

The Impact of Twitter's Acquisition on Stock Price: An Empirical Study on Event Analysis

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Abstract

This research examined the impact of Twitter acquisition. The main focus was on the stock prices of Tesla and Twitter. The time for the study was divided into three: Elon Musk initiated an acquisition of Twitter, Musk announced his intention to abandon the acquisition, and Musk became Twitter's new owner and CEO. As one of Musk's listed companies, Tesla is also the analysis object of the paper. The S&P 500 return was used to help obtain the return. This work analyses stock prices, annual reports, and news from Twitter and Tesla. Through descriptive statistical analysis, we get some critical conclusions. The study fills a research gap in the existing literature on Twitter acquisition.

1 INTRODUCTION

Currently rebranding to X, Twitter is a popular online social media platform. (Davis, 2023) People can post texts, images, and videos or comment on others' posts on X. Users can also directly send messages to others. (Conger, 2023) Twitter was created in March 2006 in San Francisco, California. Twitter launched its IPO on the NYSE on November 7, 2013. (Heidi, 2013) With its iconic blue bird logo and users spanning the globe, Twitter has become a dynamic hub for real-time updates and public discourse. In July 2023, Twitter had 541 million MAU. However, a businessman wanted to have this bluebird.

On January 31, 2022, Musk started to purchase Twitter stock. In April, he became the company's largest shareholder and owned 9.2% of the company's shares. (Isaac & Hirsch, 2022) After

the announcement, Twitter's stock had its most significant surge since 2013, rising by as much as 27%. (Turner & Trudell, 2022) On April 14, Musk formally proposed an offer to Twitter to purchase the company for \$43 billion, \$54.20 per share, and take it private. (Turner & Adler, 2022) Later, Twitter's board launched a "poison pill" strategy.

On July 8, because of spam accounts, Elon Musk announced his intention to terminate the proposed acquisition. (Duffy et al., 2022) Twitter's board of directors has decided to use the lawsuit against Musk to let him complete the purchase.

Musk decided to continue his proposed acquisition on October 3, on the condition that Twitter drop its lawsuit. (Lombardo & Dana Cimilluca, 2022) In the afternoon of October 27, Musk and Twitter signed papers, and Musk successfully acquired Twitter. The next day, Twitter shares ceased trading. Twitter's stock ticker "TWTR" was delisted from the New York Stock Exchange on November 8. (Scott Nover, 2022)

As a successful businessman, Elon Musk owns many companies. These companies were affected by the acquisition. For example, Tesla's stock sank by over \$125 billion, causing Musk to lose about \$30 billion of his net worth during the acquisition. It is more than double the cost of acquiring Twitter. (Faiz Siddiqui, 2022)

The study analyses stock prices, annual reports, and news of Twitter and Tesla from January 31, 2022, to October 27, 2022, to find out the impact of the acquisition on these two companies. This research will answer why Musk wanted to acquire Twitter and whether this was a successful and correct acquisition.

2 METHODOLOGY

2.1 Linear regression

Linear regression is a linear approach to finding the relationship between dependent and independent variables. Linear regression generally has two types: used for prediction or used to show causality relationships. For example, if we have a random sample $(Y_i, X_1, X_2, \dots, X_i)$, $i = 1, \dots, n$. We add an error term ϵ_i and then find out all the factors β_i that affect Y_i . Thus, the

model takes the form

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_i X_i + \epsilon_i \quad (1)$$

Where Y_i refers to response variable, x_k refer to explanatory variables. β_k are elements known as effects or regression coefficients. ϵ_i is called the error term, this variable means all other factors which influence the dependent variable other than the explanatory variables.

Linear regression will be used to find out the relationships between Twitter's and TESLA's market indexes, related financial news and average return of the stock.

2.2 Coefficient of determination

A statistic known as the coefficient of determination is employed in statistical models whose primary goal is the testing of hypotheses based on additional relevant data or the prediction of future events. it gives a gauge of how results are shown by the model. The definition of the coefficient of determination is

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}} \quad (2)$$

Where residual sum of squares $SS_{res} = \sum_i (y_i - f_i)^2$, the total sum of squares $SS_{tot} = \sum_i (y_i - \bar{y})^2$. A data set has n values marked y_1, \dots, y_n , each associated with a fitted value f_1, \dots, f_n

Coefficient of determination will shows the stocks return and the sp500 in the year and a half before the acquisition event, so as to predict the confidence interval of stocks return during the event window.

2.3 Confidence Intervals

Confidence intervals use data from a sample to estimate a population parameter. But an interval estimate must use sample data, so they are random, and the end points of the interval will be different.

95% Confidence Interval for the Mean of a Normal Population, Let x_1, x_2, \dots, x_n be $iidN(\mu, \sigma)$, where μ is unknown

We know that $Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} N(0, 1)$, so $P(\bar{X} - 1.96 \frac{\sigma}{\sqrt{n}} < \mu < \bar{X} + 1.96 \frac{\sigma}{\sqrt{n}}) = 0.95$

It provides the credibility of the measured values of the stock price and acquisition.

2.4 Event Study

It is a statistical method that analyze whether stock prices changes when an event occurs in the market and whether abnormal returns occur. Through this method, we can understand whether stock price changes are related to the event.

2.4.1 Event window and Estimation window

Select two windows, which we call event window and estimation window. event window should include the event occurrence time $T=0$. Estimation window is used to determine the linear relationship between individual stocks and the market, while event window is used to measure the difference between the actual individual stock returns after an event and the predicted returns. The magnitude of this difference is used to determine the impact of the event.

2.4.2 Individual stock returns

In Market Model, Individual stock returns R_t are related to contemporaneous market returns. The model takes the form $R_t = \alpha + \beta R_{mt} + \epsilon_t$ $var(\epsilon_t) = \sigma^2$

The parameter *beta* measures the systematic risk of stock. The parameter α measures the idiosyncratic return of stock. The parameter σ measures the variability of the idiosyncratic shock.

We will use this method to calculate the stocks returns

2.4.3 Measuring Abnormal Return

We define the so-called Abnormal Returns inside the event window

$$AR_t = R_t - (\alpha + \beta R_{mt}), t = 1, \dots, E \quad (3)$$

On average, under the null hypothesis of no effect the Abnormal Returns should be zero on average.



The Cumulated Abnormal return for each t in the event window

$$CAR(t) = \sum_{s=1}^t AR_s = \sum_{s=1}^t \epsilon_s \quad \epsilon_s \sim N(0, t\sigma^2) \quad (4)$$

Compare $CAR(t)$ with $z_{\alpha/2}(\sigma\sqrt{t})$ for two sided $\alpha - level$.

These results will show the difference between the actual return of a security and the expected return of Tesla and Twitter.

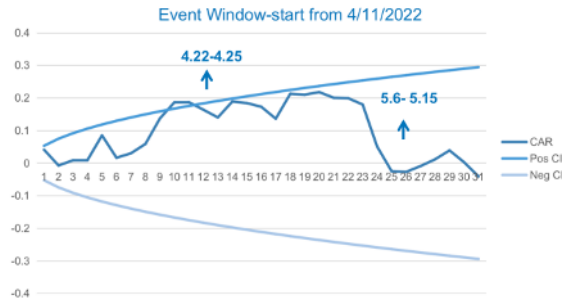
3 EVENT ANALYSIS - TWITTER

The event analysis method described in the previous section can be applied to analyze the impact of three key time points on Twitter's stock price in the acquisition timeline. If CAR exceeds the confidence interval, it is confident enough to conclude that Musk's behavior during this period has impacted the stock price. Estimation window: The estimated window is 2021. Twitter's historical stock price data, market indexes, and related financial news are used during this time. The main goal is to look at the average return of the stock in the year and a half before the announcement. The following regression equations and graphs are obtained:

$$Y = 1.3722X - 0.007 \quad (5)$$

$$R^2 = 0.2069 \quad (6)$$

This step obtained the correlation between Twitter's stock return and the sp500 in the year and



a half before the acquisition event to predict the confidence interval of Twitter’s stock return during the event window. Since it is crucial to isolate each event’s impact, some market volatility events that could affect stock prices are also excluded. In other words, there were no other significant events happening during the event window that were bound to impact Twitter’s stock price.

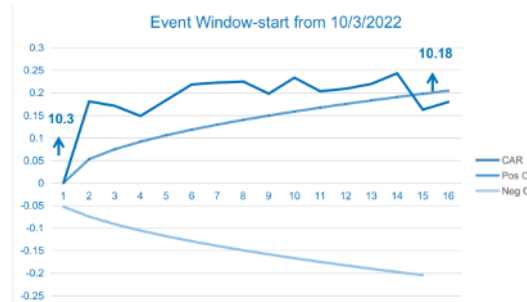
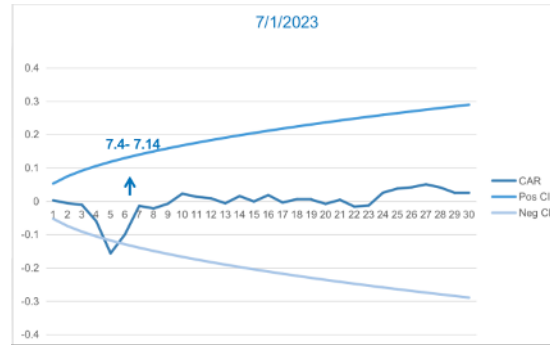
Event window 1:

The first typical phase of the acquisition process was Musk’s continued aggressive bid. Since April 14, Musk has been actively negotiating a purchase price with Twitter. Finally, on April 25, Twitter agreed to Musk’s offer of \$43billion. In the first phase of the analysis, the starting point of the event window was set on April 14, when Musk made his first bid of \$43 billion. The graph below shows the return on Twitter stock during the event window compared to the confidence interval obtained in the previous step. In this case, the null hypothesis is that Twitter’s stock price did not experience any impact in the first stage.

As the results show, during the period of Musk’s active bid, Twitter’s stock price exceeded the positive confidence interval, which means that we are confident enough to reject the null hypothesis and conclude that Musk delivered an excess return to Twitter’s stock price during this period. At the same time, between May 6 and May 15, the chart shows a significant decline in yields. What happened during this period is the next stage of content.

Event window 2:

On May 13, the next phase of the acquisition process began. Musk began claiming that Twitter had a problem with fake accounts. After a series of statements and games between the two sides, Musk officially announced on July 8 that he would stop acquiring Twitter. To account for the fact that some messages leaked early, the event window for this stage was set to July 1. Similarly, the null hypothesis is that stopping the acquisition did not affect the earnings of Twitter’s share price.

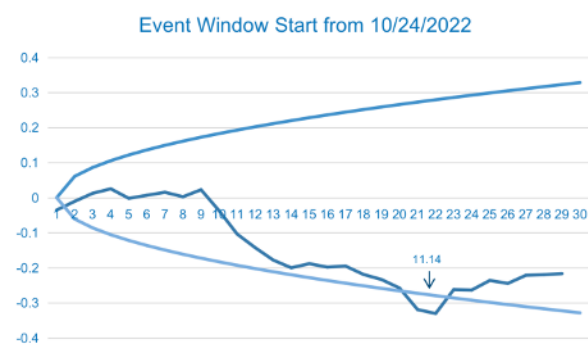
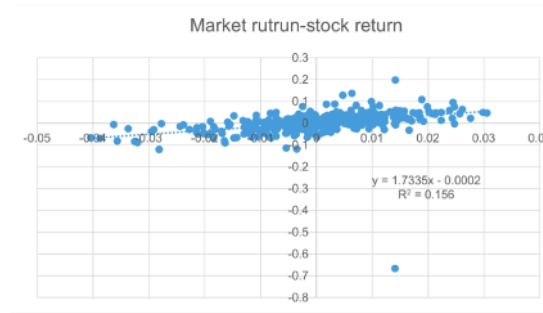


The chart above shows that between July 4 and July 14, Twitter’s stock yield exceeded the negative confidence interval predicted by the estimate window. We are still confident enough to reject the null hypothesis and conclude that Musk’s suspension has had a negative impact.

Event window 3:

After being sued by Twitter, Musk rebid the bid on October 4. The two sides revived the \$44 billion offer and closed the deal on October 27. At this stage, the starting point of the event window is set to October 3. As the chart below shows, we can observe that the return of the stock at the completion stage has far exceeded the confidence interval. In other words, we can still reject the null hypothesis: the acquisition stage does not affect the price of Twitter.

Conclusion: In the three stages of the acquisition process, there are three distinct events windows in which Musk has influenced the stock price. In the first phase, Musk actively bid for half a month from April 11. The results of the data analysis also showed that his actions increased the yield of Twitter’s stock price. In the second two Windows from July 11, Musk suspended the acquisition, and the analysis results also showed that in this stage, there was a reduction in profitability beyond the confidence interval. During the last event window, the period when the acquisition was completed, from October 3 until Twitter’s shares were suspended, yields improved significantly. In these three stages, data studies can also support the argument that the reason for



the change in yield is due to the acquisition event.

4 EVENT ANALYSIS-TESLA

Similarly, event analysis can also be used to examine Tesla's stock price movements during the acquisition.

Estimation window:

The expected window is 2022. During this period, the following regression equation and chart were obtained using Tesla's historical stock price data:

$$Y = 1.7335X - 0.0002 \quad (7)$$

$$R^2 = 0.156 \quad (8)$$

From the figure, the correlation between the stock return rate of Tesla's stock price after the Twitter acquisition event and the SP500 is clear.

Event Window:



Figure 1: (<https://finance.yahoo.com>)

The results of the data analysis showed that Tesla's yield exceeded a negative confidence interval during the event window, meaning that the null hypothesis that the acquisition event had no impact on Tesla's stock price can be rejected.

5 REASONS OF TESLA'S STOCK PRICE HAS BEEN AFFECTED

This is Tesla's stock price chart in 2022. It can be seen from the chart that Tesla's stock price has continued to fall since April. The related event is Elon Musk's public announcement on April 25 that he would acquire Twitter. On October 27, Elon Musk officially acquired Twitter, and Tesla's stock price experienced another wave of decline.

Here are some of the most likely reasons why Tesla stock is falling. First of all, for investors in Musk's companies, they play a crucial role. Some investors believe Musk's involvement in Twitter distracts from his role at Tesla, leading investors to worry about his ability to focus on the electric car company and reduce or cancel investments in Tesla accordingly. Tesla shares fell.

In addition, Musk's involvement in various ventures, including SpaceX and The Boring Company, has seen mixed reactions from his investors. Some see his entrepreneurial spirit as a positive, while others worry about his over-expansion.

Last but not least, to buy Twitter, Musk needed to raise much money, forcing him to sell a lot

of Tesla stock. Musk sold approximately 22 million Tesla shares worth approximately \$3.6 billion, according to regulatory filings in December 2022.

6 THE FOUNDING OF TESLA

Tesla was founded in 2003 by engineers Martin Eberhard and Marc Tarpenning. Their goal is to create electric vehicles to solve environmental problems and reduce dependence on fossil fuels. In early 2004, Elon Musk got involved with Tesla by leading Tesla Motors' Series A investment funding and joining the board of directors. Musk has poured a lot of his own money into the company.

Here are some reasons why Musk is investing in Tesla. First of all, for environmental sustainability, Musk has long been concerned about the environmental impact of fossil fuels and climate change. He sees electric cars as a greener alternative to gasoline-powered cars. Secondly, Musk recognized that existing electric vehicles at the time lacked mass-market appeal due to limitations in range, performance, and design. He hopes to develop high-quality, high-performance electric vehicles that can compete with conventional gasoline vehicles. Thirdly, to demonstrate the feasibility of electric vehicles, Tesla's first product, the Tesla Roadster, aims to prove that electric vehicles can be fast, attractive, and suitable for everyday use. Based on the Lotus Elise chassis, the Roadster was Tesla's way of demonstrating the potential of electric vehicle technology. Fourthly, for long-term vision, Musk has always had a long-term vision for Tesla. He sees it not just as an automaker but as an energy company capable of delivering sustainable energy solutions, including electric vehicles, solar, and energy storage. This broader vision aims to reduce the world's dependence on fossil fuels. Fifthly, for breaking down the oligopoly, the auto industry is dominated by established players, and Musk believes the industry needs to be disrupted. Tesla aims to challenge the status quo and prove that newcomers can compete with traditional automakers, paving the way for innovation and competition in the industry. Sixthly, for innovation and technological advancement, Musk is known for his passion for cutting-edge technology and innovation. By founding Tesla, he could push the boundaries of electric vehicle technology, battery technology, and self-driving systems and contribute to advances within Tesla and the auto industry.

In conclusion, Elon Musk founded Tesla to create a sustainable future by promoting electric vehicles, advancing electric vehicle technology, and providing clean energy solutions. His commitment to environmental sustainability and innovation are the drivers of Tesla's success and its role in the electric vehicle revolution.

7 THE REASONS OF MUSK BOUGHR TWITTER

First of all, Musk wants to reduce content moderation. He tweeted that the social media platform's policies should treat left and right alike and said Twitter had "the potential to become a global platform for free speech."

Secondly, Musk wants to eliminate robots. He promised to "defeat spam bots" and "verify the authenticity of all users." Bots here may mainly refer to cryptocurrency scams, which is also one of the issues affecting Musk's acquisitions. Scammers have used fake accounts impersonating Musk on various social media sites in an attempt to get people to give away cryptocurrency. In 2020, Musk's account was also one of the high-profile Twitter accounts hacked to promote a Bitcoin scam.

Finally, Musk also wants to reduce his reliance on advertising: In the deleted tweet, Musk said that he would launch a new subscription model for Twitter and get rid of ads for premium subscribers.

However, many people do not believe that Musk's intentions are pure. The most common narrative is that Musk's acquisition plan is to preserve his ability to influence millions of people without interference, to control social discourse, and to make his businesses and projects grow.

8 TWITTER'S OPERATION AFTER ACQUISITION

On November 6, 2021, Elon Musk launched a poll on social media Twitter, asking whether his 63 million followers on Twitter would support him selling 10% of his Tesla shares, and the majority of the Twitter voting results were in favor of him selling. As a result, Tesla's stock price fell by 16% in two days. Since Elon Musk publicly announced the acquisition of Twitter on

April 25, 2022, Tesla's stock price has been falling all the way. At this time, Tesla's stock price was \$960.5. On April 26, Tesla's stock price plummeted 12.18%, the largest one-day drop since September 2020, leading to a decline in technology giants. The market value evaporated by about 125 billion U.S. dollars in one day, falling below the integer mark of 1 trillion U.S. dollars. The value is also down by \$21 billion, matching the \$21 billion in cash he pledged to buy Twitter. On May 20, 2022, the closing price was as low as \$633.9. Within 25 days, the stock price down nearly 33%. On December 22, 2022, Tesla's stock is poised for its biggest monthly, quarterly, and annual decline ever, surpassing Meta as the worst-performing stock among the most valuable technology companies in 2022. Tesla stock has fallen 73% from its all-time high in November 2021 and is down 69% so far this year. Twitter, which Musk bought in October, is burning through cash, forcing him to sell a lot of Tesla stock. According to a regulatory filing in mid-December, Musk recently sold about 22 million more Tesla shares, worth about \$3.6 billion. Earlier this year, Musk told his followers on social media that he had "no further plans to sell Tesla shares" after April 28. After the latest sale, Musk said that he would not sell Tesla shares again in the next two years. If he breaks his promise this time, it takes work to judge.

9 LIMITATION AND IMPROVEMENT

The study analyzed the part about stocks and annual reports in the Twitter acquisition case. However, some limitations still exist in the study. First, as a very significant financial event, stocks can only be a small part of it and cannot fully reflect the complete picture of the event. Second, the event window is extraordinary, and the obtained data may have limitations, and validity is questionable. Another factor that was not taken into consideration is external influencing factors such as U.S. government intervention. Last, future studies should consider including other models in the analysis.

10 CONCLUSION

In the final analysis, this is undoubtedly a cost-effective and successful acquisition for Twitter. In the three stages of the acquisition process, In the first phase, the results of the data analysis also showed that Musk's actions increased the yield of Twitter's stock price. When Musk suspended the acquisition, the analysis results also showed that in this stage, there was a reduction in profitability. During the last event window, yields improved significantly. However, after the takeover, Musk almost laid off half of Twitter's workforce and attempted to transform Twitter. Whether this change can benefit the company, as X is a private company, it cannot be known from the stock price.

For Tesla, this acquisition has had a significant negative impact. From Tesla's stock price we can see from the chart that Tesla's stock price has continued to fall since April. The related event is Elon Musk's public announcement on April 25 that he would acquire Twitter. When Elon Musk officially gained Twitter, Tesla's stock price experienced another wave of decline. For investors in Musk's companies, they play a crucial role. Some investors believe Musk's involvement in Twitter distracts from his position at Tesla, leading investors to worry about his ability to focus on the electric car company and reduce or cancel investments in Tesla accordingly. Tesla shares fell. Above all, to buy Twitter, Musk needed to raise much money, forcing him to sell a lot of Tesla stock. Musk sold approximately 22 million Tesla shares worth roughly \$3.6 billion, according to regulatory filings in December 2022. It is still being determined whether Twitter will benefit Tesla after the acquisition.

For Elon Musk, this takeover has caused him and his company some losses, but he has a highly influential social media company. This event gives him a more influential voice in social speech and is also more conducive to the development of his career. Musk wants to reduce content moderation. He tweeted that the social media platform's policies should treat left and right alike and said Twitter had "the potential to become a global platform for free speech." As Musk's business map, in the future, Musk hopes to build X into software similar to WeChat, integrating all functions into X and making it more influential.

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