

Stock Data Analysis of Competing Companies in Competitive Market: The Case of NVIDIA Corporation

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Abstract. On May 24, 2023, NVIDIA released its impressive first-quarter results, and the stock soared 30% that day, making NVDA the sixth largest company in the world. NVDA has been a heavy player in almost most of the global technology fronts of recent years (cloud computing, cryptocurrency, metaverse, artificial intelligence, etc.). NVDA dominates the AI training space with over 95% market share. Thus, it is extremely important to keep an eye on the NVDA stock market trend because it is not only crucial for the stock market but also a key aspect of how human science and technology will progress in the future. This article mainly analyzes the correlation between the stock market data of NVDA and its competitors (from NVDA's data center, graphics cards, professional visualization, games, and other business aspects) to achieve the purpose of monitoring and predicting the future trend of NVDA's stock market. It is hoped that provide valuable insights for investors and market analysts, enabling them to make informed decisions and predict the trajectory of NVDA's stock market performance.

Keywords: Pearson correlation coefficient; Granger causality; Multivariate adaptive regression splines.

1. Introduction

The association between NVDA (NVIDIA) stock market movements and those of rival firms was investigated. This means that when there are movements in the stock markets of rival companies, they may have an impact on NVDA's stock market.

First, stock market movements of rival firms may reflect trends and risks in the industry as a whole. For example, if the industry as a whole is facing an adverse economic environment or policy change, the stock market of a competitor company may decline, resulting in NVDA's stock market also being affected. Secondly, the performance and development of rival companies may have a direct impact on NVDA's stock market [1]. If a rival company makes significant gains in terms of market share, product innovation, or technology leadership, investors may shift more of their investments to the shares of the rival company, causing NVDA's stock market to decline.

In addition, the market reputation and investor sentiment of rival companies may also have an impact on NVDA's stock market [2]. If there is adverse news such as a scandal, legal action, or financial problems in a rival company, investors may take a pessimistic view of the industry as a whole, which could lead to a decline in NVDA's stock market. However, it should be noted that NVDA's stock market movements are not only related to competitors but also affected by a variety of other factors, such as overall market trends, macroeconomic indicators, company performance, etc. Because the stock market is a complex system, it is necessary to consider a wide range of elements while studying and understanding stock price variations [3]. However, in this article, we only consider the correlation between NVDA and its representative 9 competitors. The nine representative competitors were selected based on NVDA's industrial structure.

The current research results include Pearson correlation analysis, Granger causality, and linear regression of NVDA stock price of competitors in the NVDA stock market. Pearson correlation analysis of turnover rate; Pearson correlation and linear regression for amplitude; Pearson correlation analysis, Granger causality and linear regression for volume and turnover. And stock market perspective for all relevant companies from September 2009 to July 2023. The primary goal of this

essay is to investigate how the stock markets of competing businesses affect NVDA's stock price market.

2. Methodology

In this paper, we mainly use three methods: PCCs, Granger causality, and MARS to analyze the data.

2.1. Pearson correlation coefficient (PCCs)

The Pearson correlation coefficient, also referred to as Pearson's r, is a statistical measure that expresses the linear relationship between two variables. The Pearson Correlation Coefficient, which was created by Pearson in 1895, is used to determine the strength and direction of a link between two variables [4]. The Pearson's r scale runs from -1 to +1, where +1 indicates a fully positive linear relationship and -1 indicates a perfectly negative linear relationship [5]. The PCC between the elements xi (stock attributes) and y (stock price) is calculated using the formula below:

$$r_{x,y} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2} \sqrt{\sum_{i=1}^n (y_i - \bar{y})^2}} \quad (1)$$

2.2. Granger causality model

If a sequence's variance can be accounted for by another sequence, it passes the Granger causality test. The goal of the test is to establish a causal connection between the stock markets. The following is the typical causality specification:

$$y_t = c + \sum_{i=1}^n b_t x_{t-i} + \sum_{i=1}^n b_{2t} y_{t-i} + u_t \quad (2)$$

$$x_t = c' + \sum_{i=1}^n b_i^t y_{t-i} + \sum_{i=1}^n b'_{2t} x_{t-i} + u_t \quad (3)$$

In the aforementioned model, the null hypothesis is that "the current value of variable y is not statistically significantly affected by previous values of variable x." The null hypothesis for equation (3) is "the past values of variable y have no meaningful effect on the present value of variable x." If the coefficients of the lagged variables (lagged xs for equation 1 and lagged ys for equation (3)) are collectively significant and different from zero, these null hypotheses would be rejected. If both null hypotheses are disproved, it is likely that the two variables have a reciprocal or bidirectional relationship. This implies a feedback loop between the two variables and shows that the previous values of both variables are significant in explaining the current values of each other.

The dynamic causal relationship between indicators is examined by the Granger causality test:

We reject the null hypothesis if the p-value is less than 0.05, which suggests that X1 is Granger for X2.

We accept the null hypothesis that X1 is not a Granger cause of X2 if the p-value is greater than 0.05.

The standard of p-value is not fixed and is subject to the researcher;

The lags are usually set to 2.

2.3. Multivariate adaptive regression splines (MARS)

Friedman pioneered the use of multivariate adaptive regression splines (MARS), a nonlinear and non-parametric regression technique [6]. The generalized additive modelling and recursive partitioning techniques that regulate classification and regression trees are the primary inspirations for MARS' modelling technique [6]. MARS is quite good at choosing the best variable

transformations and capturing interactions between variables. As a result, it is highly suited for dealing with the complex data patterns that are frequently found in high-dimensional data sets. The following equation can be used to express the general MARS function:

$$\hat{f}(x) = a_0 + \sum_{m=1}^M a_m \prod_{k=1}^{K_m} [s_{km}(x_v(k, m) - t_{km})]_+ \quad (4)$$

where $v(k,m)$ is the label of the independent variable, t_{km} designates the knot position, and s_{km} specifies the right/left direction of the corresponding step function [7]. The number of fundamental operations is M , the number of knots is K_m , and the parameters a_0 and a_m are.

3. Experiment

3.1. Data collection

The crawler technology was used to survey Nvidia (NVDA), Intel (Intel), AMD (AMD), Amazon (Amazon), Qualcomm (QCOM), Taiwan Semiconductor Manufacturing (TSM), Universal X Metaverse ETF (VR) on the Dongcai website, Data scraping of stock market-related information for Broadcom Broadcom (AVGO), Texas Instruments (TXN), and NVIDIA (NXPI). Crawled information includes date, open price, close price, high price, low price, volume, amount, amplitude, Chg, change, and turnover rate. In addition, after data collation and cleaning, the data of all relevant companies from September 2009 to July 2023 were selected. Stock market data for NVDA and its competitors prior to September 2009 were excluded from the study for two main reasons:

(1) Information Asymmetry: The global financial crisis has had a profound impact on companies in various industries, leading to information asymmetry, and external macroeconomic influences obscure the specific performance of companies. To mitigate the effect of information asymmetry, we excluded data from this period, enabling a more accurate assessment of NVDA's performance, and basing the analysis solely on firm-specific factors.

(2) Temporal dynamics: Academic research needs to focus on temporal dynamics to gain accurate insights into a company's trajectory and strategic adaptation. Adding data prior to September 2009 would limit the time breadth of the assessment, making it difficult to identify potential changes in NVDA's operations, strategic decisions, or market positioning after the crisis. By considering more recent data, we are able to get a more complete picture of NVDA's performance over time. Answer this question from an academic perspective.

After that, the relevant data of the stock market of each company were put into perspective. As shown in Figure.1, Each company is structured into four perspectives (K plot, VOL&AMOUNT, up-and-down, and Amplitude & Turnover), which makes each set of data more intuitive.

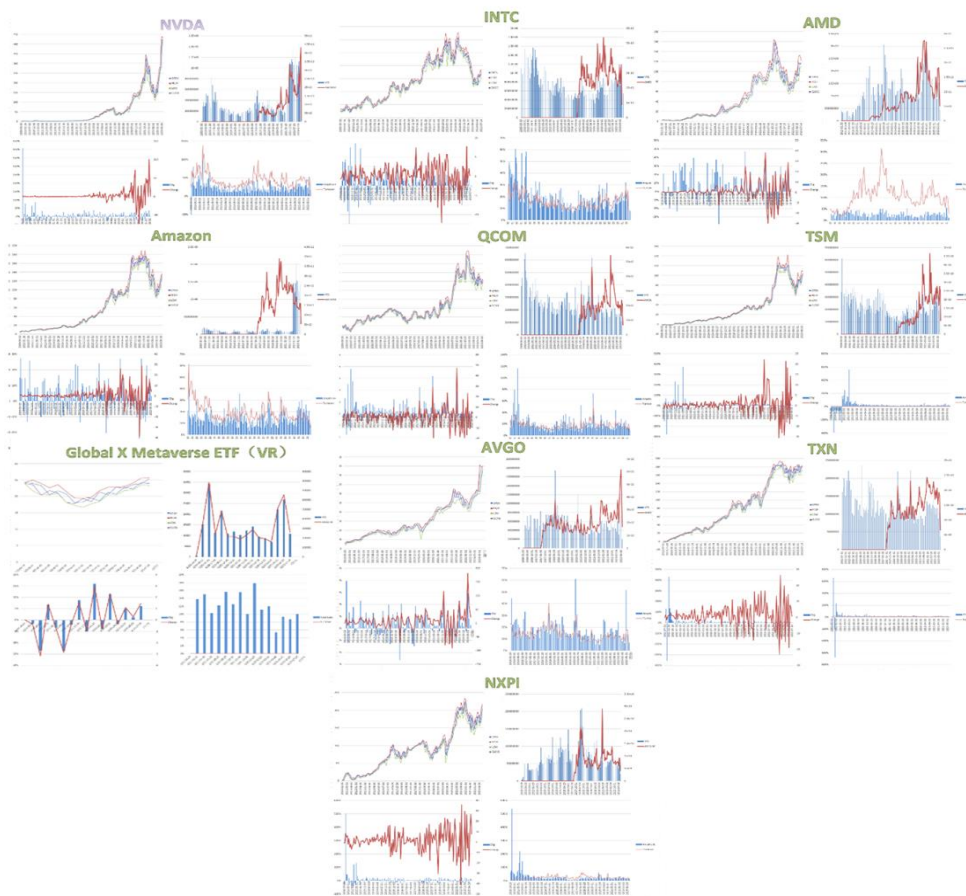


Figure 1. Monthly perspective of stock market data for NVIDIA and its competitors

3.2. Data filtering

After completing the data pre-processing, alignment and filtering steps, the relevant analysis results become more reliable and rigorous, which improves the credibility of the research results.

3.3. Data analysis

When classifying the relevant data one by one finished, it is aligned according to the time. The stock price, turnover rate, amplitude, volume, and AMOUNT in the data are used to carry out Pearson correlation experiment, Granger causality experiment and multivariate linear regression experiment by SPSSAU. Finally, after removing the invalid data, the experimental results are obtained for further analysis.

Since the closing price serves as the benchmark for the day's market price and serves as the foundation for the opening price of the following trading day, it is more accurate for forecasting future stock market prices. The exact data of the stock price in the data is the closing price.

Statistical Package for the Social Sciences (SPSSAU) is a popular statistical analysis software, which is widely used in data analysis and statistical research. It provides rich statistical analysis functions and data visualization tools.

4. Experiment results

4.1. Stock price

4.1.1. PCCs

The correlation between NVDA and INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI is studied using correlation analysis, and the power of the link is shown by the Pearson correlation coefficient. According to the data below:

NVDA and INTC have a substantial positive association with a correlation value of 0.562 and significance at the 0.01 level;

NVDA and AMD have a substantial positive association with a correlation value of 0.919 and significance at the 0.01 level; etc.

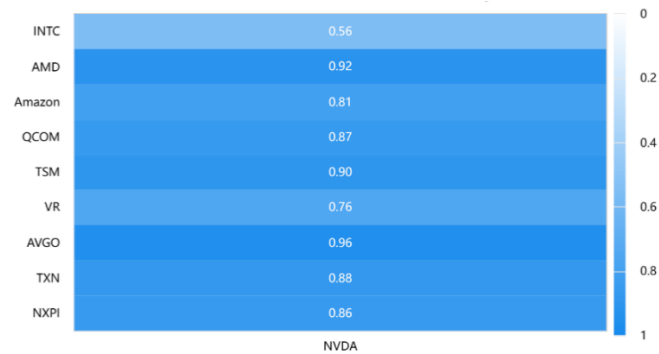


Figure 2. Visualization of the Pearson correlation of stock prices

4.1.2. Granger cause

For TXN and NXPI are not the Granger cause of NVDA, $p\text{-value} = 0.017 < 0.05$ and $p\text{-value} = 0.031 < 0.05$, respectively, so the null hypothesis is rejected, which means that X1 is the Granger cause of X2; For NVDA is not the Granger cause of AMD and TXN, $p\text{-value} = 0.037 < 0.05$ and $p\text{-value} = 0.049 < 0.05$, separately, so the null hypothesis is rejected, which means that X1 is the Granger cause of X2.

As for NVDA not being a Granger cause of NXPI, the $p\text{-value} = 0.023 < 0.05$, thus rejecting the null hypothesis, implying that X1 is a Granger cause of X2. It can be concluded that some of the indicators in this study are Granger causes, and some are not. Among them, TXN and NXPI, and NVDA are Granger causes of each other respectively, while NVDA is Granger causes of AMD, and AMD is not Granger cause of NVDA [8].

Table 1. Stock price Granger test results

H0	F =	p =	df 1	df 2	Result
'INTC' is not a Granger cause of 'NVDA'	2.338	0.152	2	9	1
'AMD' is not the Granger cause of 'NVDA'	4.184	0.052	2	9	1
'Amazon' is not the Granger cause of 'NVDA'	3.95	0.059	2	9	1
'QCOM' is not a Granger cause for 'NVDA'	3.172	0.091	2	9	1
'TSM' is not a Granger cause of 'NVDA'	2.142	0.173	2	9	1
'VR' is not the Granger cause of 'NVDA'	1.284	0.323	2	9	1
'AVGO' is not a Granger cause of 'NVDA'	0.428	0.664	2	9	1
'TXN' is not a Granger cause of 'NVDA'	6.643	0.017*	2	9	0
'NXPI' is not a Granger cause of 'NVDA'	5.222	0.031*	2	9	0
'NVDA' is not a Granger cause of 'INTC'	1.874	0.209	2	9	1
'NVDA' is not the Granger cause of 'AMD'	4.888	0.037*	2	9	0
'NVDA' is not the Granger reason for 'Amazon'	3.676	0.068	2	9	1
'NVDA' is not a Granger cause for 'QCOM'	0.07	0.933	2	9	1
'NVDA' is not a Granger cause of 'TSM'	3.385	0.08	2	9	1
'NVDA' is not the Granger cause of 'VR'	5.703	0.025*	2	9	0
'NVDA' is not a Granger cause of 'AVGO'	0.572	0.584	2	9	1
'NVDA' is not a Granger cause of 'TXN'	4.308	0.049*	2	9	0
'NVDA' is not a Granger cause of 'NXPI'	5.862	0.023*	2	9	0

* p<0.05 ** p<0.01

4.1.3. MARS

Stock prices for INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI will be used as independent variables, and the stock price of NVDA will be used in a linear regression study as the variable of dependence [9]. The following chart displays the model's equation:

$$\omega_{NVDA} = -245.186 - 4.008 \times INTC + 1.274 \times AMD - 0.345 \times Amazon + 1.320 \times QCOM - 2.548 \times TSM + 16.423 \times VR + 0.679 \times AVGO - 0.410 \times TXN - 0.605 \times NXPI \quad (5)$$

With a model R square of 0.983, companies including INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI could account for 98.3% of the stated causes for these changes. The model underwent a F test, which revealed that it explains relationships between INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI in at least one effect. On the other hand, the model's multicollinearity test found that the VIF value is larger than 10, indicating the presence of a collinearity problem. Therefore, the stock price of NVDA will be significantly boosted by AVGO. The stock price of NVDA won't, however, be impacted by the stock price of INTC, AMD, Amazon, QCOM, TSM, VR, TXN, NXPI.

4.2. Turnover rate

Correlation analysis was used to assess the relationship between NVDA's turnover rate and the turnover rates of six other rival product businesses (INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI).

The findings reveal a strong positive link between NVDA and INTC, AMD, Amazon, QCOM, TSM, AVGO, and TXN. All of the correlation coefficients ranged from 0.359 to 0.521 and were significant at the level of 0.01. This shows that NVDA and these businesses have a very strong, beneficial relationship. However, there is no discernible link between VR and NVDA. The p-value (1.000) exceeded 0.05 and the correlation between NVDA and VR was nearly zero, indicating that there was no correlation. Additionally, there is a sizable inverse relationship between NVDA and NXPI. The correlation value was -0.186, and it was significant at the 0.05 level.

In summary, the correlation analysis reveals significant positive relationships between NVDA and INTC, AMD, Amazon, QCOM, TSM, AVGO, and TXN, while no correlation was found between NVDA and VR. Additionally, there is a substantial opposing relationship between NVDA and NXPI.

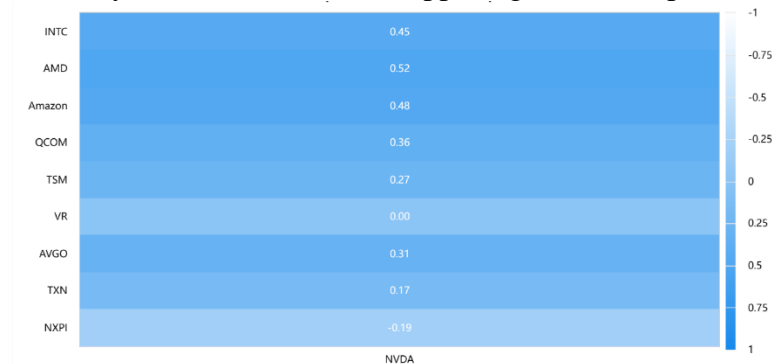


Figure 3. Visualization of the Pearson correlation for turnover

4.3. Amplitude

4.3.1. PCCs

Pearson correlation analysis showed that the amplitude of NVDA was significantly and positively correlated with INTC, AMD, Amazon, QCOM, TSM, AVGO, and NXPI. The association between NVDA and VR was 0.143, or nearly zero, and the significance level was $0.598 > 0.05$. The correlation between NVDA and TXN is -0.126 , close to 0, and the p-value is $0.150 > 0.05$, indicating that there is no link between NVDA, VR, and TXN. So, there is no significant correlation between NVDA and the amplitudes of VR and TXN [10]. The results show that the stock price trend of NVDA is similar to the stock market amplitude trend of intel, AMD, Amazon, QCOM, TSM, AVGO and NXPI, but it is different from the stock market amplitude trend of VR and TXN.

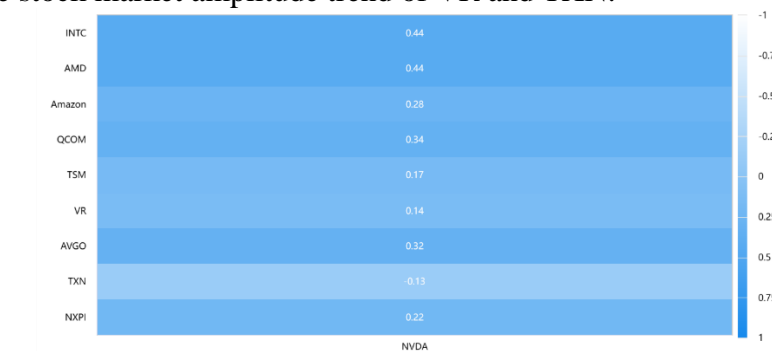


Figure 4. Visualization of the Pearson correlation for amplitude

4.3.2. MARS

Will be INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, NXPI stocks amplitude as the independent variable, the amplitude of NVDA which will be given as can be observed from the graph, the model's formula for a dependent variable linear regression analysis is:

$$\omega_{NVDA_a} = 1.063 + 0.024 * INTC + 0.689 * AMD + 0.376 * Amazon + 1.887 * QCOM + 0.174 * TSM - 0.934 * VR + 0.117 * AVGO - 1.692 * TXN - 0.384 * NXPI \quad (6)$$

Model R square value of 0.879 means that INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI can explain why given amplitude 87.9% of the stock market change. The model passes the F-test, according to the results of the analysis ($F=4.861$, $p=0.0340.05$), which means that at least one of the amplitudes of INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, NXPI will have an impact on the amplitude of NVDA.

4.4. Volume and AMOUNT

4.4.1. PCCs

The derived Pearson correlation coefficient shows the VOL and AMOUNT of NVDA and INTC, AMD, Amazon, and TSM are significantly related. at the 0.01 level, proving that NVDA has a good relationship with these companies. The p value is $0.393 > 0.05$, and the correlation between the VOL of NVDA and QCOM is -0.067 , which is close to 0. The correlation coefficients between the trading volume of NVDA and VR, AVGO, and TXN are 0.156 , -0.103 , and -0.032 , respectively, while the corresponding p values are 0.563 , 0.332 , and 0.712 , respectively. Consequently, it demonstrates that there is no relationship between NVDA and VOL of QCOM, VR, AVGO, or TXN. According to the correlation values between the transaction volume of NVDA, VR, and NXPI, which are 0.383 and 0.080 , respectively, and the p values of $0.143 > 0.05$ and $0.502 > 0.05$, respectively, there is no association between the amount of NVDA, VR, and NXPI. The correlation between the trading volume of NVDA and NXPI is -0.201 , with a 0.05 level of vitality, it may be concluded that there is a strong negative link between the two.

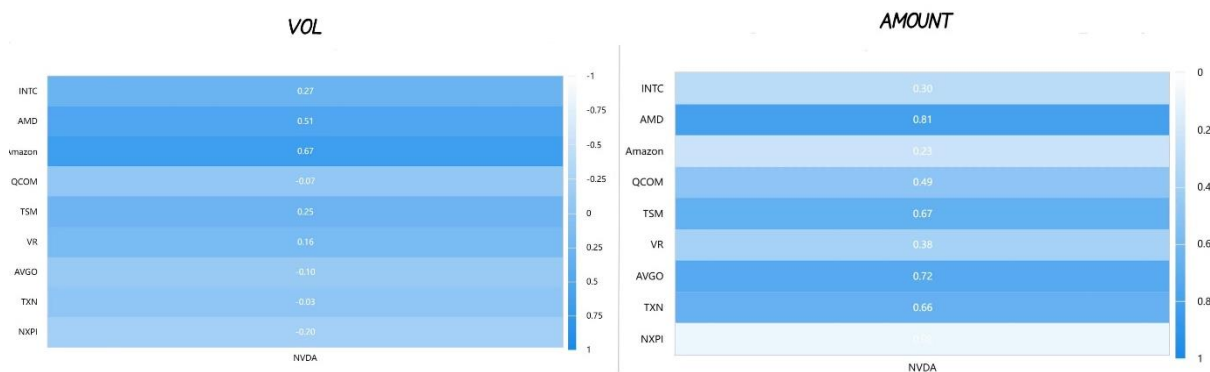


Figure 5. Visualization of the Pearson correlation of VOL and Amount

4.4.2. Granger cause

The lag order in this Granger causality test is 2, as seen in the accompanying table: The null hypothesis is rejected because the volume of AVGO is not the Granger cause of the volume of NVDA ($p\text{-value} = 0.0010.05$), indicating that X1 is the Granger cause of X2. The null hypothesis is rejected since the AMOUNT against NVDA is not the Granger cause of TXN AMOUNT ($p\text{-value} = 0.0170.05$), indicating that X1 is the Granger cause of X2.

In general, the Granger cause of the volume of NVDA is the volume of AVGO, whereas the Granger cause of the amount of NVDA is the amount of TXN, and none of the other Granger causalities are valid.

Table 2. Volume Granger test results

H0	F =	p =	df 1	df 2	Result
'INTC' is not a Granger cause of 'NVDA'	3.348	0.082	2	9	1
'AMD' is not the Granger cause of 'NVDA'	0.509	0.618	2	9	1
'Amazon' is not the Granger cause of 'NVDA'	0.132	0.878	2	9	1
'QCOM' is not a Granger cause for 'NVDA'	0.562	0.589	2	9	1
'TSM' is not a Granger cause of 'NVDA'	0.488	0.629	2	9	1
'VR' is not the Granger cause of 'NVDA'	0.523	0.61	2	9	1
'AVGO' is not a Granger cause of 'NVDA'	16.723	0.001**	2	9	0
'TXN' is not a Granger cause of 'NVDA'	0.235	0.795	2	9	1
'NXPI' is not a Granger cause of 'NVDA'	0.022	0.979	2	9	1
'NVDA' is not a Granger cause of 'INTC'	2.421	0.144	2	9	1
'NVDA' is not the Granger cause of 'AMD'	0.469	0.64	2	9	1
'NVDA' is not the Granger reason for 'Amazon'	0.277	0.764	2	9	1
'NVDA' is not a Granger cause for 'QCOM'	0.092	0.913	2	9	1
'NVDA' is not a Granger cause of 'TSM'	0.275	0.766	2	9	1
'NVDA' is not the Granger cause of 'VR'	0.43	0.663	2	9	1
'NVDA' is not a Granger cause of 'AVGO'	0.216	0.81	2	9	1
'NVDA' is not a Granger cause of 'TXN'	0.156	0.858	2	9	1
'NVDA' is not a Granger cause of 'NXPI'	0.501	0.622	2	9	1

* p<0.05 ** p<0.01

Table 3. Results of the Granger test for AMOUNT

H0	F =	p =	df 1	df 2	Result
'INTC' is not a Granger cause of 'NVDA'	2.385	0.148	2	9	1
'AMD' is not the Granger cause of 'NVDA'	0.249	0.785	2	9	1
'Amazon' is not the Granger cause of 'NVDA'	0.499	0.623	2	9	1
'QCOM' is not a Granger cause for 'NVDA'	0.519	0.612	2	9	1
'TSM' is not a Granger cause of 'NVDA'	1.439	0.287	2	9	1
'VR' is not the Granger cause of 'NVDA'	0.503	0.621	2	9	1
'AVGO' is not a Granger cause of 'NVDA'	1.545	0.265	2	9	1
'TXN' is not a Granger cause of 'NVDA'	1.533	0.267	2	9	1
'NXPI' is not a Granger cause of 'NVDA'	0.13	0.879	2	9	1
'NVDA' is not a Granger cause of 'INTC'	3.805	0.063	2	9	1
'NVDA' is not the Granger cause of 'AMD'	0.305	0.744	2	9	1
'NVDA' is not the Granger reason for 'Amazon'	3.667	0.068	2	9	1
'NVDA' is not a Granger cause for 'QCOM'	2.359	0.15	2	9	1
'NVDA' is not a Granger cause of 'TSM'	3.034	0.098	2	9	1
'NVDA' is not the Granger cause of 'VR'	0.38	0.694	2	9	1
'NVDA' is not a Granger cause of 'AVGO'	2.018	0.189	2	9	1
'NVDA' is not a Granger cause of 'TXN'	6.6	0.017*	2	9	0
'NVDA' is not a Granger cause of 'NXPI'	0.434	0.661	2	9	1

* p<0.05 ** p<0.01

4.4.3. MARS

Will be INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, NXPI volume as the independent variable, and will be given volume as per to the graph's dependent variable linear regression analysis, the model's formula is:

$$\begin{aligned} \omega_{NVDA_{VOL}} = & -293061637.939 + 0.490 * INTC + 0.173 * AMD + 0.033 * Amazon \\ & + 4.564 * QCOM - 1.245 \\ & * TSM + 9251.060 * VR - 7.123 * AVGO + 10.829 * TXN - 17.578 * NXPI \quad (7) \end{aligned}$$

Model R square value of 0.937 means that INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, NXPI can explain 93.7% of the given volume changes in the volume of sales. When the model is put to the F-test, it is discovered that it passes (F=9.935, p=0.0060.05), indicating that at least one of INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, NXPI will have an impact on the volume of NVDA. Summary analysis shows that INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI all have no impact on NVDA.

From the table shows that will be INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, NXPI as independent variables, as seen in the graph, and will use the NVDA AMOUNT is the outcome of a linear regression analysis, the dependent variable. The model's formula is:

$$\begin{aligned} \omega_{NVDA_{AMOUNT}} = & -112826298360.954 + 8.651 * INTC + 0.369 * AMD - 0.023 \\ & * Amazon - 7.312 * QCOM \\ & + 8.833 * TSM - 187835.366 * VR + 4.191 * AVGO - 11.379 * TXN + 19.867 * NXPI \quad (8) \end{aligned}$$

With a model R square value of 0.951, INTC, AMD, Amazon, QCOM, TSM, VR, AVGO, TXN, and NXPI are able to account for 95.1% of the causes of these changes when NVDA is provided. The F test was successful for the model (F=12.826, p=0.0030.05). Following investigation, it is determined that TSM and AVGO will significantly benefit NVDA. However, the AMOUNT of NVDA is unaffected by the transaction volume of INTC, AMD, Amazon, QCOM, VR, TXN, and NXPI.

4.5. Conclusion Analysis

From the above series of experimental results, it can be concluded that the stock price is the group of data with the largest correlation coefficient and the most determining factors for NVDA and its competitors. So NVDA's share price is closely tied to the market share price of its competitors. By monitoring the stock market of the relevant competitor companies, you can predict the movement and rise and fall of NVDA's stock price in advance.

5. Conclusion

The article states that NVDA's stock market movements are mainly correlated with the stock markets of rival companies. The article provides specific data and analysis to support this argument, as well as relevant economic and statistical theory. Since NVDA is a technical company, the health of the whole economy may have an effect on how well it performs on the stock market. Macroeconomic variables including GDP growth, employment trends, interest rate fluctuations, etc., may have an effect on the stock markets of NVDA and its competitors. The stock exchange fluctuations between NVDA and its competitors may also be correlated with each company's performance. One of the top businesses in the semiconductor and graphics processing unit industries is NVDA. In terms of technological innovation, market share, product advantages, etc., NVDA may have a competitive edge over its rivals. The stock market's performance may be impacted by these variables. In short, it is looking ahead that more comprehensive consideration of macroeconomic factors, performance comparison and the impact of market competition are needed to obtain more data for a more comprehensive understanding of NVDA's stock market movements.

References

- [1] W. Lu, J. Li, J. Wang, and L. Qin, "A CNN-BiLSTM-AM method for stock price prediction," *Neural Comput. Appl.*, vol. 33, no. 10, pp. 4741–4753, 2021.

- [2] C. -J. Lu, C. -H. Chang, C. -Y. Chen, C. -C. Chiu and T. -S. Lee, "Stock index prediction: A comparison of MARS, BPN and SVR in an emerging market," 2009 IEEE International Conference on Industrial Engineering and Engineering Management, Hong Kong, China, 2009, pp. 2343-2347, doi: 10.1109/IEEM.2009.5373010.
- [3] C. K. Tse, J. Liu, and F. C. M. Lau, "A network perspective of the stock market," *J. Empirical Financ.*, vol. 17, no. 4, pp. 659–667, 2010.
- [4] K. Pearson, "Contributions to the mathematical theory of evolution," *Philos. Trans. Roy. Soc. London A*, vol. 185, pp. 71–110, Dec. 1894.
- [5] G. Li, A. Zhang, Q. Zhang, D. Wu and C. Zhan, "Pearson Correlation Coefficient-Based Performance Enhancement of Broad Learning System for Stock Price Prediction," in *IEEE Transactions on Circuits and Systems II: Express Briefs*, vol. 69, no. 5, pp. 2413-2417, May 2022, doi: 10.1109/TCSII.2022.3160266.
- [6] Friedman, J. H. (1991)., "Multivariate Adaptive Regression Splines (with discussion)," *The Annals of Statistics*, 19, 1-141.
- [7] Ashish, K. (2011). An empirical analysis of causal relationship between stock market and macroeconomic variables in India. *International Journal of Computer Science & Management Studies*, Vol.11, Issues 01, May 2011.
- [8] Muhammad Azri bin Mohd and Abdul Halim b. Mohd Nawawi, "Causality linkages between USA and Asian Islamic stock markets," 2011 IEEE Symposium on Business, Engineering and Industrial Applications (ISBEIA), Langkawi, Malaysia, 2011, pp. 123-128, doi: 10.1109/ISBEIA.2011.6088787.
- [9] Sun Dao-de. Selection of the Linear Regression Model According to the Parameter Estimation[J]. *Wuhan University Journal of Natural Sciences*, 2000, 5(4):400-405.
- [10] Y. Eftekharypour, C. H. Ngo and H. Ong, "Partial Correlation Threshold Network Analysis of Malaysia Stock Market," 2018 4th International Conference on Computer and Information Sciences (ICCOINS), Kuala Lumpur, Malaysia, 2018, pp. 1-4, doi: 10.1109/ICCOINS.2018.8510594.