

Stockminer

An application to guide financial decision making

*Application is not intended for financial advice and should only be considered for educational purposes

Warren Borders, Hande Pehlivan, Peter Hope, Lirsan Myrtaj, Anuj Patel, Vi Nguyen

Summary

Stockminer is an application designed for those interested in investing and having a go-to application that can assist with understanding different financial models and the investment decision making processes. The current iteration of this application utilizes strictly historical data to run various calculations on stocks to educate investors on which stocks to consider adding to a portfolio. Future iterations will include enhanced interactive features with more financial models/algorithmic features and possess the ability to utilize real-time data.

Our Approach

The approach for creating this application relied on heavily leveraging pre-existing financial models and illustrating their functions in the application as well as how they work to complement each other. This is intended to improve an investors understanding of how to analyze and build a portfolio and the metrics and definitions to do so. The use of explanation, and interactive visualization combined helps users build financial understanding and intuition as to how one metric can influence another, is what makes the approach novel. The models used are the same kinds of models favored by financial professionals to build the product offerings they typically recommend.

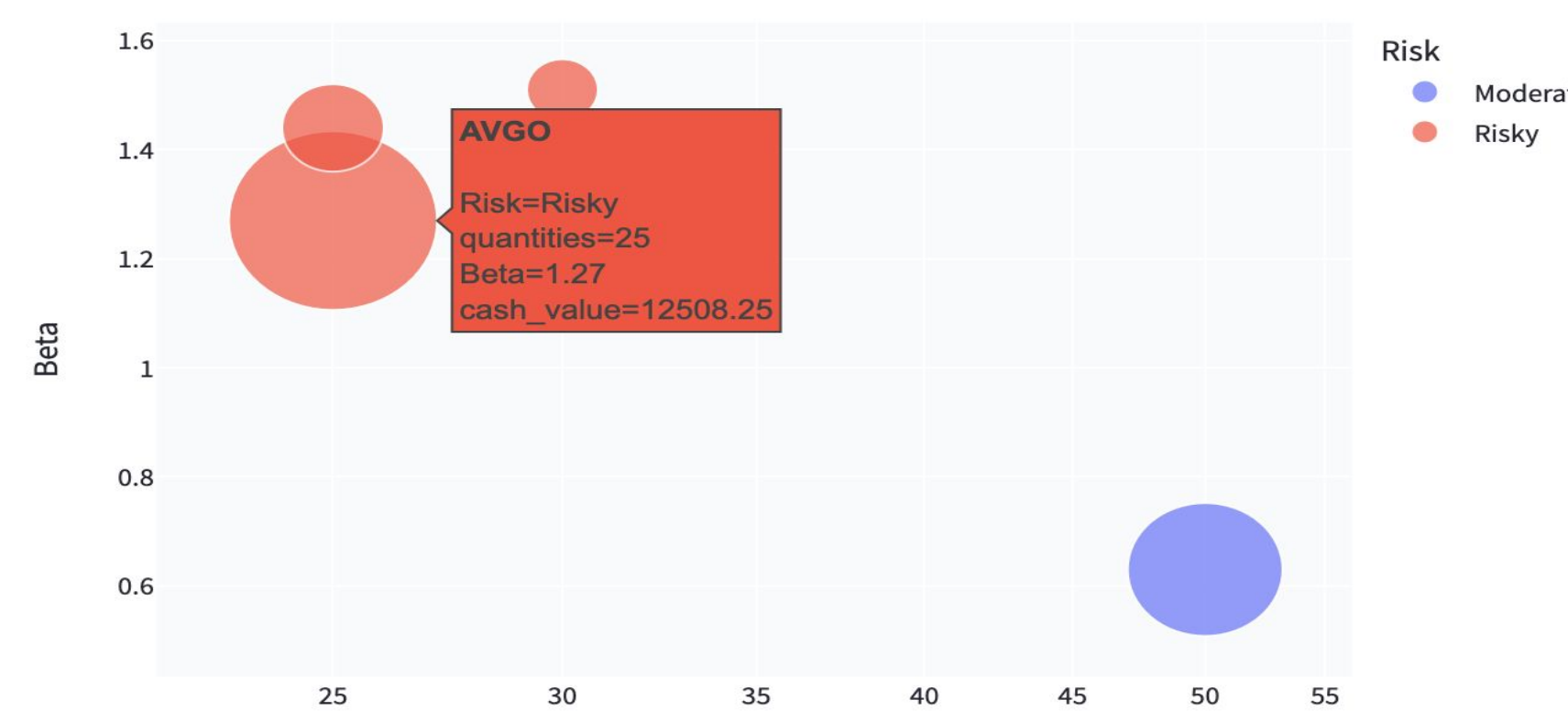


Figure 1. CAPM

The Capital Asset Pricing Model (CAPM) utilizes a formula to enable the application to calculate risk, return, and variability of return to a benchmark. This variability factor will prove helpful for various calculations, such as understanding market risk versus expected returns. If the beta equals 1.0, the stock price is correlated with the market. When the beta is smaller than 1.0, the stock is less volatile than the market. If the beta is greater than 1.0, the stock is more volatile than the market.

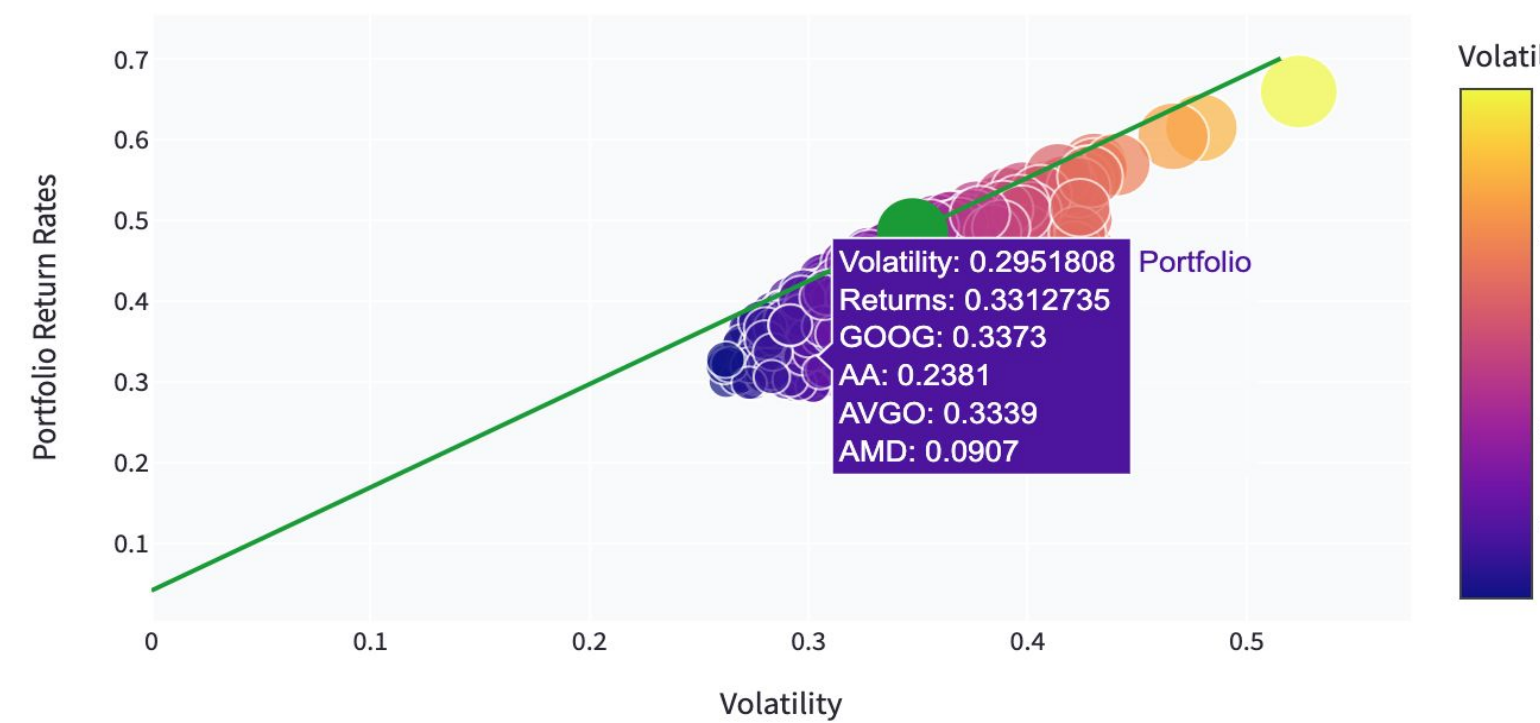


Figure 2. Efficient Frontier

The Efficient Frontier maps the return vs volatility for different weight combinations of portfolio assets, which allow us to construct a portfolio for a target (optimal) return and volatility depending on the user's level of risk aversion.

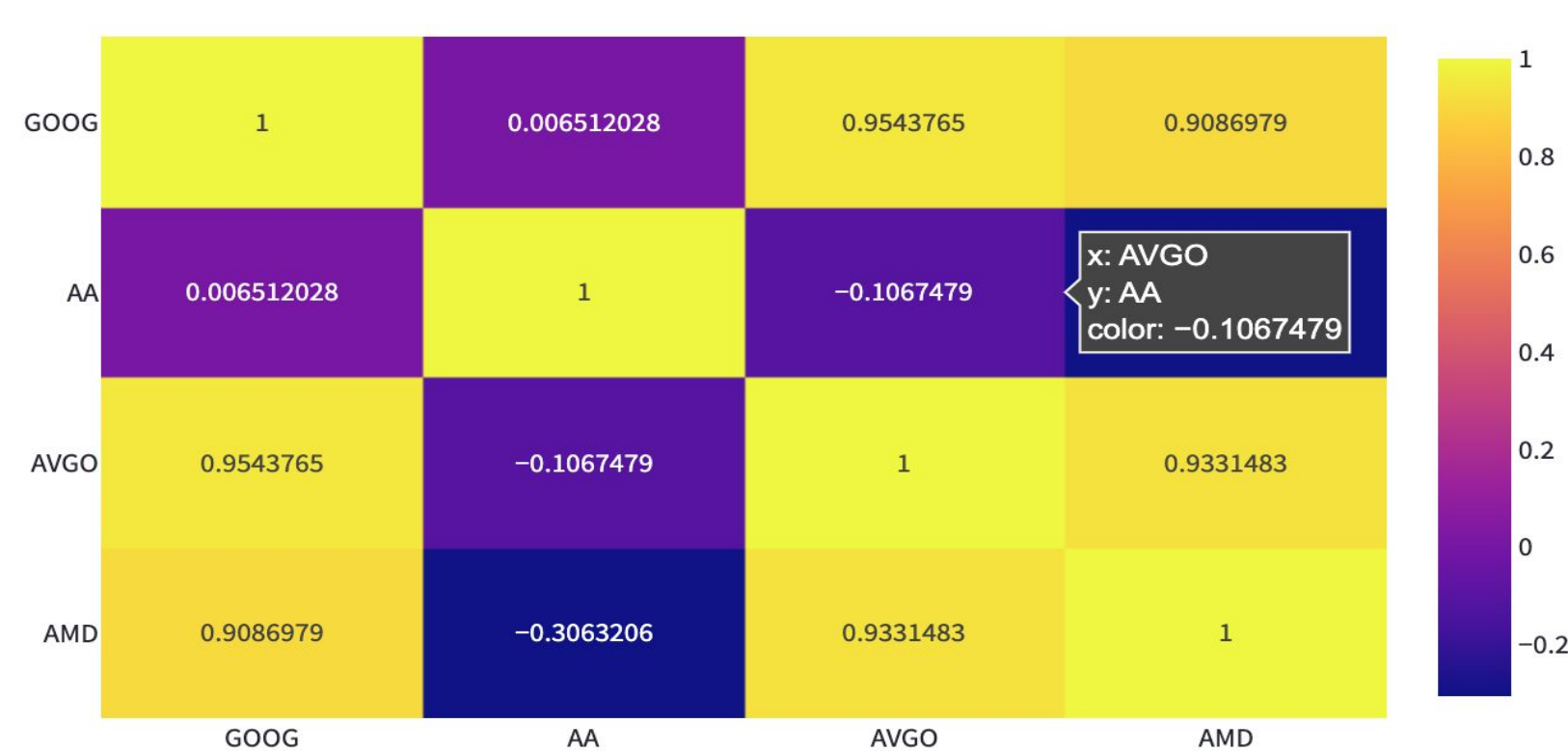


Figure 3. Correlation Matrix

This is a snapshot of the correlations (range 0 to 1) and visualize patterns between all the assets in a portfolio. This is also a diagnostic tool for more advanced analysis models. If a portfolio is highly correlated then estimates using regression models such as Beta, and Utility functions are less reliable.

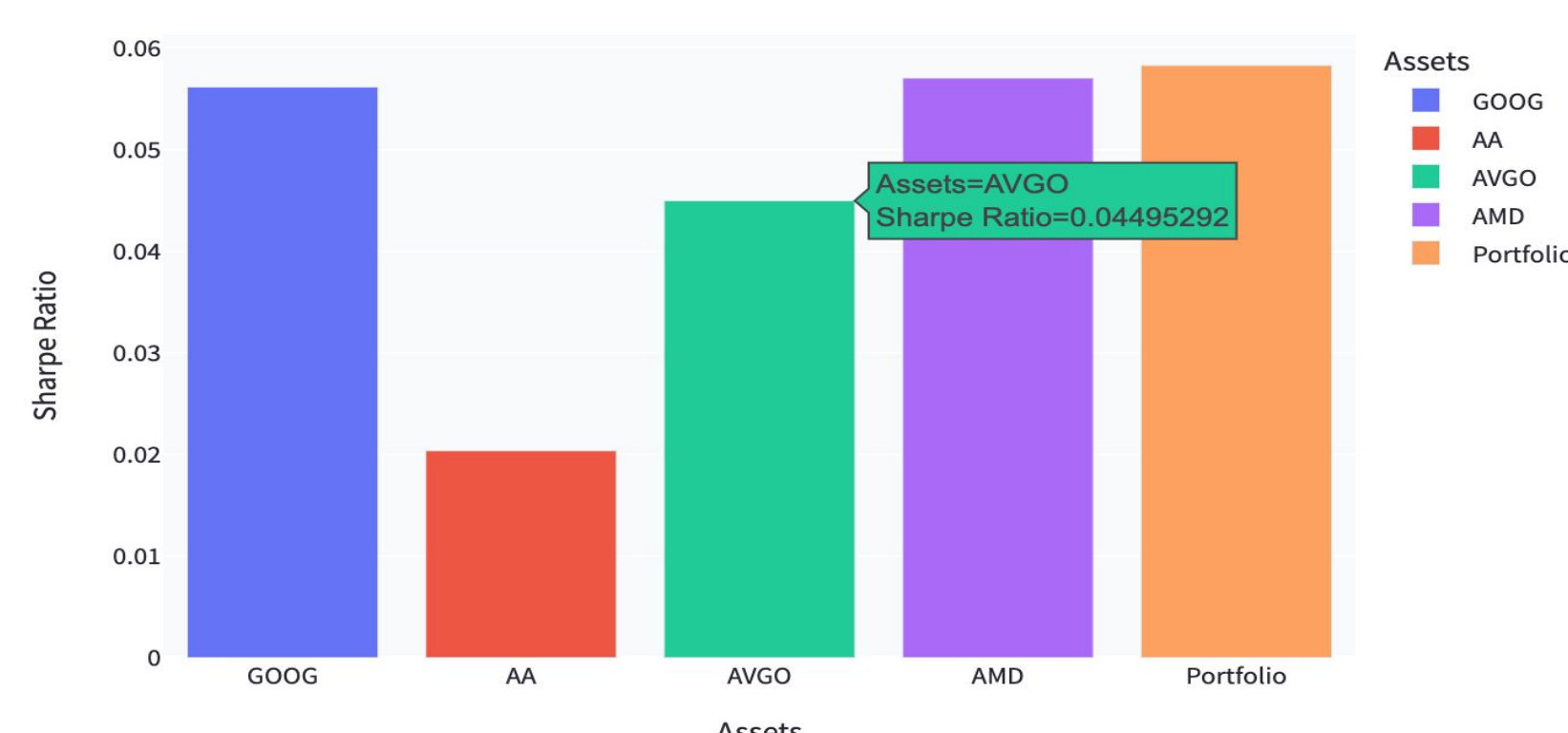


Figure 4. Sharpe Ratio

The Sharpe Ratio represents the excess return of a single or many financial assets versus their volatility or measure of risk. Ratios above 1.0 are generally considered "good" because, historically, the asset has provided excess returns compared to the measure of risk.

Motivation/Introduction

The climate of the stock market has changed drastically over the last few decades, whereby more novice investors have entered the market without tools, feedback, or financial knowledge for investing. Stockminer will analyze historical stock price data and illustrate beneficial relationships through dynamic visualizations to educate investors. Through interactions with the platform, investors can easily understand the underlying function of financial models. Stockminer, has the potential to help investors learn to make better-informed decisions and manage risk to reach their financial goals.

Data

5 year historical stock data collected by downloading from simfim.com. The dataset includes eleven columns named Ticker, SimFinId, Date, Open, Low, High, etc. ~3.1 million rows and ~ 215 megabytes on disk.

5 year historical S&P 500, AOK, and IXIC equity indexes scraped from Yahoo Finance using Python and Pandas. The datasets include Date, Open, High, Low, Close, etc. ~105.5 kilobytes on disk.

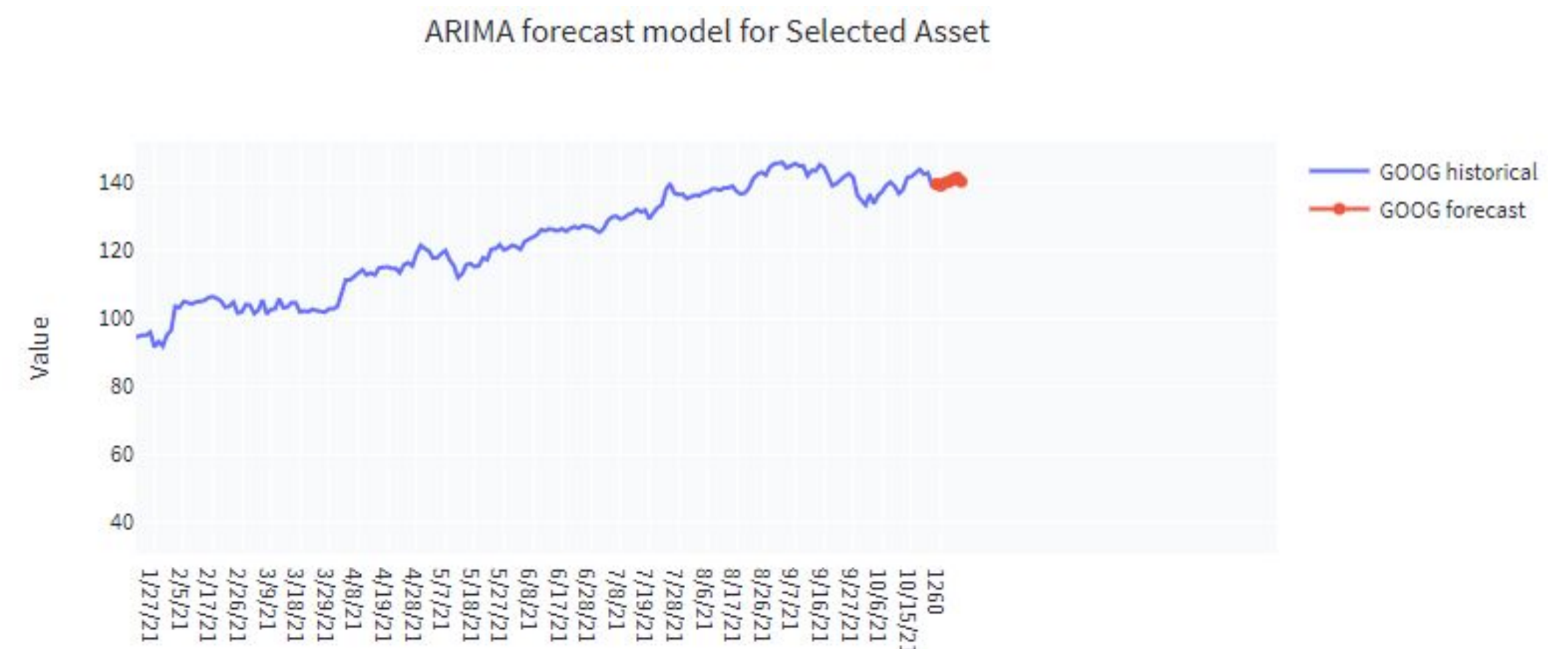


Figure 5. ARIMA

The Autoregressive Integrated Moving Average is a model the application will incorporate to forecast the prices of the assets that the user specifies based on historical data. The forecast will give 7 days of future daily price predictions within a 95% confidence Interval using the previous 21 data points to predict.

Evaluation and Results

Currently, investors need to find a financial advisor, human or algorithm. Otherwise they need to consume large amounts of computer and finance theory to develop an understanding of how to make an informed decisions in the market. Those methods are time consuming and expensive. We are offering investors free tool to make more informed financial decisions.

We created an on-going survey, and so-far collected 9 responses. We decided to use surveys to assess the background and knowledge understanding of our end-users. 77.8% of our respondents are investment novices. They used the Stockminer app hosted on HuggingFace.com to analyze stocks that they are interested in and a summary of their feedback is below.

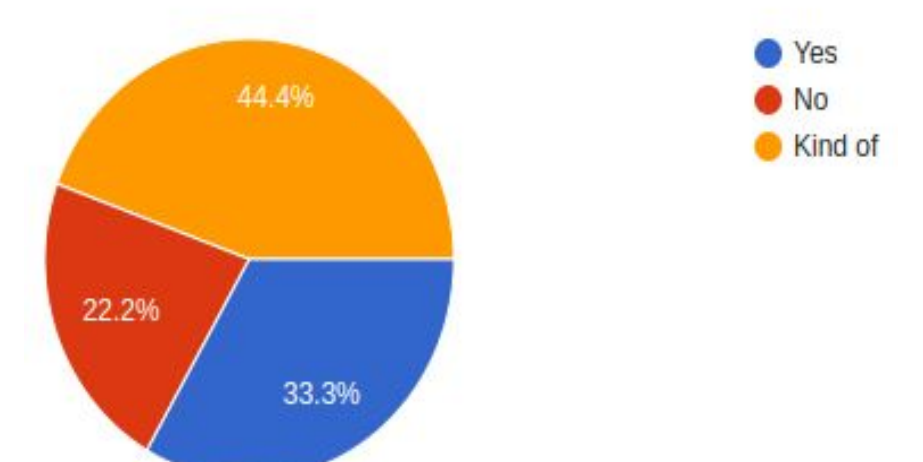


Figure 6. Stock Miner helped improve understanding of financial concepts

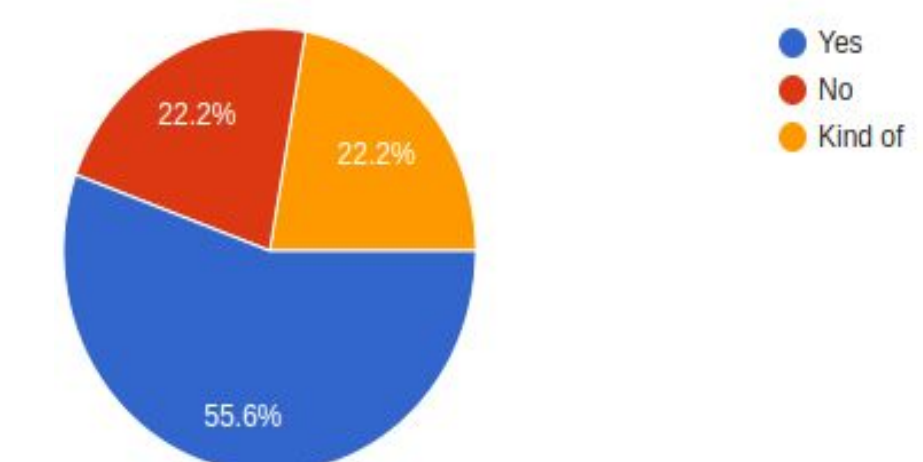


Figure 7. Stock Miner helped improve Intuition of application of financial concepts

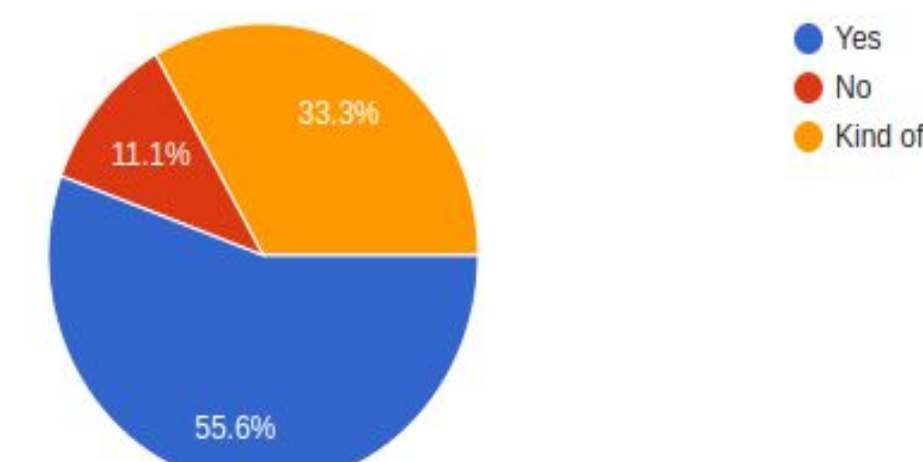


Figure 8. Stock Miner helped improve evaluation of risky stocks and mitigate risks

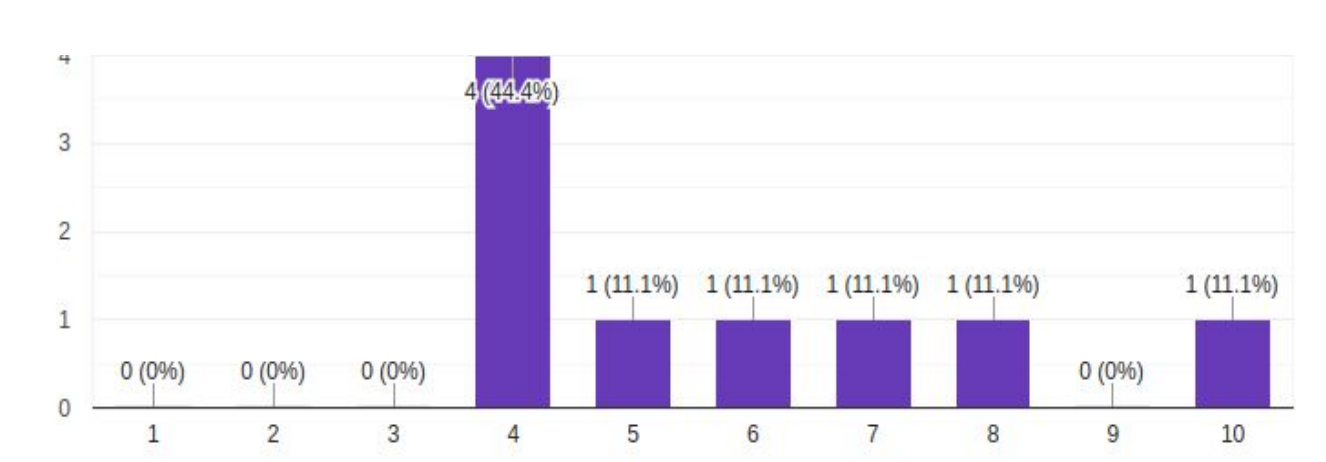


Figure 9. Likely to recommend Stock Miner to others (10-very likely)

The majority of the respondents are interested in sectors such as: healthcare, technology, science, medicine, energy, finance, sustainable energy, and cryptocurrency. We will keep their interests in mind as we make improvements. In addition we received valuable feedback on how to improve organization, readability, retainability of information for users of Stockminers as well. We plan to incorporate all these feedbacks in the future.

Conclusion

The prototype application, Stockminer, has proved users can utilize models for stock analysis purposes to research options for investments within their portfolios. Further analysis of feedback training will need to be implemented to allow our team to determine if the users are learning from their experience by utilizing the application. Stockminer was designed explicitly for the user to gain knowledge from their investment and not necessarily utilize this information for financial advice. After using the application, a user survey is provided to gain further insight into fine-tuning the application's learning components.