Impact of the 2020 U.S. Presidential Election on the S&P 500 and Nasdaq Indices

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Abstract. The study explores the impact of the large political event of the 2020 U.S. presidential election on the S&P 500 and Nasdaq indexes amid a backdrop of deep political and social divisions exacerbated by the COVID-19 pandemic. The study uses the ARIMA model to conduct in-depth analysis to assess the volatility and performance of these indices before and after the election, with the aim of understanding changes in market sentiment. The research reveals different market performance and sentiment changes under such political evensts, providing insights into specific industry reactions. The findings highlight the impact of elections on market trends and investor behavior, providing novel insights for investors and policymakers dealing with market uncertainty during major political events. This study highlights the importance of considering the impact of political events in financial market analysis and contributes to the literature by focusing on the performance of specific indices and employing advanced forecasting methods to predict market movements.

Keywords: 2020 U.S. Presidential Election, S&P 500, Nasdaq Indices, Market Volatility, ARIMA Model.

1. Introduction

The presidential election, which occurs every four years, is a very important political event in the United States. The 2020 U.S. presidential election is arguably one of the most important political events in U.S. history in the last decade, attracting global attention because of its unique and significant political context, circumstances, and far-reaching implications. This is because the election was taking place against the backdrop of a deeply politically and socially divisive context in the United States, with heated debates around issues such as immigration, healthcare, environmental policy, and racial equality, which were further exacerbated by the COVID-19 pandemic. The election is between current Republican President Donald Trump and Democratic challenger Joe Biden [1].

Donald Trump, entrepreneur and television personality, was elected President of the United States in 2016. Throughout his presidency, Trump is known for implementing controversial policies and displaying a unique leadership style. Joe Biden is a seasoned politician with extensive experience in politics, foreign affairs, and social policy. He served as Vice President from 2009 to 2017. The impact of this election was significant because the public health crisis (COVID-19) posed unprecedented challenges to the organization and procedures of the election, leading to an expansion of mail-in voting and early voting adjustments. The 2020 U.S. presidential election was dominated by discussions about how the economy could recover, how to address jobs, and how to develop and modify trade policies that would give the United States a significant role in international affairs. Role.

In recent years, a considerable amount of scholarly work and analysis has been devoted to exploring how significant political milestones, like the U.S. presidential elections, influence the stock market. Furthermore, there are relatively few studies analyzing the impact of election results on the S&P 500 and Nasdaq. Especially in a highly controversial election such as the 2020 U.S. presidential election, the existing literature mainly focuses on the impact of the election results on the fluctuations of the entire industry, and lacks in-depth analysis of the S&P 500 Index and the Nasdaq Index. Research, especially the impact on specific post-election policy measures.

Compared with other current literature, this study conducted more in-depth research and analysis. The study provides an in-depth analysis of the impact of the 2020 U.S. presidential election results

on the S&P 500 Index and the Nasdaq Index, thereby drawing conclusions about the differential performance of the two indexes before and after the U.S. presidential election and the changes in market participant sentiment before and after 2020. The study was conducted by examining the volatility of both indices before and after the election, as well as the likely performance of the financial sector and companies following the election results. Through this research, investors can better understand the impact of the election results on the stock market and provide a more accurate basis for their decision-making.

Developed in the 1970s by George Box and Gwilym Jenkins, the ARIMA model employs mathematical methods for time series forecasting and modeling to lower the rate of duplication. Often referred to interchangeably with the Box-Jenkins method, this model aims to refine the accuracy of predictions by minimizing the discrepancy between modeled predictions and actual observations. Its utility lies in its ability to adeptly handle both stationary and non-stationary data series, offering a flexible tool for addressing different kinds of data variability. A stationary series is characterized by constant mean and variance over time, with covariance that solely depends on the interval between observations. In contrast, non-stationary series are subject to random fluctuations that can lead to changes in mean and variance, challenging the assumption of stationarity. This distinction highlights the ARIMA model's capacity to adapt to various types of time series, making it a versatile choice for forecasting in diverse situations. [2].

2. Literature Review

In the exploration of the impact of the 2020 U.S. Presidential Election on the S&P 500 and Nasdaq indices, a comprehensive review of literature highlights the significance of ARIMA models in forecasting market responses to major political events. ARIMA models, known for their capacity to model time series data by integrating autoregressive (AR), integrated (I), and moving average (MA) components, are particularly salient for understanding the nuanced dynamics of stock prices in the wake of political changes [3].

Dhaduk further elucidates on the application of ARIMA models in stock market forecasting, emphasizing the critical step of rendering the time series data stationary to bolster the model's predictive accuracy. This methodological rigor ensures that the ARIMA models can capture the underlying patterns in stock market data effectively, making it an indispensable tool in the financial analyst's repertoire for navigating market uncertainties precipitated by electoral outcomes [4].

Moreover, the literature extends beyond conventional econometric models to incorporate comparative analyses with alternative predictive frameworks, such as Markov-Switching and Fractionally Integrated GARCH models, which serve as a benchmark for evaluating the efficacy of ARIMA models in capturing electoral impact on market volatility [5]. This comparative perspective enriches the discourse on the methodological diversity in financial market forecasting, inviting a deeper inquiry into the suitability and robustness of various models in different political and economic contexts [5].

Integrating insights from various studies on the impact of U.S. presidential elections on financial markets reveals the multifaceted nature of how political dynamics can influence market performance. Historical analyses, such as those by S&P Global, illustrate the trend of positive returns during election years, emphasizing the complexity of correlating electoral outcomes with market performance due to the influence of broader economic and geopolitical factors [6]. Further research by the U.S. Bank extends this analysis over 75 years, highlighting the minimal long-term impact of election outcomes on markets compared to the significant role of economic and inflation trends, suggesting that underlying economic fundamentals are key in determining the market's direction over time [7].

Seeking Alpha's comparative analysis under different presidential administrations adds depth by showing that market trends are influenced by a combination of factors including fiscal policies and international relations, challenging the simplicity of attributing market performance to the identity of

the sitting president [8]. Nasdaq's real-time analysis underscores the dynamic relationship between political events and market movements, illustrating the immediate impact of political news on financial markets and the fluid nature of market sentiment [9].

Existing literature explaining the impact of the 2020 U.S. presidential election on the S&P 500 and Nasdaq illustrates the key role of the ARIMA model in predicting market reactions to major political events. The importance of stationary time series data to improve the forecast accuracy of ARIMA models is highlighted, demonstrating their integral role in coping with election-induced market uncertainty. Comparative analyzes with other forecasting models such as Markov switching and fractional integral GARCH provide a broader methodological perspective in assessing the effectiveness of ARIMA models relative to alternative models. Furthermore, this literature delves into the relationship between political events and market performance, showing that while elections influence market trends, broader economic and geopolitical factors play an important role.

3. Research Design

This study primarily aims to examine the effects of the 2020 U.S. presidential election on the S&P 500 and Nasdaq indices, focusing on the market fluctuations preceding and succeeding the election to determine whether distinct trends emerge in response to the electoral outcome. By analyzing these indices, the research seeks to identify any divergent patterns in market behavior, thereby understanding the broader implications of political events on financial markets.

3.1. Data Sources

The Nasdaq and S&P 500 data used in this article come from Investing.com. Investing.com is a website that provides comprehensive financial information and real-time news updates. It is currently the third largest financial and currency information portal in the world, covering a wide range of financial markets, including stocks, foreign exchange, commodities and cryptocurrencies. The website is known for its real-time data, analytical tools, and calendar of financial events. Today, Investing.com has become one of the most trusted sources of information for global financial market participants.

3.2. ADF Unit Root Test

A unit root test functions as a tool to detect the presence of a unit root within a dataset, indicating non-stationarity in the series. This situation suggests that the series does not maintain a constant mean or trend, showing variations in its variance and mean over time. When testing the smoothness of a sequence is important for sequence identification and prediction, for example: If the sequence exhibits smoothness, conducting a Granger causality test can reveal potential causal links between the variables observed; in cases of irregularity, opting for a cointegration test or employing difference, cointegration, and error correction models is advisable.

Table 1 ADF test

	t	p
Nasdaq		
Ln index	-1.509	0.8259
1st order difference	-7.523	0.0000
2nd order difference	-12.718s	0.0000
SP500		
Ln index	-1.830	0.6903
1st order difference	-7.235	0.0000

Table 1 shows the results of the augmented Dickey-Fuller (ADF) test for stationarity of S&P 500 and Nasdaq time series data. Test statistics are shown along with critical values for different confidence levels. According to the test in the above table, since the p-values of the Nasdaq first-

order difference series, the Nasdaq second-order difference series and the SP500 first-order difference series are greater than 0.05, this indicates that the time series data of these three series are stationary and suitable further analysis. The econometric analysis confirms that the data are ready for modeling and that there is no risk of spurious regression. For the Nasdaq logarithmic series and the SP500 logarithmic series, the test result p-value is less than 0.05, so the assumption of unit root does not exist and is not suitable for further analysis.

3.3. ARIMA Model Settings

ARIMA, which stands for autoregressive integrated moving average, is a forecasting technique that utilizes historical time series data. It operates on the principle of serial correlation, implying that previous observations have a bearing on future ones. This method is employed for analyzing time series data to grasp the dataset more effectively or to forecast upcoming trends [10].

$$y_t = \partial_0 + \sum_{i=1}^{p} \partial_i y_{t-i} + e_t + \sum_{i=1}^{q} \phi_i e_{t-i} \quad (1)$$

ARIMA can encompasses three primary components, each integral to its forecasting methodology. The "AR" part signifies autoregression, a technique that uses the dependency between an observed value and its historical counterparts to predict future values. This implies that the model leverages past data points to forecast upcoming values, essentially indicating that future observations are regressions of past data.

The "I" in ARIMA refers to integration, a critical step that involves differencing the data series to stabilize its mean, thereby rendering it stationary. Stationary data is characterized by unchanging statistical properties over time, including mean, variance, and autocorrelation, which are crucial for reliable predictive modeling. To verify that a data series has achieved stationarity, data scientists often employ the ADF test, a statistical procedure designed to test for stationarity.

Lastly, "MA" or Moving Average highlights the relationship between an observed data point and the residual errors from a moving average model applied to lagged observations. This component of the ARIMA model accounts for the influence of past forecast errors on current predictions, providing a method to smooth out data series by identifying underlying patterns in the residual errors.

Together, these components form the ARIMA model, a robust statistical approach used for time series forecasting that accounts for the dynamics of past data, ensures data stationarity, and integrates the impact of past errors for improved prediction accuracy [11].

4. Empirical Results and Analysis

The 2020 U.S. presidential election is a major event that may have broad implications for global financial markets. This study utilizes ARIMA models to understand the S&P 500 and Nasdaq index responses to elections, focusing on identifying autoregressive (AR) and moving average (MA) components to predict market movements.

The ARIMA model is key to time series forecasting and combines AR, I (for integration) and MA terms. In the process of forecasting, especially when using ARIMA models, the evaluation heavily relies on two essential graphical instruments: the ACF and the PACF. These diagrams play a key role in detecting the time-dependent relationships in the dataset. The ACF plot reveals the correlation between a time series and its lagged instances, shedding light on the autocorrelation pattern over various time delays. This is critical for grasping how much present values in the series are affected by previous ones.

Conversely, the PACF plot provides a more detailed perspective by showing the partial correlation between a series and its lagged versions, adjusting for the effects of the series at all shorter lag intervals. This distinction is crucial for determining the specific lags that have a direct relationship with the current value, independent of intermediate values. This helps in pinpointing the order of the AR component within the ARIMA model.

Apart from these graphical tools, choosing the best ARIMA model significantly depends on statistical measures like the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) [12]. AIC and BIC are metrics used to assess the comparative quality of statistical models for specific data. They weigh the fit of the model against its complexity, favoring models with lower scores as they indicate superior performance [13]. The AIC assesses the loss of information, offering a basis for comparing models, whereas the BIC incorporates a penalty for the model's number of parameters, encouraging simplicity and aiding in avoiding overfitting.

Together, ACF and PACF plots, along with AIC and BIC scores, form a comprehensive toolkit for model selection. This process ensures that the chosen ARIMA model not only captures the essential dynamics of the time series data but also remains parsimonious and generalizable to future data points.

4.1. Determine the AR and MA Orders

Figure 1 shows that ACF and PACF plots are shown for differential time series data for the S&P 500 and Nasdaq.

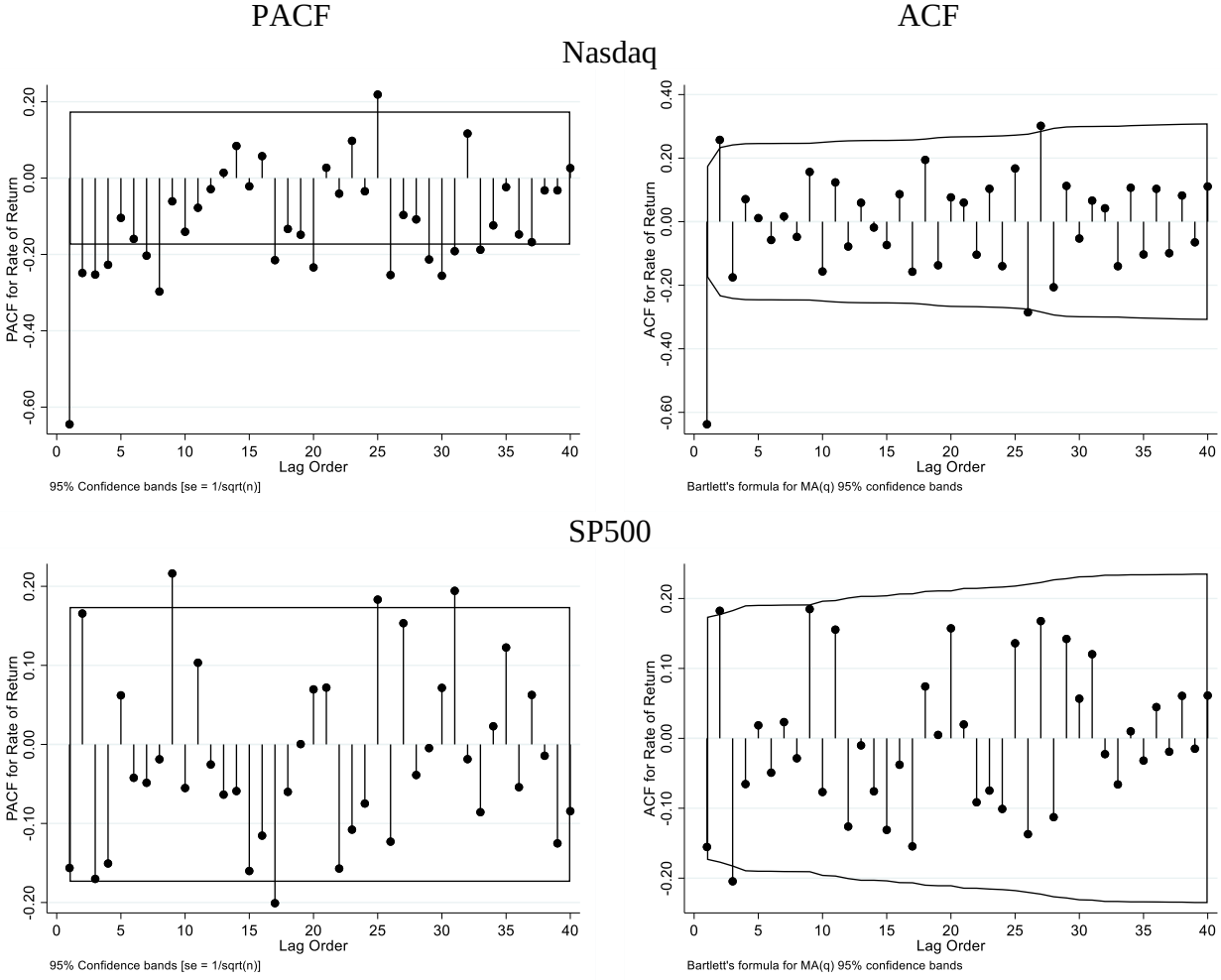


Figure 1 ARMA (p, q) identification

Photo credit: Original

These plots are crucial for identifying the order of the ARIMA model. The ACF plot shows a gradual decrease in autocorrelation within the lag period, while the PACF plot shows a sharp cutoff after the first lag for both indices. These findings help specify ARIMA model parameters to accurately predict index responses to elections. For the S&P 500 and Nasdaq, the initial analysis involves a close examination of the ACF and PACF charts. The peaks in the ACF plot represent potential MA orders, while the peaks in the PACF plot represent the required number of AR orders. The optimal order is

determined through iterative testing, striking a balance between model simplicity and predictive power, as the lowest as reflected by AIC and BIC scores. As shown in the figure, we can get Nasdaq: ARIMA (8,2,2), SP500: ARIMA (9,1,3) This means that for Nasdaq, the AR order is 8 and the difference order (I) is 2, And the MA order is 2. For the SP500, the AR order is 9, the differential order is 1, and the MA order is 3.

Table 2 Residual test

Model	Portmanteau (Q) statistic	Prob > chi2
Nasdaq-ARIMA(8,2,2)	39.3265	0.5004
SP500-ARIMA(9,1,3)	33.7053	0.7482

Table 2 shows the value Prob > chi2 of the model Nasdaq-ARIMA (8,2,2) and SP500-ARIMA (9,1,3) both larger than 0.05. So, this paper can determine the residuals of both models Think of it as white noise.

4.2. Prediction Results and Explanations

Figure 2 illustrates the actual versus predicted values for the Nasdaq over a specific period (October 21 to November 13, 2020). Although specific data points are not quoted, this visualization would show how closely the ARIMA model's predictions align with actual market performance.

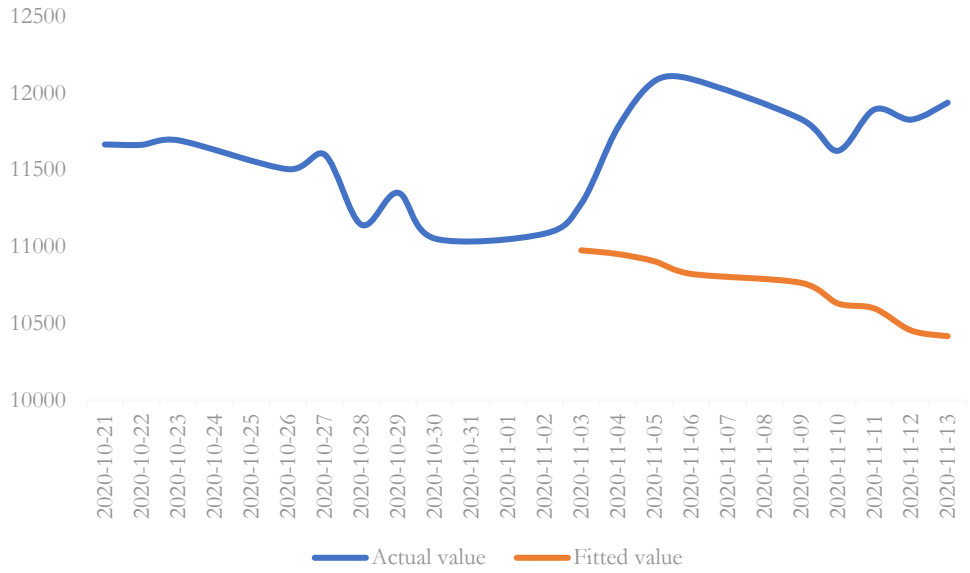


Figure 2 Actual value and predicted value, Nasdaq

Photo credit: Original

Table 3 Actual value and predicted value, Nasdaq

	Actual value	Predicted value	Difference	Difference (%)
2020-10-21	11665.4			
2020-10-22	11662.9			
2020-10-23	11692.6			
2020-10-26	11504.5			
2020-10-27	11598.9			
2020-10-28	11142.8			
2020-10-29	11350.7			
2020-10-30	11053			
2020-11-02	11084.8			
2020-11-03	11279.9	10976.087	303.813	2.77%
2020-11-04	11777	10951.785	825.215	7.53%
2020-11-05	12078.1	10904.375	1173.725	10.76%
2020-11-06	12091.4	10822.621	1268.779	11.72%
2020-11-09	11830.4	10764.086	1066.314	9.91%
2020-11-10	11624.3	10630.333	993.967	9.35%
2020-11-11	11892.9	10597.342	1295.558	12.23%
2020-11-12	11827.1	10454.291	1372.809	13.13%
2020-11-13	11937.8	10416.8	1521	14.60%

Table 3 provides a detailed comparison between the actual and predicted values of the Nasdaq, with differences and percentage differences listed. The predictions vary from the actual values, with percentage differences ranging from 2.77% to 14.60%, demonstrating the model's accuracy and areas for improvement.

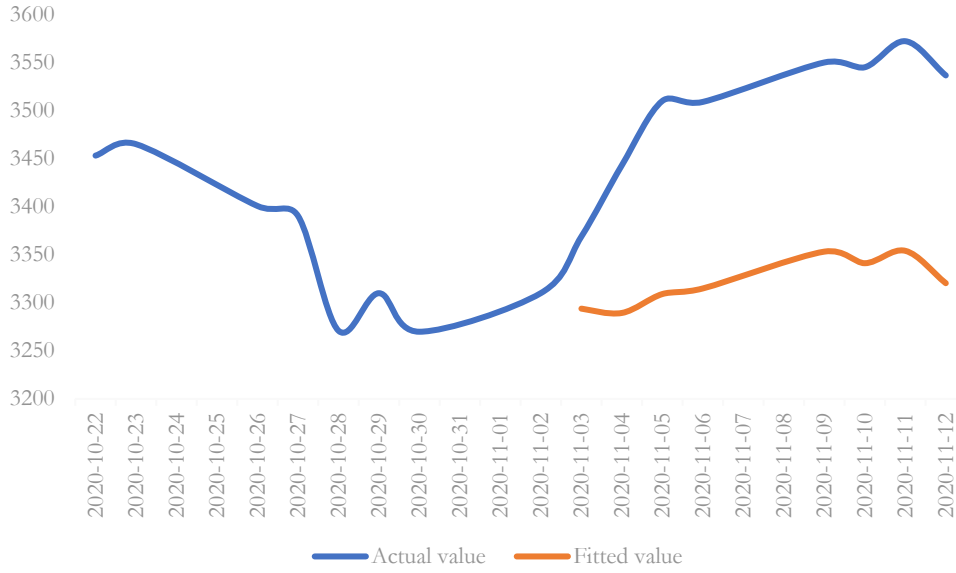


Figure 3 Actual value and predicted value, SP500

Photo credit: Original

Table 4 Actual value and predicted value, SP500

	Actual value	Predicted value	Difference	Difference (%)
2020-10-22	3453.49			
2020-10-23	3465.39			
2020-10-26	3400.97			
2020-10-27	3390.68			
2020-10-28	3271.03			
2020-10-29	3310.11			
2020-10-30	3269.96			
2020-11-02	3310.24			
2020-11-03	3369.16	3294.029	75.131	2.28%
2020-11-04	3443.44	3289.5289	153.9111	4.68%
2020-11-05	3510.45	3309.2402	201.2098	6.08%
2020-11-06	3509.44	3315.0567	194.3833	5.86%
2020-11-09	3550.5	3353.418	197.082	5.88%
2020-11-10	3545.53	3341.348	204.182	6.11%
2020-11-11	3572.66	3354.2639	218.3961	6.51%
2020-11-12	3537.01	3320.5214	216.4886	6.52%

Figure 3 and Table 4 plots the trajectory of the S&P 500's daily closing prices from three months before to three months after the 2020 U.S. presidential election. The chart highlights a significant increase in volatility as the election date approaches, with large swings occurring on key dates such as the first presidential debate and Election Day. The sharp rise immediately after the election reflected market optimism about the outcome. This chart highlights a period when markets are highly sensitive to election-related news and events, illustrating the direct impact of political uncertainty on market performance. Similar to the Nasdaq, these parts of the document present the actual versus predicted values for the S&P 500 for the same period. The percentage differences for the S&P 500 predictions range from 2.28% to 6.52%, indicating the model's predictive performance for this index.

Using deterministic AR and MA orders, the ARIMA model predicts the reaction of the S&P 500 and Nasdaq three months after the 2020 election. These models do this by capturing pre-election market volatility as well as post-election market volatility. It is concluded that the market trend is clearly stable. Investors clearly reacted to the election results, with volatile growth in some sectors likely to benefit from the elected government's policies. For example, technology stocks in the Nasdaq have surged, reflecting investor optimism about favorable regulatory and economic policies.

The forecast results provide insight into market sensitivity to the 2020 presidential election. The observed volatility suggests investors are taking a wait-and-see approach amid uncertainty over the election outcome and its impact on economic policy and stability. The post-election market recovery and growth in certain sectors indicate a positive response to the elected government, most likely due to anticipated policy benefits. These dynamics highlight the importance of political events in influencing market trends and investor behavior, and the utility of ARIMA models in capturing these effects.

This analysis demonstrates the effectiveness of the ARIMA model in predicting the S&P 500 and Nasdaq index responses to the 2020 U.S. presidential election. The model makes valuable predictions about market movements by carefully identifying AR and MA sequences, providing insights into how major political events affect financial markets. This research not only enriches the academic community's understanding of market behavior related to political events but also guides investors in dealing with market uncertainty during elections.

5. Discussion

Comparing this study with existing literature, this study points to a deeper impact of the 2020 U.S. presidential election on the S&P 500 and Nasdaq. Different from earlier literature studies on the overall impact of elections on the financial market environment, this study conducts an in-depth analysis of the differential performance and volatility changes of the two indexes caused by the elections and uses the ARIMA model to predict the market's subsequent reaction.

The significance of this study is to provide new insights to help investors and the general public better understand the market fluctuations related to political events, emphasizing the need to consider large political events such as elections in financial market analysis. Importance of results. It shows that the ARIMA model can effectively capture the real-time dynamics of stock prices in political contexts, providing methodological advances for future research on financial market forecasting.

The help for policymakers can be understood as the understanding that political events can significantly affect market sentiment and fluctuations. Being aware of the immediate and longer-term market reactions to election results can provide more useful information when considering potential market volatility during the election.

Investors can use the study's findings to better navigate market uncertainty during the election. By understanding predicted market movements and the industries that are likely to benefit from the election results, investors can make smarter and faster decisions because the market is changing every second. It can also use insights into post-election market behavior and specific industry reactions to optimize its investment strategy.

6. Conclusion

This research investigates the impact of the 2020 U.S. presidential election on the S&P 500 and Nasdaq indices, leveraging data from the first six months post-election to forecast the ensuing three months' market volatility using the ARIMA model. The analysis unveils distinct volatility patterns between the two indices, accentuating the critical role of industry-specific insights in deciphering market dynamics. While the S&P 500, with its broad economic scope, and the Nasdaq, with a tech-heavy composition, both reacted to the political event, their divergent volatility curves underscore the heterogeneity in sectoral responses. This study not only sheds light on the nuanced effects of political developments on financial markets but also demonstrates the efficacy of advanced predictive modeling in navigating the intricate landscape of market volatility, offering valuable perspectives for investors and analysts aiming to understand and anticipate market behavior.

This research helps investors, policymakers and academics gain a more detailed understanding of how major political events affect financial markets. For future research to further explore the long-term impact of political changes on market performance, variables can be added as well as controlled to help improve the accuracy and comprehensiveness of forecasts.

In addition, the study has certain limitations, as there is the possibility of sudden and unpredictable major events in the market, which cannot be predicted and avoided in advance. Therefore, it can be further studied in the future to refine the forecasting model and explore the correlation between the long-term effects of political events on market volatility. The study will help investors, policymakers and academics gain a more detailed understanding of how major political events affect financial markets. For future research that can further explore the long-term effects of political changes on market performance, variables can be added as well as controlled to help improve the accuracy and comprehensiveness of forecasts.

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