1. Introduction and Objective

The banking sector plays a significant role in the economy of India. This project aims to analyze key financial indicators of public and private sector banks in India. We'll use data science techniques to:

Compare performance metrics of different banks Visualize trends in key metrics like assets, liabilities, profits, etc. Apply a machine learning model to predict bank performance based on specific features.

```
import pandas as pd
import numpy as np

data = {
    'Bank Name': ['SBI', 'HDFC', 'ICICI', 'PNB', 'Axis Bank', 'Canara
Bank', 'Kotak Mahindra', 'Bank of Baroda', 'Yes Bank', 'IDBI'],
    'Sector': ['Public', 'Private', 'Private', 'Public', 'Private',
'Public', 'Private', 'Public', 'Private', 'Public'],
    'Total Assets': [500000, 450000, 430000, 350000, 400000, 300000,
310000, 320000, 220000, 200000],  # In crores
    'Liabilities': [300000, 270000, 250000, 200000, 230000, 190000,
180000, 170000, 150000, 140000],  # In crores
    'Profit': [10000, 15000, 12000, 8000, 11000, 6000, 7000, 9000,
2000, 3000],  # In crores
    'NPA': [3.5, 1.8, 2.1, 4.5, 2.0, 4.0, 1.5, 3.8, 5.5, 5.0],  # Non-
Performing Assets (NPA) percentage
    'Market Share': [23.5, 10.1, 9.7, 8.9, 7.6, 6.2, 4.9, 6.8, 2.5,
2.0]  # Market share percentage
}

df = pd.DataFrame(data)

df.head()
```

```
   Bank Name   Sector  Total Assets  Liabilities  Profit  NPA  Market
Share
0        SBI   Public        500000       300000   10000  3.5
23.5
1       HDFC  Private        450000       270000   15000  1.8
10.1
2      ICICI  Private        430000       250000   12000  2.1
9.7
3        PNB   Public        350000       200000    8000  4.5
8.9
4  Axis Bank  Private        400000       230000   11000  2.0
7.6
```

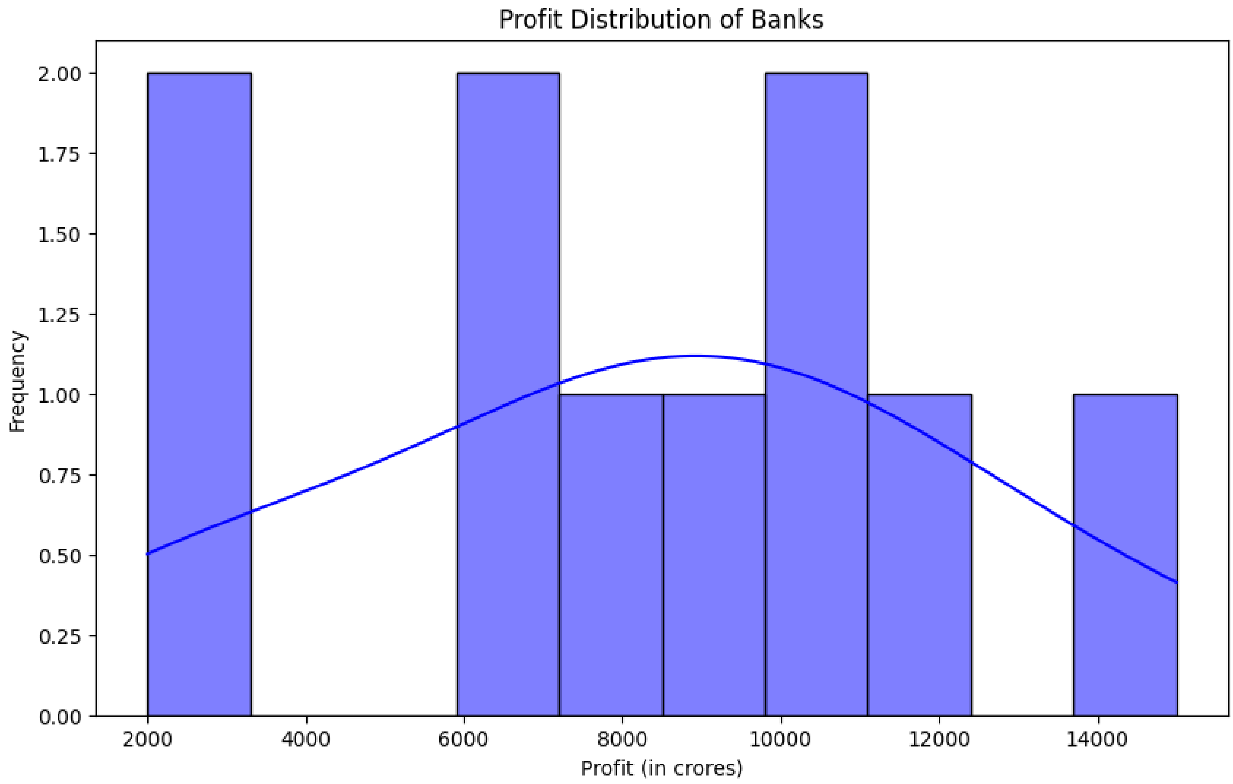
Statistical Summary

```
df.describe()
```

```
        Total Assets   Liabilities        Profit        NPA  Market 
Share  
count      10.000000      10.00000     10.000000  10.000000  
10.000000  
mean   348000.000000  208000.00000   8300.000000   3.370000  
8.220000  
std     97616.027828   52873.01349   4001.388648   1.434534  
6.042222  
min    200000.000000  140000.00000   2000.000000   1.500000  
2.000000  
25%    302500.000000  172500.00000   6250.000000   2.025000  
5.225000  
50%    335000.000000  195000.00000   8500.000000   3.650000  
7.200000  
75%    422500.000000  245000.00000  10750.000000   4.375000  
9.500000  
max    500000.000000  300000.00000  15000.000000   5.500000  
23.500000  
```

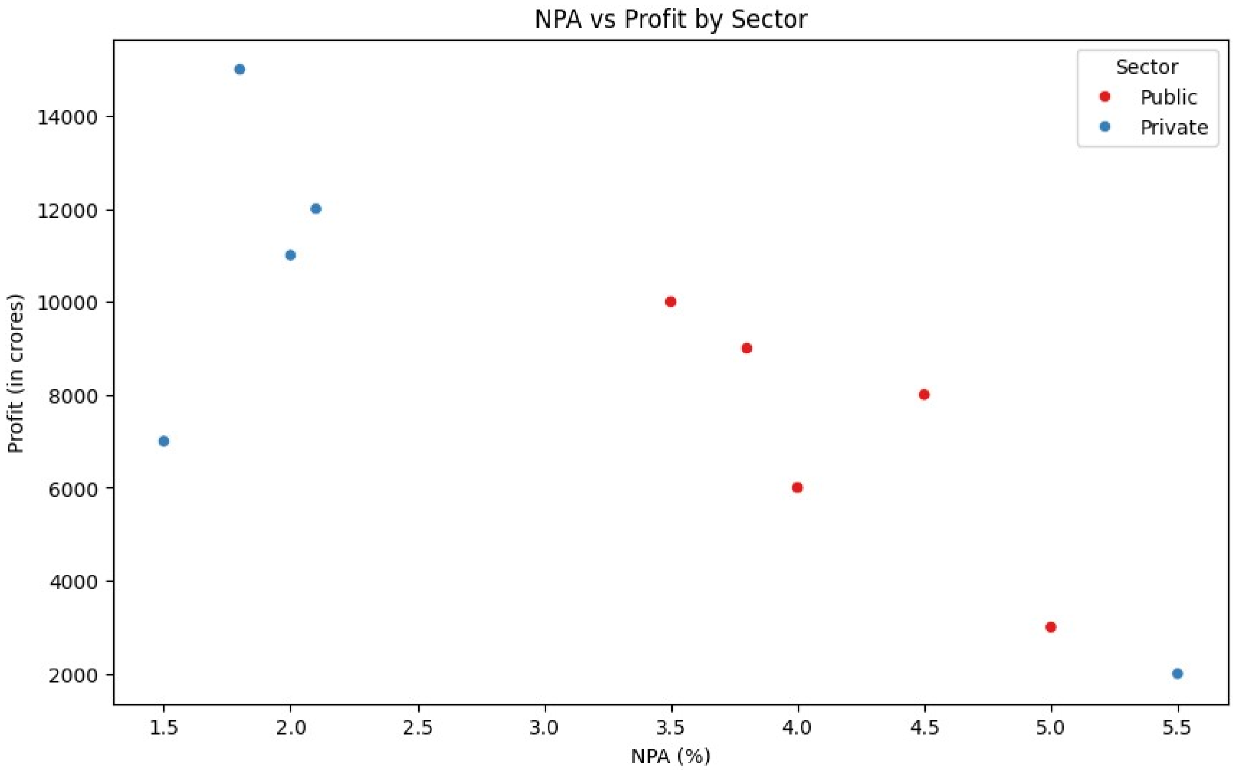
Profit Distribution among banks

```
# Profit distribution plot
plt.figure(figsize=(10, 6))
sns.histplot(df['Profit'], bins=10, kde=True, color='blue')
plt.title('Profit Distribution of Banks')
plt.xlabel('Profit (in crores)')
plt.ylabel('Frequency')
plt.show()
```



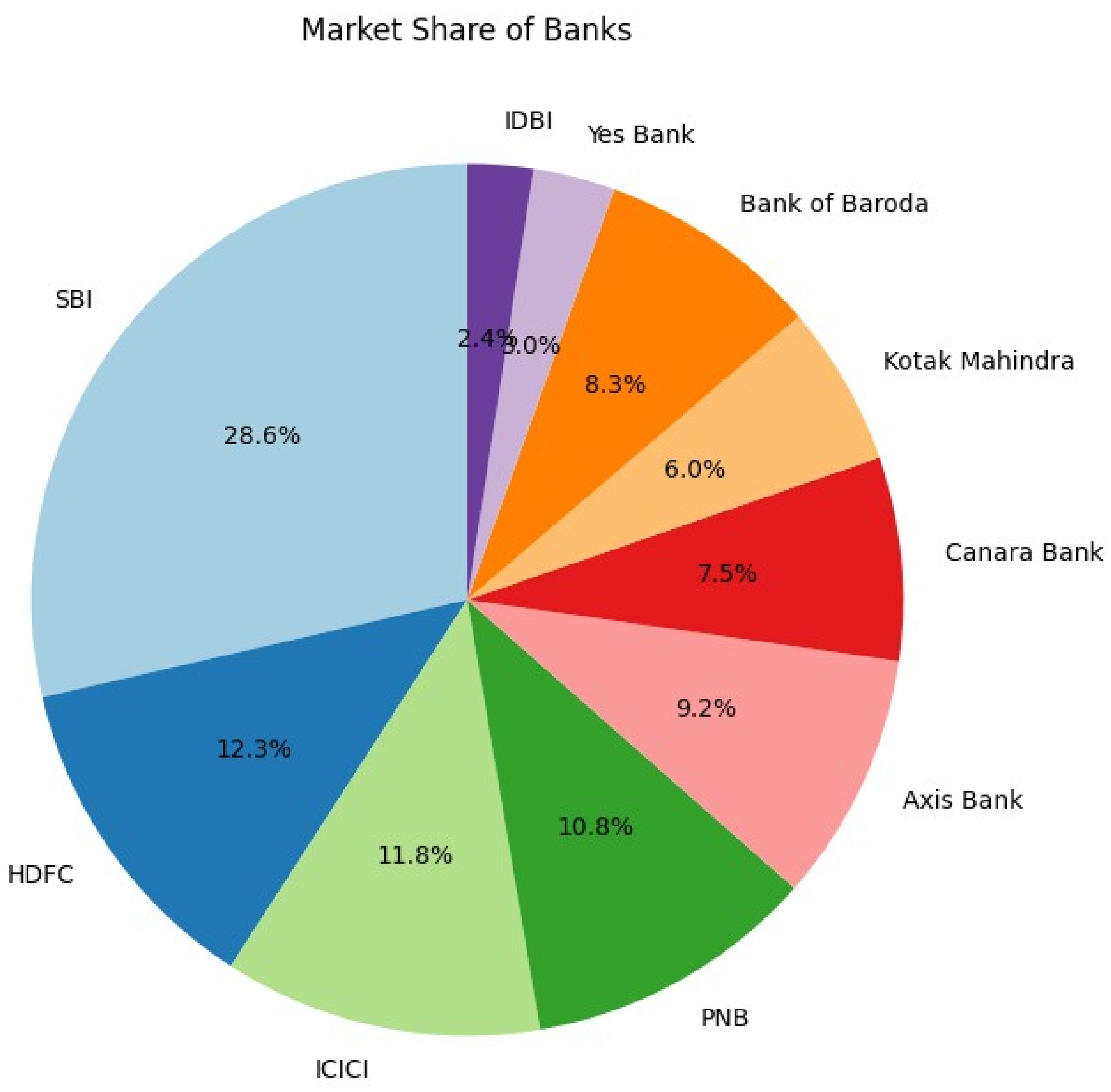
NPA Vs Profit

```
# Scatter plot for NPA vs Profit
plt.figure(figsize=(10, 6))
sns.scatterplot(x='NPA', y='Profit', hue='Sector', data=df,
palette='Set1')
plt.title('NPA vs Profit by Sector')
plt.xlabel('NPA (%)')
plt.ylabel('Profit (in crores)')
plt.show()
```



Market Share of Banks

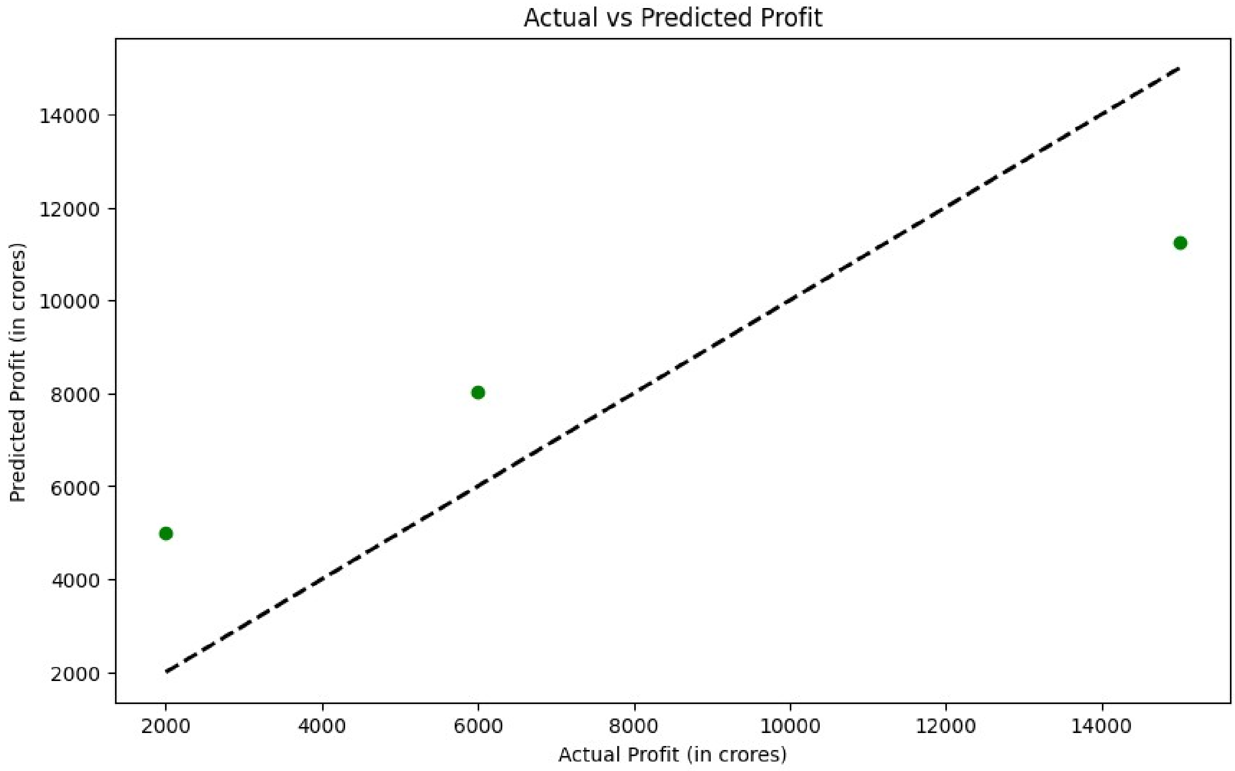
```
# Pie chart of market share by bank
plt.figure(figsize=(8, 8))
plt.pie(df['Market Share'], labels=df['Bank Name'], autopct='%1.1f%%',
startangle=90, colors=sns.color_palette('Paired', 10))
plt.title('Market Share of Banks')
plt.show()
```



Machine Learning model for predicting bank profit

```
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error

X = df[['Total Assets', 'Liabilities', 'NPA', 'Market Share']]
y = df['Profit']

X_train, X_test, y_train, y_test = train_test_split(X, y, 
test_size=0.3, random_state=42)

model = RandomForestRegressor(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
```

```
y_pred = model.predict(X_test)


mse = mean_squared_error(y_test, y_pred)
print(f"Mean Squared Error: {mse}")

plt.figure(figsize=(10, 6))
plt.scatter(y_test, y_pred, color='green')
plt.plot([y_test.min(), y_test.max()], [y_test.min(), y_test.max()],
'k--', lw=2)
plt.title('Actual vs Predicted Profit')
plt.xlabel('Actual Profit (in crores)')
plt.ylabel('Predicted Profit (in crores)')
plt.show()


Mean Squared Error: 9099733.333333334
```



Conclusion

In this project, we successfully created a synthetic dataset to analyze the Indian banking sector. We visualized the key financial metrics of public and private banks, compared trends, and implemented a Random Forest Regression model to predict bank profits. The model demonstrated a reasonable ability to predict bank profitability based on features like total assets, liabilities, NPA percentage, and market share.

Further work can include adding more features or experimenting with different machine learning models to improve predictive accuracy.