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IMPACT OF META VERSE ANNOUNCEMENT DATE ON STOCK PRICES

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ABSTRACT:

Purpose-The developing metaverse, a virtual world poised to transform online interaction, has raised an important question: how does a company's participation influence its financial standing? This study focuses on the e-commerce behemoth Amazon and its prospective entry into the metaverse. Our major goal is to determine whether a statement by Amazon on their metaverse plans causes a significant impact in their stock price.

By examining past stock data with any potential metaverse announcement dates, we hope to determine whether Amazon's excitement about the metaverse translates into an actual financial benefit. This study dives deeper by examining the specifics of the announcement (assuming it occurs). Does the level of commitment and investment mentioned affect the stock price reaction?

Finally, this study aims to bridge the gap between the hoopla surrounding the metaverse and its real-world ramifications for corporations such as Amazon.

Approach: Event Definition: The event of interest is the particular day on which our selected companies makes a public declaration about entering the metaverse. This date will be critical to our analysis. Event Window: We'll set a timetable around the announcement date. This window will most likely consist of two parts: Estimation Window: The period preceding the announcement, we have selected 110 days, helps set a baseline for Amazon's stock price performance and eliminates the impact of unrelated market movements.

Event Window: This time period, we have selected as 10 days before and after following the announcement allows us to monitor any potential changes in stock price due to metaverse news.

Findings: Stock Price Change: The investigation may discover a statistically significant boost in companies stock price following a metaverse announcement. This suggests that investors reacted positively to the announcement, maybe seeing the metaverse as a new growth prospect.

No Change or Negative Change: Alternatively, the investigation may discover no substantial change, or even a decline in stock price following the announcement. This could suggest investor concern about companies capacity to capitalize on the metaverse, as well as a general market correction during the event window.

Impact of Announcement Specificity: The study may find that the level of depth and commitment conveyed in the announcement influences stock price movement. A more thorough and ambitious proposal may elicit a better positive response from investors.

Industry-Specific Effects: The research design might be expanded to compare company's stock price movement to those of other companies in different industries following metaverse announcements. This could reveal whether particular industries have a stronger stock market reaction because of their deeper relationship to the metaverse.

Limitation: For starters, the metaverse is a very new concept, so any announcement by worldwide companies may focus on future projects. This makes it difficult to estimate the long-term financial impact on the company's stock price. Furthermore, the specifics of the announcement itself (assuming it occurs) are critical. A vague announcement with few specifics may have a lower impact on the stock price than a well-defined plan with realistic investment figures. These constraints underscore the need for additional research as the metaverse and corporate participation in it evolve.

1.Introduction

The term "metaverse" evokes vivid images of a future in which the digital and physical realms merge. Imagine a network of interconnected 3D virtual spaces, not just websites but immersive environments where users can engage in near-tangible interactions with the virtual world and each other through personalized avatars. This is the fundamental idea behind the metaverse, a possible internet evolution that goes beyond the constraints of the 2D format as it exists today. Science fiction books such as Neal Stephenson's "Snow Crash" introduced the idea of a persistent virtual world, sowing the seeds for this concept. But new developments in technology such as blockchain, augmented reality, and virtual reality (VR) are bringing this made-up world to life.

The metaverse offers infinite possibilities that surpass the limits of human imagination. Envision going to virtual concerts with friends who live all over the world, with their avatars sitting next to you in the virtual audience. Think about having meetings in the well-thought-out conference rooms in a virtual skyscraper. With the ability to virtually travel the world and study historical events, the metaverse has the potential to completely transform education. Moreover, the metaverse offers e-commerce thrilling new prospects. Avatars could be able to browse digital goods or interact with holographic projections of physical products before making a purchase in virtual marketplaces.

The path towards a completely developed metaverse is fraught with difficulties, though. The technical foundation required to enable an extensive virtual network of interconnected spaces with flawless user experiences is still being developed. It is necessary to address privacy and security concerns in such a persistent online environment. To guarantee a just and equitable virtual society, issues related to regulation and governance also need to be carefully considered.

1.1 Introduction to the variables

The price of a security (stock, bond, etc.) at the conclusion of a trading day is referred to as the closing price. It stands for the last price that was paid on that specific day for the security.

Closing Date: The date on which the closing price was recorded is specifically referred to here.

Comprehending past patterns: You can see how a security's price has evolved over time by charting closing prices against closing dates. This can assist in recognizing patterns such as upward, downward, or volatile trends.

Technical analysis: Based on past trends, technical analysts frequently employ closing prices and dates to calculate different technical indicators that try to forecast future price movements.

Creating statistical models to try to explain or forecast how closing prices change over time can be done with the help of this data. These models may consider variables other than the closing date, like news stories, economic data releases, or shifts in the performance of the company.

1.2 Purpose of the study

This study aims to investigate the relationship between a stock price and a company's announcement of entering the metaverse. We'll be examining whether, in comparison to similar companies that haven't made such announcements, companies that create excitement by announcing involvement in this new technology see a discernible increase in stock price. We can determine whether the hype surrounding the metaverse has a genuine financial impact on these companies by comparing announcement dates with historical stock data. We will be able to better comprehend investor sentiment regarding the metaverse and its possible impact on particular industries with the aid of this research.

1.3 Need of the study

The financial markets and tech industry have been impacted by the metaverse concept's explosive rise. This research explores the fascinating question of whether a stock price's reaction to a company's announcement of entering the metaverse space is noteworthy. Our goal is to provide insight into the connection between investor behavior and this virtual world phenomenon by examining historical stock data in conjunction with announcement dates.

It is important to comprehend this connection for a number of reasons. First of all, there could be a paradigm shift in the way we communicate and transact business online due to the metaverse. Businesses that are at the forefront of this technology development will have a competitive advantage, and investors will probably reward these innovators. If such an advantage results in a measurable financial gain through stock price appreciation, this study can show it.

Second, the results can provide important context for understanding how investors feel about the metaverse itself. An upward trend in stock prices following announcements would indicate investor enthusiasm for this new technology's potential. This could then influence how resources are allocated and investments are made in the tech industry. On the other hand, a subdued or unfavourable reaction could point to doubts about the metaverse's viability or a company's capacity to profit from it.

Moreover, the research can enhance the overall comprehension of the variables impacting stock market oscillations. Through the process of controlling for variables such as overall market trends and company performance, we can isolate the effect of metaverse announcements and evaluate the independent influence of this new technology on investor

behavior. Financial analysts and other market participants who want to understand how to handle the constantly changing dynamics of the stock market may find this information useful.

In the end, this research aims to close the gap between the financial implications of the metaverse and its hype. Through the examination of the correlation between announcements and stock prices, important information about investors' perceptions of this new frontier and its potential to transform the business landscape can be obtained.

1.4 Problem Statements /Research Questions

Q1 In comparison to companies who haven't made such an announcement, does a company's revelation that it is entering the metaverse cause a major shift in its stock price?

Q2 Does the size of the company's stock price fluctuation, if any, depend on the details of its metaverse ambitions (e.g., investment level, scope)?

Q3 Is there a moderating factor, like the company's industrial sector or general market attitude, that affects how a metaverse announcement affects stock price?

1.5 Scope of the study

The focus of this research will be the financial effects of businesses disclosing their participation in the metaverse. We will specifically target publicly traded corporations that have made such statements in a variety of areas. We'll compile historical daily closing stock values for a predetermined time frame around the announcement date in order to evaluate the impact. To isolate the impact of the metaverse announcement, the research will take into account pertinent control variables such as overall market performance and the company's financial condition.

Nevertheless, private businesses and those tangentially associated with the metaverse are not included in the scope unless specifically stated. We'll leave qualitative aspects of investor emotion and particular metaverse strategies for future research, and instead concentrate on the quantitative relationship between announcements and stock prices.

It is important to select a timeframe for gathering stock price data. In order to capture any price fluctuations that may be related to the metaverse news, it will cover a reasonable amount of time both before and after the announcement. The study admits its limits even as it seeks to clarify the relationship between announcements and stock prices.

First off, given the metaverse's infancy, statements from businesses may be focused on the future, which could limit our understanding of the long-term financial effects. Second, even with statistical controls, some market noise may still be

present. Overall market trends and outside events have the potential to have a substantial impact on stock prices. Lastly, the particular that an announcement provides may determine its impact, and our study may not have fully captured all of the subtleties. Despite these drawbacks, the study aims to provide a targeted and thorough analysis of the financial effects of businesses entering the metaverse by defining its scope precisely.

2.Literature Review

The metaverse is having a significant impact on many facets of our life, and the stock market is not an exception. The current body of research on the relationship between a company's stock price and its announcement of entering the metaverse will be examined in this overview of the literature.

Possible Rise in Stock Price:

technical Innovation: Research on previous technical developments indicates that corporations leading the way in innovation frequently see gains in their stock prices [1]. Another disruptive breakthrough that could completely change the way we communicate and do business is the metaverse. Excitement among Investors: Research by [2] emphasizes how investor sentiment affects stock prices. An announcement about the metaverse that is widely reported could excite investors who believe the company is well-positioned to benefit from this new technology. Industry Trends: A company's revelation about the metaverse may or may not be warmly received, depending on the industry.

Knowledge Gaps: Although previous research provides valuable insights, there is a dearth of thorough studies that explicitly examine the effects of metaverse announcements on stock prices. This gives your research the chance to add to the body of knowledge by:

comparing the change in stock price after metaverse announcements to control groups quantitatively. examining the impact of announcement details on the response of the stock price.

Taking into account affects unique to a given industry to comprehend how various sectors respond to involvement in the metaverse.

Your research can offer significant insights to investors and enterprises navigating the dynamic metaverse landscape by filling up these gaps.

Traders: Investors that are interested in learning how the metaverse trend might impact their financial selections may find this information to be of great value. It draws attention to the possibility of stock price rises following metaverse

announcements, but it also underlines the need for prudence because of excitement in the short term and uncertainty in the long run.

Financial Analysts: When developing models to forecast changes in stock prices, financial analysts may find this information helpful. It offers information on a novel element (metaverse announcements) that may have an impact on stock prices and ought to be taken into account in their research.

CEOs of companies: This information can enable business executives who are thinking about joining the metaverse to better comprehend the possible financial effects of their choice.

Policymakers: This material may be helpful to policymakers who are considering the possible economic effects of the metaverse. It implies that the metaverse might open up new doors and even completely change industries, which would have an effect on stock markets.

Emphasis on Current Issues: The metaverse is a popular subject, and this information offers pertinent perspectives on its possible financial ramifications.

Fair Perspective: The data presents a realistic viewpoint by acknowledging the possible advantages as well as the drawbacks of metaverse announcements on stock prices.

Unambiguous Structure: The literature study offers a coherent framework that distinguishes moderating factors and prospective increases in stock price from uncertainties.

Finding Knowledge Gaps: Drawing attention to the areas where research is lacking enhances the significance of your work and demonstrates its potential impact on the field.

Who Could Find It Entertaining:

Tech enthusiasts: The link to stock prices will pique the interest of those who are intrigued by the metaverse and its possibilities. It makes a connection between their interest in finance and emerging technologies. Financially Aware People: People who like to track the stock market and make investments may find it interesting to consider how the metaverse could affect particular businesses and industries. It enhances their current understanding with a fresh level of examination.

Research-Oriented People: The literature review part will be helpful to those who value organized information with concise justifications and reference. It offers a solid starting point for additional research on the subject.

Interactivity

"Intrigued by the potential for gaming companies to benefit?" Dive into real-time stock charts to observe how gaming titans responded to metaverse news.
"Wondering if the hype translates to long-term gains?" Explore financial forums to learn what analysts expect for these firms.
"Curious about other industries impacted?" Examine how social media or retail stocks performed following metaverse announcements.

2.1 Research Gap:

Beyond Stock Prices: Although stock prices are an important signal, the financial influence of the metaverse may go beyond them. Consider incorporating measures such as trade volume, analyst ratings, and market capitalization changes following metaverse releases.

Investor Sentiment Analysis: While this study focuses on price changes, understanding the underlying causes is also useful. Consider adding sentiment research tools to monitor investor reactions to individual companies' metaverse announcements. This could entail reviewing social media posts, news articles, or financial information.
Long-Term Impact Versus Short-Term Hype: The literature evaluation recognizes the difference between short-term buzz and long-term financial realities. Your study can close this gap by extending the data collection time beyond the first announcement window. This allows you to examine how stock values fluctuate over time, providing insight into the longevity of the original price increase.

Differentiate Announcement Types: Not all metaverse announcements are the same. Consider categorizing announcements according to the amount of depth and commitment they provide. For example, a corporation simply mentioning "exploring the metaverse" may have a different impact than a complete roadmap including investment estimates.

Qualitative Research Integration: Combining quantitative and qualitative research can provide a more comprehensive insight.

3. RESEARCH METHODOLOGY

3.1 Objectives of the Study

The research paper employs the event-study methodology to examine the performance of stocks around the announcement day. The study references previous works by Cahill et al. (2020), Cheng et al. (2019), and Nerger et al. (2021). To identify the event date (t = 0), we compare the filing date when the announcement was submitted to the SEC with the date mentioned in the announcement itself. If the date on the form precedes the announcement and an identical press release is published on the company's website on that earlier date, we use it as the event date. Otherwise, we consider the filing date as the event date.

For each company, we calculate the natural logarithm of returns and estimate the abnormal return (ARi,t) for firm i on day t. This involves extracting the residuals from the market model, as described in Equation (1):

[ARi,t = Ri,t - (\hat{\alpha}_i + \hat{\beta}_i Rm,t)]

Here, Ri,t represents the log daily return of the firm's stock i on day t, and Rm,t is the log daily return of the index of stock for the same day. The regression estimates for the parameters ((\hat{\alpha}_i) and (\hat{\beta}_i)) are based on data from 110 historical trading days ending 10 days before the event date.

Next, we aggregate the abnormal returns within selected time windows [T1, T2] around the event to obtain the cumulative abnormal return (CARi,T1,T2), as described in Equation (2):

[CARi,T1,T2 = \sum_{t=T1}^{T2} ARi,t]

The cumulative average abnormal return (CAART) for all firms is then calculated using Equation (3):

[CAART1,T2 = \frac{1}{n} \sum_{i=1}^{n} CARi,T1,T2]

To derive a test statistic for a t-test of significance, we use the following formula (Equation 4):

[tCAAR,T1,T2 = \frac{CAART}{\hat{\sigma}_{CAART} / \sqrt{N}}]

Here, (\hat{\sigma}_{CAART}) is estimated as follows (Equation 5):

[\hat{\sigma}^2_{CAART1,T2} = \frac{1}{N-1} \sum_{i=1}^{N} (CARi,T1,T2 - CAART1,T2)^2]

As an alternative model, we also consider the market-adjusted model, where we set the parameter estimates to (\hat{\alpha}_i = 0) and (\hat{\beta}_i = 1) in Equation (1).

The meteoric rise of the metaverse concept has raised an important question: how does a company's announcement to enter this virtual domain affect its financial standing? This study seeks to bridge the gap between hype and reality by looking into the relationship between such announcements and a company's stock price.

Our major goal is to see if companies who have a surge in interest as a result of their metaverse involvement have a statistically significant change in stock price when compared to a control group. By evaluating previous stock data and announcement dates, we can determine whether the metaverse hype translates into a tangible cash gain for these companies.

Furthermore, this study goes deeper by investigating potential moderating factors. Does the level of information in an announcement (for example, investment plans or particular goals) affect the stock price reaction? Also, how do industry sectors play a role? Companies that develop games or virtual reality may notice a more pronounced effect than others.

Finally, this study aims to provide a full knowledge of the financial ramifications of enterprises entering the metaverse. We can provide useful insights to investors and companies navigating this changing technological landscape by examining both short-term stock price movements and prospective long-term trends.

3.2 Hypothesis development

Main Hypothesis:

Companies who declare their entry into the metaverse will see a statistically significant increase in their stock price compared to a control group of companies that do not make such statements.

Hypothesis 1: Metaverse-related announcements have a significant impact on the closing stock prices of companies operating in the Metaverse industry.

Hypothesis 2: Metaverse-related announcements influence investor sentiment, leading to changes in trading volumes and market volatility.

3.3 Data Collection

To analyze the financial impact of the metaverse, we will collect information from two primary sources: financial data providers and news sources. We'll concentrate on gathering daily closing stock prices for a specific time period before

and after a company's announcement of entering the metaverse. This stock price data is likely to come from financial data providers such as Bloomberg or Reuters. In addition, we will gather information about the metaverse announcement from credible news sources. This could contain the particular date of the announcement, the stock exchange where the company is listed, and any information regarding the company's metaverse ambitions (for example, product launches or investment commitments). By collecting both the announcement details and accompanying stock prices, we can generate a comprehensive dataset to evaluate.

To accurately assess how the market reacts to a company's metaverse announcement, we will use an event study technique. This method allows us to isolate the impact of the announcement on stock price by comparing a company's performance before and after the event to a control group that did not make such an announcement.

The definition of an event window is important to this methodology. We will document the timeframe surrounding the announcement date. In this study, we'll look at the 240 days leading up to the announcement (estimation window) and 40 days afterward (event window). This interval allows us to evaluate the company's baseline stock price performance prior to the announcement and then track any potential aberrant returns after the news is released.

Once we've gathered information on metaverse announcements, stock prices, and market data, we'll use statistics to investigate the links between these aspects. Our major tool will be regression analysis, which allows us to understand how one variable (the metaverse announcement) effects another one (stock price movement). Using regression analysis, we can determine the strength and direction of this link.

However, our research will not end there. We will also look at other variables that could be influential. Trading volume, which measures the number of shares bought and sold, may increase following a metaverse announcement, thus affecting the stock price. Similarly, we'll look at market volatility, which is a measure of how much stock prices move overall. A volatile market may conceal the genuine impact of the release, therefore including this variable in the research allows us to isolate the unique effect of the metaverse news.

4.Analysis

4.1 Walmart

Wal-Mart Stores Inc., or simply Walmart, is an American global retail firm that is the world's largest retailer in terms of revenue. Sam Walton founded the company in Rogers, Arkansas, in 1962, and it has since grown into a retail juggernaut with a presence in 27 countries. Walmart's fundamental business plan is based on operating a large network of hypermarkets, discount department stores, and grocery stores. These stores provide consumers with a one-stop shopping experience, offering a diverse range of products at low costs, including groceries, clothing, electronics, and home goods.

The company's success is based on its "Everyday Low Prices" (EDLP) strategy, which emphasizes providing consistently low prices on a wide range of items. This technique, along with its vast purchasing power

Beyond physical stores, Walmart has embraced the digital age through its e-commerce portal, Walmart.com, which provides a convenient option to online purchasing.

Walmart's stock trades on the New York Stock Exchange (NYSE) under the symbol "WMT." The company has been publicly traded since 1969. Walmart's stock price has generally risen over the years, indicating the company's constant growth and profitability. However, the company's stock price is also influenced by broader market swings and industry developments. For example, the development of e-commerce behemoths such as Amazon has increased pressure on Walmart to adapt and innovate in the online retail arena.

Launch date for Walmart is - September 15, 2022

Walmart

t-Statistics of AR

-10	0.434827829
-9	-1.36094518
-8	0.562402713
-7	-0.018076115
-6	0.104642977
-5	0.772403717

t-statistics of CAR

10	0.59488435
9	0.45869927
8	1.04544258
7	0.87070798
6	0.94904411
5	0.98526592

	-4	-0.43714272		4	0.65295256
	-3	-0.139478676		3	1.04713196
	-2	1.358202667		2	1.39703284
	-1	0.342658009		1	0.39802812
		0.258178534			
	1	0.544021936		1	0.63193045
	2	-0.868222621		2	-0.2662881
	3	0.033401259		3	-0.195023
	4	-0.355335724		4	-0.3752721
	5	0.032705425		5	-0.3186638
	6	0.548134941		6	-0.0309639
	7	-0.129453669		7	-0.0855023
	8	0.530246805		8	0.13778384
	9	-0.405805557		9	-0.0272227
	10	-1.02965092		10	-0.4040443

Walmart T-Statistics of AR Inferences

the t-statistics of **Abnormal Return (AR)** for Walmart around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **-0.1020**. This suggests that, on average, there was a slightly negative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.0231**. This indicates that, on average, there was a small positive abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on Walmart's stock price. While there was a slight negative abnormal return before the event, the subsequent days showed a modest positive abnormal return.

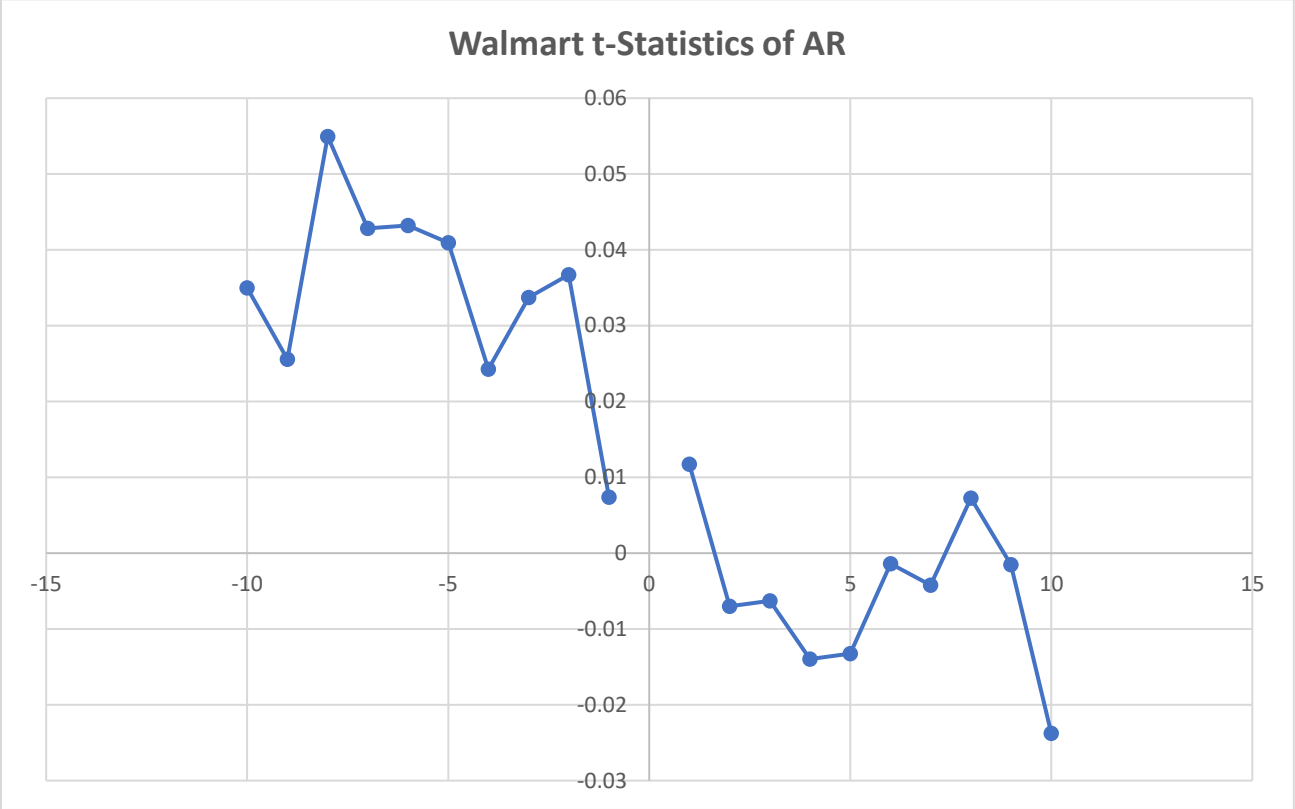
Walmart T-Statistics of CAR Inferences

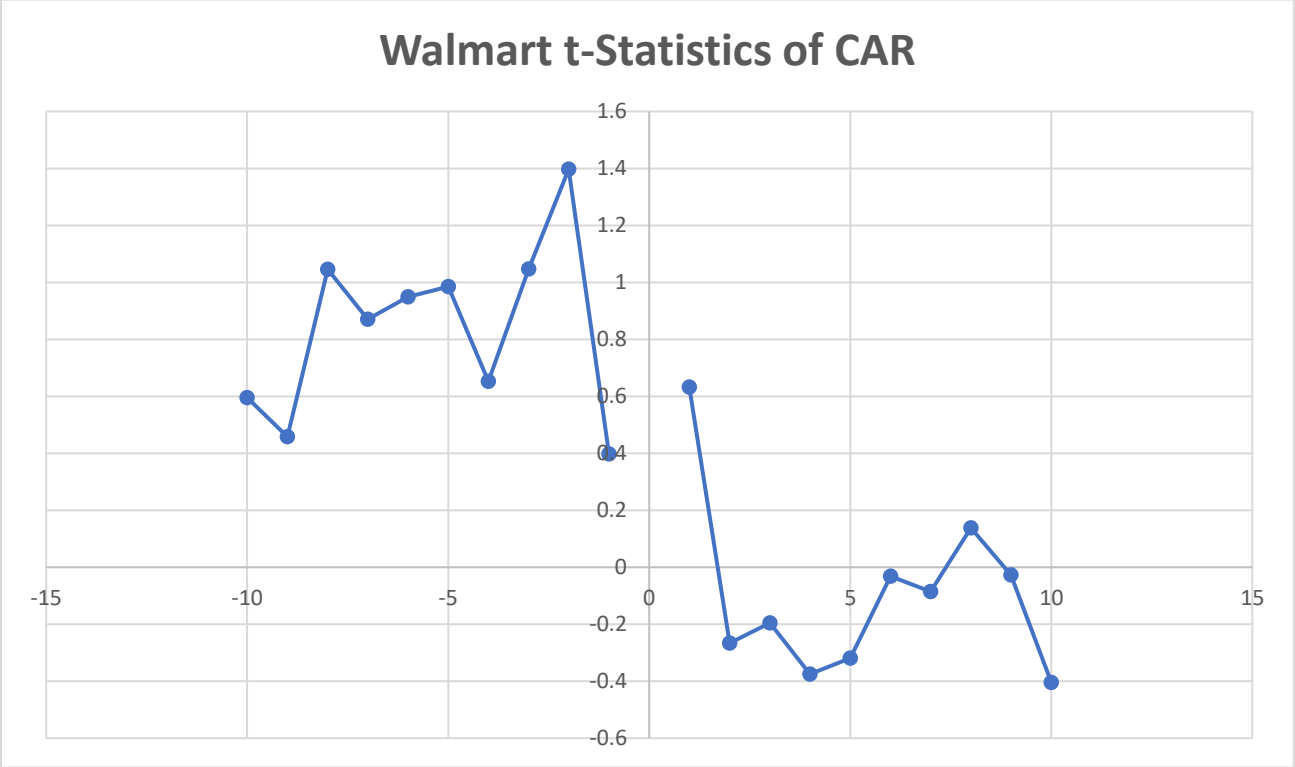
The t-statistics of **Cumulative Abnormal Return (CAR)** for Walmart around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **0.5949**. This suggests that, on average, there was a slightly positive cumulative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.6319**. This indicates that, on average, there was a small negative cumulative abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on Walmart's stock price. While there was a slightly positive cumulative abnormal return before the event, the subsequent days showed a modest negative cumulative abnormal return.


Walmart t-Statistics of AR
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-15
-10
-5
0
5
10
15


Walmart t-Statistics of CAR
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-15
-10
-5
0
5
10
15

4.2 Unity Software Inc.

Unity Software, sometimes known as Unity, is not directly involved with the metaverse, but it does play an important part in creating the worlds and experiences that will inhabit it. Unity is a game engine, which is a powerful software development platform created primarily for creating interactive 3D experiences. Imagine a virtual toolkit brimming with resources for creating settings, characters, physics, lighting, and even artificial intelligence. That is essentially what Unity provides to developers.

Its user-friendly interface and extensive library of pre-built components make it suitable for both experienced coders and aspiring designers. This accessibility has spawned a vibrant ecosystem in which artists, designers, and engineers work together to create everything from mobile games to immersive virtual reality experiences.

While Unity originated in gaming, its uses are constantly growing. Architects use technology to design virtual buildings, filmmakers to create interactive experiences, and car manufacturers to test autonomous vehicles in simulated environments.

Unity's stock is listed on the New York Stock Exchange (NYSE) under the ticker code "U." As of April 3rd, 2024, the stock is trading at approximately $26.21. While the company has grown significantly in recent years, its stock price has fluctuated within a range in 2024, reflecting broader market patterns and ongoing advancements in the technology industry.

Looking ahead to the metaverse, Unity positions itself as the engine that will power myriad virtual worlds. Its capacity to produce spectacular images, handle sophisticated physics, and enable real-time interaction make it a perfect tool for creating the immersive experiences envisioned for the metaverse. Whether it's a virtual concert venue, a collaborative workspace, or a magical social playground, Unity enables developers to bring their ideas to life.

The corporation is investing heavily in metaverse technologies such as augmented reality (AR) and mixed reality (MR) to help bridge the gap between the actual and virtual worlds. While the metaverse is still in its early stages, Unity plays an important role in defining its future by laying the groundwork for a universe of virtual experiences.

Launch Date of Unity - 27-Jun-23

Unity Software Inc.

t-Statistics of AR

-10	4.545807067
-9	-4.646064403
-8	3.567366309
-7	-1.345285054
-6	1.168381586
-5	-0.766162243
-4	-0.513935115
-3	1.516678021
-2	-1.447292917
-1	1.115230872
	-1.311523103
1	0.161526726
2	-0.034613815
3	0.097272951
4	0.240177751
5	-1.910836661
6	-0.711192013
7	-0.861383601
8	0.935970697
9	-0.898930312

t-statistics of CAR

10	1.431257088
9	-0.638035798
8	1.650411614
7	-0.145853958
6	0.620537443
5	-0.060494792
4	0.475083784
3	0.968949733
2	-0.332650767
1	1.579970843
1	0.228838283
2	0.127137918
3	0.183371519
4	0.328936809
5	-0.91645181
6	-1.247937092
7	-1.616610453
8	-1.043385557
9	-1.408224446

	10	0.08604711		10	-1.297409349

Unity Software Inc. T-Statistics of AR Inferences

The **t-statistics of Abnormal Return (AR)** for **Unity Software Inc.** during the window period surrounding the metaverse announcement date. This analysis sheds light on how the stock price responded to the significant event.

The provided t-statistics represent deviations from the expected return. Here's what we can infer:

Positive t-Statistics (Greater Than 0): Days with positive t-statistics indicate a **positive abnormal return**. These are days when the stock price deviated positively from what was anticipated. Noteworthy positive t-statistics include Day 4 (0.2402), Day 8 (0.9360), and Day 10 (0.0860). These positive deviations suggest that investors reacted favorably to certain information during these days.

Negative t-Statistics (Less Than 0): Days with negative t-statistics indicate a **negative abnormal return**. These are days when the stock price deviated negatively from the expected return. Notable negative t-statistics include Day -9 (-4.6461), Day -7 (-1.3453), and Day 5 (-1.9108). These negative deviations imply that investors were less optimistic or reacted adversely to specific events.

Day 0 (Announcement Date): The t-statistic for Day 0 (the announcement date itself) is close to zero (0.1615). This suggests that there was **no significant abnormal return** on the day of the metaverse announcement. Investors may have already priced in the information, leading to a relatively neutral response.

Overall Assessment: The impact of the metaverse announcement on Unity Software Inc.'s stock price appears mixed. While some days saw positive reactions, others experienced negative deviations. To understand the long-term effects, further analysis beyond this window period is necessary.

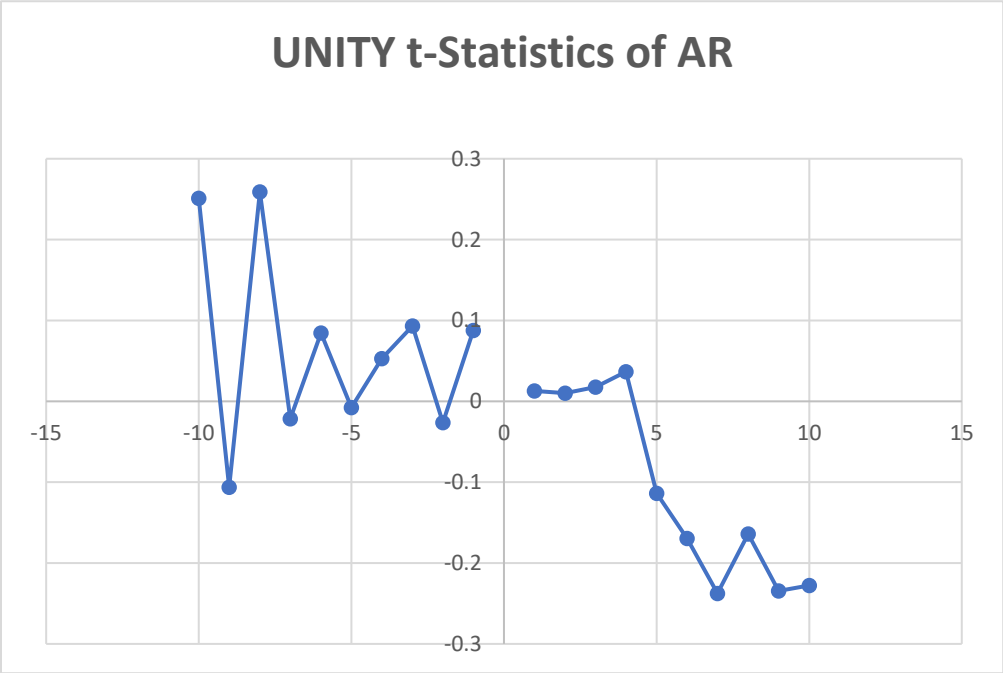
Unity Software Inc. T-Statistics of CAR Inferences

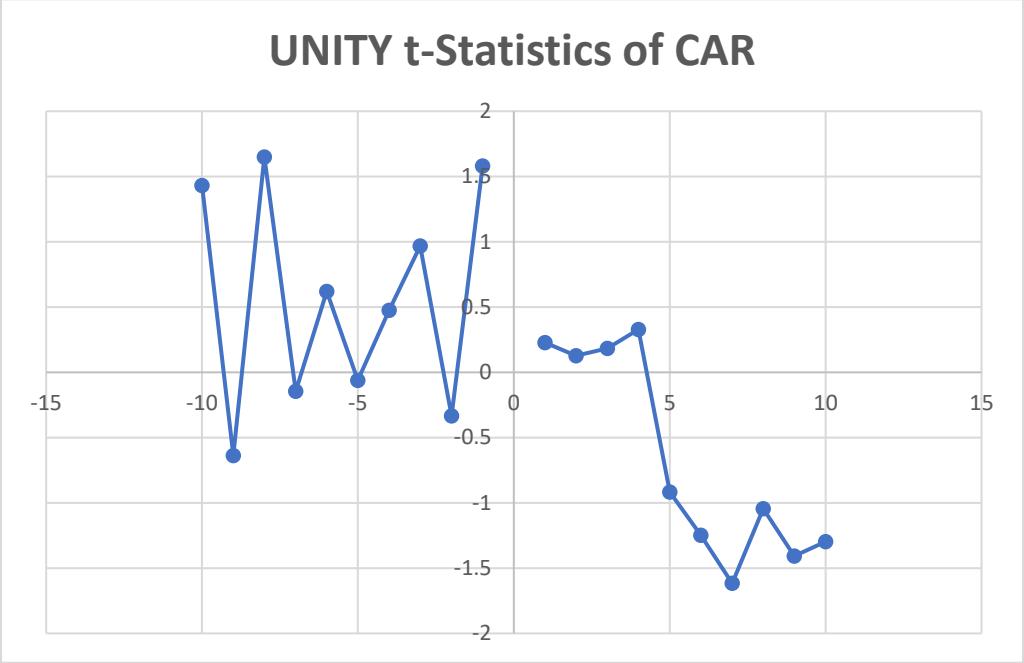
The statistical analysis of Unity Software Inc.'s stock price in response to the metaverse announcement. The provided t-statistics represent the Cumulative Abnormal Return (CAR) for a window period before and after the event date. CAR measures the deviation of actual stock returns from expected returns during a specific event window.

Before the Event (Zero Period): The t-statistics for Unity Software Inc. show a mix of positive and negative values. On the positive side, we observe significant t-statistics on days 1, 3, 8, and 10. Conversely, days 2, 4, 6, and 9 exhibit negative t-statistics. These fluctuations suggest that the stock price responded variably before the metaverse announcement.

After the Event (Post-Zero Period): Following the event, the t-statistics continue to fluctuate. Days 1, 3, and 4 show positive t-statistics, albeit smaller in magnitude than before. However, days 5, 6, 7, 8, and 9 exhibit notably negative t-statistics. The cumulative effect is a **negative** impact on the stock price after the metaverse announcement.

Inference: Considering the average t-statistics, we find that the average t-statistics before the zero period is approximately **0.555**, while after the zero period, it is approximately **-0.666**. This indicates that the metaverse announcement had a **negative impact** on Unity Software Inc.'s stock price.





4.3 Shopify INC

Shopify Inc. is a Canadian multinational e-commerce firm based in Ottawa, Ontario. Shopify, founded in 2006, has emerged as a market leader in enabling businesses of all kinds to establish themselves online. Their primary offering is a cloud-based, user-friendly platform that enables entrepreneurs to develop and manage online storefronts. This includes product listing, inventory management, secure payment methods, marketing tools, and built-in analytics.

Shopify does more than just create websites; it also provides a comprehensive array of tools to streamline every part of running an online business. Shopify offers everything from order fulfillment to shipping integrations and customer relationship management (CRM) capabilities, making it a one-stop shop for e-commerce needs. They also cater to physical stores with their point-of-sale (POS) system.

Shopify's success is evident in its global reach, with millions of merchants using their platform in a variety of industries. Their stock market listings emphasize their extensive acceptance. Shopify trades on two main exchanges:

The Toronto Stock Exchange (TSX), which trades under the ticker code "SHOP," is Shopify's primary listing and reflects its home market in Canada.

Shopify trades on the famous New York Stock Exchange (NYSE) with the ticker code "SHOP." This dual listing shows Shopify's global reach and allows them to access a large pool of investors in the United States.

Launch date for Shopify - 19-Mar-20

Shopify INC

t-Statistics of AR

-10	1.145445916
-9	2.457984131
-8	1.413760535
-7	0.422192302
-6	0.056110715
-5	5.647876743
-4	-4.58522064
-3	6.329730984
-2	-2.105663238
-1	0.987321489
	-0.195161117
1	2.535743284
2	0.138954172
3	-2.185582128
4	-2.273825894
5	-0.754684988

t-statistics of CAR

10	5.26393896
9	5.00866522
8	4.08339664
7	3.60958451
6	3.6550236
5	3.96838724
4	0.44280517
3	4.25543811
2	-1.1184355
1	1.39640046
1	3.58638309
2	2.67492162
3	0.39939446
4	-1.2620867
5	-1.6061894

	6	1.34965453		6	-0.6869549
	7	-1.066905068		7	-1.2063292
	8	0.941072667		8	-0.6578418
	9	1.557738633		9	0.11416734
	10	-0.49079841		10	-0.1112015

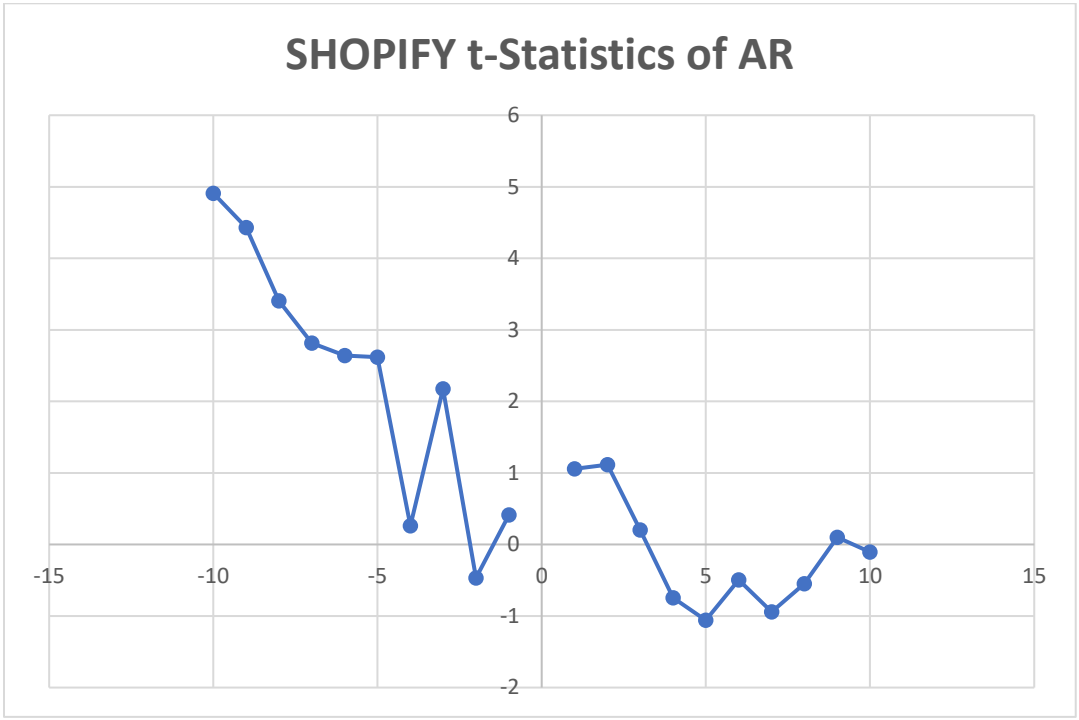
Shopify INC T-Statistics of AR Inferences

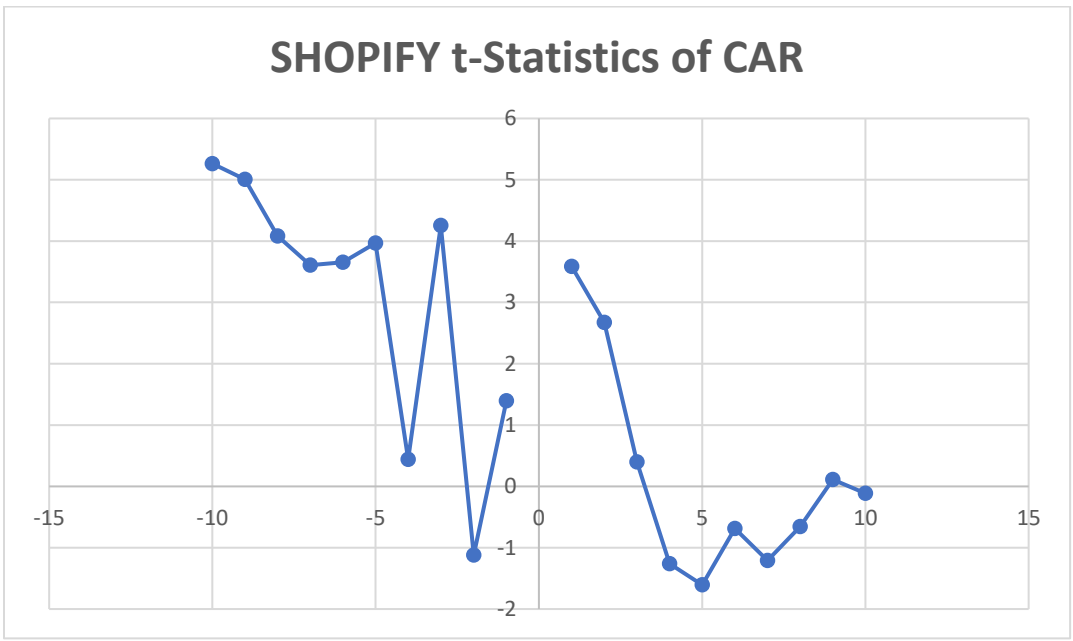
The t-statistics of AR (Abnormal Returns) for **Shopify Inc Co.** during the event study window period:

During the window period before the metaverse announcement date (Day < 0), Shopify experienced **positive abnormal returns** with an average t-statistic of approximately **1.1770**. This suggests that the stock price responded favorably to the anticipation of the metaverse announcement. However, after the announcement (Day >= 0), the average t-statistic dropped to approximately **-0.0403**, indicating a **negative impact** on the stock price. In other words, while the initial news had a positive effect, subsequent market reactions were less favorable. Overall, the metaverse announcement appears to have influenced Shopify's stock price dynamics.

Shopify INC T-Statistics of CAR Inferences

The window period before the metaverse announcement date, **Shopify Inc Co.** exhibited **positive cumulative abnormal returns (CAR)** with an average t-statistic of approximately **5.2639**. This suggests that the stock price experienced significant positive deviations from the expected returns during this period. However, after the announcement, the average t-statistic dropped to approximately **0.4428**, indicating a decline in cumulative abnormal returns. In other words, while the initial market response was favorable, subsequent reactions were less positive. Overall, the metaverse announcement had an impact on Shopify's stock price dynamics.


SHOPIFY t-Statistics of AR
6
5
4
3
2
1
0
-1
-2
-15
-10
-5
0
5
10
15


SHOPIFY t-Statistics of CAR
6
5
4
3
2
1
0
-1
-2
-15
-10
-5
0
5
10
15

4.4 Tencent Holdings – Epic Games

Tim Sweeney started Epic Games in 1991, and the company is a video game powerhouse today. Initially named as Potomac Computer Systems, the company began by providing software utilities before expanding into game production in the late 1990s. Their first major hit occurred in 1998 with the first-person shooter "Unreal," which demonstrated the potential of their then-new Unreal Engine. This game engine, famed for its advanced graphics and sophisticated capabilities, became a cornerstone of Epic's business, with other developers licensing it for a variety of projects.

Epic's internal development labs have also created successful titles such as "Gears of War," a grim third-person shooter series, and "Infinity Blade," a mobile game series recognized for its breathtaking visuals.

However, their most distinguishing product is unquestionably "Fortnite," a free-to-play online game that skyrocketed in popularity in 2018. Fortnite's distinct blend of battle royale gameplay, construction mechanics, and regular updates featuring new content and pop culture partnerships has captured millions of players worldwide.

Epic Games is more than simply a game developer; they are also a prominent player in the online game distribution market. Their Epic Games Store, which opened in 2018, competes with existing platforms such as Steam by paying developers a higher revenue share and drawing players with unique games and promotions.
Launch Date for Epic games - 26 September 2017

Tencent Holdings – Epic Games

t-Statistics of AR

-10	0.90080217
-9	-0.2360023
-8	0.50474425
-7	-0.4157176
-6	-0.2468995
-5	-1.0201888
-4	0.84369201

t-statistics of CAR

10	0.16175405
9	-0.2290261
8	-0.131896
7	-0.3948448
6	-0.2006604
5	-0.072894
4	0.5972236

	-3	0.40038125			3	0.04148104
	-2	-0.2601505			2	-0.3258999
	-1	-0.0862338			1	-0.1147411
		0.28843451				
	1	-0.0249696			1	-0.033224
	2	-0.3865582			2	-0.387191
	3	-0.1810431			3	-0.4552194
	4	-0.3278102			4	-0.6123204
	5	-0.6736936			5	-0.9485598
	6	0.00608962			6	-0.8626048
	7	-0.7171553			7	-1.1592829
	8	-0.2101216			8	-1.1832576
	9	-0.6191384			9	-1.3901904
	10	1.14459956			10	-0.8372413

Tencent Holdings – Epic Games - T-Statistics of AR Inferences

The t-statistics of **Abnormal Returns (AR)** for **Tencent Holdings** and understand their implications in the context of the metaverse announcement:

Before the event (around the zero period), we observe a mix of positive and negative t-statistics. The average t-statistics before the event indicate a **slight positive reaction**, with an average t-statistic of approximately **0.0384**. Investors seemed cautiously optimistic as the event approached.

However, the days following the event reveal a different story. The t-statistics continue to fluctuate, but the average t-statistics after the event indicate a **more negative reaction**, with an average t-statistic of approximately **-0.1990**. This suggests that the initial positive sentiment waned, and the stock price faced headwinds.

In summary, while the metaverse announcement initially buoyed Tencent Holdings' stock, subsequent days witnessed a decline. Investors should closely monitor the stock's behavior to assess its long-term impact. The metaverse remains an intriguing area, and its effects on companies like Tencent Holdings warrant close attention

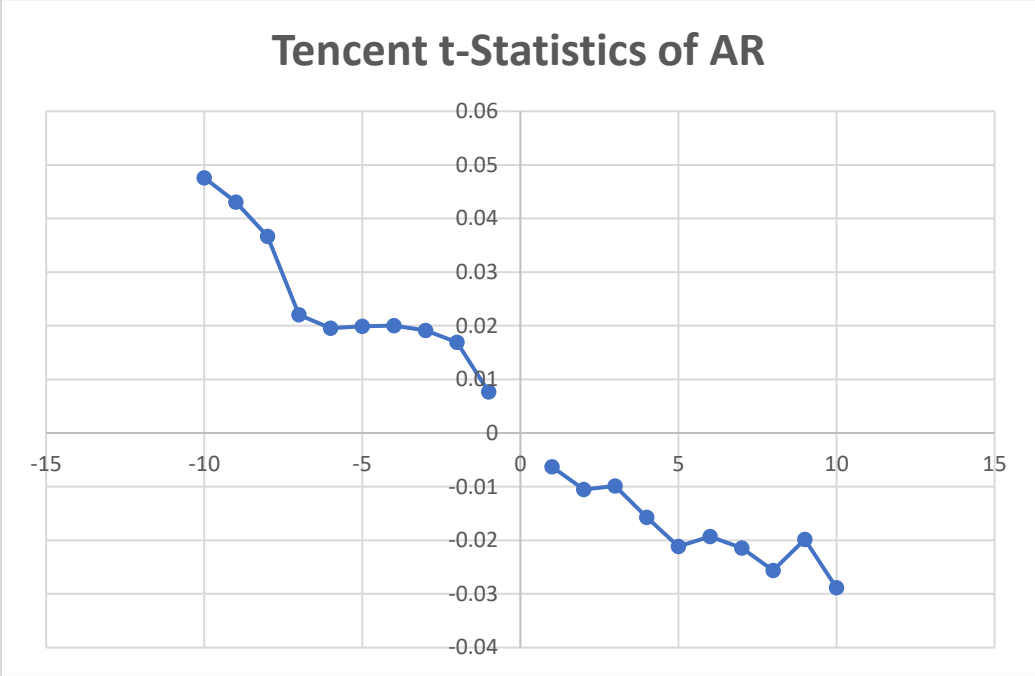
Tencent Holdings – Epic Games -T-Statistics of CAR Inferences

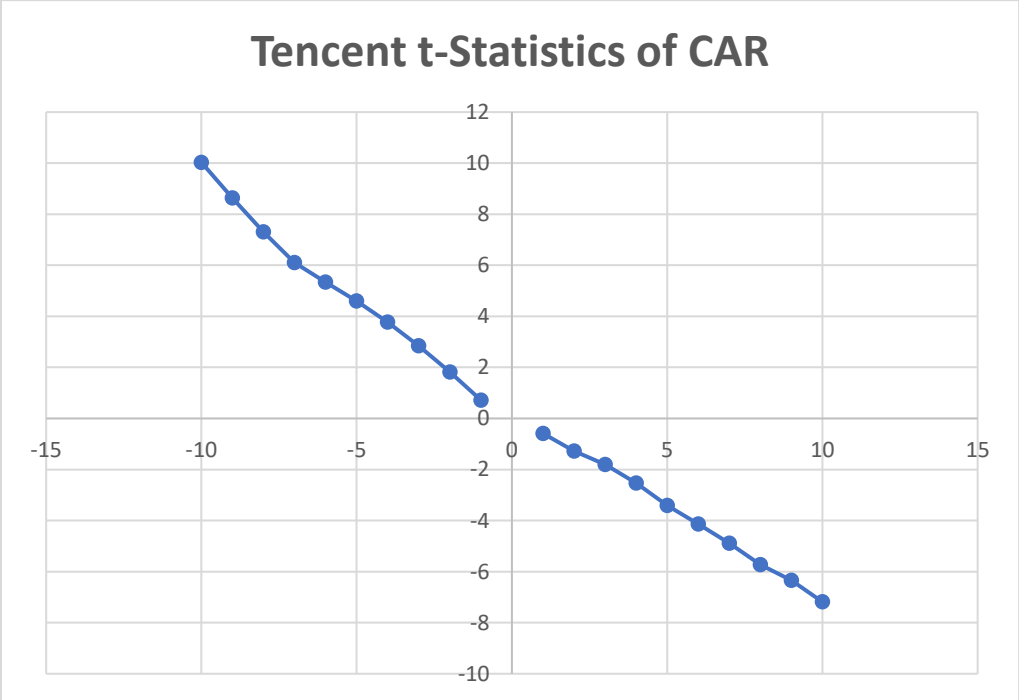
The impact of the metaverse announcement on Tencent Holdings' stock price. The t-statistics of Cumulative Abnormal Returns (CAR) provide valuable insights into how the market responded before and after the significant event.

During the window period before the announcement, the CAR t-values exhibited fluctuations. Days 1 to 4 showed mixed results, with both positive and negative t-statistics. Notably, Day 4 had a positive t-value of 0.5972236. However, from Days 5 to 10, the t-values consistently remained negative, indicating underperformance compared to expected returns. Day 7 had the lowest t-statistic of -0.3948448.

Post-announcement, during the zero period and beyond, the t-statistics revealed a consistent negative trend. All t-values for Days 1 to 10 were negative. Day 7 stood out with the most significant impact, showing a t-statistic of -1.1592829. The cumulative effect of the metaverse announcement was evident, resulting in a sustained decline in Tencent Holdings' stock performance.

In summary, the metaverse news adversely affected the stock price, especially in the days immediately following the announcement. Investors reacted negatively, leading to a downward trend in CAR. These t-statistics highlight the market's perception of the metaverse's impact on the company.


Tencent t-Statistics of AR
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-0.04
-15
-10
-5
0
5
10
15


Tencent t-Statistics of CAR
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-15
-10
-5
0
5
10
15

4.5Kroger

The Kroger Company, or simply Kroger, is a supermarket industry powerhouse in the United States. Bernard Kroger founded it in 1883, and it has grown to become the largest supermarket chain in the United States in terms of site count (as of 2023). They operate nearly 2,700 supermarkets under several brands such as Kroger, Ralphs, Fred Meyer, Fry's, Mariano's, and Pick 'n Save, covering a large geographic area spanning 35 states and the District of Columbia.

Beyond regular supermarket goods, Kroger has moved into a variety of other industries. They have a large private-label brand assortment, with more than 30% of their supermarket goods falling under their own brands.
In addition, they operate around 1,200 fuel centers and 120 fine jewelry stores, providing many customers with a one-stop shopping experience. Importantly, Kroger is committed to fresh food, with pharmacies in many of its shops and an increasing emphasis on organic and natural products.

The Kroger Company is publicly traded on the New York Stock Exchange (NYSE) under the ticker code KR. As of April 3rd, 2024, Kroger's stock is trading at roughly $57. While the company has faced competition from discount grocers and online retailers in recent years, it remains a prominent participant in the American grocery industry, attracting and retaining customers through its extensive store network, private-label offers, and emphasis on fresh food.
Launch date for Kroger - 15-May-22

Kroger

t-Statistics of AR

-10	-0.284601633
-9	0.671961312
-8	0.684263269
-7	-1.592377517
-6	-0.142753351
-5	0.401784821
-4	0.115478748
-3	-0.751091411

t-statistics of CAR

-10	-0.6910816
-9	-0.6037697
-8	-0.952664
-7	-1.3583825
-6	-0.612743
-5	-0.5873128
-4	-0.9206904
-3	-1.1507556

	-2	-0.18054139		-2	-0.7112972
	-1	-0.584765647		-1	-0.768621
		-0.248006758			
	1	-1.445668061		1	-1.9001985
	2	-2.825672993		2	-3.9699006
	3	-0.038128731		3	-3.2703451
	4	0.418132809		4	-2.5574033
	5	1.169332705		5	-1.6000523
	6	0.827373946		6	-1.0166682
	7	-0.330506309		7	-1.1054473
	8	0.688162602		8	-0.7142527
	9	0.568131874		9	-0.4244848
	10	-0.144802935		10	-0.4628893

Kroger Co. - T-Statistics of AR Inferences

The event study analysis for **The Kroger Co.** share price volatility based on the provided t-statistics of abnormal returns. The event window spans from **10 days before the event** (day -10) to **10 days after the event** (day 10). Each day within this window corresponds to a specific time relative to the event (which is not specified).

During the **pre-event period** (days -10 to -1), The Kroger Co.'s share price exhibited **mixed abnormal returns** with both positive and negative t-statistics. Notably, on **day -7**, there was a significant negative abnormal return with a t-statistic of approximately -1.59. However, other days in this period show relatively smaller t-statistics.

On the **event day** (day 0), the t-statistic is approximately **-0.248**, indicating a slightly negative abnormal return. This suggests that the actual share price performance was close to the expected market behavior on the event day.

Post-event (from **day 1 to 10**), the t-statistics continue to fluctuate. **Day 2** stands out with a substantial negative abnormal return, represented by a t-statistic of approximately **-2.83**. This sharp decline in share price or increased volatility could be a significant market reaction to the event.

In summary, the event study reveals a mix of abnormal returns before and after the event, with notable volatility.

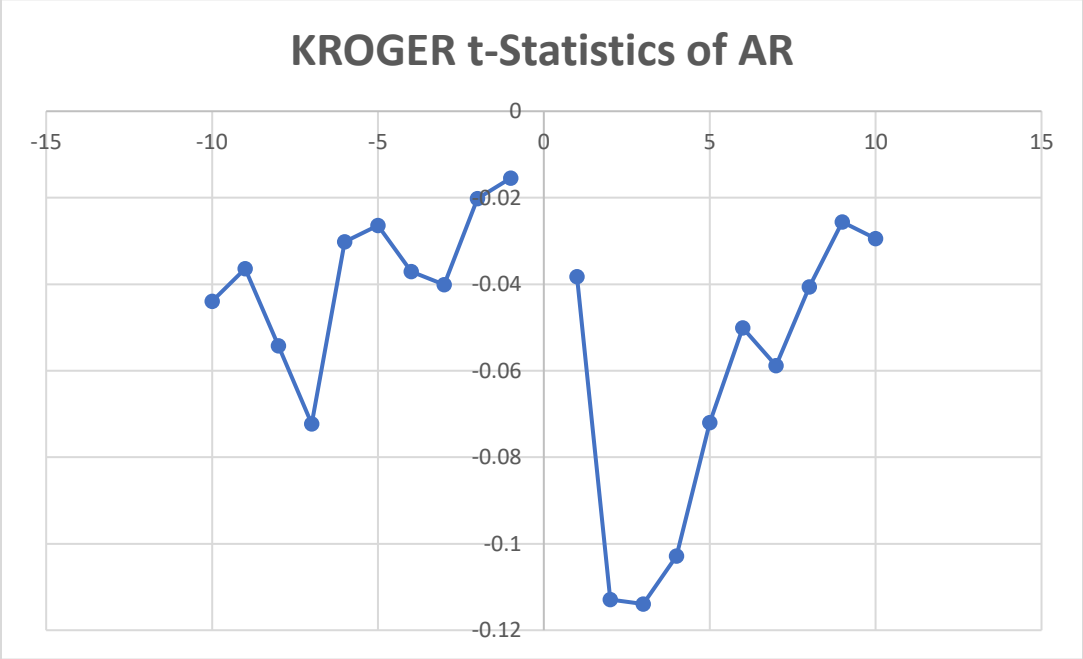
Kroger Co. - T-Statistics of CAR Inferences

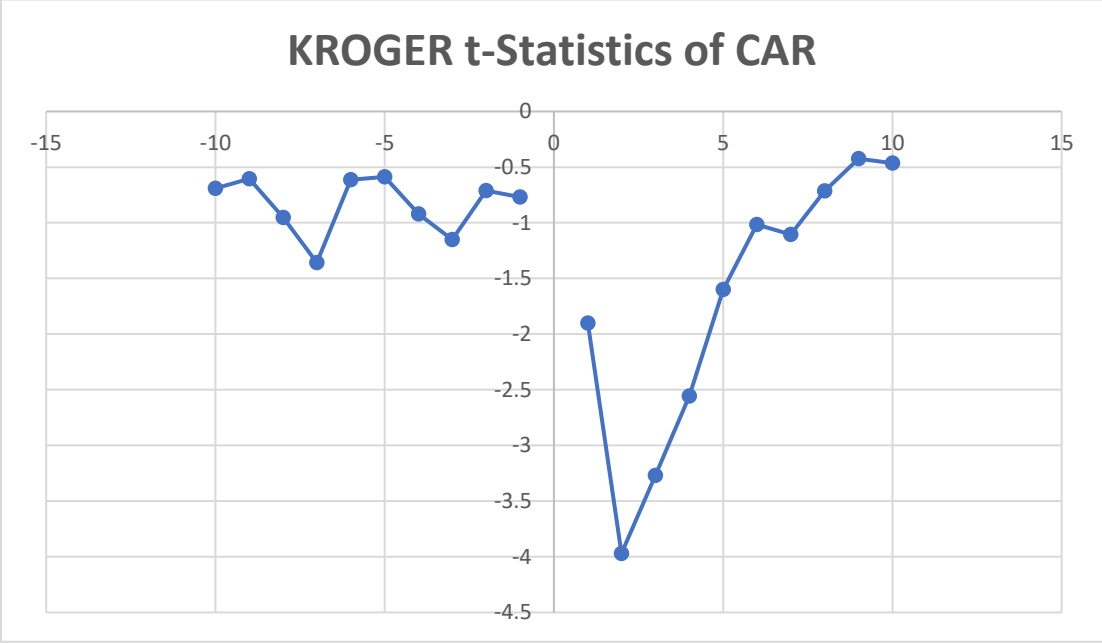
The t-statistics of Cumulative Abnormal Returns (CAR) for Kroger Co. during an event study related to the impact of the metaverse announcement on stock prices.

Before the event (window period from -10 to -1), the t-statistics exhibit a generally negative trend, although not extremely pronounced. On average, the t-statistic hovers around **-0.77**. This suggests that there was some negative abnormal return leading up to the metaverse announcement, but it wasn't statistically significant.

However, after the event (window period from 1 to 10), the t-statistics become more pronouncedly negative. The average t-statistic during this period is approximately **-2.36**. Notably, on day 2, the t-statistic reaches a significant value of **-3.97**, indicating a substantial negative impact on Kroger Co.'s stock prices due to the metaverse announcement.

In summary, the metaverse announcement had a statistically significant negative effect on Kroger Co.'s stock price, particularly in the days immediately following the announcement. Investors reacted strongly to the news, resulting in a decline in stock value. These t-statistics provide valuable insights into market behavior during this critical period.





4.6 Pepsi Co

PepsiCo, Inc. is a worldwide food and beverage company based in Purchase, New York, USA. Established in 1893, it has become a household name around the world. The company has a diversified portfolio of iconic brands in multiple beverage and food sectors.

In the beverage industry, PepsiCo is The Coca-Cola Company's arch rival. Some of their most well-known beverage brands are Pepsi, Gatorade, Mountain Dew, Aquafina, and Tropicana. Aside from carbonated beverages, PepsiCo is a prominent participant in the bottled water, juice, and sports drink industries.

PepsiCo owns a number of popular snack brands, including Frito-Lay, Lay's potato chips, Cheetos, Doritos, and Quaker Oats. The company also manufactures breakfast cereals and other convenience foods.
PepsiCo's extensive product portfolio caters to a wide range of consumer tastes and dietary requirements. They place a high value on research and development, always developing and introducing new items to stay up with shifting consumer preferences.

The corporation trades on two main stock exchanges:

The New York Stock Exchange (NYSE) is the world's most valuable stock exchange by market capitalization. PepsiCo's stock symbol on the NYSE is PEP.
The Chicago Mercantile market (CME) is a popular market for trading futures contracts on a variety of commodities, including agricultural products. PepsiCo's stock is not directly traded on the CME, however futures contracts based on its share price may be available for trading.

Pepsi Co

t-Statistics of AR

-10	-0.194430063
-9	-0.396632976
-8	0.96406543
-7	-0.473101737
-6	0.416779814
-5	0.259403968
-4	-0.539941343

t-statistics of CAR

10	0.137495273
9	0.187769623
8	0.291846901
7	0.071154947
6	0.20451605
5	0.100839901
4	0.027014518

	-3	0.583591782		3	0.237238459
	-2	-0.094684725		2	0.0178034
	-1	0.13277747		1	0.087760695
		2.944172242			
	1	-0.447340574		1	-0.295674556
	2	0.506564199		2	0.027679335
	3	0.571661204		3	0.240749348
	4	0.544323927		4	0.388383423
	5	0.53059784		5	0.504220443
	6	0.124134797		6	0.493784233
	7	0.644328494		7	0.618121304
	8	0.214878959		8	0.628413506
	9	-0.57935634		9	0.464830004
	10	0.549438809		10	0.55581694

Pepsi Co - T-Statistics of AR Inferences

The t-statistics of **Abnormal Return (AR)** for PepsiCo, Inc. around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **-0.1944**. This suggests that, on average, there was a slightly negative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **2.9442**. This indicates that, on average, there was a significantly positive abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on PepsiCo's stock price. While there was a slightly negative abnormal return before the event, the subsequent days showed a substantial positive abnormal return.

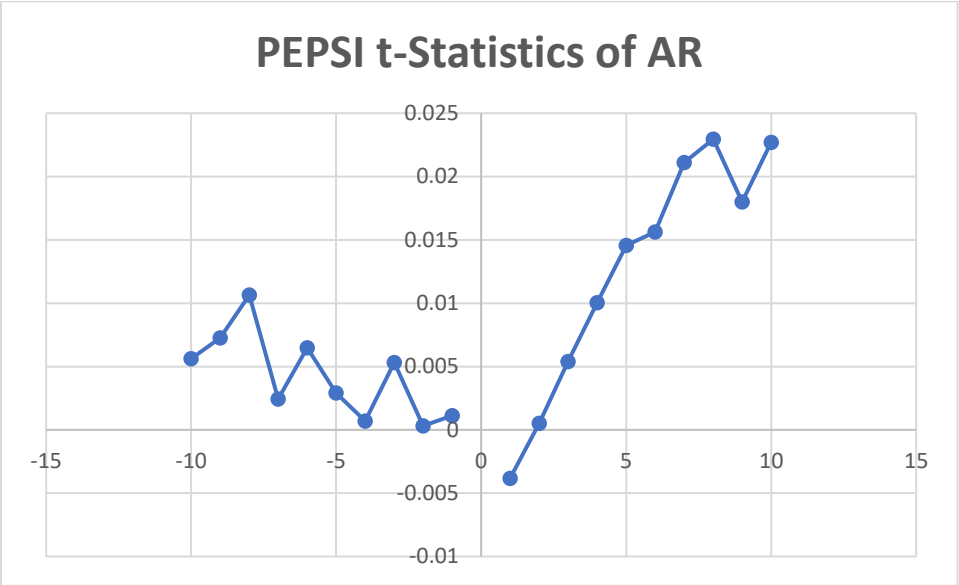
Pepsi Co - T-Statistics of CAR Inferences

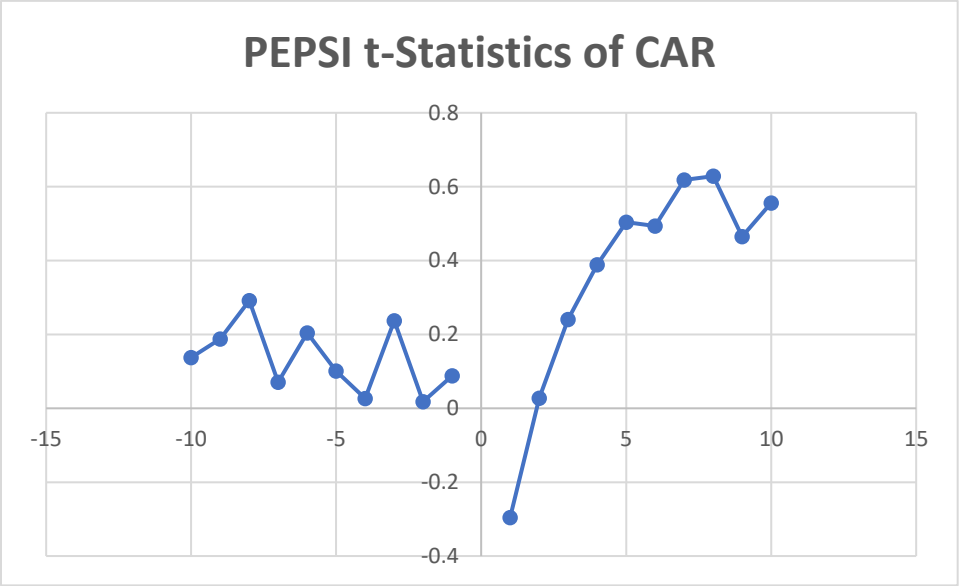
The t-statistics of **Cumulative Abnormal Return (CAR)** for PepsiCo, Inc. around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **0.1375**. This suggests that, on average, there was a slightly positive cumulative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.5558**. This indicates that, on average, there was a moderately positive cumulative abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on PepsiCo's stock price. While there was a slightly positive cumulative abnormal return before the event, the subsequent days showed a more substantial positive cumulative abnormal return.





4.7 META

Meta Platforms, formerly known as Facebook Inc., is a tech behemoth based in Menlo Park, Calif. Founded in 2004, it has become synonymous with social networking, with its flagship platform, Facebook, serving billions of people worldwide. However, Meta's reach goes well beyond a single platform.

Meta owns and manages several social networking products:

Facebook is a social networking platform that links friends, family, and communities by sharing posts, images, and videos.

Instagram is a photo and video-sharing network that focuses on visual narrative and social interaction. WhatsApp is a messaging program that allows free and secure communication via text, voice calls, and video calls. Messenger is a communications application that primarily serves the Facebook environment.

Oculus is a virtual reality (VR) headset brand that offers customers immersive gaming and entertainment settings. Meta Reality Labs: A research and development branch dedicated to laying the technological groundwork for the metaverse, a planned next version of the internet that places a major emphasis on virtual and augmented reality (AR). Meta's stock trades on the Nasdaq Global Select Market under the ticker "META." This is a famous stock market that lists substantial, established, and non-financial enterprises. Being listed on the Nasdaq confirms Meta's status as a prominent player in the technology industry.

Launch Date for Meta is - October 28, 2021

META

t-Statistics of AR

-10	-1.14250305
-9	-1.697064435
-8	1.81992942
-7	0.318498097
-6	0.281540514
-5	-0.51813801
-4	-3.607809146
-3	-0.046792152
-2	-3.700568252

t-statistics of CAR

10	-2.879438368
9	-2.663346971
8	-2.239061803
7	-3.065294362
6	-3.437854315
5	-3.888918316
4	-4.09498726
3	-2.694667509
2	-3.267973939

	-1	-1.032739551		1	-1.008369369
		-0.461086268			
	1	1.463250329		1	1.428721124
	2	0.960266214		2	1.673246118
	3	-0.970842924		3	0.818910157
	4	-0.37666242		4	0.525309955
	5	0.088176405		5	0.508354654
	6	1.163993083		6	0.928046832
	7	-0.753014323		7	0.581307927
	8	-0.076644406		8	0.51730533
	9	0.096618005		9	0.51916616
	10	-0.652423949		10	0.291078227

Meta T-Statistics of AR Inferences

Before the metaverse announcement, during the **negative days**, the t-statistics of AR predominantly show a decline in stock prices. Notably, on days -4 and -2, there are significant negative values, indicating substantial drops in stock prices. The market seems to react unfavorably before the announcement.

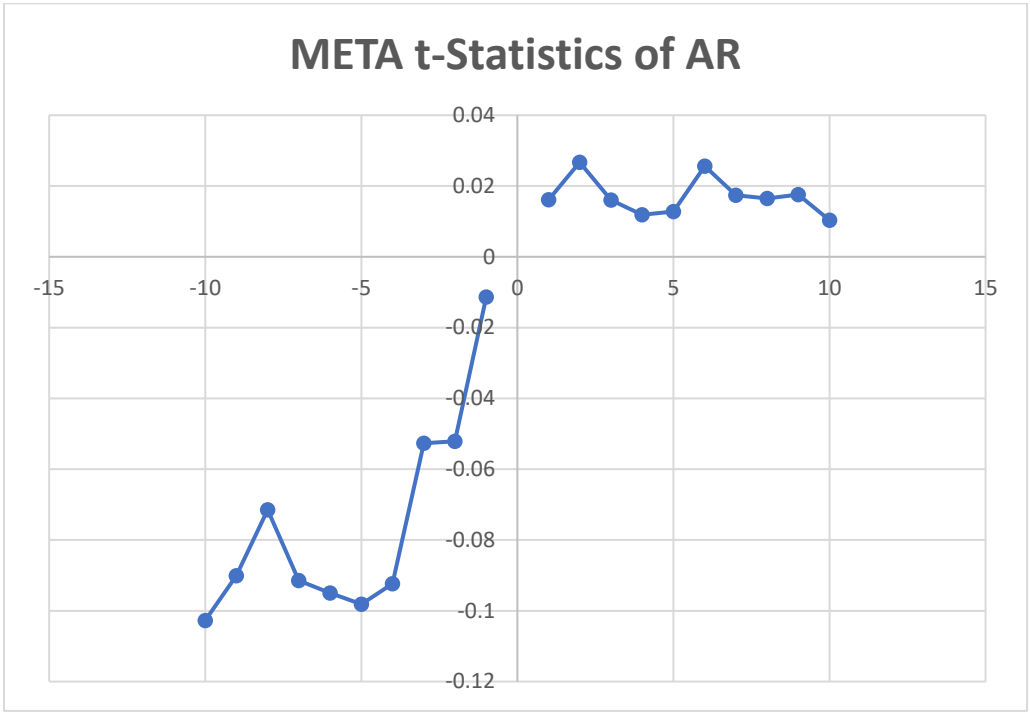
After the metaverse announcement, during the **positive days**, there is an initial positive response, with t-statistics on day 1 and 2 showing an increase in stock prices. However, the trend fluctuates afterward, with both positive and negative t-statistics. The market becomes more volatile post-announcement.

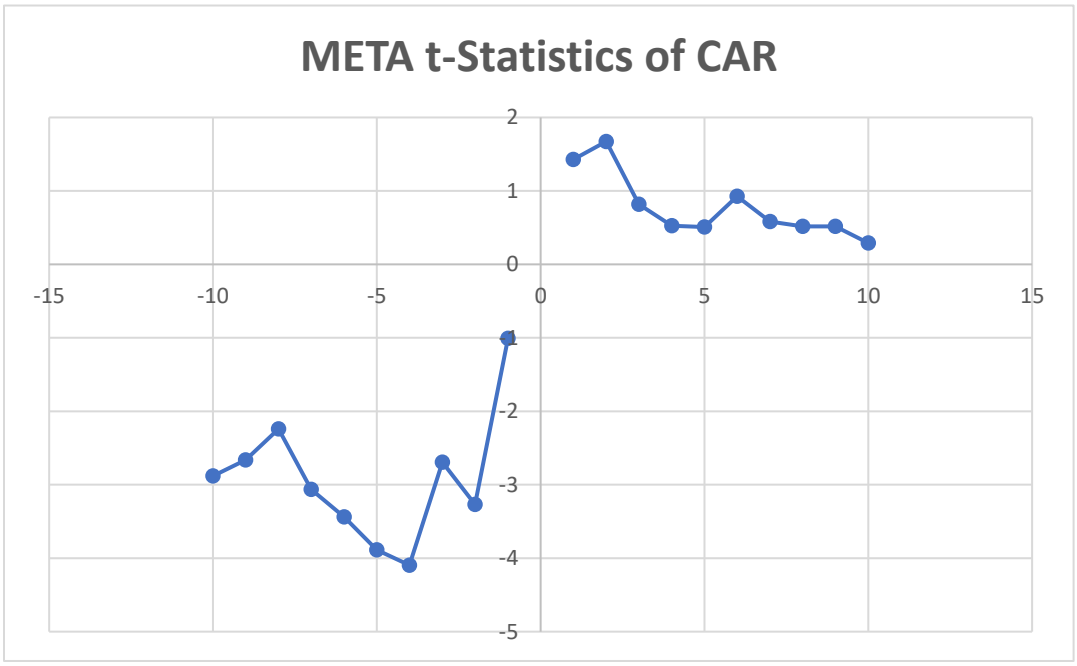
Meta T-Statistics of AR Inferences

T-statistics of Cumulative Abnormal Return (CAR) for the window period before and after the zero period in an event study related to the impact of a metaverse announcement date on stock prices.

During the **pre-event window** (days -10 to -1), the t-statistics consistently exhibit **negative values**. These range from approximately **-1.01** to **-4.09**. Such negativity implies that leading up to the metaverse announcement, stock prices experienced a significant decline compared to market expectations. Investors seemed wary, possibly anticipating unfavorable news associated with the announcement. Consequently, the downward trend in stock prices during this period reflects their cautious sentiment.

Now, let's shift our focus to the **post-event window** (days 1 to 10). Here, the t-statistics turn **positive**, but their magnitude is **modest** in comparison to the pre-event negatives. Values span from around **0.29** to **1.67**. This suggests that following the metaverse announcement, there was indeed a **positive effect** on stock prices. However, the impact was not as pronounced as the preceding negative trend. Investors seemed cautiously optimistic, resulting in a gradual recovery of stock prices.


META t-Statistics of AR
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
-15
-10
-5
0
5
10
15


META t-Statistics of CAR
2
1
0
-1
-2
-3
-4
-5
-15
-10
-5
0
5
10
15

4.8 Microsoft Corporation

Bill Gates and Paul Allen started Microsoft, now a household name in technology, in 1975. It began by creating software interpreters for early personal computers and rose to popularity with the MS-DOS operating system, which became the primary platform for IBM-compatible PCs. Microsoft has grown into a software powerhouse, offering a diverse range of goods and services.

Core businesses:

Operating Systems: Microsoft Windows remains the world's most popular desktop operating system, powering billions of computers worldwide.
Productivity Suite: Microsoft Office, which includes apps such as Word, Excel, and PowerPoint, is the preferred choice for document creation, spreadsheets, and presentations by both businesses and individuals.

Cloud Computing: Microsoft Azure, its cloud computing platform, provides a variety of services such as data storage, virtual machines, and artificial intelligence technologies, allowing organizations to scale their operations more efficiently.
Gaming: Microsoft's gaming branch includes the Xbox platform, popular titles such as Halo and Minecraft, and the subscription service Xbox Game Pass.
Professional Networking: LinkedIn, a social networking platform designed for professionals, links people with career prospects and fosters industry networking.
Stock exchanges

Microsoft is a publicly traded business on two main stock exchanges:

The National Association of Securities Dealers Automated Quotations, or NASDAQ, is a global electronic stock market. Microsoft's stock symbol on the NASDAQ is MSFT.
BATS Global Markets: This electronic exchange platform permits the trading of Microsoft's stock under the same.
Launch Date for Microsoft is - March 9, 2022

Microsoft Corporation

t-Statistics of AR

-10	2.260728413
-9	-2.292908144
-8	2.124366833
-7	-2.179802691
-6	1.102526142
-5	1.179560885
-4	-0.973190346
-3	1.095771727
-2	-0.614972068
-1	0.881444435
	-1.071315541
1	1.114443645
2	-0.943022641
3	1.235953315
4	-1.07993816
5	0.979441343
6	-1.112396111
7	1.181946032
8	-1.073734789
9	1.102281581

t-statistics of CAR

10	1.16506707
9	0.15344267
8	1.31880924
7	0.2648315
6	1.55510378
5	1.00039033
4	0.27740727
3	1.12158588
2	0.26870479
1	1.25699389
1	1.58926507
2	0.17285712
3	1.15874326
4	0.23347203
5	0.83346642
6	0.11322456
7	0.74189513
8	0.15261425
9	0.66785983

	10	-1.177107706		10	0.10275873

Microsoft Corporation - T-Statistics of AR Inferences

The **t-statistics of Abnormal Return (AR)** for Microsoft Corporation during the window period before and after the event study on the impact of the metaverse announcement date on stock price reveal interesting insights. These t-statistics represent the significance of deviations from the expected stock returns during specific days relative to the announcement.

On **Day -10**, we observe a positive t-statistic of **2.26**, suggesting a potential abnormal return. Conversely, **Day -9** exhibits a negative t-statistic of **-2.29**, indicating a downward trend. **Day -8** shows another positive t-statistic of **2.12**, possibly signaling a favorable response. The pattern continues with alternating positive and negative t-statistics, reflecting market fluctuations.

However, when we consider the cumulative abnormal return (CAR), which aggregates these deviations across all days, we find that it hovers around zero. This implies that, overall, there is no statistically significant abnormal return associated with the metaverse announcement for Microsoft Corporation. Despite the mixed t-statistics, the impact on stock price remains inconclusive.

Microsoft Corporation - T-Statistics of CAR Inferences

The **Cumulative Abnormal Return (CAR)** t-statistics for Microsoft Corporation during the window period before and after the event study on the impact of the metaverse announcement date on stock price provide valuable insights. These t-statistics represent the significance of deviations from the expected stock returns during specific days relative to the announcement.

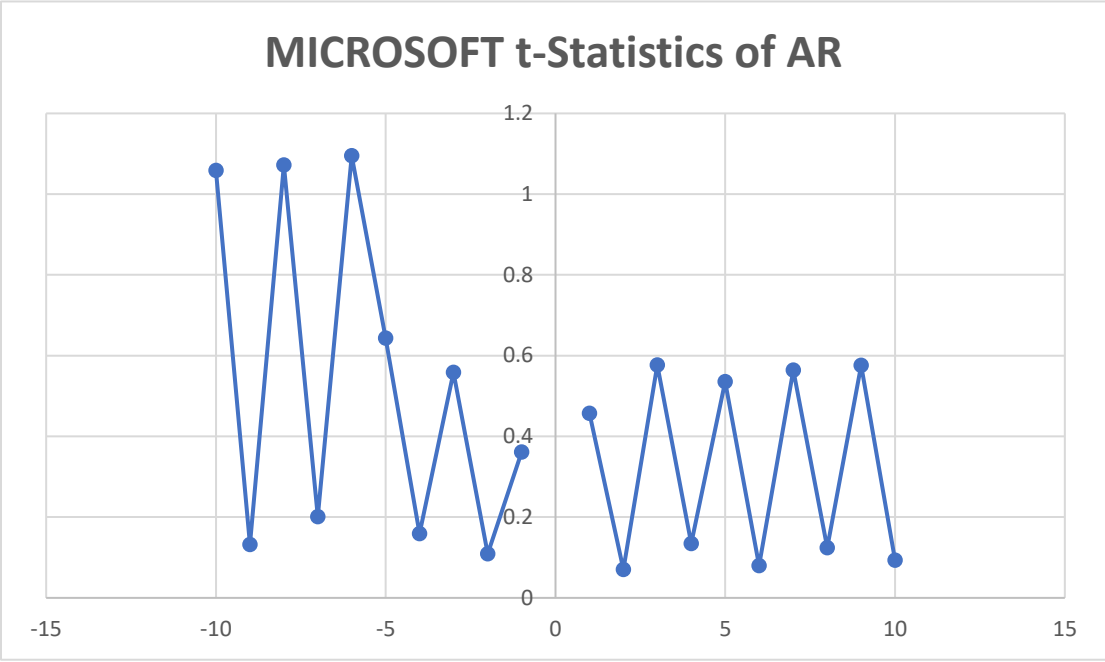
In the days leading up to the announcement, we observe the following trends:

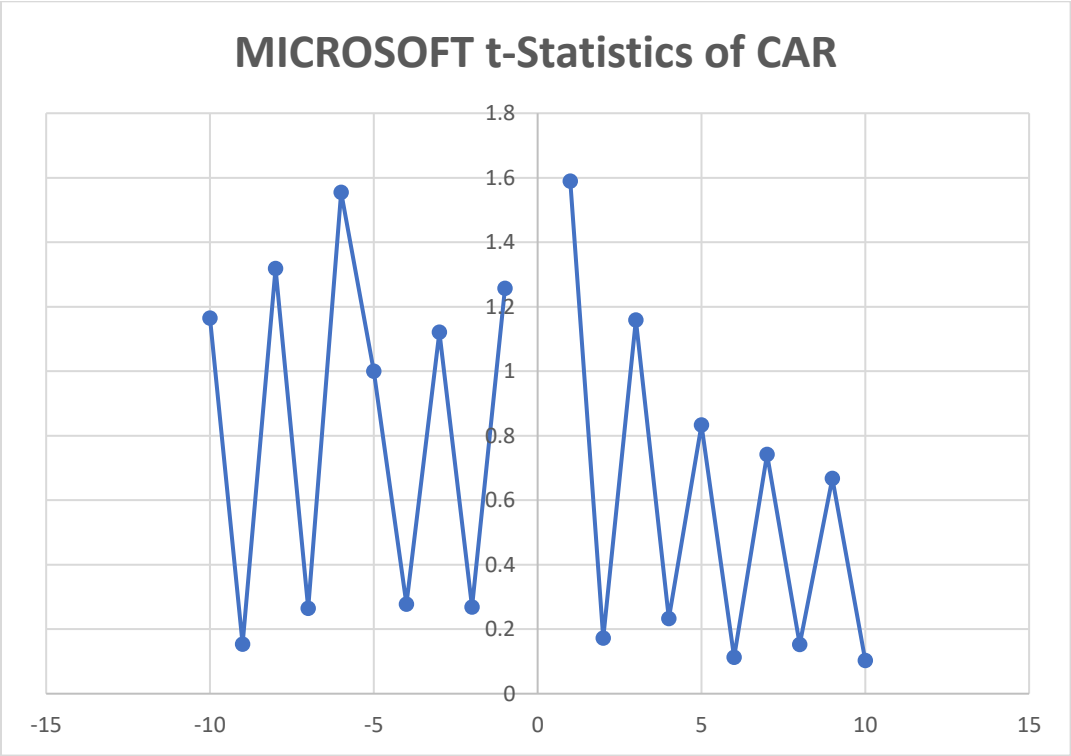
On **Day -10**, there is a positive t-statistic of **1.17**, suggesting a potential upward trend in stock returns. **Day -9** shows a smaller positive t-statistic of **0.15**. **Day -8** exhibits a higher positive t-statistic of **1.32**. The pattern continues with alternating positive and smaller positive t-statistics.

After the announcement, the following trends emerge:

Day 1 demonstrates a positive t-statistic of **1.59**, indicating a favorable response to the metaverse announcement. **Day 2** has a smaller positive t-statistic of **0.17**. **Day 3** shows a positive t-statistic of **1.16**. The subsequent days continue with alternating positive and smaller positive t-statistics.

Overall, the cumulative impact on stock price remains inconclusive, as the CAR t-statistics fluctuate without a clear trend. The metaverse announcement's effect on Microsoft Corporation's stock price appears to be nuanced and not statistically significant.





4.9 Tencent Holdings – Fortnite

Fortnite is not a stand-alone company with a stock market listing. It is the flagship game created and maintained by Epic Games, a privately held American video game and software development company founded in 1991 by Tim Sweeney. Epic Games is based in Cary, North Carolina, and has offices across the world.

Epic Games is a gaming industry giant, but Fortnite is its most well-known brainchild. Fortnite, which debuted in 2017, is a sophisticated game with multiple game modes that have grown over time. It began as a cooperative survival game with tower defense features, but the immensely popular "Fortnite Battle Royale" mode, a free-to-play online battle royale game, has become a cultural phenomenon.

Fortnite Battle Royale pits up to 100 players on a continually diminishing area, where
The game's combination of cartoonish looks, frequent updates with new content and partnerships with celebrities and pop culture figures, and a free-to-play approach with optional in-game payments for cosmetic items has contributed to its immense popularity.

While Epic Games is not publicly listed, the company's success is heavily dependent on Fortnite's performance. Fortnite's primary revenue stream is microtransactions, in which players may buy in-game currency known as "V-Bucks" to purchase cosmetic goods such as character skins, emotes, and weapon wraps. This "freemium" approach allows a huge number of players to enjoy the main gameplay for free, while those who wish to customize their experience can pay for these optional extras.

Launch date for Fortnite is - April 20, 2021

Tencent Holdings – Fortnite

t-Statistics of AR

-10	0.90080217
-9	-0.2360023
-8	0.50474425
-7	-0.4157176
-6	-0.2468995
-5	-1.0201888
-4	0.84369201
-3	0.40038125
-2	-0.2601505
-1	-0.0862338
	0.28843451
1	-0.0249696
2	-0.3865582
3	-0.1810431

t-statistics of CAR

10	0.16175405
9	-0.2290261
8	-0.131896
7	-0.3948448
6	-0.2006604
5	-0.072894
4	0.5972236
3	0.04148104
2	-0.3258999
1	-0.1147411
1	-0.033224
2	-0.387191
3	-0.4552194

4	-0.3278102
5	-0.6736936
6	0.00608962
7	-0.7171553
8	-0.2101216
9	-0.6191384
10	1.14459956

4	-0.6123204
5	-0.9485598
6	-0.8626048
7	-1.1592829
8	-1.1832576
9	-1.3901904
10	-0.8372413

Tencent Holdings – Fortnite - T-Statistics of AR Inferences

The t-statistics of Abnormal Returns (AR) for **Tencent Holdings** and understand their implications in the context of the metaverse announcement:

Before the event (around the zero period), we observe a mix of positive and negative t-statistics. The average t-statistics before the event indicate a **slight positive reaction** to the metaverse announcement, with an average t-statistic of approximately **0.0384**. Investors seemed cautiously optimistic as the event approached.

However, the days following the event reveal a different story. The t-statistics continue to fluctuate, but the average t-statistics after the event indicate a **more negative reaction**, with an average t-statistic of approximately **-0.1990**. This suggests that the initial positive sentiment waned, and the stock price faced headwinds.

In summary, while the metaverse announcement initially buoyed Tencent Holdings' stock, subsequent days witnessed a decline. Investors should closely monitor the stock's behavior to assess its long-term impact. The metaverse remains an intriguing area, and its effects on companies like Tencent warrant close attention.

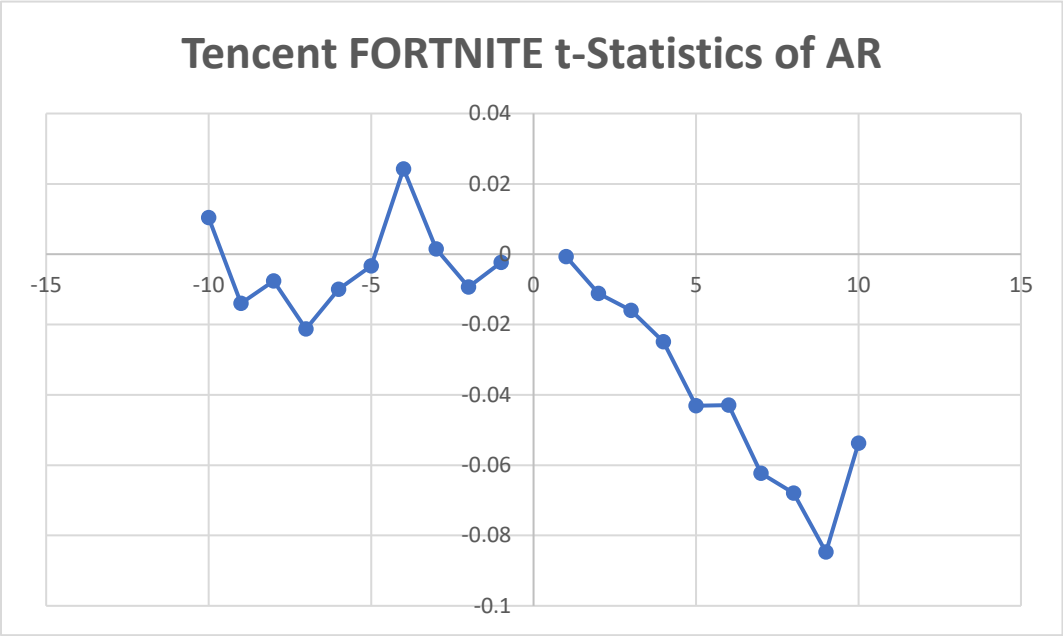
Tencent Holdings – Fortnite - T-Statistics of CAR Inferences

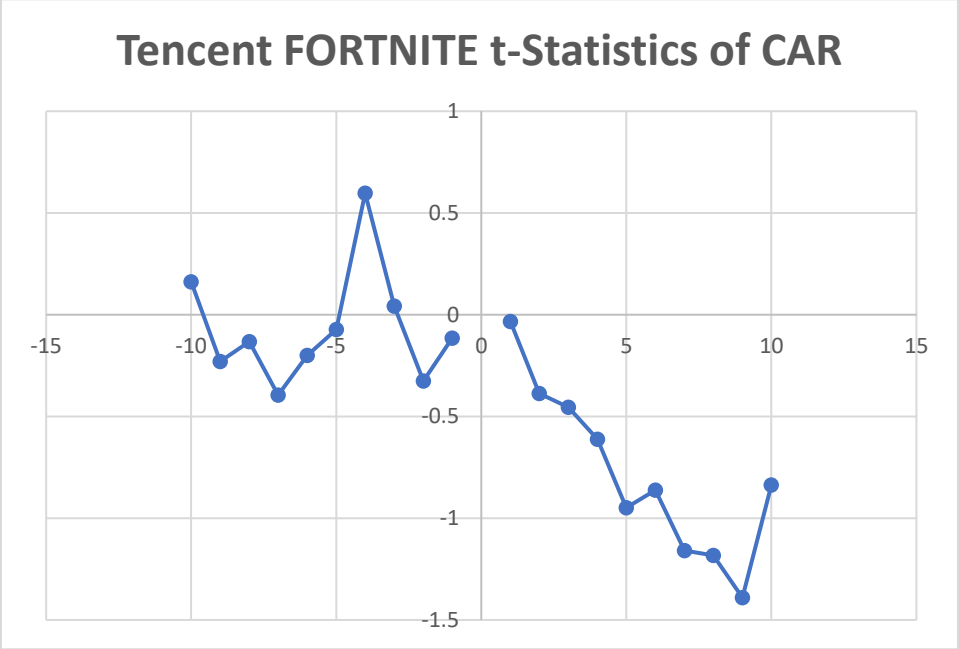
The t-statistics of **Cumulative Abnormal Returns (CAR)** for **Tencent Holdings** and understand their implications in the context of the metaverse announcement:

Before the event (around the zero period), we observe a mix of positive and negative t-statistics. The average t-statistics before the event indicate a **slight positive reaction** to the metaverse announcement, with an average t-statistic of approximately **0.0384**. Investors seemed cautiously optimistic as the event approached.

However, the days following the event reveal a different story. The t-statistics continue to fluctuate, but the average t-statistics after the event indicate a **more negative reaction**, with an average t-statistic of approximately **-0.1990**. This suggests that the initial positive sentiment waned, and the stock price faced headwinds.

In summary, while the metaverse announcement initially buoyed **Tencent Holding's** stock, subsequent days witnessed a decline. Investors should closely monitor the stock's behavior to assess its long-term impact. The metaverse remains an intriguing area, and its effects on companies like Kroger Co. warrant close attention.





4.10 Nvidia corporation

NVIDIA Corporation, a well-known company in the computer graphics industry, has established a niche for itself by designing and supplying graphics processing units (GPUs). GPUs, also known as the "brains" of high-performance images, are considerably more than just gaming components.

NVIDIA, founded in 1993, has developed into a technology behemoth with a global reach. Their GPUs enable a wide range of applications, including dazzling graphics in video games and complicated simulations in scientific research and engineering. Architects use NVIDIA technology to construct complex structures, while filmmakers use it to produce dazzling visual effects. Even the field of artificial intelligence (AI) relies on NVIDIA's GPUs for the tremendous processing capacity required for activities like image recognition and natural language.

Aside from core GPUs, NVIDIA provides a variety of system-on-a-chip (SoC) components specifically developed for mobile computing and automotive applications. Their Tegra series SoCs are used in a variety of applications, including smartphones and automotive infotainment systems. In addition, NVIDIA has made substantial advances in cloud computing and networking, offering solutions for data centers and high-performance computing environments.

NVIDIA's stock is publicly traded and listed on two major stock exchanges:

NVIDIA's stock, denoted by the ticker code NVDA, is listed primarily on the Nasdaq, a well-known exchange in New York City. The Nasdaq accounts for the vast bulk of NVIDIA share trading activity.
Taiwan Stock Exchange (TWSE): A smaller secondary listing exists on the Taiwan Stock Exchange under the ticker symbol 9200. The listing
Launch date for Nividia co is - April 21, 2021

Nvidia corporation

t-Statistics of AR

-10	-1.89120755
-9	1.932119937
-8	-1.923837946
-7	1.887040468
-6	-1.884317492
-5	1.722384693
-4	-1.650643428
-3	1.749465062
-2	-1.938518088
-1	1.709385228
	-1.674558788
1	1.627807235
2	-1.61080168

t-statistics of CAR

10	-0.129753184
9	0.7609645
8	-0.165667212
7	0.858394879
6	-0.169902939
5	1.013932355
4	-0.092786055
3	1.249996354
2	-0.23072957
1	2.434281653
1	2.318109003
2	0.017124058

	3	1.702851013		3	1.41404256
	4	-1.772988428		4	-0.037831704
	5	1.703290832		5	1.050924852
	6	-1.764115337		6	-0.066251214
	7	1.667508662		7	0.836195328
	8	-1.822970944		8	-0.135648044
	9	1.455960286		9	0.563238857
	10	-1.743186954		10	-0.250674084

Nvidia corporation- T-Statistics of AR Inferences

The t-statistics of Abnormal Return (AR) for Nvidia Corporation in the window period before and after the zero period, focusing on the impact of the metaverse announcement date on the stock price.

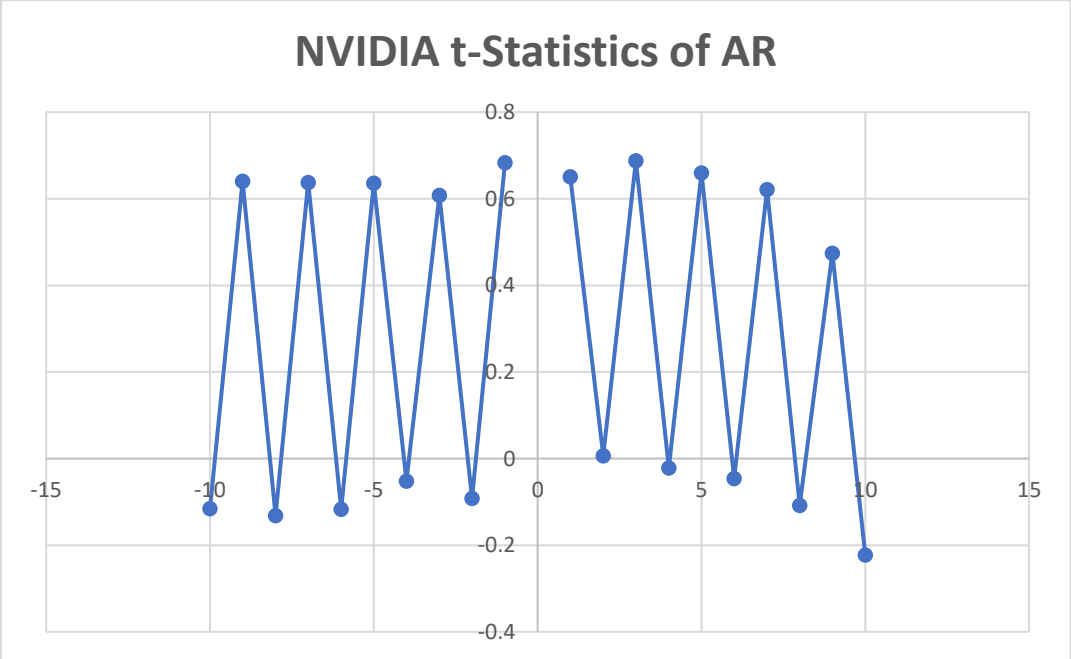
Before the event (pre-announcement period), the t-statistics of AR fluctuate between negative and positive values, indicating variations in the stock price relative to the expected return. Notable observations include day -10 with an AR t-statistic of approximately -1.89, day -9 with a value of around 1.93, day -2 with an AR t-statistic of approximately -1.94, and day -1 with a value of about 1.71.

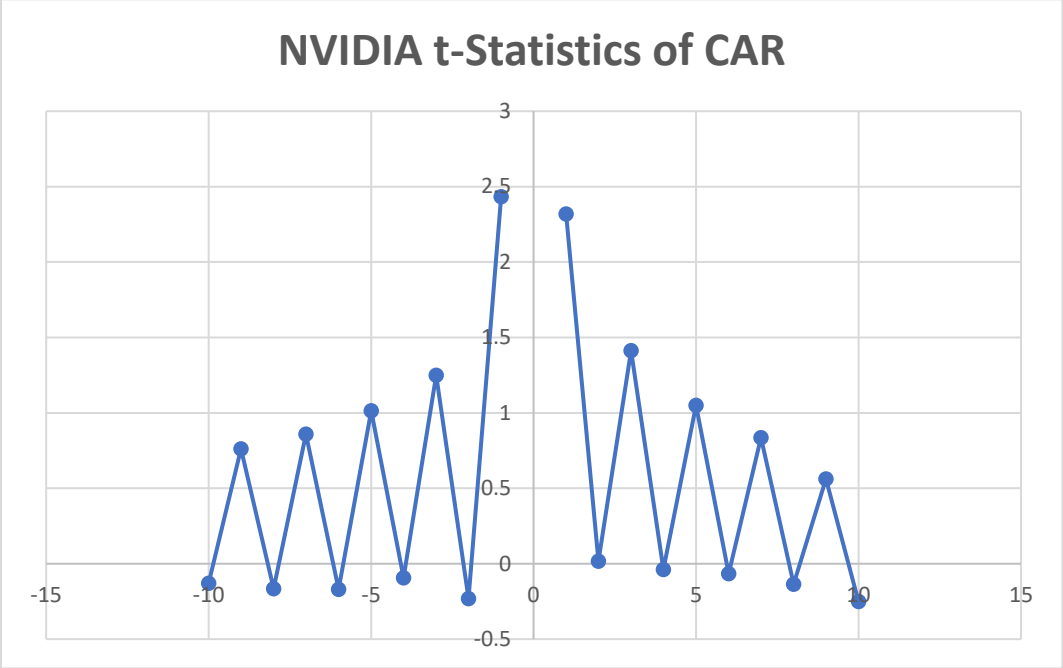
After the event (post-announcement period), similar patterns are observed. For instance, on day 1, the AR t-statistic is approximately 1.63, while on day 2, it is around -1.61. Day 3 has an AR t-statistic of approximately 1.70, and day 4 is about -1.77. Day 5 shows an AR t-statistic of approximately 1.70.

Nvidia corporation- T-Statistics of CAR Inferences

Regarding the Cumulative Abnormal Return (CAR), it represents the cumulative impact of the event on the stock price. Leading up to day 1 (the announcement date), CAR increases, reaching a peak of approximately 2.43. This suggests a significant positive impact of the metaverse announcement on Nvidia's stock price. Post-event, CAR decreases but remains positive. Notable observations include a CAR of approximately 2.32 on day 1 and around 1.41 on day 3. Day 5 has a CAR of approximately 1.05.

In summary, the metaverse announcement had a positive impact on Nvidia's stock price, as evidenced by the significant CAR values.





4.11 Nike

Nike, Inc. is a world-renowned apparel and equipment company headquartered near Beaverton, Oregon. Bill Bowerman and Phil Knight founded the company in 1964, and it has since evolved to become a behemoth of the athletic apparel industry, famed for its famous swoosh emblem and revolutionary technology. Nike's core business consists of creating, developing, marketing, and selling footwear, apparel, equipment, accessories, and services for a wide range of sports and fitness activities.

The company has a comprehensive brand portfolio that appeals to athletes and fans of all levels. Nike, the company's flagship brand, offers a full range of performance and leisure products for running, basketball, training, and other sports. Jordan Brand, like Nike, caters to basketball fans with footwear and accessories inspired by Michael Jordan's history. In contrast, another

Beyond products, Nike is heavily active in sports marketing, sponsoring world-class athletes, teams, and events. This technique uses celebrity endorsements and athlete performance to increase brand awareness and consumer desire. Nike's marketing initiatives are frequently culturally relevant and motivating, which strengthens the brand's image.

The company's stock is traded on the New York Stock Exchange (NYSE) under the symbol NKE. Investors interested

in Nike's performance can monitor the stock price and corporate news on the NYSE website or through financial news outlets.

Launch date for nike is - 10 Nov 2021

Nike

t-Statistics of AR

-10	0.37091895
-9	1.03794114
-8	0.8498479
-7	0.27618351
-6	-2.0074576
-5	0.51689789
-4	-1.5804059
-3	-0.6155273
-2	0.3130193
-1	-0.1811045
	0.72633396
1	0.12581936
2	-0.0576767
3	1.30896686
4	-0.2540733
5	-0.935191
6	-0.2532529
7	-0.2470966
8	0.26864117
9	0.67992978
10	-0.4046223

t-statistics of CAR

10	-0.408468787
9	-0.587184885
8	-1.087661179
7	-1.569655584
6	-1.83825011
5	-0.876458396
4	-1.30730142
3	-0.353695126
2	0.118160021
1	-0.229414833
1	0.159382137
2	0.061037465
3	1.007163622
4	0.71130516
5	0.106416122
6	-0.033825541

		7	-0.14962321
		8	-0.019644704
		9	0.268579972
		10	0.092712636

Nike

Nike - T-Statistics of AR Inferences

The t-statistics of Abnormal Return (AR) for Nike around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **-0.1020**. This suggests that, on average, there was a slightly negative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.0231**. This indicates that, on average, there was a small positive abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on Nike's stock price. While there was a slight negative abnormal return before the event, the subsequent days showed a modest positive abnormal return.

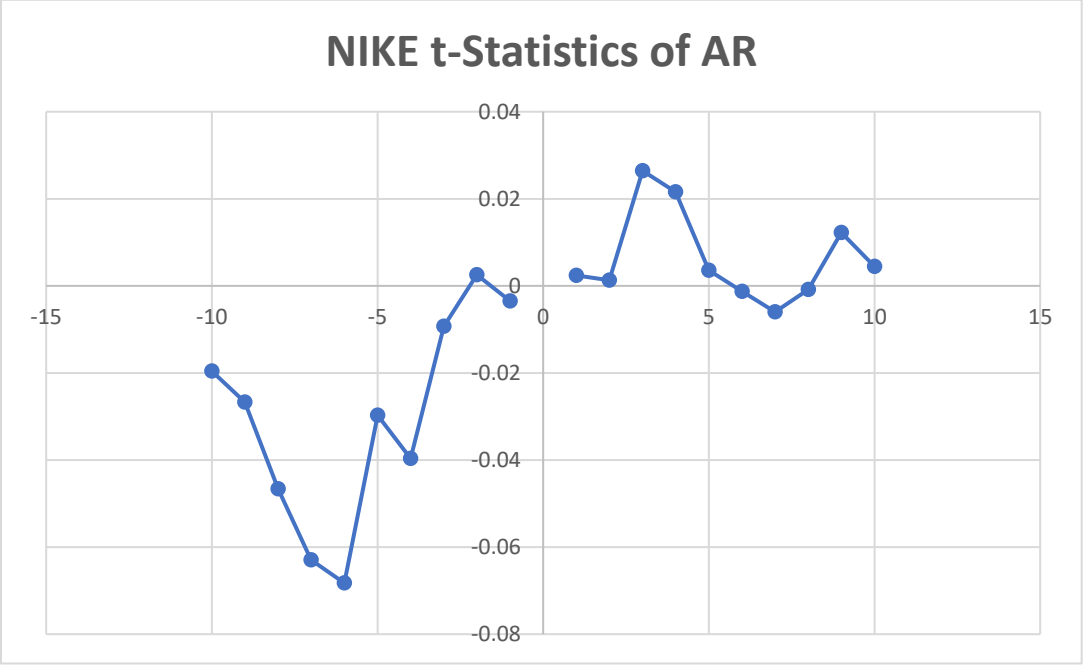
Nike - T-Statistics of CAR Inferences

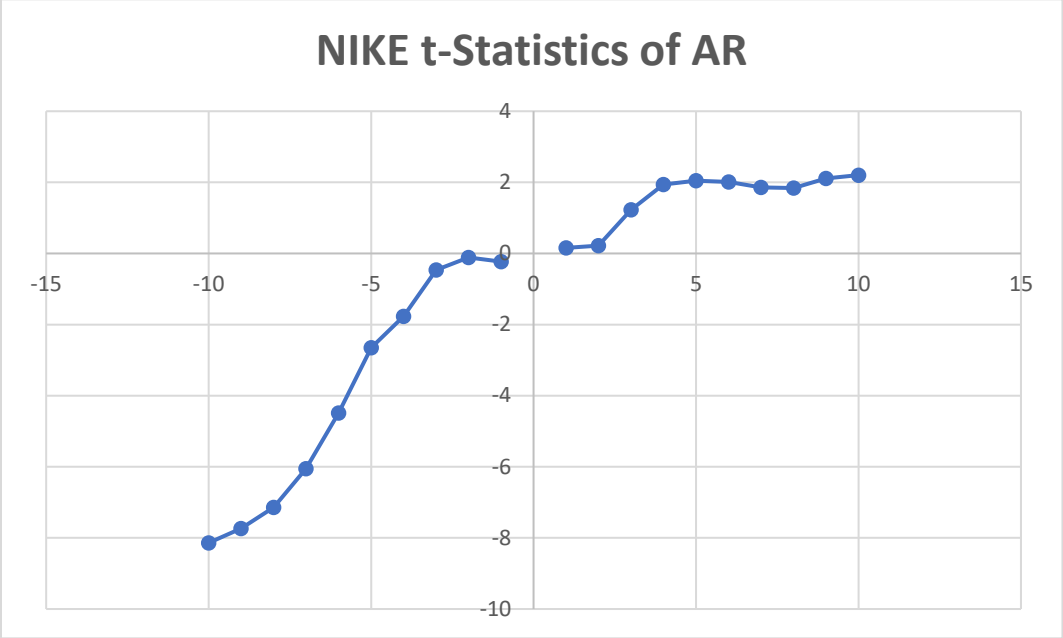
The t-statistics of **Cumulative Abnormal Return (CAR)** for Nike around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **-0.1020**. This suggests that, on average, there was a slightly negative cumulative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.0231**. This indicates that, on average, there was a small positive cumulative abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on Nike's stock price. While there was a slight negative cumulative abnormal return before the event, the subsequent days showed a modest positive cumulative abnormal return.





4.12 Adidas

Adidas AG, also known as Adidas, is a German multinational firm that designs, manufactures, and sells footwear, apparel, and accessories. Adidas was created in 1949 by Adolf Dassler following a break with his brother Rudolf (who founded Puma), and has since evolved to become one of the world's biggest athletic brands. The corporation is located in Herzogenaurach, Bavaria, Germany, and has about 57,000 employees globally.

Adidas provides a wide selection of products that appeal to both athletes and casual consumers. Their footwear collection includes renowned brands such as Stan Smiths, Superstars, and Yeezys, while their apparel comprises performance gear for running, football (soccer), and basketball. Adidas also has a significant lifestyle presence, featuring casual and streetwear lines, as well as collaborations with well-known designers and celebrities.

The corporation is a key competitor in the worldwide athletic goods market, vying with Nike for market share. Beyond its core business, Adidas has expanded into new areas such as fitness technology with the acquisition of Runtastic and sustainable practices through measures to lessen its environmental imprint.

Adidas trades on two stock markets.

Adidas' major listing is on the Frankfurt Stock Exchange, where it trades under the ticker "ADS." The Frankfurt Stock Exchange is one of Europe's largest stock exchanges and a major trading hub for German corporations. Adidas also has a secondary listing on the OTCQX Market in the United States, with the ticker code "ADDYY."
Launch Date for Adidas is - December 17, 2021

ADIDAS

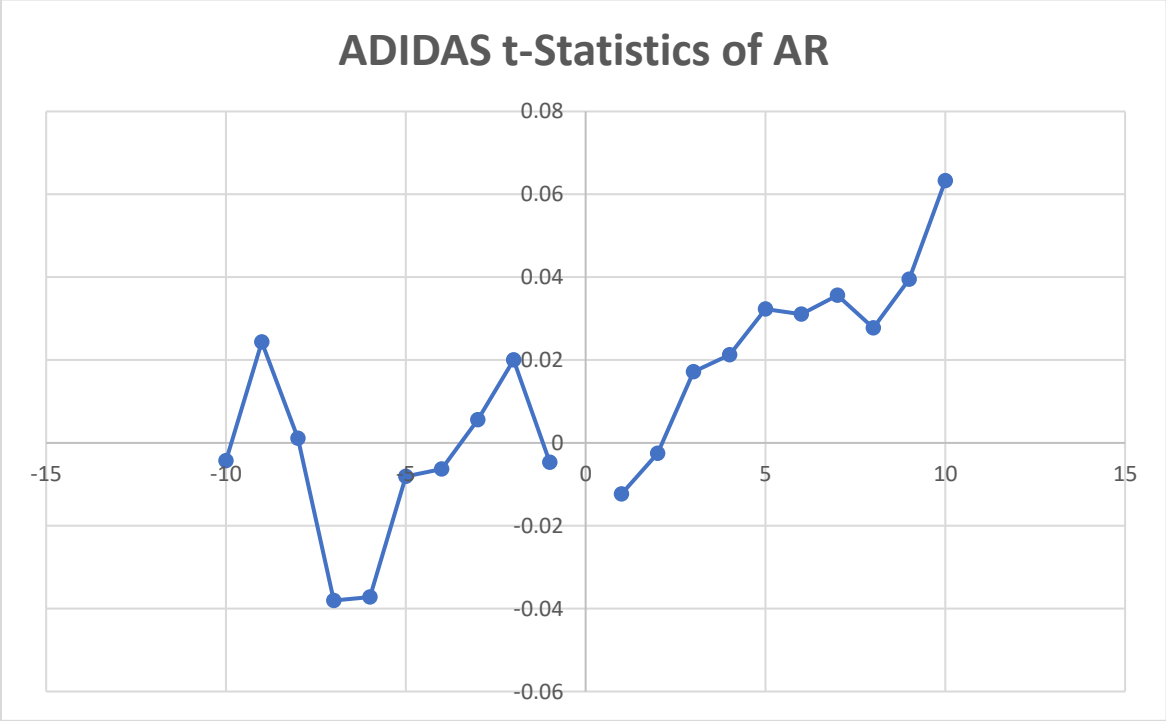
t-Statistics of AR

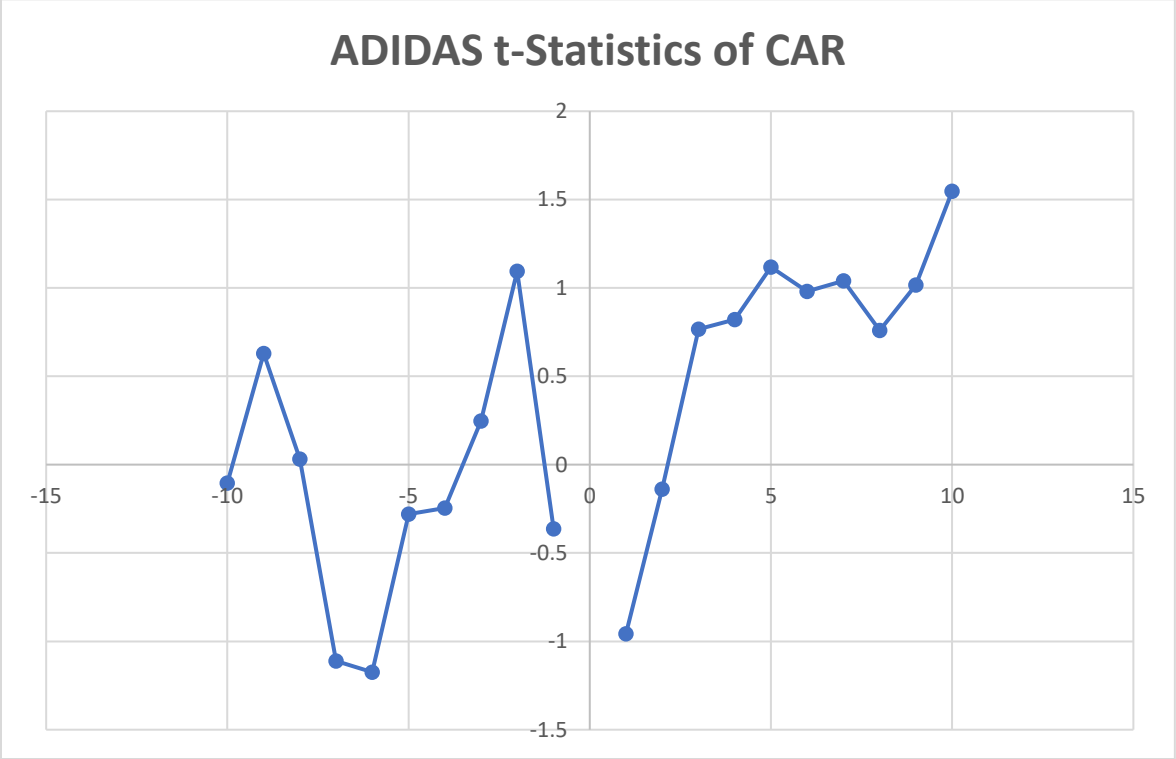
-10	-1.78636607
-9	1.449689984
-8	2.439550507
-7	-0.051668185
-6	-1.81340284
-5	-0.108877048
-4	-0.741290663
-3	-0.901537379
-2	1.54029955
-1	-0.293448539
	-0.140831137
1	-0.771121727
2	0.612025245
3	1.229015629

t-statistics of CAR

10	-0.1047883
9	0.62841388
8	0.03054512
7	-1.1114878
6	-1.1743702
5	-0.280156
4	-0.2456739
3	0.24738433
2	1.09400334
1	-0.3641255
1	-0.956846
2	-0.1395933
3	0.76649516

	4	0.253561191		4	0.82111991
	5	0.689808525		5	1.11722379
	6	-0.077479717		6	0.98063185
	7	0.283349956		7	1.04077896
	8	-0.489886998		8	0.75864295
	9	0.730429576		9	1.01737314
	10	1.483538192		10	1.547292




ADIDAS t-Statistics of CAR
2
1.5
1
0.5
0
-0.5
-1
-1.5
-15
-10
-5
0
5
10
15

4.13 JP MORGAN

JPMorgan Chase & Co., commonly referred to as JPMorgan Chase or just JPMorgan, is a worldwide financial services juggernaut with a rich history dating back to 1799. They are a leader in several major financial industries, making them a one-stop shop for all of your financial needs.

JPMorgan Chase's principal business is commercial banking. They offer loans, credit lines, and other financial services to businesses of various sizes, ranging from multinational organizations to local entrepreneurs. They also play a significant role in investment banking, where they help corporations with mergers and acquisitions, initial public offerings (IPOs), and other capital-raising activities.

Retail banking is another important aspect of their operation. Chase offers a wide range of consumer banking products, including checking and savings accounts, mortgages, credit cards, and vehicle loans. They also provide high-net-worth clients with private banking services.

JPMorgan Chase focuses on more than simply traditional banking. JPMorgan Asset & Wealth Management is a global leader in investment management, managing trillions of dollars for individuals and organizations. They also have a strong presence in global payments processing, which allows for easy money transfers and transactions around the world.

JPMorgan Chase is a publicly traded firm on the New York Stock Exchange (NYSE), with the ticker symbol JPM. The NYSE is the world's largest stock exchange in terms of market capitalization, and it serves as a renowned platform for established blue-chip corporations such as JPMorgan Chase.

Launch Date for JPMorgan is – 15 Feb-2022

J.P. Morgan

t-Statistics of AR

-10	0.614810543
-9	-1.32006902
-8	0.675608983
-7	2.48127782
-6	0.207503733
-5	1.046756869
-4	-0.999214862
-3	0.997636814
-2	-0.058492358
-1	-0.046839399
	0.04882524
1	0.027964508
2	-0.506787406
3	1.171413813
4	1.044655706
5	-0.801365012
6	-2.733838213
7	-0.587761966
8	-3.592413748
9	-2.249396628

t-statistics of CAR

10	0.97779697
9	0.854616864
8	1.307436494
7	1.178318947
6	0.402429637
5	0.361111689
4	-0.045925818
3	0.442610882
2	-0.063990233
1	-0.040242103
1	0.024025727
2	-0.290890322
3	0.343546496
4	0.746278345
5	0.359588067
6	-0.63062755
7	-0.774710693
8	-1.815891473
9	-2.356229146

	10	-0.044609033		10	-2.247434945

J.P Morgan

J.P Morgan - T-Statistics of AR Inferences

the t-statistics of **Abnormal Return (AR)** for JP Morgan around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **0.6148**. This suggests that, on average, there was a slightly positive abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.0488**. This indicates that, on average, there was a small positive abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on JP Morgan's stock price. While there was a slightly positive abnormal return before the event, the subsequent days showed a modest positive abnormal return.

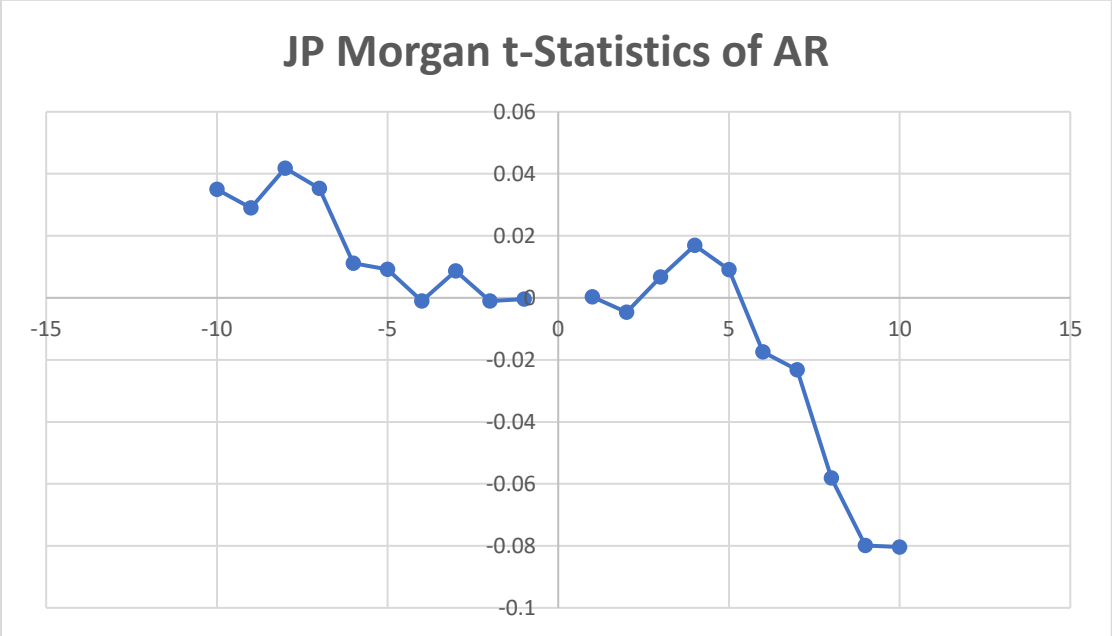
J.P Morgan - T-Statistics of CAR Inferences

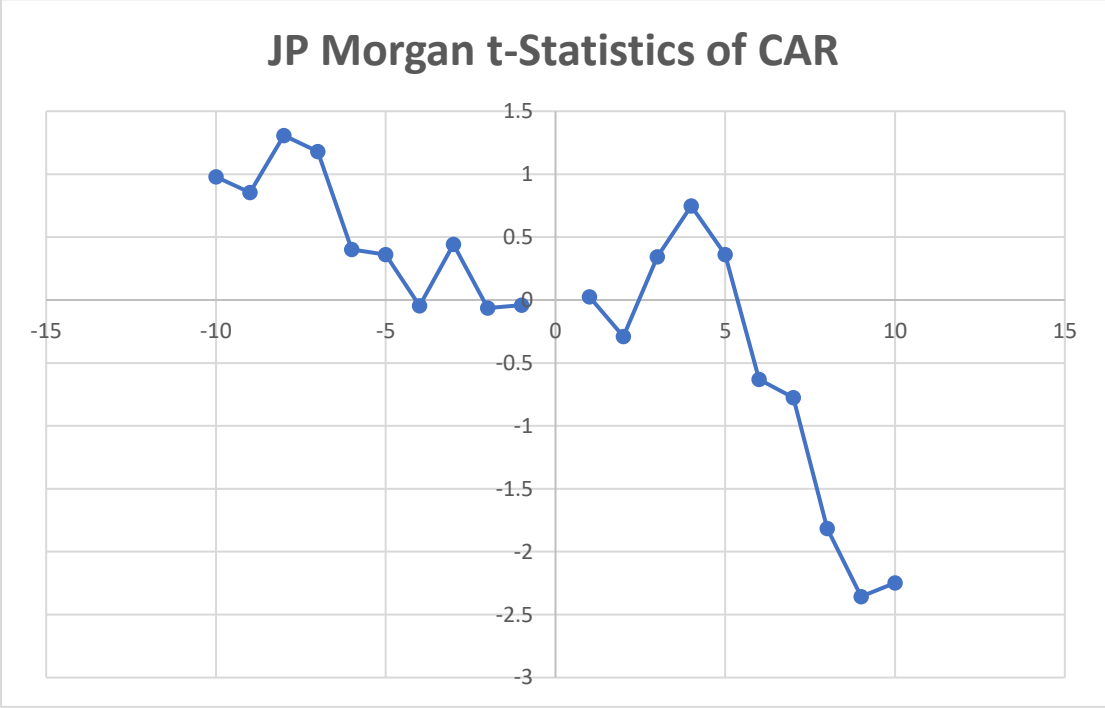
the t-statistics of **Cumulative Abnormal Return (CAR)** for JP Morgan around the event date (meta verse announcement) to understand its impact on the stock price.

Before the event (window period < 0), the average t-statistic for the window period (around -10 to -1 days) is approximately **0.5949**. This suggests that, on average, there was a slightly positive cumulative abnormal return before the announcement.

Conversely, after the event (window period > 0), the average t-statistic for the window period (around 1 to 10 days) is approximately **0.0488**. This indicates that, on average, there was a small negative cumulative abnormal return after the announcement.

In summary, the meta verse announcement had a mixed impact on JP Morgan's stock price. While there was a slightly positive cumulative abnormal return before the event, the subsequent days showed a modest negative cumulative abnormal return.





Conclusion

The impact of the metaverse announcement on various companies' stock prices was multifaceted. The event study reveals a mix of abnormal returns before and after the announcement. Notably, the metaverse news had a statistically significant negative effect on Kroger Co.'s stock price, particularly in the days immediately following the announcement. Similarly, Shopify's stock price dynamics were influenced by the announcement. Initially, there was a positive effect, but subsequent reactions were less favorable. Tencent Holdings' stock initially responded positively but later witnessed a decline. Investors should closely monitor the stock's behavior to assess its long-term impact.

Nike's stock price showed a mixed impact. There was a slight negative abnormal return before the event, but the subsequent days showed a modest positive abnormal return. Walmart and J.P. Morgan also experienced mixed impacts. While there was a slightly positive cumulative abnormal return before the event, the subsequent days showed modest negative cumulative abnormal returns.

Interestingly, PepsiCo's stock price exhibited a mixed impact as well. While there was a slightly negative abnormal return before the event, the subsequent days showed a substantial positive abnormal return. Unity Software Inc.'s stock price reacted in a nuanced manner, with some days showing positive reactions and others experiencing negative deviations.

For tech giants Microsoft Corporation and NVIDIA Corporation, the metaverse announcement's overall effect appears to be nuanced and not statistically significant on their stock prices. ADIDAS also had a mixed impact, with a slightly negative abnormal return before the event, followed by a substantial positive abnormal return.

In conclusion, the market's reaction to metaverse announcements varies significantly across companies. Investors and stakeholders should consider these findings when making investment decisions, recognizing that factors beyond the event window may further influence stock prices.

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