

# Profit and Stock Prices: New Evidence Contrasting the General Consensus of Their Relationship

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## ABSTRACT

Ever since the early 17th century, the stock market has become one of the most important aspects of the economy in modern society. This is why it is important to clearly understand the stock market and invest in the companies that would bring profit. When profit and stock prices are discussed together, people tend to assume that there is a correlation between the two. This is because profit is the monetary representation of that company outside of the stock market, and stock prices are the monetary representation within the stock market. However, while there are countless articles proving why there are such relationships between the two, there are also articles debating that there are any significant relationships. Due to this disagreement in the literature, this paper is going to investigate the relationship between profit and stock prices.

## Introduction

In the early 17th century, the Dutch East India Company (VOC) needed money to fund their expedition and trade to America. To solve this crisis, VOC constructed a model where investors would buy a portion of the company's profit that is brought by the voyages to America funded by the investors. This was the first conceptualization of the stock market, and VOC would gain around 78 million Dutch guilders, translated to 7.9 trillion USD today, from this model (Salomons 2021). The success of the first IPO shook the world and left a deep impression of the possibility for the stock market (Beattie 2022). Compared to its initial size in the 17th century, the stock market has grown inconceivably and became an integral part to the foundations of economics. Every increase or decrease in the stock market deeply affects the wellbeing of the economy and tens of thousands of companies compete every day to gain the favor of the investors. As more and more companies join the market, the competition becomes more intense as there is an increase in companies but not the investors (Hwang 2021). Which is why it is imperative that the investors should know which company would securely bring them profit. With such knowledge, the investors would use it to avoid businesses that is most likely going to have a decrease in market value and invest in the business that is almost certain in increasing its market value. The main purpose of this paper is to investigate on the effect of the annual net profit of a company would on its stock prices.

## Background

Intuitively, when profit and stock prices are discussed together, the consensus is that there is a significant relationship between the two, whether it's a positive or negative linear. For example, popular websites such as Zacks and Investopedia both agree that the increase of profit gives the investors a confidence boost for that company. Thus, more investors would invest in that company due to its growth, increasing the stock prices (Lane 2019, Harper 2022). A professional research study done by Faculty of Economics and Business also concluded that "Profitability proved to be significant on stock price with a positive direction, meaning that when the profitability value increases, the stock price will increase" (Fatmawati 2021). However, there are other articles that disputes with such claims,

such as Enterprising Investor using a century worth of stock data collected by Robert J. Shiller at Yale University to concluded that there was “low correlation” between profit and stock prices (Rabener 2021). These disagreements between the literatures are likely caused by the different perspective of the authors of the articles. For most of the articles claiming that there is a significant relationship between profit and stock prices, they usually analyze the serious investors who look at the company’s factors: profit, growth, stability, before investing. The other articles disputing those claims usually look at the general investors who aren’t taking a deep look at the companies they invest. Due to these controversies, the author wanted to answer the question: how does the publication of a company’s annual revenue report and its net income affect that company’s stock market?

## Study Measures

*Profit.* The measure of a company’s net income over a year in billion dollars as the unit. This variable is a secondary data that the author collected from the internet (Macrotrends). It takes the company’s annual revenue minus both the cost of goods sold and expenses, such as taxes or interest payments, to acquire the net income (Equation 1).

$$Profit_{t(year)} = Revenue_t - Cost\ of\ Goods\ Sold_t - Expenses_t \quad (1)$$

*Stock prices.* Measured in dollars, the stock prices measure a company’s price that a share of the company is trading on the market. In this study, stock prices are only measured from 11/1 of a year to 3/1 to the next year. This way, the study could fully explore the effect that profit have on stock prices. Since stock prices are just the recording of a company’s trading volume and investors, there are no equations to find out past stock prices, but only equations to predict the future price.

*% Difference of stock prices/profit.* These two variables are latent constructs that measures the percent change of stock prices and profit respectively. They are particularly useful for this study since it is a good way to show growth. The equation to calculate both variables is quite similar, which is formulated as follows:

$$\% \text{ Change for stocks }_{t(year)} = \frac{Stock\ prices_{11/1/t} - Highest\ Stock\ prices_{(11/1/t)\ to\ (3/1/t+1)}}{Stock\ prices_{11/1/t}} \quad (2)$$

$$\% \text{ Change for Profit }_{t(year)} = \frac{Profit_t - Profit_{t+1}}{Profit_t} \quad (3)$$

## Method

In this project, the program R Studio and its coding language R, would be used to analyze the stock market to find the correlation between the net profit and the corresponding stock prices. The data used for this study is the stock prices of the Nasdaq-100 (National Association of Securities Dealers Automated Quotations) for every day from 2019~2022. The stock used in this study, the Nasdaq-100, is a stock market index made up of 100 of the largest non-financial companies that is listed on the Nasdaq stock exchange (Chen 2021).

Despite its popularity in the stock market, there were troubles finding good secondary data for the purpose of the study. Therefore, this study used primary data that the author collected from the excel stocks database, provided by Refinitiv ("Refinitiv An LSEG"). The dataset also includes secondary data that were pulled from the annual reports of the said companies.

However, there are challenges with the use of both primary and secondary data. First, creating primary data is tedious and time consuming, this could often lead to human error or negligence in creating the data (Rabianski 43). Second, primary data may not contain the most accurate data as there were multiple instances of missing dates from the dataset, which potentially could alter the resulting of this study. Lastly, although secondary data are most likely

to be objective and collected regularly, they are subject to errors as the amount of data is quite extensive (Rabianski).

The dataset itself are comprised of the following variables: Date, Open, Close, High, Low, Name and Profit. The variables also contain differences in the unit that it is measured in, with Dates measured in Days; Open Closed, High, and Low are measured in dollars, while Profit are measured in Billion dollars. The first five variables change daily, while the annual net profit only changes once per year (Annual Reports). Several other datasets were also created during the process of this study, but they are mostly like the original data set. For this study, the dependent variable is High (Highest stock prices for that day), and the independent variable is the profit.

The main analytical method used for this for this study is linear regression. Linear regression is an analytical approach that assumes a linear relationship between the input or independent variables (x) and the single output or dependent variable (y) with the equation represented in Equation 4 (Yale University 1997). This approach can test the significance of the variable's relationship and gives us an exact result of that relationship and make predictions for the dependent variable. In this study, the variables used can be latent construct or direct observations.

$$Y_i = f(X_i, \beta) + e_i \quad (4)$$

This study also utilizes the function of ANOVA, an analytical approach that is especially useful when finding out the statistical differences between the means of multiple data groups (Kenton 2022). It allows this research to further its focuses of discovering the relationship between variables. The section of the ANOVA analytical approach that this study is going to focus on is the f value (Equation 5), the result of ANOVA for determining the statistical significance of the variables and Tukey HSD test.

$$F \text{ value} = \frac{\text{Variance of the 1}^{\text{st}} \text{ dataset}}{\text{Variance of the 2}^{\text{nd}} \text{ dataset}} = \frac{\sigma_1}{\sigma_2} \quad (5)$$

The Tukey HSD test compares the variable groups to find out whether the variables relationship is significant, more specifically, this study focuses on the p value Beck 2018); which is the probability of their existing evidence against a NULL hypothesis or an insignificant relationship between the profit and stock prices (Equation 6) (Bangia 2022).

$$p \text{ value} = 1 - ptukey(q, k, df) \quad (6)$$

Both linear regression and ANOVA are common when analyzing the relationship between variables. Looking at the overall picture of the entire data set and ANOVA looking into the details between the data groups. Combined, both approaches help this research to examine the connection between the stock prices and annual net profit of different companies.

Data such as the one used in this study gives the community insights on the stock market and aid the investors in making the correct choices when investing in the market (Tsarouva 2022). With such knowledge for each of the 100 companies, it allows this study to further explore its focus of determining the relationship between net profit and stock prices.

## Results

A total of around 1097 days of stock data collected from 100 companies were sampled and analyzed in this study. Through linear regression, this research was able to determine the significance of the relationship between the dependent variable, percent difference of stock prices and the independent variable, profit. In the linear regression

model, it contains all three years of dependent variable and independent for every company. The dependent variable for these models where the percent change in stock prices, and the independent variables are the profit for that year. From the summary of the analytical approach, the  $Pr(>|t|)$  value is 0.248 and the adjusted r square of this model is 0.001129.



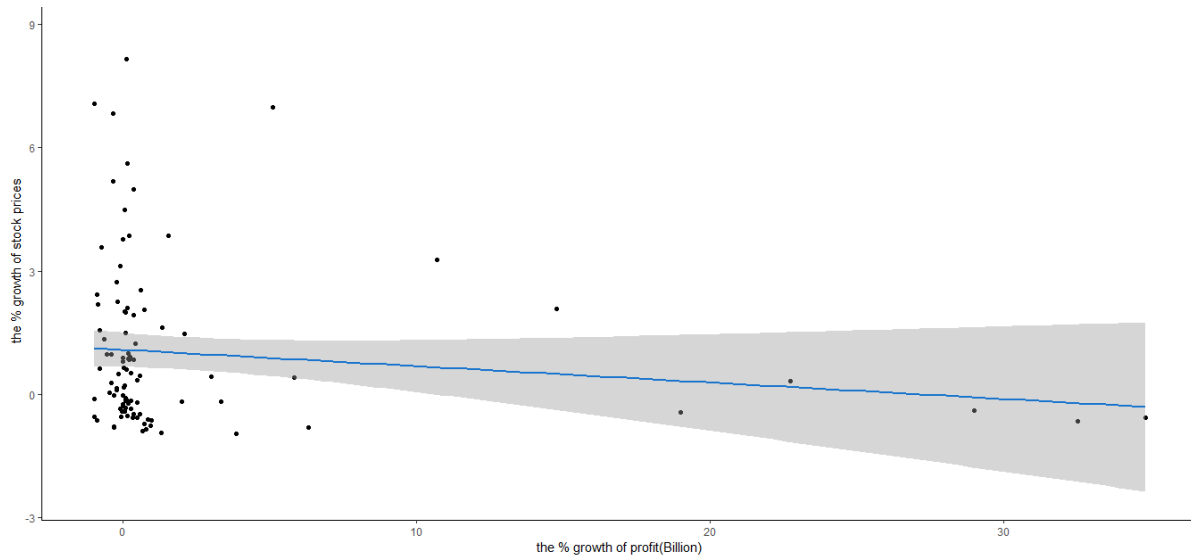
**Figure 1.** Combined graph of Profit (Billion) VS Percent Increase of Stocks in 2019~2021

This study is going to number the graphs in Figure 1 as graph 1, 2, 3, 4 from left to right, top to bottom. In all the graphs above, the best fit line shown was always flat meaning the coefficient for all three graphs are 0 or close to 0. Furthermore, most of the points in the graphs are clustered around the origin point of the graph since profit is measured in billions instead of millions to accommodate for larger companies such as Apple. When compared side by side, there are essentially no differences between the three graphs. (Graph 4). The gray area shown in the graphs are confidence intervals—the mean of the linear model plus and minus the variation of that model.

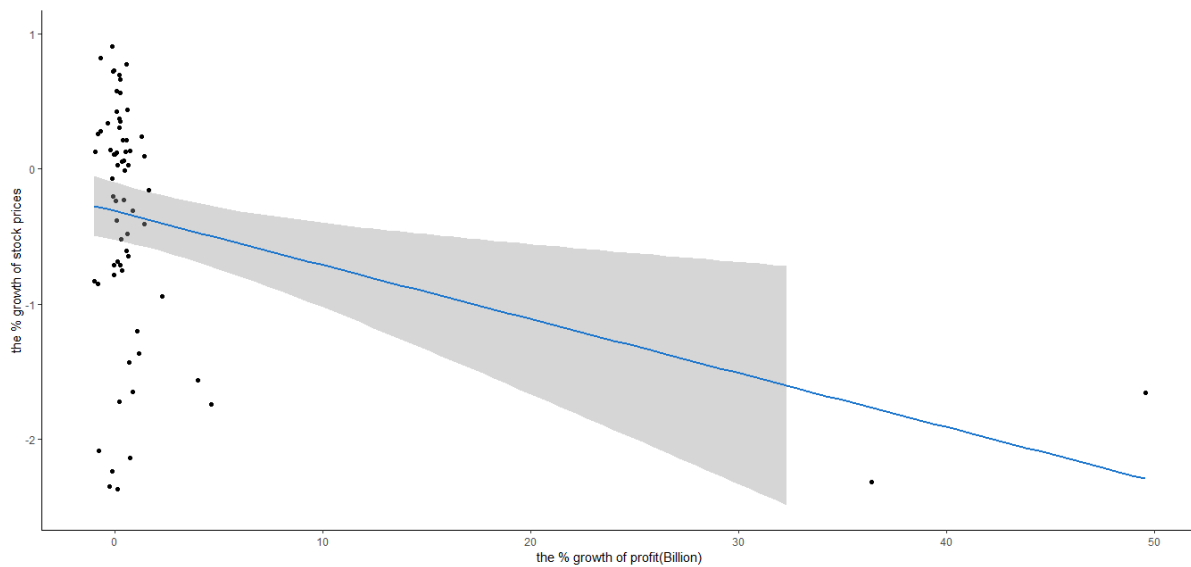
The primary purpose of graph 4 is to show that there are essentially no differences between all three graphs. As shown above, the best fit line barely changes and most of the points overlaps. This illustrates that the trend of this linear regression model is consistent and reoccurring, at least for the past three years.

The p-value for Figures 2 and 3 are 0.6799 and 0.87 respectively, furthermore, the adjusted r square is -0.00842 and -0.00993 respectively. Figure 2 and 3 shows a different graph and relationship than the previous Figures. These two graphs are linear regression models for the growth of a company and how that affects the growth of their stock prices. The percentage difference of profit is the way to show growth of that company, as this study can get an accurate idea of how much growth the company got between the years.

The ANOVA model also presents a similar result to the linear regression model. The dependent and independent value of the ANOVA model is the same as the regression model. The F value for this model is 0.583 and the  $Pr(>F)$  for this model is 0.994. The main purpose of the ANOVA model is to find out whether the difference between the data groups is statistically significant.



**Figure 2.** The growth of the profit in 2019~2020 and its effect on the growth of the percent difference of the stock prices.



**Figure 3.** The growth of the profit in 2020~2021 and its effect on the growth of the percent difference of the stock prices.

**Table 1.** The summary of the ANOVA model

	Df	Sum Sq	Mean Sq	F-value	Pr(>F)
Profit	257	927744	3610	0.583	0.994

For the actual results that was acquired from the Tukey HSD test (Table 2), it does no stray away from the conclusion above. The P adjusted value or the “adjusted p value for the multiple comparison using the R function TukeyHSD ()” is the value that this research is going to focus on from the Tukey HSD test (Stefan 2016). In the results of the Tukey HSD test, the p adjusted value was always 1 or close to 1 with a few exceptions.

**Table 2.** The results from the Tukey HSD test with Profit (Billion as the independent variable and stock prices as the dependent variable).

Profit (Billion)	lwr	upr	p adj
0.02-0.001	-405.031	380.896	1.000
0.024-0.001	-561.577	649.892	1.000
0.-3-0.001	-575.064	536.405	1.000
0.05-0.001	-544.064	567.405	1.000
0.06-0.001	468.885	438.626	1.000
0.07-0.001	-592.163	519.305	1.000
0.08-0.001	-490.953	416.557	1.000
0.09-0.001	-487.735	419.776	1.000
0.1-0.001	-592.263	519.205	1.000
0.101-0.001	-499.131	612.158	1.000
0.12-0.001	-587.464	524.005	1.000
0.123-0.001	-592.664	518.805	1.000
0.13-0.001	-468.335	439.176	1.000
0.14-0.001	-422.542	405.798	1.000
0.16-0.001	-461.435	446.076	1.000
0.17-0.001	-578.164	533.305	1.000
0.18-0.001	-579.464	532.005	1.000
0.181-0.001	-568.527	542.942	1.000
0.213-0.001	-537.236	574.233	1.000
0.215-0.001	-565.764	545.705	1.000
0.23-0.001	-579.964	531.505	1.000
0.243.-0.001	-579.777	531.692	1.000

The column name “lwr” (lower bound) and “upr” (upper bound) simply means the lower and upper bound for the groups of data used in this model. As said above, these values are not important to further this study and they do not give insight of the relationship between the differences of the data groups. For the actual comparison between profits, only 0.001 billion dollars are used to compare with other amount of profit due to the program that is used in this study, R studio, omits the data after row 252. Thus, only the comparison with 0.001 was present in the results for the Tukey HSD test. Lastly, only 23 rows of results were used in this study, as the p adjusted value for most of the comparison is 1.

## Discussion

Based on the results of both linear regression and the ANOVA model, it could be concluded that there are no significant relationships between profit and stock prices. The evidence to back up this claim is strong. First the high p value for the linear regression model is greater than 0.05, indicating that the assumption that there is a relationship between the profit and percent difference of stock prices is not significant. Furthermore, the adjusted r square of this model is 0.001129 which is extremely low, signifying that the input value is not adding value to the regression model (Fig.1) (Muralidhar 2021).

Also, shown in Figure 1, the best fit line is almost flat, meaning that the coefficients for the best fit line of all graphs are mostly 0 or even negative numbers. This means that despite the profit increase, the percent increase of

stocks does not change. In some cases, stock prices even decrease as the profit increases. These graphs fully show the insignificant relationship of profit and stock prices.

In both Figures 2 and 3, most points in the graph are concentrated 0,0, this indicates that despite there being growth in the companies, their stock prices did not change accordingly. For example, there are several companies shown in the Figure that have an increase of 3000% in profit but still showed a decrease in stock prices. While there are other companies that showed little growth in profit but increased significantly in stock prices. Therefore, there are it could be concluded that there is no significant relationship between growth of profit and growth of stock prices. Furthermore, the p value for both graphs is extremely high, passing 0.05, this also further implies the insignificance between the variables.

As for the ANOVA and the Tukey HSD results, it does not stray far away from the results of the linear regression. For example, the f value of the ANOVA is 0.583, this is a low value for f, this indicates that the groups mean are closely related to each other relative to the variability within the group. This disproves that there are significant relationships between the variables as it does not reject the NULL hypothesis. Further prove that the model does not disprove the NULL hypothesis is the p value. The p value is 0.994, an extremely high value that the significant value of 5% or 0.05, this value proves that the ANOVA model does not reject the NULL hypothesis, meaning that it is certain that there no significant relationship between the variables.

The Tukey HSD test also came to the same conclusion as the previous two analytical methods. The main component that this study is looking at is the p adjusted value. In this test, the p adjusted value indicates that there is a significant difference between the comparisons of profit in relation to the percent difference of stock prices if the p adjusted value is below the 0.05. However, since almost all the comparisons have a p adjusted value of 1, that signifies that there are no significant differences between the comparisons.

Upon the results and analyzation of all three different analytical methods, it can be concluded that there are no significant relationships between the annual profit of the company and its percent change in stock prices. One reason for this phenomenon is that most investors aren't reading the annual reports for a company before investing. They look at the trend of the stock prices, not the profit of that company. To decide which companies they should invest, the investors first choose the companies that they have encountered the most on the news or social media such as Apple, or Netflix, etc. Then they look at the trend of the stock prices, if it's relatively low, then the investors buy. The process does not involve profit or anything else that is in the annual report of a company. Therefore, there are some companies that had five times the growth in profit, but none of the investors look at that growth, causing the company's stock prices to remain unchanged or even decrease.

## Conclusion

In professional stock market research, most studies typically use analysis methods that accounts for the broader trend of stock market such as Technical, Fundamental and Qualitative analysis (SoFi 2021). Whereas in this study, it uses different analysis methods that investigate one specific area of the stock market with much less data. Therefore, despite the results of the study indicating that there are no relationships between profit and stock prices, it is important to understand there are much more factors affecting the stock market than what is realized in this paper.

This paper also concluded that the growth of a company does not affect its stock prices. However, this is not accurate to the full scope of the company, as this paper investigates the percentage change of the stock prices, not the amount of shares or the actual value of stock prices or something that is significant in their relationship with profit. Furthermore, the percentage change of a company is dependent on the size of the company, meaning that for example, a company such as Apple would have much less fluctuations in stock prices due to its enormous size in the stock market than a much smaller company whose stock prices easily fluctuate due to its small size.

Ultimately, there are several limitations that this study is restricted upon. For example, there is only one person, the author, working on this study, therefore not as much data on stocks were able to be collected and more data



is needed to come to a more confident conclusion. This paper is an initial exploration of this subject and further research is needed to forward the study.

The next steps would be to collect much more data points for more companies and use more varied analyzation methods so that all fields are covered. Furthermore, there should be more variables and details to be accounted for in the stock market, as there are many factors influencing stock prices. Thus, a much more detailed and dataset is needed to further the research. Currently this paper offers an insight to the readers: the profit of a company is not its only determining value in the stock market, higher profit does not necessarily mean that there would be a beneficial return in the future, and they should carefully think over their choices before investing.

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