INSTITUTO POLITÉCNICO DE LISBOA
INSTITUTO SUPERIOR DE CONTABILIDADE
E ADMINISTRAÇÃO DE LISBOA

HOW DOES THE STATUS "TRENDING" ATTRIBUTED BY TWITTER TO A CORPORATION INFLUENCE TRADING OF ITS STOCK? THE CASE STUDY OF THE TOP 25 COMPANIES IN THE S&P500 INDEX

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Dissertation submitted to the Higher Institute of Accounting and Administration of Lisbon to fulfil the necessary requirements to obtain the master's degree in Management Control and Performance Evaluation, conducted under the scientific guidance of Professor Maria Margarida Cróca Piteira,

Constitution of the Jury:
President _____ Dr. Marina Antunes
Member _____ Dr. Maria Gubareva
Member _____ Dr. Margarida Piteira

Lisbon, May 2022

D E D I C A T I O N :

I would like to dedicate this dissertation to my grandmother, Rina Jongejan, for supporting me throughout my whole master's degree, not only financially by buying the supplies needed, including this computer on which I'm currently writing my dissertation, but also psychologically by giving me the strength to continue. My grandmother is a survivor of the second world war and unfortunately never had the opportunity to get a proper education. Even so, she always educated herself to keep up with the newest technologies, and at 81 years old she uses facetime, WhatsApp and makes online purchases. I am the first one in my whole family to graduate secondary education and thus the first one to achieve a master's degree and my grandmother couldn't be prouder. This one is for you Granny! Love, Jearina.

EPIGRAPH:

"YOU CAN'T GET RICH BY EXCHANGING YOUR TIME FOR MONEY" – DR. VÍTOR PEREIRA, PROFESSOR AT ISCAL

A C K N O W L E D G E M E N T S :

The completion of this thesis could not have taken place without the patience and expertise of my supervisor and mentor Dra. Margarida Piteira. I would truly like to thank her for believing in this investigation, questioning me the right questions at the right time.

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Thank you all for making this possible.

D E C L A R A T I O N O F O R I G I N A L I T Y :

I, Jearina Isabelle Imanse, declare, for all due purposes, that my dissertation, entitled "How Does the Status "Trending" Attributed by Twitter to a Corporation Influence Trading of its Stock? The Case Study of the Top 25 Companies in the S&P500 Index" to obtain my master's degree in Management Control and Performance Evaluation, supervised by Professor Dr. Maria Margarida Cróca Piteira, is an original and unpublished work, the result of my research and investigations. I declare that this research was developed using the APA 6th edition style editing format as well as the Manual para a Elaboração de Dissertações e Outros Trabalhos Académicos by ISCAL. I further declare that I have cited and referenced all authors and documents used by me in this research.

A B S T R A C T :

With some news sources mentioning that young individual investors are massively manipulating the market, while others mention that there is nothing to worry about, it is hard to understand what is truly going on. One of the factors mentioned of this uncertainty is the communication and sharing of information via social media, like Reddit and Twitter. Hence, the objective of this investigation is to analyse if there is a correlation between going trending on Twitter and certain stock market events like a trading volume peak and/or a daily price peak or drop. This investigation used the case study of the top 25 S&P500 companies to investigate whether this is true. The observation of this sample occurred in the period of September 2020 - September 2021 analysing the quantitative data available in this empirical field. Given the nature of the problem, the case study is markedly exploratory and descriptive, following a deductive approach, via a pre-existing theoretical model. It was found that worldwide in 46% of the cases there did exist a correlation between going trending on Twitter and a peak or drop on the stock daily stock prices. Only in 29% of the cases this was true for the trading volume. Yet for the USA, in 41% of the cases there was a correlation between going trending on Twitter and a daily price peak or drop, compared to 32% in case of the trading volume. As this is a recent and complex phenomenon, where knowledge is scarce, the present work also discusses the practical implications of the conclusions, offering clues for future investigations.

Keywords: Stock market, Twitter, Market Manipulation, Trending, Case Study

I N D E X :

T A B L E I N D E X :

C H A R T I N D E X :

F I G U R E I N D E X :

L I S T O F A B B R E V I A T I O N S / S Y M B O L S :

IMC - Integrated Marketing Communications

VIX - Chicago Board Options Exchange Market Volatility Index

fsQCA - fuzzy-set qualitative comparative analysis

S&P500 – Standard & Poor's 500

FOMO – Fear Of Missing Out

1. INTRODUCTION

1.1. Context of the investigation

Even though the first stock market officially started in Amsterdam, in the 15th century, there are authors who argue that the history of the stock market is much older and started with the Roman empire or even in Ancient Greece (Petram, 2011; Absiyeh-Eichmeier, 2017). Regardless of the official start date, it is a fact that Mankind has always had an interest in predicting the future of the market, to be able to enjoy the maximum returns with the minimum investment. This dissertation is about the old desire of Mankind to predict or influence the stock market, but with a modern and relevant touch, considering the information that is being spread on social media, specifically on Twitter.

1.1.1. Twitter

So why Twitter? Why may Twitter be more relevant comparing to other Social Media platforms in predicting or influencing the stock market, and what exactly is Twitter? Twitter (2021) defines its platform using the following words: "Twitter is what's happening in the world and what people are talking about right now," and "When it happens it happens on Twitter." Twitter is considered a microblogging platform, where its users can write short messages of about 280 characters (Twitter, 2021). According to Java, Song, Finin and Tseng (2007, p.56), "Microblogging is a new form of communication in which users can describe their current status in short posts distributed by instant messages, mobile phones, email or the Web." Although the concept of microblogging is not new anymore, Twitter continues to be a relatively easy way to fast communicate information or thoughts with an audience. According to Bartov, Faurel and Mohanram (2018, p.25)

> with the rise of the Internet, individual investors are increasingly relying on each other as peer-to-peer sources of information (e.g., Yahoo! Finance, Silicon Investor, and Raging Bull). By far, however, the biggest revolution in the dissemination of information on the Internet has been the advent of social media platforms such as Twitter, which allow users to post instantaneously their views about stocks to a wide audience.

Even though, Twitter is not considered the world's biggest social media platform, having ´only´ about 353 million users worldwide, compared to for example Facebook, with an astonishing 2.701 million users (Statista, 2020), Swani, Cromer, Milne, and Brown (2013)

confirm that Twitter is one of the most widely used social media sites, as a part of an integrated marketing communications (IMC) plan for businesses.

1.1.2. Reason of interest

This research topic was chosen by the relevance of the stock market in the world economy and trying to predict certain economic events. The interest was gained with the realization that many economic events were often heavily influenced by certain "key people", such as the President of the United States, or CEOs of certain companies. At the time, the modern word "influencer" did not yet exist, but in the end, it was this: a character (or entity) who was able to influence opinion and thus the general behaviour of the public, making them act or think in a certain way. Lastly the behavioural economics is an emergent area of research, so this dissertation intents to be a combination of economics and psychology, facing the current social networks and influencers.

1.2. Objective

The initial objective of this dissertation was to analyse whether there seems to exist a direct relationship between the tweets of certain selected influencers and the behaviour in the stock market, for selected companies. Considering the recent event of Tesla´s CEO Elon Musk, publishing on Twitter “Use Signal” as can be seen in Figure 1.1 (Twitter, 2021), and the sudden 1100% rise of the unrelated stock with a similar name, called Signal Advance, there seems to be a vivid relation between Twitter influencers and the stock market (Novet, 2021). However, it seems to be difficult to identify beforehand certain influencers and certain companies, to really study the effect of their tweets on the stock performance of the company. For example, Signal Advance was not even the company Elon Musk referred to and was simply way an interpretational mistake by his audience. This is because it is not possible to know who is ever going to talk about a certain company.

What can be known is that if a company is randomly getting a lot of attention, independently of who tweets about it first, Twitter will mark it as ´Trending´, just like it did with the term “Signal”, several hours after Musk’s tweet. This means that the current research question is: Does there exist a correlation between going trending on Twitter and certain stock market events. These events can be identified as for example suddenly presenting a higher-than-normal trading volume, or a sudden day price peak or drop.

Figure 1.1 Tweet of Elon Musk on 07/01/2020

Source: https://twitter.com/elonmusk/status/1347165127036977153

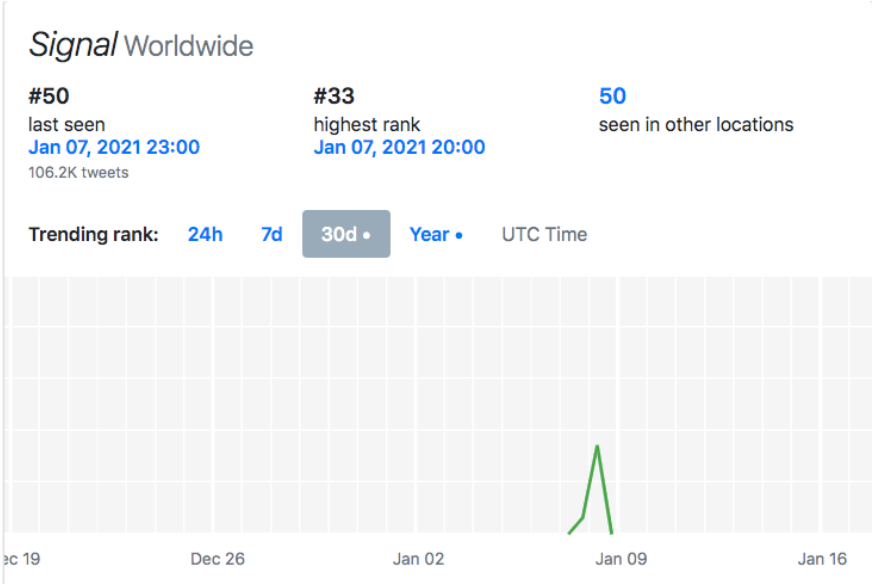


Figure 1.2 The term "Signal" 's Trending statistics from 19/12/2020 until 19/01/2021

Source: https://getdaytrends.com/trend/Signal/

Note. Figure 1.2 shows when the term "Signal" went trending on Twitter from 19/12/2020 until 19/01/2021. This image was taken from Getdaytrens, is not up to scale, and is merely illustrative.

In Figure 1.2 it can be seen how on the 7th of January the term "Signal" started trending on Twitter, getting its peak on the same day at 20:00, reaching position #33 in the worldwide ranking. Twitter has a special algorithm to define trending topics. On their website, Twitter (2021) explains how trends are being determined.

> trends are determined by an algorithm and, by default, are tailored for you based on who you follow, your interests, and your location. This algorithm identifies topics that are popular now, rather than topics that have been popular for a while or daily, to help you discover the hottest emerging topics of discussion on Twitter. You can choose to see Trends that are not tailored for you by selecting a specific Trends location on Twitter.com (…). Location Trends identify popular topics among people in a specific

> geographic location. Note: The number of Tweets that are related to the Trends is just one of the factors the algorithm looks at when ranking and determining trends. Algorithmically, Trends and hashtags are grouped together if they are related to the same topic. For instance, #MondayMotivation and #MotivationMonday may both be represented by #MondayMotivation.

From this statement, it can be concluded that analysing a sample of trending companies over a determined time spawn, may give us an idea of whether there seems to exist a correlation between going trending on Twitter and certain stock market events.

Regarding the specific objectives of this investigation, the theoretical objectives are to prove if daily stock prices present either a peak or a drop when the company goes trending on Twitter; and if the Trading Volume seems to present a peak when the company goes trending on Twitter. According to different authors, like for example Oliveira, Cortez, and Areal (2016), the trading volume and volatility are some of the main factors to analyse, when analysing if the market responds to certain stock market events. Even though the volatility might be a useful tool, it was considered it to be too vague for this investigation as the historical volatility takes into consideration all data from a specific time frame which is generally not smaller than 21 days. It does not mean it will present values that are either significantly above or below average, as in this 21-day time frame other events will be included and will influence the average. As this research is more on a daily micro level, it was considered that calculating the volatility would not lead to relevant results, thus considering the daily stock prices was more relevant. The provisional answers to the research problem are the two hypotheses raised, to be confirmed by the data of the case built for this purpose.

The methodologic objectives of this research, which is based on a case study of the top first 25 companies of the S&P500, is to give a clear idea whether for the case of these 25 selected companies, there seems to exist a correlation between going Trending on Twitter and presenting either a daily price peak or drop or a trading volume increase. According to Yin (2009, p.11) "(…) the case study is preferred in examining contemporary events, but when the relevant behaviours cannot be manipulated", which is the case.

However, it is also important to take into consideration that a case study, as the term itself determines, studies only one or a sample of cases, so it is fundamental not to take general conclusions out of these investigations. Nevertheless, according to Yin (2009, p.6) and Bennett (2004,) many researchers also use the case study as an exploratory phase of an

investigation, which means that these results can also be taken into consideration for other investigations with a bigger and more diverse sample of companies for example.

The practical objectives of this research are to give relevant market information to for example the marketing and communications departments of these specific companies and/or competing companies. The results of this investigation can conclude if social media, in this specific case, going trending on Twitter, seems to have such a big impact on the stock prices or the trading volume as some media channels would like us to believe. This way, it can also be relevant for business analysts, financial analysist, general management and even for investors, among others.

1.3. Relevance and justification of the problem

The relevance of this dissertation for the master's degree in Management Control and Business is that the results of this research may affect the strategy of the companies, mainly in terms of communication on their social media platforms like Twitter. This means that if there is a direct relationship between going trending and the behaviour of stock values, the company can think of strategies to improve its communication on Twitter to try to go trending or can anticipate going trending and optimizing the occurrence to maximise the visibility of the brand. If there doesn´t exist a relevant relationship between the two, the company may adapt its' social media strategy accordingly. This means that the company may stress less about stock events that may influence their social media or vice-versa.

Historically, the financial markets were only discussed by well-educated people on the topic, in places like Wall Street, for example. Lately, especially with the rise of social media and investment opportunities like cryptocurrencies for example, many non-technical and individual people are starting to gain interest in investing and the stock market. Consequently, many companies are starting to interact more and more with their stakeholders through these new communication channels, as will be explained and developed on further in the second and third chapter.

1.4. Structure

In chapter two "Theoretical Framework" there will be given an overview of previous studies that have been done where investigators try to link content on Twitter to the stock market performance. This chapter has been divided into three main subchapters starting with "An introduction to investors activity on social media" which has been divided into two subchapters: Wisdom of the crowds and Cashtags, explaining both concepts and how these might be relevant for this investigation. The second subchapter is "Can Social Media Influence or predict the Stock Market?" giving an overview of various authors who have tried to investigate this theme. The last subchapter of the theoretical framework is "Corporate Communication Strategies – Sharing (financial) information on Twitter." in which it is briefly described how many companies communicate with the public and how they use social media. At the end of the literature revision, the gaps in the current investigations were explained, and how this new research will compare.

In chapter 3, called "Model of analysis and operationalization of variables", the problem will be explained, and the possible investigation hypotheses will be presented. The chapter has been divided into three subchapters, being the first one the hypothesis formation, which has been subdivided into two subchapters "H1 – Daily stock prices present a peak or drop when the company goes trending on Twitter" and "H2 – Daily trading volume presents a peak when the company goes trending on Twitter". Subchapter 3.2 called "Comparing to Google searches" explains why the results were also compared to the Google search results for the same period the trending peaks and stock charts were analysed. The last subchapter of the third chapter, called "Research problem" determines in detail what the problem is and why this might be relevant to investigate.

The fourth chapter of this dissertation is called "Method and procedures" and explains the investigation methodology detail, mentioning which companies have been selected and why, and how their Twitter data will be compared to their specific stock market performance and to the overall market performance. This chapter has been divided into two subchapters: "Collection of the data" and "Comparison and analysis of the data".

In chapter 5 "Description of the data" all collected data will be shown into tables. This chapter has two subchapters "Invalid data" and "Selection of the data" which explains why some data is considered invalid, and what the selected data means, respectively.

Chapter 6 “Analysis and discussion of data: empirical study” shows the overview of all the data and the possible relations that can be made, considering the investigation hypotheses. This chapter has been divided into three subchapters “Results and discussion”, “Does there exist a correlation between going trending on Twitter and certain Stock Market events?” and “FOMO – fear of missing out”. This first subchapter has also been divided into two subchapters, which are again the hypothesis “H1 – Daily Stock Prices present a peak or drop when the company goes trending on Twitter” and “H2 – Daily Trading Volume presents a peak when the company goes trending on Twitter” where it is explained if the hypotheses are true or not according to the collected data, and why. The other subchapters explain the results and explain the possible relation with FOMO.

The 7th chapter, “Conclusions” shows which are the final conclusions from the data and from this investigation. This chapter has been divided into 5 subchapters: “General conclusions” which gives an overview of the whole investigation, taken the general conclusion of this research; “Implications of the study” which explains how this investigation might be relevant for, for example, the analysed companies and others.; “Suggestions for future investigations” where it is mentioned how this research could be the framework of future works; “Critical reflection” and “Study limitations” which mentions some of the limitations this research found in terms of data collection.

At the end, the references are mentioned in alphabetic order, according to APA6th edition, together with a declaration of originality.

In the appendix of this work, the charts and graphs of the investigated companies are shown, which is where the data was collected from. These are print screens from the websites GetDayTrends and Tradingview. Please note that the graphs from GetDayTrends are not up to scale and serve merely an illustrative purpose of when, more or less, the term went trending. The Y axis of these graphs does not represent the exact position the term hit in the trending lists. This applies for all graphs taken from GetDayTrends.

2. THEORETICAL FRAMEWORK

The efficient markets model argues that in an efficient market, market prices completely reflect the information available (Fama, 1970). Yet, the behavioural finance branch, on the other hand, argues that prices are influenced by investors' emotions and prejudices, like the media is suggesting (Chousa, González & Pico, 2017). Whichever model we consider, the main objective is to try to find a way that justifies the movement of the market, to try to predict its movement more accurately. Many investigators have tried to successfully predict the market and develop different models. But how many researchers consider the recent and rising importance of social networks? And are all investors keen on taking their information from platforms like Twitter?

2.1. An introduction to investors activity on social media

Social networks are indispensable communication tools today. Never in history has any generation had access to as much information and as quickly as this generation today. However, considering the different modern concepts of “fake news" and "influencers", what will be the value that can be attributed to this available information? Is it possible to have access to quality primary information that can influence the market, and if so, are companies already aware of this powerful new tool?

Bartov *et al*. (2018, p.26) for example, identified that in 2013 some false information about two companies, Audience, Inc (ADNC) and Sarepta Therapeutics, Inc (SRPT) that circulated on Twitter, plunged their stock prices by 28 and 16 percent respectively. The authors related this event since “(…) Twitter is an unregulated platform with potentially anonymous users (…)” (p. 26). However, this does not directly mean that Twitter isn’t a reliable information source.

Chousa *et al*. (2017) investigated the existence of a relationship between social networks and the stock market, analysing investor activity through the specified social network, StockTwits.com, as well as influence on the Chicago Board Options Exchange Market Volatility Index (VIX), using a logit model and a fuzzy-set qualitative comparative analysis (fsQCA). The logit model demonstrated that the feelings of the networks influence the stock market, while the fsQCA demonstrates that the investor profile is important to consider in the explanation. Thus, they found that the retention period combined with experience, in technical investors, helps to avoid an increase in market risk, while for non-technical

investors, the sentiment and experience message form the combination that contributes to avoid an increase in risk. Technical investors are investors that use a technical analysis to analyse the market; yet non-technical investors prefer other methods such as fundamental analysis, global macroanalysis or momentum analysis, for example. (Chousa *et al*., 2017). According to Chousa *et al*. (2017, p.101) StockTwits "(...) is a social network, similar to Twitter, where users share messages about stocks, indices, and financial markets". As we know, social media platforms are nowadays widely available for everyone, which makes it attractive for especially non-technical investors to gather information from these sources. (Chousa *et al*., 2017). In this study, the researchers found that technical investors have more experience compared to non-technical investors. It also seems that a nontechnical analysis leads to an overall more pessimistic opinion from the investors. Also, the holding period of nontechnical investors seems to be higher. Regarding the number of followers, the nontechnical investors have more followers in general. Nevertheless, a higher deviation in this group of investors can be observed too, which means that even though the average number of followers is higher compared to technical investors, some present a much lower number of followers, when technical investors present a more homogenous number of followers. The study also shows that for technical investors, only monthly dummies are significant for the explanation of the qualitative variation of VIX. Users' experience, message sentiment, holding period, and the number of followers does not seem relevant for this group of investors. As for nontechnical investors, message sentiment seems to positively influence this group. The conclusion of this study states that regarding the logit results, technical investors do not really take the other variables into consideration, except for the monthly dummy. As for nontechnical investors, message sentiment seems to be an important factor. Yet, regarding the fsQCA results, technical investors value experience and holding period to avoid a raise in market risk, while nontechnical investors value experience and sentiment, even when the environment is strongly pessimistic. In general, this means that social media influences the decisions the investors make, leading to a variation of market risk (Chousa *et al*., 2017).

Even though, this study does not focus directly on Twitter, it gives an idea on how social media can affect the stock market by influencing investors decisions. As stated in this study, it is important to know that there are different types of investors. StockTwits, as mentioned before, is a professional platform, specifically designed for investors to share their opinions about certain stocks. Twitter, on the other hand, is just a normal general microblogging

platform where people can talk about many different topics, which will probably mean that technical investors will not be so interested in these kinds of platforms to gather information, considering that it is probably not highly efficient. However, Bartov *et al.* (2018) did use the conventional Twitter to test the theory if Twitter would be able to help to predict firm-level company earnings and stock returns, considering the wisdom of crowd theory filtering the tweets by *cashtags*.

2.1.1. Wisdom of the crowds

The Wisdom of Crowds, mentioned in Bartov *et al.* (2018) was a theory originally developed by James Surowiecki in 2004. According to this theory the many are often smarter than the few in predictions, even comparing to single experts, considering the median of the crowd's guesses, compared to all individual guesses. Surowiecki (2004) showed several cases in which it seems like the crowd has a more accurate prediction comparing to single individuals or experts. Nevertheless, is this a valid theory or just a matter of probabilities and maths?

According to Hong and Page (2004, p.16386) in Bartov *et al.* (2018, p.28) "(…) a diverse group of intelligent decision makers reaches reliably better decisions then a less diverse group of individuals with superior skills (…)" concluding that under certain circumstances "diversity trumps ability". In this case it doesn't seem like it's a matter of simple maths and probabilities, but more of a 'two know more than one' case, even comparing to one with superior skills. In this case, the more diverse the group, the better. Nobre and Fontanari (2020) mention that there doesn't exist a relation between the diversity of the group and the accuracy of the estimate, comparing one diverse and one more homogenous group with each other when predicting the number of candies in a jar and the length of a paper strip. However, in defence of Hong and Page (2004), these decisions are quite simple and do not require much analysis in which different perspectives might be useful for the case. Like mentioned before, the case of Nobre and Fontanari (2020) seems to be rather mathematical and a matter of probabilities, being it easier for the median of the crowd to guess the number of candies in the jar, comparing to individual guesses. Yet, for more complicated decisions, it might be useful to have a diverse group of people with different backgrounds who will all take in consideration their personal experiences and will be less likely to get biased by the results.

Mannes, Larrick and Soll (2012) discuss yet another phenomenon which might be confused by the Wisdom of Crowds, which is called the Asch situation, in which people might change their opinion to match theirs with the crowd. According to McLeod (2018), Dr. Solomon

Asch (1956), who based his experiment on Sherif's conformity experiment of autokinetic effect (1935), conducted an experiment with a clear answer where individuals had to tell whether the size of straw X was like the size of straw A, B or C. Within this experiment, Dr. Asch asked a group of stooges to give all the same wrong answer, without the innocent participant knowing, to see if he would conform and give the same wrong answer, even though knowing very clearly it is wrong. His findings were that about 32% of innocent participants conformed with the incorrect answer during all the critical trials, and 75% conformed at least once. About 25% never conformed. In the control group, where only real participants were competing, less than 1% gave the wrong answer. After confronting the participants at the end, some mentioned that they knew the answer was wrong, but they didn't want to be ridiculed by the group. Other mentioned that they really thought the wrong answer was the correct answer. Asch divided these people in individuals who were normative influenced (wanting to fit in) and individuals who are informationally influenced (the group must be better informed then they, themselves are) (McLeod, 2018). Even though, Dr. Aschs' study may be criticized because of the limited sample group (all men, students of same age group), it is true that 'peer pressure' and herd behaviour must be taken into consideration when analysing cases in terms of Wisdom of Crowds.

2.1.2. Cashtags

Like mentioned before, studies like done by Chousa *et al*. (2017), but also Bartov *et al.* (2018), use *cashtags*, the so-called cash-hashtags, to identify tweets about the stock market. Twitter (2021) describes *cashtags* as "(…) a company ticker symbol preceded by the U.S. dollar sign, e.g., $TWTR. When you click on a *cashtag*, you'll see other Tweets mentioning that same ticker symbol." According to Roof (2016), the *cashtag* was originally invented by Stocktwits in 2009 by being the first platform to put a ticker symbol ($) in front of a company name of stock symbol to make it clear they were talking about a specific company or stock. However, it seems like it wasn't until 2012 that this symbol gained its new official name '*cashtag'*, when being introduced by Twitter (Kim, 2012). *Cashtags* make it easier to communicate about certain stocks on social media platforms like Twitter, to make clear you are specifically talking about the stock and not about other aspects of the company. However, this may also mean that if investors only consider the information that is shared by identifying certain *cashtags*, that they may be missing out on information that doesn't use the *cashtag*. On the other side, it may be a good first filter.

2.2. Can social media influence or predict the stock market?

'Can social media influence the stock market, and if so, how?' That is the question many investigators are asking themselves and tried to prove with different studies, like ones mentioned before. Recently, this question has been particularly important as our nº1 Twitter market influencer Elon Musk is being investigated for potentially manipulating the cryptocurrency market by having strong opinions about certain currencies, which he, without a filter, shares on his personal Twitter account. The biggest question that arose is, is this considered market manipulation or is he just sharing his honest opinion? Does this man have a secret agenda or is he just clumsy in his words and doesn't think before sharing something on Twitter? (Parker, 2021).

Together with Musk, other individuals and companies are currently being investigated for sharing certain information on Twitter. An example is FOX Business journalist Charles Gasparino, who is being accused by different nonofficial market analysers on YouTube for influencing the market in the favour of trading companies Robinhood and Citadel. Almost immediately after Charles' Tweet, Robinhood's stock prices, HOOD, increased around 6,25%. (Kohrs, 2021)

Bartov *et al.* (2018) investigated if aggregate opinion can predict earnings surprises and announcement returns. They also researched the role of the environment, considering two environments: one of strong information and one of weak information. They concluded that "(…) the aggregate Twitter opinion helps predict quarterly earnings after controlling for other determinants of earnings, including aggregate opinion from traditional media sources". They also concluded "(…) that the aggregate Twitter opinion predicts abnormal returns around earnings announcements". (Bartov *et al.,* 2018, p.50)

However, this study shows some limitations. As mentioned before, the Asch situation is not considered into this experiment, stating the possibility that some people might base their prediction on others, rather than on their personal knowledge. Oliveira, Cortez, and Areal (2016) investigated the impact of microblogging data for stock market prediction by analysing the sentiment of Twitter users while twittering about a certain company, as well as the posting volume. There are several studies done in this field, however, Oliveira *et al.,* (2016) mentions that many of these studies lack in accuracy and that this specific study takes in consideration a, at the time, recent and very large Twitter dataset from 2012 to 2015, including like this about 31 million tweets. They also explained that they used a lexicon

specifically adjusted to financial microblogging data and that this was the first paper using these specific lexicons. Also, a Kalman Filter (KF) procedure was used to eliminate statistical noise. This way, the daily sentiment indicator obtained from a Twitter indicator was compared to four other sentiment indicators obtained from a survey (Oliveira *et al.,* 2016, p.30). In their sentiment analysis, Oliveira *et al.* (2016) filtered the tweets by being either positive, negative, or neutral about a certain stock. The goal was to evaluate if these sentiments could predict or affect the stock market, either positively or negatively, according to the sentiment transmitted by the majority. The researchers predicted daily returns trading volume and volatility of different indices such as Standard & Poor's 500 (S&P500), Russell 2000 (RSL), Dow Jones Industrial Average (DJIA) and Nasdaq 100 (NDQ). They found that "(…) microblogging sentiment and attention indicators were particularly useful for the prediction of returns of S&P500 index, portfolios of lower market capitalization (…)" and some other sectors. However, the application seems to be less convincing for the forecasting of trading volume and volatility (Oliveira *et al.,* 2016, p.32).

However, according to Lopez, Batyrshin and Gelbukh (2018), Oliveira *et al.* (2016) 's result is since the sentiment analysis was done at company level and not at market level, which may present different results, referring "from the evidence in the literature it seems that sentiment analysis is more useful at global market level than at the company stocks level" (Lopez *et al.*, 2018, p. 3339). Lopez *et al.* (2018) investigated the relationship between tweet content and stock market prices. They tested the relation between stock related tweets and financial indicators like prices, returns and transaction volume. Then they analysed the tweet content to see if they would be able to distinguish those by automatic classifiers during different stock trends.

2.3. Corporate communication strategies – sharing (financial) information on Twitter

Finally, is it important to analyse how companies currently face social media and how they decide to communicate and who they turn their communication to. Is Twitter considered a valid medium of communication for companies to communicate with their stakeholders? Or is Twitter just considered to be a social platform, not relevant for businesses? Mamic and Almarez (2013) researched how larger corporations engage with stakeholders through Twitter and concluded that "(…) corporations are not effectively employing the full interactivity potential this site offers to build mutually beneficial relationships with stakeholders," (Mamic & Almarez, 2013, p. 851). It can be argued that this article seems to be relatively dated, as social media and internet communication has seen a huge grow this last decade. A more recent study from Yue, Thelen, Robinson and Men (2019), researched how CEOs communicate on Twitter, comparing Fortune 200 companies to rising start-ups. Yet the findings are comparable to the research of Mamic and Almaraz (2013, p.532), concluding that "(…) neither Fortune 200 CEOs nor top start-up CEOs fully utilized dialogic principles for Twitter communication." Nevertheless, it seems like that specially the last couple of months the importance of social media has been increasing for some companies, as since the pandemic the number of retail investors has been growing, as well as the amount they are investing. According to Fitzgerald (2021), trading company Charles Schwap recently declared that 15% of all retail investors began their investing activities in 2020, even calling this investor wave the "Generation Investor". Currently, some major changes are happening within the stock market as retail investors decided to gather and to invest against the corporate and professional investors which were until recently leading the market. (Shah, 2021). This all happened on social media platforms like Twitter and Reddit.

It can also be seen that companies are getting notice of this new wave of investors, like one of these days most talked about companies, together with Gamestop, AMC. According to Terrett and Gasparino (2021), the CEO of AMC is turning to Twitter to build a relationship with the retail investors. As reported in the article, Adam Aron, the current CEO of AMC Theatres follows and interacts with the companies' smaller investors on Twitter to get to know them better, as now about 70% of outstanding shares are owned by retail investors. With the current raging war between the retail investors and the hedge funds, it is predictable that more companies will start to follow this trend and being owned by a bigger percentage of retail investors, opposed to the larger institutional investment companies. This new

phenomenon where retail investors are massively investing in plunging stocks, increasing the stock price by convincing each other on social media to invest in a certain company is called the 'meme-stock phenomenon'. This phenomenon has started in January 2021 when a group of individual retail investors gathered on Reddit and decided to fight back to the bigger institutional hedge funds, which buy shorts on the companies, gaining money when the stock prices of that company go down (Dailey, 2021). This phenomenon is possibly one of the reasons many companies this last year are investing more in social media (Drenik, 2021) and why many are planning to continue investing in the upcoming years (Portada, 2021). Fox (2021) states that according to a survey executed by CNBC, social media is currently the most popular source of investment ideas for young investors. The article states that "thirty-five percent of 18-to-34-year-olds said they use social media to look into possible investments (…)", which, Fox (2021) explains, can be a rather tricky investment strategy as the agenda of these called 'Finfluencers' might not be pure. Fox (2021) mentions that anyone on social media can start giving financial advice without really knowing what they are talking about, or even worse, leading people to make certain investment choices on purpose to influence the market in their favour. This is one more reason why companies should be very aware of what is going on on social media and where people are currently talking about. This way, they can prevent that misinformation is being shared about their company and that stock prices are being manipulated. The main goal of this research is to investigate whether going Trending on Twitter, might influence the stock market for that certain company.

3. MODEL OF ANALYSIS AND OPERATIONALIZATION OF VARIABLES

So how can going trending on Twitter potentially predict or influence the stock market or vice-versa and how might this study be complementary to for example Oliveira's *et al.* (2016) sentiment analysis? Like mentioned before, Twitter's algorithm is a rather complex formula and very hard to understand. Nowadays, Twitter is looking to provide more information about why a certain topic is trending on Twitter, but sometimes it is very difficult to find the real source. Why are people talking about this now? This might even blow up a certain theme even further as people start to tweet topics like: 'why is #X trending on Twitter?' Sometimes there just doesn't exist any logical explanation as to why people start suddenly talk about a certain topic, blowing it up, and making it a trending topic on Twitter. Even though, this might not be the rule, being that most trending topics are trending for a known reason, it might be curious to investigate if going trending on Twitter has any effect on the stock market and if this would be a viable way to know if a certain stock is about to blow up.

On the other hand, it might be curious to investigate this theme for another reason which is the fact that people can be discussing a certain company for other reasons then their stock prices. In the previously mentioned research, these topics were mostly not covered, as cashtags were used to filter the tweets. However, if a certain celebrity is talking about a certain brand, like Cristiano Ronaldo ditched Coca-Cola on the 14 of June 2021 at the UEFA European Championship on live television, it is more likely that the topic will go trending first on Twitter, before investors even have the chance to analyse in detail what might be going on and to Tweet about the possible effect it is going to have on the stock market, using cashtags. Even because at the moment it happened, nobody knew it was going to be such a big deal, while after a couple of days, this incident caused Coca-Cola a 4-billion-dollar loss (Sweney, 2021; Quiroz-Gutierrez, 2021). This means that potentially, investors might be missing out on very recent information. On the other hand, this might give non-technical investors which might be more likely to collect their information from sources as Twitter, the advantage and opportunity to invest or disinvest in a certain stock.

According to different sources and as mentioned before, more and more people are getting interested in investing their money. Nova (2021) for example, mentions that since the pandemic, as people are bored and looking for entertainment, many have turned to the stock

market to look for a new hobby in day trading. CBS News (2021) mentioned that many first-time investors are entering the market. According to CBS News, about 35% of all investors at Charles Schwab, an international investment company, are under 40 years old, which is almost double the rate of two years earlier. Besides, the more recent accounts, of less than one year old, are trading more than the older accounts of 10 year and more (CBS, 2021). CBS (2021) recognizes though that social media plays an important role in this development, mentioning "social media has only amplified the trend, as traders talk on Reddit, Twitter and elsewhere about what stocks to buy. They've been helping to push up the stock market broadly (…)". However, is it that big of a deal like the big media suggests? Do individual investors really manipulate the market, or did it just happen once or twice and is it broadly generalised?

3.1. Hypothesis formation

To test whether going trending on Twitter might have an effect on the market prices of the corporate shares, two hypotheses have been formed based on the previous literature.

3.1.1. H1 – Daily stock prices present a peak or drop when the company goes trending on Twitter

One of the most important and instant indicators of the stock market are the daily stock prices. The daily stock prices are the price of a share of stock that is available on the stock market. The stock prices are influenced by the supply and the demand of the market, which means that is the demand goes up, the prices increase. Yet, if the demand decreases, the stock prices go down with it. (Harper, 2021)

One of the hypotheses that this investigation would like to take to the test is if going trending on Twitter, may or may not demonstrate a correlation on the stock prices. The possibility lays in the prospect that if people are talking more about a certain company than usual (going trending), the demand to buy stocks of that certain company may increase or decrease within a short time frame. This analysis is not based on predicting whether the stock prices go up or down, rather than analysing if there might exist a noticeable variation whatsoever, which might be linked to going trending. This, because the possibility that there might exist an opposite effect on going trending should not be ruled out. This means that if many people are talking about a certain company, the demand may possibly increase, even though people are talking in a negative way about the company. This may also occur the other way around.

The main goal of this analysis is not predicting if the stock price goes up or down, but if the fact that a company goes trending, may or not influence the stock price in either way at all, or if going trending on Twitter does not have effect in any way for the company's performance on the stock market.

Oliveira et al. (2016) decided to analyse the daily returns, which is the difference between the opening and the closing price of a certain stock. However, for this investigation it was decided that the daily returns would not be relevant as these as individual values and do not say anything about the further context. Thus, it was decided to look at the trading graph of each company as a whole and identify peaks and drops on a visual basis.

3.1.2. H2 – Daily trading volume presents a peak when the company goes trending on Twitter

Another very important and instant indicator is the trading volume of a certain company stock. Abbondante (2010, p.287) defines the trading volume as the number of shares traded each day. This indicator is mainly important to identify trading trends, as when suddenly, the trading volume increases, this indicates that the stock is moving and either a rise or a decrease are happening. The trading volume by itself does not indicate whether that market is growing, so it is important to keep analysing the stock prices. (Nickolas, 2021)

For this specific analysis, the trading volume might be relevant as the trading trend might follow the Twitter trend, meaning that if a company goes trending on Twitter, the trading volume increases. In this case, it is not important whether the stock price is going up or down. Also, many other investigators like Oliveira et al. (2016) used the trading volume as a relevant indicator for their research.

Table 3.1 and Figure 3.1 show an overview of the three variables: Going trending on Twitter; Presenting a price peak or a price drop in daily stock prices and presenting a peak in the trading volume. Going trending on Twitter was identified as being the independent variable as going trending on Twitter could be the cause of fluctuations on the stock market. This way, presenting a price peak or drop in daily stock prices; for presenting a trading volume peak would be the dependent variables as the goal of this investigation is to evaluate if Twitter could possibly influence the Stock market. Table 3.1 also explains a little more in depth what the variables mean and how they will be analysed. The goal is to identify whether there seems to exist a correlation between the independent and dependent variables which

means that both, the independent and the dependent variables move in coordination with one another.

Table 3.1 - Model of analysis

Variables	Definition and Indicators	References
Going trending on Twitter	Day and hour a company from the sample went trending on Twitter	GetDayTrends; ExportData; Tradingview
Presenting a peak or drop in daily stock prices	Presenting a match of a stock market trend shift (either growing or descending) on the day and hour a company went trending on Twitter.	Oliveira *et al.* (2016); GetDayTrends; ExportData; Tradingview
	Presenting a noticeable daily price peak or drop on the days that a company went trending on Twitter.	
Presenting a peak in trading volume	Presenting a noticeable trading volume peak on the days that a company went trending on Twitter.	

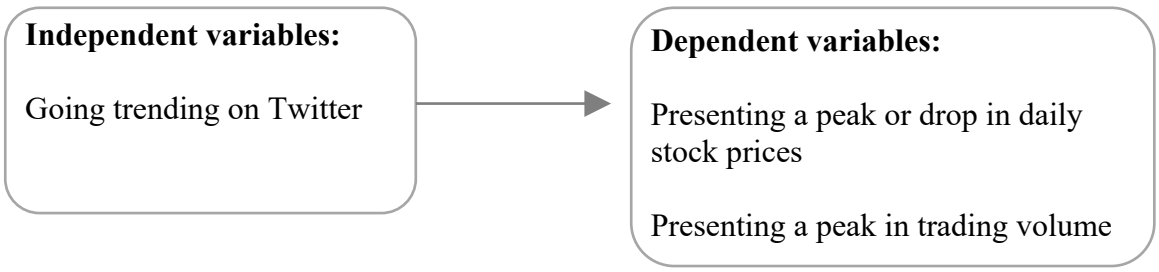


Figure 3.1 – Model of analysis: Identification of Independent and dependent variables

3.2. Comparing to Google searches

At the end, it was decided to compare both hypothesis to the Google search volume too, to know if these companies only went trending on Twitter or if they also went 'trending' on Google. Some companies will for sure go 'trending' on both platforms, even if the main source of information came from Twitter, because people will use Google to check why a certain topic is currently Trending on Twitter. However, this might not be the case with all trending companies. This 'control' mainly serves to filter if a company has already been talked about on other platforms, then Twitter, and after that started gaining popularity on Twitter, so the company turned trending. This can be checked by comparing the timelines of these events. It was decided to compare to the Google search engine as this is the world's most popular search engine with an almost 88% search market share in June 2021 according to Statista (2021).

3.3. Research problem

So why might it be pertinent to investigate whether going trending on Twitter seems to influence the stock market or not? As already mentioned in the introduction chapter, companies might want to adapt their social media strategy, accordingly, deciding to invest more or less into Twitter. Not only for their own company this might be relevant information, but it might also be a useful tool for competitor analysis. Companies might follow their biggest competitors closely; however, it might be difficult to always get track of the newest information, especially when this information is rather unexpected and a company suddenly gains popularity because a certain influencer is talking about it for example, or when a company goes trending without anyone really knowing why, which can also happen.

If this theory seems to be true, when a company sees that suddenly a competitor goes trending on Twitter, it knows that that companies' stock prices can respond and the company can act accordingly, adapting its own strategy, for example. It also works the other way around, meaning that if a company sees that their stock is peaking or dropping, they can push their social media account to gain visibility and brand awareness.

4. METHOD AND PROCEDURES

The methodological approach of the case study was followed because the intention of the present investigation was to understand the phenomenon in question. The top 25 companies of the S&P 500 index were constituted as an empirical field, that is, the case study of the present analysis. Thus, given the nature of the problem, this work is part of exploratory and descriptive studies. Considering the advantages of this methodological scenario, like having a more holistic approach (Yin, 2009 p.4). Case studies can be very versatile and will depend more on the researcher and the sample the researcher chooses, as well as the variables the researcher chooses to address (Yin, 2009).

Regarding the role of theory in the research process, the work is markedly hypothetical-deductive, based on a theoretical analysis model; that is, from the review of pre-existing literature. This option guided the collection and analysis of data. Regarding the nature and analysis of the data, which are markedly quantitative, quantitative analysis techniques were applied, namely a correlation analysis where instants a certain company went trending on Twitter, were visually compared to their stock market daily price graph to notice if during that instant any special event was noticeable, just like a price peak or drop or a trading volume peak.

To analyse these two previously mentioned hypotheses, a selection of companies was made to analyse. It was chosen to follow the case study model and to analyse the top 25 companies of the S&P 500 index, using economic research to compose the results. According to Robert Yin (2009, p. 2), the case study research is the preferred method when "(…) the focus is on contemporary phenomenon within a real-life context (…)", which is the case. According to Bennett (2004, p.19) some of the comparative advantages of a case study methods are identifying new or omitted variables and hypotheses, and developing historical explanations of cases, among others. Eckstein (1975) as cited in Bennett (2004, p.20) defines the case study as a "phenomenon for which we report and interpret only a single measure or any pertinent variable." However, Bennett mentions that this might not be the right definition as this may imply that each case only has one dependent variable and many independent variables.

Regarding to the sample choice, according to Reiff from Investopedia, one of the most known sources of financial information, (2021) “the S&P 500 is one of the most widely quoted stock market indexes because it represents the largest publicly traded companies in the U.S. The S&P 500 focuses on the U.S. market's large-cap sector.” According to SP Global (2021)

> The S&P 500 is recognized worldwide as one of the premier benchmarks for the U.S. stock market’s performance. The S&P 500 does not simply contain the 500 largest stocks; rather, it covers leading companies from leading industries. The S&P 500 represents a broad cross-section of the U.S. equity market, including common stocks traded on U.S. exchanges.

To be included in this index, the company must respond to many strict criteria. One of the most important criteria is market capitalization. This is the reason why mainly the big multinationals can be seen in this index. According to Reiff (2021) the current market cap a company must have, is 11,8 billion American dollars to be included in the S&P 500. Also, the company must be American and present a public float of at least 10% of its shares outstanding, besides some other criteria. According to Slickcharts on the 19th of September 2021, the top 25 by weight, were the following companies, shown in Table 4.1.

Table 4.1 shows us which are the 25 largest companies by weight included in the S&P 500 on the 19th of September 2021. During the research the order of these companies might change, but this table will be used as reference.

Tabel 4.1 – Top 25 of S&P 500 by weight

#	Company	Symbol	Weight	Price	Chg	% Chg
1	Apple Inc.	AAPL	6.160825	145.75	-0.31	(-0.21%)
2	Microsoft Corporation	MSFT	6.067927	299.69	-0.18	(-0.06%)
3	Amazon.com Inc.	AMZN	3.9471	3,456.50	-6.02	(-0.17%)
4	Facebook Inc. Class A	FB	2.359494	363.05	-1.67	(-0.46%)
5	Alphabet Inc. Class A	GOOGL	2.280477	2,812.00	-4.00	(-0.14%)
6	Alphabet Inc. Class C	GOOG	2.17008	2,825.99	-3.28	(-0.12%)
7	Tesla Inc	TSLA	1.540134	759.35	-0.14	(-0.02%)
8	NVIDIA Corporation	NVDA	1.463281	218.50	-0.50	(-0.23%)
9	Berkshire Hathaway Inc. Class B	BRK.B	1.388581	276.76	0.00	(0.00%)
10	JPMorgan Chase & Co.	JPM	1.263418	157.68	0.00	(0.00%)
11	Johnson & Johnson	JNJ	1.148641	164.75	0.00	(0.00%)
12	UnitedHealth Group Incorporated	UNH	1.03851	419.90	-0.26	(-0.06%)
13	Visa Inc. Class A	V	1.001812	221.75	0.00	(0.00%)
14	Home Depot Inc.	HD	0.944219	334.01	-1.66	(-0.49%)

#	Company	Symbol	Weight	Price	Chg	% Chg
15	Procter & Gamble Company	PG	0.931428	144.34	0.00	(0.00%)
16	Walt Disney Company	DIS	0.879435	183.47	0.00	(0.00%)
17	PayPal Holdings Inc	PYPL	0.877588	275.15	-1.19	(-0.43%)
18	Adobe Inc.	ADBE	0.839192	654.30	-0.18	(-0.03%)
19	Bank of America Corp	BAC	0.805295	40.50	0.00	(0.00%)
20	Mastercard Incorporated Class A	MA	0.799643	342.90	-0.14	(-0.04%)
21	Comcast Corporation Class A	CMCSA	0.693322	57.00	-0.11	(-0.19%)
22	Netflix Inc.	NFLX	0.686578	588.00	-1.35	(-0.23%)
23	salesforce.com inc.	CRM	0.66373	260.53	0.00	(0.00%)
24	Pfizer Inc.	PFE	0.657176	43.89	0.00	(0.00%)
25	Cisco Systems Inc.	CSCO	0.637874	56.70	-0.15	(-0.26%)

Source: https://www.slickcharts.com/sp500

4.1. Collection of the data

To check the historical data of companies that have gone worldwide trending in the previous 12 months, the website GetDayTrends was used, as this is one of the few currently free of charge existing websites to show this data. However, this website has some limitations, as the keywords must be precise. For example, 'Apple Inc' does not show any results. Yet 'Apple' by itself shows results, as well as variations like: Apples, Appleby, Apple M1, Apple ID any many others. However, the most inclusive terminology that seems to talk about the company and not any other topic with the same word but different meanings (for example, Apple the company vs. the fruit), will be considered. The time range of September 2020 until September 2022 was considered for this investigation.

A rather unpractical limitation of GetDayTrends is that the graphs they provide are not as precise as would be needed for this purpose. According to Robertson, Geva and Wolff (2007) the market can react in a 90 minute or less timeframe to news. This means that it will be needed that the data indicates the exact date and if possible, even the hour of which a certain topic went trending on Twitter. To check on which exact day and time a certain topic went trending on Twitter, the website called ExportData.io was used. ExportData collects the whole history of all topics that ever went trending on Twitter by date and time. Unfortunately, this website does not have the option to search for certain terms, to look directly into the history for the companies. They do have their data sorted by date and time which made it possible, by analysing the graphs from GetDayTrends and guessing more in less in which time frame a certain topic went trending on Twitter, to search for that time frame and look for the term. However, this is extremely time consuming as it was not certain

on which day the company went trending, and each day presents 24 time slots with each slot containing a list of 50 trending topics to check. Nevertheless, considering the limited resources available, this looked like the only option to get the relevant and most accurate data. To compare the days a company went trending to the stock prices and trading volume, the website Tradingview.com was used, for presenting a large range of analysing tools. Once again, the time range of September 2020 until September 2021 was considered for this study.

To verify if there has been a significant variation in the stock prices and/or the trading volume, the trading graphs were observed, not only of that specific day, but also as a whole to see if the days the company went trending were considerable in the trending graph. This may mean that the day a company went trending on Twitter was at the beginning or the end of a periodical rise, or at the beginning or the end of a periodical drop. It might also mean that the trading volume is considerably higher or lower than normal or that there is a big day difference between opening and closing price for example. These are all variations that might indicate that there seems to exist a correlation between going trending on Twitter and stock market events.

4.2. Comparison and analysis of the data

As previously mentioned, as a control, it was decided to also compare the stock data to the Google searches during the trending peaks. If the stock market seems to be influenced by Twitter, the google searches should ideally remain the same for that time. Nevertheless, this control is not 100% waterproof, as people can choose to look up a certain company after they see it trending on Twitter, boosting the Google searches regardless. The goal of this study whatsoever is to check if going trending on Twitter may present any effect on the stock market, and the best way to compare if it is genuine is to compare it also to the Google searches.

5. DESCRIPTION OF THE DATA

During the month of September 2021, the financial data from the top 25 companies of the S&P 500 were collected, using different websites to obtain this data. The trending graphs were collected from Getdaytrends.com. As previously mentioned, it was decided to check data Worldwide and for the USA only, as these companies are all American companies, so more known in the USA then elsewhere. For some companies only graphs for the USA were obtained, like previously expected. For some companies there was no trending history at all, meaning that that company never went trending, as for example the UnitedHealth Group.

At Getdaytrends.com the website already fills in the name of the trend in the searchbar according to the trending history and data they have available. This made it easier to look for variations as for example 'Johnson & Johnson' only appeared as 'Johnson and Johnson' in the search results. Another peculiar case was from Procter & Gamble, where in fact the company listed in the search results has a typo and states 'Proctor and Gamble'. The result was looked up to check if it had any other meaning, but the search engine kept showing results for procter & gamble, so it was assumed that it was a universal typo and thus the trending information was considered valid for the research. Also, companies including inc, co, corp, company etc. were shortened and their street names were used, as for example Walt Disney was just Disney and Cisco Systems just Cisco. In October of 2021 the website GetDayTrends was checked again after it was found that the term Johnson & Johnson did went trending a couple of times last year. This time, the website did show a graph, for the USA and worldwide, which means that in September there was a slight glitch for that specific company. All the other companies were checked, but no other variations were noticed.

5.1. Invalid Data

As previously mentioned, some of the 25 companies did not have any trending history, meaning that they never went trending Worldwide or in the USA before. These companies are invalid for the study, as the aim is to compare the trending history to the stock history during the same period. As so, the following companies were invalid for the study: Facebook, UnitedHealth Group and Netflix. As mentioned before, it is difficult to determine why a certain term didn't go trending yet, especially in the case of Facebook and Netflix it can be considered almost with certainty that many people are talking about these topics on social media. However, the reason why these companies didn't go trending yet must be

because the tweet volume is always reasonably high for these companies, not showing any significant enough positive flows to be considered trending. Another possibility is that people rather talk about related terminology but not that much about the company itself. In the case of Netflix, they might be talking about the shows, for example. In the case of UnitedHealth, it is probably because not many people mention the company at all.

5.2. Selection of the data

The tables 5.1 and 5.2 are an overview of the dates the companies went trending Worldwide and their opening prices and trading volume of that day. As can be seen, some companies only went trending once or didn't go trending at all worldwide, while others went trending 5 or 6 times. Companies that did not go trending were not considered in these tables. Some companies went trending during the weekend when the stock market was closed. In these cases, the immediate data available before the trending date was considered.

The Tables 5.3, 5.4 and 5.5 are an overview of the dates the companies went trending in the USA and their opening prices and trading volume of that day. As can be seen, in general the companies went trending more times in the USA and some companies like bank of America only went trending in the USA and not Worldwide. The main reason might be because these are all USA based companies, besides the filtering out of all the other countries' trending options, when looking only into the USA data. As the company of Google is not commonly known as Alphabet, it was decided to also include a search for the term 'Google' and obtained the following results that can be seen in Figure 5.1 and 5.2 for Worldwide and the USA respectively. Also, the company of Berkshire Hathaway was untraceable on GetDayTrends.com, so it was decided to look up a shorter version of the company, like Berkshire. For worldwide, there were no results found. Yet for the USA a trending peak was found, and it was decided to include it in the analysis as can be seen in Figure 5.2. However, it was decided to not include these companies like this in the general overview. First, because Alphabet does have a trending peak in the USA, and because the term Berkshire can also refer to the region of Berkshire in England.

In the case of Google, the stock market data is retrieved from the GOOGL Nasdaq stock, which are the Class-A shares which are held by regular investors, with one vote per share. The Class-B shares of Alphabet do not appear in the S&P500 because they are mainly owned by the founders, Sergey Brin, and Larry Page. Yet, the class-C shares are mainly held by employees.

Trending Peaks Worldwide compared to the stock opening price and the day's trading volume												
Company	Date & Time (UTC) Trending Peak #1	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #2	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #3	Highest rank	opening stock price	trading volume (M)
Google (GOOGL)	14/12/2020 13:00	1	1770,72	1,652	09/01/2021 06:00	26	1777,16	1,774	22/06/2021 07:00	1	2529,00	1,049

Figure 5.1 - Trending Peaks Worldwide compared to the stock opening price and the day's trading volume for Google

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

Trending Peaks in the USA compared to the stock opening price and the day's trading volume												
Company	Date & Time (UTC) Trending Peak #1	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #2	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #3	Highest rank	opening stock price	trading volume (M)
Google (GOOGL)	20/10/2020 16:00	8	1523,11	2,086	14/12/2020 13:00	2	1770,72	1,652	09/01/2021 11:00	15	2435,00	1,120
Berkshire (BRK.B)	27/02/2021 15:00	48	370220	1,863								

Figure 5.2 - Trending Peaks in the USA compared to the stock opening price and the day's trading volume for Google and Birkshire

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

Table 5.1 – Trending Peaks Worldwide compared to the stock's opening price and day's trading volume

Trending Peaks Worldwide compared to the stock opening price and the day's trading volume												
Company	Date & Time (UTC) Trending Peak #1	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #2	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #3	Highest rank	opening stock price	trading volume (M)
Apple Inc.	13/10/2020 23:00	8	125,27	262,330	09/01/2021 02:00	2	132,49*	105,158	28/02/2021 18:00	8	122,59	164,560
Microsoft Corporation	22/01/2021 20:00	29	227,08	30,173	23/03/2021 08:00	10	237,49	31,638	04/05/2021 00:00	21	250,97	32,756
Amazon.com Inc.	15/04/2021 07:00	9	3371,00	3,234								
Facebook Inc. Class A												
Alphabet Inc. Class A												
Alphabet Inc. Class C												
Tesla Inc	17/11/2020 00:00	31	460,17	61,188	07/01/2021 22:00	20	777,63	51,499	08/02/2021 14:00	7	869,67	20,162
NVIDIA Corporation	01/09/2020 18:00	2	134,80	51,247	28/10/2020 18:00	9	131,98	37,625	13/04/2021 04:00	43	152,32	67,621
Berkshire Hathaway Inc. Class B												
JPMorgan Chase & Co.												
Johnson & Johnson	29/01/2021 15:00	13	164,26	22,506	24/02/2021 15:00	13	162,40	10,286	13/04/2021 16:00	2	156,86	18,424
UnitedHealth Group Incorporated												
Visa Inc. Class A	29/03/2021 11:00	39	212,45	7,792	11/05/2021 09:00	46	223,74	7,633	23/08/2021 12:00	43	232,70	6,342
Home Depot Inc.	22/04/2021 19:00	9	326,20	4,875								
Procter & Gamble Company												
Walt Disney Company	18/11/2020 02:00	2	144,50	9,456	11/12/2020 05:00	1	169,68	87,411	23/04/2021 23:00	25	182,35	6,079
PayPal Holdings Inc	21/10/2020 15:00	14	208,30	17,247	07/05/2021 07:00	46	255,92	10,170				
Adobe Inc.	13/04/2021 04:00	29	506,85	2,196								
Bank of America Corp												
Mastercard Incorporated Class A												
Comcast Corporation Class A	24/11/2020 17:00	22	50,00	31,754								
Netflix Inc.												
salesforce.com inc.	02/12/2020 00:00	22	225,48	52,226	12/05/2021 01:00	27	213,34	5,482	15/06/2021 05:00	23	245,21	5,135
Pfizer Inc.	09/11/2020 19:00	1	39,68	230,353	02/12/2020 10:00	7	40,47	84,347	13/05/2021 18:00	12	39,50	25,424
Cisco Systems Inc.												
* the trending peak was during the weekend so the immediate day before was considered												

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

Table 5.2 – Chronological continuation of table 5.1

Company	Date & Time (UTC) Trending Peak #4	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #5	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #6	Highest rank	opening stock price	trading volume (M)
Apple Inc.	21/04/2021 00:00	36	132,36	68,847	07/06/2021 19:00	4	126,17	71,058				
Microsoft Corporation	13/06/2021 19:00	15	257,99	19,000	24/06/2021 20:00	24	266,16	21,447				
Amazon.com Inc.												
Facebook Inc. Class A												
Alphabet Inc. Class A												
Alphabet Inc. Class C												
Tesla Inc	24/03/2021 08:00	35	667,91	33,795	27/04/2021 01:00	47	717,96	29,437	13/05/2021 06:00	16	601,54	44,185
NVIDIA Corporation												
Berkshire Hathaway Inc. Class B												
JPMorgan Chase & Co.												
Johnson & Johnson	12/07/2021 22:00	46	169,73	7,840								
UnitedHealth Group Incorporated												
Visa Inc. Class A												
Home Depot Inc.												
Procter & Gamble Company												
Walt Disney Company	30/07/2021 22:00	43	177,53	6,813								
PayPal Holdings Inc												
Adobe Inc.												
Bank of America Corp												
Mastercard Incorporated Class A												
Comcast Corporation Class A												
Netflix Inc.												
salesforce.com inc.												
Pfizer Inc.	11/08/2021 00:00	16	47,78	50,878	23/08/2021 20:00	9	50,29	88,652				
Cisco Systems Inc.												

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

Table 5.3 – Trending Peaks in the USA compared to the stock's opening price and day's trading volume

Trending Peaks in the USA compared to the stock opening price and the day's trading volume

Company	Date & Time (UTC) Trending Peak #1	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #2	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #3	Highest rank	opening stock price	trading volume (M)
Apple Inc.	13/10/2020 23:00	4	125,27	262,330	30/10/2020 07:00	4	111,06	190,573	09/01/2021 01:00	2	132,49*	105,158
Microsoft Corporation	21/09/2020 20:00	2	197,19	39,84	10/11/2020 11:00	21	214,50	44,045	22/01/2021 19:00	14	227,08	30,173
Amazon.com Inc.	02/02/2021 23:00	3	3380,00	7,099	25/03/2021 14:00	7	3072,99	3,563	26/05/2021 17:00	6	3274,59	2,384
Facebook Inc. Class A												
Alphabet Inc. Class A	04/01/2021 15:00	22	1760,00	1,866								
Alphabet Inc. Class C												
Tesla Inc	23/09/2020 01:00	30	405,16	95,074	17/11/2020 00:00	10	460,17	61,188	07/01/2021 22:00	22	777,63	51,499
NVIDIA Corporation	01/09/2020 19:00	6	134,80	51,247	28/10/2020 17:00	19	131,98	37,652	18/11/2020 06:00	36	134,65	51,093
Berkshire Hathaway Inc. Class B												
JPMorgan Chase & Co.	11/01/2021 13:00	35	134,58	15,949	07/04/2021 13:00	18	153,10	16,904				
Johnson & Johnson	29/01/2021 14:00	6	164,26	22,506	24/02/2021 15:00	2	162,40	10,286	01/04/2021 00:00	47	162,60	7,230
UnitedHealth Group Incorporated												
Visa Inc. Class A	14/12/2020 21:00	46	207,85	11,968	29/03/2021 13:00	7	212,45	7,792	05/06/2021 11:00	43	229,35*	5,086
Home Depot Inc.	13/01/2021 18:00	34	278,31	3,921	22/04/2021 16:00	2	326,20	4,875				
Procter & Gamble Company												
Walt Disney Company	29/09/2020 23:00	10	125,92	7,433	11/12/2020 02:00	1	169,68	87,411	11/02/2021 17:00	9	189,18	17,508
PayPal Holdings Inc	21/10/2020 14:00	7	208,30	17,247	30/03/2021 13:00	13	236,88	6,242	07/05/2021 01:00	14	255,92	10,170
Adobe Inc.	13/04/2021 04:00	6	506,85	2,196								
Bank of America Corp	30/12/2020 14:00	47	30,00	26,37								
Mastercard Incorporated Class A	10/12/2020 23:00	44	334,65	3,507	11/02/2021 13:00	40	345,50	5,111	19/08/2021 21:00	49	356,90	2,728
Comcast Corporation Class A	24/11/2020 17:00	8	50,00	31,754	12/01/2021 14:00	32	51,29	20,999				
Netflix Inc.												
salesforce.com inc.	01/12/2020 23:00	8	245,00	19,349	04/01/2021 17:00	28	222,64	10,320	11/05/2021 23:00	14	209,00	6,098
Pfizer Inc.	16/10/2020 15:00	17	35,14	43,031	09/11/2020 18:00	1	39,68	230,353	02/12/2020 19:00	46	40,47	84,347
Cisco Systems Inc.	10/03/2021 02:00	43	48,47	19,842	09/06/2021 01:00	39	54,18	14,861				

* the trending peak was during the weekend so the immediate day before was considered

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

Table 5.4 – Chronological continuation of table 5.3

Company	Date & Time (UTC) Trending Peak #4	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #5	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #6	Highest rank	opening stock price	trading volume (M)
Apple Inc.	28/02/2021 21:00	5	122,59	164,560	07/06/2021 19:00	2	126,17	71,058				
Microsoft Corporation	09/03/2021 18:00	47	232,88	33,081	23/03/2021 07:00	6	266,16	21,447	03/05/2021 23:00	7	254,40	19,627
Amazon.com Inc.	20/07/2021 17:00	6	3567,32	3,256								
Facebook Inc. Class A												
Alphabet Inc. Class A												
Alphabet Inc. Class C												
Tesla Inc	23/01/2021 18:00	15	834,31	20,066	08/02/2021 15:00	4	869,67	20,162	24/03/2021 11:00	20	667,91	33,795
NVIDIA Corporation	12/01/2021 18:00	38	137,53	29,148	01/06/2021 09:00	22	162,70	47,280				
Berkshire Hathaway Inc. Class B												
JPMorgan Chase & Co.												
Johnson & Johnson	13/04/2021 12:00	1	156,86	18,424	23/04/2021 22:00	22	164,53	6,033	26/06/2021 16:00	13	162,94*	10,964
UnitedHealth Group Incorporated												
Visa Inc. Class A	23/08/2021 12:00	8	232,70*	6,342								
Home Depot Inc.												
Procter & Gamble Company												
Walt Disney Company	23/04/2021 17:00	3	182,35	6,079	29/07/2021 22:00	12	179,81	6,209				
PayPal Holdings Inc	26/07/2021 19:00	44	309,66	3,806								
Adobe Inc.												
Bank of America Corp												
Mastercard Incorporated Class A												
Comcast Corporation Class A												
Netflix Inc.												
salesforce.com inc.	12/09/2021 12:00	48	261,00	5,281								
Pfizer Inc.	12/03/2021 17:00	44	34,56	16,342	13/04/2021 18:00	11	37,41	33,967	04/07/2021 20:00	16	39,46*	16,596
Cisco Systems Inc.												

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

Table 5.5 – Chronological continuation of tables 5.3 and 5.4

Company	Date & Time (UTC) Trending Peak #7	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #8	Highest rank	opening stock price	trading volume (M)	Date & Time (UTC) Trending Peak #9	Highest rank	opening stock price	trading volume (M)
Apple Inc.												
Microsoft Corporation	13/06/2021 19:00	12	257,99	19,000	24/06/2021 19:00	26	266,16	21,447				
Amazon.com Inc.												
Facebook Inc. Class A												
Alphabet Inc. Class A												
Alphabet Inc. Class C												
Tesla Inc	13/05/2021 00:00	3	601,54	44,185	20/08/2021 14:00	30	682,85	14,842				
NVIDIA Corporation												
Berkshire Hathaway Inc. Class B												
JPMorgan Chase & Co.												
Johnson & Johnson	12/07/2021 21:00	19	169,73	7,840	25/08/2021 14:00	27	175,69	5,700				
UnitedHealth Group Incorporated												
Visa Inc. Class A												
Home Depot Inc.												
Procter & Gamble Company												
Walt Disney Company												
PayPal Holdings Inc												
Adobe Inc.												
Bank of America Corp												
Mastercard Incorporated Class A												
Comcast Corporation Class A												
Netflix Inc.												
salesforce.com inc.												
Pfizer Inc.	10/08/2021 23:00	1	46,20	81,189	23/08/2021 15:00	1	50,29	88,652	20/09/2021 18:00	1	43,39	41,873
Cisco Systems Inc.												

Source: https://getdaytrends.com/, https://www.tradingview.com/ and https://www.exportdata.io/

As described in the methodology, the date & time of the trending peaks refer to the peaks that can be found in the graphs of GetDayTrends, like can be seen for example in Figure 5.3.

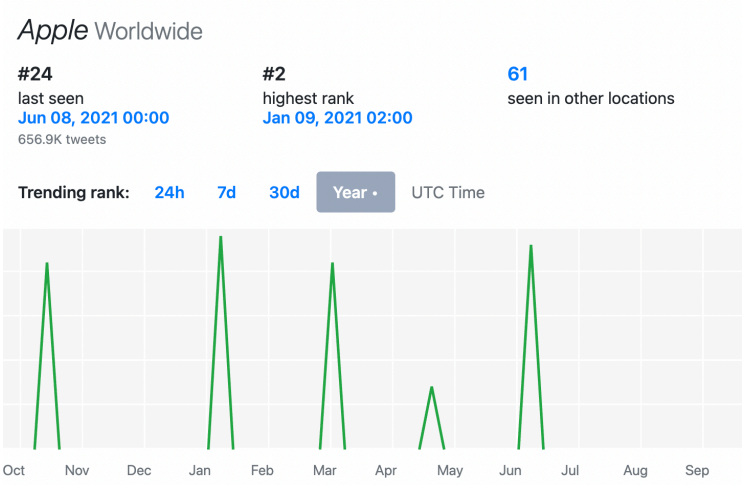


Figure 5.3 - Graph indicating when "Apple" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

Note. Figure 5.3 shows when the term "Apple" went trending on Twitter from 09/2020 until 09/2021. This image was taken from Getdaytrens, is not up to scale, and is merely illustrative.

Figure 5.3 shows that Apple went trending 5 times Worldwide in the period between 09/2020 and 09/2021. These 5 peaks were noted in Table 5.1 and 5.2, together with the highest rank they reached during their trend, being able to rank from 50 to 1, being 50 the least popular term and 1 the most popular term. Even though the ranking of the terms were not taken into consideration within this study, it was considered it to be important to note, to justify eventual discrepancies in the data from the graphs, like can be seen for example at Figure 5.1, where the term Apple was last seen on the 8th of June at 00:00, but where in the graph the date considered is the 7th of June at 19:00, as this being the peak of the event.

Sometimes slight variations may exist between the time and ranking mentioned on the figures of GetDayTrends and the data considered in the graph. This is since the data from the graph was developed with the use of ExportData, which might use a slightly different algorithm to collect their data from Twitter. The differences were not considered to be significant for this research. The other information containing in the tables is the respective opening price of the stock at the day the term went trending and the trading volume of that day. These values should not be considered individually but should be compared to the stock charts, as for example this chart in Figure 5.4 from Apple.

Figure 5.4 - Stock chart "AAPL" Nasdaq from 09/2020 until 09/2021 presenting the stock price and the trading volume by date.

Source: https://www.tradingview.com/

Note. The green "E" on the bottom of the figure stands for "Earnings & Revenue". The blue "D" stands for "Dividends". The exact values of the trading volume can be observed at www.tradingview.com.

As can be seen in Figure 5.5. on the first peak of Apple Worldwide, the chart reached a peak in the opening price, going downhill afterwards. It can also be seen that on that date the trading volume was one of the highest of the whole period considered, which means that many people were buying and selling their Apple stocks that day.

Figure 5.5 – Highlight of Figure 5.2 showing Apple's Stock performance on the 13/10/2020

Source: https://www.tradingview.com/

To have some sort of comparison, it was decided to compare these stats to the google search result for that specific company, on the days the company went trending. Figure 5.6 are the google search results for the term “Apple” from 09/2020 until 09/2021. This search result is all inclusive, even though Google does offer the filter to only search for the Apple company search results. However, as this filter is not available on the Twitter trends, it makes more sense to compare to the full results and to not only filter out the company results.

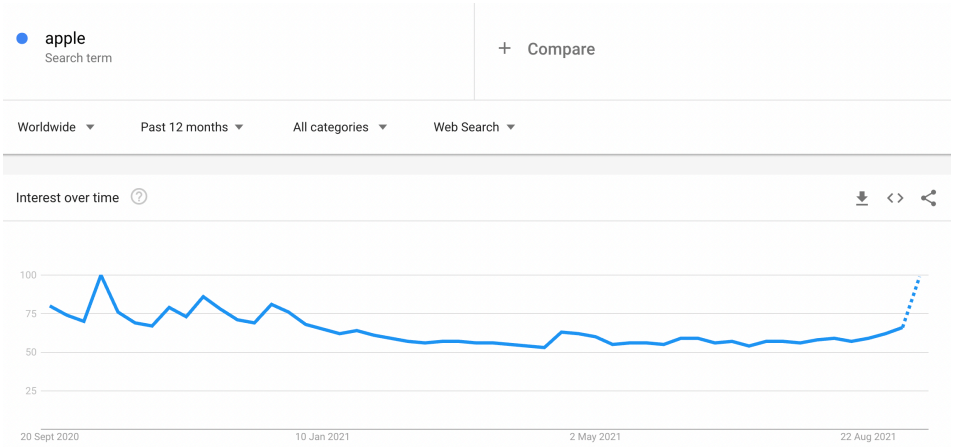


Figure 5.6 - Graph showing the interest in searching for the term “Apple” on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

6. ANALYSIS AND DISCUSSION OF DATA: EMPIRICAL STUDY

With the different data that was collected, an overview was made which can be seen in Table 6.1, of the trending peaks and if these match the highlights on the stock market or not, in price and in trading volume. In the overview the peaks were registered by number just like in the tables 5.1 until 5.5 and each one was compared to the interest over time of the google search results. Highlights in the stock market can either be positive or negative highlights. During this study, there was not made a distinction between both. In this case the overview will say 'Yes' on the question if the peak appears to match a highlight in the stock market. The overview will say "yes" when either one of the following situations appears:

- The stock price presents a peak on that day or until 2 days of difference (either before or after)

Figure 6.1 - Stock chart "DIS" NYSE from 09/2020 until 09/2021 and price peak at 11/12/2020

Source: https://www.tradingview.com/

As can be seen in Figure 6.1, there is a sudden price peak at the same date as that the company Disney went trending on Twitter. There is also a peak at the trading volume, so in this case it can be said with certainty that there seems to be a match of the trending date peak and the highlight on the stock market, so this would be a solid 'yes'.

- The stock price presents a drop on that day or until 2 days of difference (either before or after)

- The trading volume presents a peak on that day or until 1 day of difference (either before or after)

Figure 6.2 - Stock chart "CRM" NYSE from 09/2020 until 09/2021 and presents a volume peak and price drop at 02/12/2020.

Source: https://www.tradingview.com/

As can observed in Figure 6.2, the stock price on the 02/12/2020 presented a sudden drop on the same day the company went trending on Twitter. Besides that, a very clear volume peak can also be seen, so again, this is a very solid 'yes'. However, in some cases the peaks might not be as clear. In these cases, it is harder to evaluate if there is a clear peak or drop and if the trending peak matches a highlight on the stock market. It might also be clear that the trending peak does not match any special highlight in the stock market. In that case the overview will present a 'No'. This happens when there are no peaks or lows on that specific day and/or until 2 days of difference, or either when it is hard to tell. Also, the trading volume appears to be in its 'normal' range, with little difference from the surrounding days.

Figure 6.3 - Stock chart "NVDA" NASDAQ from 09/2020 until 09/2021 and presents no volume peak and no special price peak or drop at 28/10/2020

Source: https://www.tradingview.com/

As can be seen in Figure 6.3, even though the trending peak date does take part of a stock declination, there is no abnormal activity on that specific day and/or the 2 surrounding days so for this research this trending peak was not considered to match a stock highlight. In the last case, the overview might present a 'Maybe' on the question if the peak appears to match a highlight of the market when results are not clear. This might happen when there is a situation of turbulence, with many peaks and lows, or when there appears to be a big difference in the opening and closing price, for example. Any other seemingly odd situations are also considered to be 'Maybe's.

Figure 6.4 - Stock chart "AMZN" NASDAQ from 09/2020 until 09/2021 and presents no clear price peak or drop at 15/04/2021

Source: https://www.tradingview.com/

As can be seen in Figure 6.4, on the 15th of April 2021, even though there was a peak on the 12th - 13th it is unclear to see whether the date is considerable because of the surrounding price fluctuations. In the date itself there seemed to be no apparent rise or drop, nor a volume peak so it was decided to consider this event a 'maybe'. For the Google comparison the same logic was used.

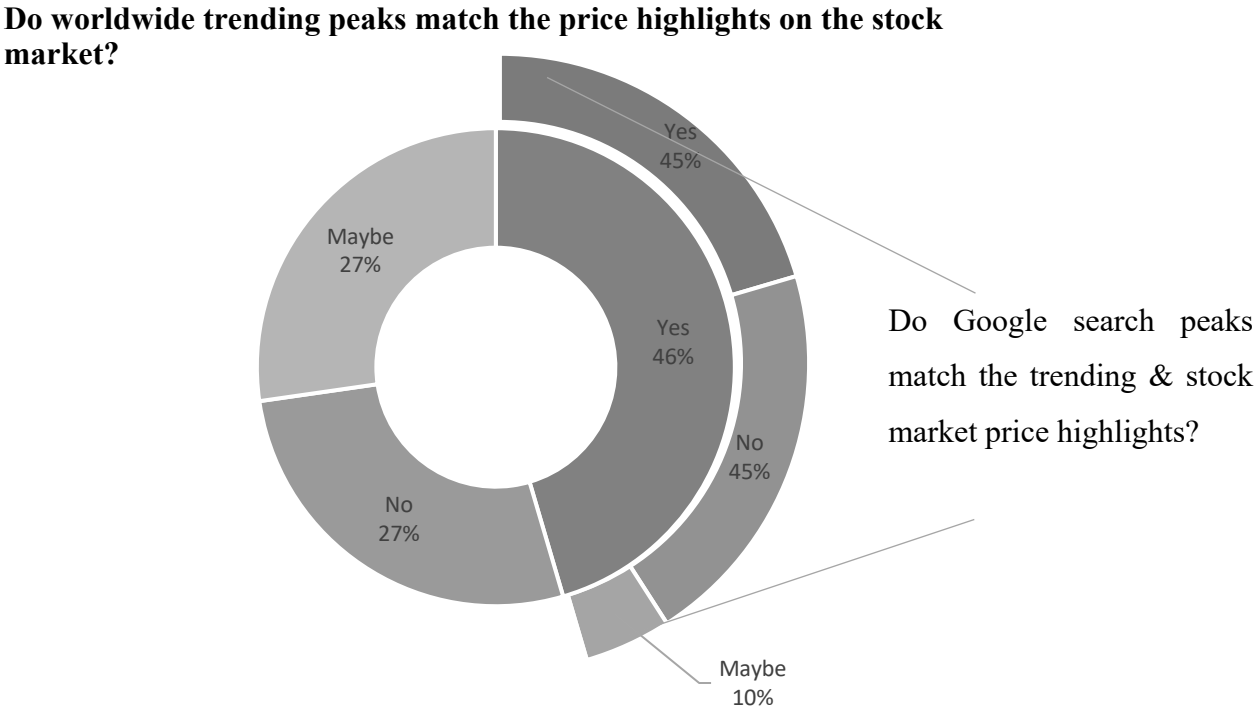
As can be seen in Chart 6.1, which is a visual summary of the relationship between the price highlights and the respective google search highlights shown in Table 6.1, most of the trending peaks Worldwide on Twitter match price highlights on the stock market (46%). In about 27% of the cases, it is unsure to say whether there is a clear match and in 27% of the cases there doesn't seem be a match. Within the 46% of cases where there does seem be a match, it can be seen that in about 45% of the cases, there is also a peak in the Google search results. In about 45% there is no peak in the search results and in about 10% it is hard to say if there is a peak in the search results or not.

Table 6.1 – Overview of whether Worldwide Trending peaks match highlights on the stock market and on Google

Does the date of Peak N Worldwide match a highlight on the stock market; Does the date of Peak N match a peak in the Worldwide Google search results?																		
Company	Peak #1			Peak #2			Peak #3			Peak #4			Peak #5			Peak #6		
	Stock price	Volume	Google	Stock price	Volume	Google	Stock price	Volume	Google	Stock price	Volume	Google	Stock price	Volume	Google	Stock price	Volume	Google
Apple Inc.	Yes	Yes	Yes	Maybe	Yes	No	Maybe	Maybe	No	No	No	Yes	Yes	No	Yes			
Microsoft Corporation	No	No	No	Maybe	No	No	No	No	No	No	No	No	No	No	No			
Amazon.com Inc.	Maybe	No	No															
Facebook Inc. Class A																		
Alphabet Inc. Class A																		
Alphabet Inc. Class C																		
Tesla Inc	Yes	No	Maybe	Yes	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes	Maybe	Yes
NVIDIA Corporation	Yes	No	Yes	No	No	No	Yes	Yes	No									
Berkshire Hathaway Inc. Class B																		
JPMorgan Chase & Co.																		
Johnson & Johnson	Yes	Yes	Maybe	Maybe	No	No	Yes	Yes	Yes	Maybe	Yes	Maybe						
UnitedHealth Group Incorporated																		
Visa Inc. Class A	Maybe	No	No	Yes	No	No	Maybe	No	No									
Home Depot Inc.	Yes	No	No															
Procter & Gamble Company																		
Walt Disney Company	Maybe	No	Yes	Yes	Yes	No	No	No	No	No	No	No						
PayPal Holdings Inc	Yes	Yes	No	Yes	Yes	No												
Adobe Inc.	Maybe	No	no															
Bank of America Corp																		
Mastercard Incorporated Class A																		
Comcast Corporation Class A	Yes	Yes	No															
Netflix Inc.																		
salesforce.com inc.	Yes	Yes	Yes	Yes	No	Yes	Maybe	No	No									
Pfizer Inc.	Yes	Yes	Yes	Maybe	No	No	No	No	Maybe	Maybe	Maybe	No	Yes	Yes	Yes			
Cisco Systems Inc.																		

Source: https://www.tradingview.com/, https://getdaytrends.com/, https://trends.google.com/, https://www.exportdata.io/

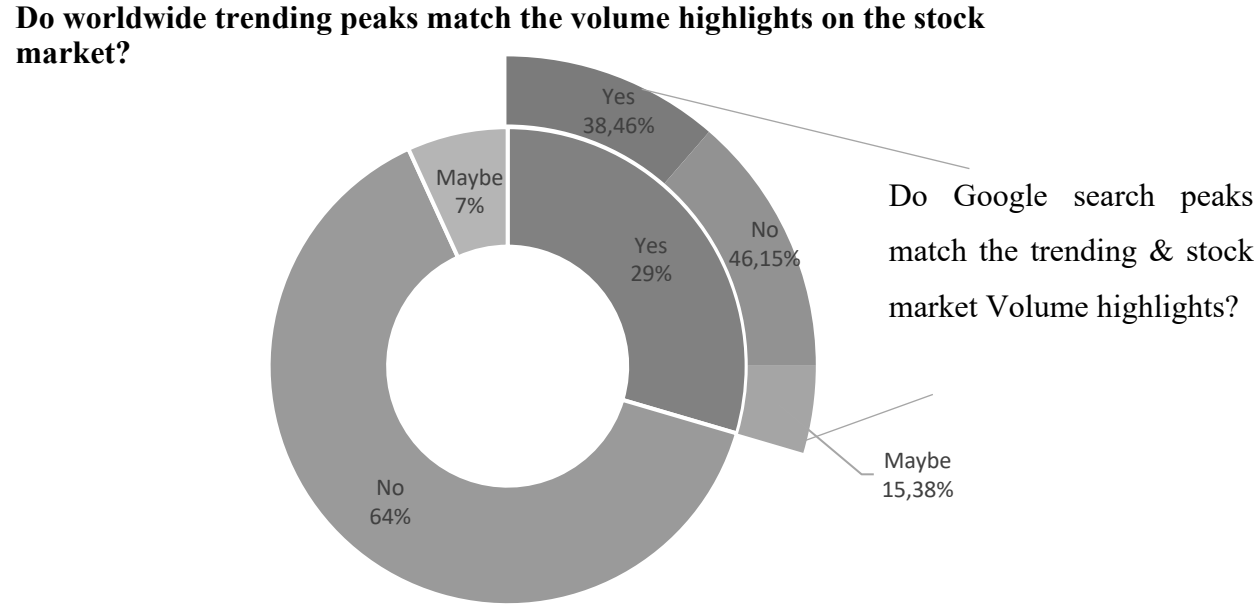
Chart 6.1 – Doughnut chart showing the percentage of Trending peaks Worldwide which match price highlights on the stock market and the peaks on the Google searches



Source: https://www.tradingview.com/, https://getdaytrends.com/, https://trends.google.com/, https://www.exportdata.io/

As can be seen in Chart 6.2, which is a visual summary of the relationship between the volume highlights and the respective google search highlights shown in Table 6.1 most trending peaks did not correspond to a significant increase in volume (64%). In only 29% of the cases the tending peaks did match an increase in volume, and in 7% it was not clear, normally because there was a slight increase, but it was unclear if it was significant enough to be considered. Yet, in the cases where there seemed to be a match, in about 39% there was also a match in the google peaks. However, in 46% this did is not the case, and in 15% it was unclear.

Chart 6.2 – Doughnut chart showing the percentage of trending peaks Worldwide which match Volume highlights on the stock market and the peaks on the Google searches



Source: https://www.tradingview.com/, https://getdaytrends.com/, https://trends.google.com/, https://www.exportdata.io/

In Chart 6.3, which is a visual summery of the relationship between the price highlights and the respective google search highlights shown in Table 6.2, it can be seen that just like Worldwide, also in the USA, most of the trending peaks match the price highlights on the stock market, with 38 yeses to a total of 78 peaks, which correspondents to 41%. What can also be seen in Table 6.2 is that there are many more peaks in the USA then Worldwide, having a total of 78, compared to 44. Like mentioned before, this might be because these companies are all American companies. In Chart 6.2 it can be seen that in this case 50% of the times the trending peaks match the stock market highlights, they do not match Google

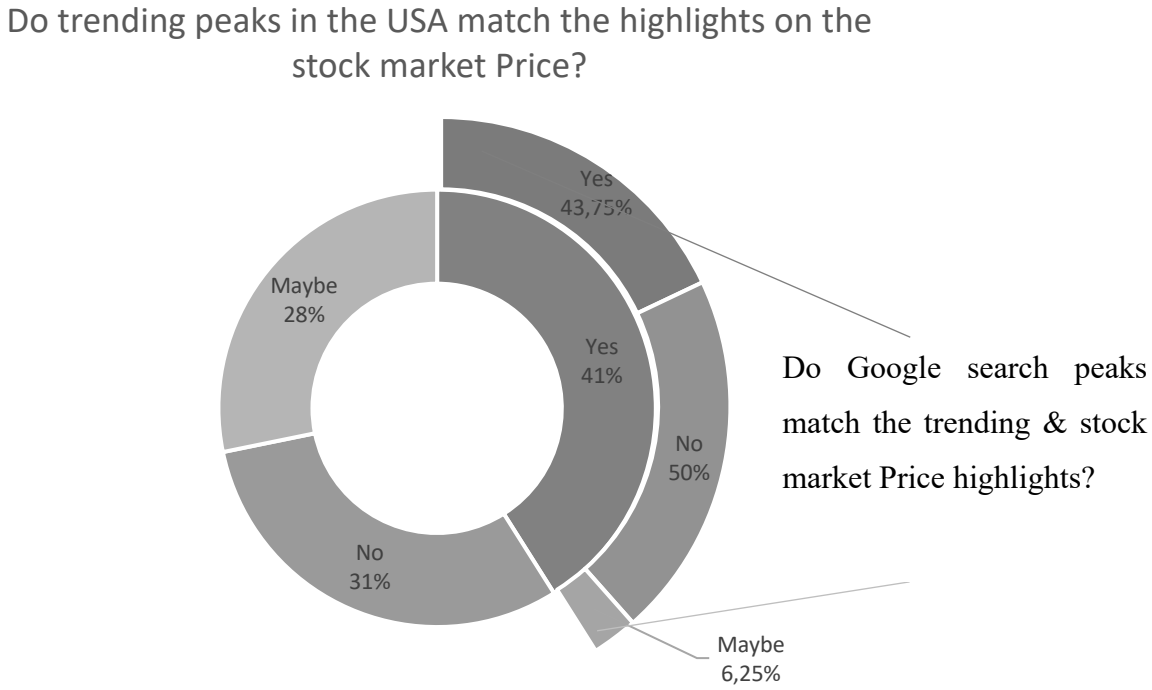
search peaks in the USA. In 43,75% of the cases they do match the Google search peaks and in 6,25% of the cases it is unclear.

Table 6.2 – Overview of whether trending peaks in the USA match highlights on the stock market and on Google

Does the date of Peak N for the USA match a highlight on the stock market; Does the date of Peak N match a peak in the USA Google search results?																												
Company	Peak #1			Peak #2			Peak #3			Peak #4			Peak #5			Peak #6			Peak #7			Peak #8			Peak #9		
	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google	Stock Price	Volume	Google
Apple Inc.	Yes	Yes	Yes	Yes	Yes	No	Maybe	No	No	Yes	Maybe	No	Yes	No	No												
Microsoft Corporation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No			
Amazon.com Inc.	Yes	Yes	No	Yes	No	No	Maybe	No	No	Yes	No	No															
Facebook Inc. Class A																											
Alphabet Inc. Class A	No	Yes	No																								
Alphabet Inc. Class C																											
Tesla Inc	Maybe	No	Yes	Yes	Yes	No	Yes	No	Yes	No	No	No	Yes	No	No	Maybe	No	No	Yes	Maybe	Yes	Yes	No	Maybe			
NVIDIA Corporation	Yes	Yes	Yes	No	No	Yes	No	Maybe	No	No	Maybe	Maybe	Maybe	No	Yes												
Berkshire Hathaway Inc. Class B																											
JPMorgan Chase & Co.	Yes	No	No	No	Maybe	No																					
Johnson & Johnson	Yes	Yes	Yes	Maybe	Maybe	No	Maybe	No	Maybe	Yes	Yes	Yes	Maybe	No	No	Maybe	Yes	No	Yes	Yes	Yes	Maybe	No	No			
UnitedHealth Group Incorporated																											
Visa Inc. Class A	No	Maybe	No	Maybe	No	No	No	No	No	No	No	No															
Home Depot Inc.	No	No	No	Maybe	Maybe	No																					
Procter & Gamble Company																											
Walt Disney Company	No	No	No	Yes	Yes	Maybe	Yes	Yes	No	No	No	No	Maybe	No	No												
PayPal Holdings Inc	Yes	Yes	No	Yes	No	No	Yes	Yes	No	Yes	Maybe	No															
Adobe Inc.	Maybe	No	No																								
Bank of America Corp	Maybe	No	Yes																								
Mastercard Incorporated Class A	Maybe	No	No	Maybe	Yes	No	No	No	Maybe																		
Comcast Corporation Class A	Yes	Yes	No	Maybe	No	No																					
Netflix Inc.																											
salesforce.com inc.	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Maybe	No	Maybe															
Pfizer Inc.	No	Yes	No	Yes	Yes	Yes	Maybe	Maybe	No	No	No	No	Maybe	Maybe	Yes	No	No	No	Yes	yes	No	Yes	Yes	Yes	No	Yes	Maybe
Cisco Systems Inc.	No	No	No	Maybe	Maybe	No																					

Source: https://www.tradingview.com/, https://getdaytrends.com/, https://trends.google.com/, https://www.exportdata.io/

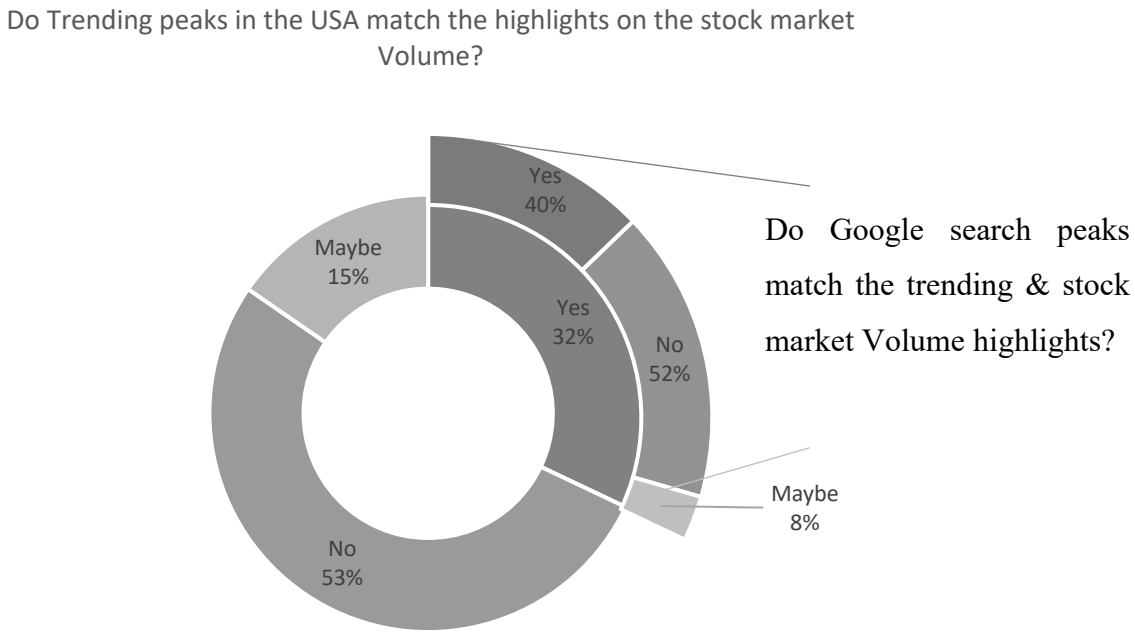
Chart 6.3 – Doughnut chart showing the percentage of trending peaks in the USA which match highlights on the stock market Price and the peaks on the Google searches



Source: https://www.tradingview.com/, https://getdaytrends.com/, https://trends.google.com/, https://www.exportdata.io/

As can be observed in Chart 6.4, just like worldwide, also in the USA most trending peaks do not match volume peaks. Also, most cases where they do match, there does not exist a peak within the Google searches. A curiosity that can be seen in this overview is that there are more values in which it is not sure whether there was a match or not compared to the Worldwide overview. Possibly because the range was bigger, thus fluctuations were more difficult to identify. Another possible explanation is, is that there does exist a match, however the volume peak is too small to be a solid yes.

Chart 6.4 – Doughnut chart showing the percentage of trending peaks in the USA which match highlights on the stock market Volume and the peaks on the Google searches



Source: https://www.tradingview.com/, https://getdaytrends.com/, https://trends.google.com/, https://www.exportdata.io/

6.1. Results and discussion

6.1.1. H1 – Daily stock prices present a peak or drop when the company goes trending on Twitter

As can be observed in Charts 6.1 and 6.3, in 46% worldwide and 41% for the USA, there seems to be a correlation between the times a certain company went trending on Twitter and an abnormal price peak or drop. This means that this hypothesis seems to be confirmed, although the results are not very convincing. With these results it is not possible to say with certainty that there is a clear correlation between going trending on Twitter and demonstrating alterations in the daily stock prices, possibly because of the influence of social media. It is still possible to observe that in about 27% worldwide and 31% for the USA there does not exist a correlation between going trending on Twitter and demonstrating a price peak or drop.

These results are not a complete surprise as Oliveira *et al.* (2016) also encountered that by developing a Twitter sentiment analysis. The researchers found that it was difficult to

determine whether the sentiment was influencing the market volatility, which is directly linked to the daily stock prices. Nevertheless, this investigation differs from the research of Oliveira *et al.* by not considering the context of the tweets but looking purely at the trend. A possible explanation for these results can be the sample that was used. For this investigation it was decided to use the top 25 of S&P500 companies as those companies are some of the most known companies, which increased the probability of them having been trending somewhere during the last 12 months, and thus would give the data that would be necessary to complete this investigation. However, it could be possible that the result for less stable and smaller companies would be completely different.

6.1.2. H2 – Daily trading volume presents a peak when the company goes trending on Twitter

As can be observed in Charts 6.2 and 6.4, there does not exist any correlation between going trending on Twitter and a peak in the trading volume of the company that went trending. Worldwide, in 64% of the cases there does not exist a correlation, comparing to the 29% of the times these events do match up. Yet for the USA the results are a little less intense, but even though 53% of the times there does not be a correlation between a company going trending on Twitter and an increase in the trading volume, comparing to 32% of the times where the correlation does be present. Just as like with H1, these results could be expected, based on the investigation of Oliveira *et al.* (2016). Nevertheless, these results are peculiar, as there exist a more evident correlation between the daily stock prices and going trending as there seems to exist for the trading volume. This is peculiar because like Nickloas (2021) mentioned, the trading volume indicates a possible new trend at the stock market. It would be expected that there would be a more evident correlation between trends on social media and on the stock market, but the opposite seems to be true for these 25 companies.

6.2. Does there exist a correlation between going trending on Twitter and certain stock market events?

Even though both scenarios, worldwide and in the USA only, present that trending peaks do match highlighted events on the stock market sometimes, such as price peaks or drops or an abnormal increase in trading volume, the results are not convincing, meaning that for the 25-company analysis, in about 41% - 46% of the cases it was possible to identify a match in trending peaks and price related stock highlights; and in about 32% - 29% of the cases this same relation was found for trading volume highlights, worldwide and in the USA. Table

6.3 gives an overview of the two hypothesis and whether they were confirmed or rejected. In the case of the first hypothesis, as in 41% and 46% of the cases there seemed to exist a match between trending peaks on Twitter and price related stock highlights, the hypothesis was confirmed, as it is possible to observe a significant higher number of matches comparing to the non-matching events. Also, Oliveira *et al.* (2016, p.32) mentioned that "(…) microblogging sentiment and attention indicators were particularly useful for the prediction of returns of S&P500 index (…)". Although the indicators that were observed were not really the overall S&P500 returns, price trends were considered, which are strongly related.

Yet, for the second hypothesis for the same reason, the proposition was rejected, as in most identified cases there did not exist a match between going trending on Twitter and presenting a trading volume peak. Also, Oliveira *et al.* (2016, p.32) referred that "(…) the application of microblogging features was less convincing for the forecasting of trading volume and volatility (…)". As mentioned before, the investigation of Oliveira *et al.* does not align completely with this present research as they developed a sentiment analysis and posting volume analysis, but similar results could be expected as especially the posting volume is highly linked to the possibility of going trending on Twitter.

However, to have a better idea of the existence of a possible correlation between going trending on Twitter and stock market highlights, a bigger sample of companies should be used. Possibly, these results can be different for companies with less financial stability, for example start-ups, like Oliveira *et al.* (2016, p.32) also mentioned in their investigation.

Second of all, in both scenarios, more or less half of the time trending peaks and stock market highlights matched, so did the Google search results. Even though this does not mean the data is not valid, it could possibly mean that the stock market highlight was caused by an external event, not related to social media, which was hyped on Twitter afterwards. Nevertheless, the Twitter hyping could also push the market even further.

So, what can these results mean? What does it mean if a company goes trending on Twitter? It means that possibly a highlight on the stock market is happening at the same time or within a close timeframe, so it might be relevant to keep notifications open, for certain companies that might be relevant for the organization. On the other hand, it might mean that if something important is happening on the stock market, that the company might go trending within a short time spawn. In that case it is important for the company to analyse with which term they would like to go trending and try to push the hype towards that term. Would it be

the company name? Would it be a related product or even person? Once the company knows something big might happen in terms of the market, it might decide to adapt its social media strategy accordingly, to optimise results.

Table 6.3 – Overview of hypotheses: confirmed or rejected

Hypothesis	Status (confirmed/ not confirmed)	Empirical evidence vs theoretical evidence
H1	**Confirmed**	**Empirical evidence**: in 41% and 46% of the cases a match between trending peaks on Twitter and price related stock highlight were identified **Theoretical evidence**: "(…) microblogging (…) indicators were particularly useful for the prediction of returns of S&P500 index (…)" Oliveira *et al*. (2016, p.32)
H2	**Rejected**	**Empirical evidence**: in only 29% and 32% of the cases a match was found between trending peaks on Twitter and trading volume peaks **Theoretical evidence**: Oliveira *et al*. (2016, p.32) also mentioned that "(…) the application of microblogging features was less convincing for the forecasting of trading volume and volatility (…)"

6.3. FOMO – Fear of missing out

So, in case a certain company goes trending on Twitter and the stock market seems to respond to that, what might have caused that response? As mentioned before, the rate of individual investors, mostly without a to big knowledge of the market, for just starting to step in, has been rising in the last year. This, together with the appearance of the meme stocks, created a big FOMO, or fear of missing out among these investors. (Vega, 2021)

Edmonds, from the Centre for Mental Health in the UK (n.d.), refers to FOMO as:

> (…) a pervasive apprehension that others might be having rewarding experiences from which one is absent' and is 'characterised by the desire to stay continually connected with what others are doing'. FOMO has been linked to intensive social media use and is associated with lower mood and life satisfaction (…).

Even though there is still relatively little information available about the effect of FOMO on the stock market, in September of 2020 Ph.D. Hal Hershfield wrote an article for Avantis Investors about how availability bias and FOMO can impact financial decision-making. He concludes that FOMO might be a rather costly trait, as certain stock prices are being overvalued just because people are afraid that their friends might be gaining big money and they are missing out if they don't jump in. However, even though this has found to be a recent movement, which appeared originally with the appearance of social media and youngsters feeling that they are missing out on the events their friends are attending, isn't this a rather known phenomena within the stock market and like the commonly known herd behaviour?

Nevertheless, following the herd blindly without searching in dept for relevant information about a certain stock before buying, doesn't seem like a very smart and sustainable idea to invest anyway, regardless of FOMO being around for a long time already or not.

6.4. Implications of the study

Some implications of this study might be how companies start to look at their social media strategy and start tracking their social media accounts and stock market performances. For example, the UnitedHealth Group currently only has 38k followers on Twitter and never went trending. Also, Netflix and Facebook which are popular companies among youngsters, never went trending with their company name which is curious. These companies might want to invest in their Twitter strategy as going trending brings visibility to the company which might possibly reflect on their stock market performances. Companies which already showed a strong association, just like PayPal, might want to invest in its Twitter strategy to go trending for longer amounts of time, or to reach a higher ranking, to increase even more its visibility during the peak. Companies might even predict possible times the company can go trending by keeping a close eye on their stock market performances.

On the other hand, when it can also be relevant the other way around, meaning that if a stock has been growing or dropping for some time, and suddenly the company goes trending on Twitter, this might indicate that the tendence might have a 180º turnaround and that the increase or decrease might stop, just like in the case of Apple on the 7th of June, which can be seen in Figure 7.1.

Figure 6.5 - Stock chart "AAPL" NASDAQ from 09/2020 until 09/2021

Source: https://www.tradingview.com/

As can be seen, the 7th of June indicates the beginning of a large peak within the stock market. Companies like Apple could track their trending tendencies to predict what their stock prices will be doing.

Another big implication of this study is that bigger companies clearly do not have to 'worry' as much about the implications of social media as people might think. In the media we constantly read how certain companies exploded or presented a big drop after something that happened on social media. Even though these messages might be true for some companies, as can be seen, this is clearly not the case for the vast majority, considering the sample of 25 big companies.

7. CONCLUSIONS

7.1. General conclusions

As mentioned in Chapter 6, even though it was possible to notice in 46% and 41% of the cases that the trending peaks did match stock market highlights, and only in 27% and 31% of the cases that there was no clear match of these events, based on this research only it is not possible to conclusively consider that there seems to be a clear correlation between going trending on Twitter and a highlight on the stock market. However, it can be rather strategical for some companies to keep tracking these records and figure out for their own company and other competitors within the sector if there might be a clearer relation. This, because it seems like for some companies there seems to exist a clearer relation than for others, as can be seen for example in the case of PayPal, where 100% of the trending peaks represented stock market highlights.

As mentioned before, it is rather difficult to determine what was the exact cause of the stock highlight or of the trending peak. Did the trending peak on Twitter happened because there was a highlight on the stock market and the company gained the peoples interest to talk about? Or did it happen the other way around and did people started to talk about a certain company, either because a special event happened for the company or because an influencer mentioned the company, or even just out of the blue, which can also sporadically happen, and did the stock market follow the trend because of FOMO for example? Just like Robertson *et al.* (2007) mentioned, it takes about 90 minutes for news to reach the stock market, so it is also possible that both events strengthened each other, meaning that if a highlight on the stock market happened, people started to talk about the company on Twitter and subsequentially the market reacted even more because of the trending topic, for example.

However, if companies notice that their company of interest, being it their own or being it similar companies within the same sector and/or competitors is presenting a clear relationship between stock events and trending events, they might adapt their financial and social media strategy accordingly. This means that when the company knows they are going to launch a new product for example and that the market will react, they can similarly launch a social media event, getting even more out of their trending peak, making it last longer for example or making the peak reach a higher ranking. In this specific study there were no links

made with the length of going trending and/or the reached rankings, but for future studies, these associations might be relevant.

On the other hand, if a company goes trending suddenly and out of the blue, they might want to keep an eye on their stock prices and investigate more in dept why the company went suddenly trending. It the case an influencer mentioned the company in either a positive or negative way, the company can decide to react quickly on social media to do some damage control or to promote the company even further, to boost stock prices.

Even though this study did not present the clear results which were hoped for, this clearly can be the beginning of furthermore in dept studies, of another range of companies for example. In this case it was chosen to analyse the biggest and more known American companies, but it could be that for example start-ups and companies that are much less financially stable like the recently selected meme stock companies, do present much clearer results, just like Oliveira *et al.* (2016, p.32) mentioned.

7.2. Suggestions for future investigations

Like mentioned, this first investigation can be considered as an embryonic study for a vast group of variations and more in dept studies. This study could go more in dept to also evaluate the length a company went trending on Twitter and the rank it reached. Besides, it would be possible to investigate whether the market would go up or down when the peaks match the stock market highlights. Yet also variations of this study can be done with different company samples like start-ups for example. It might be the start-ups which do not have the financial stability of these big players in the market are more susceptible to social media trends. This study could also be applied to other social media channels just like reddit for example, which also have shown to be a very important channel these past few months, being the driver channel of for example the infamous ‘GameStop Squeeze’. Gurdus (2021) of CNBC even wrote an article about how reddit can be responsible for what she called to be ‘massive market manipulation’.

7.3. Critical reflection

The results of this research were in general satisfactory, even though they were different from what was expected in the beginning. It was expected that the correlation between going trending on Twitter and certain stock market events would be clearer, especially the search volume was expected to be more affected by the Twitter trends. Nevertheless, this may indicate how powerful the media has been, biasing people into thinking that social media has a very strong power on the stock market, when this isn't completely true in all the cases. This reinforces the relevance of this research. As to be commonly known, the media tends to blow up these events, probably also trying to manipulate the market somehow, but what can be seen is that the link between social media and the stock market is not that big for these 25 big companies. Even though it was possible to find an apparent correlation in about 40/45% of the analysed cases, in about 30% of the time these companies went trending and nothing special seemed to happen, which means that the overall power that social media is said to have, doesn't seem that big after all.

As a result of these conclusions, it is intended to continue to investigate this issue, with further work being desirable, which corroborates these results, integrating other cases, variables, and methods.

7.4. Study limitations

Some of the limitations which were experienced in this study were the words chosen to analyse. As described, it was decided to only focus on full company names like 'Apple' and 'Microsoft' for example, not considering other related terms, such as 'iOS', 'iPhone', 'MacBook', and 'Tim Cook' for example in the case of Apple, and 'Windows', 'MS office' and 'Bill Gates' for example in the case of Microsoft. It was noticed that almost all companies had terms that were related to them that might have gotten trending as well, that were not being considered during this analysis. To have a more in dept and detailed idea of the influence of going trending on Twitter on the stock market, these terms should be considered in future analysis as well.

The need to adapt the more formal company names, to the 'street names' the company is known for within the public to optimise trending and search results was also felt. Words as Corp. or Inc. were standardly left out of the results. Yet, other companies were shortened like for example Walt Disney to just Disney and Cisco Systems to just Cisco. In the case of

Alphabet, the commercially known name Google was even looked at. It is possible that there exist more and better alternatives for the company names to consider instead of the ones that were used during this analysis.

Another noticeable study limitation is the existence of homonyms or homographs like in the case of Visa, which besides the company name also means “an official mark, usually made in a passport, that allows you to enter or leave a particular country”, according to the online Cambridge dictionary (2021). Fortunately, most companies don’t have homonyms or homographs, but in the cases of Visa, Apple, and Alphabet, it could be possible that people are in fact talking about something else then the company, even though, in my opinion this is unlikely. Nevertheless, it is important to also consider these homographs even when people are in fact talking about something else, because in a matter of fact, it might influence the stock market for these companies, just like in the case of Signal Advance, the company mentioned in the introduction.

The last big limitation was the fact that it was not possible to access the Twitter database directly. This meant that, as mentioned in the methodology, every single trending peak had to be looked up manually and as the graphs of Getdaytrands.com are not precise at all, and every day has 24 possible time slots, it took a long time to find the companies in the trending lists. As it all had to be done manually, there is also the possibility that some slight human errors might exist in, for example, the exact peak time.

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I, Jearina Isabelle Imanse, declare, for all due purposes, that my dissertation, entitled "How Does the Status "Trending" Attributed by Twitter to a Corporation Influence Trading of its Stock? The Case Study of the Top 25 Companies in the S&P500 Index" to obtain my Master's degree in Management Control and Performance Evaluation, supervised by Professor Dr. Maria Margarida Cróca Piteira, is an original and unpublished work, the result of my research and investigations. I declare that this research was developed using the APA 6th edition style editing format. I further declare that I have cited and referenced all authors and documents used by me in this research.

APPENDIXES

APPENDIX A: S&P500 TOP 25 GRAPHS AND CHARTS

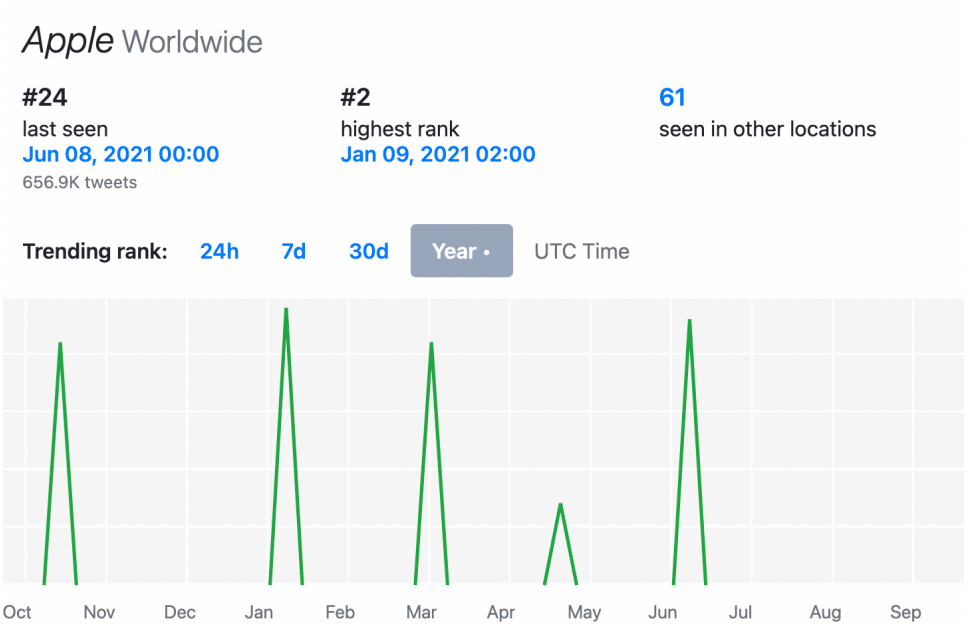

Figure 1: Graph indicating when "Apple" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

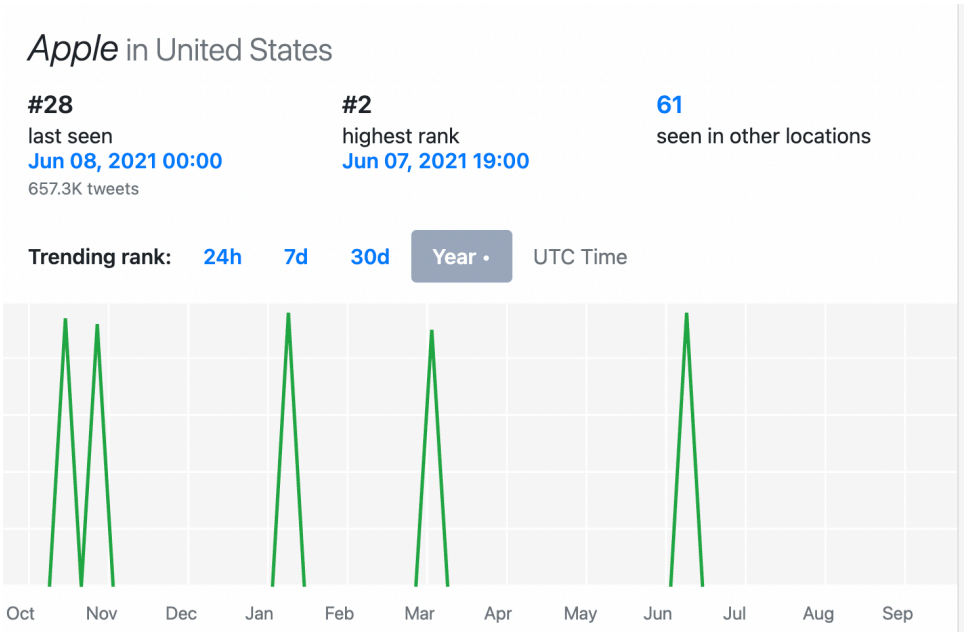

Figure 2: Graph indicating when "Apple" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

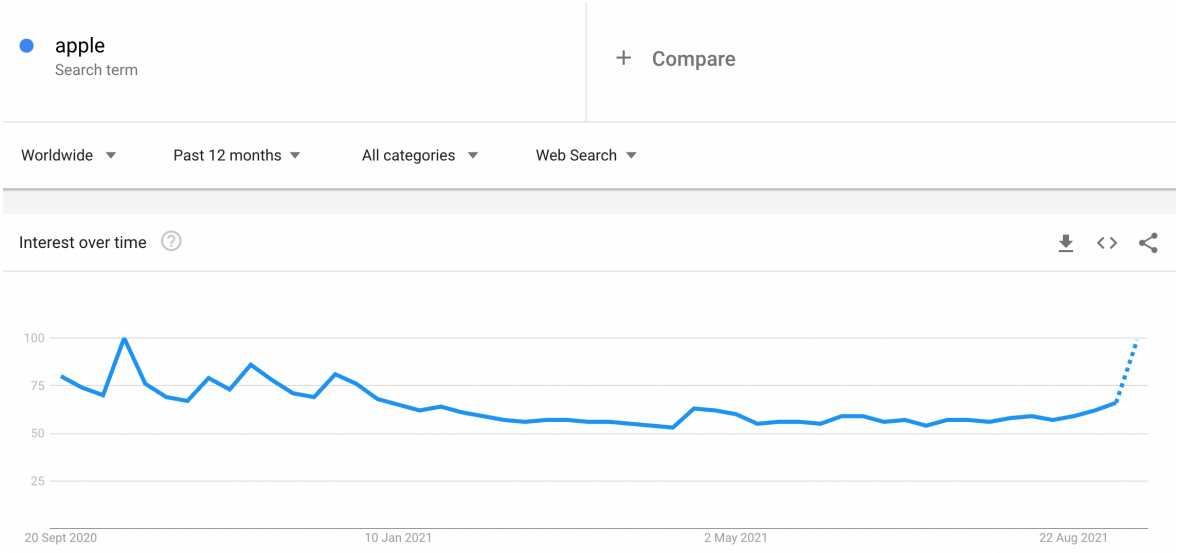

Figure 3: Graph indicating when "Apple" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

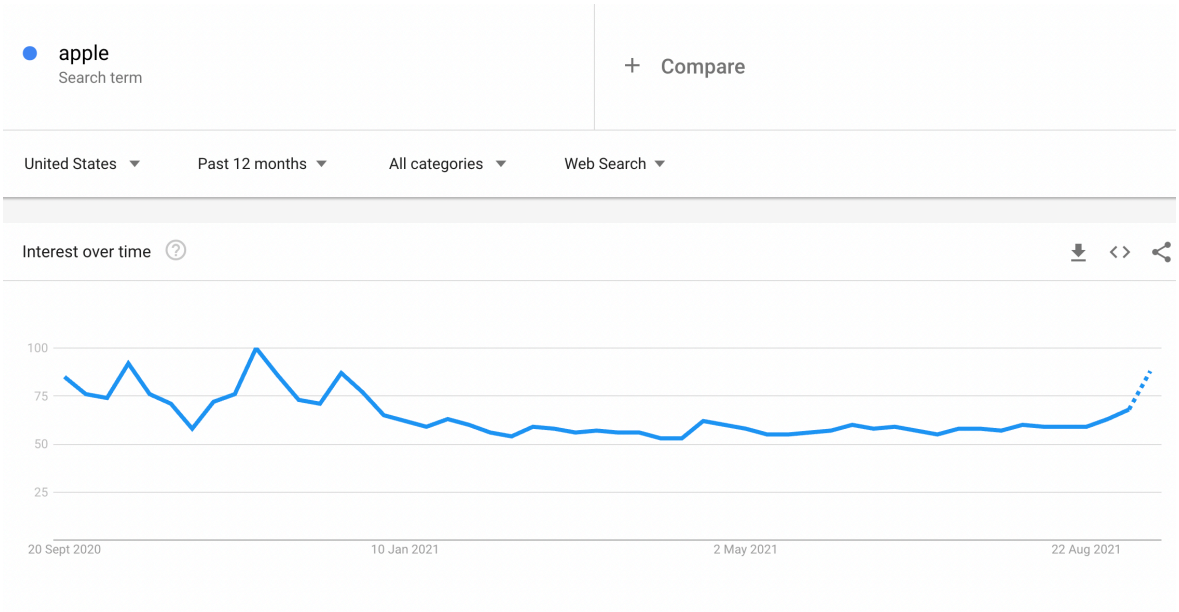

Figure 4: Graph indicating when "Apple" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 5: Stock chart "AAPL" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

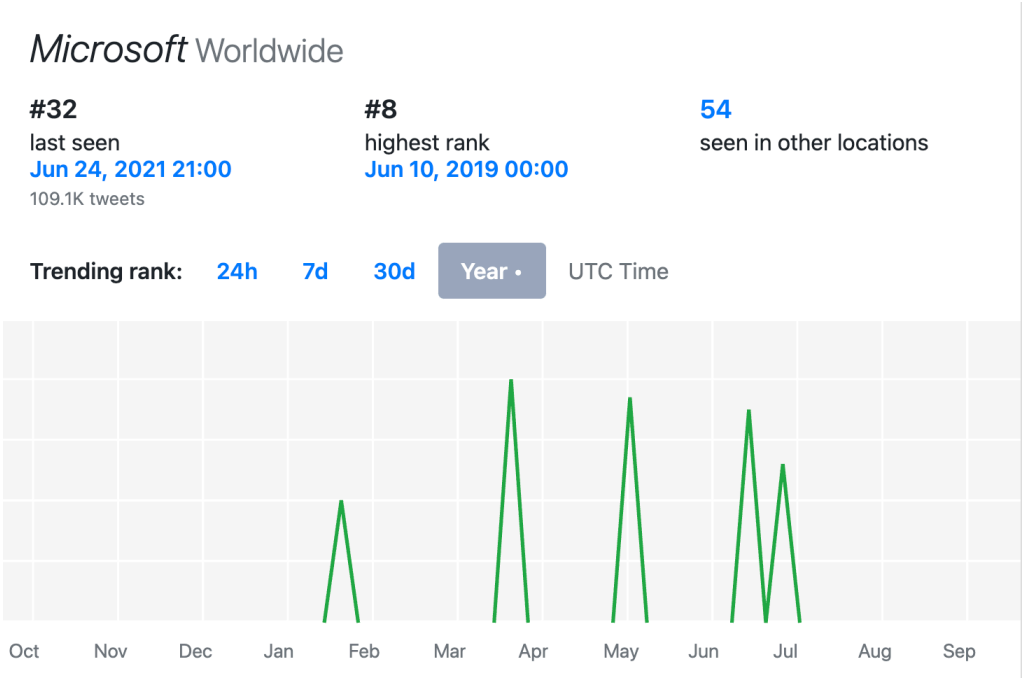

Figure 6: Graph indicating when "Microsoft" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

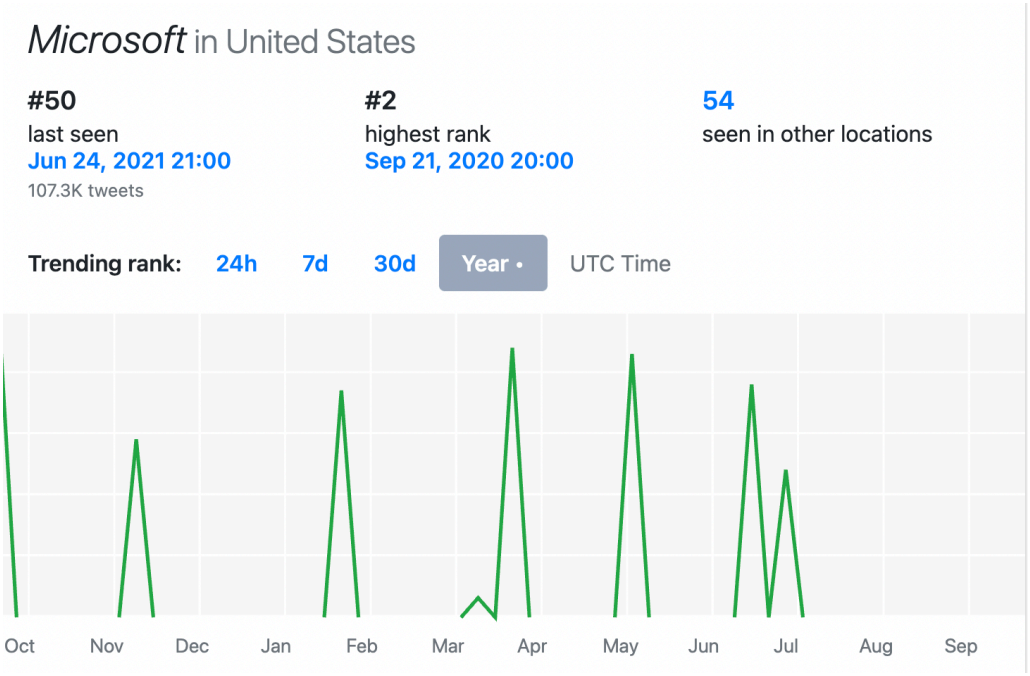

Figure 7: Graph indicating when "Microsoft" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

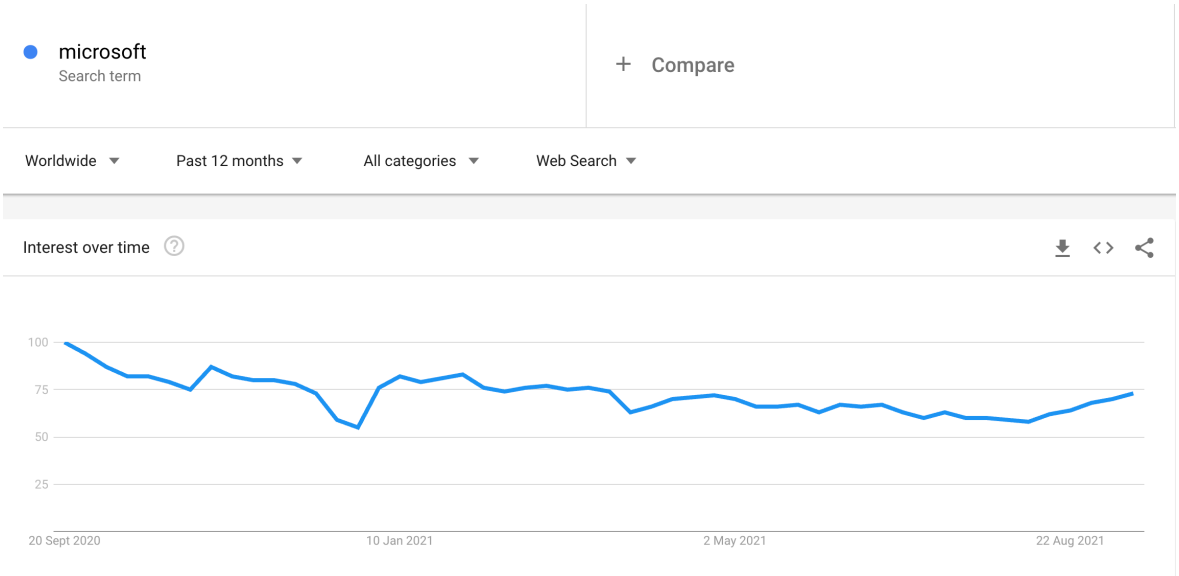

Figure 8: Graph indicating when "Microsoft" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

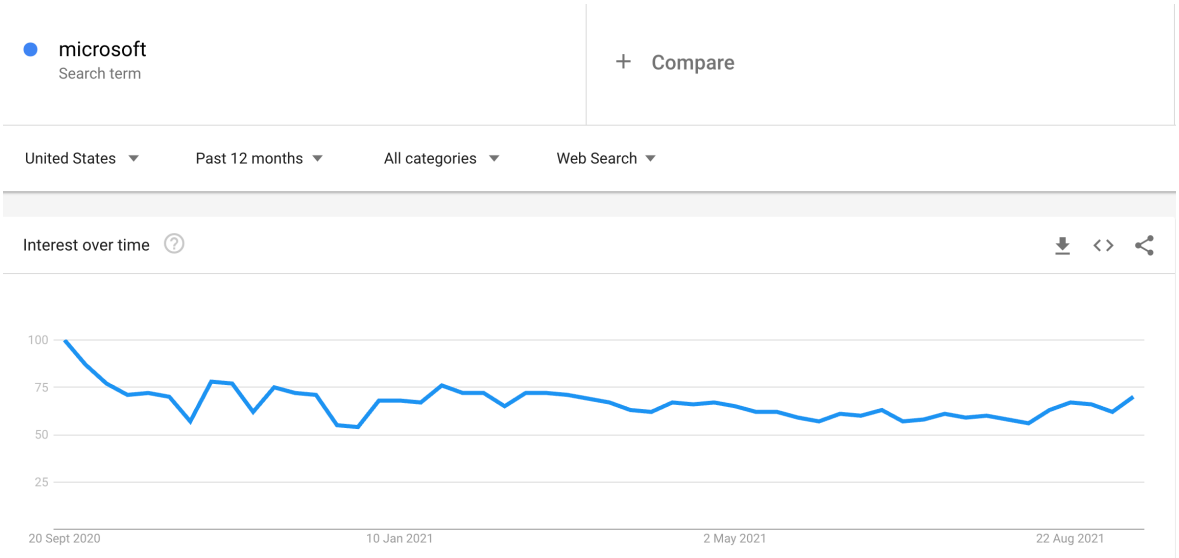

Figure 9: Graph indicating when "Microsoft" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 10: Stock chart "MSFT" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

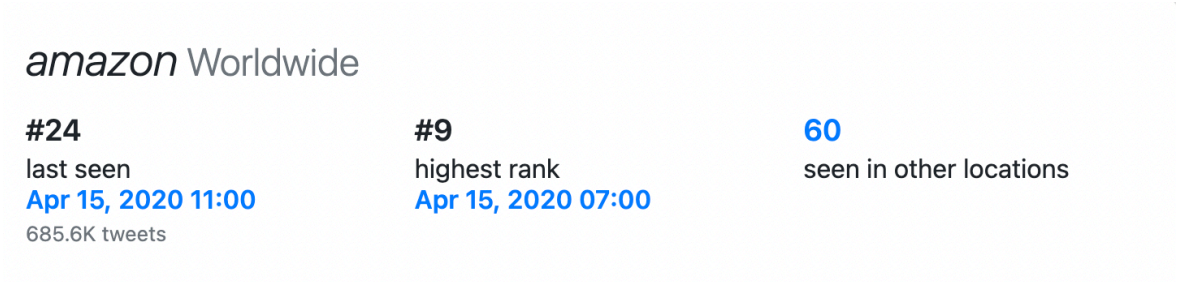

Figure 11: Image indicating when "Amazon" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

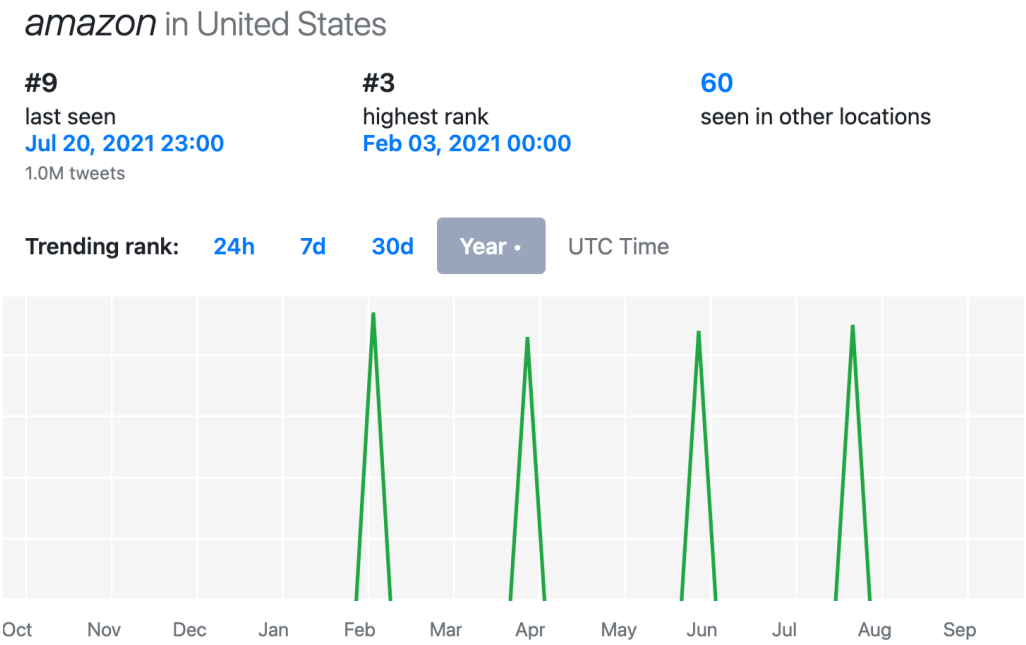

Figure 12: Graph indicating when "Amazon" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

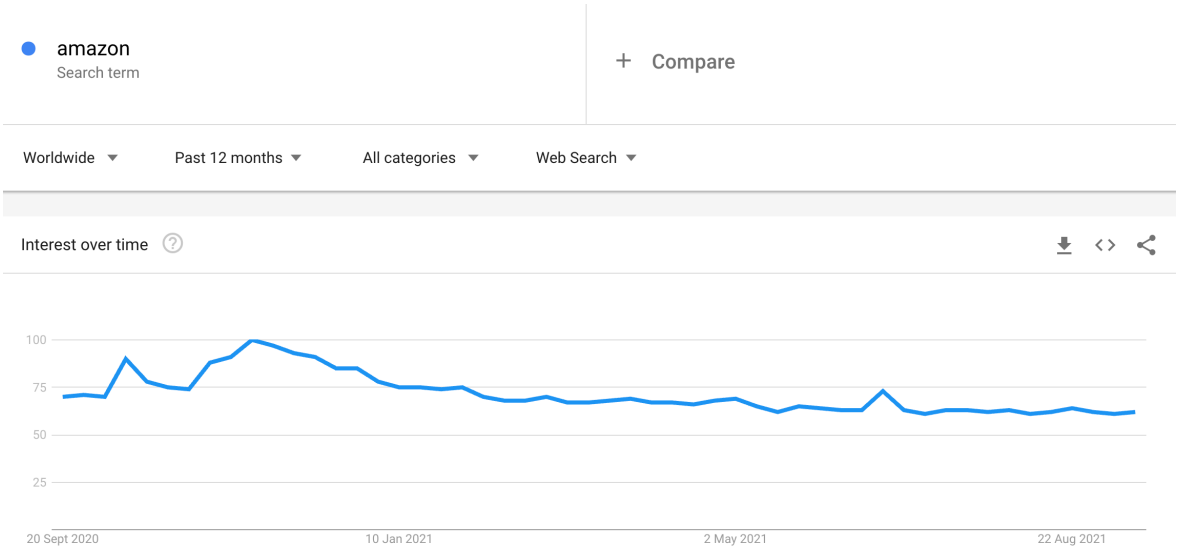

Figure 13: Graph indicating when "Amazon" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

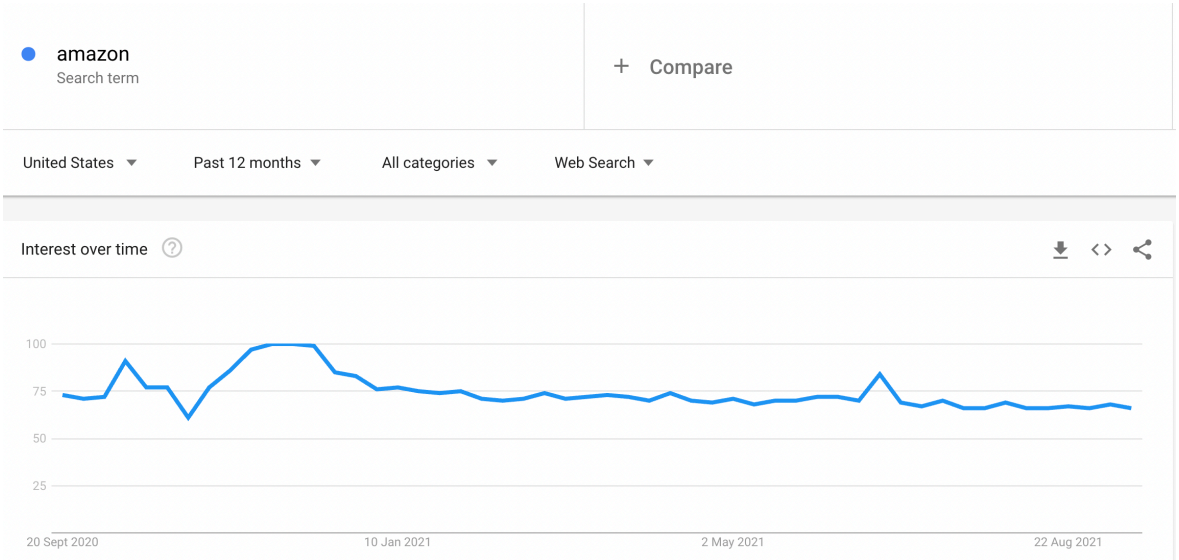

Figure 14: Graph indicating when "Amazon" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 15: Stock chart "AMZN" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

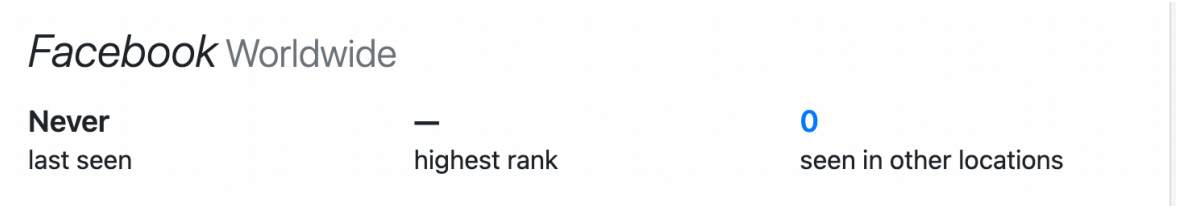

Figure 16: Image indicating when "Facebook" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

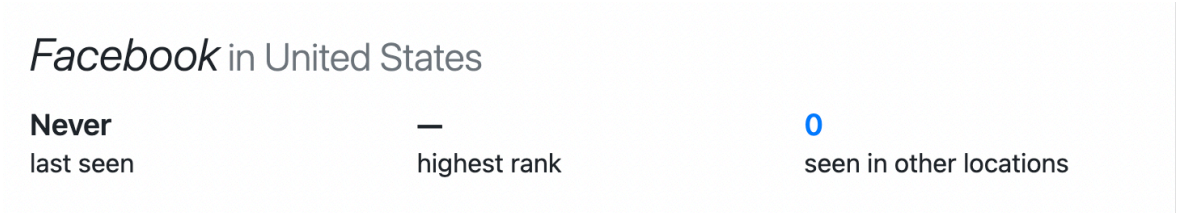

Figure 17: Image indicating when "Facebook" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

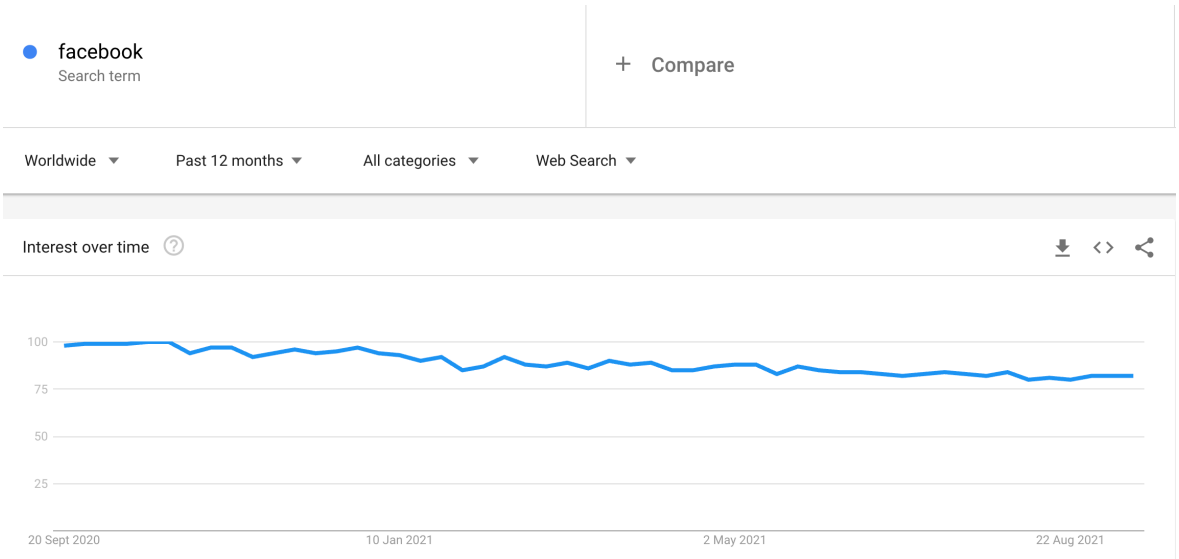

Figure 18: Graph indicating when "Facebook" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

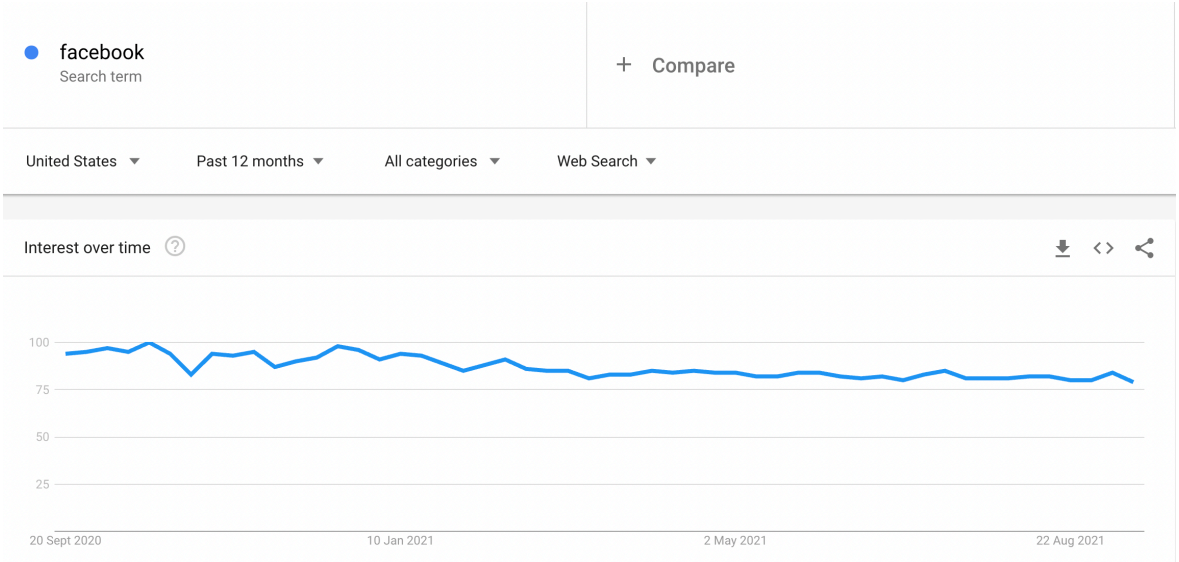

Figure 19: Graph indicating when "Facebook" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 20: Stock chart "FB" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

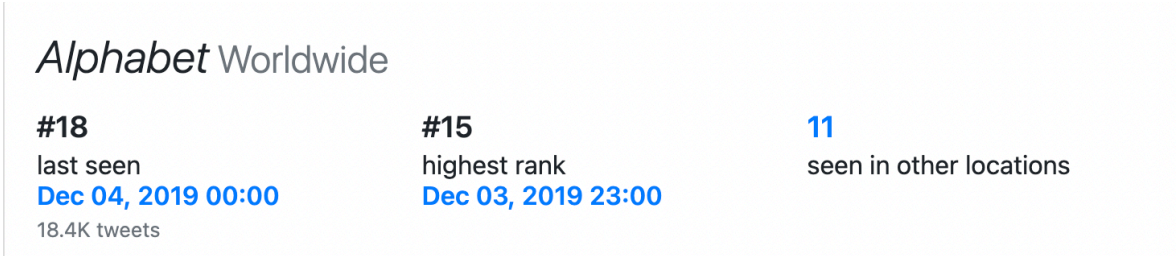

Figure 21: Image indicating when "Alphabet" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

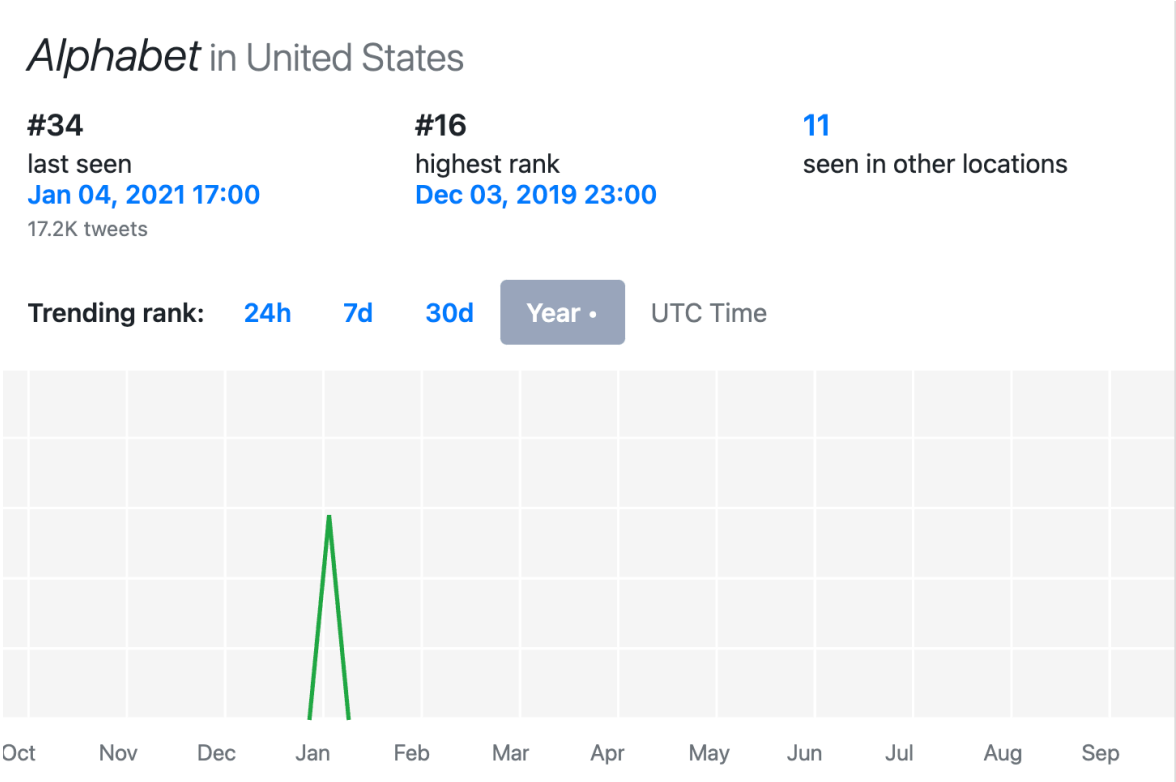

Figure 22: Graph indicating when "Alphabet" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

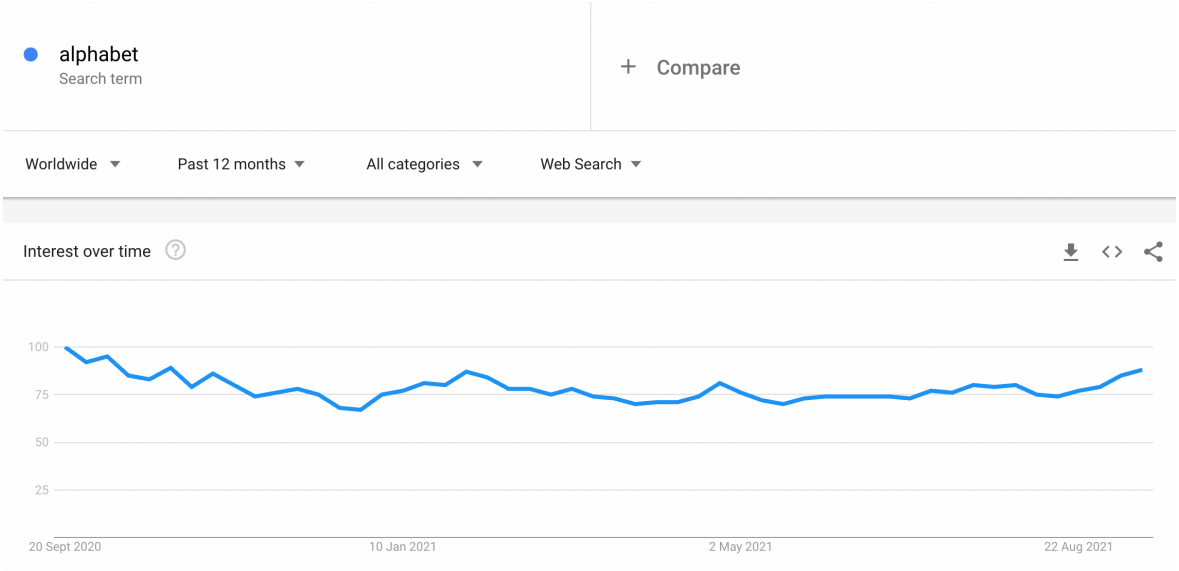

Figure 23: Graph indicating when "Alphabet" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

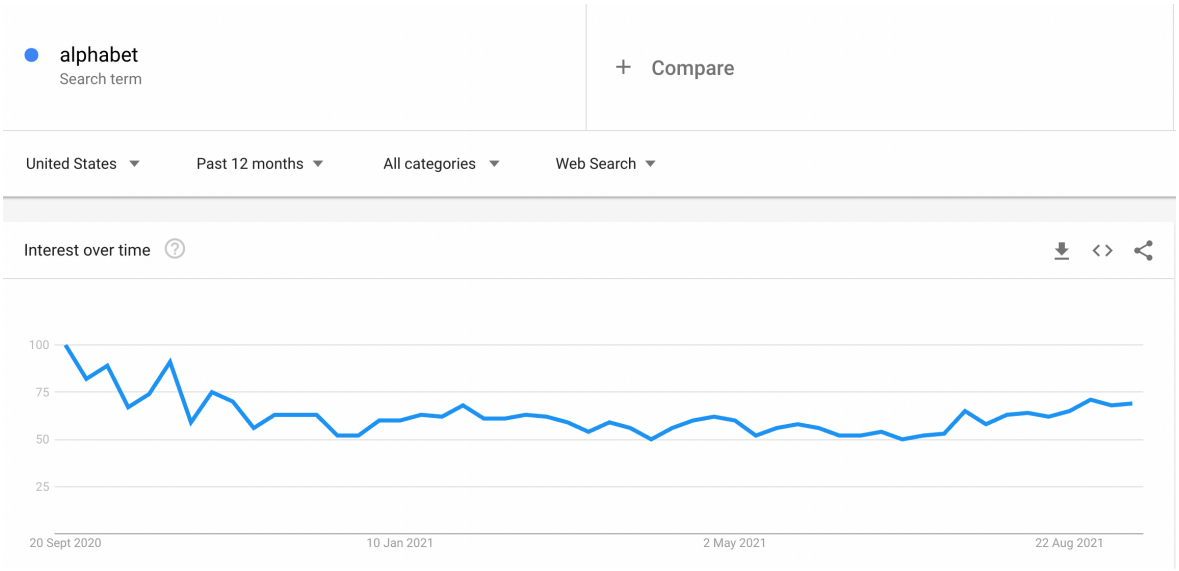

Figure 24: Graph indicating when "Alphabet" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

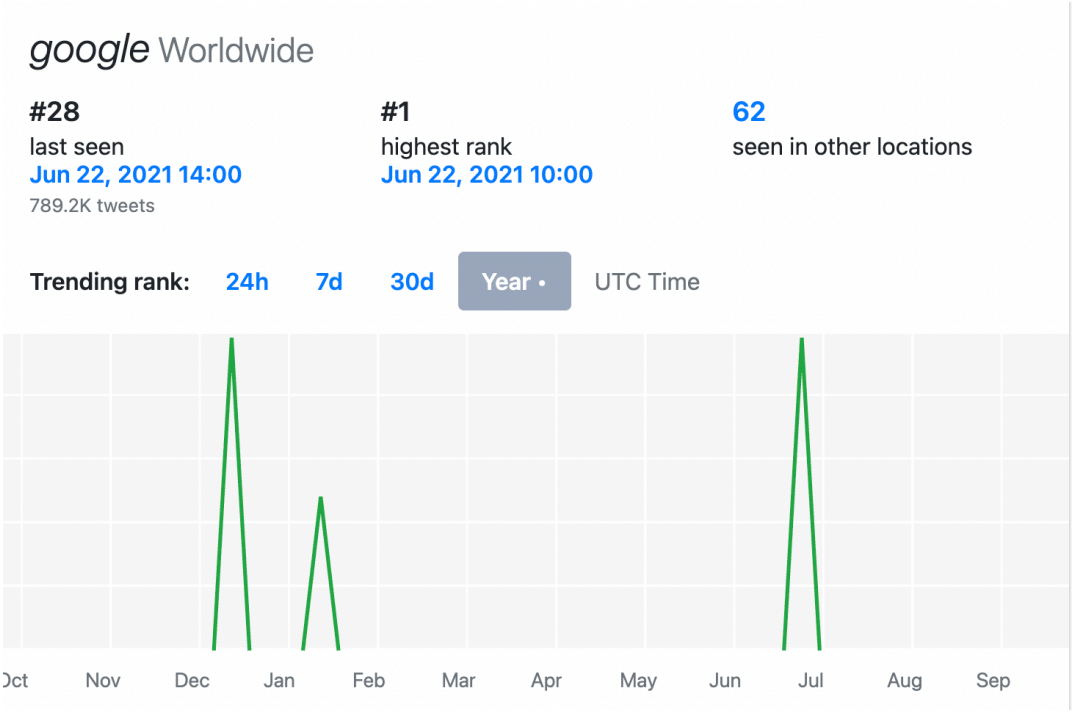

Figure 25: Graph indicating when "Google" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

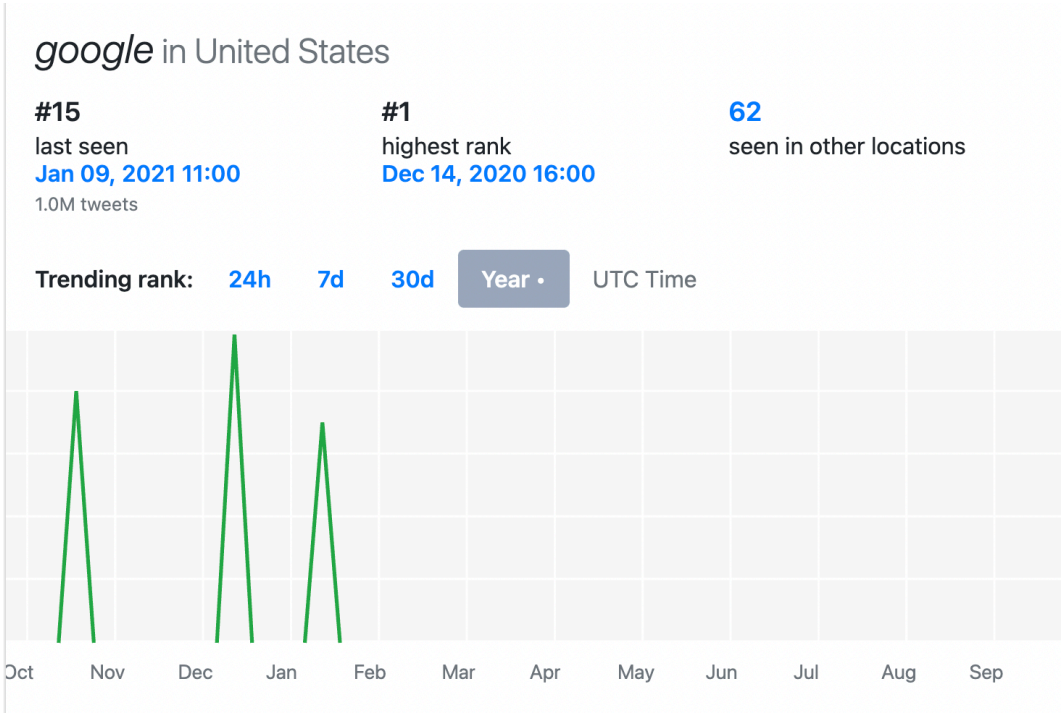

Figure 26: Graph indicating when "Google" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

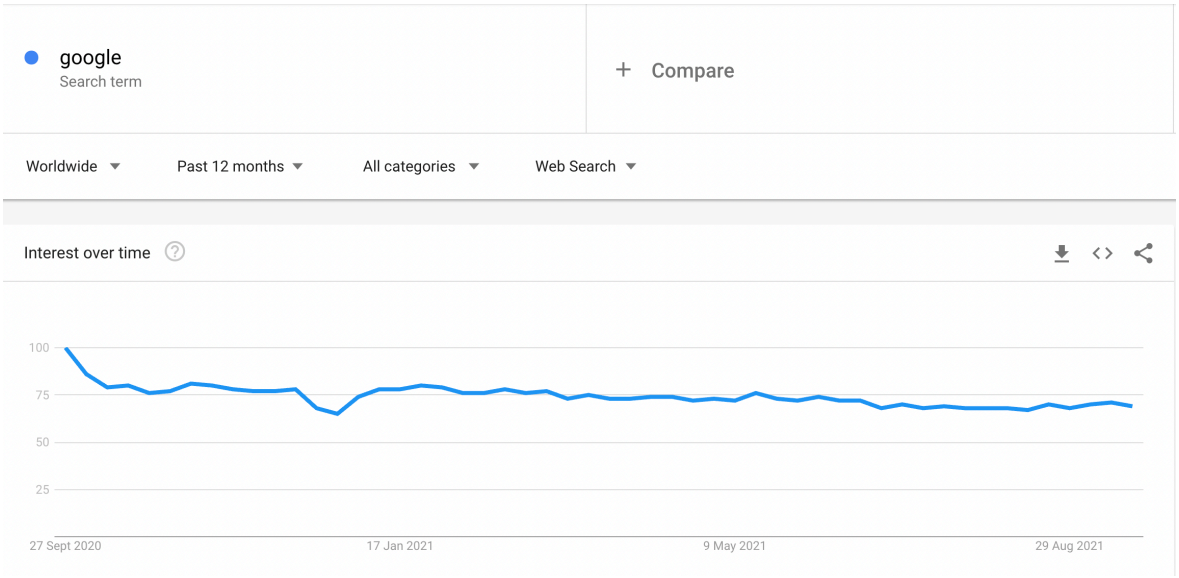

Figure 27: Graph indicating when "google" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

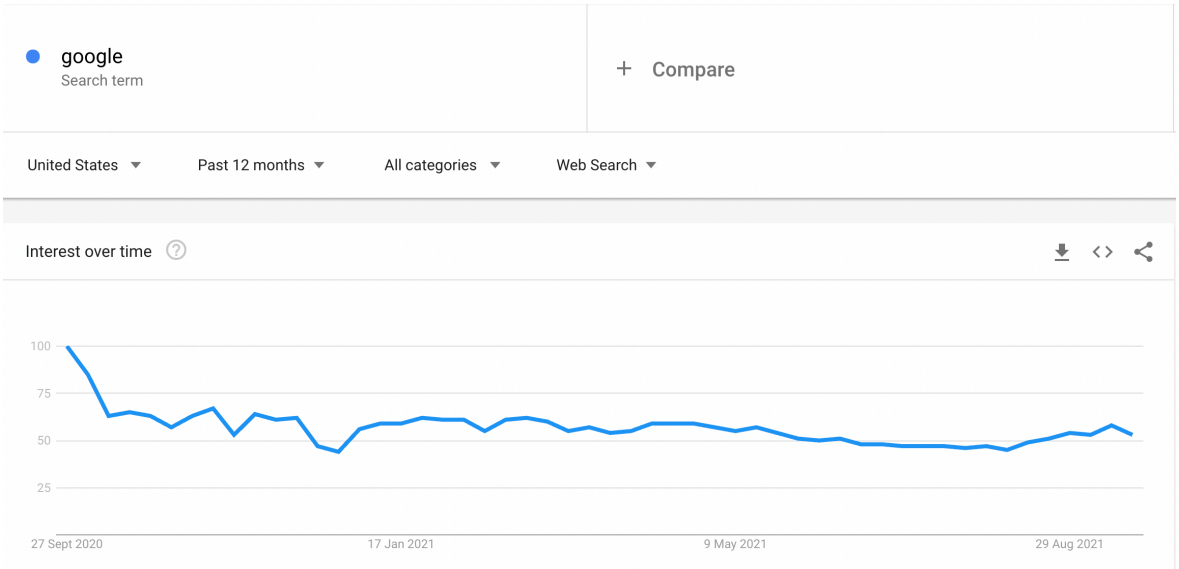

Figure 27: Graph indicating when "google" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 28: Stock chart "GOOGL" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

Figure 29: Stock chart "GOOG" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

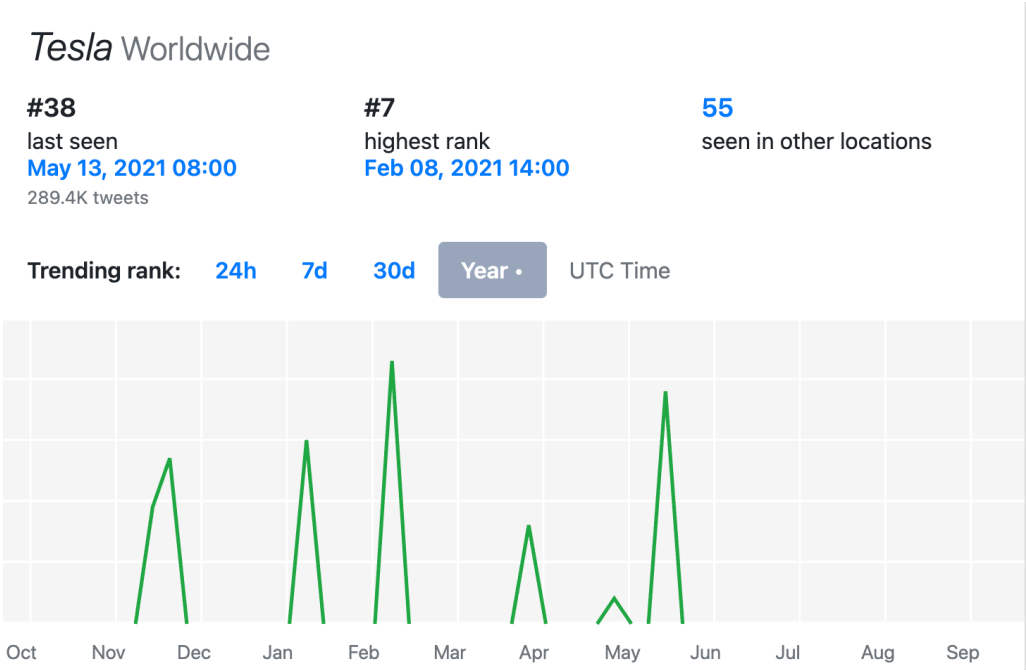

Figure 30: Graph indicating when "Tesla" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

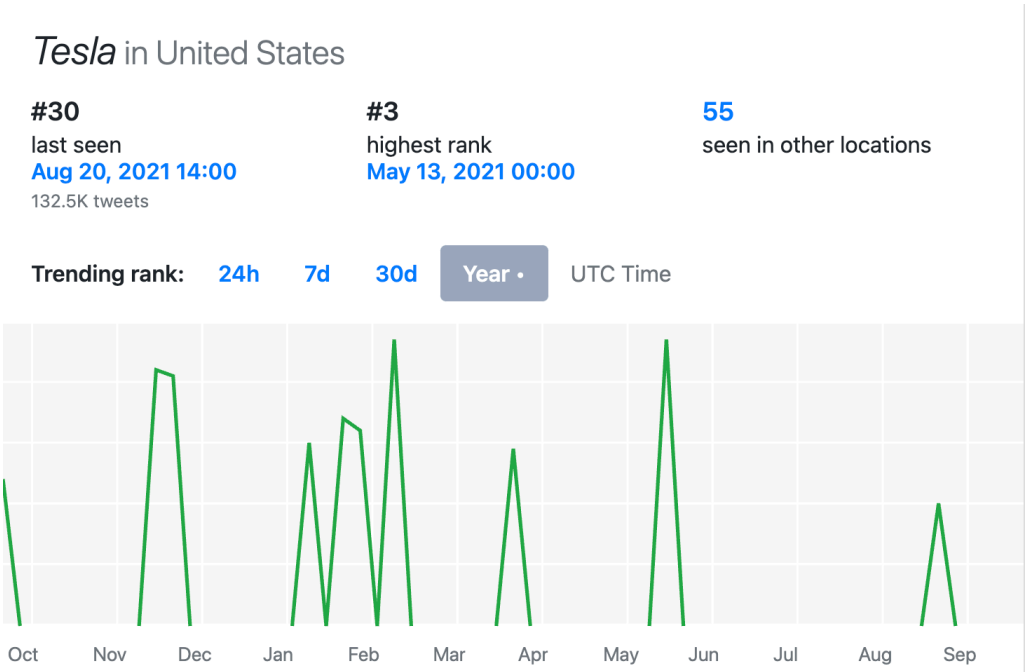

Figure 31: Graph indicating when "Tesla" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

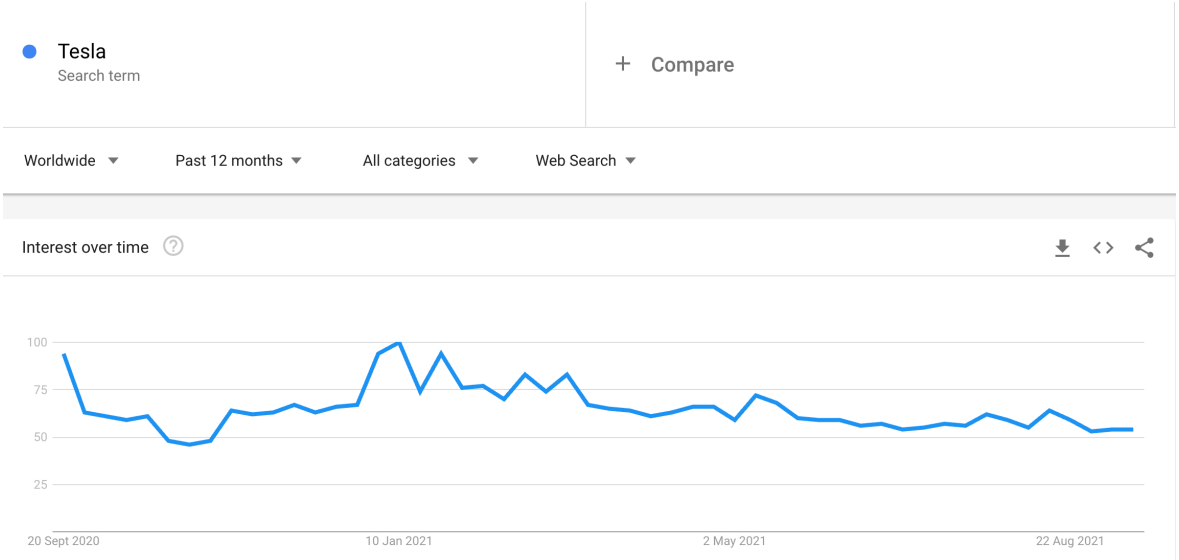

Figure 32: Graph indicating when "Tesla" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

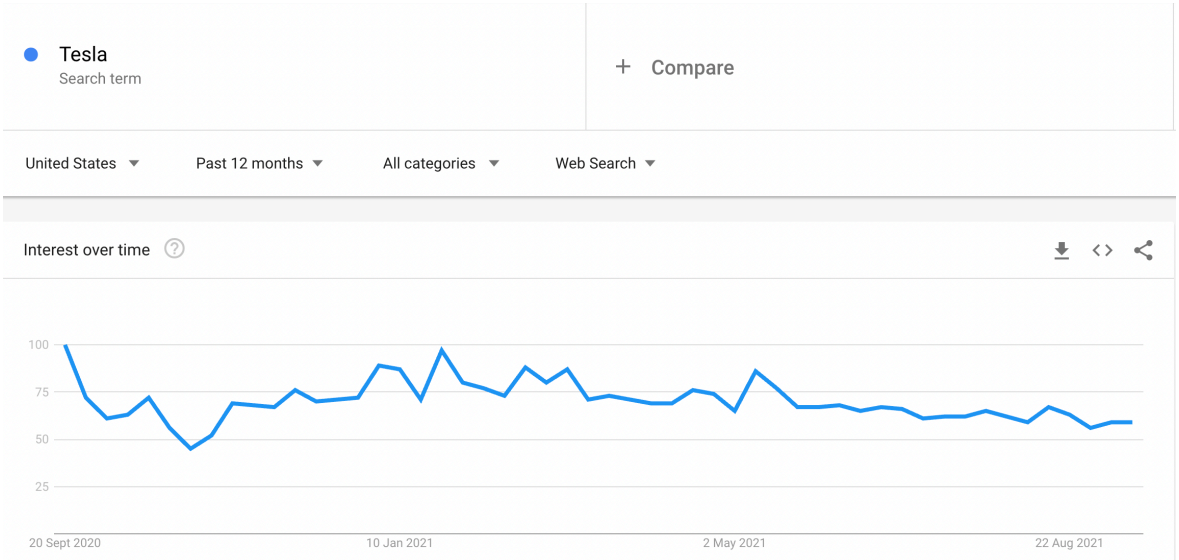

Figure 33: Graph indicating when "Tesla" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 34: Stock chart "TSLA" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

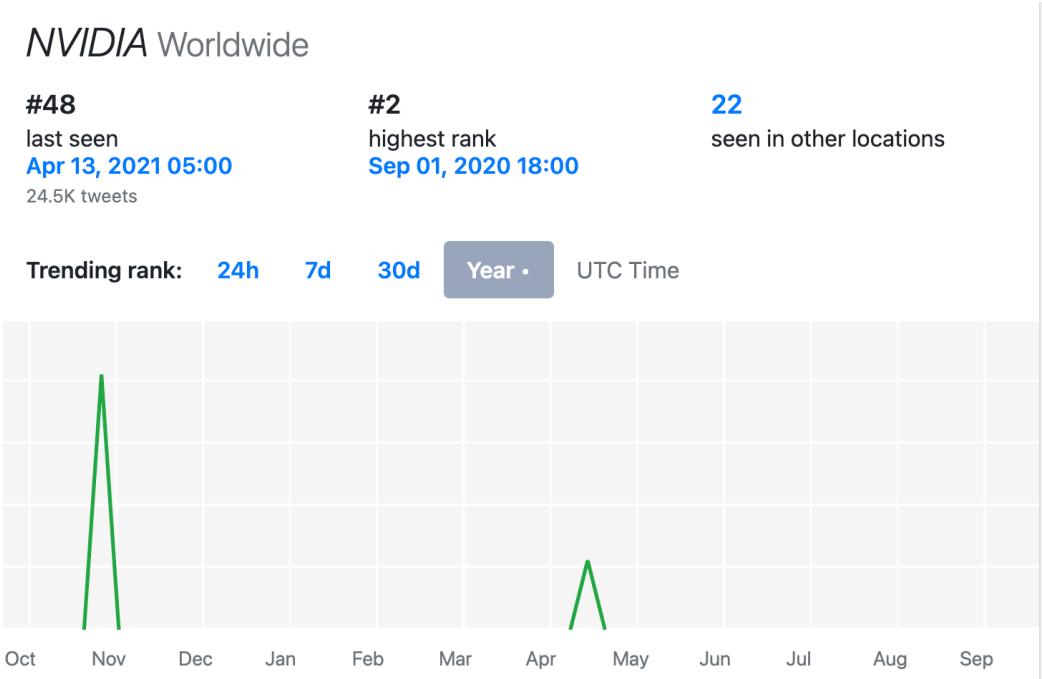

Figure 35: Graph indicating when "NVIDIA" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

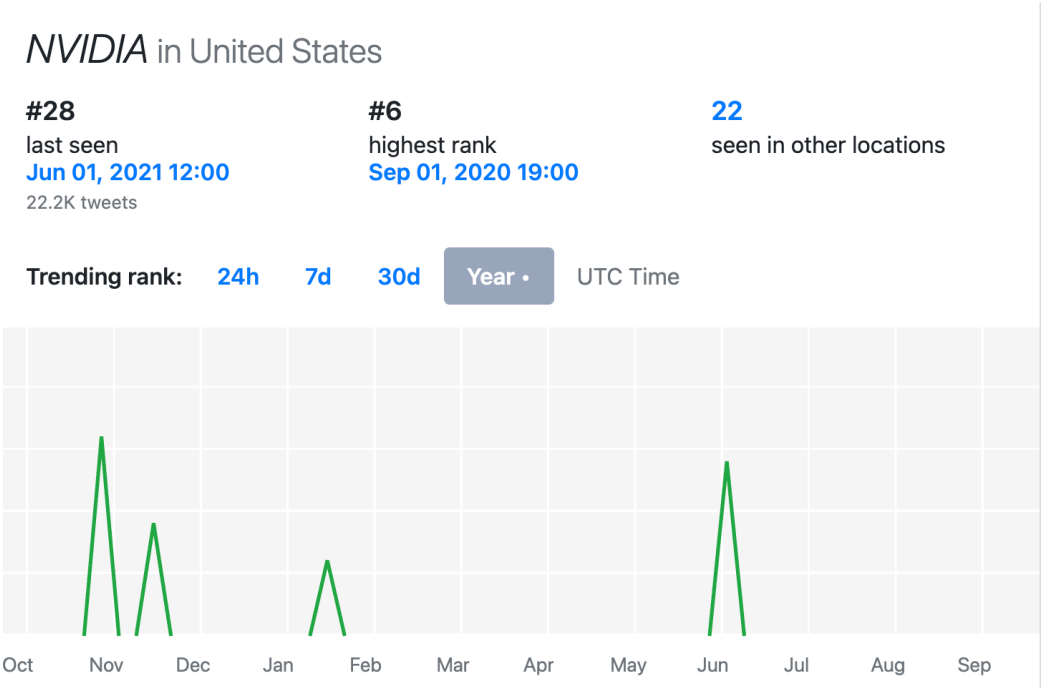

Figure 36: Graph indicating when "NVIDIA" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

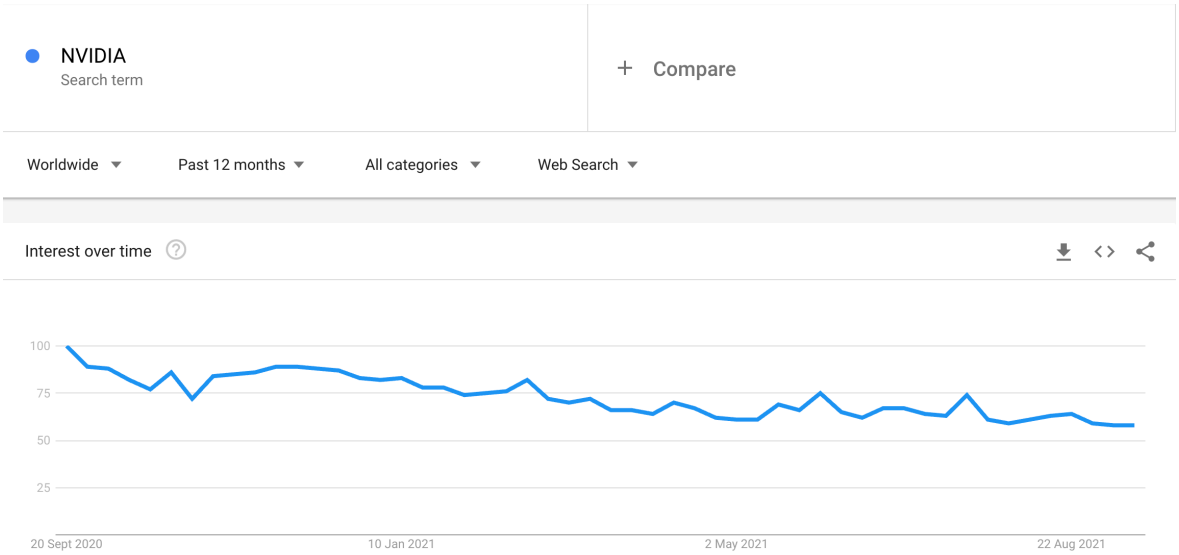

Figure 37: Graph indicating when "NVIDIA" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

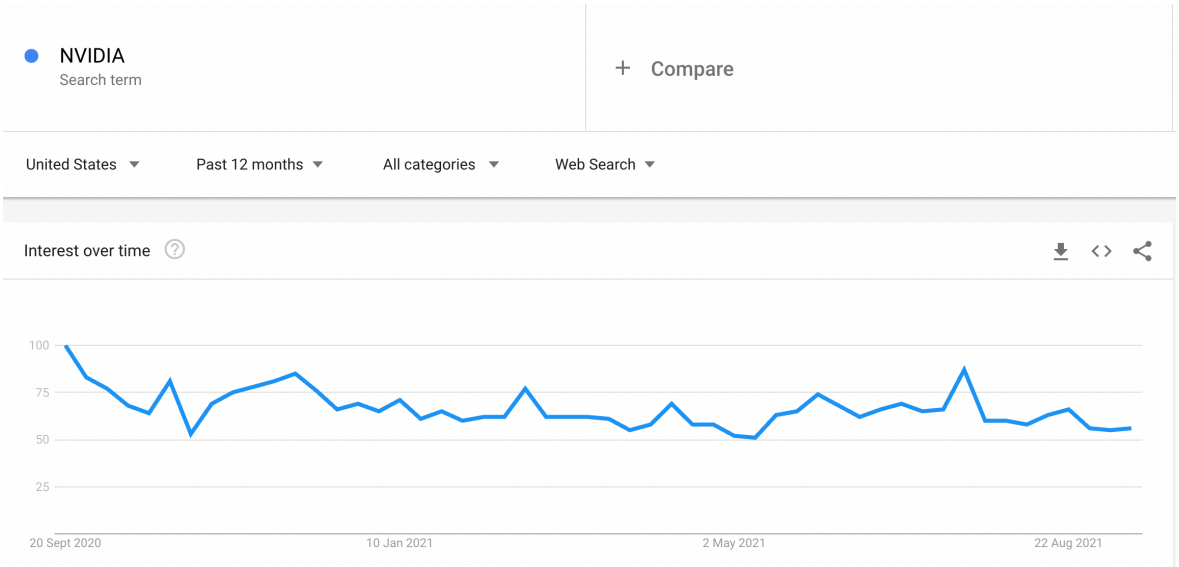

Figure 38: Graph indicating when "NVIDIA" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 39: Stock chart "NVDA" Nasdaq from 09/2020 until 09/2021

Source: https://www.tradingview.com/

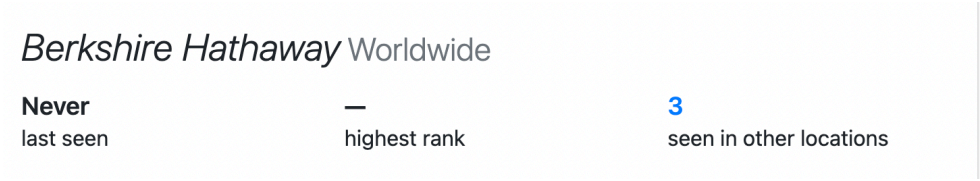

Figure 40: Image indicating when "Berkshire Hathaway" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

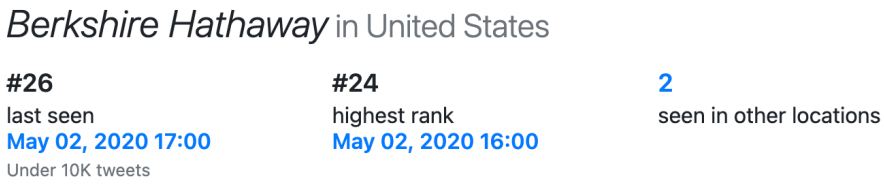

Figure 41: Image indicating when "Berkshire Hathaway" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

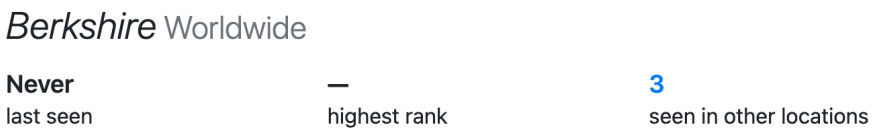

Figure 42: Image indicating when "Berkshire" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

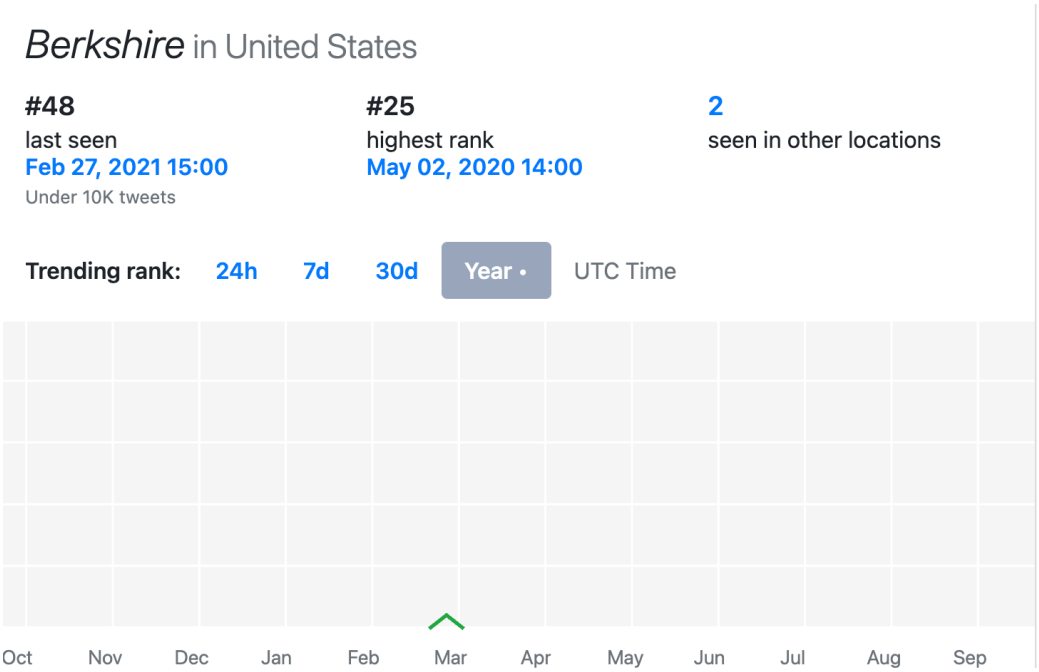

Figure 43: Image indicating when "Berkshire" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

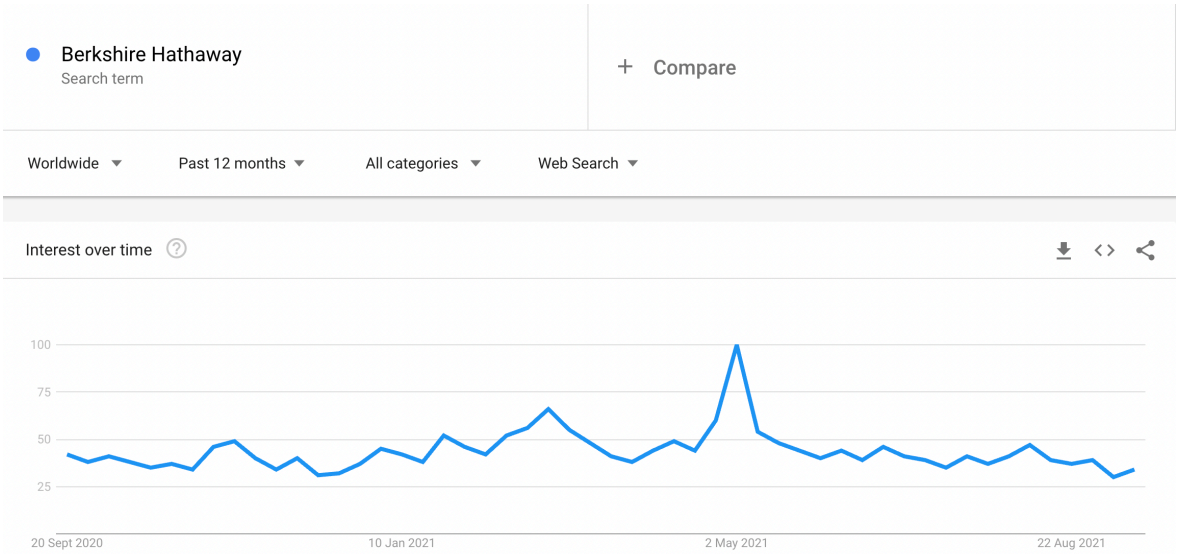

Figure 44: Graph indicating when "Berkshire Hathaway" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

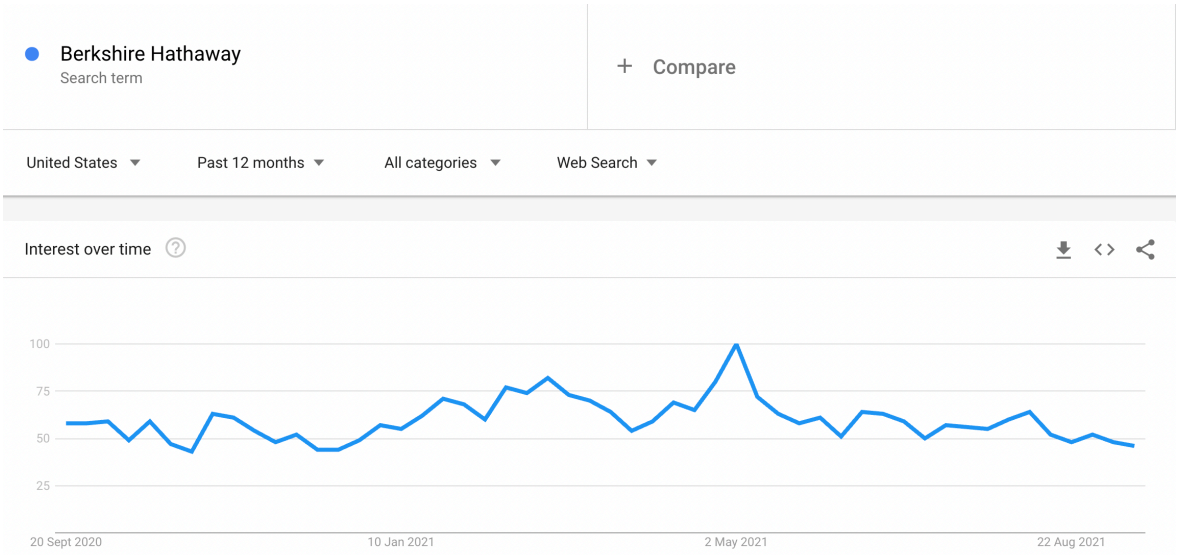

Figure 45: Graph indicating when "Berkshire Hathaway" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 46: Stock chart "BRK.B" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

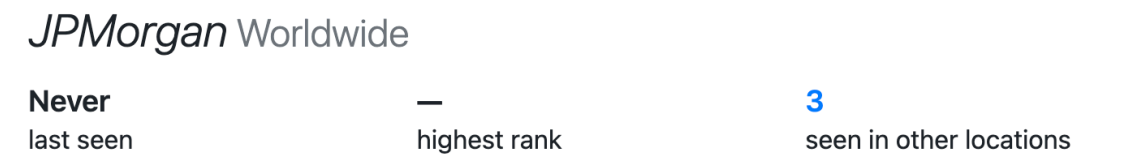

Figure 47: Image indicating when "JPMorgan" was trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

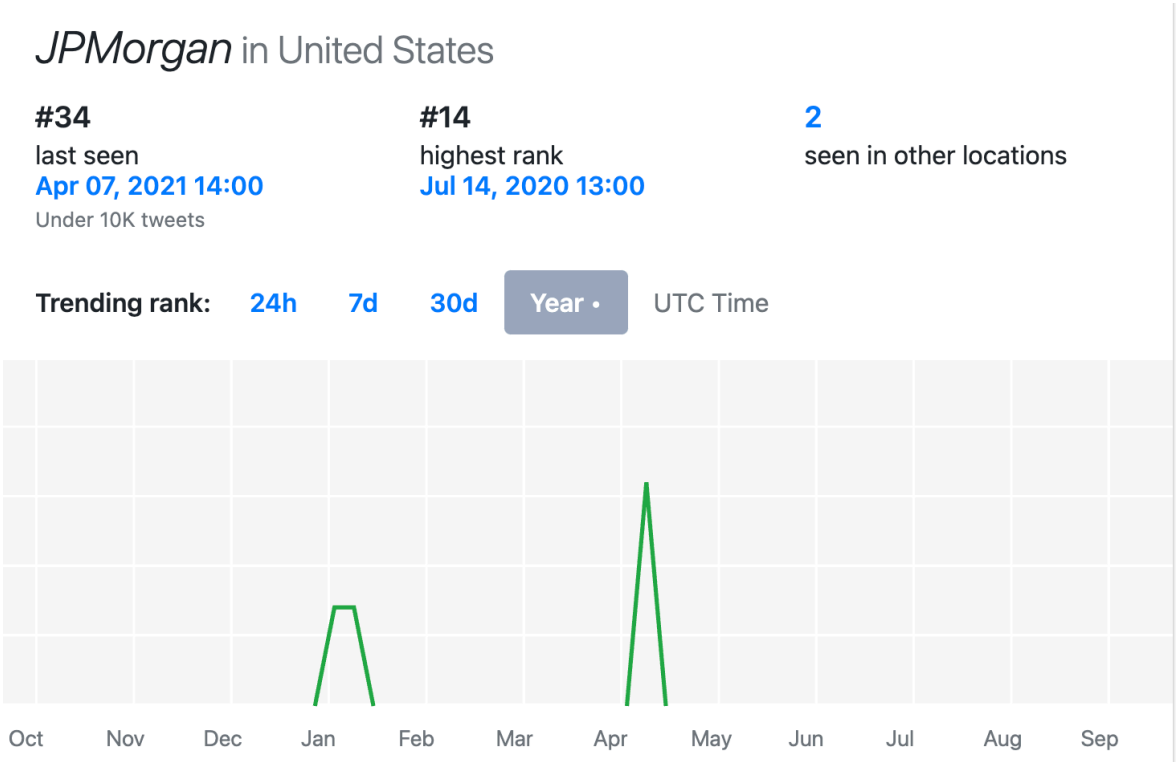

Figure 48: Graph indicating when "JPMorgan" was trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

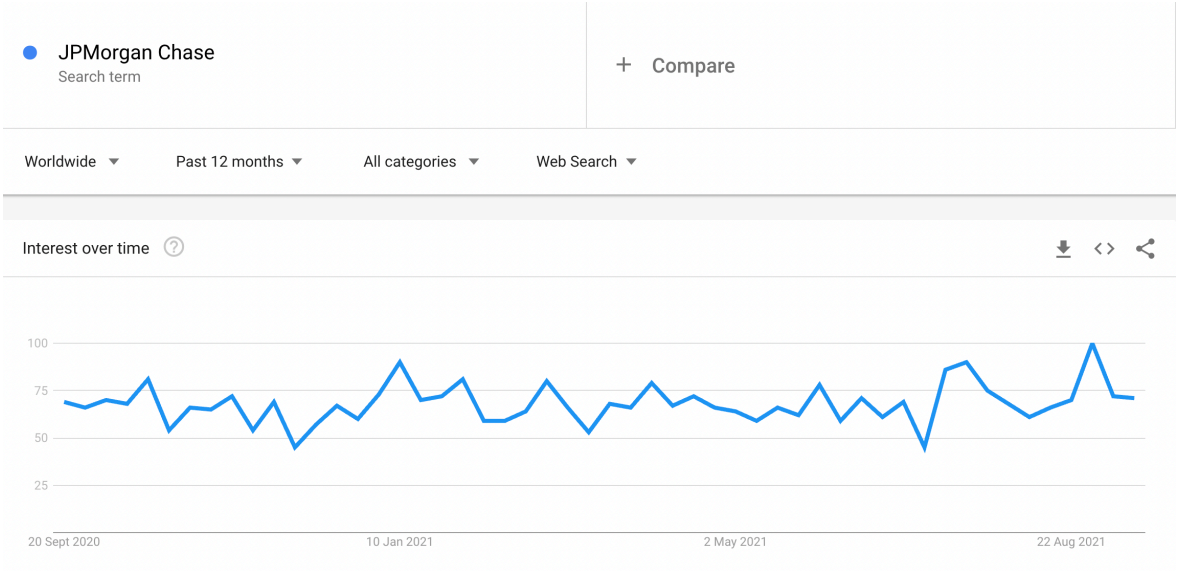

Figure 49: Graph indicating when "JPMorgan Chase" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

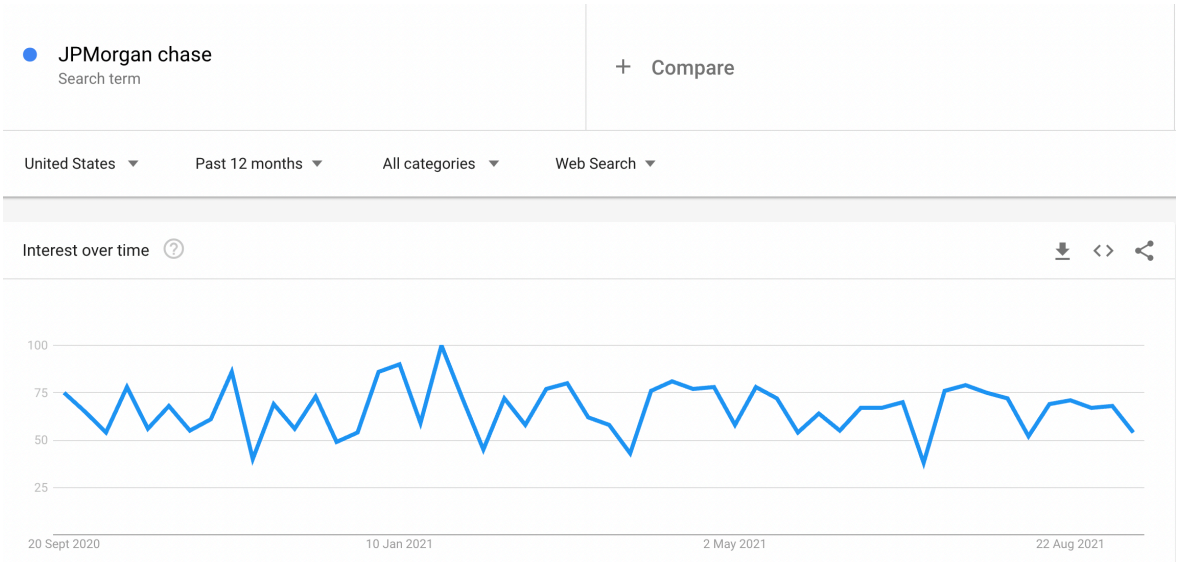

Figure 50: Graph indicating when "JPMorgan Chase" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 51: Stock chart "JPM" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

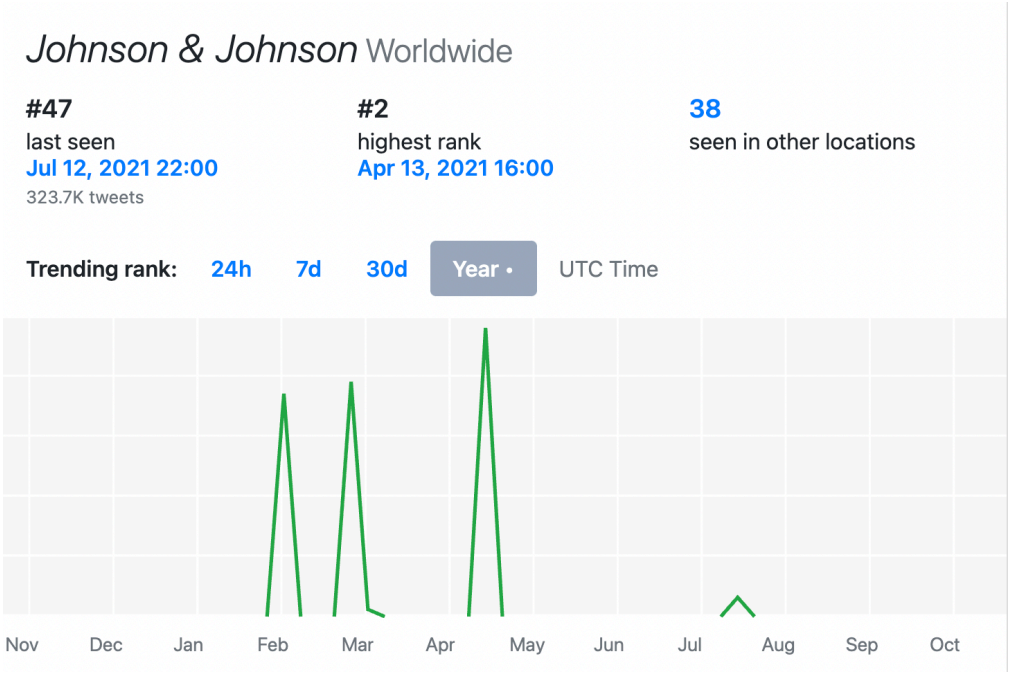

Figure 52: Graph indicating when "Johnson & Johnson" was trending on Twitter from 10/2020 until 10/2021 Worldwide

Source: https://getdaytrends.com/

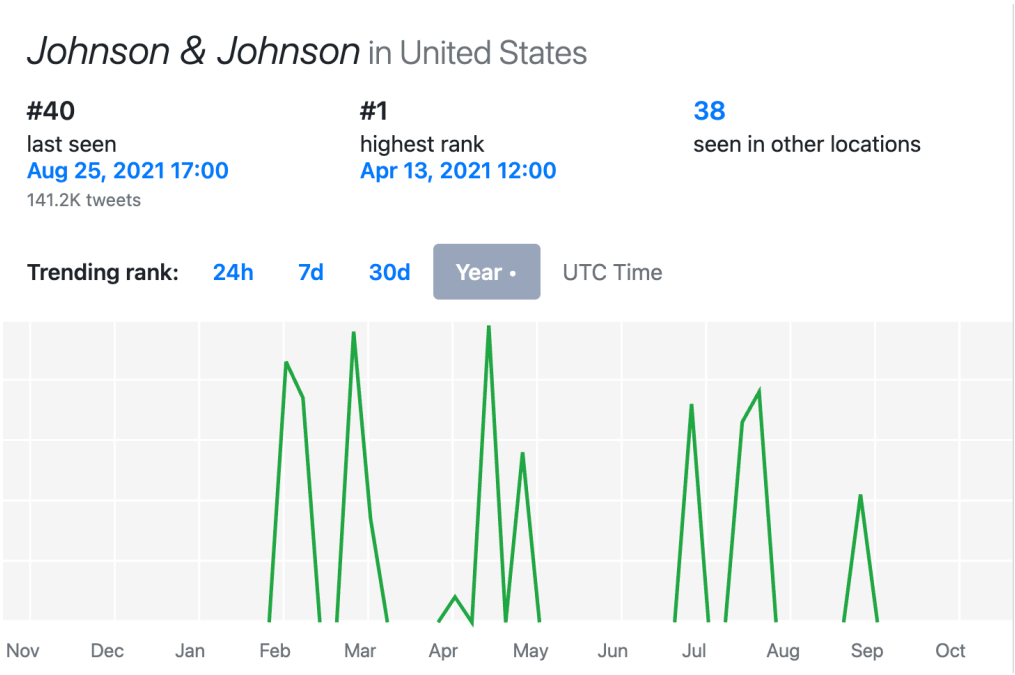

Figure 53: Graph indicating when "Johnson & Johnson" was trending on Twitter from 10/2020 until 10/2021 in the USA

Source: https://getdaytrends.com/

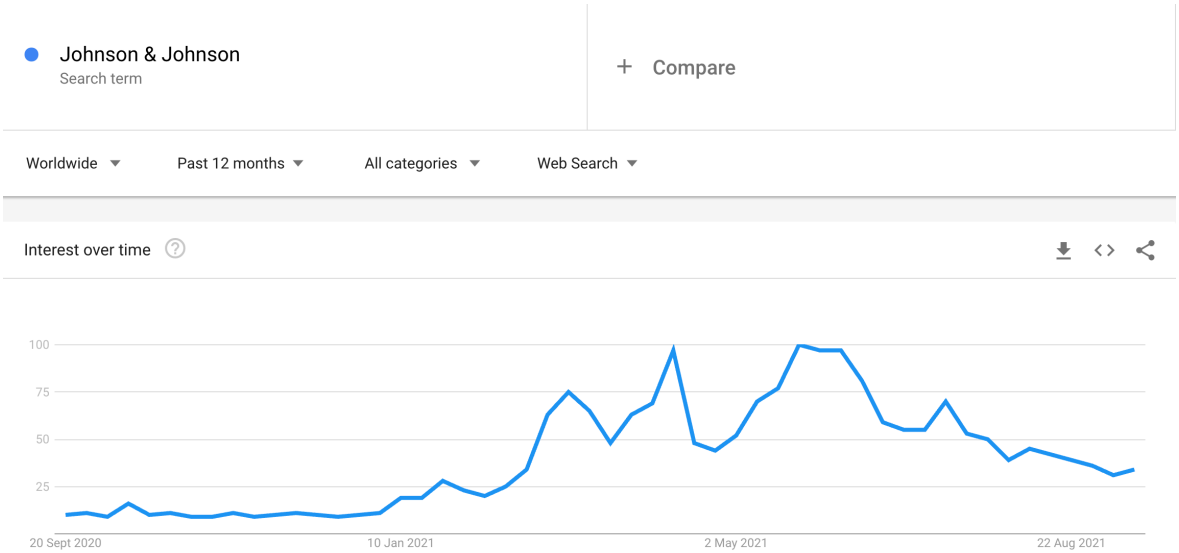

Figure 54: Graph indicating when "Johnson & Johnson" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

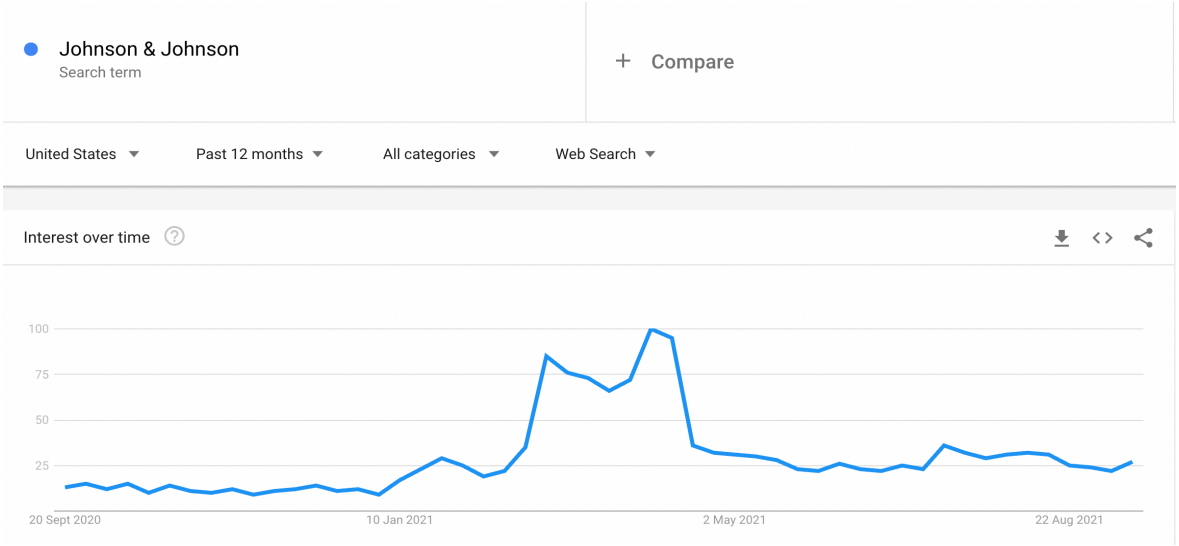

Figure 55: Graph indicating when "Johnson & Johnson" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

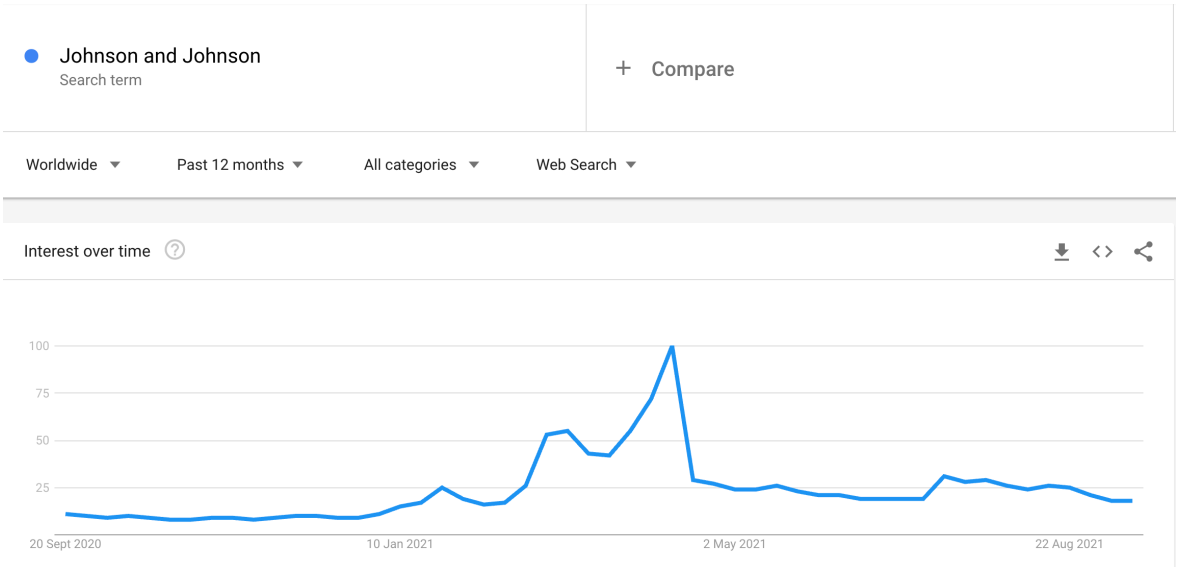

Figure 56: Graph indicating when "Johnson and Johnson" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

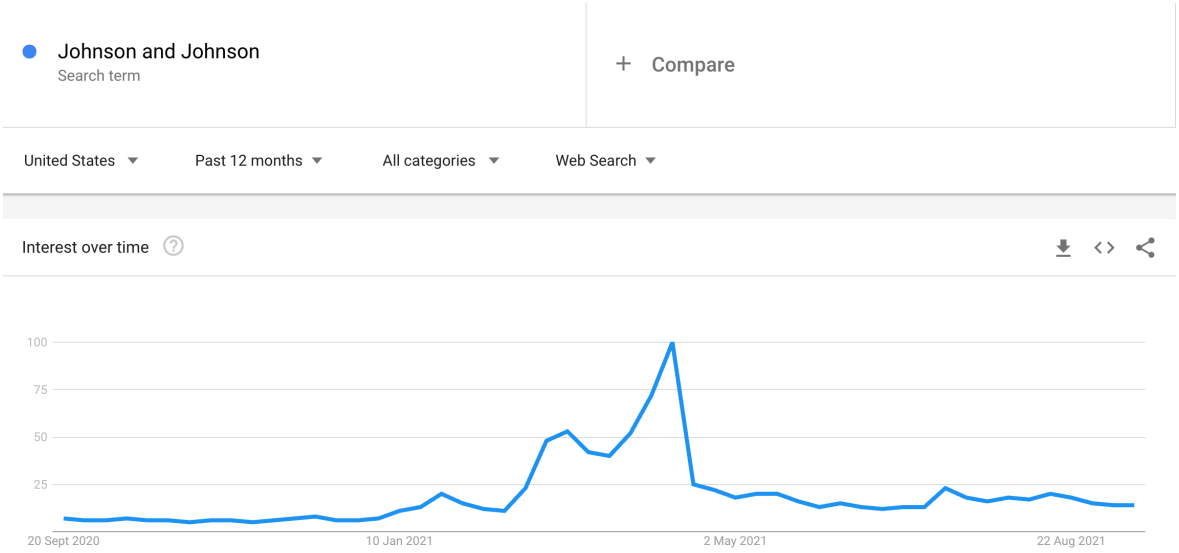

Figure 57: Graph indicating when "Johnson and Johnson" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 58: Stock chart "JNJ" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

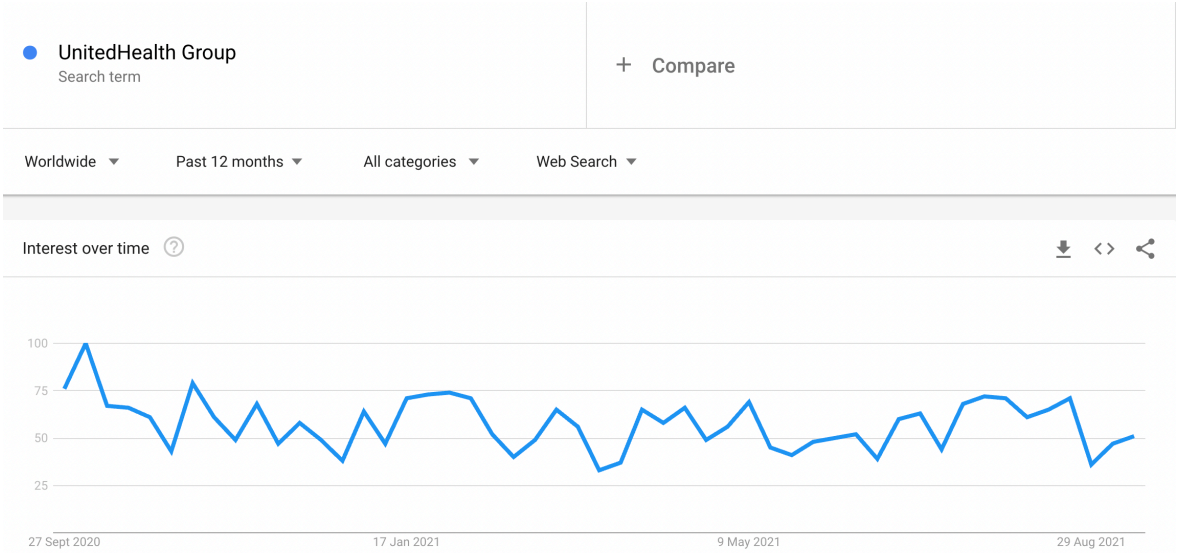

Figure 59: Graph indicating when "UnitedHealth Group" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

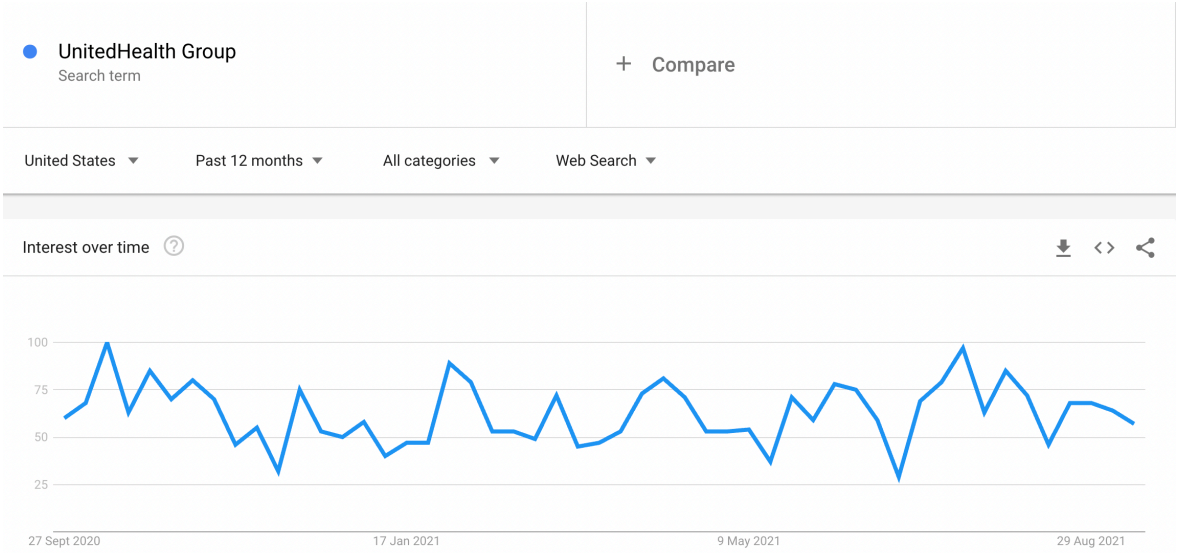

Figure 60: Graph indicating when "UnitedHealth Group" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 61: Stock chart "UNH" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

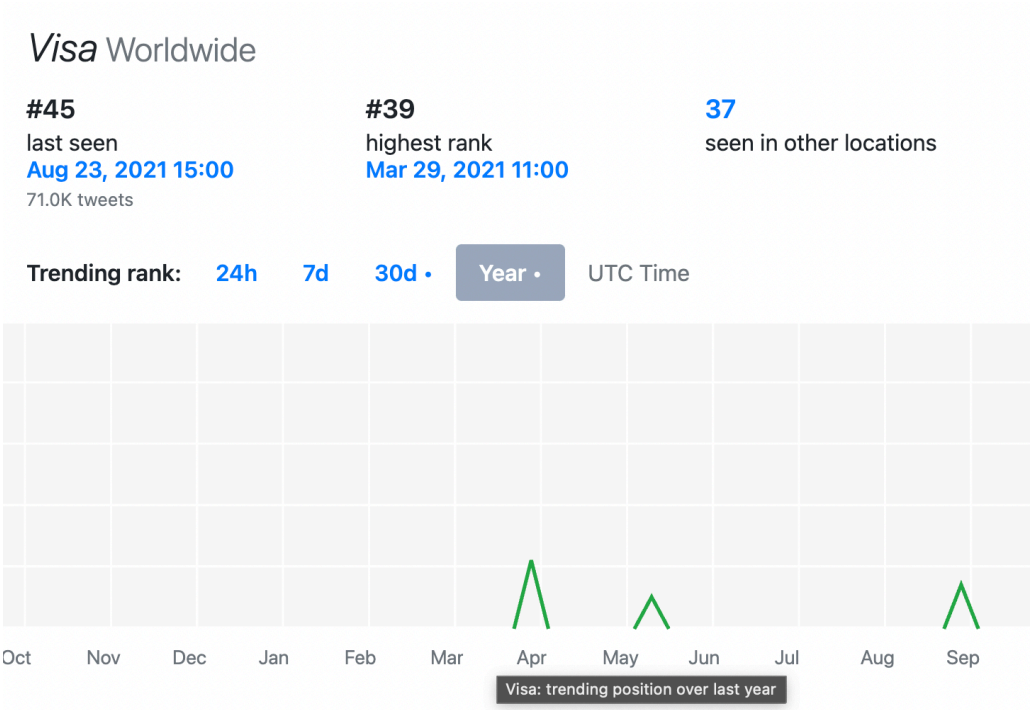

Figure 62: Graph indicating when "Visa" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

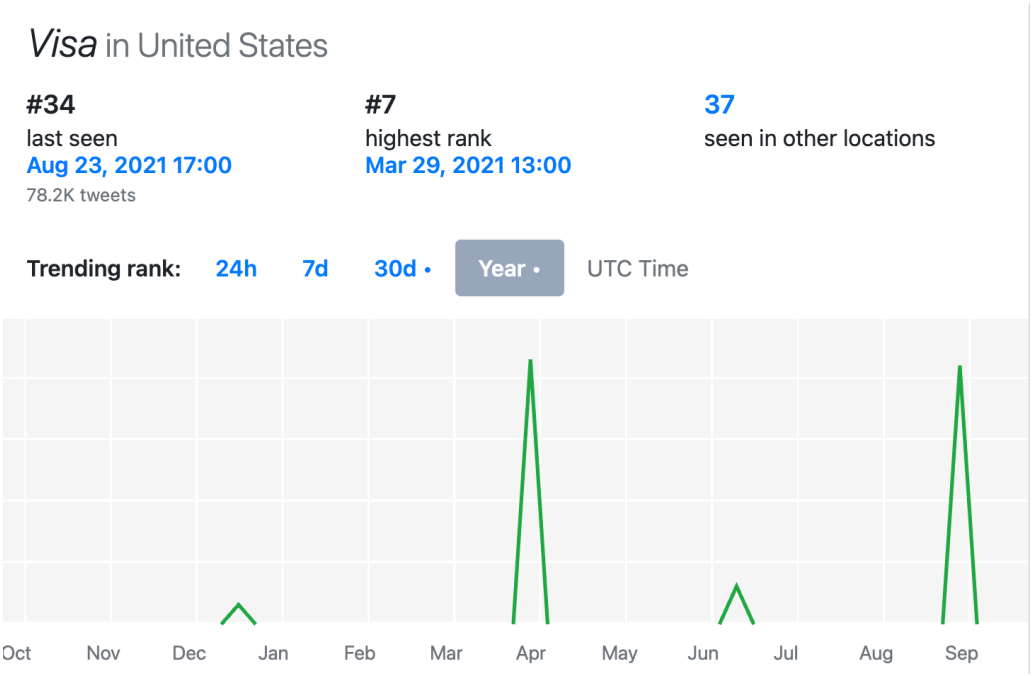

Figure 63: Graph indicating when "Visa" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

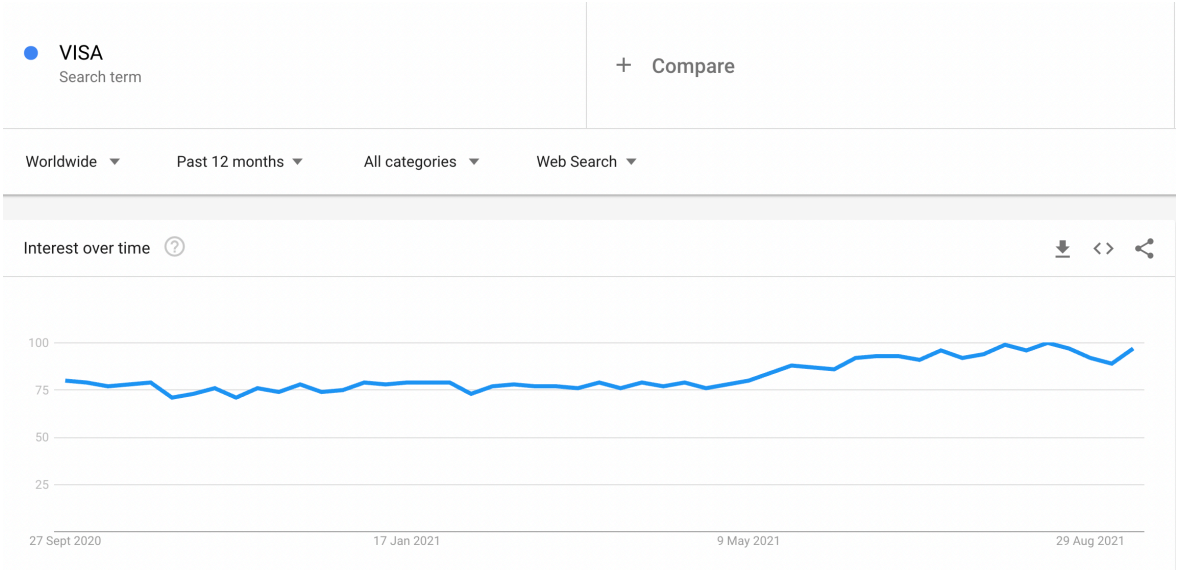

Figure 64: Graph indicating when "Visa" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

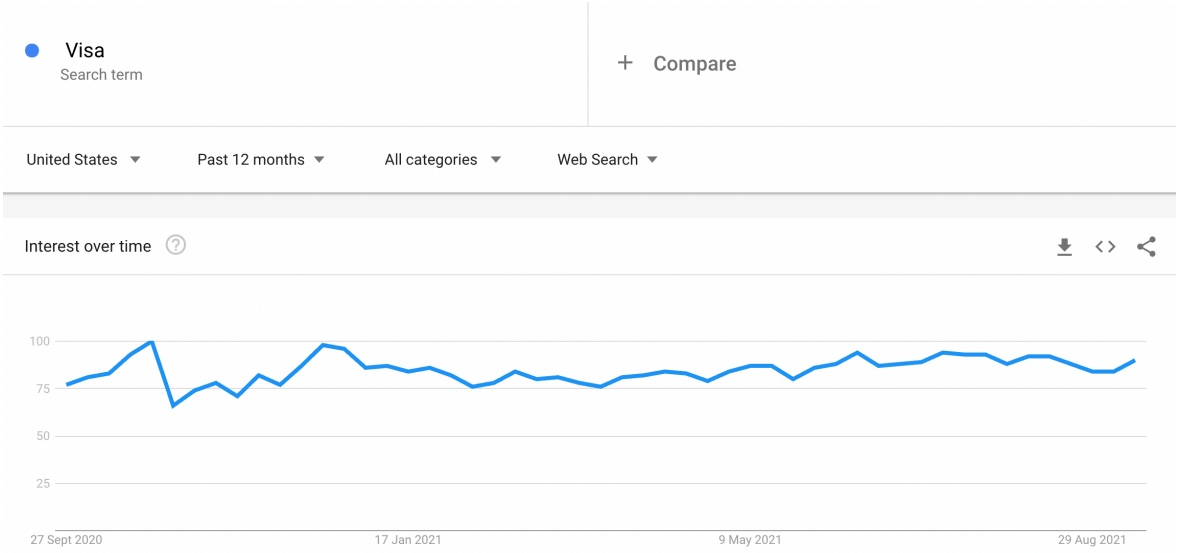

Figure 65: Graph indicating when "Visa" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 66: Stock chart "V" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

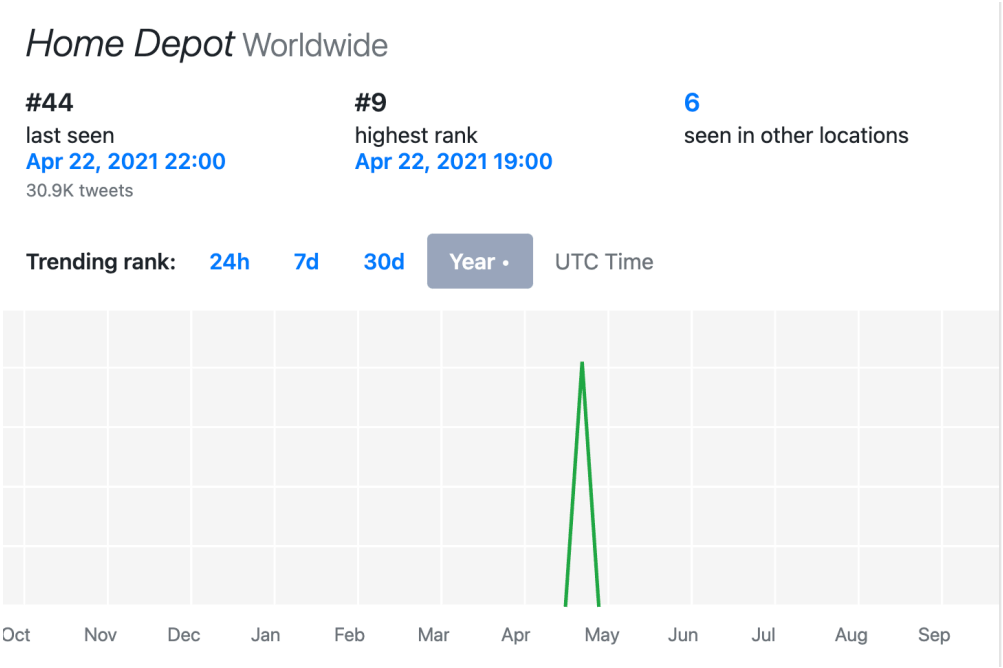

Figure 67: Graph indicating when "Home Depot" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

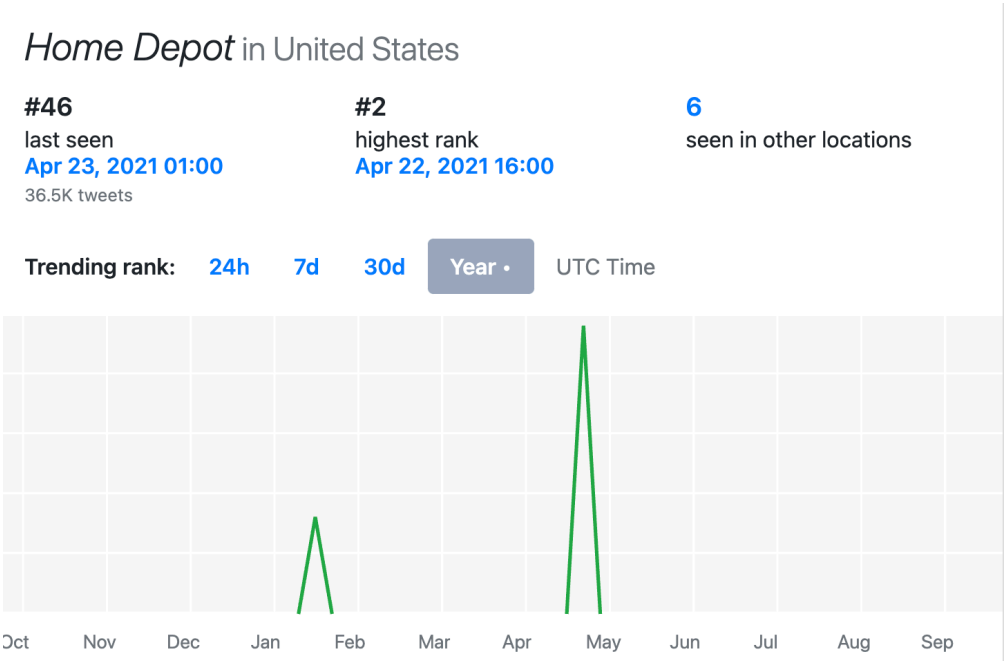

Figure 68: Graph indicating when "Home Depot" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

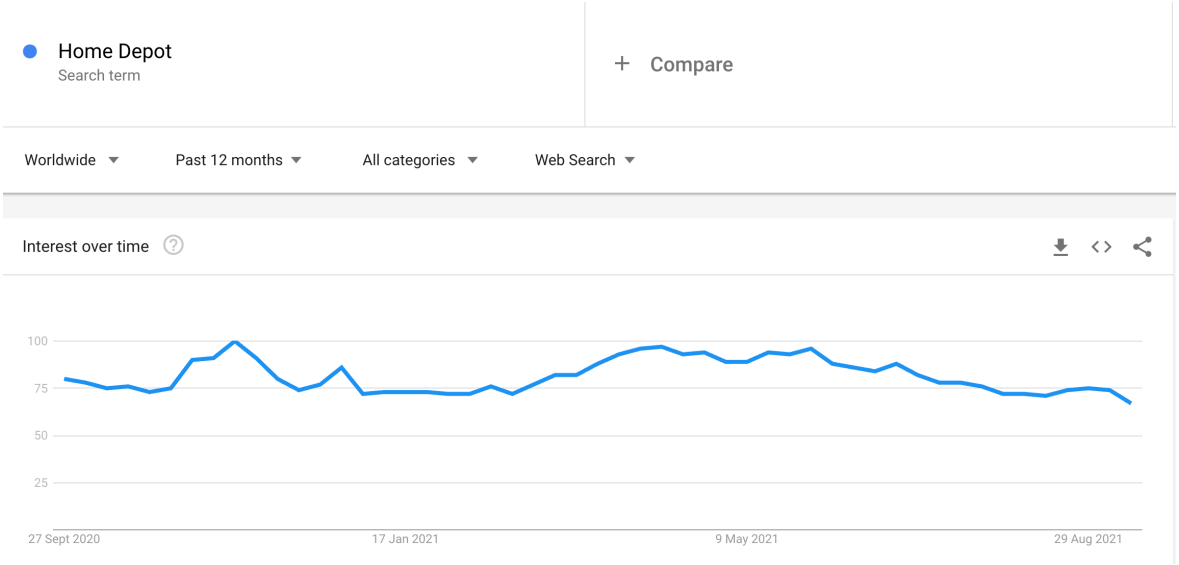

Figure 69: Graph indicating when "Home Depot" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

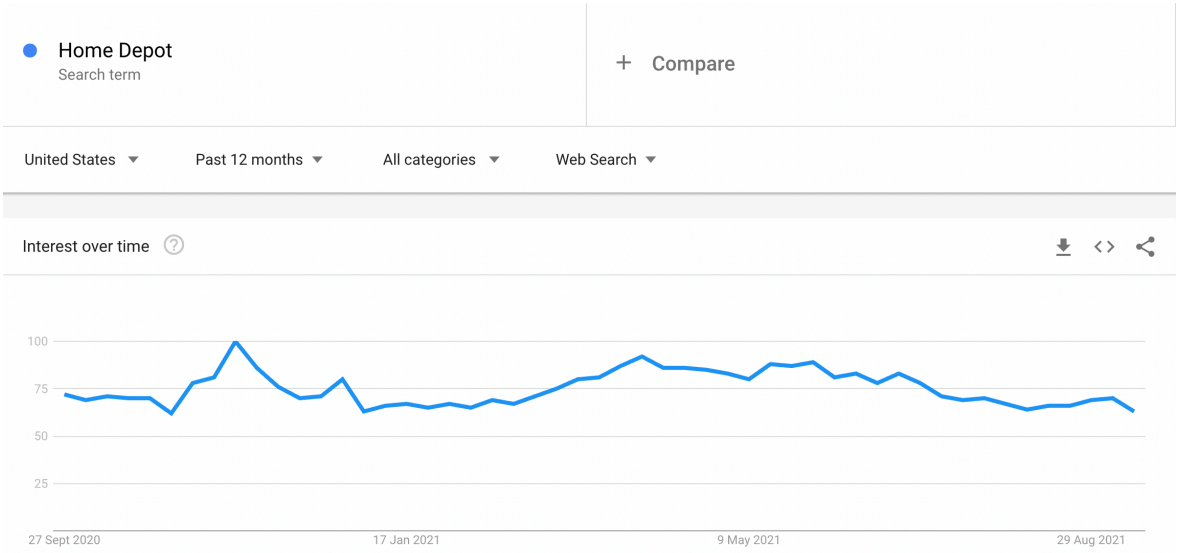

Figure 70: Graph indicating when "Home Depot" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 71: Stock chart "HD" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

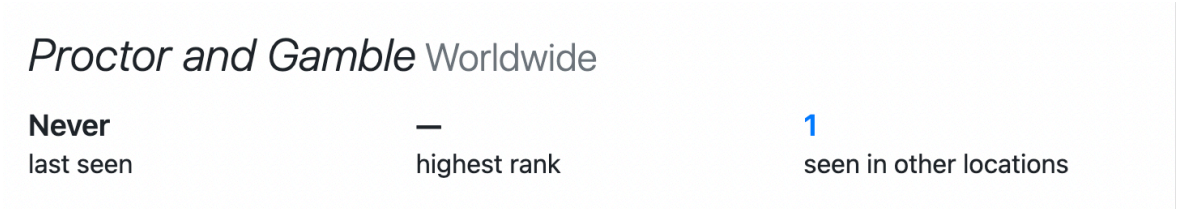

Figure 72: Image indicating when "Proctor and Gamble" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

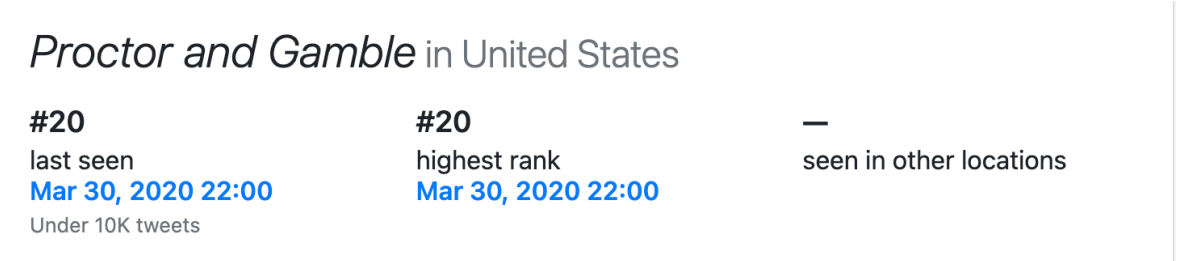

Figure 73: Image indicating when "Proctor and Gamble" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

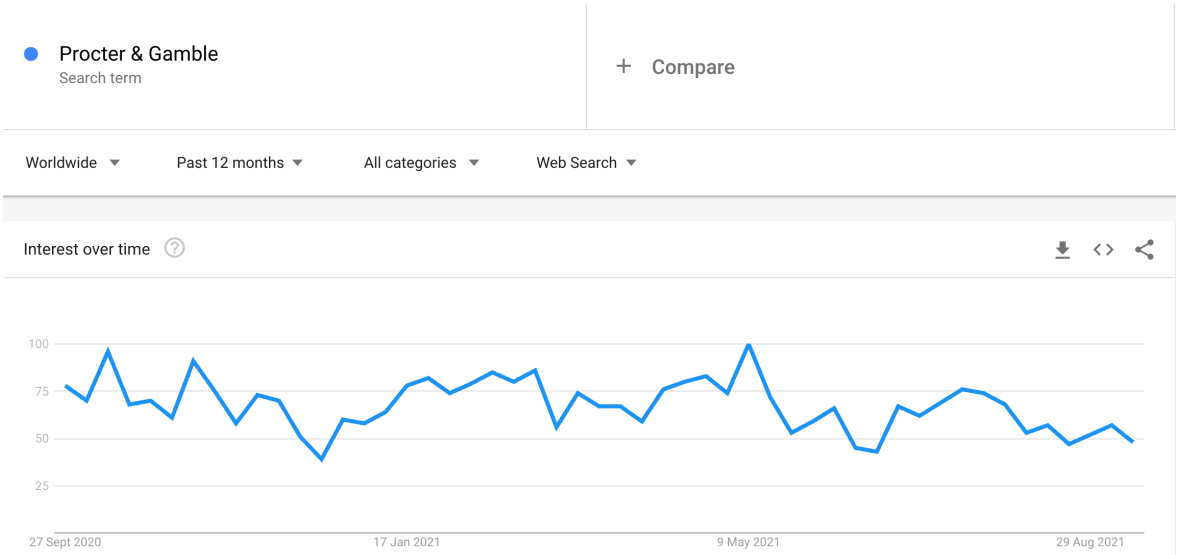

Figure 74: Graph indicating when "Procter & Gamble" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

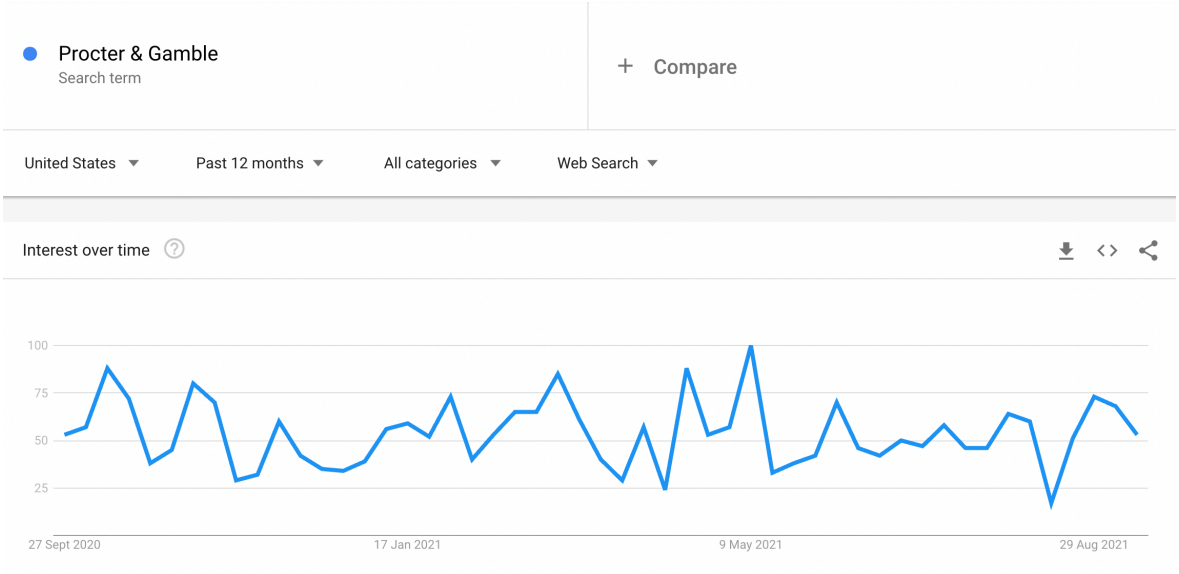

Figure 75: Graph indicating when "Procter & Gamble" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 76: Stock chart "PG" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

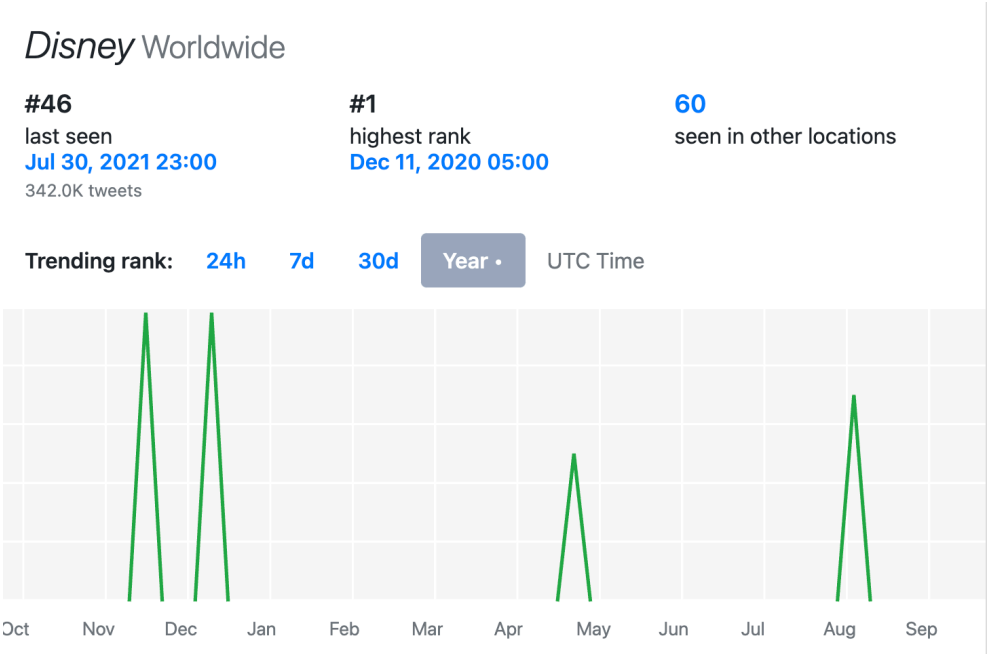

Figure 77: Graph indicating when "Disney" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

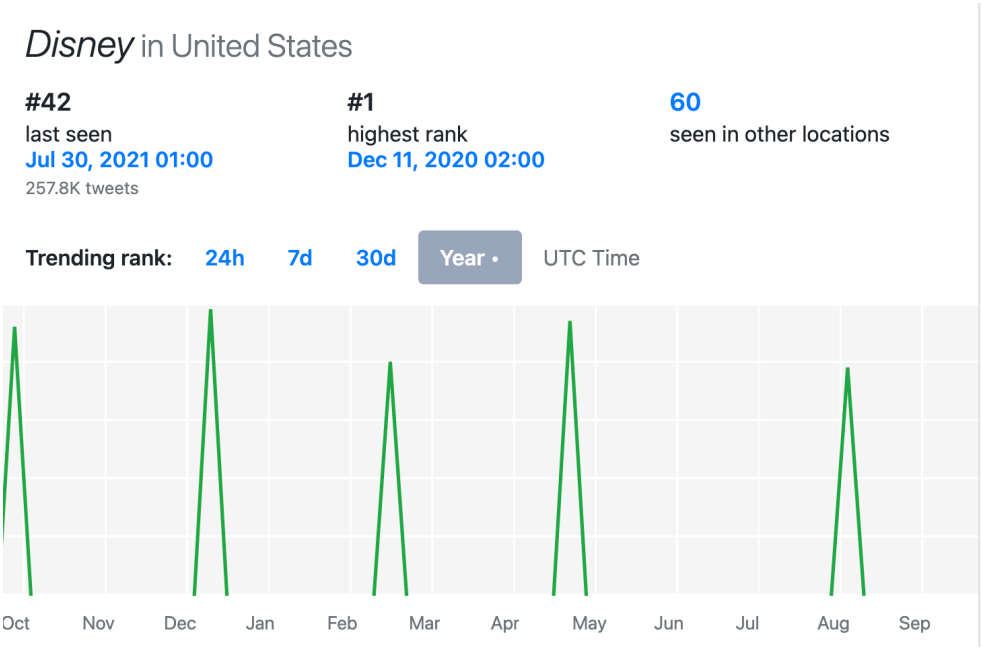

Figure 78: Graph indicating when "Disney" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

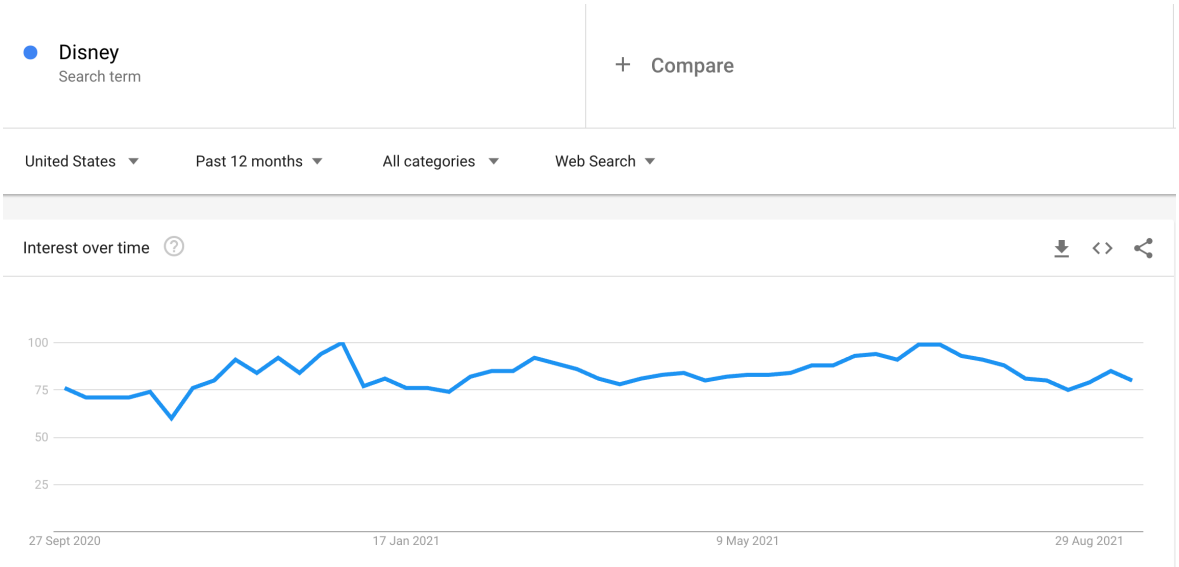

Figure 79: Graph indicating when "Disney" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

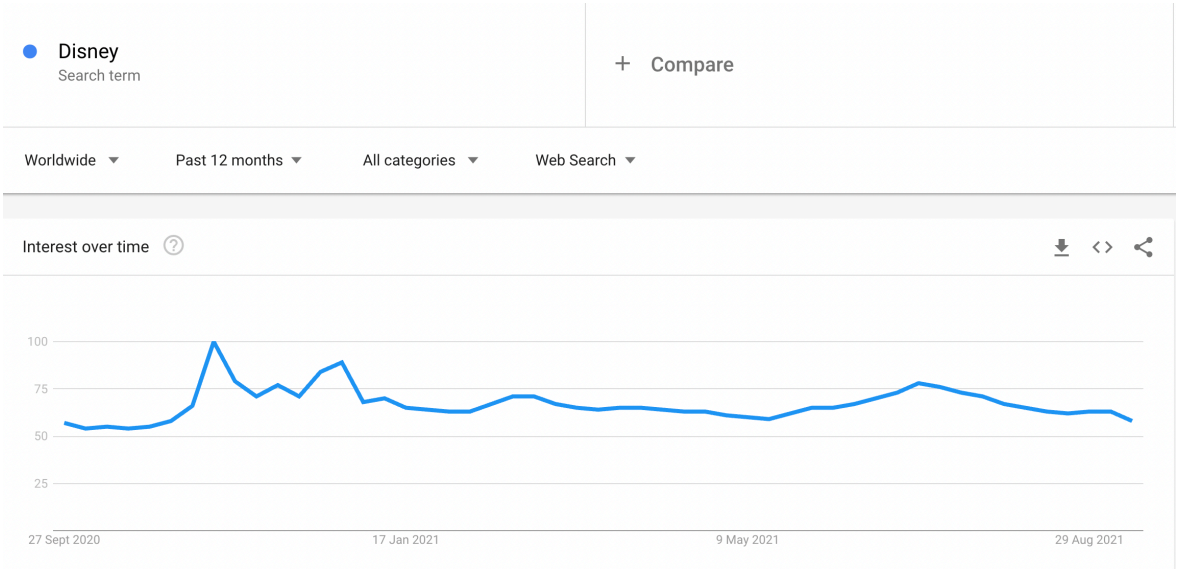

Figure 80: Graph indicating when "Disney" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 81: Stock chart "DIS" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

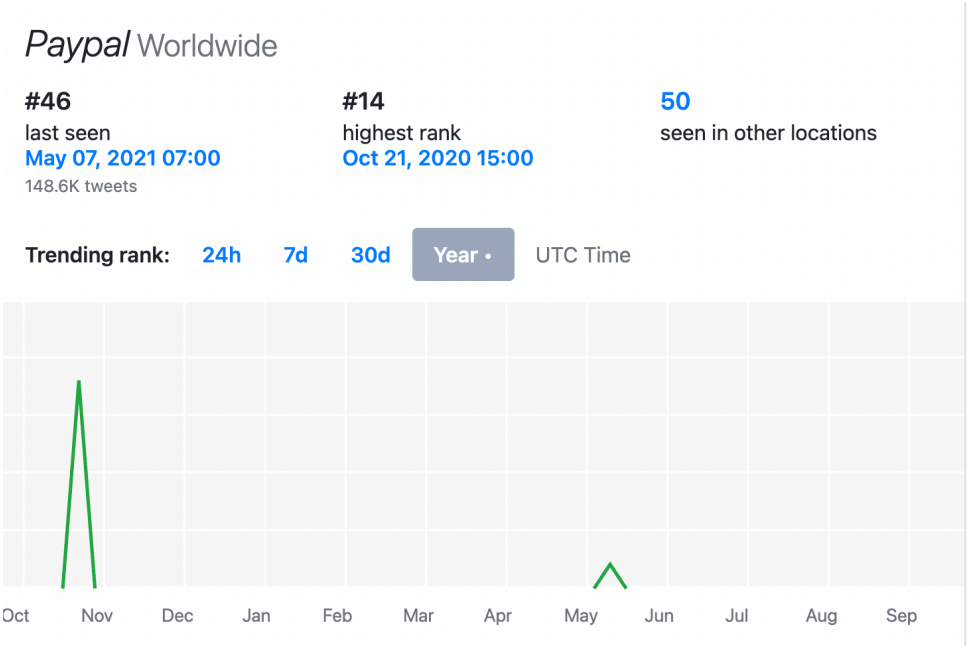

Figure 82: Graph indicating when "Paypal" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

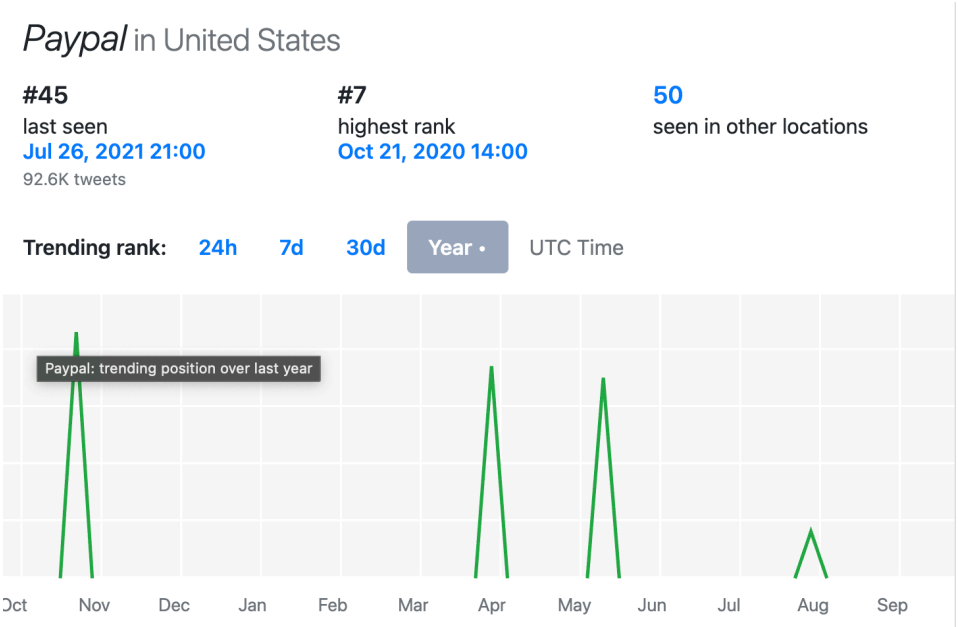

Figure 83: Graph indicating when "Paypal" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

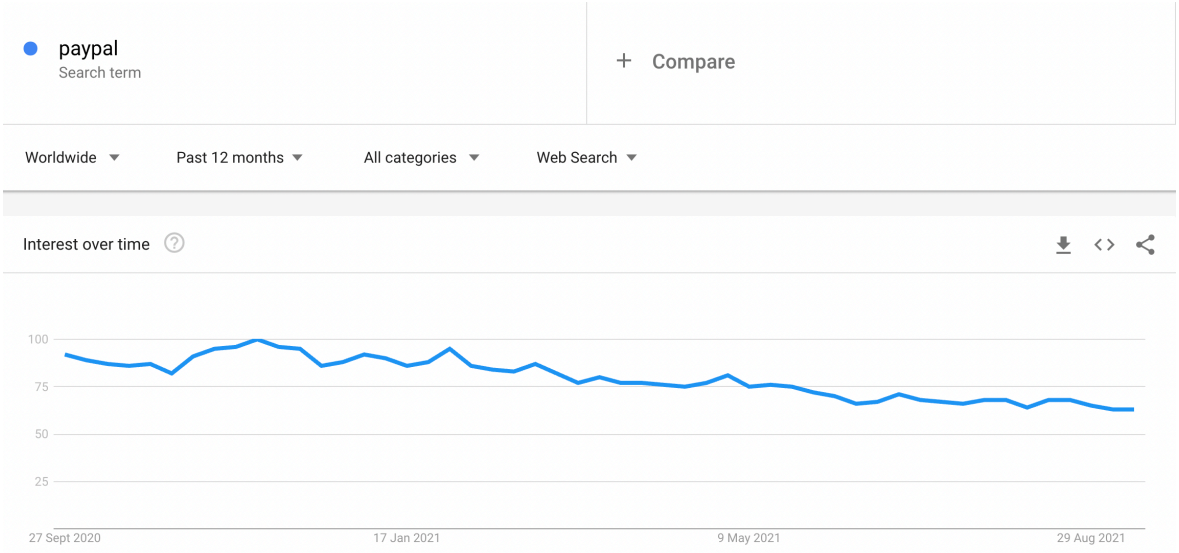

Figure 84: Graph indicating when "Paypal" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

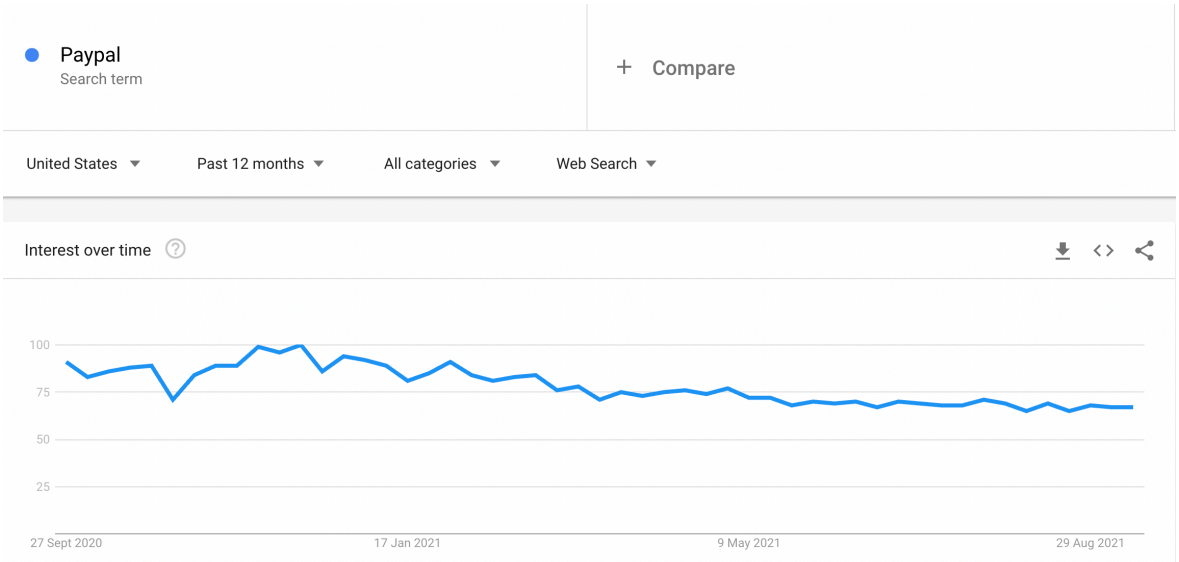

Figure 85: Graph indicating when "Paypal" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 86: Stock chart "PYPL" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

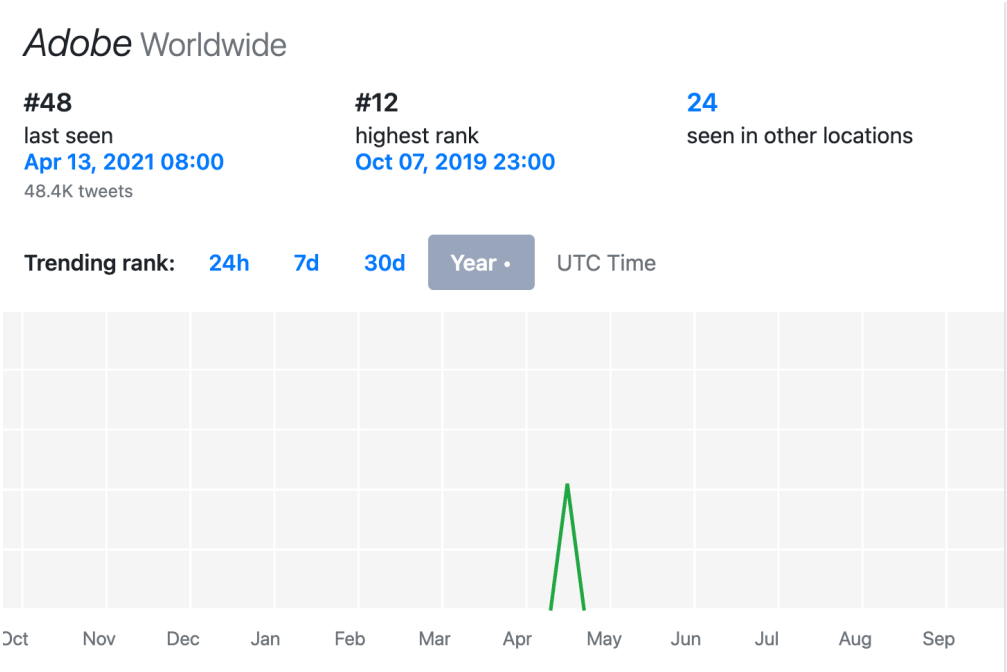

Figure 87: Graph indicating when "Adobe" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

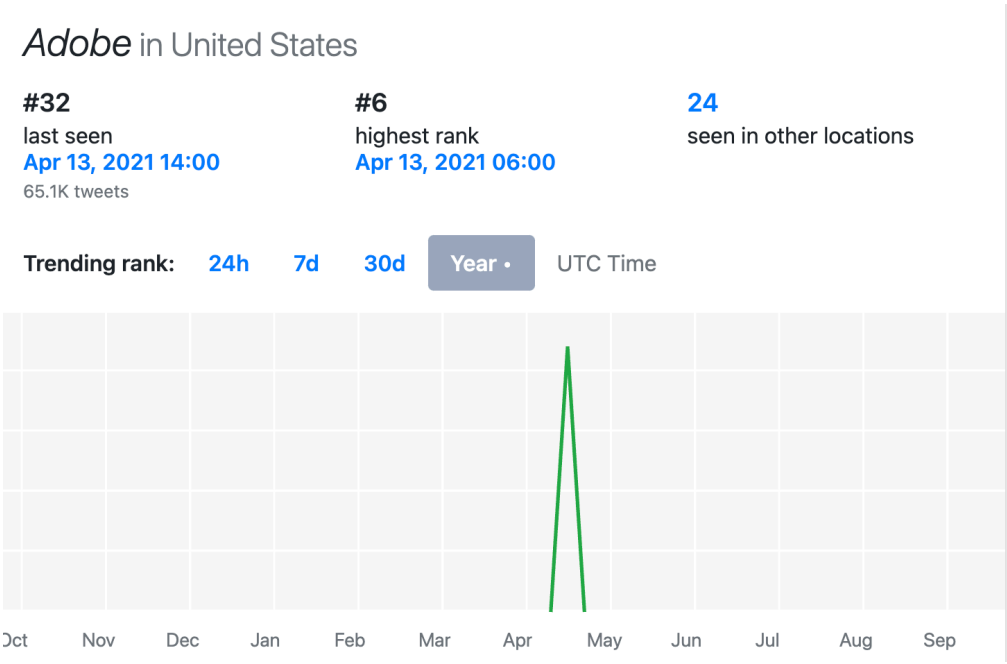

Figure 88: Graph indicating when "Adobe" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

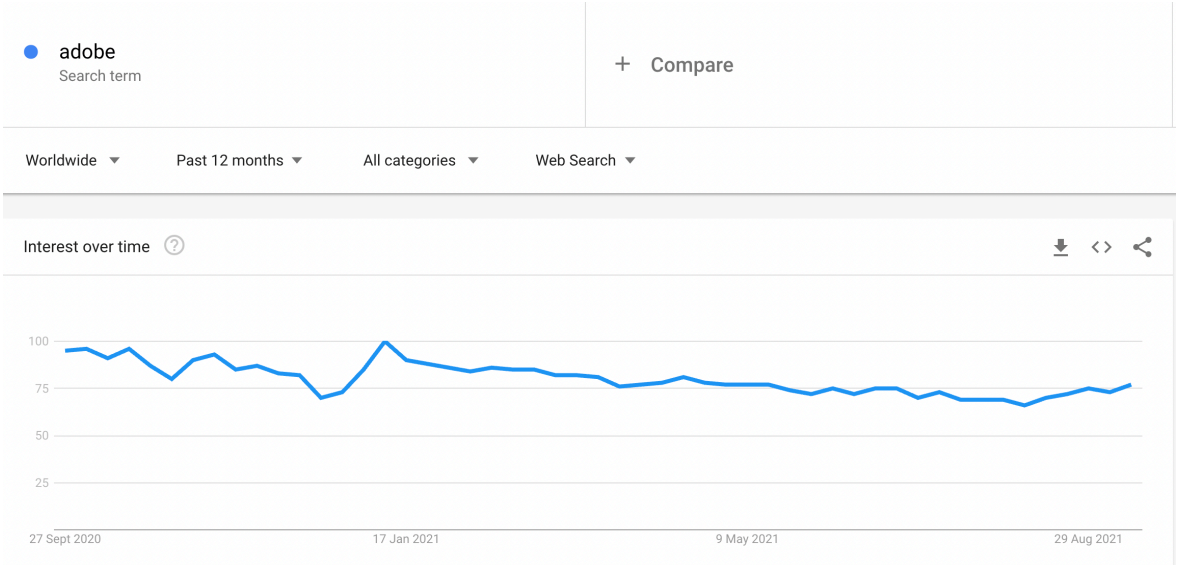

Figure 89: Graph indicating when "Adobe" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

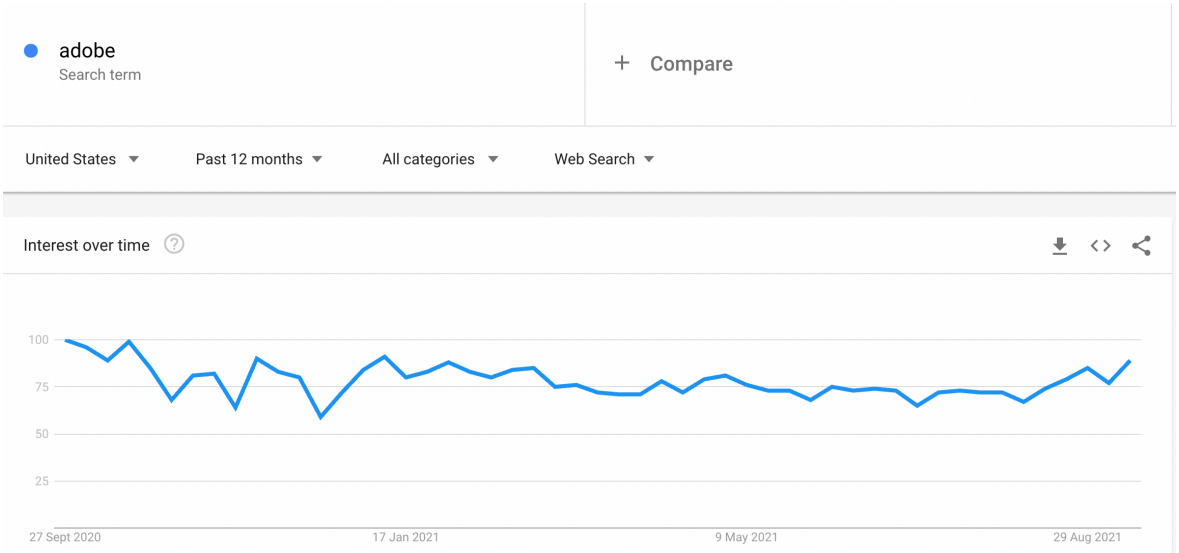

Figure 90: Graph indicating when "Adobe" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 91: Stock chart "ADBE" NASDAQ from 09/2020 until 09/2021

Source: https://www.tradingview.com/

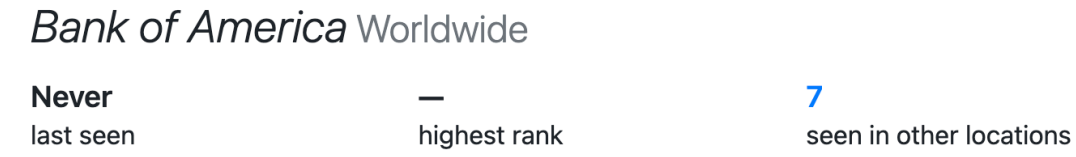

Figure 92: Image indicating when "Bank of America" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

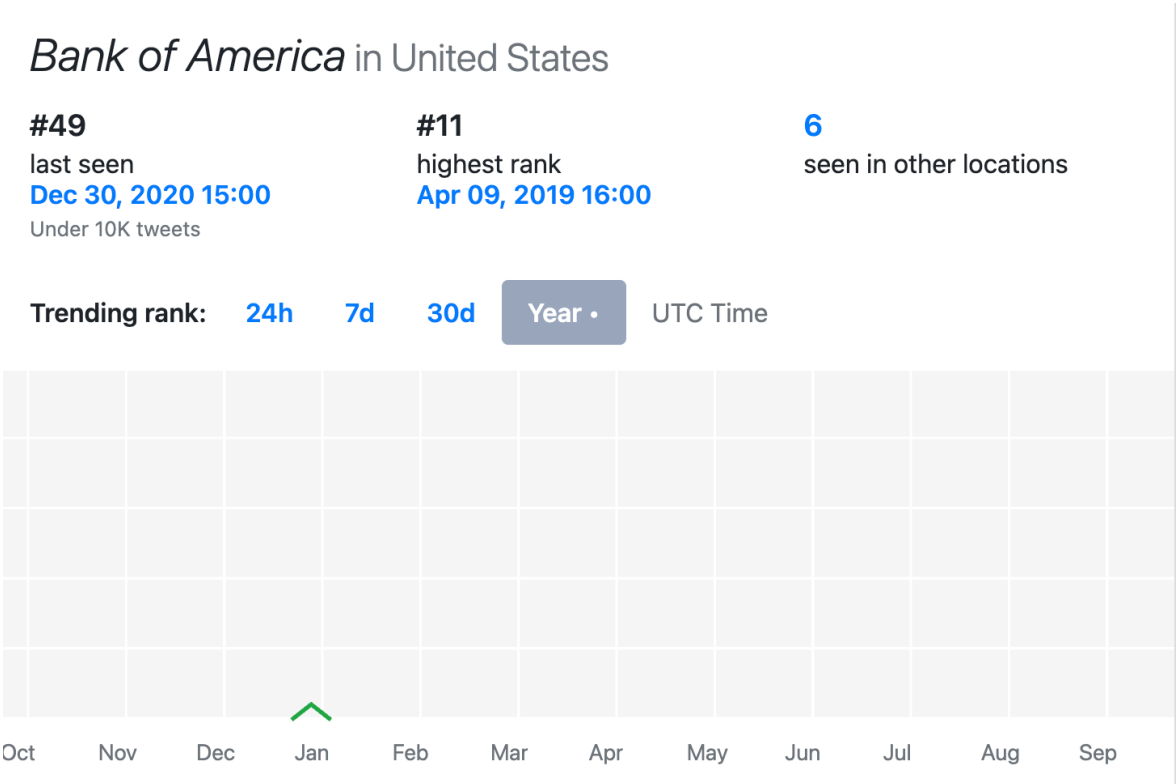

Figure 93: Graph indicating when "Bank of America" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

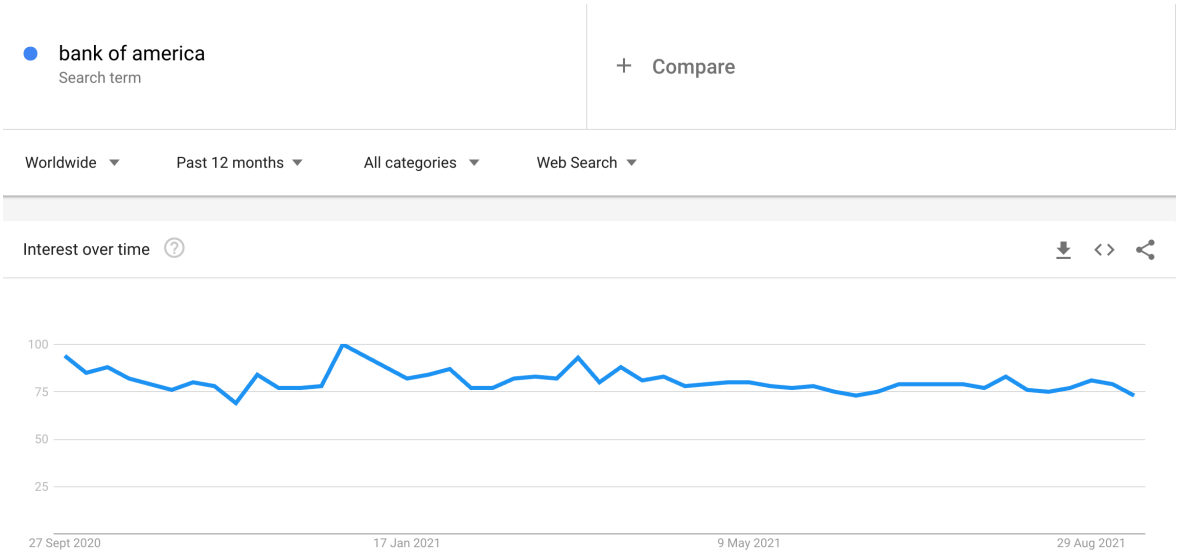

Figure 94: Graph indicating when "Bank of America" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

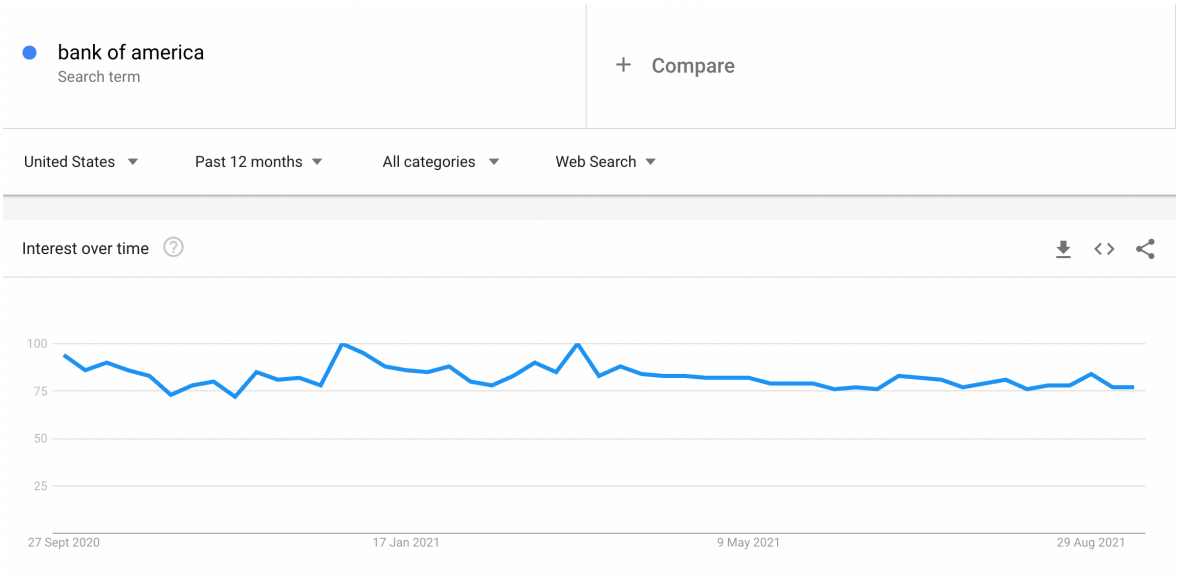

Figure 95: Graph indicating when "Bank of America" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 96: Stock chart "BAC" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

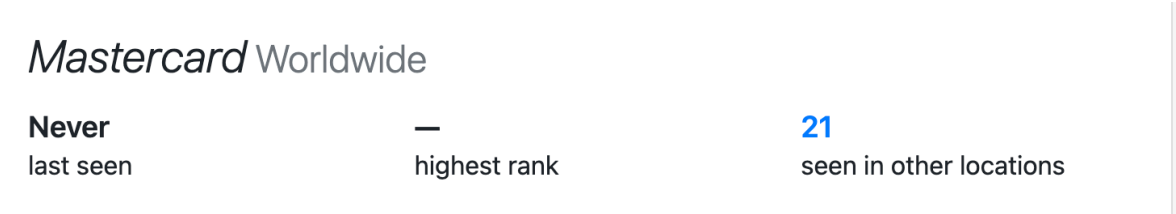

Figure 97: Image indicating when "Mastercard" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

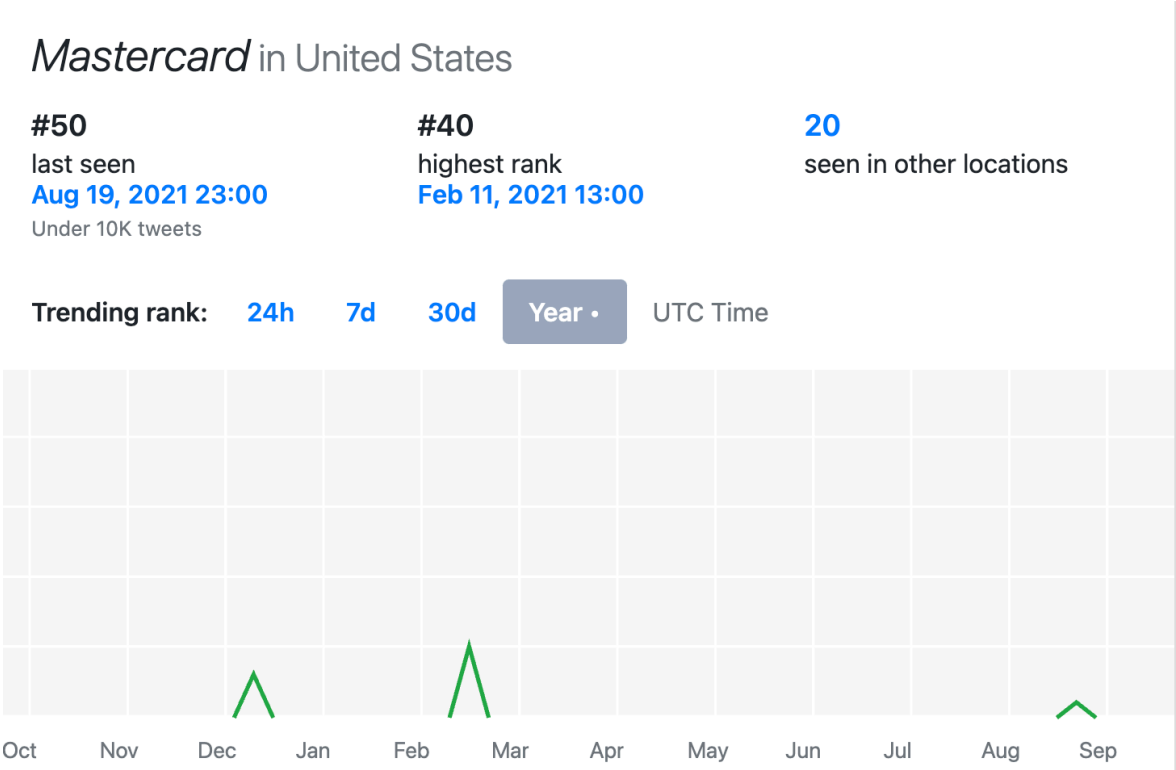

Figure 98: Graph indicating when "Mastercard" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

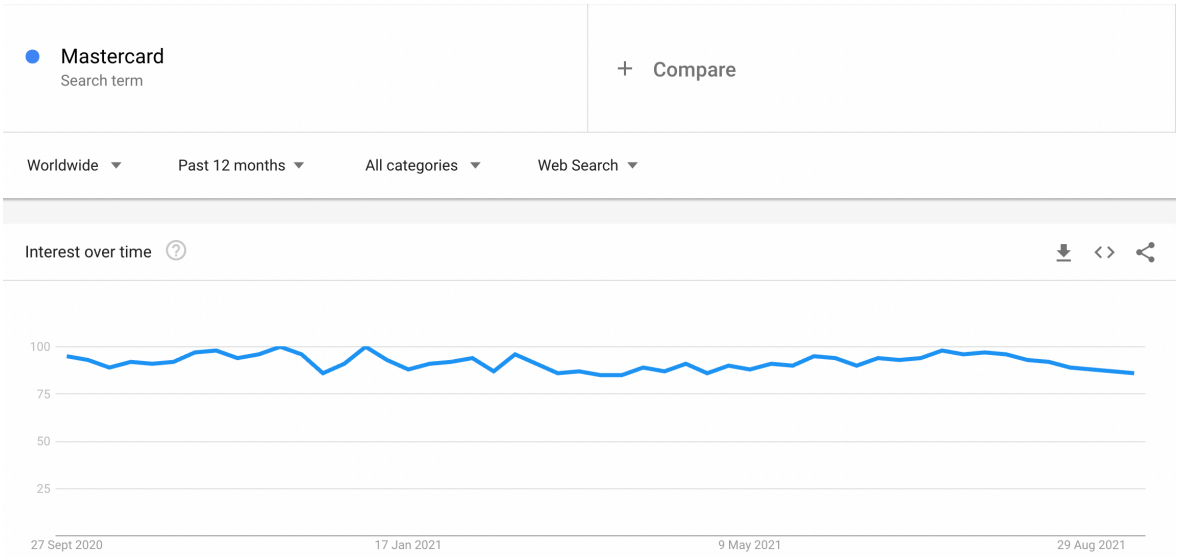

Figure 99: Graph indicating when "Mastercard" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

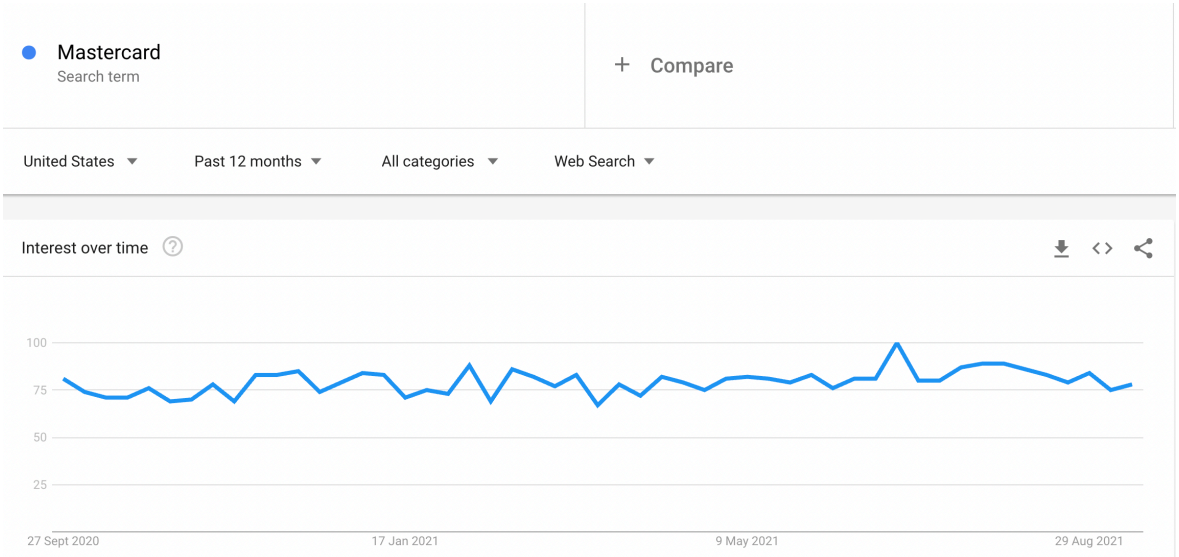

Figure 100: Graph indicating when "Mastercard" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

Figure 101: Stock chart "MA" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

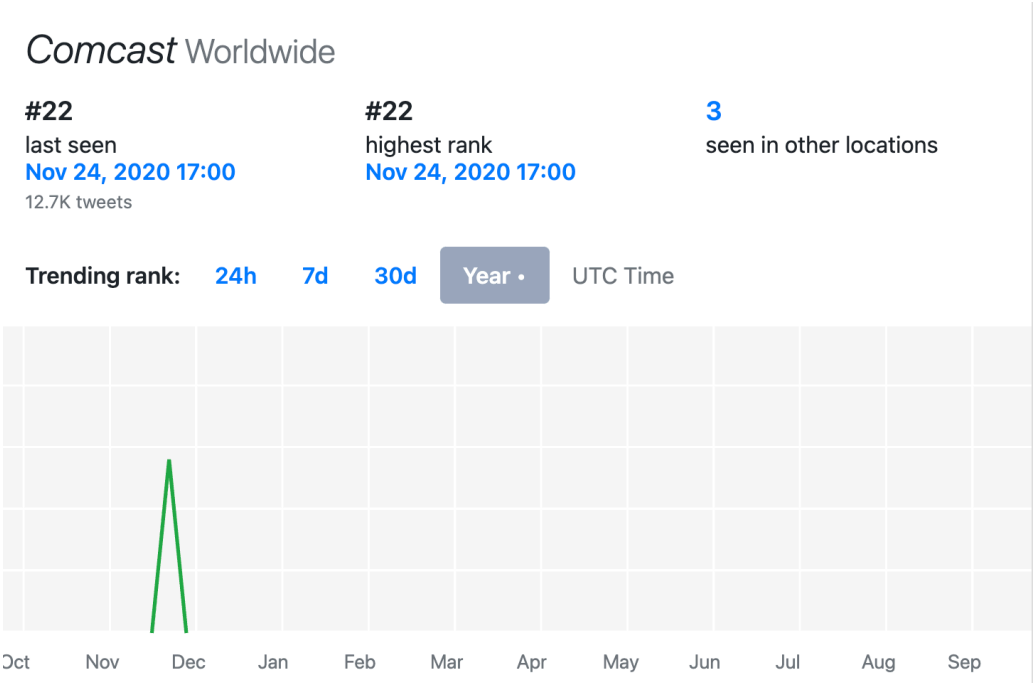

Figure 102: Graph indicating when "Comcast" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

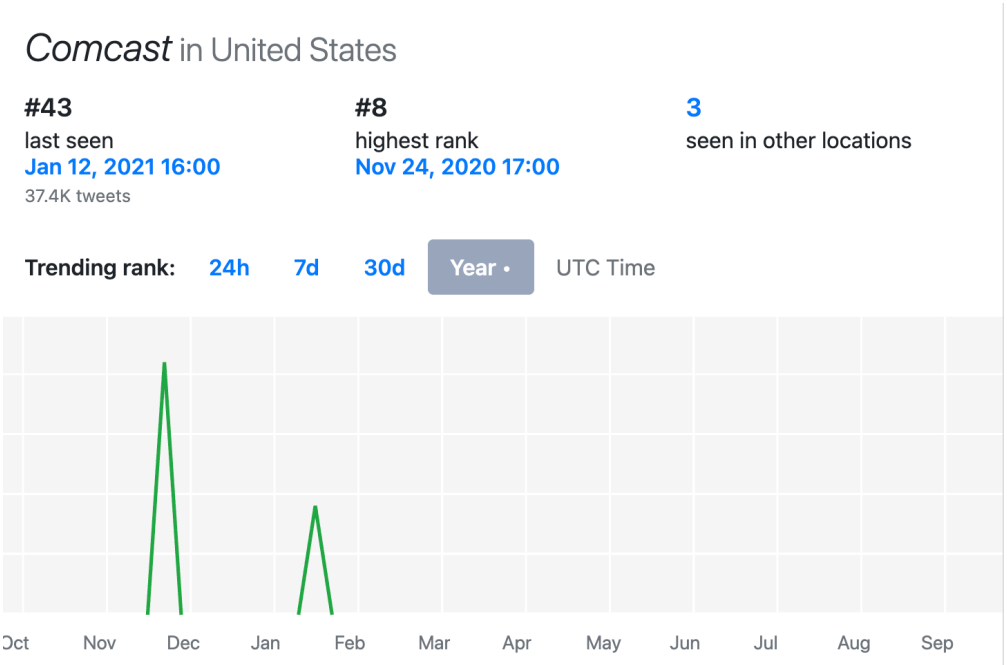

Figure 103: Graph indicating when "Comcast" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

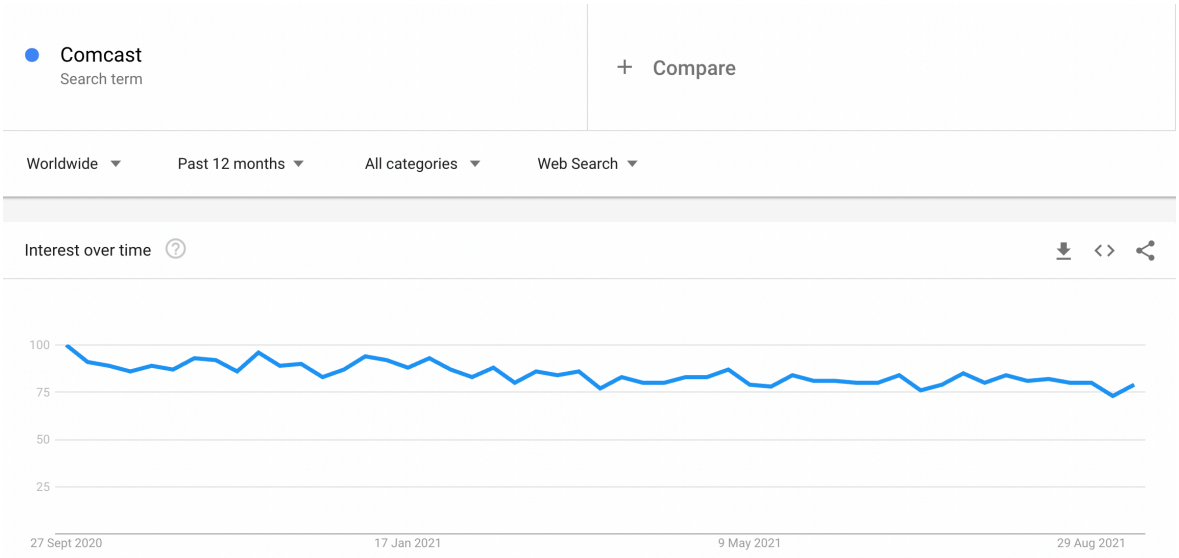

Figure 104: Graph indicating when "Comcast" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

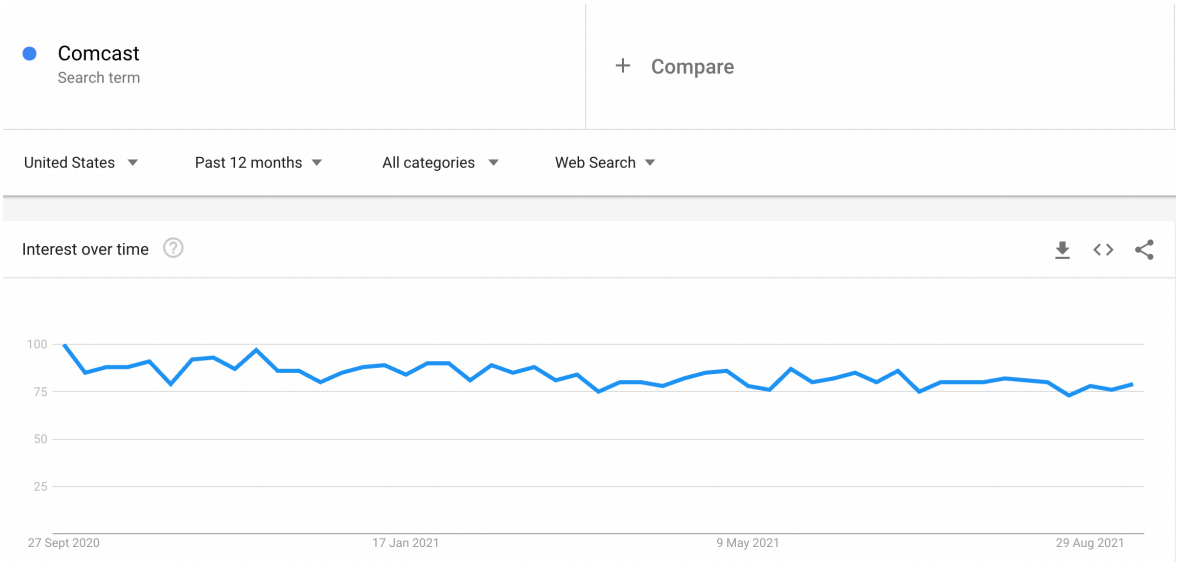

Figure 105: Graph indicating when "Comcast" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 106: Stock chart "CMCSA" NASDAQ from 09/2020 until 09/2021

Source: https://www.tradingview.com/

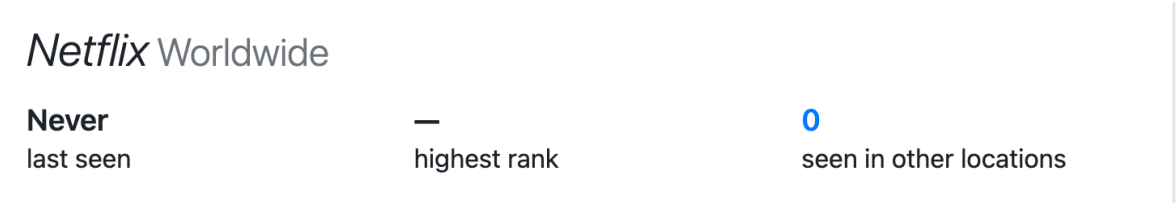

Figure 107: Image indicating when "Netflix" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

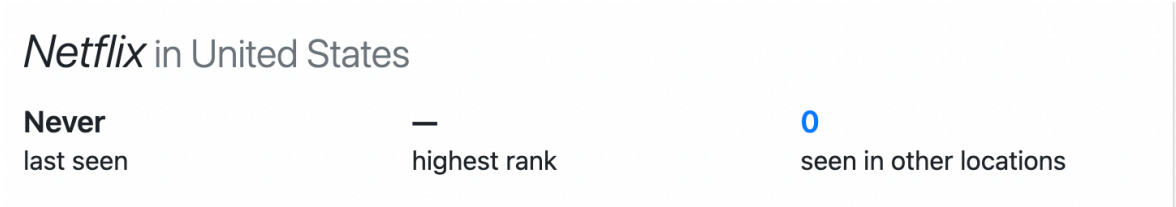

Figure 108: Image indicating when "Netflix" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

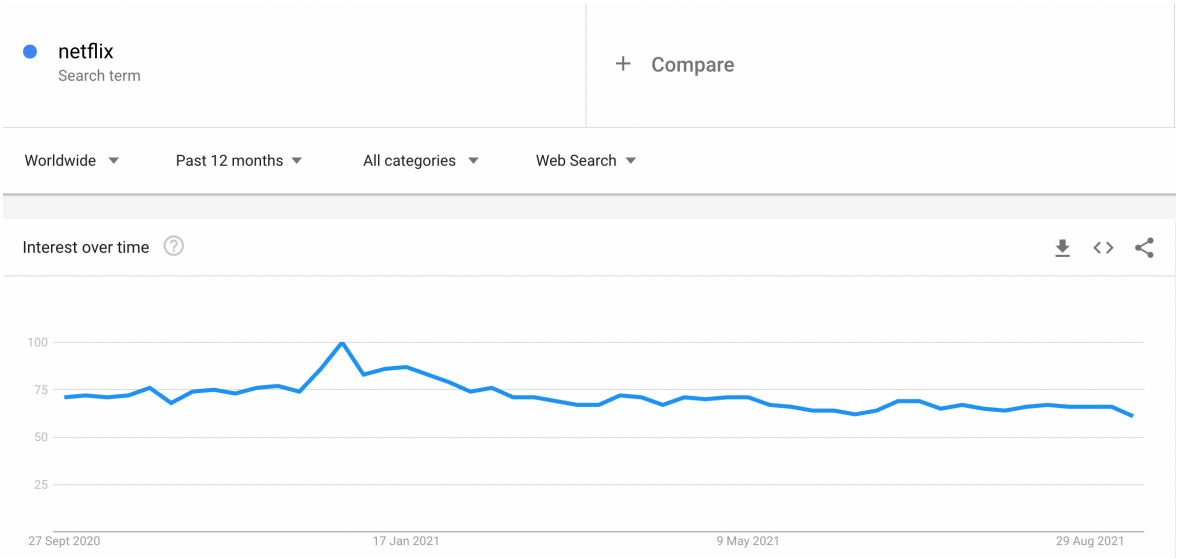

Figure 109: Graph indicating when "Netflix" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

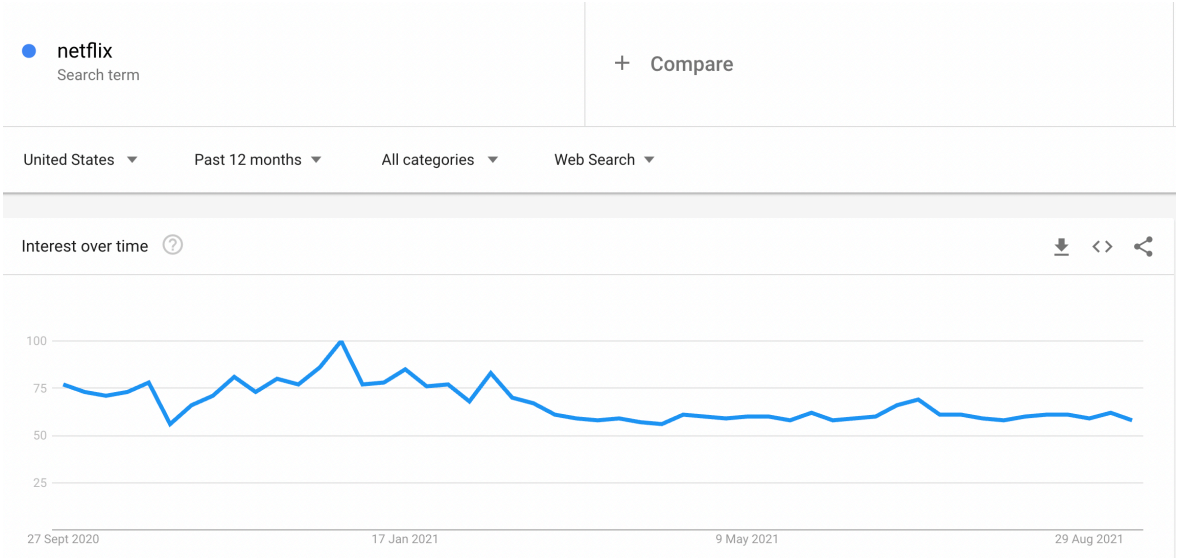

Figure 110: Graph indicating when "Netflix" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 111: Stock chart "NFLX" NASDAQ from 09/2020 until 09/2021

Source: https://www.tradingview.com/

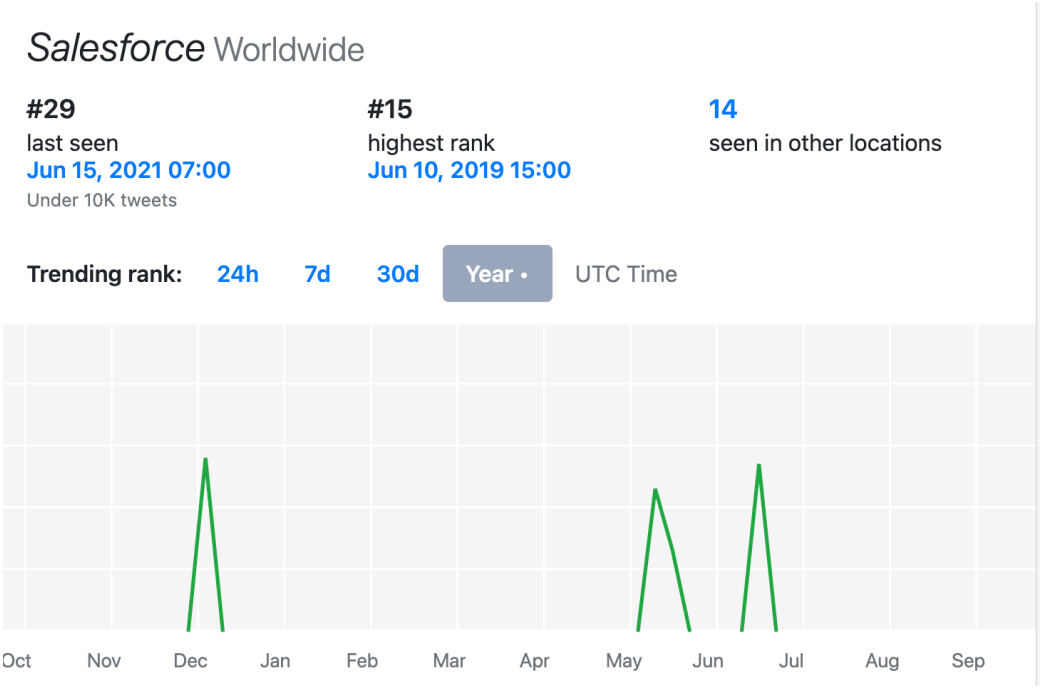

Figure 112: Graph indicating when "Salesforce" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

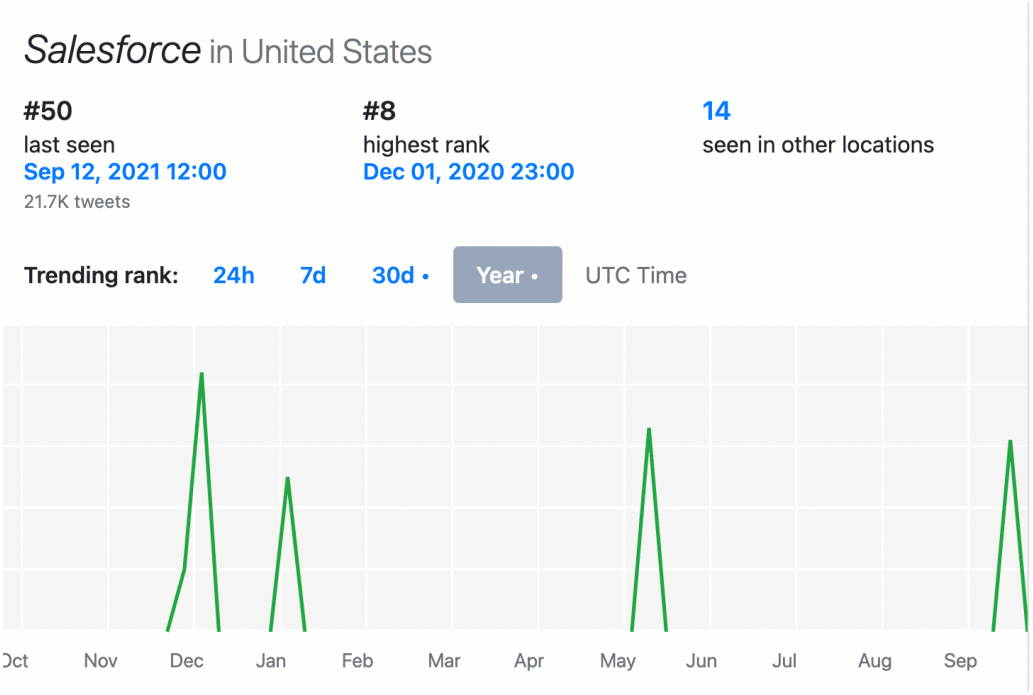

Figure 113: Graph indicating when "Salesforce" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

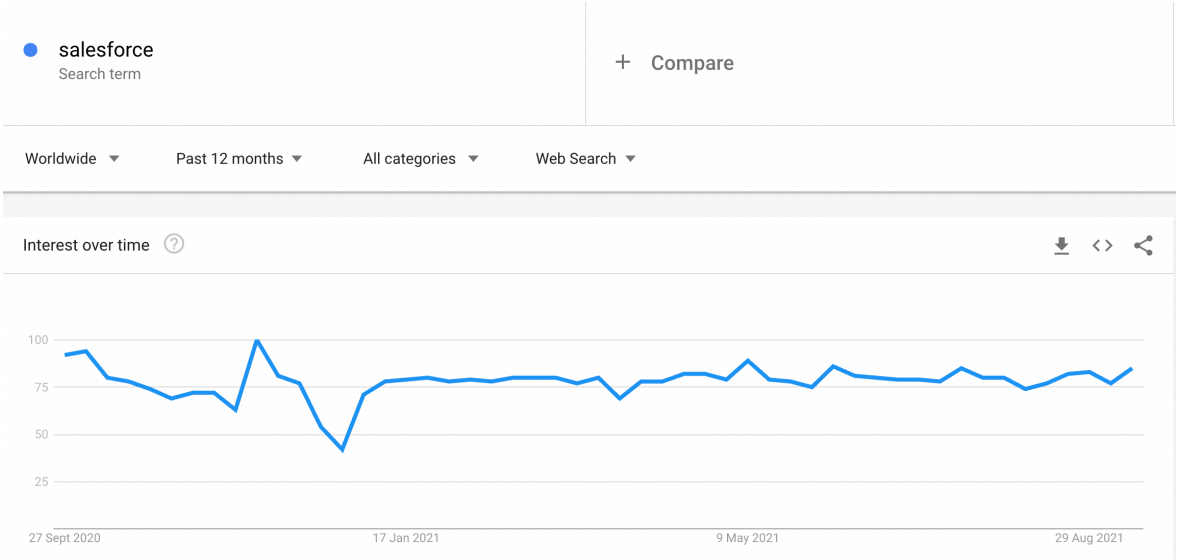

Figure 114: Graph indicating when "Salesforce" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

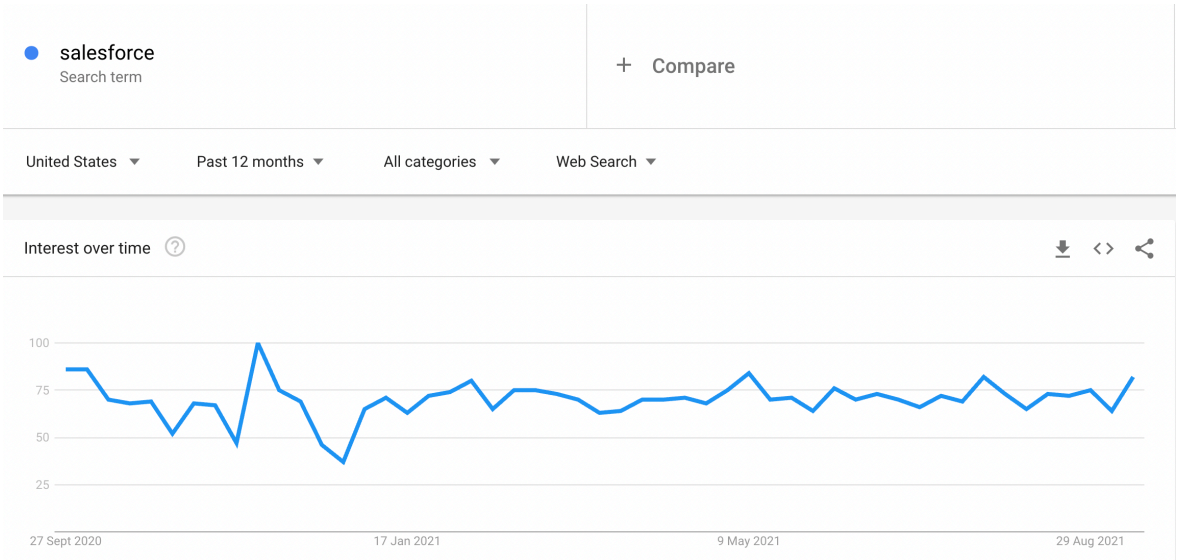

Figure 115: Graph indicating when "Salesforce" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 116: Stock chart "CRM" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

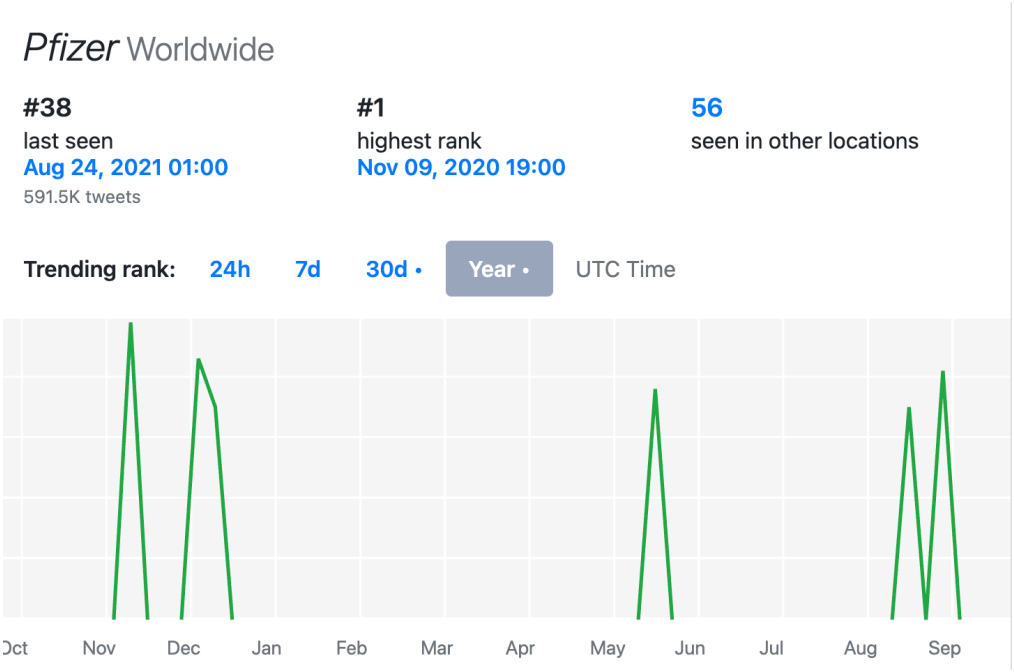

Figure 117: Graph indicating when "Pfizer" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

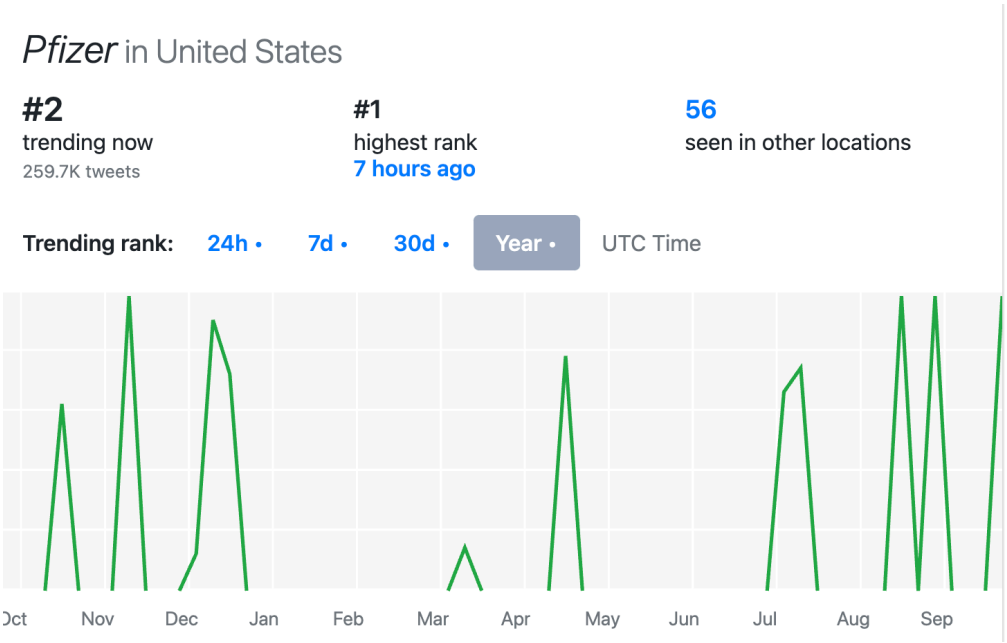

Figure 118: Graph indicating when "Pfizer" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

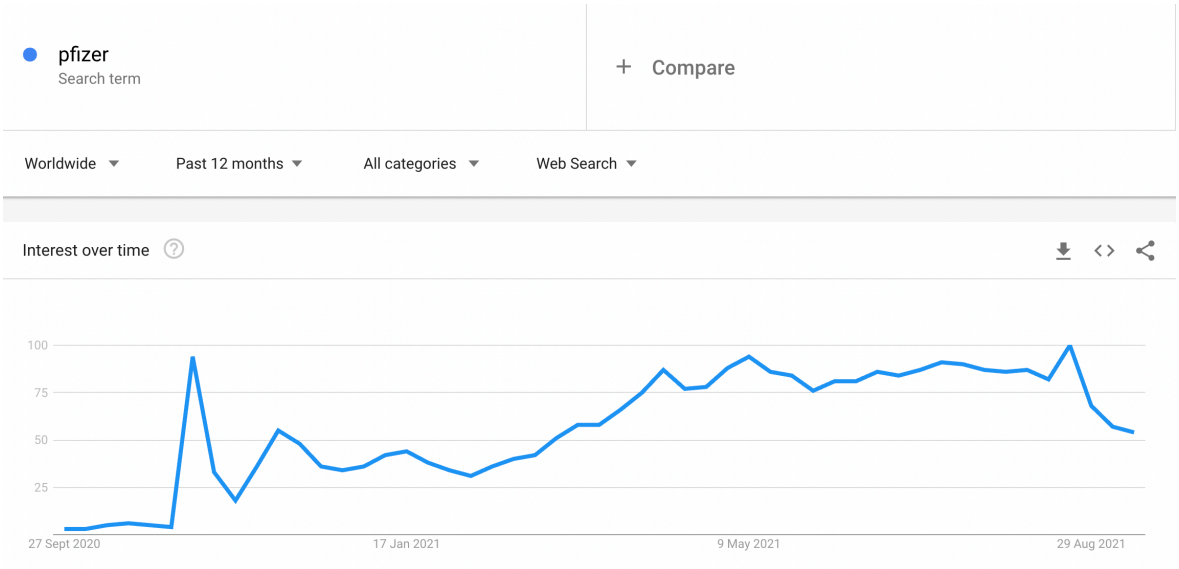

Figure 119: Graph indicating when "Pfizer" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

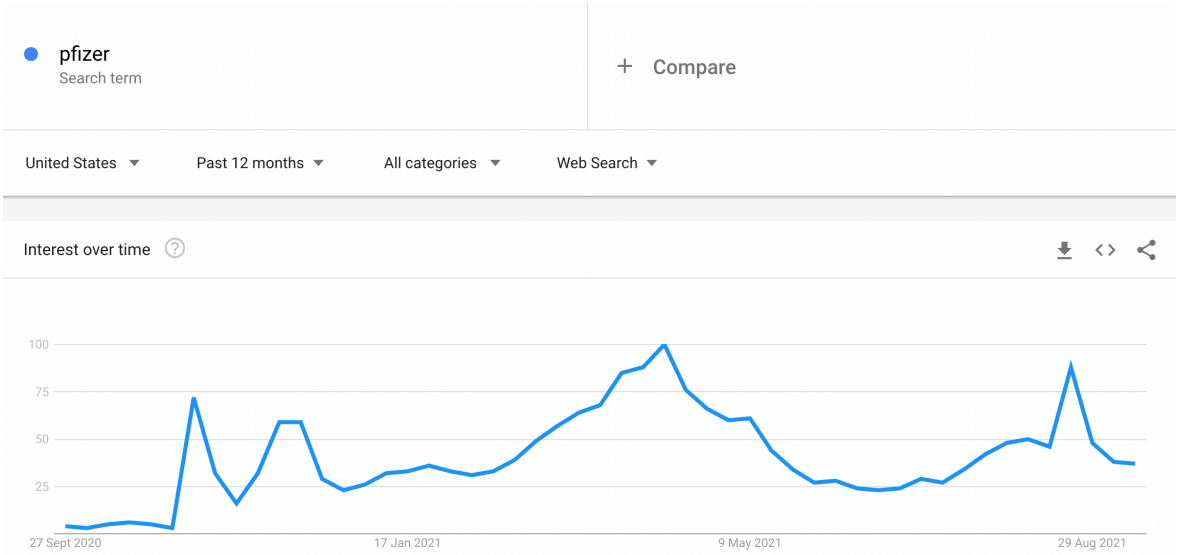

Figure 120: Graph indicating when "Pfizer" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 121: Stock chart "PFE" NYSE from 09/2020 until 09/2021

Source: https://www.tradingview.com/

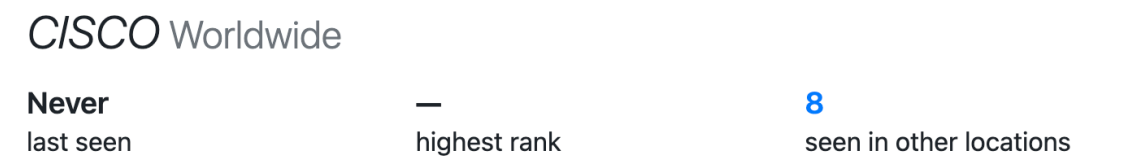

Figure 122: Image indicating when "Cisco" was Trending on Twitter from 09/2020 until 09/2021 Worldwide

Source: https://getdaytrends.com/

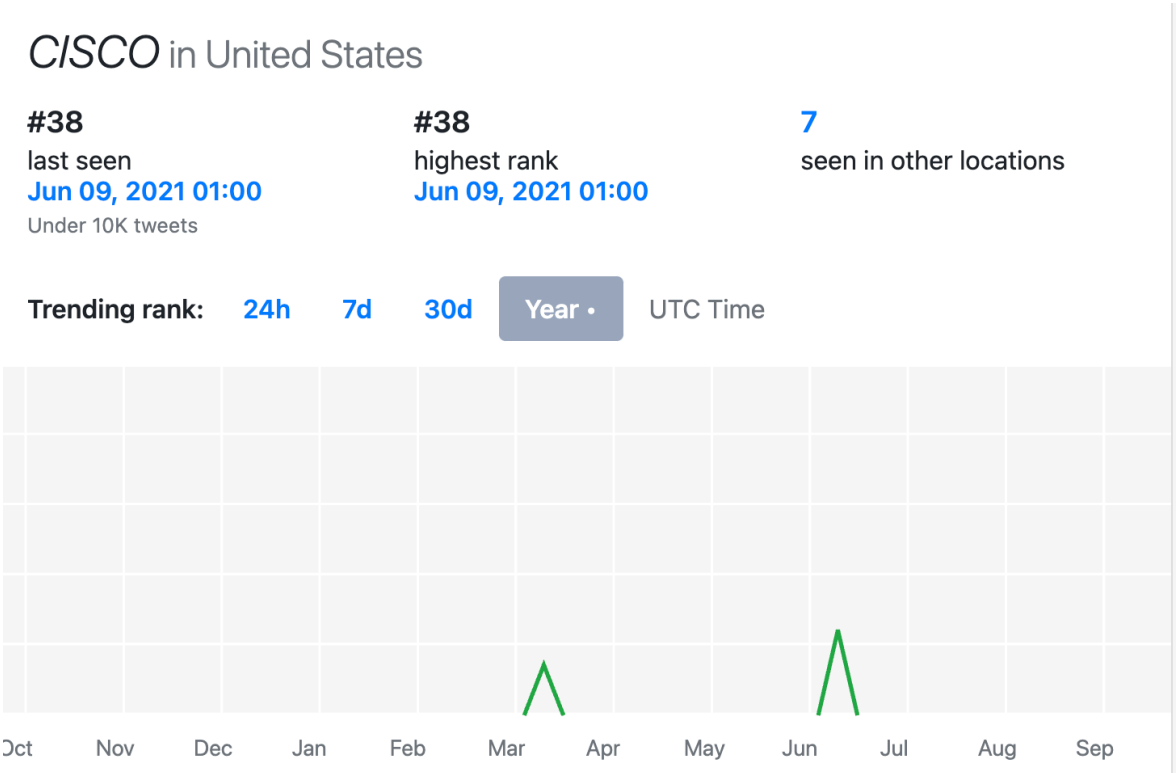

Figure 123: Graph indicating when "Cisco" was Trending on Twitter from 09/2020 until 09/2021 in the USA

Source: https://getdaytrends.com/

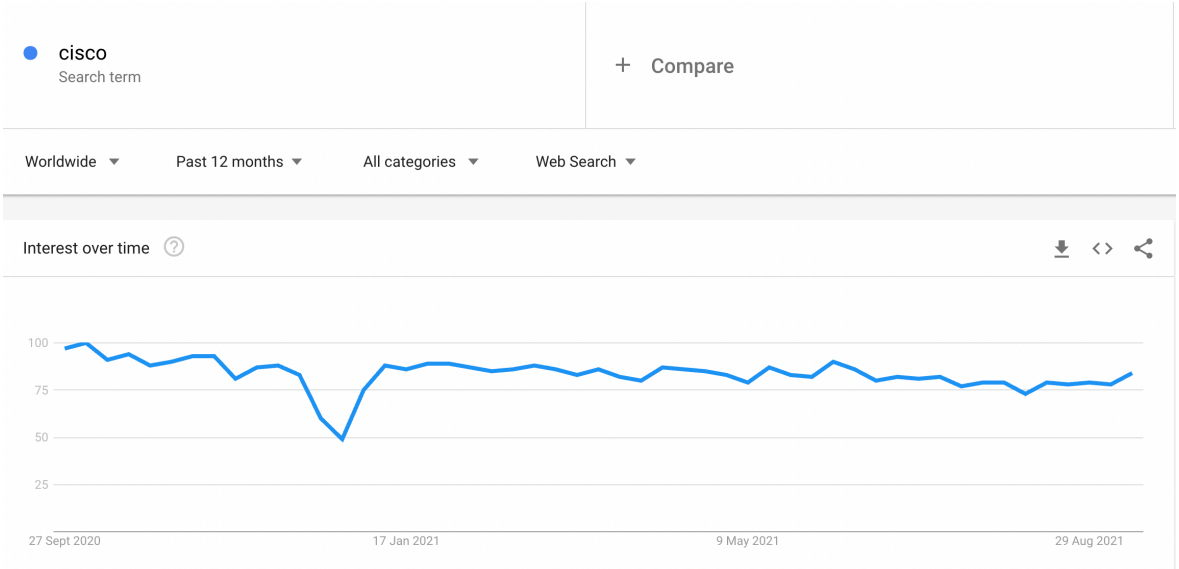

Figure 124: Graph indicating when "Cisco" was Trending on Google from 09/2020 until 09/2021 Worldwide

Source: https://trends.google.com/

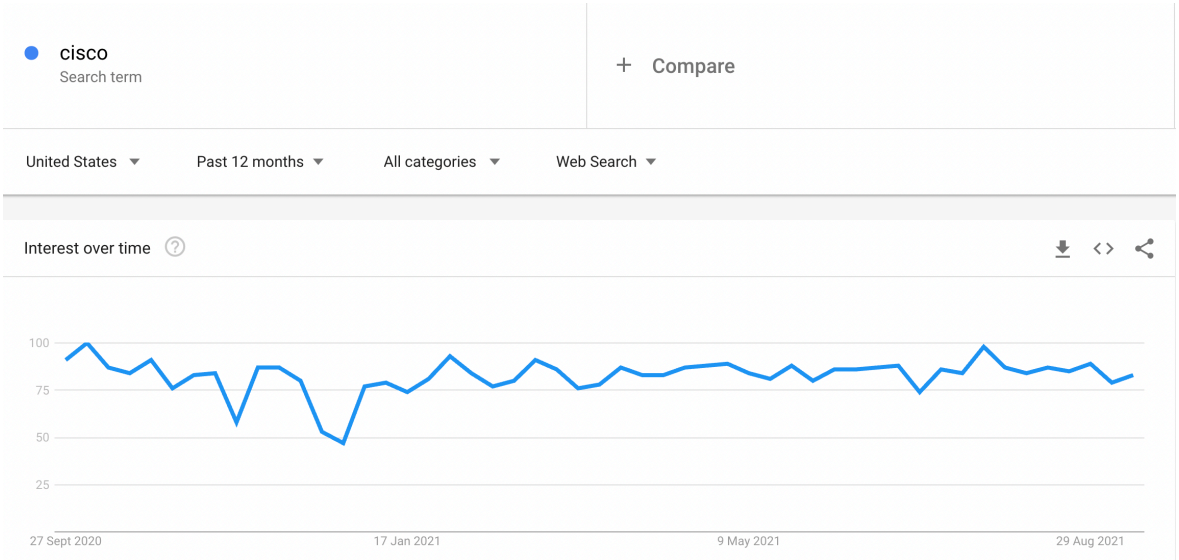

Figure 125: Graph indicating when "Cisco" was Trending on Google from 09/2020 until 09/2021 in the USA

Source: https://trends.google.com/

Figure 126: Stock chart "CSCO" NASDAQ from 09/2020 until 09/2021

Source: https://www.tradingview.com/

ATTACHMENTS