

S&P 500

Time Series analysis

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1. Introduction

The S&P 500 (Standard & Poor's 500) is a market index representing the stock performance of 500 large companies on US stock exchanges. It's widely regarded as the best single gauge of large-cap U.S. equities and a key indicator of the health of the economy. This report is an analysis of the S&P 500's daily closing prices from 1950 to 2020 taken from Kaggle [1], aiming to uncover trends, seasonal variations, and forecast future closing prices for the next year.

2. Explanatory Data Analysis

By looking at figure 1 we can see that the data has some exponential trend so we will continue the analysis and the rest of the work with the Log close price which has a more linear trend (figure 2)

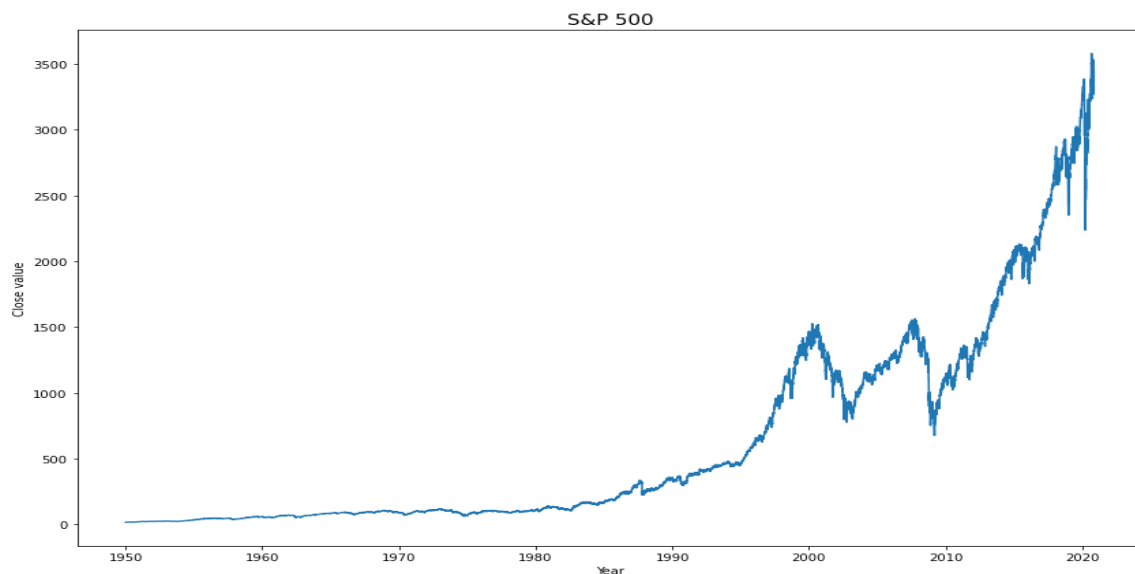


Figure 1: Close price of the S&P 500 stock index each day from 1950-2020

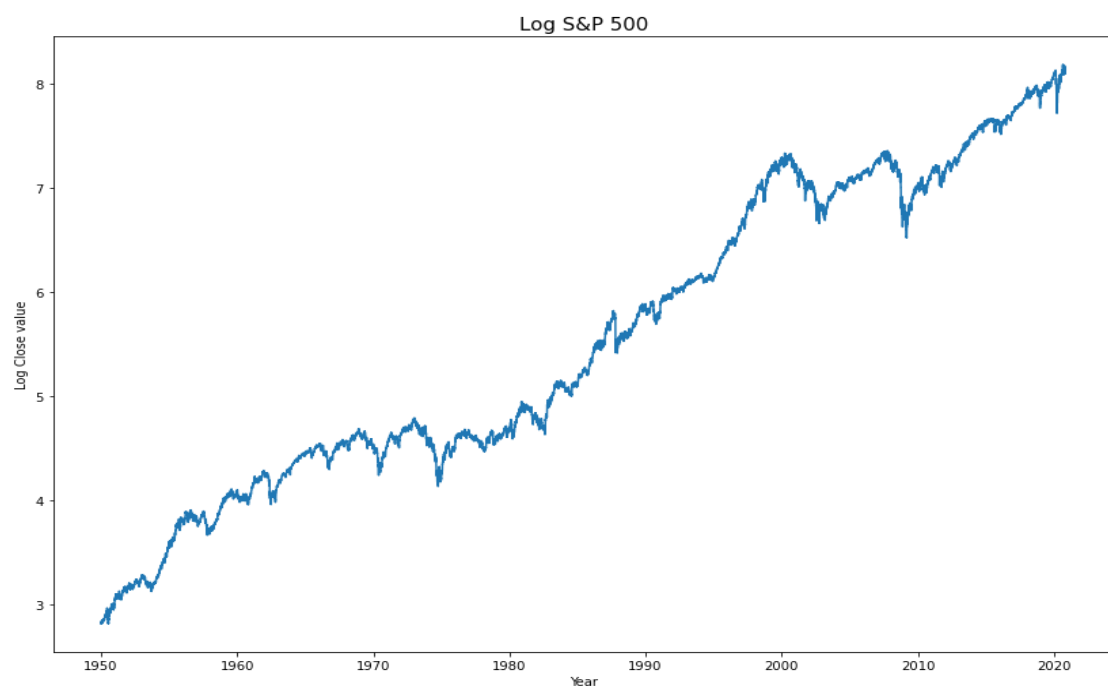


Figure 2: Log close price of the S&P 500 stock index each day from 1950-2020

By looking at the decomposition of the time series with a yearly period (figure 3) we can see that there is some seasonality over the year and that the general trend of the data is upwards with a high noise. The magnitude of the seasonality is very low ($-0.02 - 0.01$) which suggests that although its present it does not dominate the S&P 500 movements.

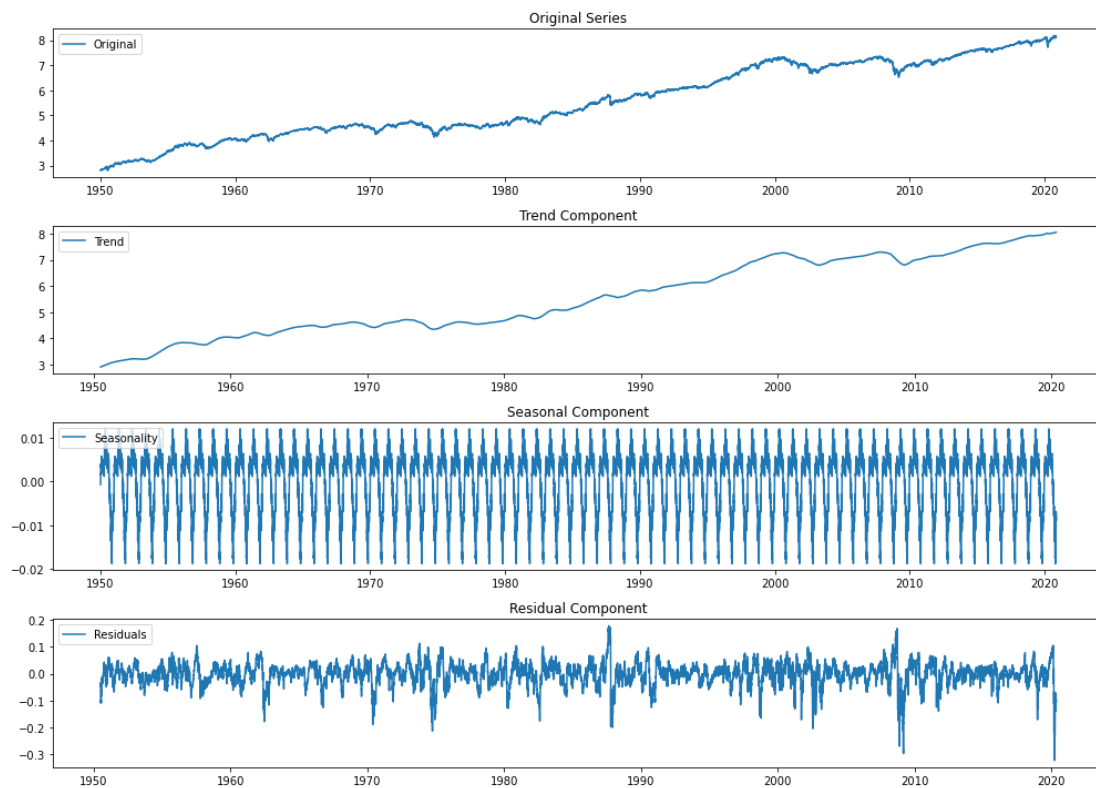


Figure 3: Break down of S&P Log Close price into Trend, Seasonality and Residual. with a period of 365 days.

Taking a closer look at the seasonality (Figure 4) we can see that the start of the year tends to have greater price than the end of the year, this correlated with the “Sell in May and go away” phenomenon [2] which claims that the stock market historically underperforms at the summer months May - October.



References

[1] <https://www.kaggle.com/datasets/henryhan117/sp-500-historical-data/data>

[2] Bouman, Sven, and Ben Jacobsen. 2002. "The Halloween Indicator, "Sell in May and Go Away": Another Puzzle ." *American Economic Review*, 92 (5): 1618-1635.DOI: 10.1257/000282802762024683