



StackwisR

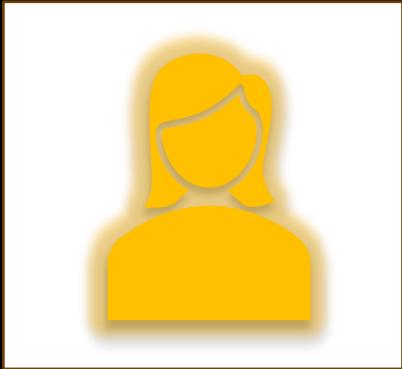


WELCOME TO THE PREDICTIVE ANALYTICS FOR
BANK STOCK PRICES

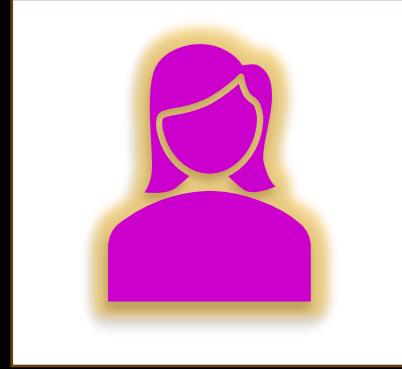


TEAM MEMBERS

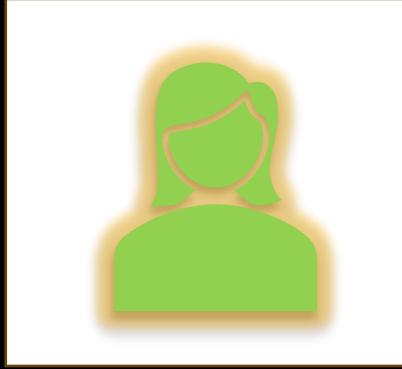
Team Members



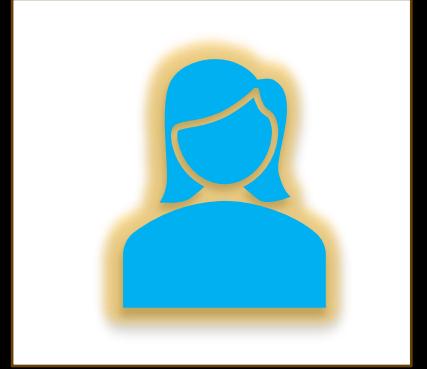
Mowa
Business Analyst
Team Leader



Victoria
Business Analyst
Asst. Leader



Linda
Data Scientist



Shweta
Data Analyst

Team Roles:

Business Analyst (BA): Requirements gathering, creating user stories, defining KPIs, understanding business needs, documentation, and defining objectives.

Data Analyst (DA): Collected, cleaned, and prepared the dataset for analysis. Conducted exploratory data analysis (EDA) to uncover key trends and insights. Generated insights from data and provided investment guidelines and recommendations. Also contributed to the creation of the presentation slides

Data Scientist (DS): Developed and refined predictive models, focusing on feature engineering and evaluation. Collaborated with the data analyst to enhance model accuracy and created a Streamlit app to visualise outputs.

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Business Overview



MSEG is a fintech startup focused on providing tailored investment solutions for retail investors.



The company has historically relied on traditional methods for stock price forecasting and financial analysis.



To enhance its capabilities, MSEG has partnered with StackwisR to develop advanced predictive models for more accurate investment forecasting.



MSEG is committed to leveraging technology to offer data-driven insights as it scales its operations and financial services.

AIMS



Enhance Long-Term Investment Strategies: Use predictive analytics to inform long-term investment decisions, maximizing returns and reducing risk over time.



Accurate Stock Price Forecasting: Develop a robust model to predict bank stock prices with accuracy, aiding in proactive and data-driven investment choices.



Financial Health Assessment: Incorporate key financial ratios into the predictive model to provide a deeper insight into bank stability and performance.



Maximize Stakeholder Value: Increase stakeholder value by optimizing investment strategies that support consistent financial growth.

OBJECTIVES



Data Collection & Transformation

Gather and structure stock data from multiple sources into a format suitable for analysis



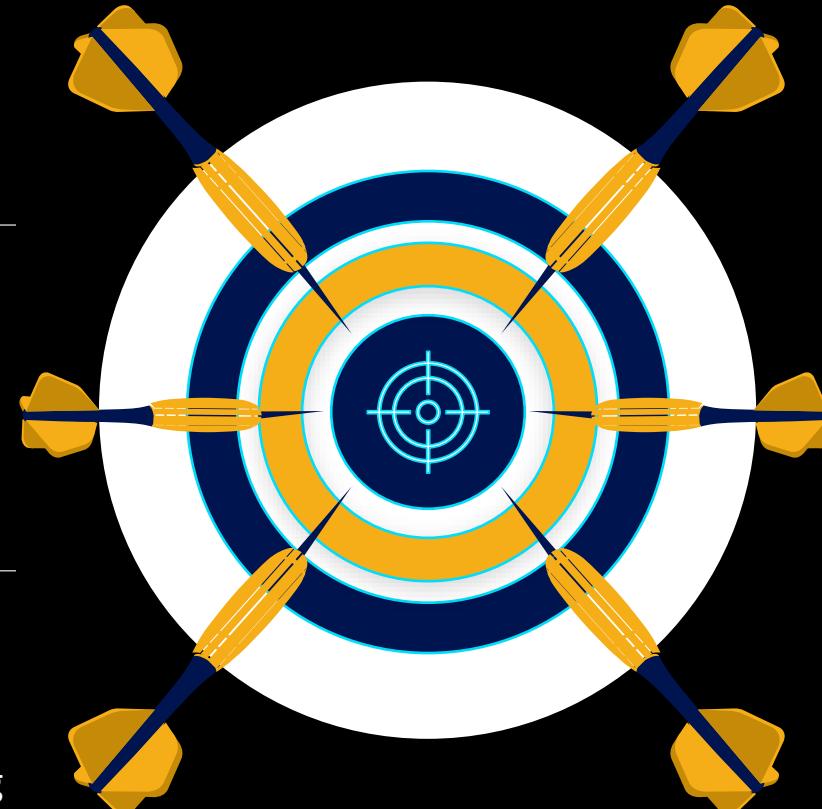
Predictive Model Development

Develop a predictive model using historical data to forecast future bank stock prices



Algorithm Evaluation

Test and evaluate various machine learning algorithms to identify the most effective model for prediction



Dashboard Interface

Implement a user-friendly dashboard for MSEG analysts to visualise stock price forecasts and compare model results



Macroeconomic Integration

Incorporate external economic indicators, such as interest rates, GDP growth, and inflation rates, to improve model accuracy



Financial Ratios

Incorporate financial ratios, such as the P/E, ROE, and CET1 ratios, as indicators to help investors determine when to invest or divest.

Business Problem Statement



The banking sector has experienced significant fluctuations in stock prices over recent years, creating challenges for investors trying to make informed decisions.

These fluctuations, often driven by long-term economic indicators and trends, make it difficult to predict future stock performance accurately.

MSEG's current reliance on traditional analysis methods has proven inadequate for forecasting these trends effectively, leading to missed opportunities and increased risk.

To stay ahead of the market, MSEG requires a reliable, data-driven predictive tool that focuses on long-term stock price trends and provides actionable insights for investment decisions.

Project Scope

In Scope



Data collection and integration from financial data providers (e.g. Alpha vantage)



Development of a predictive model using machine learning algorithms.



Incorporation of macroeconomic indicators (e.g., interest rates, GDP) into the model.



Design and development of a user-friendly dashboard for visualizing prediction results.



Basic reporting and analytics features.

Project Scope

Out Of Scope



Market sentiment and regulatory changes, which tend to drive short-term volatility, are excluded from the scope, as the focus is on long-term price trends.



Advanced AI models like deep learning (to be explored in future phases).



Detailed financial portfolio management tools.



Integration with external trading platforms.



Long-term maintenance beyond project handover

KPIs to Track

Stock Price Forecasting Performance

Root Mean Squared Error (RMSE):

Measures the square root of the average squared differences between predicted and actual values.

Mean Absolute Error (MAE):

Calculates the average of absolute differences between predicted and actual values, showing how close predictions are to actual outcomes.

R-squared (R^2):

Explains the proportion of variance in the actual data captured by the model, with values closer to 1 indicating a better fit.

Financial Health Indicators

P/E Ratio:

Measures a company's stock price relative to its earnings, helping to assess whether a stock is over- or under-valued.

ROE (Return on Equity):

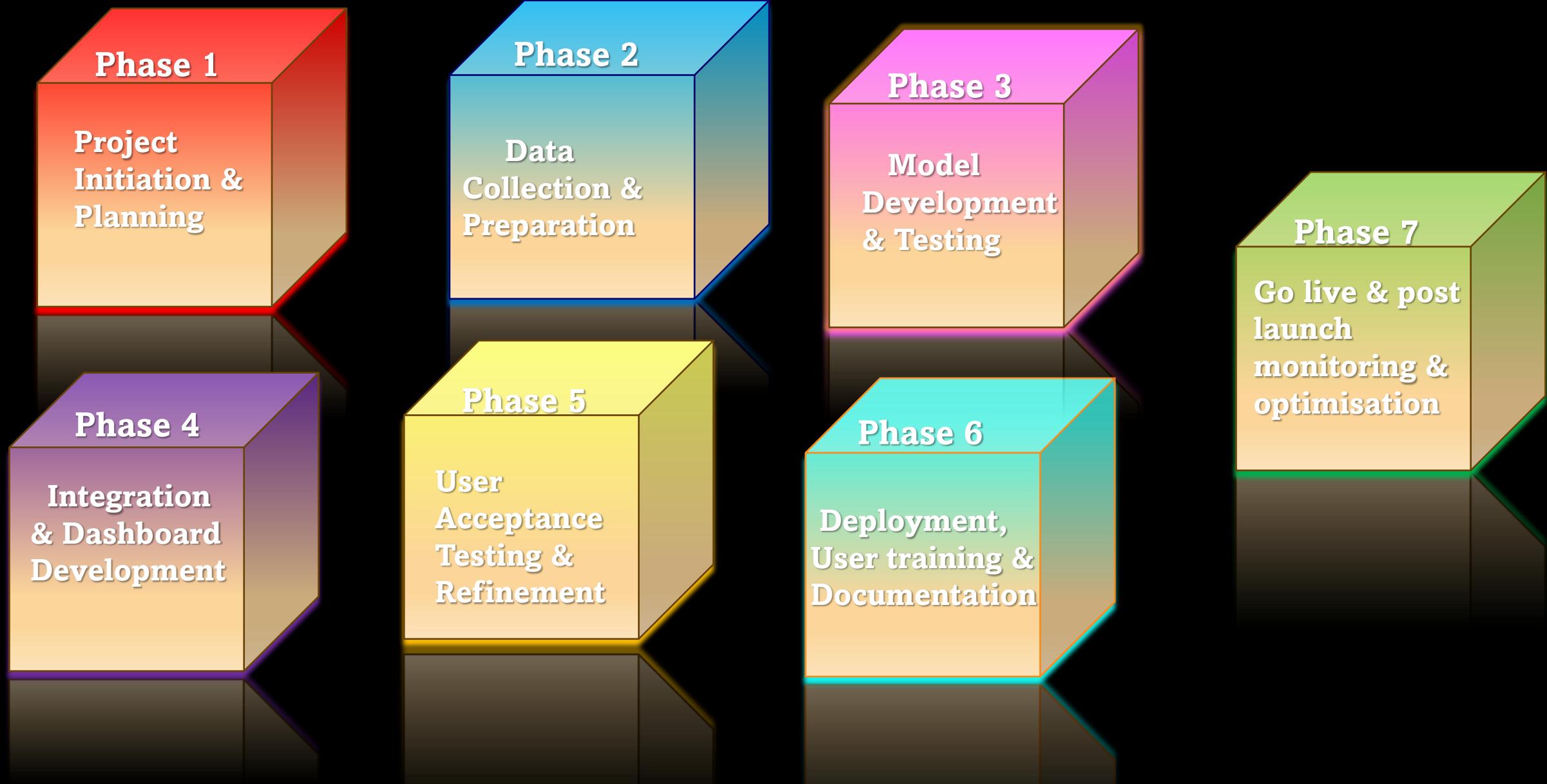
Indicates how efficiently a company uses shareholder equity to generate profits, with higher values showing better profitability.

CET1 Ratio:

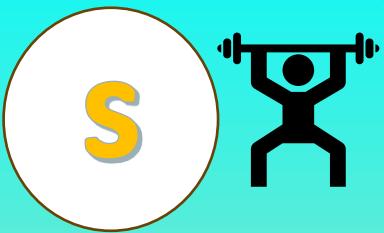
Reflects a bank's core capital strength, ensuring it has sufficient capital to withstand financial stress.



Phases Of The Project



SWOT Analysis



STRENGTHS

Diverse Team Skills:

The presence of Business Analysts (BAs), Data Analysts (DAs), and Data Scientists (DS) enables comprehensive analysis and effective model development.

Access to Historical Data: Using historical economic indicators and stock price data allows for robust trend analysis and predictive modelling.

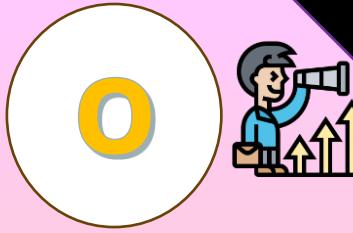


WEAKNESS

Limited Data Access:

Without subscriptions to financial databases like Bloomberg, the project faced constraints on the breadth of data.

Focused Model Selection: The project used ARIMA and Prophet models for forecasting, prioritizing accessible, proven methods over deep learning, which can be explored in future phases.

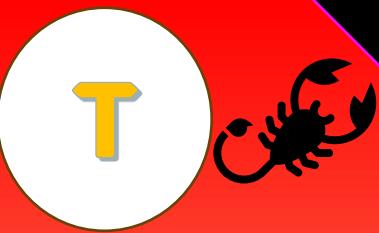


OPPORTUNITIES

Emerging Technologies:

Exploring advanced models like RNNs and other deep learning techniques could potentially capture complex patterns for even more accurate forecasts.

Partnership Potential: Collaborating with financial institutions or tech companies could yield access to better data and resources.



THREATS

Data Quality Issues: Relying on platforms like Macrotrends and Alpha Vantage can lead to challenges with data accuracy or delays in reporting, potentially resulting in misinformed investment decisions.

Unforeseen Events: Certain unpredictable events (like natural disasters or geopolitical crises) may not be adequately captured in historical data, making it difficult for the model to predict their impact.

Methodology



The project includes data collection, processing, model development, evaluation, and deployment. Agile methodology ensures iterative development, frequent feedback, and continuous improvement.

Outlined below is a detailed approach:

Agile Methodology

- Iterative Development: Develop the predictive model in small, manageable increments.
- Stakeholder Collaboration: Involve stakeholders throughout the project to gather feedback and refine requirements.
- Adaptive Planning: Allow for changes in requirements based on stakeholder feedback and evolving insights.
- Continuous Improvement: Regularly review and improve the model and processes.

Tools

Confluence -Project planning, collaboration within the team, documentation.
Jira-project management, reporting and tracking

SciPy. Stats: Skewness calculation and statistical transformations (e.g., logarithmic)

plotly: Interactive line plots for stock prices and forecasts.
matplotlib: Static visualizations (trends, confidence intervals).
seaborn: Statistical plots (e.g., histograms, heatmaps)

Pandas: Preprocessing, merging, resampling, interpolation.
NumPy: Numerical operations, Nan handling.

sklearn.ensemble (RandomForestRegressor): Analyzing feature importance.

datetime: Date manipulation and formatting.
functools.reduce: Merging dataframes with economic indicators.

Prophet: Time series forecasting with exogenous variables.
Statsmodels: ARIMA/SARIMAX models for stock price prediction.

sklearn.metrics:
Calculating RMSE, MAE, and R² for performance evaluation.

streamlit: Creating interactive dashboards with sliders and dropdowns

Predictive Modelling Pipeline

1



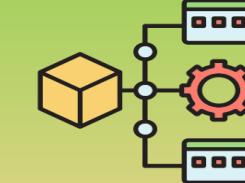
Data Collection:
Collect historical data on bank stock prices and other influencing factors.

2



Exploratory Data Analysis (EDA): Analyse and visualise data to uncover patterns, trends, and insights before modelling.

3



Train the Model:
Apply machine learning algorithms to the entire dataset.

4



Validate the Model:
Test performance using metrics like MSE, MAE and R².

5



Refine Model:
Adjust parameters for improvement.

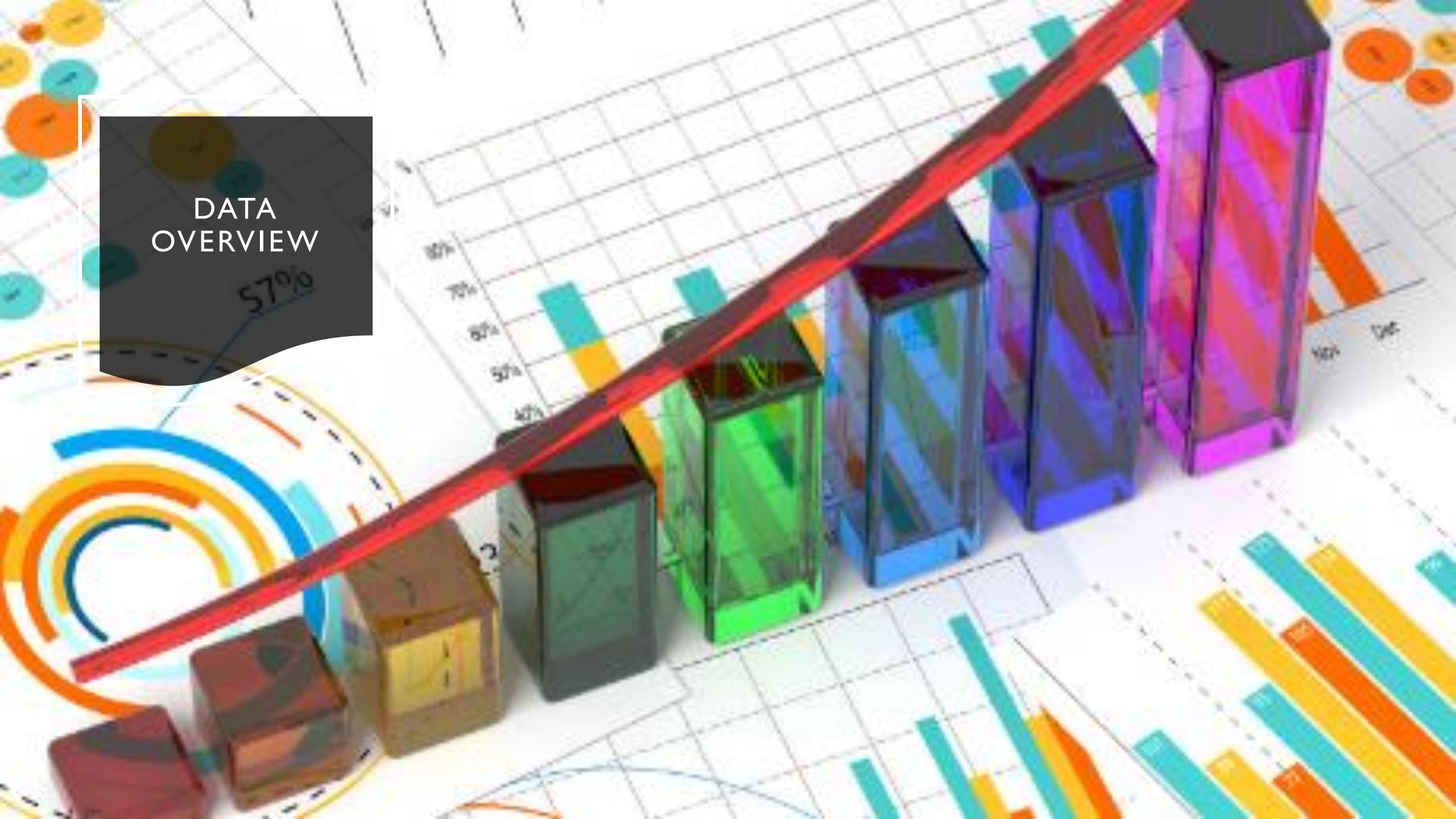
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Make Predictions:
Forecast future stock prices and communicate results.

DATA
OVERVIEW

57%



Data Overview

Prediction models were developed for three major banks: JP Morgan Chase & Co., Morgan Stanley, and Goldman Sachs.

- The dataset spans from 31st December 1999 to 30th June 2024, incorporating stock prices and relevant economic indicators.
- The model predicts monthly adjusted closing stock prices, using economic factors such as GDP, CPI, and other indicators.
- Data was retrieved from Alpha Vantage through an API and processed in VS Code & Jupyter Notebook.
- Monthly stock prices and economic indicators were selected for this project to focus on long-term investment strategies rather than short-term trading.

The table shows the raw dataset for JPMorgan Chase & Co.

1. open	2. high	3. low	4. close	5. adjusted close	6. volume	7. dividend amount	
date							
2024-09-16	222.30	224.10	200.61	207.86	207.8600	111064727.0	0.00
2024-08-30	213.20	225.48	190.90	224.80	224.8000	172436651.0	0.00
2024-07-31	202.84	217.56	202.10	212.80	212.8000	197456051.0	1.15
2024-06-28	202.31	202.60	190.88	202.26	201.1305	174902140.0	0.00
2024-05-31	192.27	205.88	188.46	202.63	201.4985	195902413.0	0.00
...
2000-04-28	87.94	93.00	71.75	72.12	22.8903	99979203.0	0.48
2000-03-31	79.88	100.75	77.13	87.19	27.5211	110318738.0	0.00
2000-02-29	82.44	86.37	74.56	79.62	25.1316	88645202.0	0.00
2000-01-31	74.75	81.50	68.25	80.69	25.4694	109109004.0	0.41
1999-12-31	77.13	83.37	72.06	77.69	24.3814	65211136.0	0.00

Economic Indicators



Economic indicators are statistics that offer insights into an economy's health, performance, and future trends.

Key indicators, such as CPI, Retail Sales, and the Unemployment Rate, can have a direct impact on stock prices.

We'll explore these specific indicators and their effects on stock markets in the following slides.

Economic Indicators

Consumer Price Index



CPI tracks changes in consumer prices over time.

A rising CPI signals inflation, reducing purchasing power and impacting company earnings and stock valuations.

Unemployment Rate



Unemployment measures the workforce actively seeking work.

High unemployment signals economic distress, reducing consumer spending, bank performance, and stock prices.

Real GDP Per Capita



GDP per capita measures average economic output per person.

Higher values indicate a healthy economy, boosting business activity, bank profits, and stock prices.

Economic Indicators(Contd)

Retail Sales



Retail sales measure consumer spending and indicate economic health.

Growth in retail sales signals rising consumer confidence and economic growth, benefiting bank stocks.

Treasury yield



Treasury yield is the return on U.S. government bonds.

Rising yields increase borrowing costs, lowering stock prices, while falling yields boost stocks by encouraging investment.

Payroll



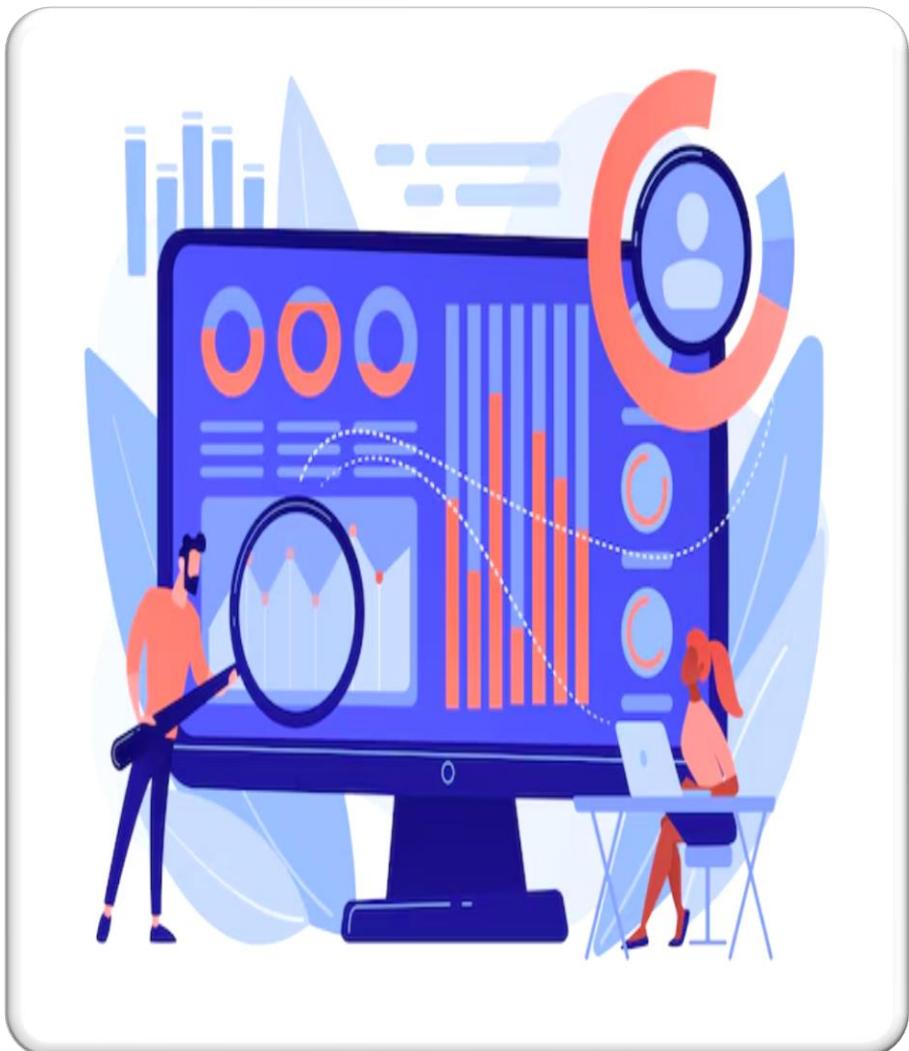
Payroll represents total employee wages.

Rising payrolls signal economic growth, boosting stocks, while declining payrolls suggest a slowdown, negatively affecting stocks.

Exploratory Data Analysis



What is EDA?



What is EDA?

Exploratory Data Analysis (EDA) is a critical step in the data analysis process that involves summarizing the main characteristics of a dataset, often using visual methods. It helps uncover patterns, detect anomalies, and test hypotheses.

Project Context:

This presentation includes EDA specifically for JPMorgan Chase(JPM). A similar EDA process was conducted for Morgan Stanley(MS) and Goldman Sachs(GS), ensuring a comprehensive analysis across major financial institutions.

EDA Process Followed In This Project

Exploratory Data Analysis (EDA)

- Explore the Dataset: Reviewed the dataset's structure to understand its columns, data types, and initial summary statistics(mean, median, mode, etc.)
- Identified outliers, missing values, and skewed features.
- Summary Insights: Discovered potential issues (e.g., skewness, missing data) and patterns that guided the next steps.

Data Cleaning

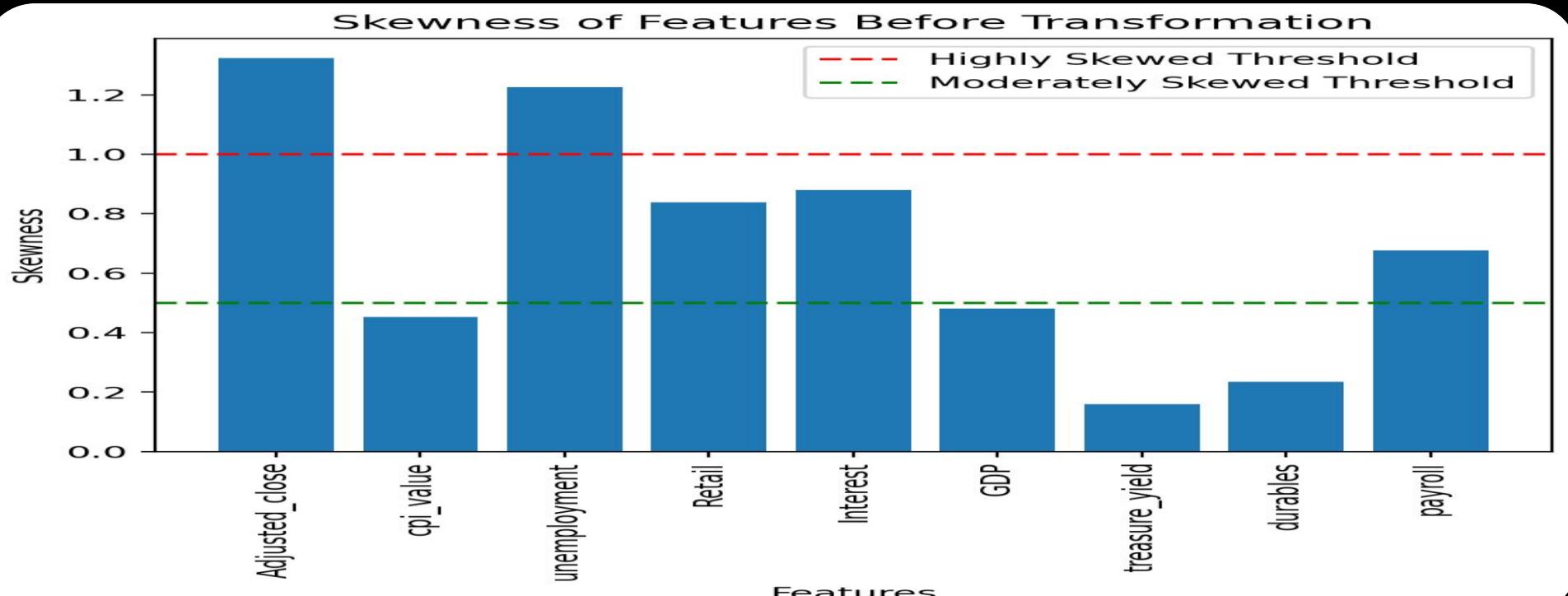
- Missing Data: Addressed missing values (e.g., used linear interpolation to fill missing GDP data when resampling quarterly to monthly)
- Data Type Adjustments: Converted data types as needed (e.g., strings to datetime or numeric)

Data Wrangling

- Resampling and Merging: Adjusted data granularity and combined multiple datasets for a cohesive analysis.
- Transformations: Reduced skewness using log and square root transformations.
- Feature Selection: Used Correlation Analysis and Random Forest for feature selection to identify important predictors

Outcome: A clean, well-structured, and relevant dataset ready for predictive modelling.

Histograms and Log Transformation:



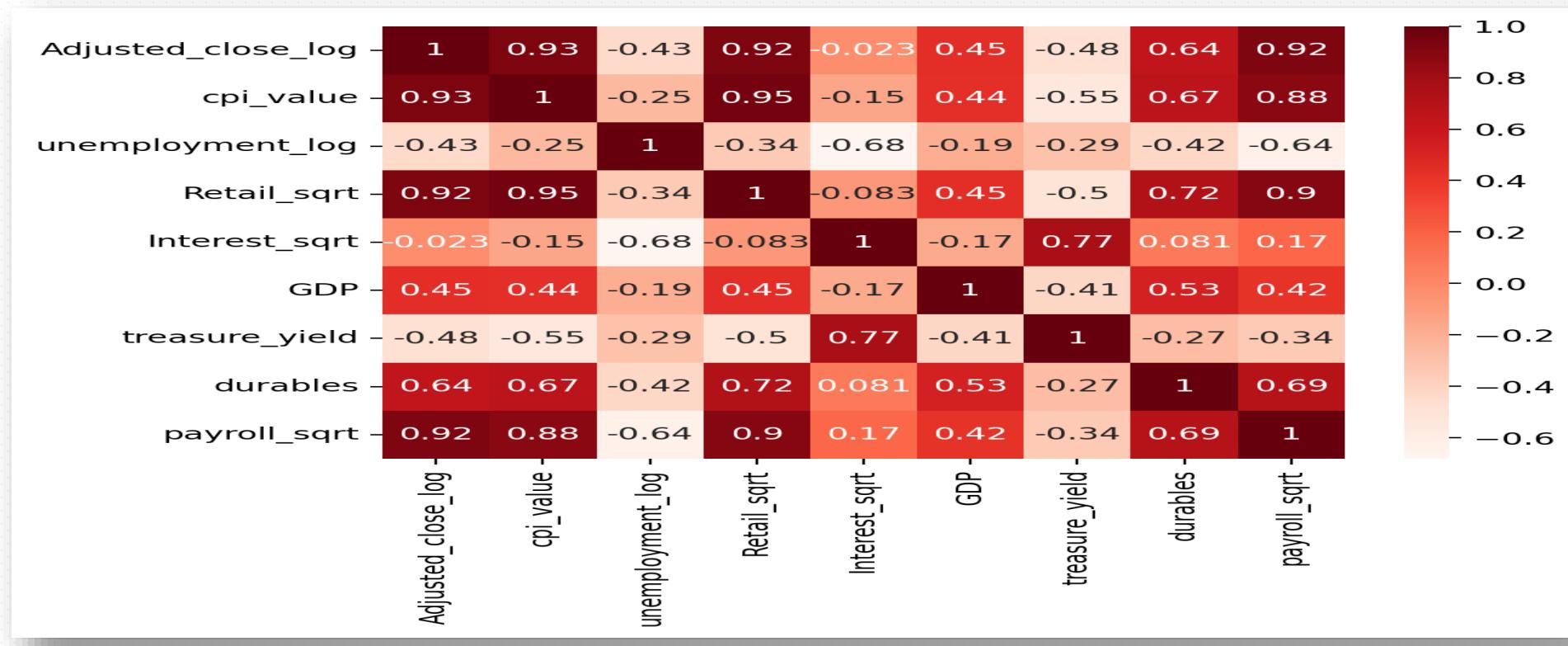
Log & Square Root Transformations: Applied based on skewness levels to normalise data, enhancing model performance:

Less than 0.5: Normal distribution, no transformation.

0.5 to 1: Moderately skewed, applied square root transformation

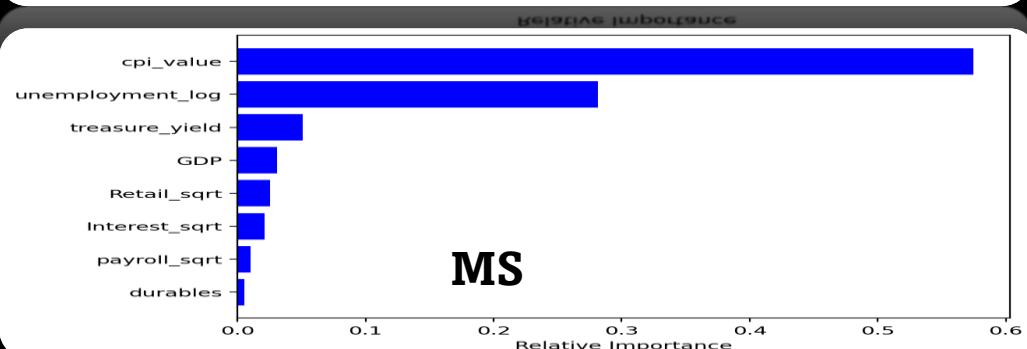
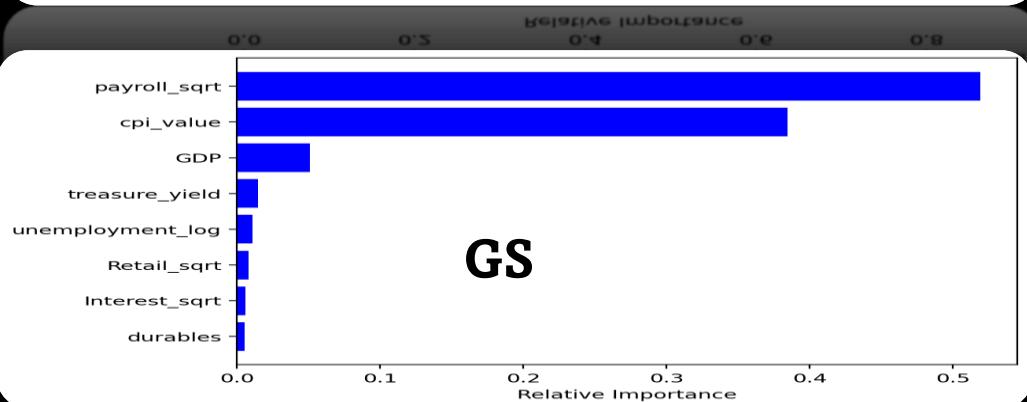
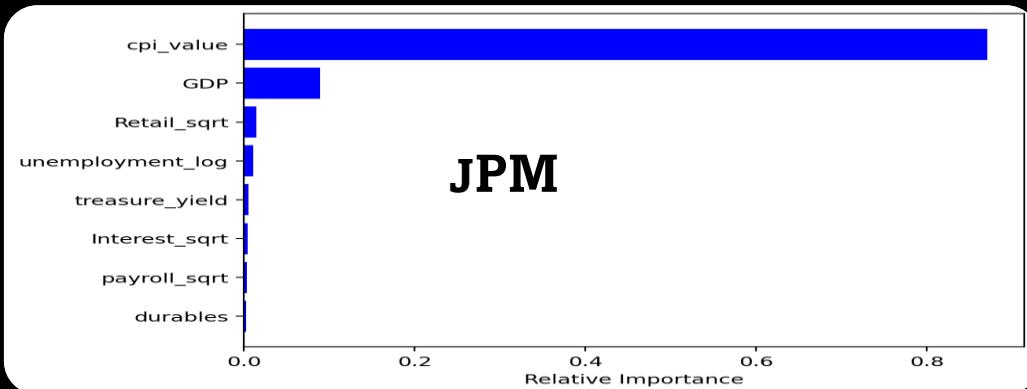
> 1: Highly skewed, applied log transformation.

Correlation Analysis



- Strong correlations exist between GDP, retail sales, CPI, and nonfarm payrolls with stock prices, highlighting their predictive importance.
- Negative correlations with the interest rate and treasury yield suggest economic conditions that may depress stock prices.
- Durable goods value also plays a role, indicating its impact on stock performance.

Feature Selection



Economic Indicators Evaluated:

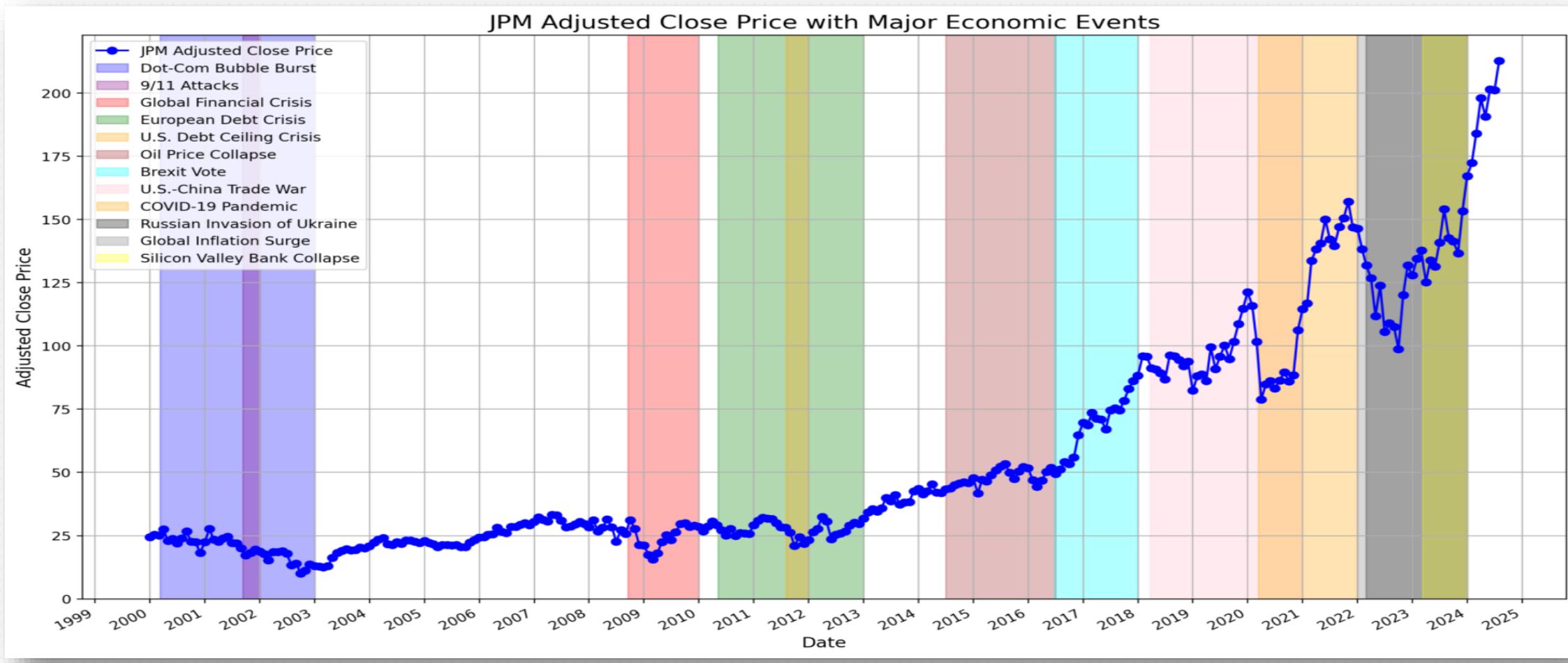
Multiple economic indicators were considered, such as CPI, GDP per capita, unemployment rates, and treasure yield, among others.

Method Used:

Gini Impurity

We applied feature selection techniques to rank and identify the top 6 economic indicators with the highest predictive power for each bank.

Stock Price Movement: A Historical Overview



This chart is crucial for understanding how various economic events impact stock prices. It highlights the correlation between market movements and significant economic indicators, demonstrating that incorporating a comprehensive dataset into our predictive model can enhance its accuracy and effectiveness.

PREDICTIVE MODELLING PROCESS



Models Evaluation

Prophet:

- It is a forecasting tool developed by Facebook that's great for time series data with trends and seasonality (like daily or monthly patterns).

ARIMA:

- ARIMA (Auto-Regressive Integrated Moving Average) is a time series forecasting model that predicts future values using past data.



Key Reasons for Selection: ARIMA & Prophet

Complementary Strengths

ARIMA:

Ideal for stationary data, trends, seasonality, and autocorrelation (e.g., financial time series).

Prophet:

Excels in long-term trends, irregular intervals, and external factors like holidays and macroeconomic cycles.

Scenario-Specific Fit

ARIMA:

Best for short-term dynamics and autocorrelation.

Prophet:

Designed for long-term forecasting with irregular data and seasonality.

Advantages

Interpretability:

Transparent and easy-to-explain results make it suitable for stakeholders. Unlike black-box models (e.g., neural networks), the outputs are easily understood.

Simplicity & Reliability:

Proven, well-documented methods balance accuracy with ease of use.



Conclusion

ARIMA and Prophet complement each other, offering robust, interpretable, and reliable solutions for diverse time-series forecasting challenges.

Forecasting with Prophet

1

Data Preparation

- Reset index(date as standard column)
- Used adj close log (log-transformed stock price) as the target column and renamed y.
- Used the date column as the time index and renamed ds to match Prophet's requirements.
- Incorporated six critical features (e.g., economic indicators) as additional predictors called regressors.

2

Forecasting

- Created a future data frame for monthly predictions.
- Populated future regressor values by extending the historical dataset with the last observed values for each feature.

3

Model Training:

- Initialized Prophet to model trends, seasonality, and external regressors.
- Trained the model using historical data.

4

Evaluation:

- Compared actual stock prices with predictions (yhat).
- Metrics Used: RMSE, MAE, and R² to evaluate accuracy

5

Key Outcome:

Delivered reliable stock price forecasts while capturing trends, seasonality, and the influence of external features.

Forecasting with ARIMA

1

Model Definition & Hyperparameters:

Defined ARIMA parameters: p, d, q combinations and seasonal parameters (seasonal_pdq with monthly seasonality). Prepared exogenous variables: GDP, unemployment_log, cpi_value, and Retail_sqrt.

2

Parameter Selection:

Used iterative testing to select the best model based on the lowest AIC value, optimizing predictive performance.

3

Model Training:

Trained the SARIMAX model with exogenous variables, capturing complex relationships in economic indicators.

4

Forecasting:

- One-Step Ahead Forecast: Predicted values from 2020-03-31, comparing observed vs. predicted values with confidence intervals.
- Multi-Step Forecast: Forecasted future periods by extending exogenous variables & visualizing historical trends and predictions.

5

Performance Evaluation:

Metrics: RMSE, MAE, and R² ensured robust evaluation of the model's effectiveness.

6

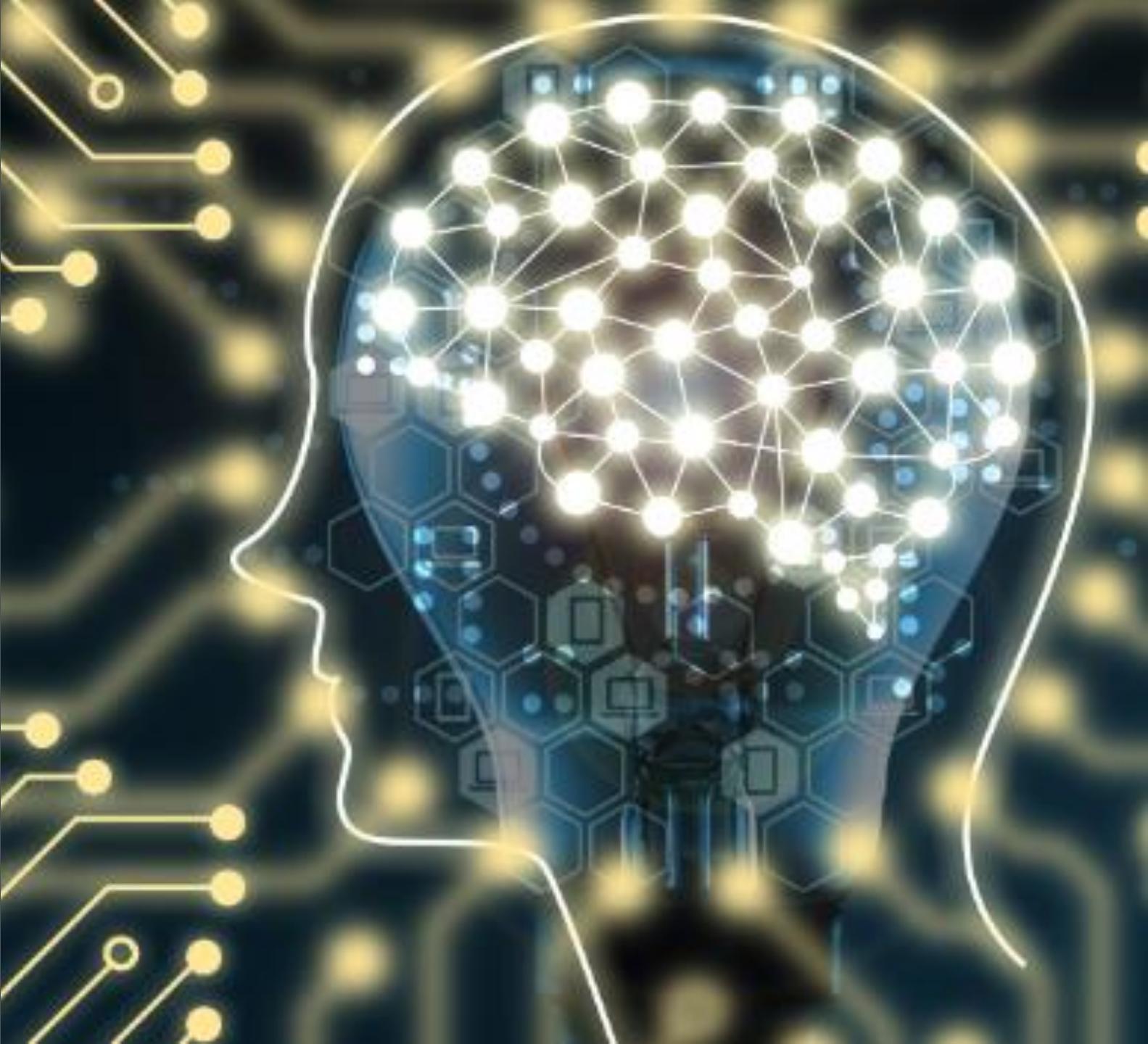
Key Outcome:

Delivered accurate monthly forecasts with insights into historical trends and future projections, displayed interactively on Streamlit.

BEST PERFORMING MODEL

Prophet achieved the lowest Root Mean Squared Error(RMSE), Mean Absolute Error(MAE) and the highest R^2 , compared to the ARIMA model.

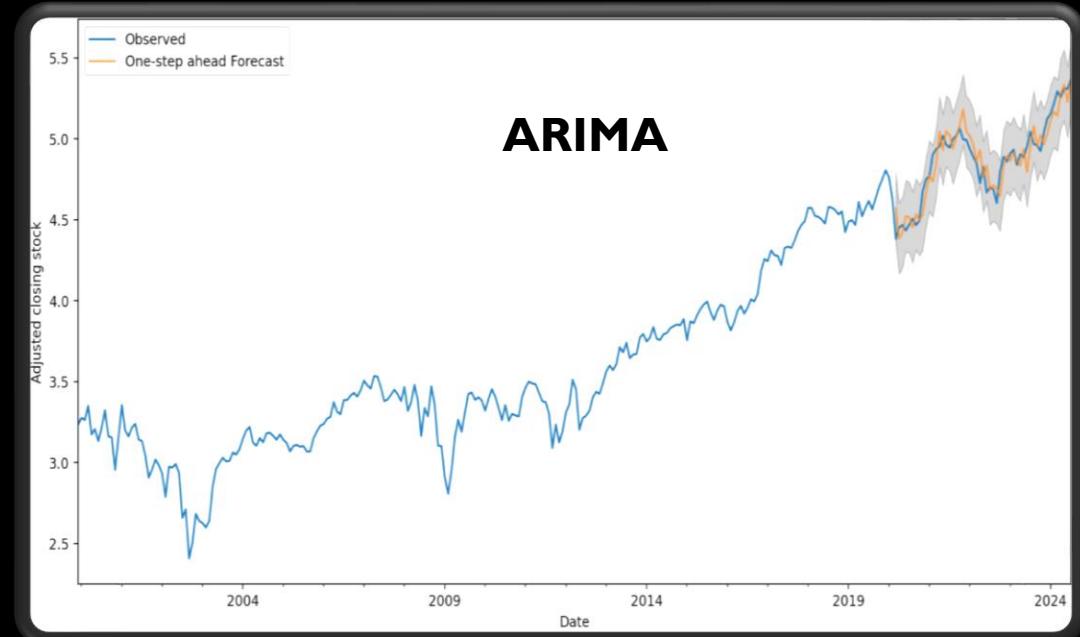
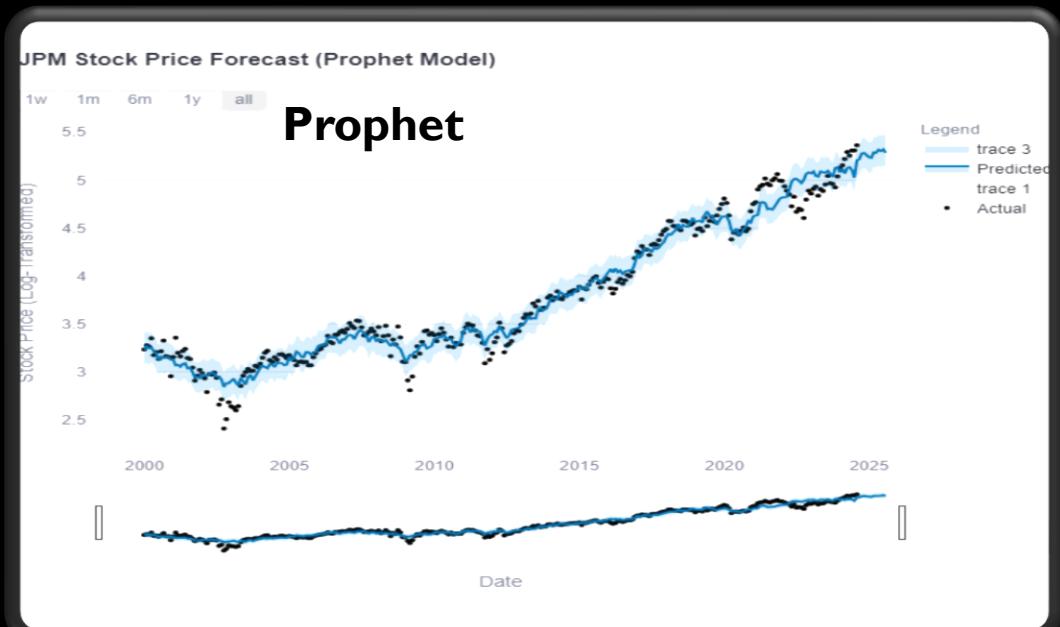
This means its predictions were very close to the actual values and it effectively explained the variability in the data.



RESULTS

Predicted vs Actual Prices for ARIMA and Prophet models

JP Morgan Chase & Co. 



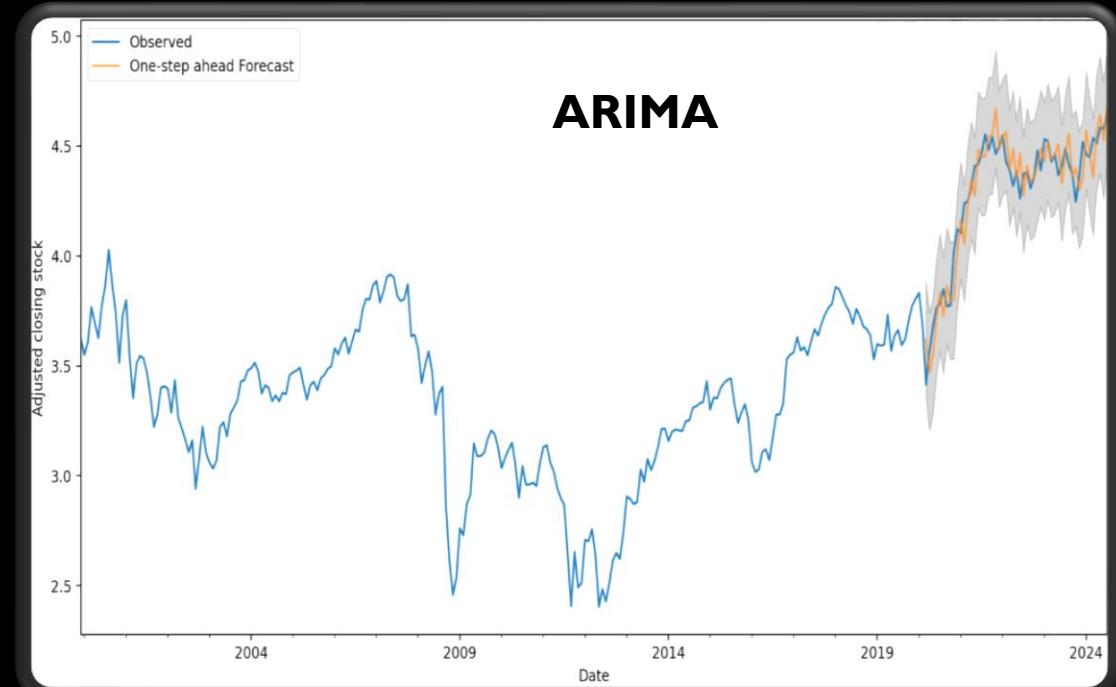
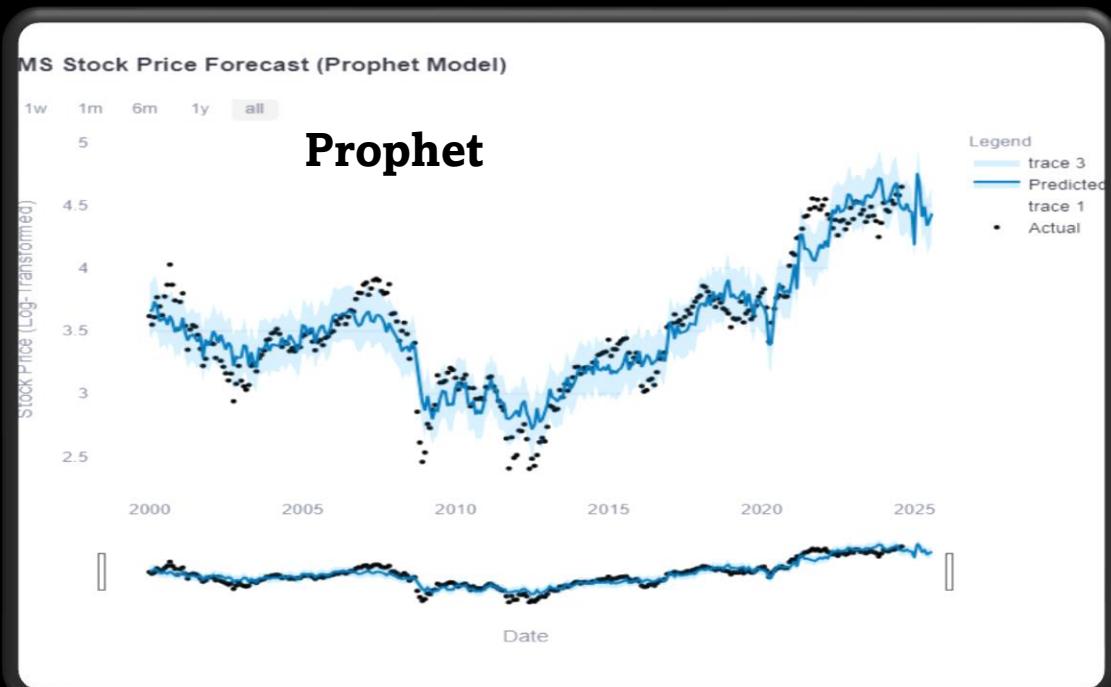
Prophet Model RMSE: 0.1258
Prophet Model MAE: 0.0939
Prophet Model R2: 0.9684

Root Mean Squared Error (RMSE) :
0.0902
Mean absolute Error (MAE): 0.0737
R2 : 0.8612

RESULTS

Predicted vs Actual Prices for ARIMA and Prophet models

Morgan Stanley ✓



Prophet Model RMSE: 0.1716

Prophet Model MAE: 0.1339

Prophet Model R2: 0.8852

Root Mean Squared Error (RMSE): 0.1017

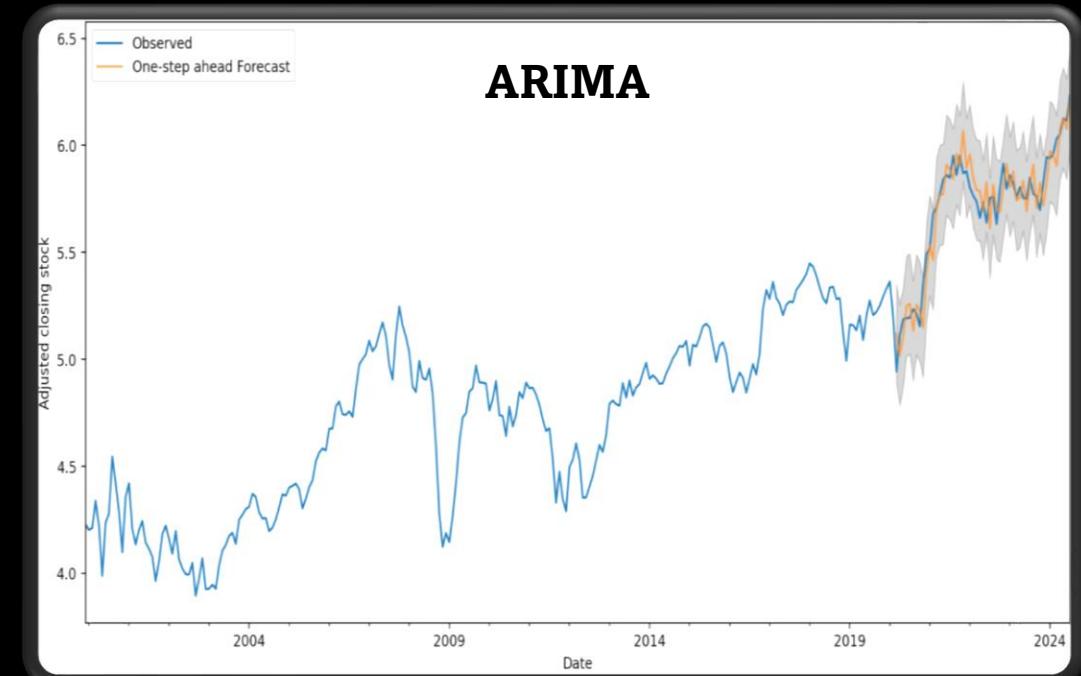
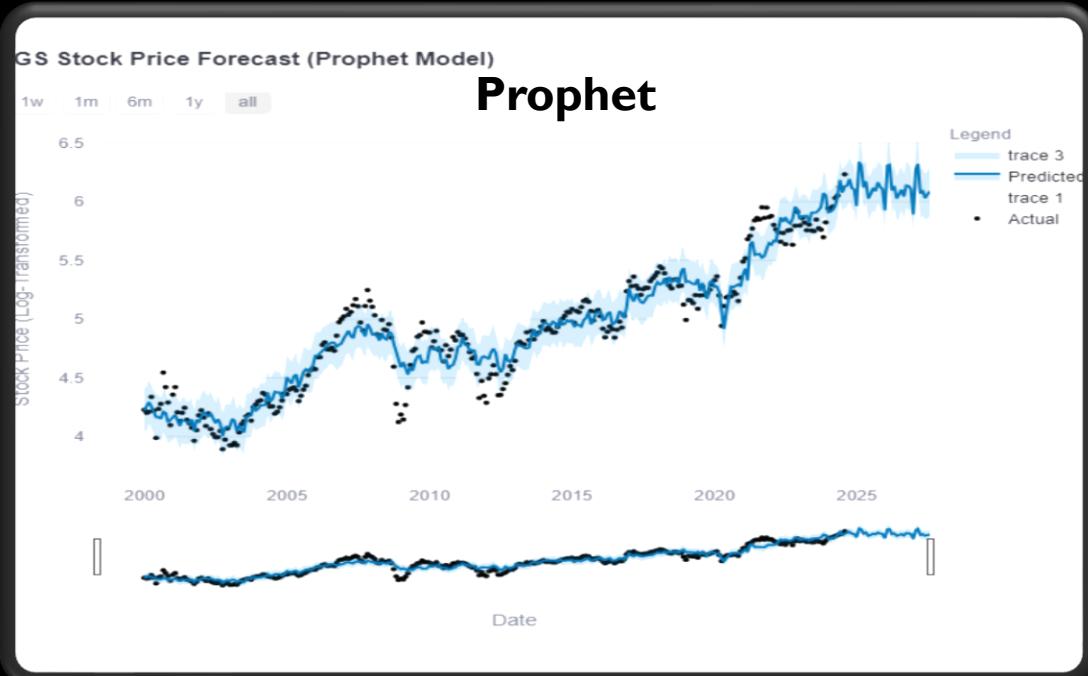
Mean absolute Error (MAE): 0.0795

R2 : 0.8724

RESULTS

Predicted vs Actual Prices for ARIMA and Prophet models

Goldman Sachs



Prophet Model RMSE: 0.1485
Prophet Model MAE: 0.1144
Prophet Model R2: 0.9266

Root Mean Squared Error (RMSE): 0.0968
Mean absolute Error (MAE) : 0.0797
R2 : 0.8813

The background of the image is a collage of various financial and industrial elements. On the left, there's a world map with blue and green highlights. In the center, there's a bar chart with blue bars and a red line graph showing an upward trend. To the right, there are several stacks of gold coins of different sizes. In the top right corner, there's a line graph with a black line and a green line, both showing an upward trend, with the year '2018' visible. The overall theme is economic growth and finance.

FINANCIAL RATIOS

Introduction To Financial Ratios



Financial ratios (e.g., P/E, ROE, CET1) assess a company's performance, profitability, and financial health. They help investors evaluate stock value, make informed decisions, and gain deeper insights into a company's potential for growth.

Integration into the App

Financial ratios have been successfully integrated into the Streamlit app to enhance investment analysis capabilities.

Key Financial Ratios Incorporated

Price-to-Earnings (P/E) Ratio:

Definition:

The P/E ratio compares a stock's market price (closing price) to its earnings. It shows how much investors are willing to pay for each dollar (or pound) of earnings.

Formula:

$$\text{P/E Ratio (Price-to-Earnings Ratio)} = \text{Current Closing Stock Price} / \text{Earnings Per Share (EPS)}.$$

Why is it Important?

The P/E ratio provides a clear perspective on the stock's valuation:

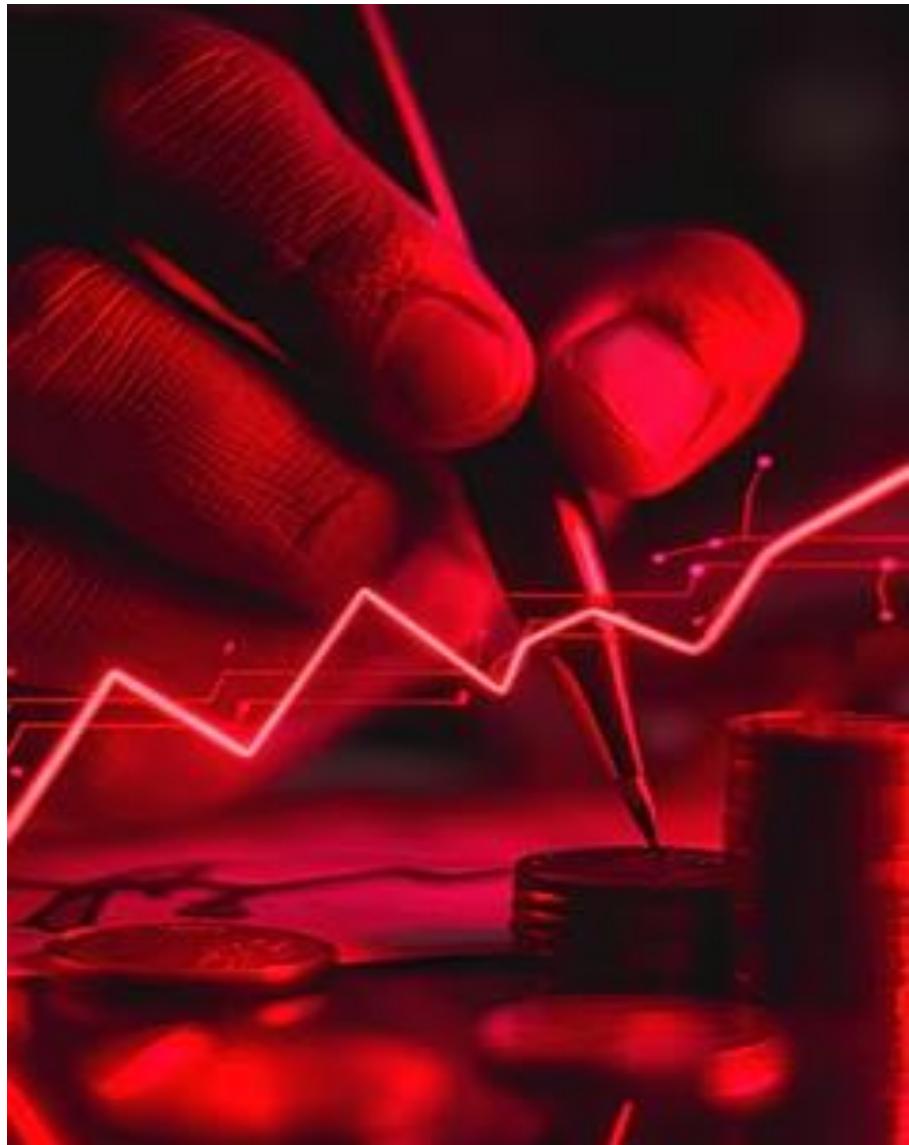
Relative Valuation (Comparing to Peers):

- A stock with a lower P/E ratio than peers is often considered cheap, like finding apples sold at a lower price in one store than others.
 - A stock with a higher P/E ratio compared to peers is often considered expensive, meaning it costs more relative to other similar stocks.
-

Valuation Relative to Earnings:

- A low P/E ratio indicates the stock is trading at a discount relative to its earnings, suggesting it might be undervalued.
- A high P/E ratio indicates the stock is trading at a premium relative to its earnings, suggesting it might be overvalued.

Key Financial Ratios Incorporated(Contd)



2. Return on Equity (ROE):

Definition:

ROE measures a company's profitability relative to shareholder equity. It indicates how effectively a company is using its equity to generate profit.

$$\text{ROE} = (\text{Net Income}/\text{Shareholders Equity}) * 100$$

Interpretation:

- A high or increasing ROE signifies that the company is effectively generating profit, instilling confidence in investors about its growth potential.
- If investors expect the company's earnings to rise (reflected in a rising ROE), they may be more likely to buy the stock, driving the price up.

Key Financial Ratios Incorporated

3. CET1 ratio(Common Equity Tier 1 ratio)

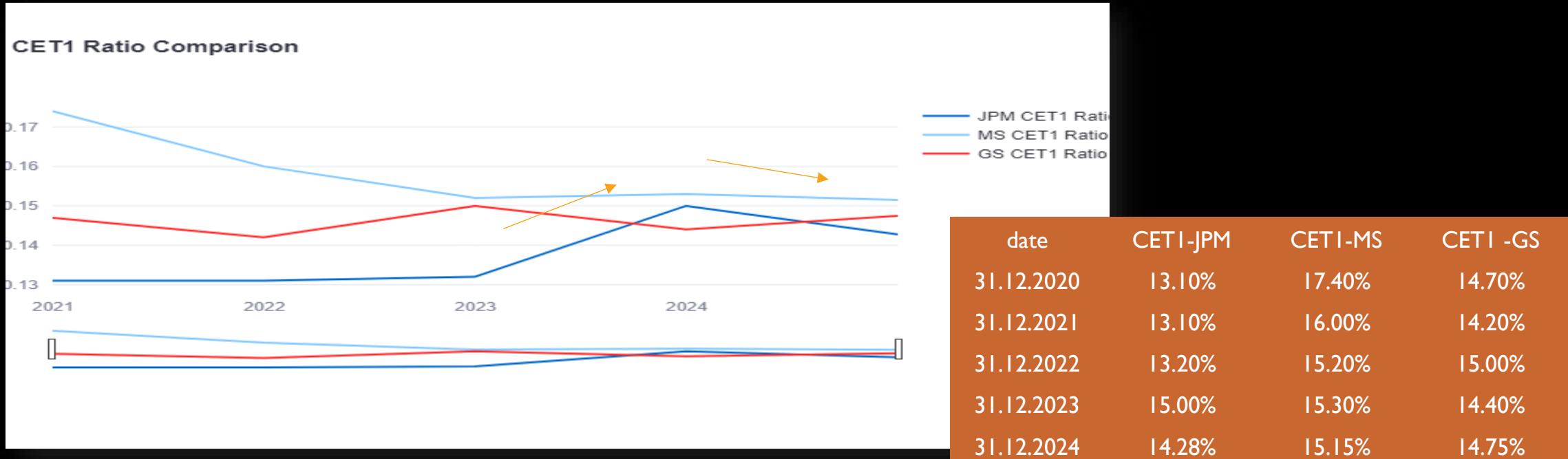
- The CET1 ratio is a key financial metric used to assess a bank's financial strength. It measures a bank's core equity capital (primarily common equity) against its total risk-weighted assets.

Formula: (CET1 Capital/ Risk Weighted Assets)*100

- A higher CET1 ratio indicates that a bank has a stronger capital position, which means it can better absorb losses during economic downturns.
 - This ratio is crucial for ensuring regulatory compliance, as banks are required to maintain a minimum CET1 ratio to promote stability and protect depositors.
 - Investors often look at the CET1 ratio to evaluate a bank's overall risk management and financial health.



CET1 Ratios: Historical Peer Comparison (2020-2024)



JPMorgan Chase (JPM): While JPM has improved its CET1 ratio recently, the slight projected decrease in 2024 should make investors cautious. This bank may be taking on slightly more risk but remains generally stable.

Morgan Stanley (MS): Despite a gradual decrease, MS maintains the strongest CET1 ratio among the three banks. This indicates that MS is well-capitalized and may be the safest choice in terms of financial stability.

Goldman Sachs (GS): GS's steady CET1 ratio suggests that it has maintained a good balance between risk and capital reserves. Investors might consider it a balanced option with relatively lower risk.

NEED TO KNOW



When to buy



When to sell



When to hold

Peer Comparison of Forecasted P/E and ROE Ratios



Objective

Determine whether a stock is overvalued or undervalued by analysing forecasted Price-to-Earnings (P/E) and Return on Equity (ROE) ratios.

Comparison Process

Forecasted Peer P/E (2024-2027): Assess the stock's projected P/E ratio relative to its peers.

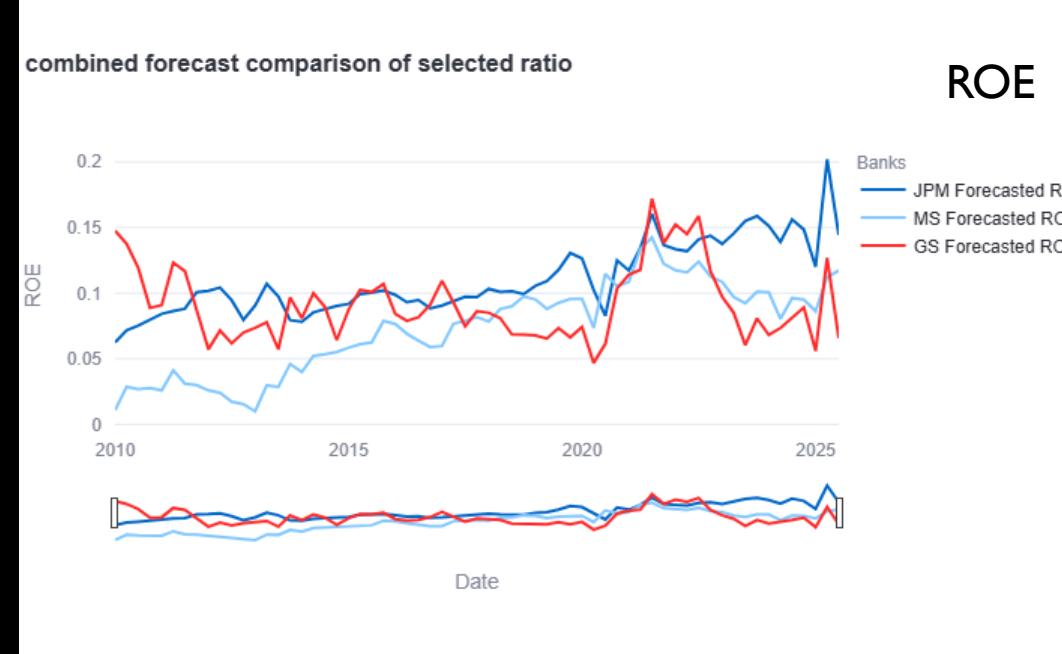
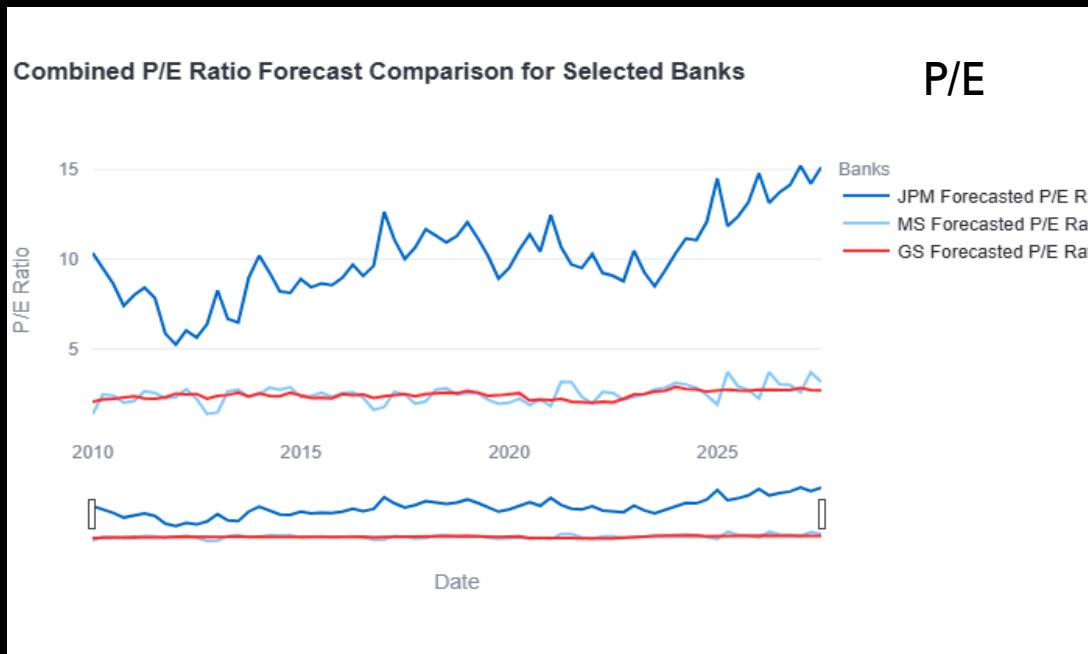
Forecasted Peer ROE (2024-2027): Compare each stock's forecasted ROE to understand profitability and efficiency.

Investment Decisions Based on Analysis

Buy: Select stocks with the lowest forecasted P/E and high forecasted ROE for potential undervaluation.

Sell: Sell if the stock has a high P/E ratio and a low ROE.

Hold: Hold if the stock has a high P/E ratio but a strong projected ROE.



Quarter	Bank	Forecasted PE Ratio	Forecasted ROE	Recommendation
Dec-24	JPM	14.51	12.01%	Hold/Buy: Despite a higher P/E, the strong ROE indicates good profitability. This makes JPM a viable option for investors.
	MS	1.89	8.60%	Buy: The low P/E ratio suggests it is undervalued. Although the ROE is lower than JPM's, it is still promising, making it an attractive buy.
	GS	2.68	5.56%	Hold: The P/E is slightly higher than MS, but the lower ROE indicates weaker profitability. Therefore, it's advisable to hold off on buying or selling at this time.

DASHBOARD



Dashboard Overview & Interactive Features

Financial Ratios Comparison:

- Interactive charts to compare key financial ratios(P/E ratio, ROE, CET1) across multiple banks
- Filters to select specific banks or all banks for peer comparisons.

Forecast Period Selection:

- Users can adjust the forecast period (1, 2, or 3 years) using a pull-across bar on the left-hand side of the dashboard
- Provides short-term and long-term forecasting flexibility based on the user's investment strategy.

Visualization Features:

Toggle between light and dark modes for a customisable user experience(Click on 3 dots on the right side of the dashboard, go to settings)

Hover-over tooltips on charts for detailed data labels

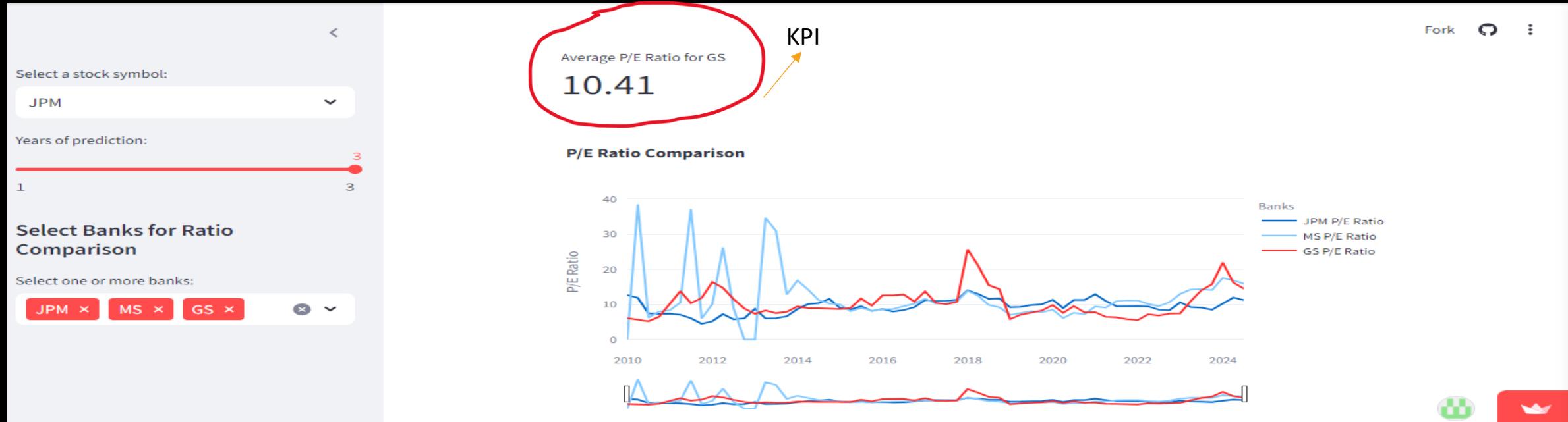
KPI cards:

- Average historical PE ratio, Average historical ROE ratio, Average Historical CET1 ratio
- These cards offer a snapshot of historical performance for instant insights.

Filtering Options:

- Bank selection filters: Users can compare JPM, GS and MS, or any combination of these, to assess their performance.
- Helps investors quickly isolate specific banks for analysis or compare multiple banks simultaneously.

Screenshots of Dashboard



Key Findings And Insights



As the model is based on long-term economic indicators rather than short-term market trends, it helps smooth out volatility, making the forecast more reliable and accurate for investment decisions.

The Prophet model demonstrated reliable performance with high R² and low MAE and MSE providing confidence in their predictive capabilities and the quality of forecasts generated for stock prices.

Financial ratios (P/E, ROE, CET1) are crucial for assessing the health of the banks analysed. Understanding these ratios helps investors gauge financial stability and make informed investment choices.

- Investors should be cautious of banks showing declining CET1 ratios, as this could indicate potential risks in the future.
- Banks like Morgan Stanley with consistently high CET1 ratios may offer greater financial stability and are likely better positioned to withstand economic downturns.

Projected Business Benefits from Predictive Models



Enhanced Decision-Making:

Predictive insights empower stakeholders to make informed investment decisions based on data-driven forecasts, reducing reliance on gut feelings or outdated information.

Optimised Resource Allocation:

Insights into the financial health of analysed banks facilitate a more strategic allocation of resources, allowing MSEG to better advise clients on where to invest or divest.

Enhanced Risk Management:

Once real-time updates are implemented, the predictive model will effectively address both systematic and unsystematic risks. Using long-term economic indicators, the model helps anticipate broader market trends, enabling MSEG to guide clients through potential downturns. This comprehensive risk coverage positions the business to make more informed investment decisions.

Competitive Advantage:

Leveraging predictive modelling can position MSEG as a leader in the investment advisory space, attracting more clients who seek sophisticated, data-backed investment strategies.

Key Project Risks & Solutions



Challenges

When building regression models with economic indicators and stock prices, multicollinearity between some indicators led to unreliable coefficient estimates and reduced the predictive power of the model.

Financial ratios, like ROE and CET1, were not readily available every quarter through Alpha Vantage, making it difficult to get up-to-date data.

Encountered issues during model deployment where the system required downgrading Python packages, causing delays and compatibility concerns.

Solutions

To improve model accuracy, we performed feature selection by removing highly correlated indicators and retaining the most impactful ones (e.g., CPI, GDP), then applied ARIMA & Prophet for forecasting.

Sourced financial ratios from Macrotrends, which provided more comprehensive and accurate data for the required timeframes, ensuring the model had the necessary inputs for precise predictions.

Coordinated with StackwisR's IT team to address compatibility issues, ensuring smooth integration and deployment of the predictive models into their existing infrastructure.



RECOMMENDATIONS

1

Building Alliances for Enhanced Predictive Analytics

Foster partnerships with financial institutions or tech companies to gain insights, share data, and leverage additional resources for improved predictive capabilities.

2

Stock Performance Insights:

Concentrate on selecting stocks that demonstrate consistently high projected return on equity (ROE), indicating strong profitability, alongside favourable price-to-earnings (P/E) ratios compared to their peers, which suggests they offer good value for their earnings.

3

Diversification strategy:

Create a balanced investment portfolio by allocating investments across the three banks—JPM, MS, and GS. This diversification helps reduce risk and enables the leveraging of each bank's strengths based on their respective P/E and ROE performance.

4

Adapting Investment Strategy to Economic Shifts

Predictive models offer valuable insights, but regular review is essential, especially during major economic shifts like recessions or financial crises. If key indicators, such as rising unemployment, deviate from the model's assumptions, it may signal the need to adjust your investment strategy. In such cases, consider shifting to safer assets (like bonds) or increasing cash reserves (For example, if economic conditions become unpredictable, instead of continuing to invest in stocks, one could sell some shares and hold that money in cash)



Conclusions





1. Successful Predictive Modelling:

We developed and implemented a predictive model(Prophet) for bank stock prices, providing MSEG with reliable monthly forecasts, helping to anticipate market trends and guide investment decisions.

2. Financial Ratios for Enhanced Analysis:

By integrating financial ratios like Price-to-Earnings (P/E) and Return on Equity (ROE), the dashboard enables investors to assess valuation and profitability, offering deeper insights into stock performance beyond price predictions.

3. Data-Driven Investment Strategy:

MSEG now has access to a comprehensive tool that integrates stock price data, economic indicators, financial ratios, and predictive analytics, enabling more informed investment decisions on whether to buy, hold, or sell based on clear metrics.

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ANY
QUESTIONS ?