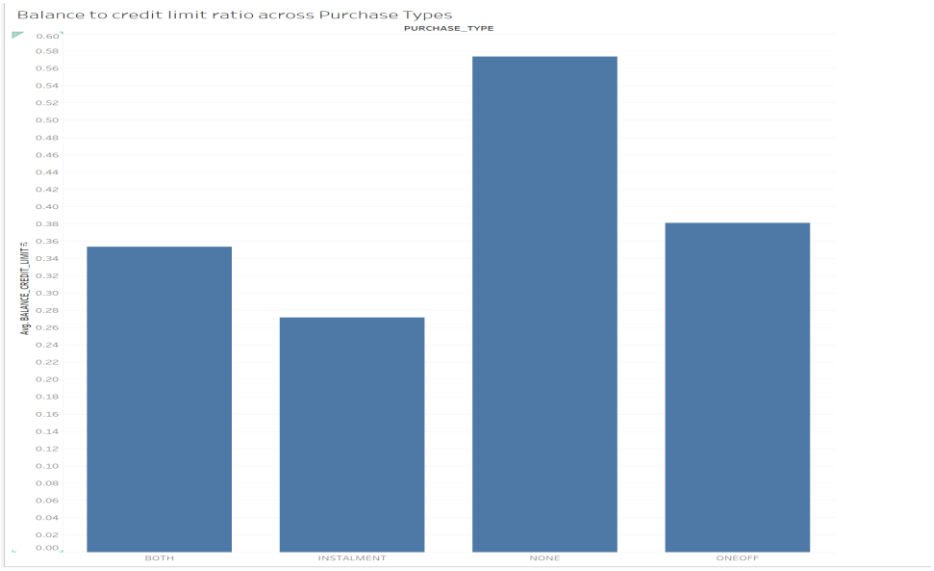
8. Balance to Credit Limit Analysis
   50 % of user have balance to limit ratio lower tan 0.3. It implies that either they are using credit card with full limit or they are paying mostly minimum due payment.



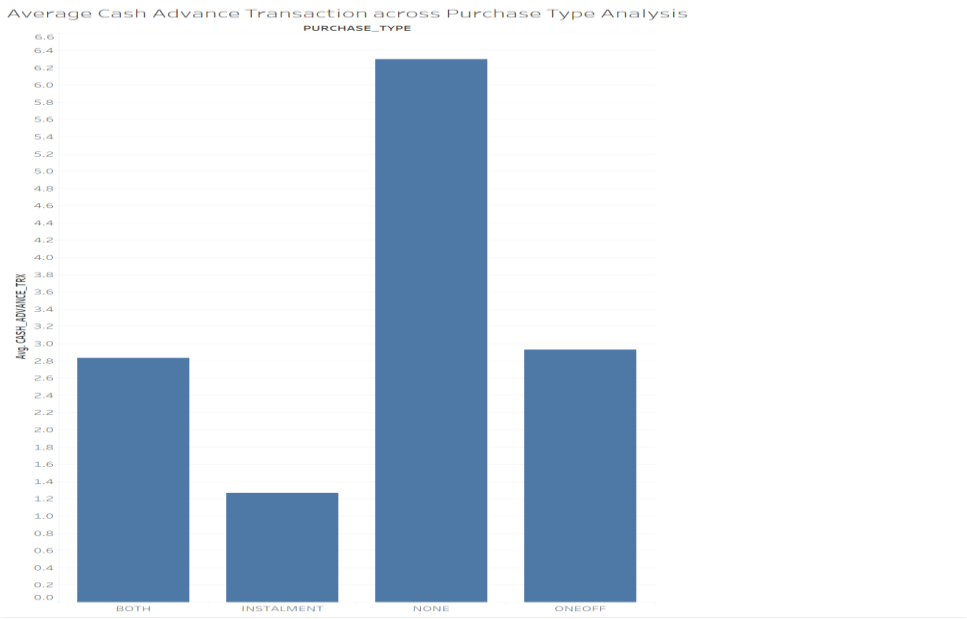
9. Avg. Payments to Minimum Payments Ratio across Purchase Types
   Payments to Minimum payments ratio is clearly higher for Instalment type purchase users as they tend to pay minimum due amount or mostly the payment in number of parts. Ratio is very low for ONEOFF purchase type users.



10. Balance to credit limit ratio across Purchase Types
    Balance to credit limit ratio of users which don't use either instalment or ONEOFF type for purchase is high. So they are not using credit card with full limit.

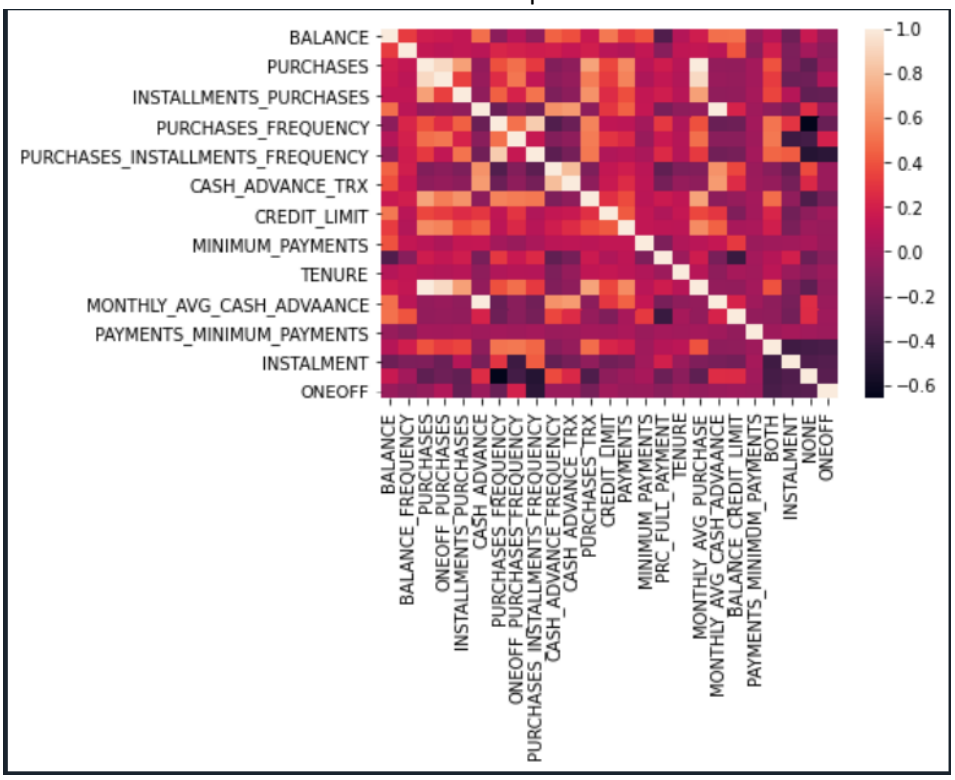


11. Cash advance across Purchase Types
    Cash advance transactions for the users which are neither use Instalment nor ONEOFF type is very high. So this None type user mostly use credit card for cash purpose.



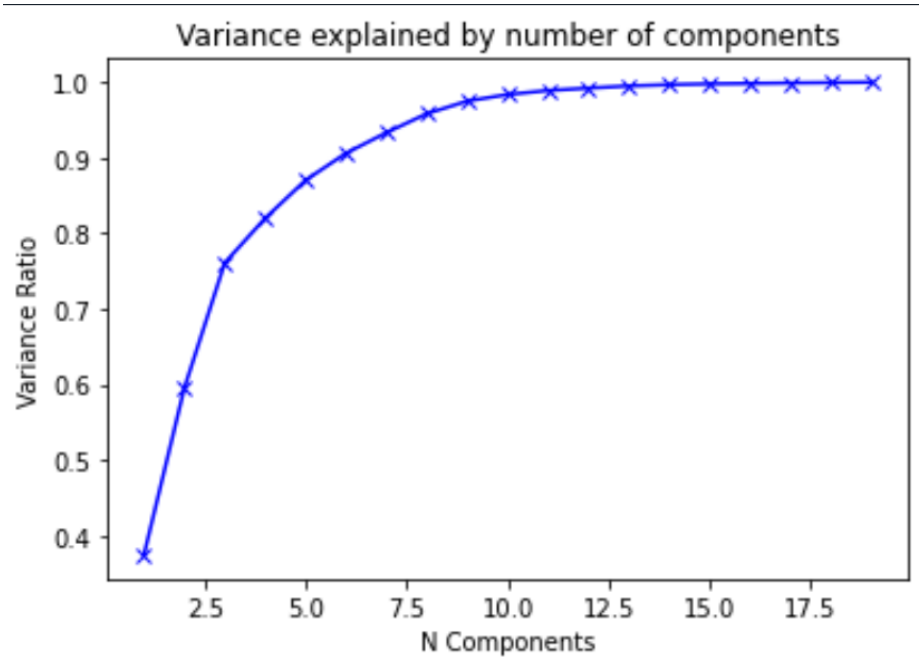
Factor Analysis Using PCA

We have 18 behavioural variables in the dataset. After finding KPI's total variables count is 23. We will check the correlation map of these variables.



From the heat map of correlation it is clear that some of the variables are correlated to each other. So, we will perform the dimensionality reduction using factor analysis technique. Principal component analysis (PCA) is a technique for reducing the dimensionality of such datasets, increasing interpretability but at the same time minimizing information loss. It does so by creating new uncorrelated variables that successively maximize variance.

To decide number of components we will check the total variance explained by the number of components for dataset. From the below plot, we can clearly see with 5 components can explain the more than 85% variance of the data. So selecting 5 components for further analysis.



Variance explained by each component for each variable is given in the below table.

Variable Name	PC_0	PC_1	PC_2	PC_3	PC_4
BALANCE	-0.01162	-0.04288	-0.03552	-0.1313	-0.11734
BALANCE_FREQUENCY	0.06251	-0.0853	-0.06984	-0.23427	-0.61031
PURCHASES	0.025404	-0.0212	0.00292	0.018269	-0.02642
ONEOFF_PURCHASES	0.015522	-0.02441	0.00845	0.019372	-0.02369
INSTALLMENTS_PURCHASES	0.027257	-0.00196	-0.00894	0.004717	-0.01466
CASH_ADVANCE	-0.01376	-0.00813	-0.01562	-0.01709	-0.02474
PURCHASES_FREQUENCY	0.518578	0.040013	0.097841	0.016997	-0.35386
ONEOFF_PURCHASES_FREQUENCY	0.185572	-0.33003	0.169852	0.191974	-0.32536
PURCHASES_INSTALLMENTS_FREQUENCY	0.487224	0.187284	-0.13446	-0.10738	-0.1645
CASH_ADVANCE_FREQUENCY	-0.06005	-0.03745	-0.06422	-0.08289	-0.10605
CASH_ADVANCE_TRX	-0.01599	-0.01234	-0.01937	-0.0274	-0.03227
PURCHASES_TRX	0.056845	-0.02938	-0.00412	0.010904	-0.05696
CREDIT_LIMIT	0.024514	-0.05716	-0.00255	0.013837	-0.06248
PAYMENTS	0.010127	-0.02064	-0.00676	0.020619	-0.02943
MINIMUM_PAYMENTS	-2.7E-05	-0.00029	-0.00343	-0.01892	-0.01376
PRC_FULL_PAYMENT	0.129212	0.084969	0.055587	0.901787	-0.03693
TENURE	0.033167	-0.03008	0.000655	-0.10389	-0.06063
MONTHLY_AVG_PURCHASE	0.025404	-0.0212	0.00292	0.018269	-0.02642
MONTHLY_AVG_CASH_ADVAANCE	-0.01376	-0.00813	-0.01562	-0.01709	-0.02474
BALANCE_CREDIT_LIMIT	-0.00747	-0.00568	-0.00878	-0.03491	-0.02561
PAYMENTS_MINIMUM_PAYMENTS	0.000169	0.000802	-0.00018	0.002107	0.002332
BOTH	0.440742	-0.50808	-0.26379	-0.05503	0.416149
INSTALMENT	0.163992	0.730647	0.071448	-0.07573	0.065084
NONE	-0.4094	-0.03183	-0.55027	0.180037	-0.36872
ONEOFF	-0.19534	-0.19074	0.74261	-0.04928	-0.11251

Customer Segmentation using Clustering

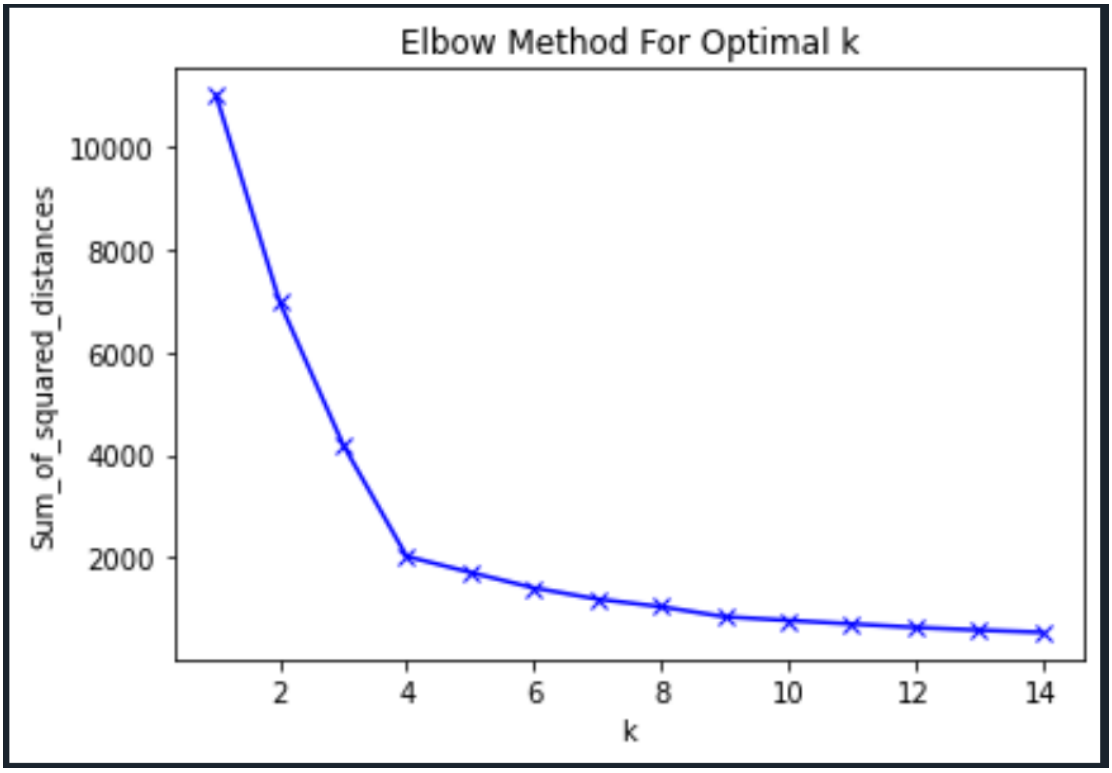
There are many clustering methods available for segmentation. Widely used methods are –

1. K – means clustering
2. Hierarchical clustering

K- means clustering is the most simple method and widely used. We will implement this method.

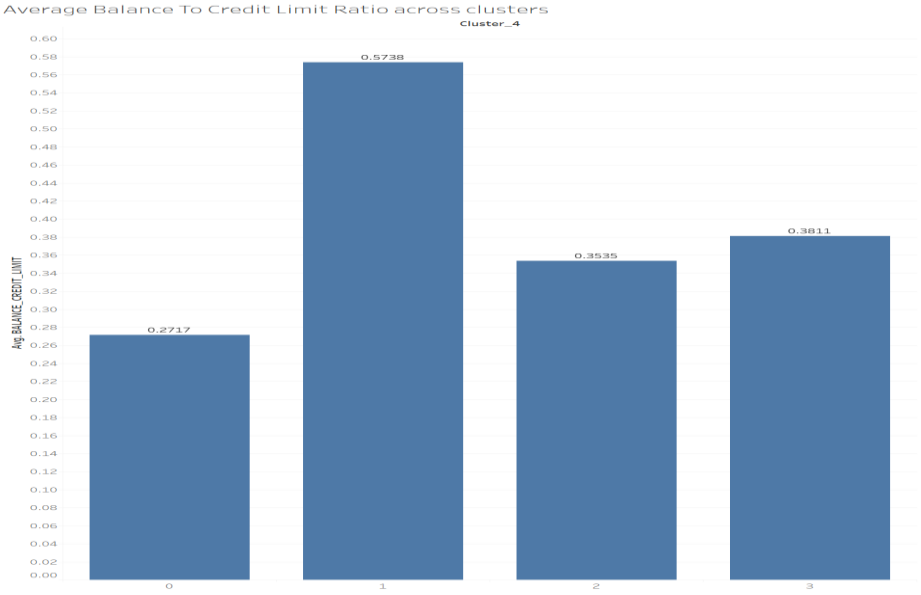
K – means method need to decide the value of k which is the clusters count. To decide that we take help of sum of squared error value.

From the graph, we can see that squared error is dropping significantly till k =4. After k = 6, the drop is not significant. Based on the analysis from Python code. We will decide k = 4

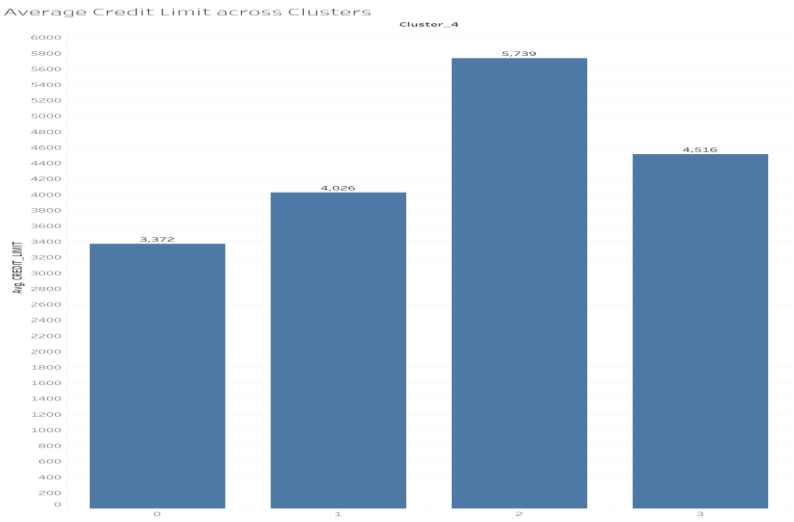


Analysis Based On 4 Clusters

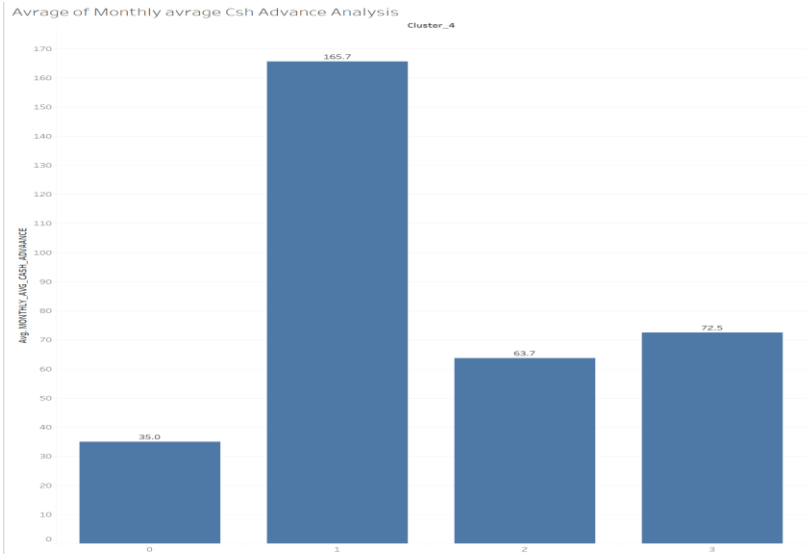
1. Average Balance to Credit Limit across clusters
   For cluster 1 users, Average Balance to credit limit is significantly high than the other clusters.
   For cluster 0 users, Average Balance to credit limit is very low i.e. 0.27



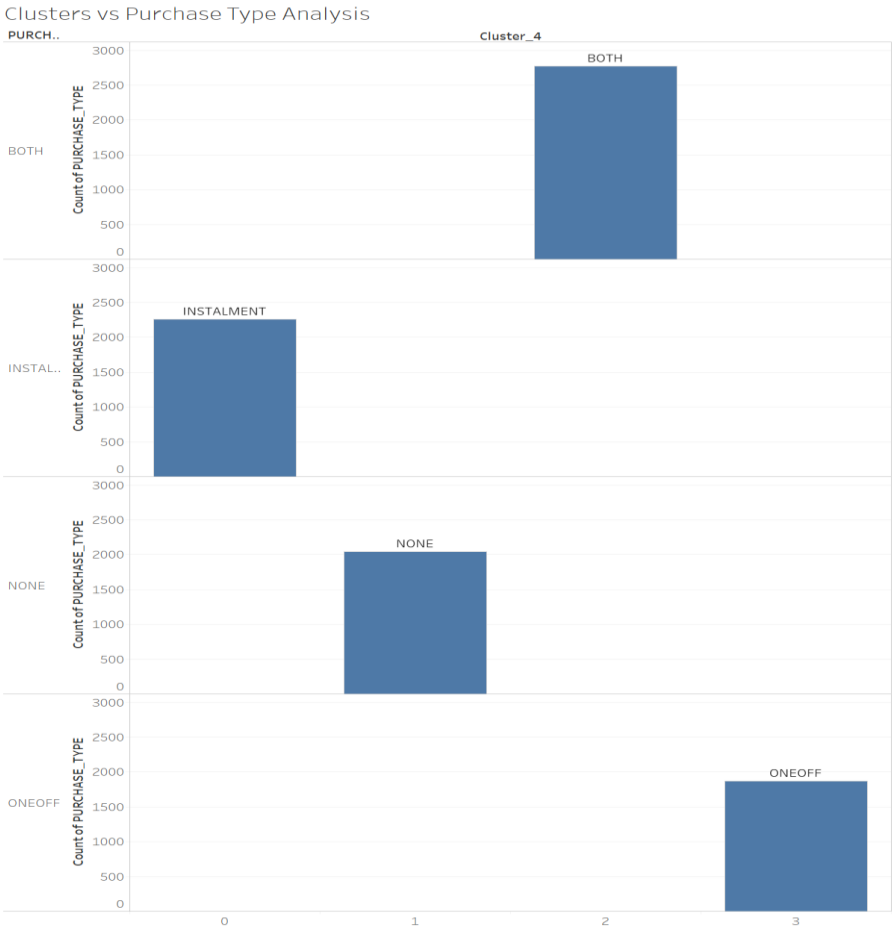
2. Average Credit Limit analysis
   Credit limit of cluster 2 users is significantly high. Cluster 0 users average credit limit is significantly low.



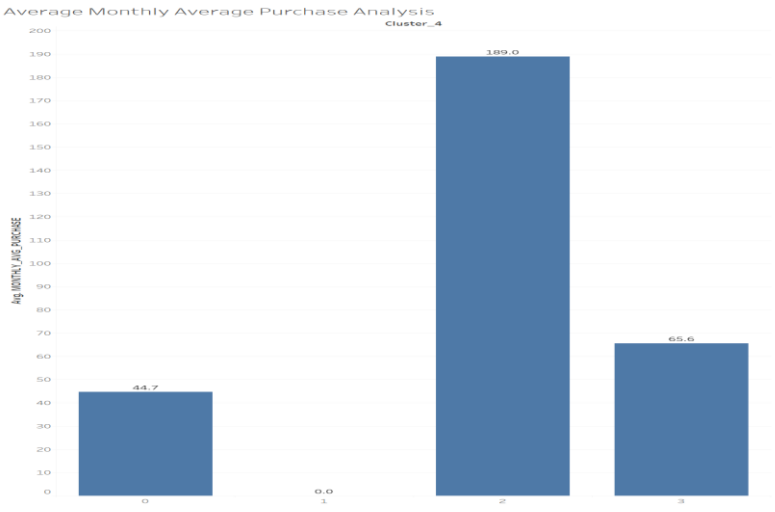
3. Monthly Cash Advance Analysis
   Monthly cash advance for cluster 1 users is very high.



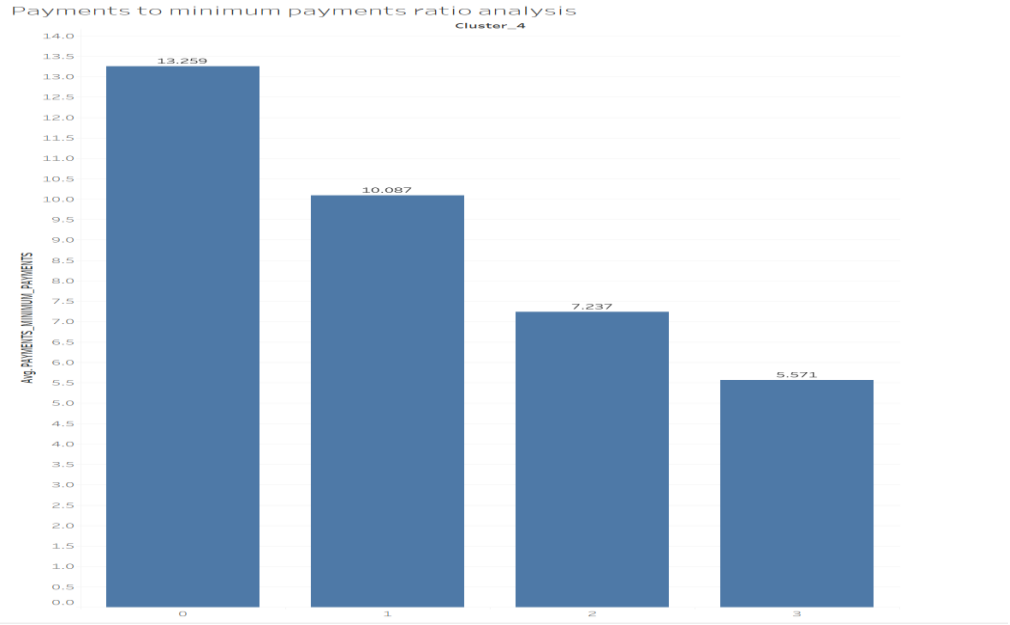
4. Clusters vs Purchase Type Analysis
   From the plot, it is evident that –
   - Cluster 2 – BOTH Tyepe Purchase Type
   - Cluster 0 – INSTALMENT
   - Cluster 1 – NONE Type Purchase Type
   - Cluster 3 – ONEOFF Purchase Type



5. Monthly Average Purchase Analysis
   From the plot, it is clear that cluster 2 users mostly do higher amount purchases. Whereas cluster 1 users do not purchase anything using credit card.



6. Payments to minimum payments ratio analysis
   Cluster 0 users have high ratio for payments to minimum payments. This implies that mostly they are paying in instalments and only the minimum due amount.



7. Cluster Based Analysis and Insights

- For Cluster 0 –

1. Purchase Type – Instalment (Purchases done by Instalment method only)
2. Balance to Credit Limit Ratio – Low (User utilising most of the credit limit so balance is low)
3. Credit Limit – Low
4. Cash Advance – Low (User usually do not use credit card for cash purposes)
5. Monthly Average Purchase – Low (User do not use it for higher amount purchases. This is also true because of lower credit limit)
6. Payments to Minimum payments Ratio – High (User pays the bills in instalment and mostly pays the minimum due amount instead of full bill amount)

From the above observations we can say user of cluster 0 is having low credit score and high risk.

- For Cluster 1 -

1. Purchase Type – None (Purchases done neither by Instalment nor by ONEOFF method)
2. Balance to Credit Limit Ratio – High (User is not utilising most of the credit limit)
3. Credit Limit – Average
4. Cash Advance – High (User is using credit card mostly to get cash in advance)
5. Monthly Average Purchase – Very Low (User do not use Credit Card for purchases)
6. Payments to Minimum payments Ratio – Average (User pays the bill payment regularly)

From the above observations we can say user of cluster 1 is using credit card only for cash purposes and paying the amount in time.

- For Cluster 2 -

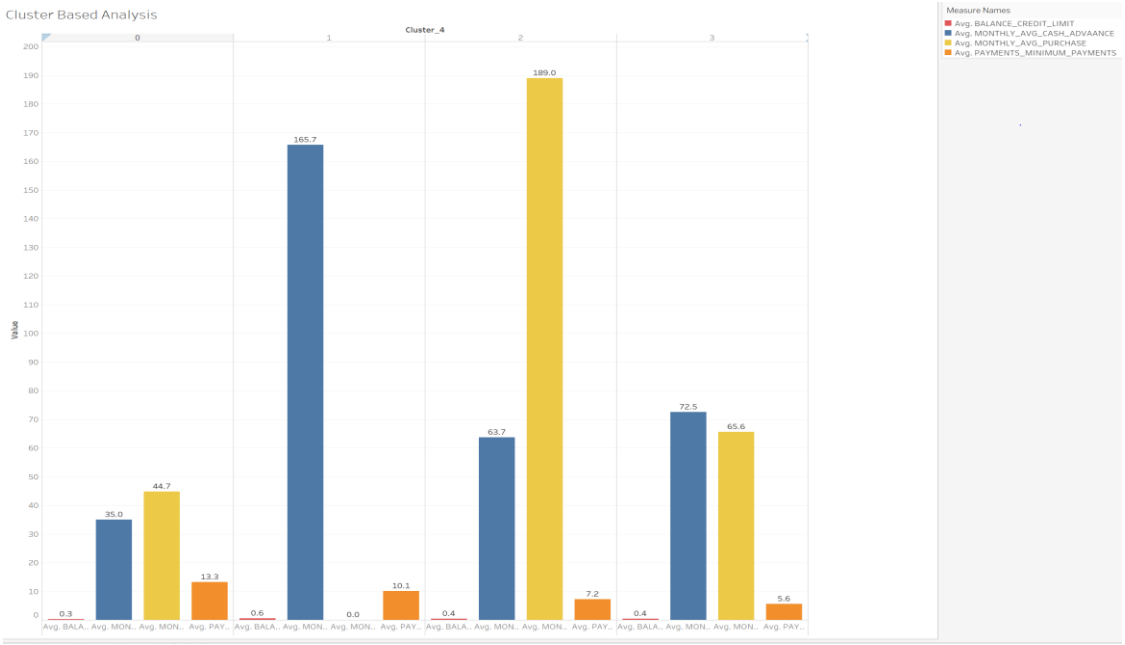
1. Purchase Type –Both (Purchases done by Instalment as well as ONEOFF method)
2. Balance to Credit Limit Ratio – Average (User is using credit card at moderate level)
3. Credit Limit – High
4. Cash Advance – Low (User usually do not use credit card to get cash in advance.)
5. Monthly Average Purchase – High (User purchasing frequently using Credit Card)
6. Payments to Minimum payments Ratio – Average (User pays the bill payment regularly)

From the above observations we can say user of cluster 2 is using credit card regularly for purchasing, paying the amount in time and having a good credit score.

- For Cluster 3 -

1. Purchase Type –ONEOFF (Purchases done by ONEOFF method only)
2. Balance to Credit Limit Ratio – Average (User is using credit card at moderate level)
3. Credit Limit – Average
4. Cash Advance – Low (User usually do not use credit card to get cash in advance.)
5. Monthly Average Purchase – Average (User purchasing frequently using Credit Card)
6. Payments to Minimum payments Ratio – Very Low (User pays the bill payment regularly)

From the above observations we can say user of cluster 3 is using credit card to purchase things in single payment only. Payments to minimum payments ratios is also very low having a good credit score.



Marketing Strategy

For Cluster 1 –

Users are using Credit card only for Cash purposes. So we can reduce the rate of interest on instalment option for this users. Promote this users to use other type of payment options.

For Cluster 2 –

Users are already most of the features of credit card facility. Also they have a good credit score. We can increase the credit limit to increase their use of credit cards.

For Cluster 3 –

Users are only using credit card for ONEOFF payment. We should lower rates of interest for instalment type of payment. Promoting them to use instalment type of payment also.

For Cluster 0 –

Users are only using credit card for Instalment purpose. Also they are returning the payments mostly minimum due amounts, low credit limit. So we need to check user profile before giving any type of advantages like increasing credit limit, etc.