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Influence of the Main Technology Companies in the NASDAQ 100 Stock Index

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Abstract

The stock market is characterized by very high volatility, especially the market where technology companies in the United States are listed, this being the NASDAQ stock exchange. The objective of the present investigation was to determine if the main technology companies listed on the NASDAQ stock exchange are the ones that really determine the growth of its main index, NASDAQ 100, in order to anticipate the general behavior of this stock market. The research focus was quantitative, descriptive, exploratory and correlational; of longitudinal design. The dependent variable was the daily percentage variability of the NASDAQ 100 indicator, the independent variables were the daily percentage price variations at the end of technology companies: Facebook Inc., Apple Inc., Alphabet Inc. (Class A), Alphabet Inc. (Class B), Amazon.com, Inc., Microsoft Corporation, Comcast Corporation. The methodology used was a multiple linear regression analysis, using the statistical package Minitab 17. The results were: It was determined through a Model that has 4 of the main companies listed in the NASDAQ 100, can explain its variability.

Keywords: *Stock Exchange NASDAQ 100, Technology Companies.*

Introduction

Nowadays technology is present in most human activities, the companies dedicated to producing it represent an attraction to consumers and organizations that goes beyond its simple use.

The movements of prices in the stock market, of the technological companies Facebook Inc., Apple Inc., Alphabet Inc. (Class A), Alphabet Inc. (Class B), Amazon.com, Inc., Microsoft Corporation, Comcast Corporation it generates that the economists develop studies because the investments in stock market are subject to risks, the yields are variable and their existence is uncertain. The prediction of the NASDAQ stock exchange is a topic of interest for those who invest in it. Being able to predict the trend and the price of shares, of companies in technology, would help investors to make appropriate movements and thus earn money.

Therefore, predicting an index on the NASDAQ stock market represents a great challenge. Numerous statistical methods have been proposed to provide more accurate predictions to investors. Some of these studies have used autoregressive models, moving averages, (Reddy, 2010), multiple regression (Chang, Yeung, Yip, 2000), genetic algorithm (Kim, Han, 2000), artificial neural networks (Chen, Leung, Daouk, 2003), exponential smoothing, linear and nonlinear methods (Zemke, 1998) among others cited by (García, Jalal, Garzón, & López, 2013).

According to (Pascale, 2005) to obtain a positive individual profit in the stock market, the agents will not always intervene under the assumption of perfect rationality. On the contrary, many individuals negotiate in the market based on subjective or speculative criteria, product of experience and possession of incomplete information.

According to the study "Application of two techniques of multivariate analysis in the Mexican stock market". Its objective is to classify 88 issuers of the Mexican Stock Exchange, using the analysis of principal components and the linear discriminant analysis, with the hypothesis of grouping broadcasters based on their stock market behavior and the economic sector to which they belong.

The results obtained represent a significant contribution to the creation of an investment portfolio since there is an illuminating panorama of the companies analyzed. However, it is suggested to complement the fundamental analysis approach to analyze the intrinsic part of the issuers in greater depth, always with the objective of seeking to minimize investment risks.

Due to this, the research question for this analysis is defended: Are the main companies that make up the NASDAQ 100 index the ones that determine its growth?

The proposed hypothesis was the companies Facebook, Google, Amazon, Microsoft, Apple and Comcast determine to a greater extent the growth of the NASADAQ 100 indicator.

Materials and Methods

In the present research work we proceeded to identify the closing price, of each of the actions on a daily basis, of the technology companies: Facebook Inc., Apple Inc., Alphabet Inc. (Class A), Alphabet Inc. (Class B), Amazon.com, Inc., Microsoft Corporation, Comcast Corporation. The range of dates to analyze the closing prices began from the period of December 3, 2015 until December 2, 2016, with a total of 252 observations for each of the 7 companies.

As for the data used for the Nasdaq 100 index, its value was downloaded in units at closing, on a daily basis, taking into account the same time range used for the closing price of the companies.

To determine the influence of the increase (or decrease) in the value of the various stocks analyzed, on the Nasdaq 100 indicator, we proceeded to calculate the daily percentage increase of each of the shares, including the Nasdaq 100 indicator. Below is an example of the calculations made:

Table 1: Daily variation

DATE	ADJ CLOSE	VARIATION
03/12/15	104.3800	
04/12/15	106.1800	0.0172
07/12/15	105.6100	-0.0054
08/12/15	106.4900	0.0083
09/12/15	104.6000	-0.0177
10/12/15	105.4200	0.0078
11/12/15	102.1200	-0.0313
14/12/15	104.6600	0.0249

Source: Own elaboration

Calculation made to determine the daily percentage change in the price of the shares, determining to take into account the closing price of a particular date, subtracting the previous closing price, and then dividing the result by 100.

Continuing with the analysis, the various variables were coded as follows:

Dependent variable

NASDAQ = Daily percentage change of the Nasdaq 100 indicator.

Dependent variables

FB= Daily percentage variation of the action of the company Facebook.
AP= Daily percentage variation of the Apple company stock.
GO= Daily percentage variation of the action (series 1) of the company Google.
GO2= Daily percentage variation of the action (series 2) of the company Google.
MZ= Daily percentage variation of the Amazon company stock.
MIC= Daily percentage variation of the Microsoft company share.
CMC= Daily percentage change of the Comcast company share.

To determine the influence of the main companies listed on the Nasdaq 100, a multiple regression analysis was used, where the initial statistical model was as follows:

$$y_i = \beta_o + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \beta_6 x_{6i} + \beta_7 x_{7i} + e_i$$

In order to have the relation that exists between the percentages variations of each one of the shares with the NASDAQ index, it was preceded to contrast each one of them with the stock market indication, by means of a dispersion chart.

Results and Discussion

Below are each of the graphs made:

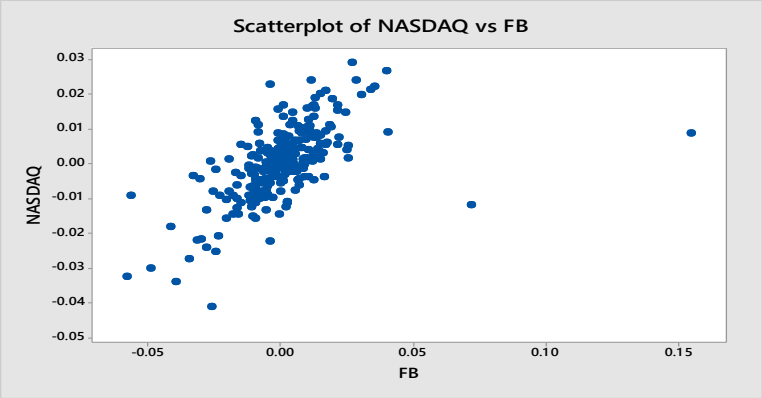

Figure 1: Scatterplot of NASDAQ vs FB
Source: Own elaboration

Dispersion chart, where the percentage variation of the price of the action of the company Facebook against the percentage variation of the Nasdaq 100 indicator is contrasted with data extracted from the page https://finance.yahoo.com.

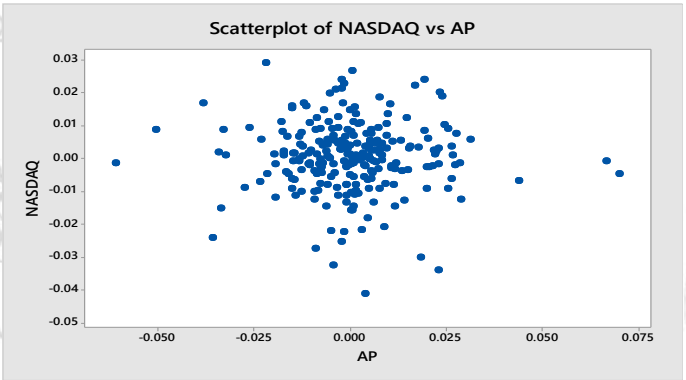

Figure 2: Scatterplot of NASDAQ vs AP
Source: Own elaboration

Dispersion chart, where the percentage variation of the share price of the Apple Company is contrasted against the percentage variation of the Nasdaq 100 indicator. Own preparation with data extracted from the page https://finance.yahoo.com.

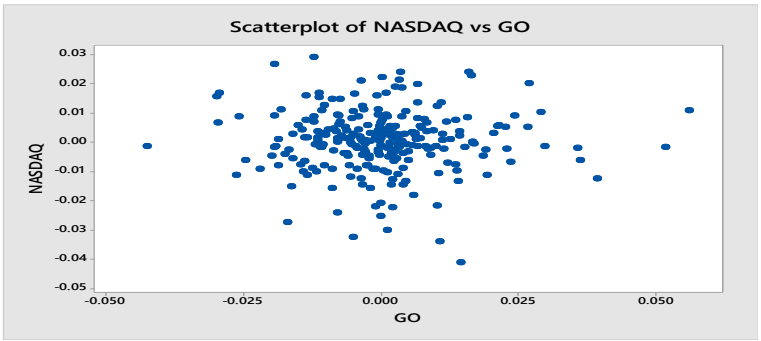

Figure 3: Scatterplot of NASDAQ vs GO
Source: Own elaboration

Dispersion chart, where the percentage variation of the share price (series 1) of the company Google is contrasted against the percentage variation of the Nasdaq 100 indicator. Own preparation with data extracted from the page https://finance.yahoo.com.

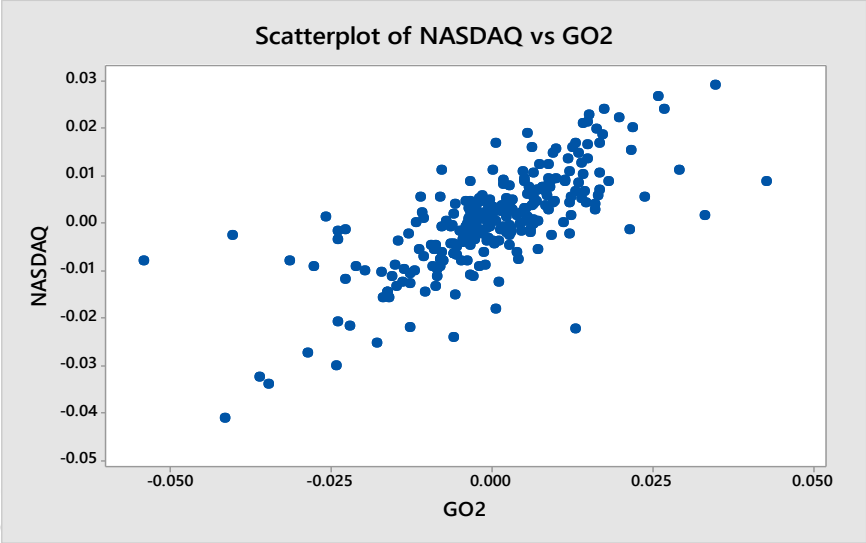

Figure 4: Scatterplot of NASDAQ vs GO
Source: Own elaboration

Dispersion chart, where the percentage variation of the share price (series 2) of the company Google is contrasted against the percentage variation of the Nasdaq 100 indicator. Source: own elaboration with data extracted from the page https://finance.yahoo.com.

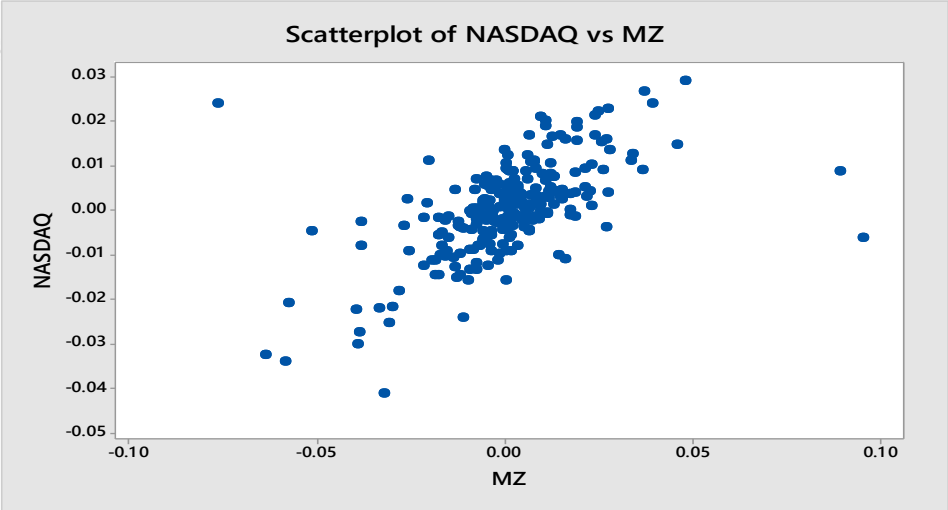

Figure 5: Scatterplot of NASDAQ vs MZ
Source: Own elaboration

Dispersion chart, where the percentage variation of the share price (series 2) of the Amazon Company is contrasted against the percentage variation of the Nasdaq 100 indicator. Source: own elaboration with data extracted from the page https://finance.yahoo.com.

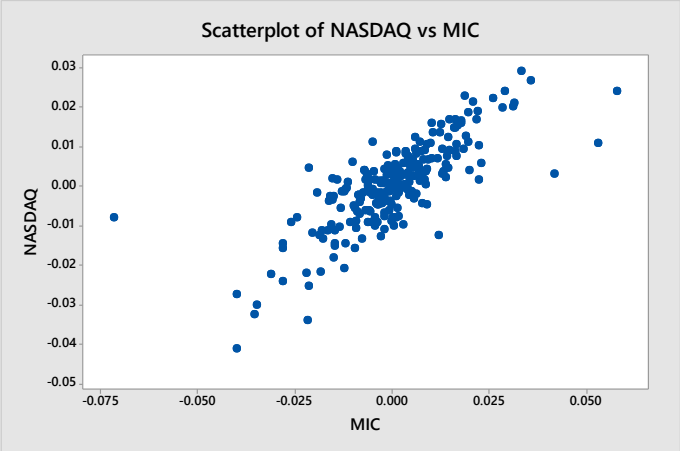

Figure 6 Scatterplot of NASDAQ vs MIC
Source: Own elaboration

Dispersion chart, where the percentage variation of the price of the stock (series 2) of the Microsoft Company is contrasted against the percentage variation of the Nasdaq 100 indicator. Source: own elaboration with data extracted from the page https://finance.yahoo.com.

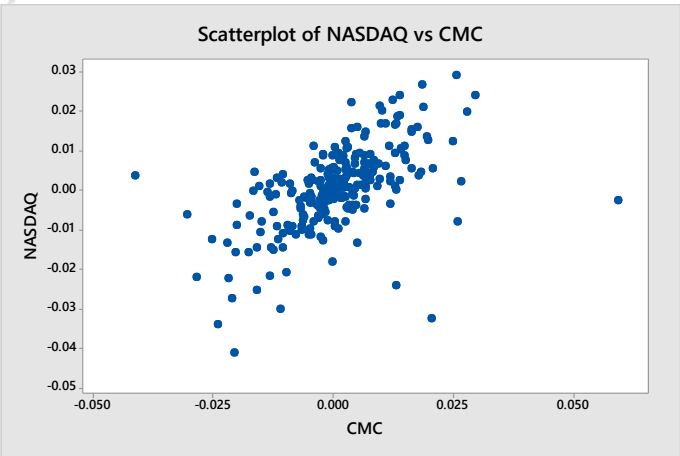

Figure 7 Scatterplot of NASDAQ vs CMC
Source: Own elaboration

Dispersion chart, where the percentage variation of the share price (series 2) of the company Comecast is contrasted against the percentage variation of the Nasdaq 100 indicator. Source: own elaboration with data extracted from the page https://finance.yahoo.com.

Correlation Analysis

In certain graphs a linear relationship can be appreciated between the percentage variation of the price of some shares and the percentage variation of the Nasdaq 100 indicator increase.

In order to confirm and have a magnitude between these relationships, a Pearson correlation analysis was used, where the matrix is presented with the data obtained:

Table 2: Correlation matrix

Correlation: NASDAQ, FB, AP, GO, MZ, MIC, GO2, CMC

	NASDAQ	FB	AP	GO	MZ	MIC	GO2
FB	0.592						
	0.000						
AP	-0.026	-0.076					
	0.684	0.232					
GO	-0.018	-0.005	0.486				
	0.782	0.938	0.000				
MZ	0.596	0.602	-0.033	-0.007			
	0.000	0.000	0.606	0.917			
MIC	0.784	0.543	0.008	0.089	0.509		
	0.000	0.000	0.895	0.160	0.000		
GO2	0.724	0.651	-0.038	0.040	0.623	0.717	
	0.000	0.000	0.546	0.523	0.000	0.000	
CMC	0.574	0.247	-0.006	-0.103	0.207	0.418	0.292
	0.000	0.000	0.918	0.102	0.001	0.000	0.000

Cell Contents: Pearson correlation
P-Value

Source: Own elaboration

With the data obtained it can be concluded that there is a strong positive linear relationship between the variables FB, MZ, MIC, GO2 and CMC, with respect to NASDAQ, while there is a relationship practically between the variables AP and GO, also with respect to NASDAQ.

However, the only variables that present a statistical significance, since they have a P-Value lower than .05, are FB, MZ, MIC, GO2 and CMC.

Multiple Regression Model

We proceeded to use a multiple regression model using all the variables, obtaining the following results:

Table 3: Multiple regression analysis 1

Regression Analysis: NASDAQ versus MZ, MIC, CMC, GO2, FB, AP, GO

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	7	0.020784	0.002969	115.46	0.000
MZ	1	0.000370	0.000370	14.37	0.000
MIC	1	0.001744	0.001744	67.80	0.000
CMC	1	0.001865	0.001865	72.51	0.000
GO2	1	0.000440	0.000440	17.10	0.000
FB	1	0.000072	0.000072	2.80	0.095
AP	1	0.000001	0.000001	0.05	0.827
GO	1	0.000022	0.000022	0.84	0.361
Error	244	0.006275	0.000026		
Total	251	0.027059			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.0050712	76.81%	76.14%	72.33%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-0.000210	0.000321	-0.65	0.514	
MZ	0.0870	0.0229	3.79	0.000	1.85
MIC	0.2787	0.0338	8.23	0.000	2.37
CMC	0.2702	0.0317	8.52	0.000	1.25
GO2	0.1720	0.0416	4.13	0.000	2.81
FB	0.0417	0.0249	1.67	0.095	1.99
AP	0.0053	0.0241	0.22	0.827	1.33
GO	-0.0265	0.0289	-0.92	0.361	1.36

Source: Own elaboration

Analyzing the data it was detected that the variables FB, AP and GO, are not significant for the model already, all of them have a P-Value higher than .05, including the variable FB that in the correlation analysis, presented a significant correlation with the NASDAQ variable.

Taking into account all the variables, the model presents a fairly acceptable R-Square being 76.81%, while the adjusted R-Square was calculated, it presented a value of 72.33%, the latter being the one to be taken into account due to the fact that it is a model that involves more than 1 explanatory variable.

We proceeded to run the model again, omitting the use of the non-significant variables detected in the previous model, where the results obtained are the following:

Table 3: Multiple regression analysis 2

Regression Analysis: NASDAQ versus MZ, MIC, CMC, GO2
Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	4	0.020687	0.005172	200.46	0.000
MZ	1	0.000550	0.000550	21.30	0.000
MIC	1	0.001808	0.001808	70.07	0.000
CMC	1	0.002026	0.002026	78.54	0.000
GO2	1	0.000621	0.000621	24.09	0.000
Error	247	0.006372	0.000026		
Total	251	0.027059			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
0.0050793	76.45%	76.07%	73.94%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-0.000203	0.000321	-0.63	0.528	
MZ	0.1004	0.0218	4.62	0.000	1.66
MIC	0.2797	0.0334	8.37	0.000	2.31
CMC	0.2773	0.0313	8.86	0.000	1.21
GO2	0.1939	0.0395	4.91	0.000	2.52

Source: Own elaboration

Analyzing the data, it is concluded that the model that best explains the behavior of the dependent variable (NASDAQ), which includes only the independent variables MZ, MIC, CMC and GO2, where all the P-Value have values lower than .05 , confirming the validity model that also has a value less than .05 in the section of the variable regression.

It is corroborated that there are no problems of multicollinearity, corroborating by means of the values of VIF, where all are inferior 5.

The Model presents an R-Square 76.07%, while the adjusted R-Square value is 73.94%, which is quite acceptable taking into account that the variables studied come from the stock market, where one characteristic is that the data present a great variability.

Analysis of Residuals

To confirm the validity of the model, we run the residual analysis using Minitab 17, where the data obtained are presented in the following tables:

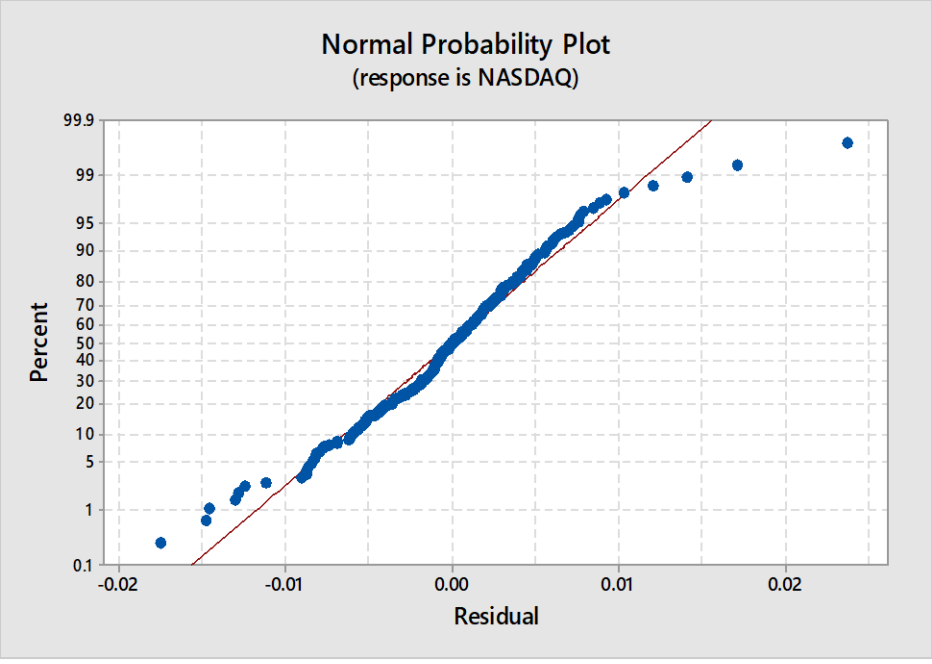

Figure 8: Normal probability plot
Source: Own elaboration

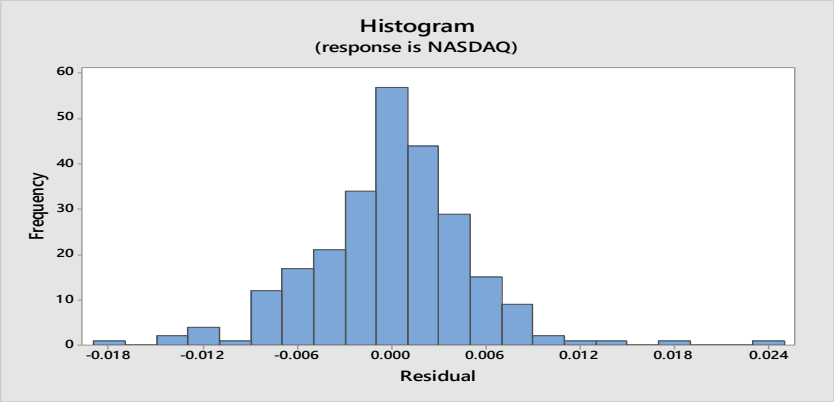

Figure 9: Normal Histogram
ource: Own elaboration

In the normal probability chart, it is observed that most of the data are adjusted to the adjustment line, while the histogram has a Gaussian bell shape, with which both graphs corroborate the assumption of normality in the data.

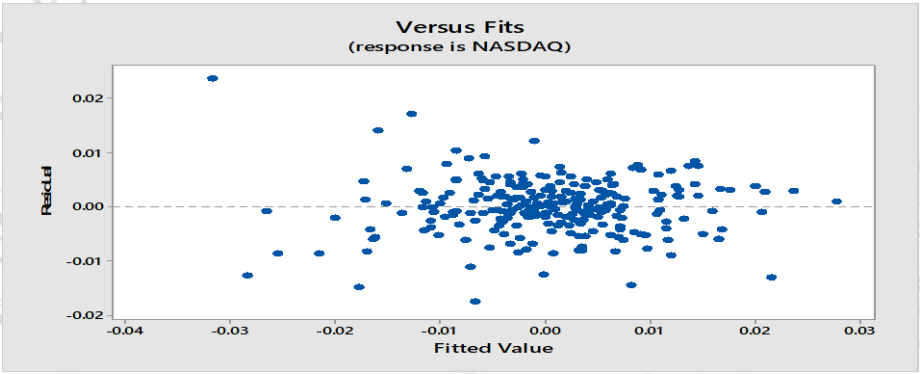

Figure 10: Residual vs fitted value
Source: Own elaboration

In the graph of residuals against adjustments, it can be observed that the data comply with the homoscedasticity assumption, since no pattern or trend in its behavior is observed.

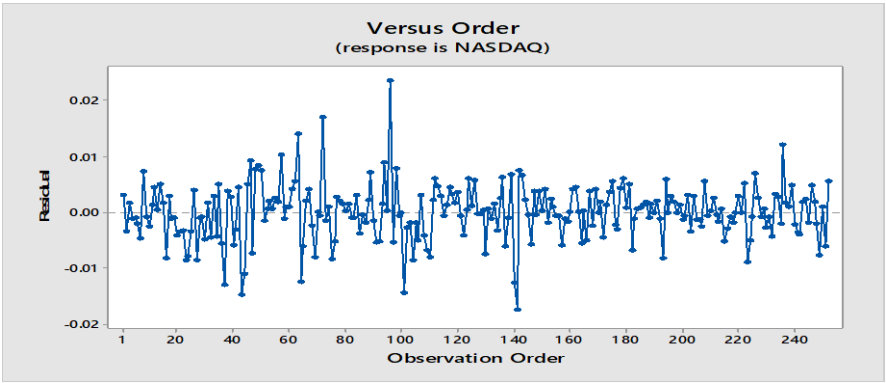

Figure 11: Observation order
Source: Own elaboration

Finally, in the order 11 graph it is observed that the data are distributed independently, fulfilling another of the necessary assumptions for a regression model.

Conclusions

After analyzing the quotations of the shares of the companies contemplated for this study, concludes the following:

- The companies analyzed are the most representative for the Nasdaq 100 Stock Exchange index.
- Not all companies correlate with the growth of the Stock Market Index.
- In the first phase of the correlation study, inclusion could be ruled out
- After running the regression analysis, only 4 of the actions studied present a statistical significance to be considered in the following final model: NASDAQ = -0.000203 + 0.1004 MZ + 0.2797 MIC + 0.2773 CMC + 0.1939 GO2
- Based on the final multiple regression equation obtained, the company that has the most influence has about the variability of the Nasdaq 100 indicator is Microsoft Corporation, followed by Comecast Corporation, Alphabet, Inc. (through its Series C action) and finally by Amazon.com, Inc.
- The obtained model explains that 73.94% (R- Squared squared) of the variability of the indicator Nasdaq 100, with a 95% confidence level (alpha = .05), does not present problems of multicollinearity, where it is also important to highlight that although they are variables that they present a high volatility, because they come from the stock market, where this is one of its main characteristics, the results obtained can generate confidence and certainty to make decisions in investment, based on the monitoring and analysis of actions in the companies of significant technology for this model.

Recommendations

The composition of the various stock indices may vary over time (for example, change the total number of companies that make up the index or the weighting of companies in the indicator), it is recommended to replicate the study, so that in this way the models obtained continue to be useful for making investment decisions.

It is also possible to involve more variables when preparing another analysis similar to the present work of research, with the intention of generating a higher coefficient of determination, which can then give greater certainty to the obtained model, although it should not be forgotten, as (Ockham's ,1349) postulate The following information "the simplest explanation is probably more correct than the most difficult and complex", so sometimes the simplest model is the one that can be more useful than a more complex model.

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