Data Understanding

We examined six economic indicators related to inflation: CPI inflation, GDP per capita, GDP growth, unemployment, real interest rate, and public debt.The histograms show large variation across countries, especially inflation, GDP per capita, and public debt, which makes clustering a good method because countries behave very differently economically.

The correlation heatmap showed mostly weak relationships among the variables, meaning no single factor explains inflation alone. This supports using clustering to capture multi-factor economic patterns.

Choosing the Number of Clusters
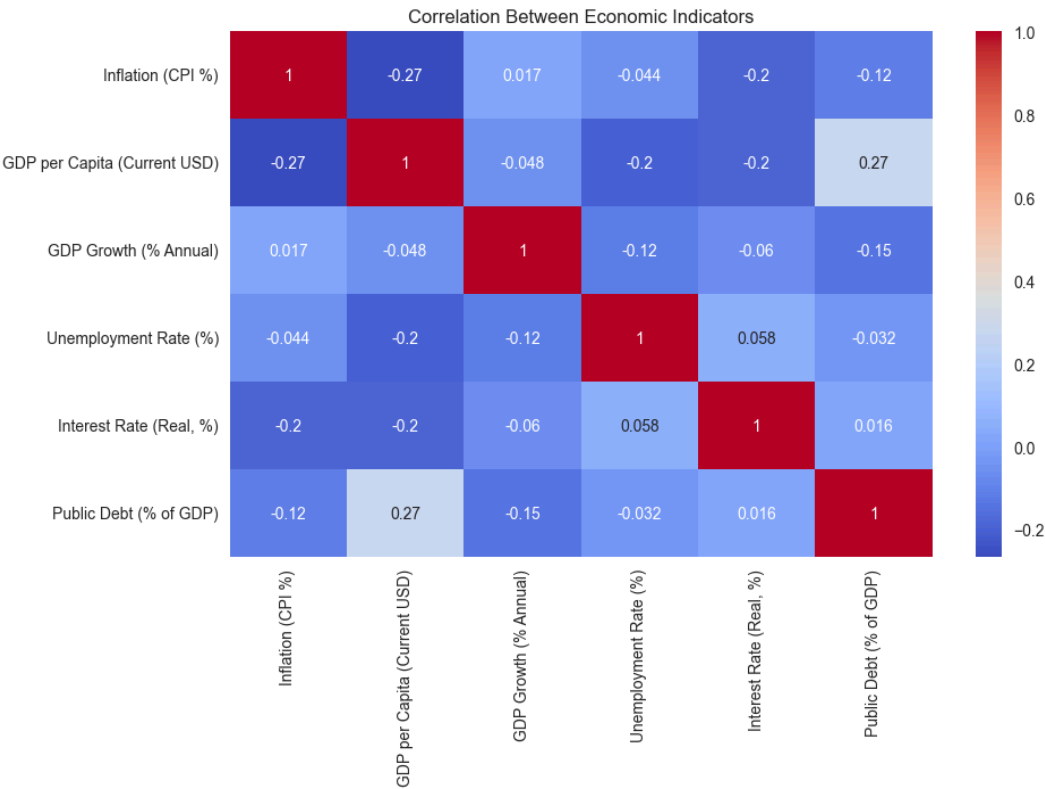
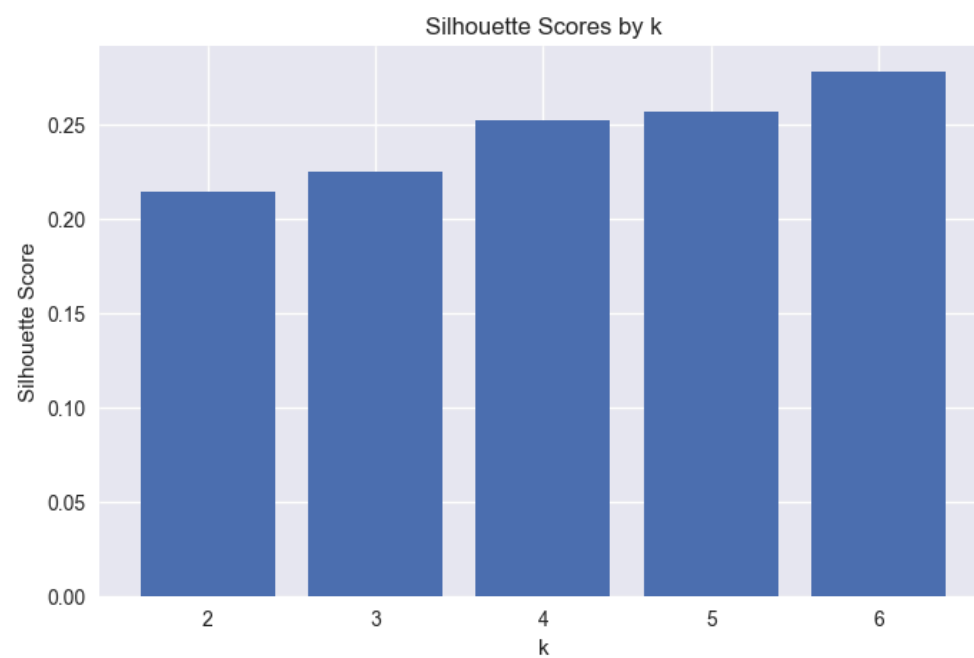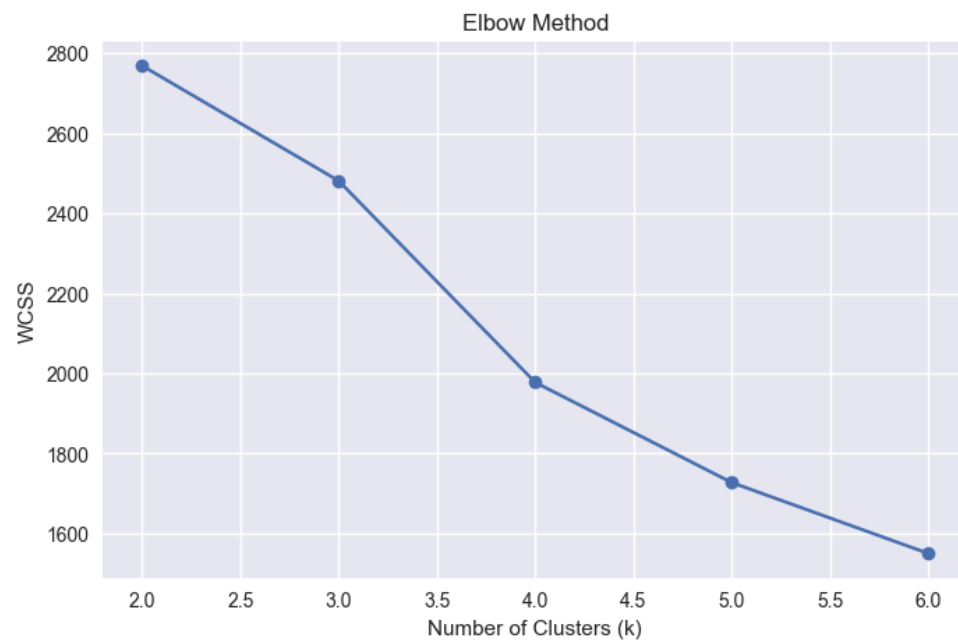We used two model selection methods:

Elbow Method

The curve showed a clear bend at **k = 3**, meaning the within-cluster variation drops significantly up to 3 clusters and then levels off.
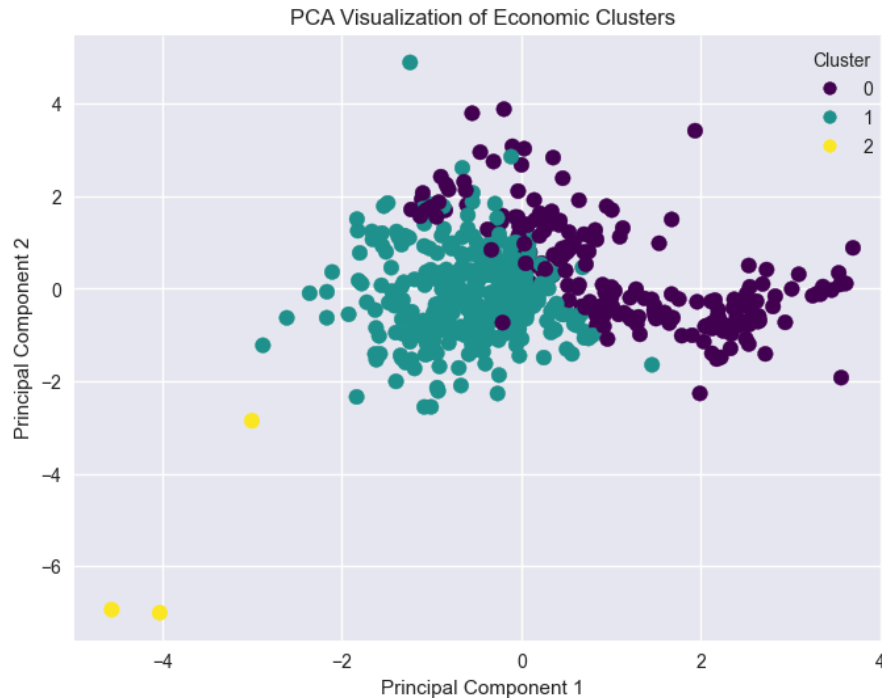
Silhouette Score

Silhouette values were stable and strong from k = 3 to k = 5, with **k = 3** offering both good separation and the easiest interpretation.

Together, these results supported using **3 clusters** as the optimal number.

Correlation Between Economic Indicators

Elbow Method

Silhouette Scores by k

PCA Visualization of Economic Clusters

Final Clusters (PCA Visualization)

The PCA plot displayed a clear separation between the three clusters, showing that the economic indicators naturally group countries into distinct categories:

Cluster 0 – High-Income, Low-Inflation Economies

- High GDP per capita
- Low inflation
- Stable unemployment and positive growth
  These represent developed, economically strong nations.

Cluster 1 – Middle-Income, Moderate Economies

- Moderate inflation
- Reasonable GDP per capita
- Balanced unemployment and growth
  This group reflects countries with generally stable but not exceptional performance.

Cluster 2 – High-Inflation, Economically Stressed Countries

- Extremely high inflation
- Low or negative GDP growth
- Lower GDP per capital. These countries face serious economic challenges and are more vulnerable to inflation shocks.

This separation confirms that inflation is strongly tied to the broader economic environment of each country.

Overall the clustering reveals that countries fall into three economic categories: strong, moderate, and vulnerable economies.This helps us understand why inflation impacts countries differently and highlights which nations are more likely to experience inflation-related instability.