

AUTOMATED TRADING PRESENTS

Trading algorithm featuring :
NYSE: TSM

PRESENTED BY

Jordan, Nick, Jeanel

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Overview

Algorithmic trading uses technical indicators and conditional logic to identify signals for entering and exiting trades.

Our selected parameters perform above the baseline. We are confident that the quality of our model will position our clients for success in an ever-evolving and competitive trading landscape.

This project aims to optimize technical indicators and identify logic maximizing trading profitability. Automated methodology competes with tradition trading in quantitative sampling and scaling. Our use of supuervised machine learning models validates our analytical strategy. In this project we build a machine learning evaluating TSM: Taiwan Semiconductor Manufacturing Company Limited

NYSE: TSM

TSMC is a leading semiconductor foundry, and is a beacon of technological innovation. The stock performance and trade volume provide extensive detail into the highly capitalized stock.

Market Cap

638.29 B

YTD Return

+ 35.68%

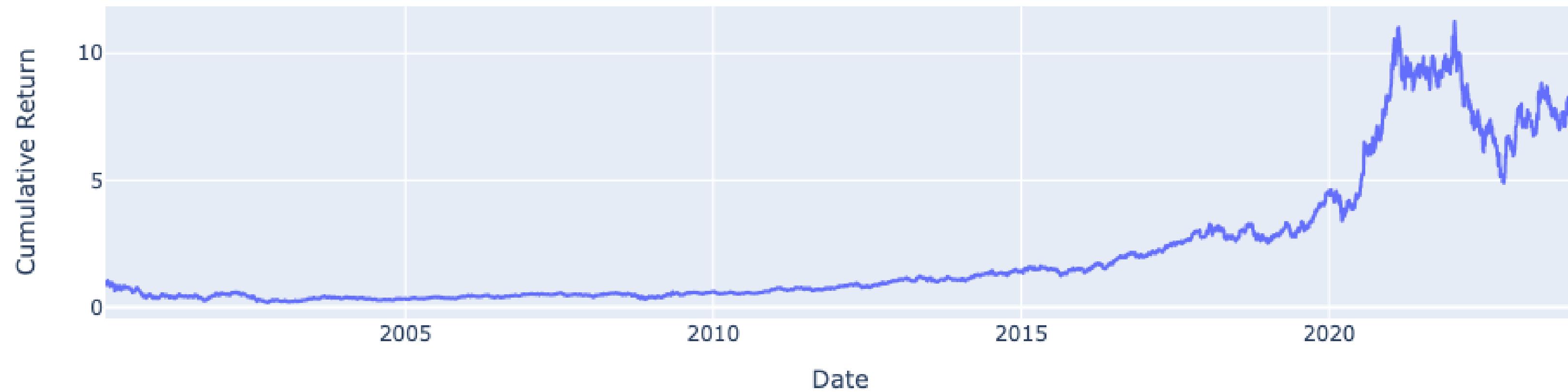
Avg. Volume

\$ 15,318,444

Closing Price of TSM



TSM Cumulative Returns



Relative Strength Index (RSI)

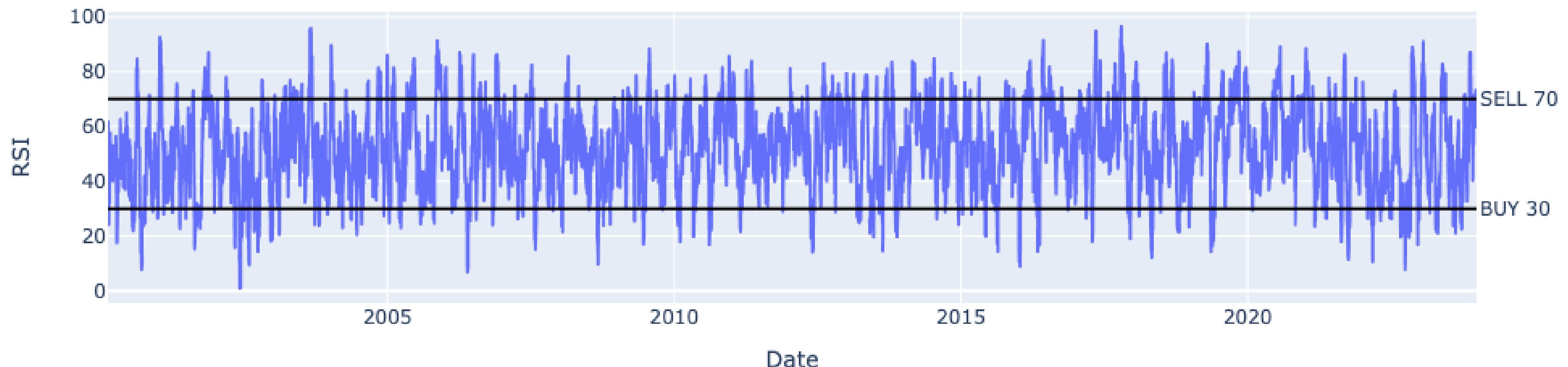
TECHNICAL ANALYSIS OSCILLATES BETWEEN 0 AND 100.

RSI measures the magnitude of recent price changes to evaluate overbought or oversold conditions in a security. It is typically displayed as an oscillator that fluctuates between 0 and 100.

The RSI to identify potential reversal points in a market. When the RSI moves above 70, it suggests that the asset may be overbought, indicating a possible downward correction.

Conversely, when the RSI drops below 30, it indicates that the asset may be oversold, suggesting a potential upward correction.

Relative Strength Index (RSI)



Stochastic Oscillator

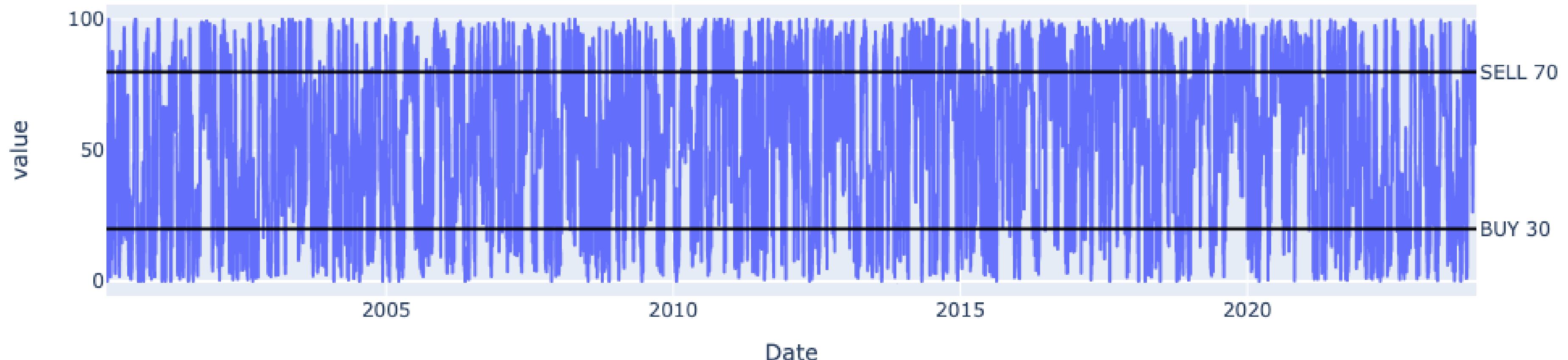
TECHNICAL ANALYSIS OSCILLATES BETWEEN 0 AND 100.

Traditionally indicators over 80 is considered overbought, conversely below 20 are oversold. Indicating that the security is due for a price rally.

Our algorithm isolates the %K and %D line crosses. A bullish signal is generated when %K crosses above %D from below, indicating strengthening momentum. Conversely, a bearish signal occurs when %K crosses below %D from above, suggesting weakening momentum.



Stochastic Oscillator



Strategy Conditions

The trading strategy involves using the Relative Strength Index (RSI) and Stochastic indicators to generate buy and sell signals for TSM stock. The model relies on RSI and Stochastic values to predict when to buy, hold, and sell.

Buy

When both the RSI and Stochastic indicators are simultaneously lower than their respective "oversold" thresholds (30 for RSI, 20 for Stochastic), a buy signal is triggered. The amount of shares to buy is calculated as 10% of the capital (cash) in the account/portfolio.

Signal Interpretation

Traders often look for bullish or bearish divergences between the Stochastic Oscillator and the price of the security. For example, if the price of the security makes a new low while the Stochastic Oscillator fails to make a new low and instead forms a higher low, it may signal bullish divergence and potential upward price reversal.

Sell

Once both the RSI and Stochastic indicators are higher than their respective "overbought" thresholds (70 for RSI, 80 for Stochastic), only the shares that were previously bought via the "buy signal" are sold back to cash.

Entry and Exit Positions



Initial Choosing of Model Parameters:

RSI - 14

Stochastic = 14, 6, 6

Training window = 144
months

Gradient Boosting Machine

An ensemble learning method that builds multiple weak learners to create a strong predictive model, minimizing the loss function.

Stochastic Gradient Descent

An optimization algorithm that iteratively updates parameters using the gradient of the loss function computed on a small subset of the training data.

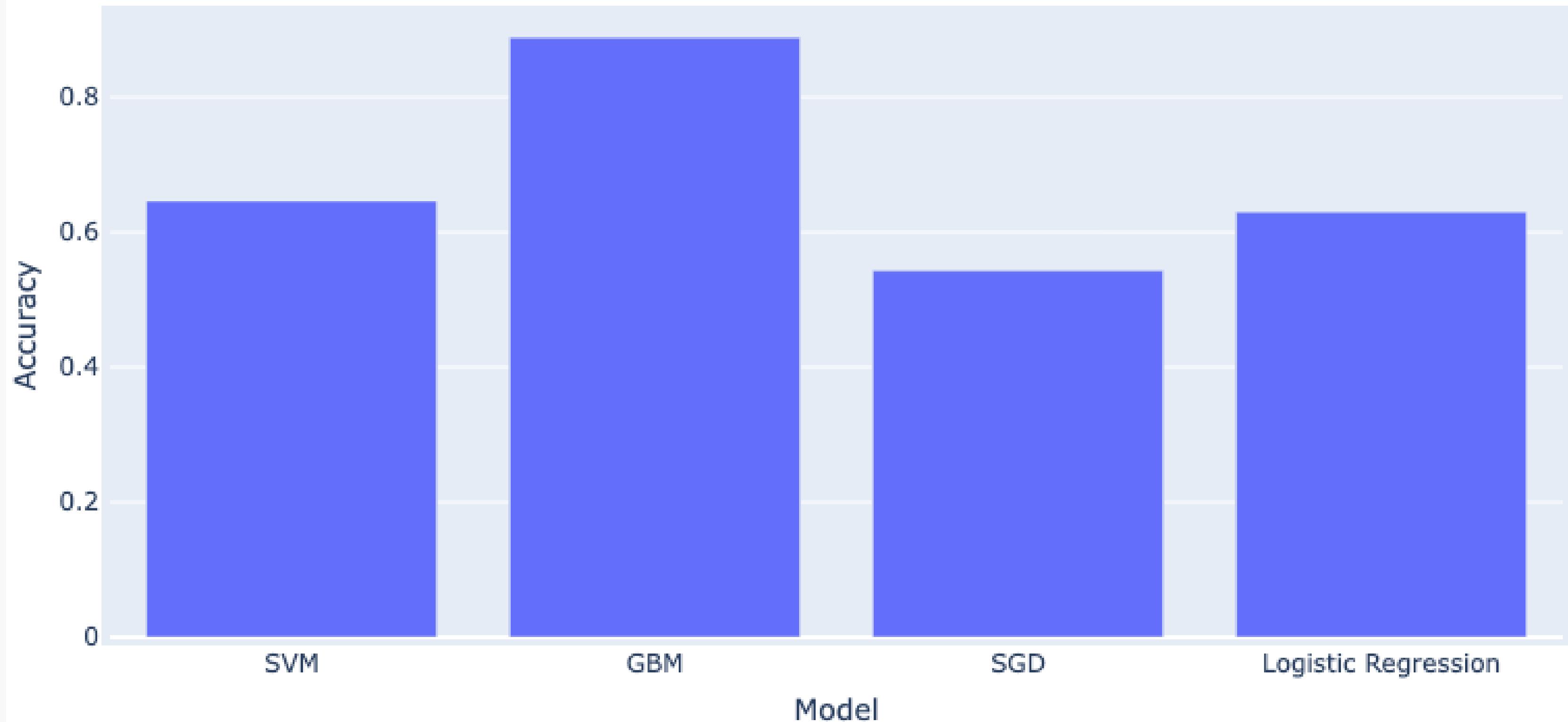
Logistic Regression

A regression model that predicts the probability of a binary outcome using a logistic function. It's commonly used for binary classification tasks.

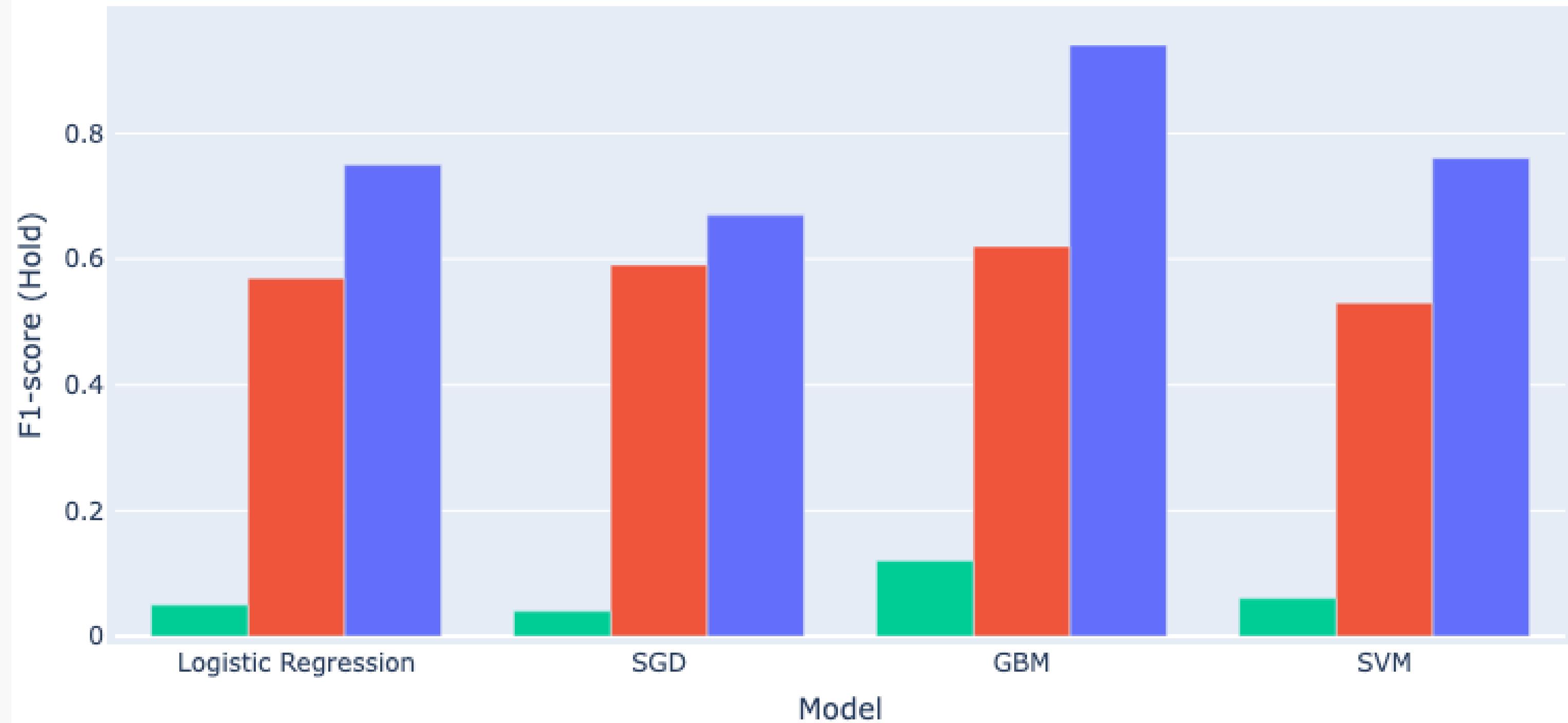
Support Vector Machines

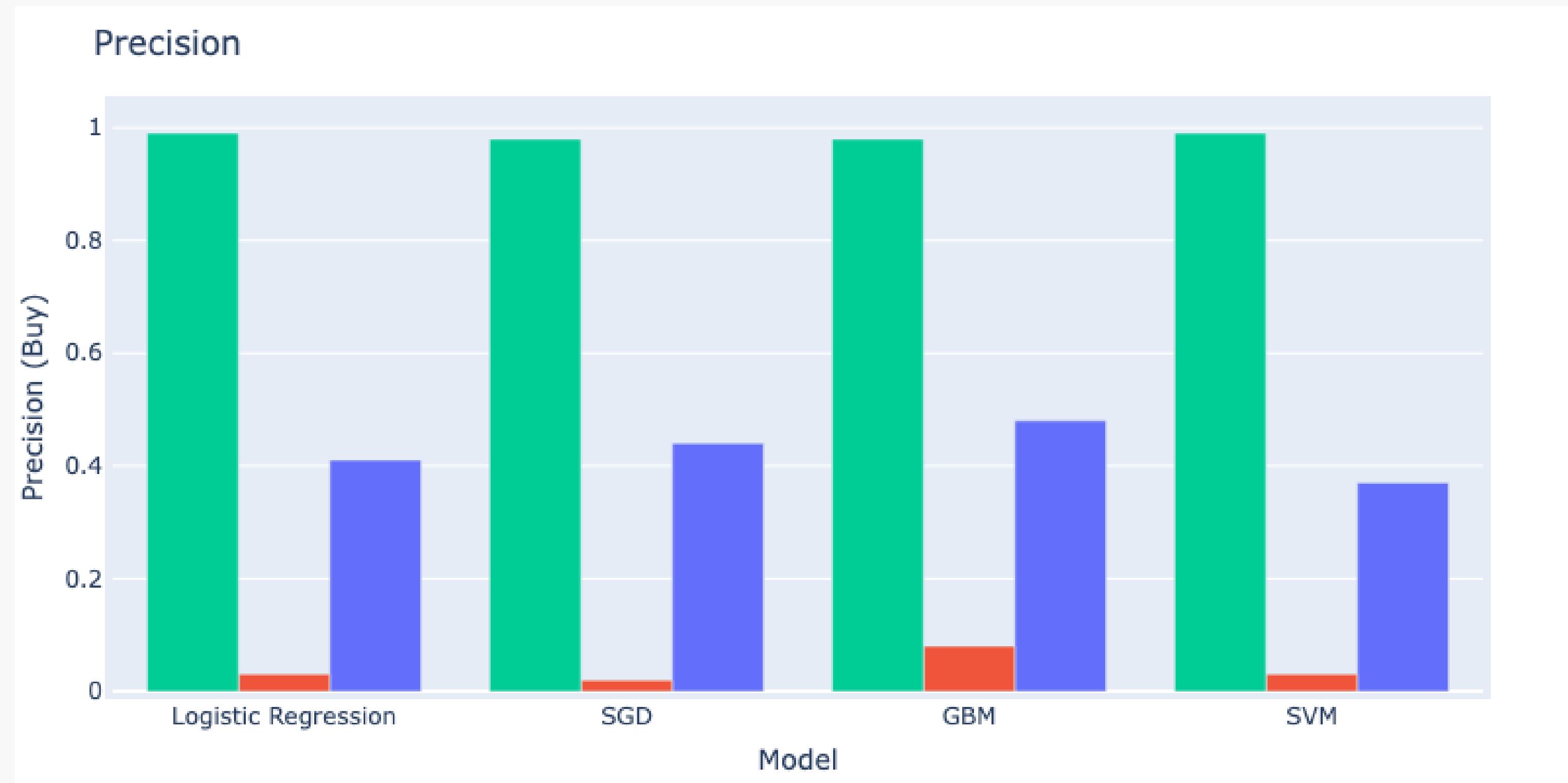
A supervised learning algorithm that classifies data by finding the hyperplane that best divides a dataset into classes.

Model Accuracy



Initial Models F1-Scores





Best Option

GBM Model

Goal # 1

Create an algorithm with an accuracy > 55%

Goal # 2

Create a profitable Algorithm utilizing combined RSI and Stochastic signals

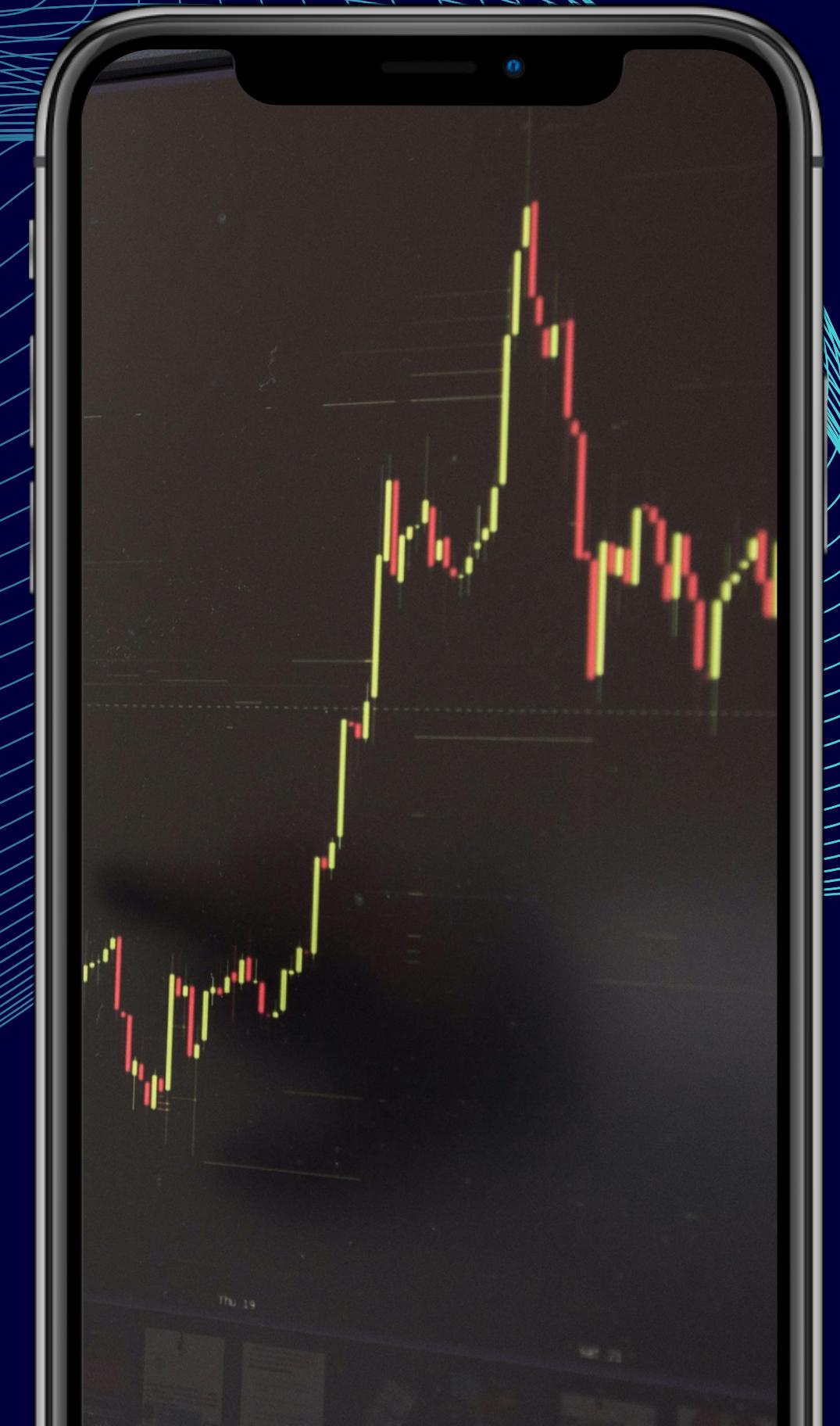
Goal # 3

Show portfolios with different asset allocation:

Conservative: 3% of capital/cash

Moderate: 5% of capital/cash

Aggressive: 10% of capital/cash



DEMONSTRATING ITS EFFECTIVENESS IN PREDICTING TRADING DECISIONS ACROSS THE DATASET.

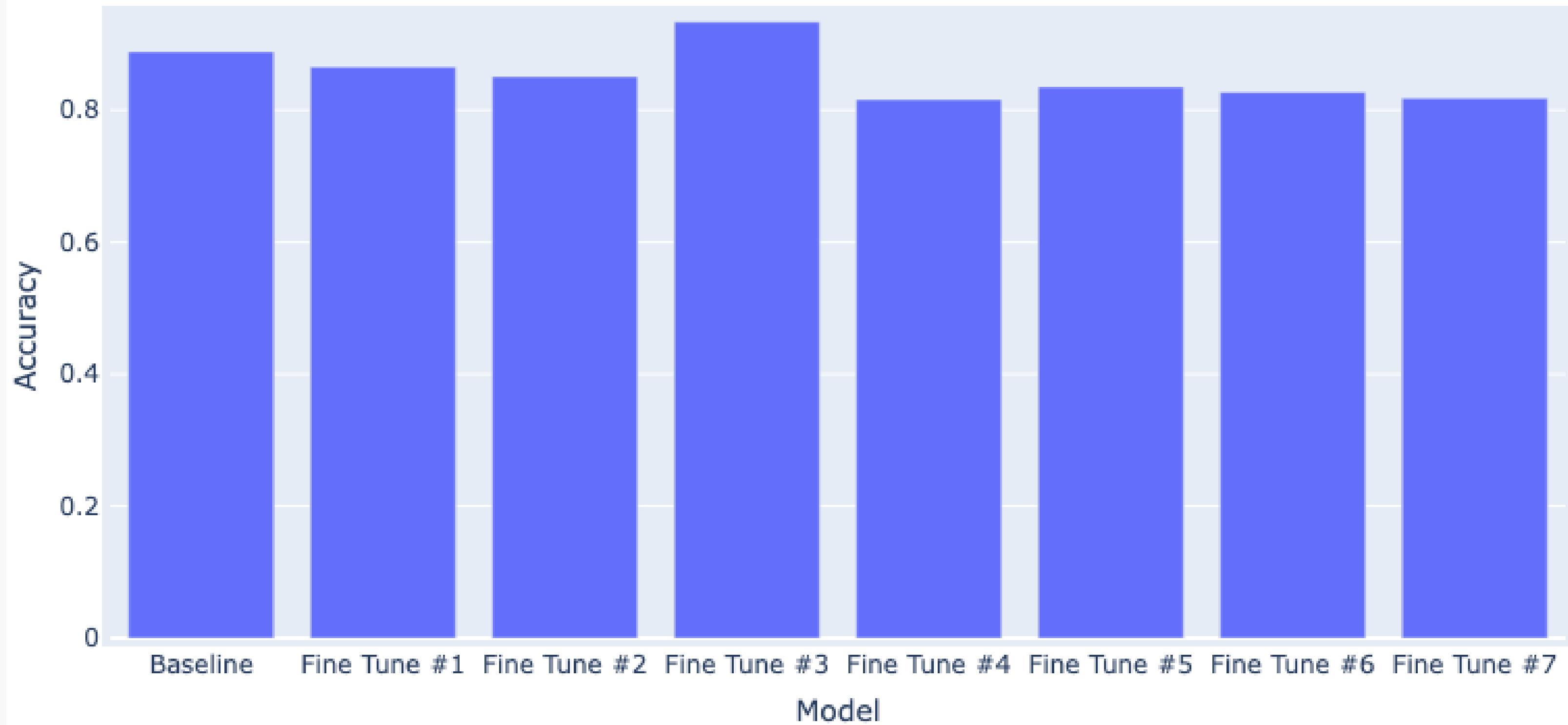
The model relies on RSI and Stochastic values to predict when to buy, hold, and sell.

The experiment involved analyzing different types of accounts by adding constant ratios of stock/cash outside of trades. The experiment adjusted the initial amount of shares the account held, as well as the amount of shares bought, to illustrate varying stock/cash holdings and trade sizes used by conservative, moderate, and aggressive algorithms.

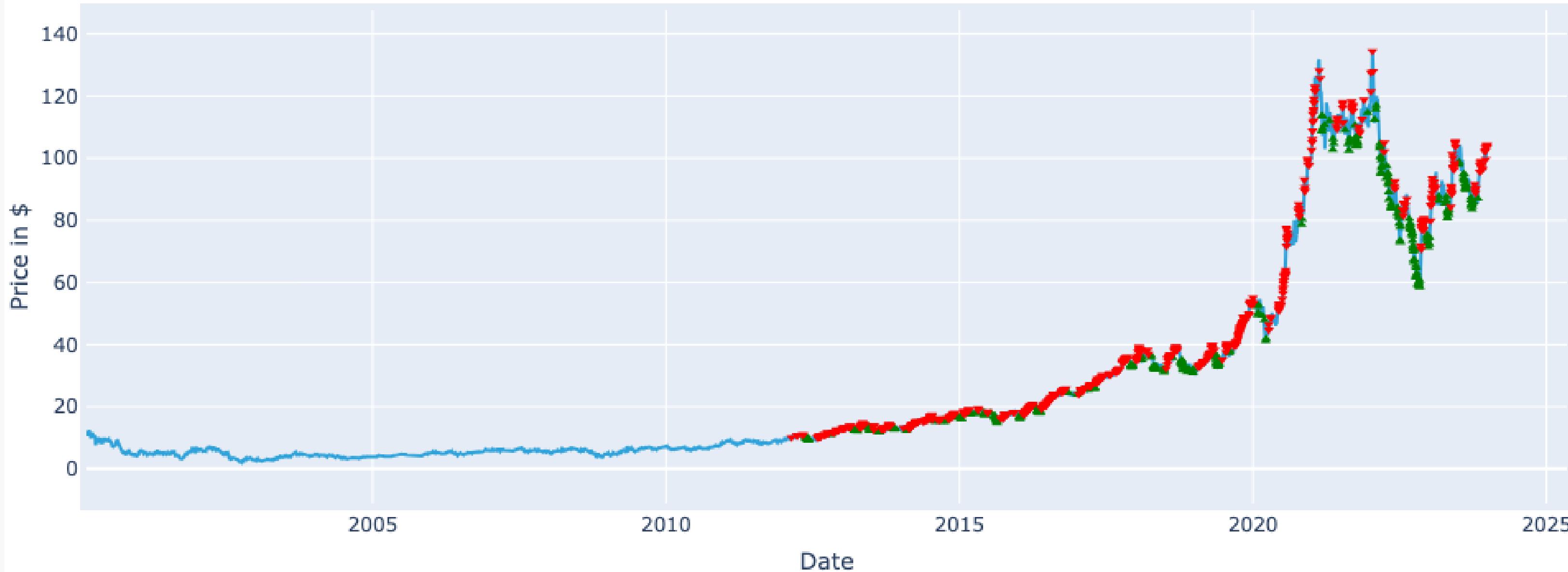
Weighted Average Accuracy

0.81

Model Accuracy



Model Entry and Exit Positions



Portfolio Allocation

Portfolio Balances

The amount bought per trade is adjusted based on the portfolio balance:

- Conservative 20% TSM stock : 80% cash/capital
- Moderate 60% TSM stock : 40% cash/capital
- Aggressive 80% TSM stock : 20% cash/capital

Once the final model is chosen, shares are bought and sold according to the specified buy and sell signals and portfolio management rules.

Aggressive

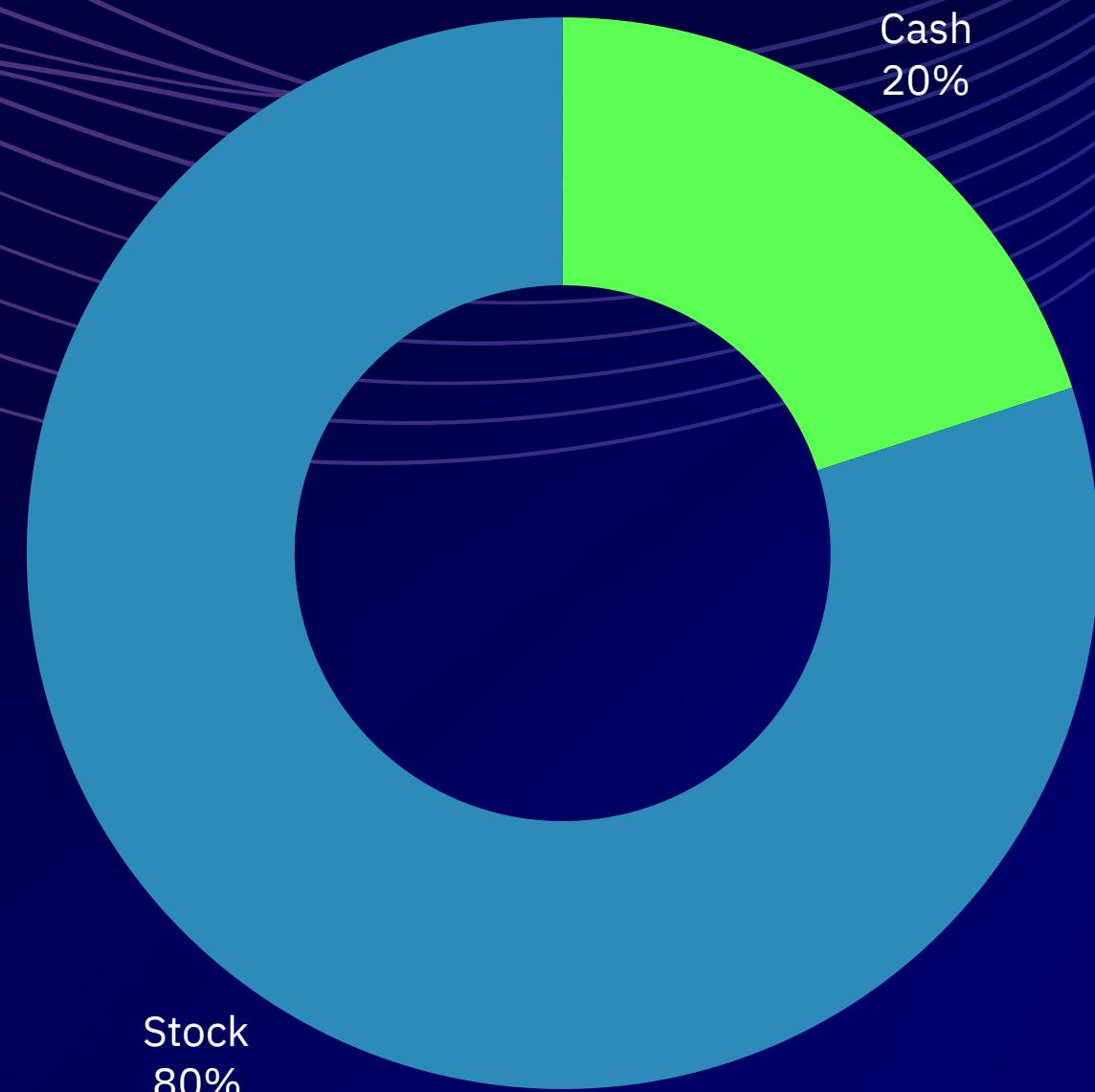
80/20 Aggressive 10% per trade

Final Balance:

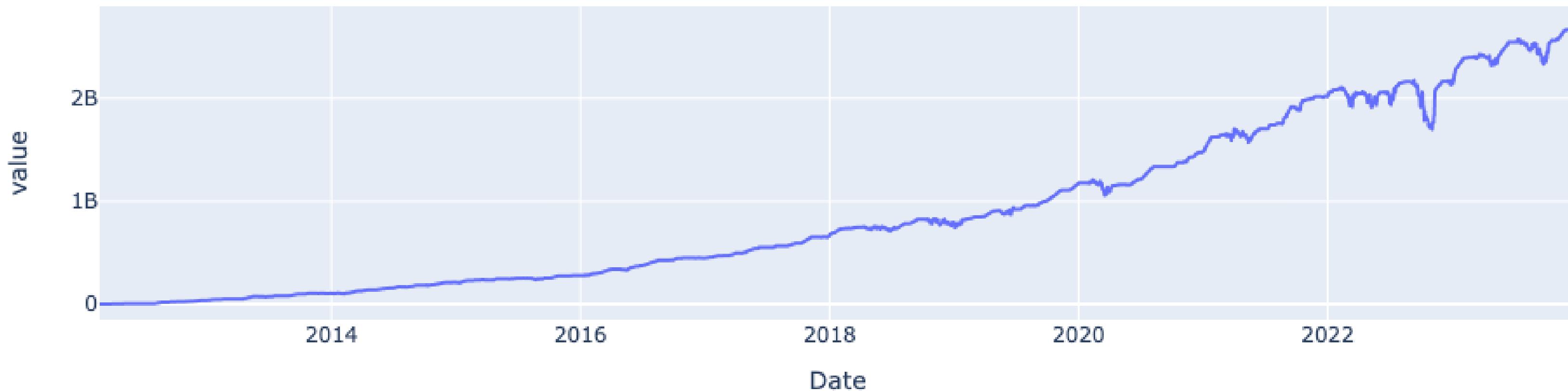
2740786756.575409

Profit/Loss:

2740686756.575409



Predicted Account Value



Moderate

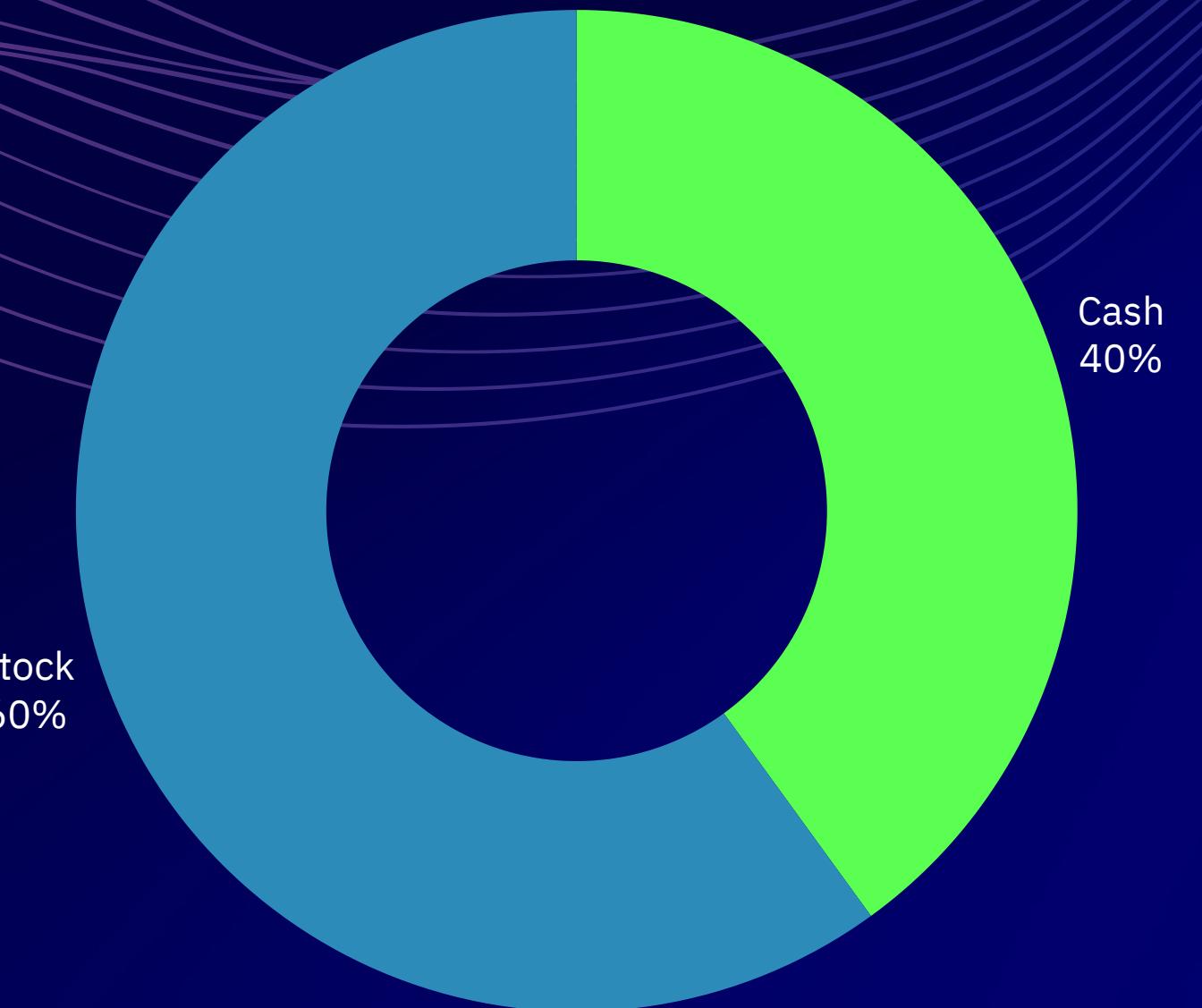
60/40 Moderate 5% per trade

Final Balance:

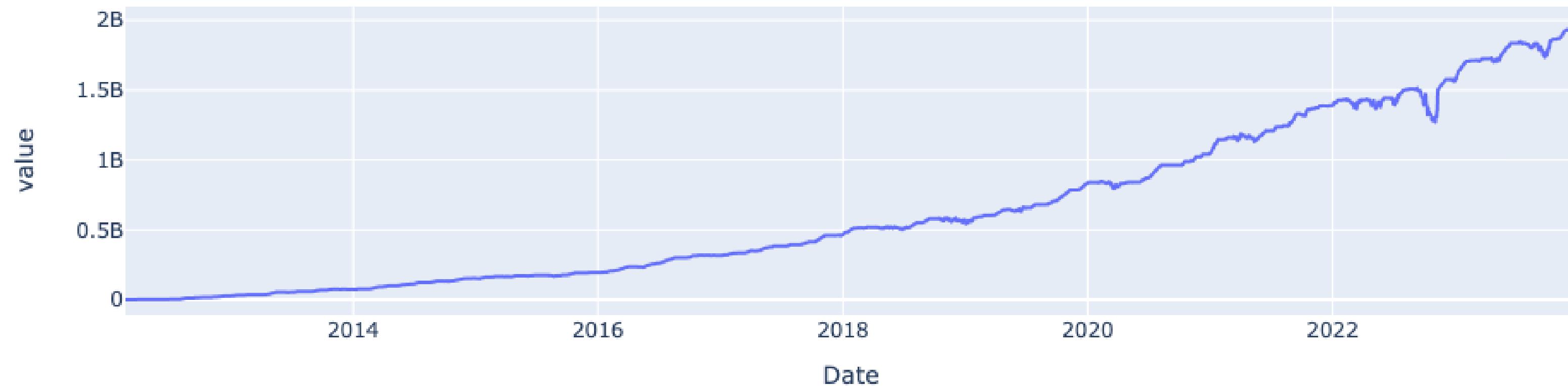
1989445834.066721

Profit/Loss:

1989345834.066721



Predicted Account Value



Conservative

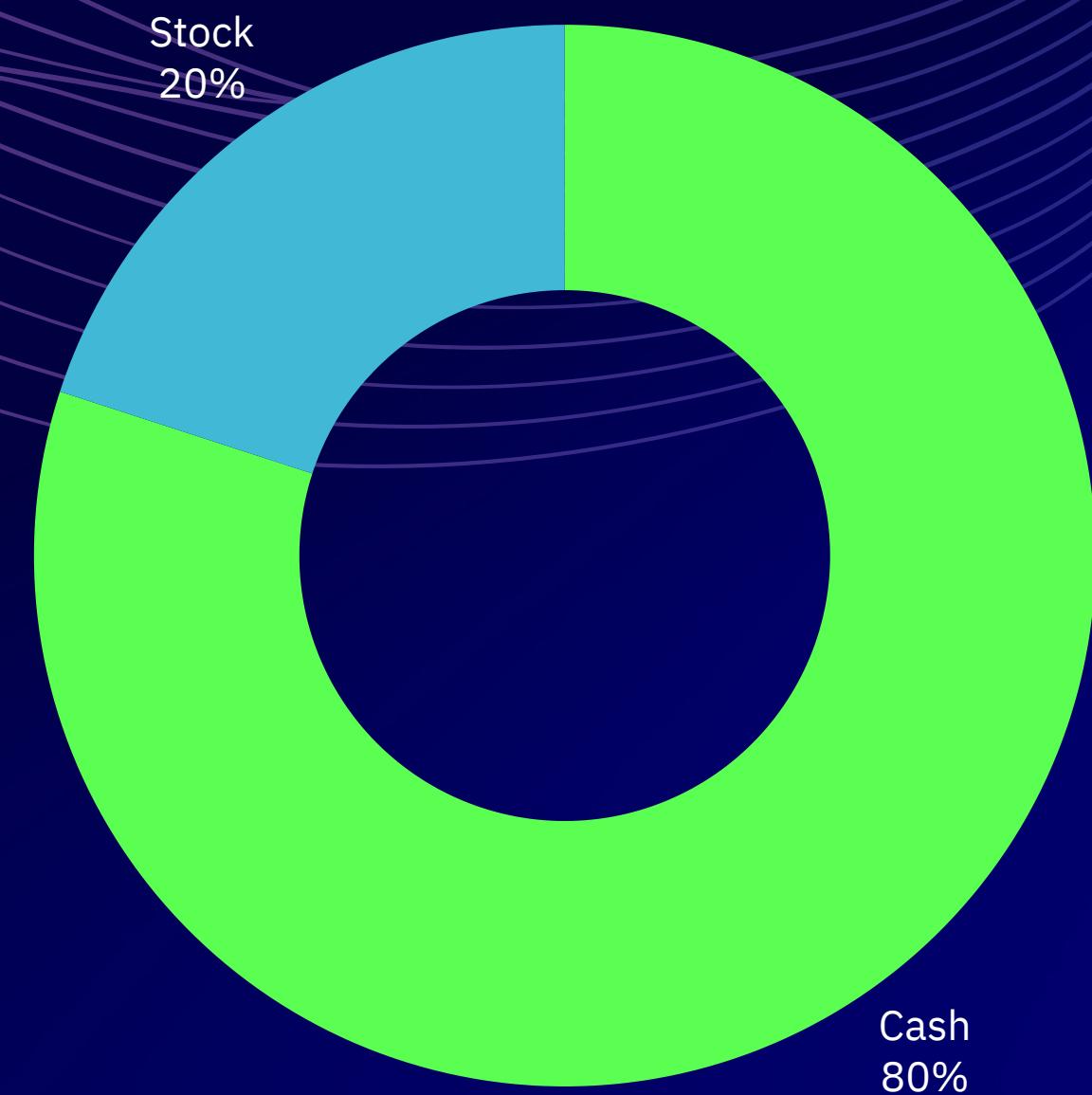
20/80 Conservative 3% per trade

Final Balance:

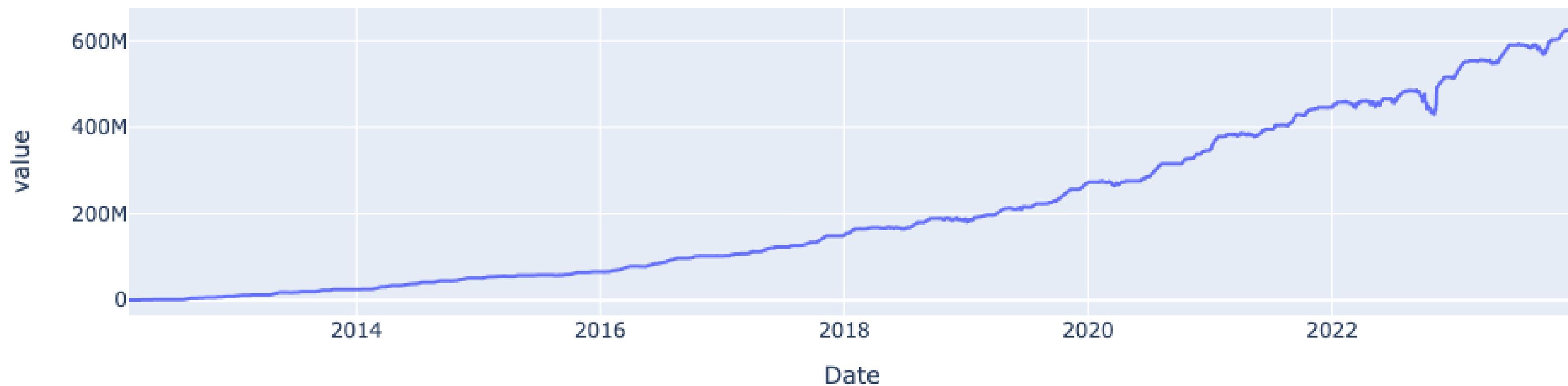
1989445834.066721

Profit/Loss:

1989345834.066721



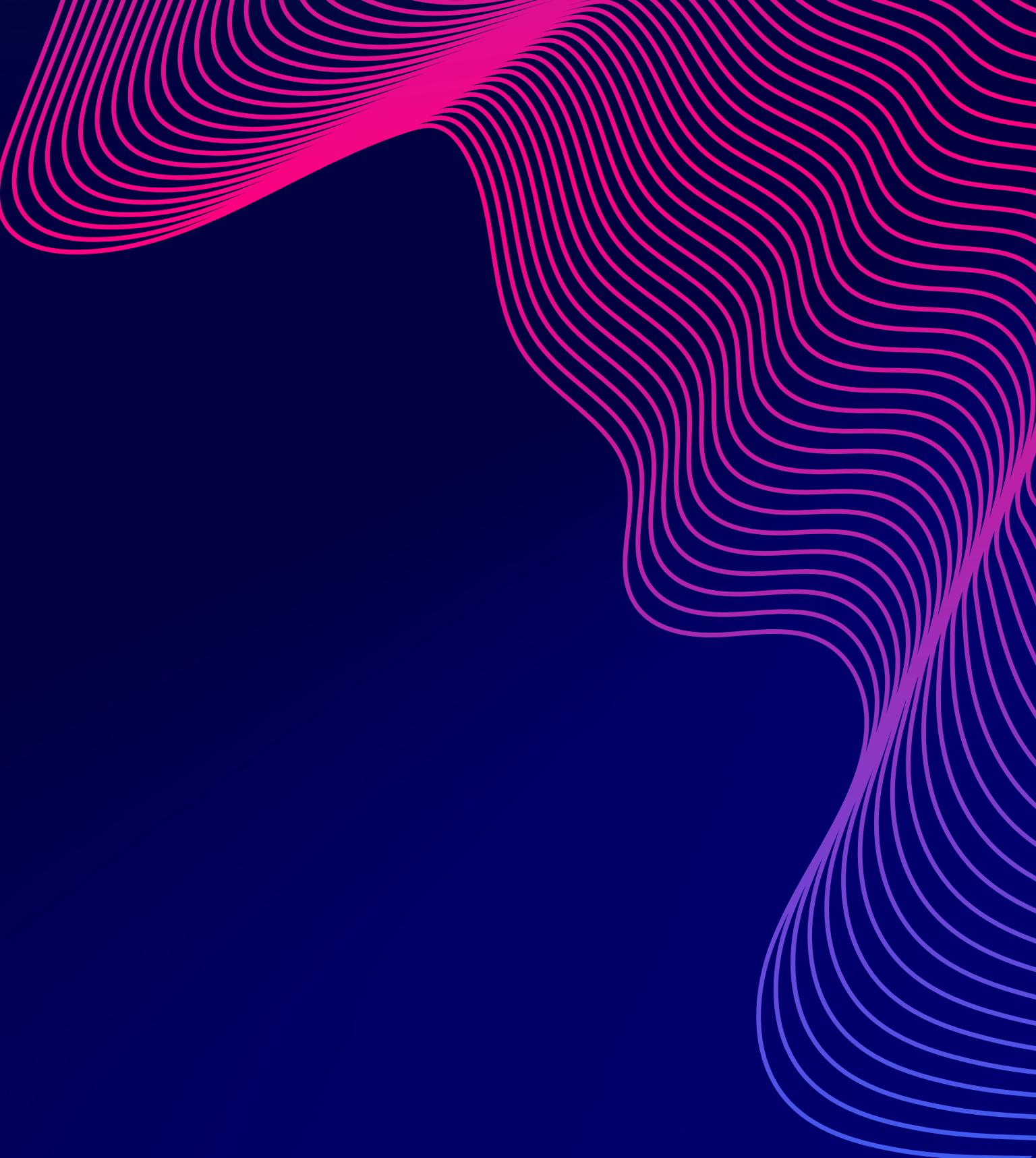
Predicted Account Value



Issues and Challenges

Thank - you

Questions welcome !



Resource Page

1

Jansen, S. (2020). Machine Learning for Algorithmic Trading - Second edition.