

# December 2024 S&P 500 Closing Price Prediction

## Application for an Analyst Position at CAMSIF

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### Abstract

Having been tasked with forecasting the closing price of the S&P 500 at the end of 2024, I used a time series analysis through Meta's Prophet API. The data came from Federal Reserve Economic Data (FRED) and Yahoo! Finance (yfinance) via their respective APIs. This computational analysis was more of a sanity check than a granular prediction so that I could roughly look at the current trends within the S&P 500 data. My analysis would suggest that we will be looking towards the high 4000s and low 5000s at the end of 2024.



Figure 1: Plot of the S&P 500 data with its regressors

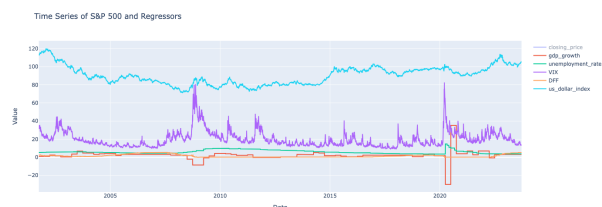


Figure 2: Zoomed in plot of the S&P 500 data with its regressors

### 1. Introduction

To forecast the closing price at the end of 2024, using Meta's Prophet API, I used the following regressors: US GDP growth, US unemployment rate, the volatility index, the Federal Reserve's fund rate and the US dollar index.

The data related to the S&P 500 and the regressors I chose can be seen in figures 1 and 2, respectively. These plots were produced after gathering and processing the required data, where the end product can be seen in figure 3.

In the following paragraphs, I will discuss the most pertinent of the variables that I have considered and how they link to the current economic climate and outlook.

	ds	closing_price	gdp_growth	unemployment_rate	VIX	DFF	us_dollar_index
5965	2023-09-19	4443.950195	3.2	3.8	14.11	5.33	105.199997
5964	2023-09-18	4453.529785	3.2	3.8	14	5.33	105.199997
5963	2023-09-15	4450.319824	3.2	3.8	13.79	5.33	105.32
5962	2023-09-14	4505.100098	3.2	3.8	12.82	5.33	105.410004
5961	2023-09-13	4467.439941	3.2	3.8	13.48	5.33	104.769997

Figure 3: Data obtained from FRED and yfinance

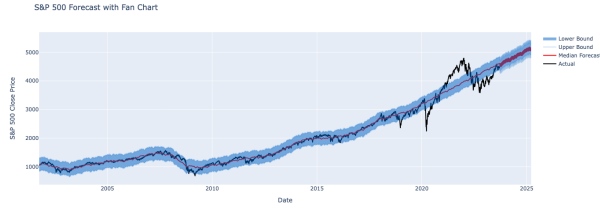
### 2. Rationale for Regressors

In this section, I will discuss the rationale behind three of the five regressors I find to be most relevant right now.

First, US GDP growth. Given that the fears of a recession have been lessening as 2023 passes, I believe that the current trend in GDP growth would be important to include, as this could mean that the data is now becoming more unlikely to undergo drastic change. My thinking for this comes from Goldman Sachs' recent cut on the chance of a US recession in the next 12 months from 20% to 15%. This statistic is likely to have an impact on the closing price of the S&P 500 as consumer spending is a big component of this statistic, which in turn influences corporate earnings.

Second, the Federal Reserve's fund rate. According to the CME FedWatch Tool, the probability of an increase in the Federal target rate at the next FOMC meeting is at 25.5%. This may suggest that they are not very likely to raise rates. Therefore, this could mean having rates unchanged again. This convinced me to include it as a regressor as a drop in the rate of increase in rates could influence the model in a way to suggest that monetary policy is not becoming tight as fast as before. This data is likely to influence the S&P 500 as borrowing costs for corporations will be affected.

Finally, the VIX. This would track the volatil-



**Figure 4:** Result of the forecast



**Figure 5:** Visual distribution of the closing price

ity of the S&P 500 and so allow us to capture this in our forecast.

### 3. Results

In figure 4, we can see the result of the forecast I have made in the form of a fan chart, and in figure 5 we can see a visual probability distribution of the closing price at the end of 2024. The result of this forecast would suggest that we may see the closing price hit the low 5000s or very high 4000s.

### 4. Discussion

Admittedly, using time series analysis is probably not the most reliable way of going about making a confident forecast. Past data does not necessarily imply what will happen in the future and current relationships between the regressors and closing price is not guaranteed to remain relevant. Perhaps implementing a machine learning model or a hybrid could be useful for further analysis. Back-testing and comparing performances could also potentially help. However, this also comes with its own set of problems. It is just the nature of trying to predict financial markets!

### 5. Conclusion

My analysis generally agrees with that of professionals in the field and is not overly optimistic or pessimistic compared with firms like Oppenheimer Asset Management. It would certainly be interesting to see where the S&P 500 will be.