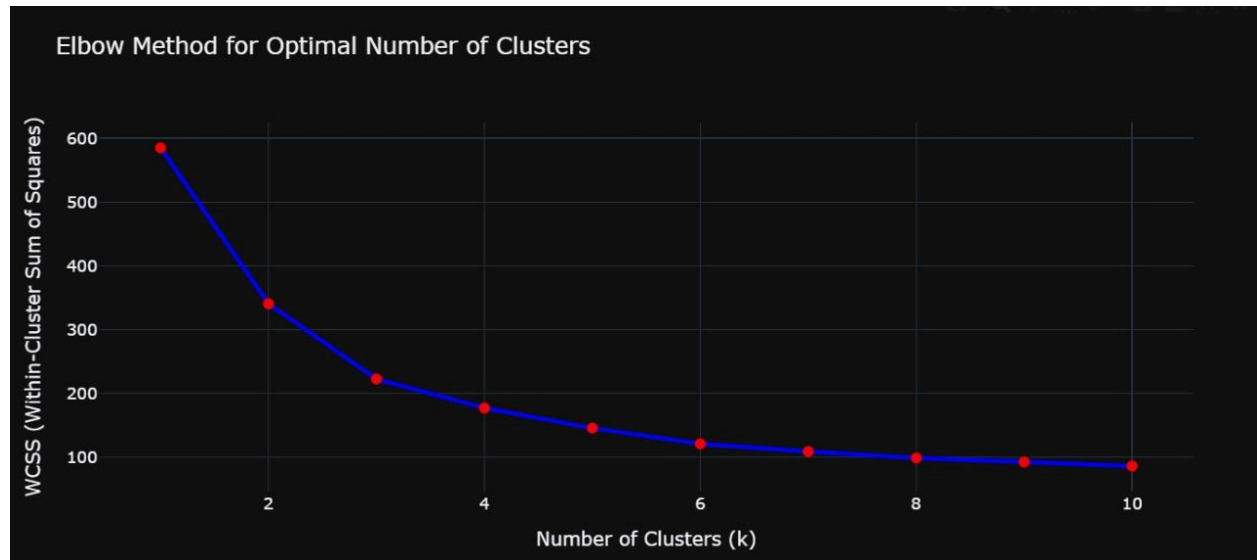


# Customer Segmentation / Clustering Report

## Number of Clusters Formed

The optimal number of clusters determined for this analysis is 3. This was chosen based on multiple evaluation methods including the Elbow Method, Silhouette Score, Gap Statistic, and Calinski-Harabasz Index.



## DB Index Value

The Davies-Bouldin (DB) Index for the chosen clustering model is 0.8819. A lower DB Index indicates better cluster separation and tightness, so this value suggests reasonably good clustering quality.

## Other Relevant Clustering Metrics

1. Silhouette Score: The highest silhouette score was 0.3827 for 3 clusters, indicating moderate cluster cohesion and separation.
2. Calinski-Harabasz Index: The highest score was 156.42 for 3 clusters, supporting the choice of 3 as the optimal number of clusters.
3. Gap Statistic: While the gap statistic suggested 6 clusters, we prioritized the consensus of other metrics in choosing 3 clusters.

## Cluster Characteristics

Based on the PCA loadings:

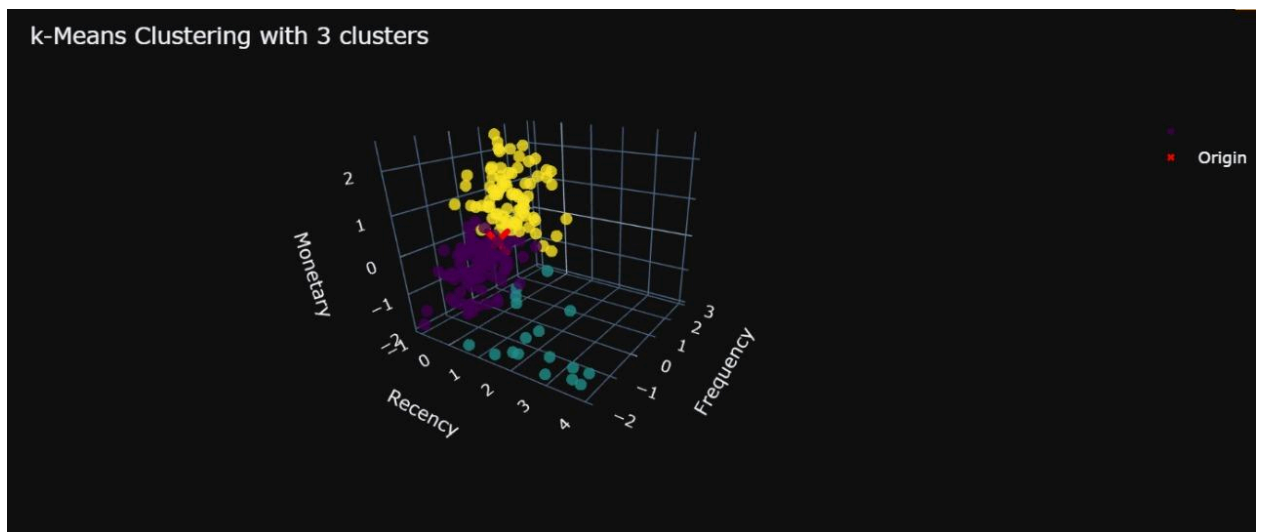
- PC1 is strongly influenced by higher Frequency (0.643) and Monetary (0.617) values, and lower Recency (-0.454).
- PC2 is primarily driven by higher Recency (0.882), with some influence from Monetary (0.411).

## Cluster Interpretations

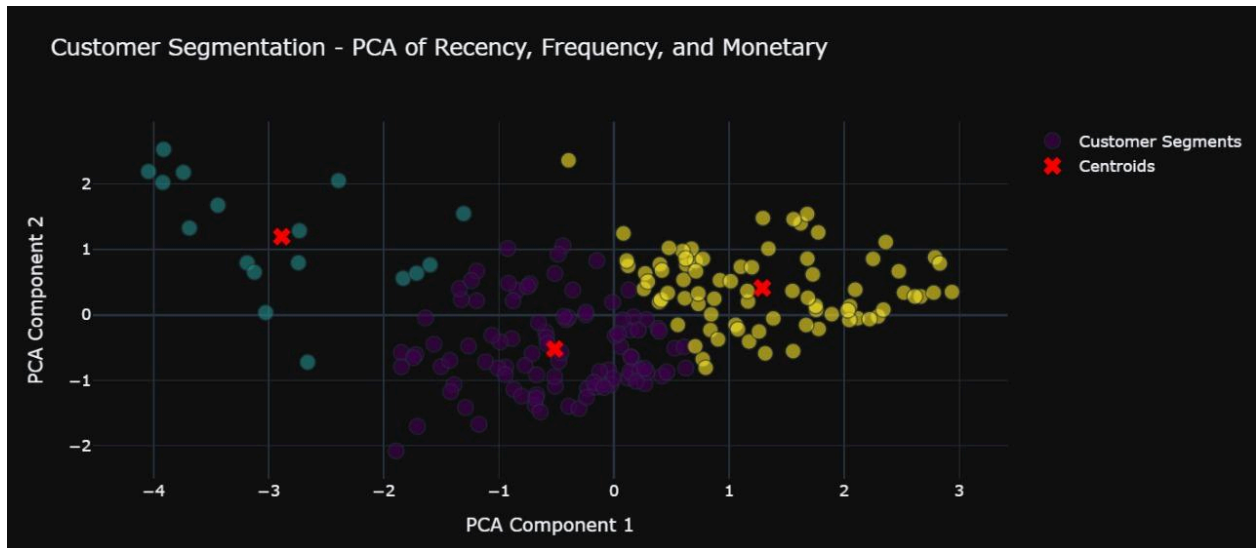
1. Cluster 0 (Blue): Low-value customers with infrequent, low-value purchases and high recency.
2. Cluster 1 (Green): High-value customers with frequent, high-value purchases and low recency.
3. Cluster 2 (Yellow): Mid-value customers with moderate frequency, value, and recency.

## Visual Representations

1. 3D Scatter Plot: Shows clear separation of clusters in the RFM space, with some overlap between mid-value and high-value customers.



- 2D PCA Plot: Demonstrates how the clusters are distributed along the principal components, providing a simplified view of customer segmentation.



## Business Implications

1. Targeted Marketing: Tailor strategies for each cluster (e.g., reactivation for Cluster 0, loyalty programs for Cluster 1).
2. Resource Allocation: Focus more resources on retaining and upselling to Cluster 1 customers.
3. Customer Journey: Develop strategies to move customers from Cluster 0 to Cluster 2, and from Cluster 2 to Cluster 1.
4. Product Development: Analyze product preferences within each cluster to inform future offerings.

This clustering analysis provides valuable insights into customer behavior and segmentation, enabling more effective, personalized business strategies.