

The Effect of Online Reviews on the Shares of Video Game Publishing Companies

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Declaration

I declare that this dissertation that I have submitted to Dublin Business School for the award of Master of Business Administration (MBA) in Finance is the result of my own investigations, except where otherwise stated, where it is clearly acknowledged by references. Furthermore, this work has not been submitted for any other degree.

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Abstract

Video game publishing companies have recently faced the loss of equity due to some underperforming games. Research has shown that reviews have an effect on the performance of game sales, as well as on many other products, and that film reviews have an effect on the shares of producing companies. This research investigates how the valence and volume of professional critic and consumer reviews affect the share of the video game publisher companies. Being that in an industry in the entertainment sector there is evidence that an influence exists, the question is: To what extent does the reviews impact the shares of the publishers?

Based on the review of the literature on the effect of reviews on sales and on the shares of the movie publishing companies, an analysis of the reviews of twenty-three video games from three of the most important companies in the industry was conducted. The valence and the volume of the reviews from both professional critics in the industry media and the consumers, as well as an average of the ratings from both sources was analysed. The analysis shows that there is a small correlation between some of the analysed variables. To control for the behaviour of the individual companies, the relation between the individual stocks and the market was analysed. The results indicate that there is a large correlation between the value of the companies and the market. Based on the results, it is concluded that the shares of the publisher companies are not affected by the reviews of the games, as they move on par with the market.

1. Introduction

The video game industry is one of the most if not the most profitable in the mass media entertainment sector outperforming, the films and tv, as well as the music industries, with a total revenue of \$135 billion in 2018 (Batchelor, 2018b; Ell, 2018). In comparison, the film and home entertainment industry had a revenue of \$97 billion in 2018 (Kay, 2019) and the music industry had a revenue of almost \$10 billion in 2018 (Rosenblatt, 2019).

It is expected that the video games industry will generate more than \$150 billion in 2019 (Wijman, 2019) and it is estimated that it will achieve \$300 billion in revenue by 2025 (Lanier, 2019). Therefore, the video games industry economic importance is the reason why more research has to be conducted, in order to increase the profitability.

Even with the estimated continuous growth of 8.22% in 2020 (Wijman, 2019), there have been games that have failed to be commercially successful (Morris, 2017; Makuch, 2018; Takahashi, 2019; Tassi, 2019).

Traditional finance theory, mainly those regarding the valuation of companies based on future cash flows discounted by a given rate, generally holds that any alteration in the expected cash flows would have an impact on the value of the company, as this determines the value of a firm (Arnold, 2013; Stancu *et al.*, 2017).

Video game estimated budgets have been steadily increasing in recent years, with the average estimated production cost of individual video games being of the order of \$50 million (Koster, 2018). There are examples of games with budgets that surpass the \$100 million, for example *Destiny* which had an estimated budget of \$500 million (Levy, 2014).

The size of the global market of video game consoles was of 18 million PlayStation 4, followed by 17 million Nintendo Switch and 7 million Xbox One in 2018 (Statista, 2019b) and the number of people that use the PC platform worldwide was of 1.2 billion in 2017 (Statista, 2019a). While there are more digital game distribution platforms for the PC, in Steam, one of the biggest with 90 million monthly users (Fenlon, 2019) more than 9000 games were released alone in 2018 (Statista, 2019c).

1.1. Research Objectives

The objective of this dissertation was to research whether the reviews have an effect on the share price of the publishing companies, therefore affecting their total market capitalisation.

The reasoning behind the objectives is that good reviews may increase sales, while bad reviews depress them and as sales are cash flows, the theory of discounted cash flows behind company valuation, means that the value of the firms will be affected by alterations in sales.

The objectives of the research can be broken down as follows:

- Understanding whether reviews, positive or negative, have an impact on market capitalisation.

- Understanding whether the volume of reviews has an impact on market capitalisation.
- Understanding whether and unified valence from professional critics and average consumers, has an impact on market capitalisation.
- Understanding the importance of the volume of reviews related to the release date of goods.
- The overall impact of volume and rating on market capitalisation.

The hypotheses proposed and tested for this research are the following:

Table 1. Hypotheses

| Hypothesis Number | Hypothesis |
|-------------------|--|
| H1 | The daily accumulated rating average of critic reviews published in the first week after the review embargo, has an effect on the share price of the video game publisher company |
| H2 | It was predicted that the daily accumulated rating average of consumer reviews released during the first week after the game was released, has an effect on the share price of the video game publisher company |
| H3 | It was predicted that the average from the daily critic and consumer reviews daily accumulated rating average released during the first week after the after the review embargo and release date, has an effect on the share price of the video game publisher company |
| H4 | The daily volume of critic reviews published during the first week after the review embargo, has an effect on the share price of the video game publisher company |
| H5 | The daily volume of consumer reviews published in the first week after the game was released, has an effect on the share price of the video game publisher company |

1.1.1. Definitions

In his examination on consumer decisions Phillip Nelson (Nelson, 1970), stated that products or consumer goods can be classified as *search* or *experience* goods.

Search goods are those on which consumers can search for information on their characteristics such as their quality (Nelson, 1970). Experience goods are goods that consumers cannot know the quality until they experience them (Nelson, 1970).

With the ease to search for information in the internet, consumers get access to information from people dedicated professionally to analyse products and services (Hall, 2003; Smart Insights, 2018).

Therefore, the internet allows people to search for the most basic information of video games as the price, release date, platform, genre, publisher and developer companies and the quality that the reviewers and other users reflect. There are professional reviewers in the video game industry media that review the games (Zhu and Zhang, 2006). With this much information in the grasp of their fingers, users can easily and effortlessly search for information about video games, basic information as

well as the opinion and analysis from professional critics and in addition, information from the perspective of consumers.

The literature is detailed and discussed in the next section.

2. Literature Review

2.1. Importance of the issue.

As stated in the outline, the video games industry is a very profitable one and while the big-name publisher companies can endure putting out in the market games that underperform, sometimes, small or independent publishing studios cannot afford this (Lahti, 2018). In the *age of information*, we live in a world where word of mouth is quite easy to generate and search with so many social networks and search engines (Marr, 2018), so much so that an article from McKinsey stated that 20 up to 50 % of all the purchasing decisions made by consumers are influenced by word of mouth (Bughin, 2010). Product reviews, which are a form of word of mouth, provide a valuable insight about the quality products and services, as the research from Rosario, Sotgiu, De Valck and Bijmolt finds (2016).

Consumers most of the time do not have unlimited resources and this means that when it comes to purchasing any type of product they have to decide whether to do it or not and for video games it is not different, for example recent survey found that teens spend an average of \$184 yearly, this amounts to three normal edition games, or a normal and premium edition games (McAloon, 2018). As brought up in the introduction, video games are not cheap. With a starting price of \$60 for the normal or base edition and some games having premium or deluxe editions that go up to \$80, \$100 or even \$120, for example the newest game in the Tom Clancy's Ghost Recon franchise from *Ubisoft* to be released in October, has a standard edition priced at \$60, a steel book 'gold' edition priced at \$110 and an ultimate edition priced at \$130 (Reed, 2019). In 2017, the expenditure on video games in the United States was of \$36 billion and divided by the estimated 211 million people that play video games, the average expenditure per person is of \$170 yearly (Bhardwaj and Gal, no date; Crecente, 2018). Therefore, as consumers have limited economic and time resources, they must choose which video game between the hundreds of games that are released every year to buy (Statista, 2019d).

2.1.2. Video game popularity

The popularity of the video games is related to the attachment that consumers have toward these games or their franchises and the word of mouth generated as a form of engagement (Burgess and Spinks, 2014). However, the popularity of a game is not the only attribute that is considered for determining if a video game will break sales records and become blockbusters. In the films industry, the term blockbuster refers to movies that break box office records (Pittman, 2018). While this term can also be applied to video games, there is another term specifically used in the video games industry.

There are some games that are developed by the major development studios and are produced by the renowned publishing studios and these games have a substantial budget (Lowry, 2017). In the literature, Cox (2014) studies the elements or components that help in classifying the games and analyses the elements that are known in the industry, finding that the companies that created the game and the

estimated budget determine the status of the game. An example of a big-budgeted video game is Battlefield V. This game was developed by *DICE*, a studio owned by Electronic Arts with approximately 400 workers (Kim, 2018). While this game was not a blockbuster, as mentioned in the introduction due to it underperforming, most of the Battlefield franchise games have been blockbusters (Avard, 2018; Takahashi, 2019).

2.2. Determinants of Company Valuation

While the profitability of any company depends on revenue, the value of any firm is obtained from a range of valuation methods (Arnold, 2013). One such method is the *discounted cash flow* method which considers the future cash flows to calculate the value of the shares (Arnold, 2013).

The discounted cash flow valuation method involves discounting the future cash flows, or the cash created in the operation of a company after investing in assets and capital to maintain its competitiveness in the long-term (Arnold, 2013). This method takes the pre-tax and pre-interest profits, adds back the depreciation and non-cash deductions, takes away the capital expenditure on fixed assets, the increases in working capital, tax paid, interest payments and finally, discount back to the present value of the resulting annual cash flows (Arnold, 2013).

2.2.1. Firm Value – Discounted Cash Flows

The research from Stancu, Obrejabraşoveanu, Ciobanu and Stancu (2017) undertook a case study that analyses different valuation methods in order to find which one is “best”. They undertook it by reviewing different financial theory models regarding the cost of capital and financial arbitrage. As Stancu et al. (2017, p. 6) state that “Typically, the correct value of financial instruments is given by the present value of estimated future revenues to be received from holding that asset”. There is no reason to believe that the video game industry is any different.

These authors discuss that the fact that financial investment companies that have to collect, process and interpret information to get the intrinsic value of financial securities, concluding that the market is not really efficient and that the buy and sell operations of any security will move the market price towards its intrinsic value (2017). The value of any security is analysed in terms of estimation due to the fact that investors not only consider the determinant factors of the security, such as profitability, risk and investment duration, amongst others, but also consider the behaviour of other investors (2017).

Holland (2018) in his research regarding the equity valuation of companies using discounted cash flows and residual income, states that in portfolio management investors will try to find firms that trade at less than the intrinsic value, in order to sell at higher prices as the price converges with the value.. It is argued that the advantage of discounted cash flow valuation is the financial roots of the cash flows (Brealey and Myers, 2000 cited in Holland, 2018). However, they have also identified a problem with the method that as this method bases firm value into future projections of cash flows that causes it to appear in later periods of the forecast and the terminal value

estimations, and these values provided by discounted cash flow techniques are higher and more volatile (Holland, 2018). The infinite life of a business or terminal value, comes from the assumption of the ability to forecast future cash flows forever (Hamadi and Hamadeh, 2012). In order for analysts to forecast cash flows forever, it makes analysts assume using metrics such as the Price/Earnings ratio to estimate the terminal value.

Damodaran (2012, cited in Hamadi and Hamadeh, 2012) stated that discounted cash flow valuation should provide an estimate of the intrinsic value of the security, instead of a relative value and the only way to obtain a relative value is to use either liquidation value or stable growth model.

While, most discounted cash flow models assume perpetual return on capital, one way to avoid this assumption is to introduce a fade rate that allows to control the speed of the return on capital converging towards the cost of capital and if assumed constant, the fade rate does not alter the invested capital growth rate (Hamadi and Hamadeh, 2012). According to Stigler (Hamadi and Hamadeh, 2012) the rate of return on investment tends toward equality in all industries when under competition and this applies to the video games industry as well, as it is a highly competitive industry where there were 526 publishing companies in 2017 (Anderton, 2017).

2.2.2. Firm value – Other theories

The finance theories evaluated in this study include the Financial Structure Model from Modigliani & Miller (1958, 1963), the Capital Asset Pricing Model from Markowitz & Sharpe (1964), the Arbitrage Pricing Theory from Ross (1976), the Black and Scholes Model (1973) and the Jensen & Meckling Model (1976) (Stancu *et al.*, 2017). It is worth noting that both the CAPM and the APT models involve is the *sensitivity coefficient* or β of the market to calculate the return of a security (Stancu *et al.*, 2017). From the analysed valuation methods, which are the discounted cash-flow valuation, valuation through adjusted net asset and liquidation value, relative valuation through price and value multiples, and valuation of growth opportunities and real options, all the valuation methods have consisting results in obtaining the value per share except for the net asset valuation, which has a premium for the market value (Stancu *et al.*, 2017).

The financial structure model from Modigliani & Miller uses arbitrage theory to find the optimum financing structure for the company in order to increase the value (Stancu *et al.*, 2017). This model takes the shareholder income of a levered company and equals it to net profit after tax of an unlevered company plus tax savings, where the benefits for the unlevered company are the cost of interest being reduced by tax savings and the net profit increases with tax savings (Stancu *et al.*, 2017).

In the CAP model from Markowitz and Sharpe, the return of any security is function of the rate of risk-free assets, the expected return of a market portfolio or risk premium and the sensitivity coefficient of the return of the security against the return of the market, thus tying the risk and the return together (Stancu *et al.*, 2017). In this model, the systematic risk is the risk premium demanded by investors for the excess market return (Stancu *et al.*, 2017). The model leads to the estimation of the cost of equity, used to determine the weighted average cost of capital of the capital of the company (Stancu *et al.*, 2017).

The APT model from Ross, a multifactor model for estimating the profitability of financial securities involves the return of the security, the risk-free rate of return, the sensitivity coefficient and the expected return of market portfolio (Stancu *et al.*, 2017).

The APT model from Black and Scholes uses the options pricing theory, where call or put option price of the underlying asset is determined by the changes in the value of the asset during the option exercise in relation to the strike price determined and involves the asset, the strike price, the risk-free rate, the option maturity and the standard deviation of the underlying asset return (Stancu *et al.*, 2017).

The Jensen and Meckling model aims to structure the contractual relations between the stakeholders of a company and its objective is to empower the structure mandate relations that minimizes costs and losses (Stancu *et al.*, 2017).

2.2.3. Use of Discounted Cash Flows in this research

The Discounted Cash Flows valuation method is the methods analysed in the literature that it is considered the most important income-based valuation method (Arnold, 2013), as well as being the standard valuation method taught in most business schools (Hamadi and Hamadeh, 2012). As shareholders invest in shares of any business, they have the perspective that as they deliver cash to the businesses, they are interested in the business capability to return it to them (Arnold, 2013). The discounted cash flow valuation method involves discounting future cash flows that the business is going to receive and deducting the interest rate desired by the investors and from this, the shareholders of video game publisher companies can evaluate the share price based on the estimated game sale figures (Arnold, 2013).

Companies with positive economic profit should trade at a premium to book, and *vice versa* they should trade at a discount to book and companies that can maintain high operating returns are worth more (Hamadi and Hamadeh, 2012). The present value of future economic profit is equivalent to the Net Present Value of the existing and future projects of a firm (Hamadi and Hamadeh, 2012), which in the case of the video game publishing companies are the present and future games to be sold.

The intrinsic value of the securities is very sensitive to the fade rate assumed and explains the risk premium for quality stocks (Holland and Mathews, 2016 cited in (Hamadi and Hamadeh, 2012). However, the risk present with quality stocks is the loss of economic and competitive advantage, by using the fade rate the discounted cash flows model evaluates the effect of profitability attenuation and allows for a better way of valuation an estimating terminal value (Hamadi and Hamadeh, 2012).

2.3. Video game reviews.

As mentioned before, the popularity of the video games is related to the attachment that consumers have toward these games or their franchises and the word of mouth generated as a form of engagement (Burgess and Spinks, 2014). The word-of-mouth, in this case video game reviews can come from two sources, professional critics and ordinary video game player reviews (Hall, 2003; Orland, 2016; Metacritic, 2019a).

2.3.1. Professional critic versus ordinary player reviews

Professional critics are people that work for the entertainment media outlets, and who spend at least a portion of their time reviewing video games (Orland, 2016). Professional critics often get to experience the video games before the release date by receiving review copies reviewers are able to experience through enough of the game content and write a review (Orland, 2016).

Ordinary video game consumers are independent enthusiast who, once the game has been released, purchase the game and write their own reviews for their game experience (Hall, 2003; Metacritic, 2019a). Even though ordinary players are not employed to analyse and write the game reviews, and are therefore considered non-professional, they may still provide valuable insight information on their experience playing the game, that anyone can access and that adds up to the total amount of information regarding the quality of the game (Hall, 2003).

One of the recent games from Electronic Arts, *Battlefront II*, has almost 12,000 user reviews and with only 112 of these reviews being from professional critics (Metacritic, 2019o, 2019p, 2019q).

The main difference between critics and consumers is that the former get payed for writing the reviews and sometimes receive review copies a beforehand the official release date (Hall, 2003; Orland, 2016).

2.3.2. Reviewing and rating.

Many of the video game media websites and aggregator websites, have a scoring system that allows the critics and users to rate the video games in a zero to hundred, or zero to ten scale (PCGamer, 2014; Gamespot, 2019a; IGN, 2019).

Typically, the game aspects that are analysed in a game review are categorised under a number of headings such as:

- Gameplay;
 - Market;
 - Social;
 - Narrative;
 - Graphics;
 - Technical;
 - Value; and
 - Audio.
- (Bernbeck, 2019)

This element of the score is what the literature refers to as valence and is classified as positive or negative.

Reviews from professional critics usually come a few days before the video games are released, although there are cases where the critic reviews happen to be under an embargo and cannot upload the reviews before the video game release date

(Orland, 2016; Thier, 2018). On the other hand, reviews from consumers come after the video game release date, once the players bought and have played them as sometimes games take even hundreds of hours to play through (Kain, 2017).

This might change in the future as nowadays video games have a purchase model that involves pre-ordering and this model sometimes lets the consumers play a couple of days before the release date, such is the case of *Battlefield V* which allowed players that pre-ordered it to play 3 days before the official release date (Macy, 2018).

In recent times some video game subscription models such as the *Xbox Game Pass* for console and PC from Microsoft, and *EA Access* and *Origin Access* for console and PC from Electronic Arts (Electronic Arts, 2018; Origin, 2019; Smith, 2019). Similarly, to the pre-order bonus, these services let consumers play some games in advance (Macy, 2018).

2.3.3. *Timing of reviews*

The literature on the effect of reviews on sales has also studied the time frame variable of the reviews and its effect on sales. Research from Huang, Boh and Goh (2017) consisting mainly of a temporal study of the effect of reviews and online opinions on movie sales, finds that reviews are more influential during the early lifecycle of the product and that this influence decreases over time. Similar findings are observed in the studies from Hu, Liu, and Zhang (2008) on books, DVD's and videos that also finds that the effect of the reviews on sales is greater at the early stages of the product sale lifecycle.

Findings from the study from Rosario et al. (2016) show that the positive reviews has a greater correlation to sales figures, while that at the beginning of the lifecycle negative reviews do not have an impact on sales, as it starts to affect later on. Lastly, on this particular finding relative to the time frame of the effect of reviews the research from Chern, Wei, Shen and Fan (2015) finds that the influence of reviews is not continuous as it decreases over time.

From the findings of these research, it can be deducted that the reviews that are written as pre-release reviews from critics or consumers and the first mass reviews that are added after the games are released, are the most influential on the purchasing decisions of consumers that did not pre-order the games and that might have been waiting for these first reviews, as the study from Hu et al. (2008) find that DVD's and videos have significant sales differences in the early stage, being significantly different from zero (difference = 621.93, p-value = 0.013) and (difference = 839.11, P-value = 0.027) respectively. Although, the research from Rosario et al. (2016) finds that at the beginning of the product lifecycle the negative reviews do not have a greater effect than positive reviews, it is expected that the any product is going to sell more if it has positive reviews. As many studies have found that reviews lead to purchases and re-purchases (Thomas, 2018; McCabe, 2019).

2.4. *Impact of reviews on sales*

2.4.1. *Linking reviews to consumer behaviour*

According to the Burgess and Spinks (2014), the *Four Factors of Brand Resonance* proposed by Keller (2009) play an important role in the consumers choice of entertainment products. The four factors of brand resonance identified by Keller, according to Burges and Spinks are applicable to the video game consumers are:

- Behavioural loyalty;
 - Attitudinal attachment;
 - A sense of community; and
 - Active engagement
- (Burgess and Spinks, 2014)

In order to understand why the reviews have an effect on sales of entertainment products, including video games, the study from Burgess and Spinks (2014) researches the factors of brand loyalty and its relation with the generation of word of mouth that in turn may have an effect on sales.

The *behavioural loyalty* defined by Oliver (1999) and improved by Keller (2013), is the process of continuous purchase and use of a product of a particular brand over the competition (Oliver, Keller, cited in Burgess and Spinks, 2014).

The *attitudinal attachment* factor is the perception of a consumer and his attachment towards a brand (Burgess and Spinks, 2014). A *sense of community* is being part of a community that surrounds the products (Burgess and Spinks, 2014). *Active engaging*, as the name implies, is the engagement of activities between the consumers and the brand (Burgess and Spinks, 2014).

To explain these factors, starting with the attitudinal attachment and behavioural loyalty, players often feel very attached to a particular video game or franchise and they will probably buy the sequels and spin-offs, or the additional content for that game; therefore, they are loyal to the brand or to the development company and even to the publishing company (Grubb, 2017).

The last two factors, the sense of community and active engagement go hand in hand as players actively engage in different communities, forums and social media, which translates to word of mouth (Lee, 2016; Game Designing, 2018).

The word of mouth related to video games comes from of reviews, discussions and videos or streaming sessions in *YouTube* and *Twitch*. These last are the platforms where most of the players engage with the community, with 63 thousand people in YouTube and 22 thousand in Twitch streamed their gaming sessions (Pannekeet, 2019). The number one streamer, *Ninja*, has almost 15 million followers that watch and engage with him frequently (Webb, 2019b). The findings of this research, are that the players generate word of mouth in many different ways, one which can be the reviews and in turn the word of mouth will have an effect on the video games sales.

2.4.2. *The effect of positive and negative reviews*

The study by Rosario, Sotgiu, De Valck and Bijmolt (2016) on the effect of the word of mouth on sales of different products including digital products, finds that positive reviews have a greater effect than negative reviews. The study examined the

literature regarding the effects of eWOM on sales, checking in scientific databases, unpublished work, focusing on papers that examine the impact of word of mouth on measures of performance, such as units sold and revenues from sales of products and services (Rosario *et al.*, 2016).

However, the studies from Cui, Lui and Gou (2012) on video games and consumer electronics and Tsao (2014) on movies, find that negative reviews have a more prominent effect than positive ones. In the research from Cui *et al.* (2012) it is explained that the prominent effect of the percentage of negative reviews, influenced by the negativity bias that the reviews, has a greater effect on the consumer decisions. Tsao (2014) also refers to the negativity bias, that the increases the influence of negative WOM on the decision of potential consumers.

It is a sign of uncertainty about its quality and affects the purchase decision process of the consumers. In other words, if a potential consumer is unsure about the quality of a product, he or she might decide not purchase this product. Furthermore, the negative effect of product quality uncertainty on sales is supported by the literature in the research from Cox and Kaimann (2015) and Rosario *et. Al* (2016).

2.4.3. Discrepancies between professional and enthusiast reviewers

One area that has been the subject of attention, has been the discrepancies that can occur between professional reviewers and consumer reviews. There have been many examples in the video game and film industries where there has been considerable discrepancy between critic and reviewers opinions and review scores (Dietz, 2011; O Malley, 2017).

The finding from researches on the effect of reviews regarding the source of the reviews is mixed. The literature from Cox and Kaimann (2015) and Tsao (2014) finds that the effect of consumer reviews on sales is greater than the effect of professional reviews.

Cox and Kaimann (2015) found that, when considering all factors of the reviews from professional critics correlated positively, showing an increase of 1 to 1.5 percent for the review score and every additional review being associated with a 1.6 per cent increase of sales, while the consumer reviews correlate positively showing an increase of 1 to 1.4 percent and every additional consumer review showing an increase in sales by 0.1 percent. This behaviour was explained by Kirby (2000), as “[consumers] may not trust just one nonexpert,... but if 9 out of 10 nonexperts agree, it’s probably worth buying” (Kirby, cited In Zhu and Zhang, 2010, p. 136).

However, while the effect of critic reviews is greater, the reviews from consumers critics still affect sales, but overall the results shows that consumers do not disregard reviews from professional critics. The research from Huang, Boh and Goh (2017) finds that the reviews from professional critics have a greater effect on sales than the reviews from consumers, but reviews from experts and consumers have a positive and significant influence on sales. While these findings are opposing, overall the literature shows that reviews from both professional critics and consumers sources have an effect on sales.

2.4.4. *The effect of the volume of reviews*

The volume of reviews boost the popularity of video games and the popularity increases the amount of reviews, as it is found in the research from Cui et al. (2012). Popularity is the other element that the research has studied the effect on sales. On the same topic Zhu and Zhang (2010) find that popular games will have a greater volume of reviews, linking it to the previous finding. According to the findings from and Zhu and Zhang (2010), not only popular video games sales might be affected by the reviews, there will also be an effect on unpopular games as the uncertainty over the quality is reduced, as this is shown from the results as the coefficients for the number for reviews is of 0.44, $p < .01$ for popular games and 0.50, $p < .01$ for unpopular games. However, the study from Chern et al. (2015) finds that in order for the sales of a product be affected by the reviews, these products need to have a great number of reviews.

2.2.5. *Ancillary effects of reviews*

Even though reviews from professional critics and consumers indicate the quality of the video games components and the research on this area appears to indicate that these reviews will have an effect on sales, this is not the only effect that the literature has researched.

Research has also found that reviews have an effect on the creation of more reviews, linking it to the analysis of the factors of brand resonance of Burgess and Spinks (2014). The research from Zhou and Duan (2016) that studies the effect that professional reviews have on consumer reviews, finds that reviews from critics influence the number of product downloads, as well as the number of consumer reviews. On the other hand, research from Wang and Gou (2017) analyses the effect that reviews from critics and consumers have on sales and on the creation of reviews, finding that both reviews from professionals and consumers will persuade other consumers to buy the products and write their own reviews.

These two similar studies show that indeed the reviews from both sources tend to generate more reviews, as consumers write reviews on their own initiative, but they also write them in response to the what the professional critics and other consumers say, in disagreement or just because they want to share another point of view (Dietz, 2011). For example of the disagreement between the professional critics and the general consumer consensus, consider is the movie *Venom* (Newby, 2018), which was reviewed harshly by the professional movie critics, but while not perfect, it was found very enjoyable by the audiences.

2.5. *Reviews and sales revenue*

Up to this point the literature reviews has examined the correlation between the reviews and the popularity of video games. The main focus of the dissertation is the effect that the average rating and volume of the reviews has on firm valuation. Cui et al. (2012) find that ratings and volume of the reviews have an effect on the sales of search goods.

2.5.1. Rating of reviews and sales

Lee et al. (2019) find that the rating of the reviews will affect the sales for both search and experience goods. Cox and Kaimann (2015) whom focus on both critic and consumer reviews, and Zhu and Zhang (2010) and Lee et al. (2019) whom focus on consumer reviews, find that the rating average have an effect on the sales figures.

Cox and Kaimann (2015) find the coefficient of 0.33 for the critic valence and 0.13 for the user valence, showing that the effect of critic reviews is more prominent on sales.

The results from Zhu and Zhang (2010) are the coefficients for the average rating is of 0.32 for popular games and 1.00, $p < .1$ for less popular games. Cox (2014) results are that an increase in the critic review score increases sales in 1.5 per cent.

2.5.2. Volume of reviews and sales

Lee et al. (2019) also find that the volume of reviews will affect the sales for both search and experience goods. The effect of volume of reviews on sales is also found by Lee and Choeh (2016).

In addition, Rosario et al. (2016) find that while rating and volume both have an effect on sales, the effect of the volume of reviews is greater.

Even if there are mixed results, there is an overall agreement between the authors of the literature that the volume of reviews from either one of the two sources influence the sales figures.

2.5.3. Volume of reviews from critic versus consumer and sales

While the findings from Cox and Kaimann (2015) and Huang et al. (2017) are contradictory, the research from Wang and Guo (2017) also finds that the volume of consumer and professional critic reviews influences the performance of sales, but with a coefficient of 0.71, $p < 0.01$ for the user reviews and 0.66, $p < 0.01$ for the critic reviews, the effect of consumer reviews is slightly higher.

Zhu and Zhang (2010) study only the reviews from consumers and that find these have an effect on sales. Huang et al. (2017) find that the volume of reviews from professional critics has an effect on sales, while the volume of user reviews does not.

The research from Cox and Kaimann (2015) find the correlation coefficients 0.35 for the critic volume versus 0.44 for user volume, showing that the effect of the volume of consumer reviews is greater than the effect of critic reviews.

Tsao (2014) studies the persuasiveness of the reviews, finding that consumer reviews have a greater influence on other consumers intentions to buy a ticket for a particular movie. The research from Lee and Choeh (2016) also find that consumer reviews have a predictor effect on box office and DVD sales.

2.5.4. Ratings from critic versus consumers and sales

Because video games can be considered both as search and experience goods, the finding from Lee et al. (2019) show that the sales going to be affected by the ratings and volume of the reviews.

Huang et al. (2017) find that the ratings of the reviews from either the professional critics or consumers have an effect the sales, with the results that the valence of expert of reviews is positively and significantly associated with movie sales ($\beta = 2.537$, $p\text{-value} < 0.001$) and valence of consumer reviews is positively associated with sales ($\beta = 1.584$, $p\text{-value} < 0.001$). Therefore, on a similar scenario to the analysis on the effect of the volume of reviews, there are mixed results.

The findings overall show that the increase or decrease of the rating of the reviews is going to affect the sales either positively or negatively. Taking in consideration the findings from the literature regarding the rating of the reviews, from both the critics and consumers, some of the best reviewed games in all the history of the video games industry are also some of the most sold video games (Gilbert, 2019b; Stockdale and Harrington, 2019).

2.5.5. Reviews and sales revenue conclusion

The conclusion from the literature regarding the topic of the effect of reviews on the sales of video games, is that it is of uttermost important for the video game industry companies to release games that have large sales figures. Thus, the word of mouth that comes from the reviews of the games is a great way to make the sales figures achieve the forecasted goals and if possible, break sales records and become

blockbusters. Otherwise, the video games just going to underperform, like all the examples mentioned throughout this chapter.

2.6. *The impact of reviews on company valuation*

Now that the subject of the effect of reviews on the performance of sales has been covered, the effect of reviews on the publishing companies share price or firm value was the main focus that this dissertation set to find. Currently there is an important amount of literature on the effect of reviews on sales. However, the effect of reviews on the share price hasn't been studied thoroughly and this was a gap in the current knowledge that was sought to fill in. Even though the two topics considered as the literature for this dissertation are somewhat similar, the findings differ enough to justify researching this subject.

2.6.1. *Impact of reviews previous to the release of a product*

Getting into the subject of the effect of reviews on the share price or firm valuation, the research for Chen, Liu and Zhang (2012) studied the effect of reviews of new films on the market capitalisation of the film production companies, which are akin to the publishing companies of the video game industry. Chen et al. (2012) analyses the effect that the reviews previous to and after the release date of the films have on the firm value. The finding is that the influence of the valence of individual reviews is more prominent during the pre-release window of the films, with results of -.024% for negative reviews ($p < 0.01$) and 0.12% for positive reviews ($p < 0.1$) (Chen, Liu and Zhang, 2012). The absolute valence of the reviews during the pre-release window of the movies has a -0.20 % for negative reviews and -0.03 % for positive reviews (Chen, Liu and Zhang, 2012). Both of these results show that the effect of negative reviews is more prominent than positive reviews.

2.6.2 *Impact of reviews subsequent to the release of a product*

Regarding reviews that gets added after the release date of the film, the research finds that only the absolute valence of the post-release reviews has an effect on the market capitalisation of the production companies (Chen, Liu and Zhang, 2012). The absolute valence results are that 0.18% for negative reviews and -0.20% for positive results, showing that both negative and positive reviews have an effect on firm value (Chen, Liu and Zhang, 2012). Regardless of the valence of the pre-release and post-release reviews, the uncertainty of the quality of the film will be reduced. For example, the last iteration of the *Avengers* movies, which was released on the 26th of April, got the first reviews up to three days before the release (Moreau, 2019) and the stock of *Disney*, the company that owns *Marvel Studios*, broke records with the massive success of the movie (BBC, 2019; Hullender, 2019; Winck, 2019). The findings from the research conducted by Chen et al. (2012) on the effect of reviews on firm capitalisation are similar to the findings from the literature regarding the effect of reviews on sales.

2.7. Literature review conclusion

Therefore, the objective of this dissertation was to find if the game reviews influence the firm value of the publishing companies in the video games industry, during the early stage of the video game sales lifecycle. Hence, considering the findings from the literature, if a new game gets released the research conducted in this dissertation tried to find if a relation exists between the game reviews from professional critics, written before and after the release date, and the reviews from consumers written after the game is available to everyone and the share price of the publisher. This effect was analysed during the first week of the critic reviews after first review was written and for the consumer after the game was released. For, example if Electronic Arts releases a new entry in the Battlefield franchise, could there be a relation between the reviews that this new Battlefield receives and the market valuation of EA.

2.7.1. Implications of the research with the literature

The implications of the possible findings of this dissertation are that, if the video game publishers want to increase their value, they must pay close attention and make sure that the games they publish have enough quality so they succeed. If a game does not have enough quality and it is reflected in the valence, rating and volume of the reviews and this affects the purchase decision of the consumers, then the question is if this would have a negative effect in the firm value of the publishing companies.

3. Research Methodology

3.1. Introduction

As a brief summary of the introduction and the literature review, research has studied directly or indirectly the effect that reviews do have an influence on the purchase decision process of consumers, which then influences product sales. Few of these studies focused on analysing the influence that reviews have on the value of the firms that produce and sell these products. The research has found that directly or indirectly reviews from consumers have an effect on sales, being the source of these reviews from professional critics or from consumers. And the research that focuses on the impact of reviews on firm value has found that reviews do have a short-term impact in the early stage of the product sales lifecycle.

The methodology for this research is required to find out if the reviews from critic and consumers have an effect on the market capitalisation of the video game publisher companies. The objective of this dissertation was to examine whether the reviews of video games from professional critics and consumers have a relation with the share price of the mayor publishing companies that trade publicly and therefore on its market capitalisation. The methodology selected to conduct the research is detailed throughout this chapter, covering the research design and variables involved in the hypotheses. The research design followed for this dissertation was selected according to the Research Onion developed by Saunders, Lewis and Thornhill (2015) shown in the Figure 1.

3.2. Research Design

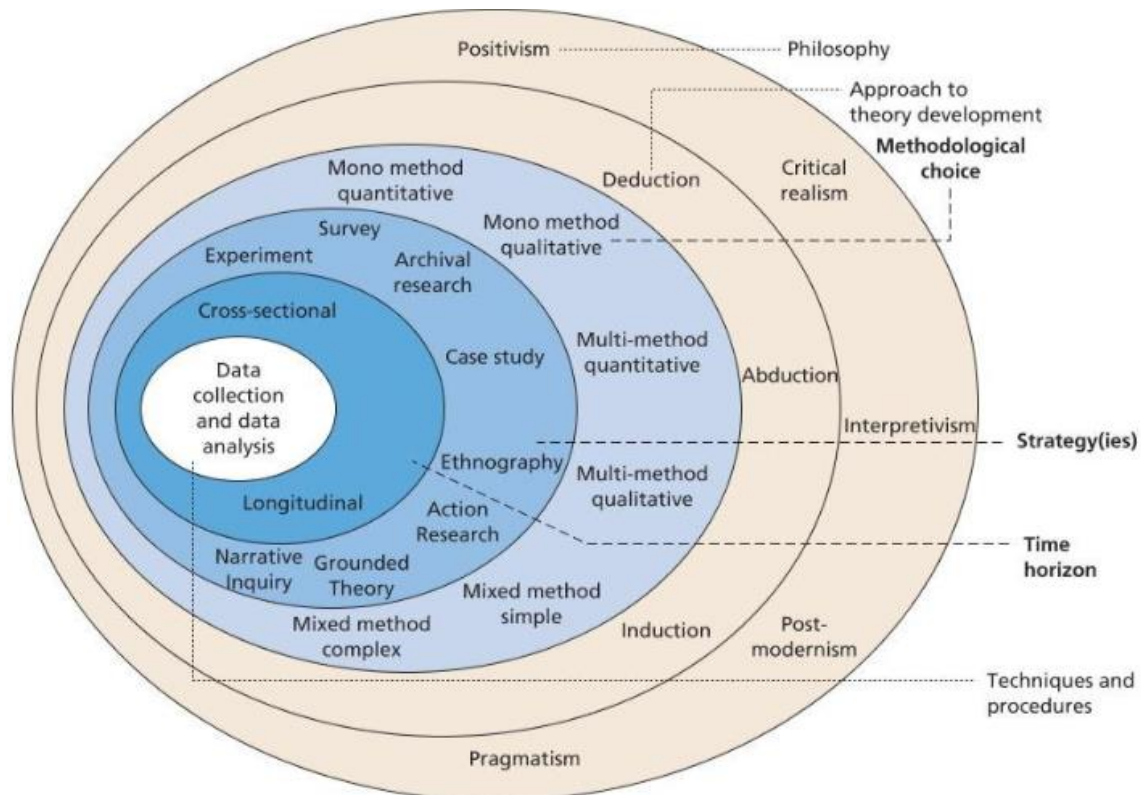


Figure 1. Research Onion. Source: (Saunders, Lewis and Thornhill, 2015, p. 164)

The purpose of the research methodology and Research Onion proposed by Saunders et al. (2015) is to aid in the formulation, statement and clarification of the research topic and question and lay the foundation of the primary research. In order to accomplish the purpose of the methodology it is necessary to identify the *philosophy*, *paradigm* or *approach*, and the *strategy* that best suits the nature of the research.

3.2.1. Research Philosophy.

The research philosophy is defined by Saunders et al. (2015, p. 124) as “[the] system of beliefs and assumptions about the development of knowledge” and it is a set of assumptions, paradigm philosophical views that rule over any research. The assumptions that shape the understanding of the research question, the methods and the interpretation of the findings involved in the process of knowledge generation are epistemological, ontological and axiological (Saunders, Lewis and Thornhill, 2015). Ontology is the set of assumptions about reality, how the world and the objects are seen under the research scope (Saunders, Lewis and Thornhill, 2015). Epistemology is the set of assumptions about knowledge, what makes it acceptable, valid and legitimate and finally, how to communicate this knowledge (Saunders, Lewis and Thornhill, 2015). Axiology is the set of assumptions regarding the values and ethics of the research process (Saunders, Lewis and Thornhill, 2015).

There are two the philosophical extremes of the set of assumptions, *objectivism* and *subjectivism* (Saunders, Lewis and Thornhill, 2015). Objectivism was defined by Ayn Rand (Rand, 1986) as the *objective theory*, which states there is not a 'good' attribute in things nor in the emotions of man, but an evaluation of the facts of reality according to a rational standard of value and that good, as an aspect of reality in relation to man, must be discovered. Therefore, by applying an objectivistic approach, the research stays grounded in reality, the researcher has an external role to the social entities studied, the elements are studied in a granular and ordered manner. The research also follows the assumption of natural sciences and is based on facts and numbers of observable phenomena, which can produce law-like generalisations (Saunders, Lewis and Thornhill, 2015). Finally, the research remains free of values due to the detachment of the social entities and social actors, in order to avoid any biased finding (Saunders, Lewis and Thornhill, 2015). Subjectivism on the other hand, focuses on the perceptions of reality and the consequent actions of the social actors, and follows the assumptions of arts and humanities (Saunders, Lewis and Thornhill, 2015).

Furthermore, as part of the research methodology and in order to define the research philosophy there is a layer that consists of the research paradigm (Saunders, Lewis and Thornhill, 2015). The research perspectives are the political or ideological approaches of the research toward the social entities studied (Saunders, Lewis and Thornhill, 2015). These perspectives are the *sociology of regulation* and the *sociology of radical change*, or regulation and radical change perspectives and as defined by Burrell and Morgan (2011). The regulation perspective is concerned with the explanation of society under its underlying unity and cohesiveness, and with the need for the regulation of human affairs, while the radical change perspective concerns with finding explanations for change and the basic premise is finding what is possible instead of what actually is (Saunders, Lewis and Thornhill, 2015). From these two perspectives and the philosophical approaches of objectivism and subjectivism, Burrell and Morgan (2011) created four paradigms of analysis, which are the *radical humanist*, the *radical structuralist*, the *interpretive* and the *functionalist*. The functionalist paradigm relies heavily on the perspective of regulation and the objectivist point of view (Burrell and Morgan, 2011). According to Burrell and Morgan (2011), the functionalist paradigm is problem-oriented, highly pragmatic and its standpoint is *realist*, *positivist*, and *nomothetic*. The functionalistic paradigm seeks to understand reality in a way that generates usable knowledge (Burrell and Morgan, 2011). Therefore, research under the functionalist paradigm seeks to explain rationally and to generate recommendations from these explanations (Burrell and Morgan, 2011).

The research philosophies stem from the sets of assumptions, perspectives and paradigms, and these are: *positivism*, *critical realism*, *interpretivism*, *postmodernism* and *pragmatism* (Saunders, Lewis and Thornhill, 2015). Positivism was created by August Comte (2017), being originated from mathematics and astronomy, it had and still has the tendency to systematize our conceptions in any subject and led to the intellectual synthesis of social sciences. Later, Emile Durkheim (1982, p. 50) further developed positivism as the *sociologic method* by defining the term *social fact* as "almost all the phenomena that occur within society, however little social interest of some generality they present" and that it can be any kind of manner of acting, thinking and feeling imposed externally to the individual. Basically, the sociologic method, as the term implies, is the application of the scientific method to the social sciences by analysing the social fact. Therefore, the positivist research philosophy as mentioned before, stems from the objectivistic-functionalist paradigm and allows researchers to observe, explain in a casual manner and produce generalisations of reality that act as

prediction. This philosophy follows the scientific empirical method of natural sciences in order to manage data and facts unambiguously and free of any bias (Saunders, Lewis and Thornhill, 2015). The positivist research that this research is based on, allows the research to develop hypotheses from the extant literature that can be tested and approved, or rejected, and from the findings add up to the theory that can be of use for future research (Saunders, Lewis and Thornhill, 2015). Finally, the positivist research philosophy chosen to conduct the research makes it structure in a manner that allows replication, due to its focus on quantitative observation and statistical analysis (Saunders, Lewis and Thornhill, 2015).

3.2.2. *Research Approach.*

Following the research philosophy, the next element in the research design is the *research approach*, which is the approach to the reasoning behind the research and it can be either *deductive* or *inductive* (Saunders, Lewis and Thornhill, 2015). The deductive or *a priori* reasoning or logic was born from the Aristotelian logic, and the Greek philosopher Aristotle is the considered its parent (Groarke, 2019). *A priori* is a Greek term that means 'prior to' (Merriam-Webster, 2019) and it summarises the deductive logic. Without getting into much detail of logic and syllogisms, the deductive reasoning goes from the general to the particular, from idea to observation and a conclusion is logically reached from one or more statements or premises (Groarke, 2019). The most basic example is "All men are mortal; Socrates, Plato and Aristotle are men; therefore, Socrates, Plato and Aristotle are mortal" (Groarke, 2019). From this example, it can be noted that the conclusion that Socrates, Plato and Aristotle are mortal, is reached from the two statements or premises that all men are mortal and that Socrates, Plato and Aristotle are men. Therefore, the deductive approach allows the researcher to find and explain casual relationships between concepts and variables, which is the main goal of this dissertation, by generating hypotheses from current theory and test them by gathering quantitative data (Saunders, Lewis and Thornhill, 2015). Using the deductive method in in this research allows for easy replication, similarly to the benefits of using the positivist philosophy (Saunders, Lewis and Thornhill, 2015).

Up to this point, by using the positivist philosophy and the deductive approach, will allow to conduct the research by taking the extant literature as basis and formulate a series of hypotheses that will be tested. In order to confirm or refute the hypotheses, data will be gathered and statistically analysed by following a methodological choice and research strategy.

3.2.3. *Research strategy.*

The methodological choice refers to the use of *quantitative* or *qualitative* means of gathering and analysing data, where quantitative research can consists of statistical analysis procedures (Saunders, Lewis and Thornhill, 2015). Under the umbrella of the methodologic choice, any research can be mono or multi method, referring to the amount of methods used. sampling techniques and maintaining the researcher in an independent role (Saunders, Lewis and Thornhill, 2015). By taking in consideration the research philosophy and approach stated before, positivism and deductive reasoning,

the methodological choice that best suited the research of this dissertation is a quantitative research design due to its association with structured data collection techniques. The choice for this dissertation falls under a mono method quantitative study, which allows to research the relation between variables using statistics in an experimental design, ensuring generalisability by using probability

Following the methodological choice comes the purpose of the research design. Saunders et al. (Saunders, Lewis and Thornhill, 2015) propose four purposes, *exploratory, descriptive, explanatory, evaluative* studies. An exploratory study is a manner of asking open questions in order to discover and gain insight, and clarify the understanding of any phenomenon (Saunders, Lewis and Thornhill, 2015). A descriptive research, that can be considered as an extension of an exploratory study or prior to an explanatory one, requires the researcher to have knowledge about the phenomenon prior to undertaking the research and this type of research allows to gain further and more accurate insight of the issue (Saunders, Lewis and Thornhill, 2015). An explanatory study allows research an issue to explain the relation between variables (Saunders, Lewis and Thornhill, 2015). And last, an evaluative study allows to research the effectiveness of any situation, as the name implies, it is an evaluation (Saunders, Lewis and Thornhill, 2015). Being the main goal of this dissertation trying to find if a casual relation exists between the video game reviews of professional critics and consumers, and the publishing companies market capitalisation. The purpose that best suits this research is the explanatory one, as its main goal is to find casual relationships between variables.

The final part of the research design is the research strategy, which is defined as a plan to conduct the intended research and all that this involves (Saunders, Lewis and Thornhill, 2015). Saunders et al. (2015) define eight research strategies, which are: *experiment, survey, archival and documentary research, case study, ethnography, action research, grounded theory and narrative inquiry*. An experiment is based in the natural sciences, that studies the probability of a change in an independent variable affecting a dependent variable and uses predictions, or hypothesis, anticipating whether this relation exists or not (Saunders, Lewis and Thornhill, 2015). A survey uses questionnaires to collect standardised data, that can be later analysed in a quantitative manner (Saunders, Lewis and Thornhill, 2015). The archival and documentary research uses a wide range of existent data from different sources, instead of gathering new data (Saunders, Lewis and Thornhill, 2015). A case study is an in-depth insight into a phenomenon in a real-life scenario or event (Saunders, Lewis and Thornhill, 2015). An ethnographic study analyses the culture of a particular group (Saunders, Lewis and Thornhill, 2015). Action research is an iterative process designed to solve problems in organisations in a participative and collaborative manner (Saunders, Lewis and Thornhill, 2015). Grounder theory is developed under an inductive approach from a set of data (Saunders, Lewis and Thornhill, 2015). Narrative inquiry describes the nature of a qualitative interview in a complete narrative of the experiences of the interviewees (Saunders, Lewis and Thornhill, 2015).

The main purpose of the experiment is to study the possibility of a *dependent variable* being affected by an *independent variable* by making use of hypotheses (Saunders, Lewis and Thornhill, 2015). The hypotheses are tested and if there is a relation between the variables, these are accepted. If there is no statistically significant relation between the variables a *null* hypothesis is accepted. Due to the relation of the experiment and survey research strategies with the positivist philosophy and

quantitative methodological choice, it was then decided which one is the best for this research. Therefore, the experiment research strategy was chosen for this dissertation.

At the end of the research onion, but before the data collection and analysis, is the *time horizon* of the strategy. The time horizon refers to the focus of the analysis of the variables in a period of time and it can be either *cross-sectional* or *longitudinal* (Saunders, Lewis and Thornhill, 2015). The cross-sectional time horizon is the one that works best for this dissertation, as it frames the analysis of the relation between the variables at a particular time.

With the structure of the research design established, the research was conducted following a positivist, deductive, quantitative mono-method cross-sectional experiment that allowed to study the relation of the effect of reviews from professional critics and consumers, with the share price of the game publishing companies and test whether the hypotheses were true or not.

3.3. Sampling

Some of video game media websites with the most traffic are GameSpot, IGN and PCGamer, with 140, 110 and 40 million visits a month respectively, where consumers can find information about video games including the genre, platform, release date, price and content included (SimilarWeb, 2019a, 2019b, 2019d). In these sites, users can find reviews, pre-views, news and more information on video games and other forms of entertainment (Gamespot, 2019b). However, there are some aggregator websites that compile reviews from other websites such as the listed before and some of these sites gather the reviews for video games, movies, tv series and music and one of the most visited is Metacritic with 20 million visits a month (SimilarWeb, 2019c). This is the reason behind the selection of the aggregator Metacritic to gather the reviews from the video games.

The predictor variables analysed in this research, which are found in the hypotheses, are the accumulated average and daily volume of the reviews from both the professional critic and consumer reviews, as well as the average of the daily accumulated rating average of consumer and critic reviews. In order to analyse the market capitalisation of the publishing companies, the criterion variable is the stock price of these companies, that is the market value of the companies in the public exchange markets. There are two predictor variables per type of reviews, plus one that bridges the gap between the rating from both types. Before proceeding with the data analysis section, these variables are explained in detail.

The first variable, the accumulated average of the rating from the reviews, is the average of the rating of all the reviews submitted per day that gets averaged in a daily cumulative manner. This variable comes from the score, mark, grade or rating of each review. The second variable is the volume of reviews, is the number of reviews that get submitted on a daily basis.

Metacritic, a review aggregator website with 24 million monthly visits (SimilarWeb, 2019c), collects reviews from many websites. As a source of reviews from video games (Metacritic, 2019a), this website was selected as the choice of data source. Metacritic has a basic structure that includes the *Metascore*, which is nothing more than an average of the rating from all the critic and consumer reviews, that

Metacritic gathers by normalising the rating systems that each video game media websites use and standardising the review rating (Metacritic, 2019a). The normalised standard for the critic reviews uses a rating system with a range of 0 to 100 and the standard for the user reviews from uses one that ranges from 0 to 10, using decimals (Metacritic, 2019a, 2019o). In the following image, the main structure and elements found in a Metacritic video game review is shown:

The image shows a screenshot of a Metacritic review page for the video game Battlefield V. The page is annotated with numbers 1 through 8 pointing to specific elements:

- 1: Game title (BATTLEFIELD V)
- 2: Console (PlayStation 4)
- 3: Publishing company (Electronic Arts)
- 4: Game release date (Nov 15, 2018)
- 5: Other consoles where the game is available (Also On: PC, Xbox One)
- 6: Metascore or critics average rating (73)
- 7: User score or consumers average rating (2.2)
- 8: Pages for all the critic and consumer reviews (Critic Reviews, User Reviews)

Figure 2. Metacritic main structure. Source: Metacritic structure. Source: (Metacritic, 2019b)

1. Video game name
2. Console of the video game reviews
3. Publishing company
4. Game release date
5. Other consoles where the game is available
6. *Metascore* or critics average rating
7. User score or consumers average rating
8. Pages for all the critic and consumer reviews.

In the main page of each video game reviews page, there is a sample of all the reviews from critics and consumers. However, to access the rest of the reviews it is needed to access the section of the reviews from either critic or user reviews. The structure of each critic or user review is shown in the following image and it is comprised of the listed elements:

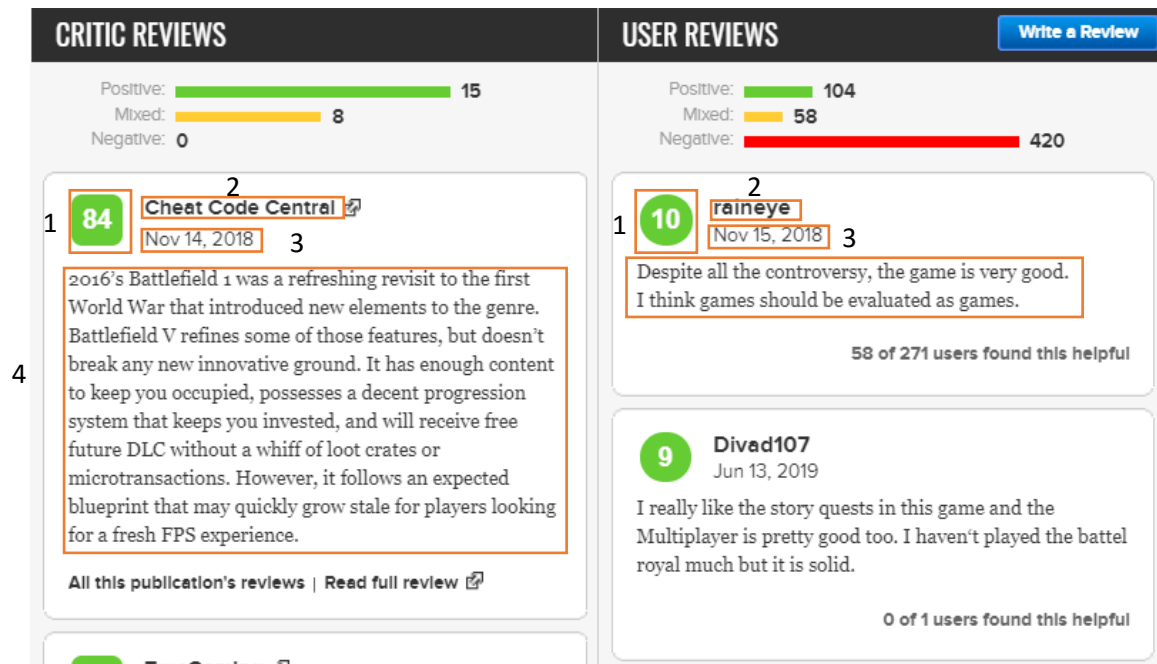


Figure 3. Reviews structure. Source: (Metacritic, 2019d)

1. Review score or rating
2. Review author
3. Review date
4. Review content

The previous explanation was needed for describing the independent variables. The detailed description of the variables is presented in the following table:

Table 2. Variables description

| Variable name | Variable Description |
|--|---|
| Critic reviews accumulated daily rating average | The accumulated daily average of the rating average of reviews from professional critics. This variable accounts for the daily rating historic considering all the reviews from each day. Each professional critic review has a score ranging between 0 and 100. |
| Consumer reviews accumulated daily rating average | The accumulated daily average of the rating average of reviews from consumers. This variable accounts for the daily rating historic considering all the reviews from each day. Each consumer review has a score ranging between 0 and 10. |
| Average critic and consumer reviews accumulated daily rating average. | This variable controls for the average of the rating of professional critics and consumers. This variable standardises into one single rating, the perception of the professional critics and the consumers. In order to do so, this variable normalises the rating range of the accumulated daily rating average of critics and consumers. |
| Critic reviews daily volume | The volume per day of reviews from professional critics. |
| Consumer reviews daily volume | The volume per day of reviews from consumers. |

The full list of the video games that were selected for the analysis of the hypotheses of can be found in the appendix section.

3.4. *Procedure and limitations of the methodology*

Before presenting the result section, this section will further describe which were the publisher companies and their videogames according to the restrictions of this research presented in the introduction.

A limitation of the methodology is the methods or sources of the data. As the reviews are gathered from an aggregator website and the company financial information is obtained through the use of a Google function that gathers the data from stocks.

The first and foremost restriction is that the video game publishing companies that are to be studied must trade publicly, as private companies market capitalisation information is not available publicly.

The second restriction is to exclude companies that are home or portable console manufacturers, electronic appliances manufacturers, or manufacturers of software any other than video games. This restriction excludes companies that do not focus solely on video game software.

The thirds restriction applied was to study companies that operate on the same stock exchange, the stock exchange *NASDAQ* was selected. Hereby excluding companies which shares are traded on the European or Asian markets.

The fourth restriction was that the companies must publish video games for games consoles, meaning companies that produce games primarily for smartphones were excluded.

The final restriction was to consider the video games released over the last five years and from a list of the 25 public trading video game publishing companies with the most revenue (Newzoo, 2019). The final selection of the video game publishing companies were Activision-Blizzard, Take-Two Interactive and Electronic Arts.

Regarding the video games, the first restriction was that the games considered were the ones that were released for the current generation of consoles (VGsales, 2019), specifically home consoles and PC. The selected video games were the ones available for the Xbox One, the PlayStation 4 and the personal computer, excluding the video games that were also released for the home consoles Xbox 360 and PlayStation 3 from the 7th generation. The second restriction applied, was that the video games must at least have 100 critic reviews and 100 consumer reviews, in order to ensure that the sample size was not statistically invalid. A total of 23 games that met the conditions were selected.

The video game reviews were gathered from Metacritic using a free to use Google Chrome web scrapping extension called *WebScraper* (WebScraper, 2019). The reviews were gathered for every game on every home console defined above, if available in that console. It is worth mentioning that there are some reviews that are in progress or are unscored. These types of reviews do not have a rating, thus are

discarded for the analysis. A total of 2,634 professional critic reviews and 27,409 consumer reviews were scrapped. At first, the research considered analysing the whole recollection of reviews, making the time horizon of the longitudinal. However, after an initial test it was decided that the time horizon was going to be cross-sectional instead. This decision was made because the literature from Chen et al. (2012) find that the film reviews affect the firm value of the film producing companies in the short term during the early stage of the films sales cycle. Therefore, the revised hypotheses considered the reviews that were written during the first seven days after the first critic review was released. This change in the research methodology and design is supported by the fact that the majority of the reviews are written in the first or first two weeks since the video games embargo lift for critic reviews and the release date for the consumer reviews, as shown in Figures 4 and 5. The evidence for this is the weekly distribution of the reviews since the first review is published for overall sample of reviews in the following figures:

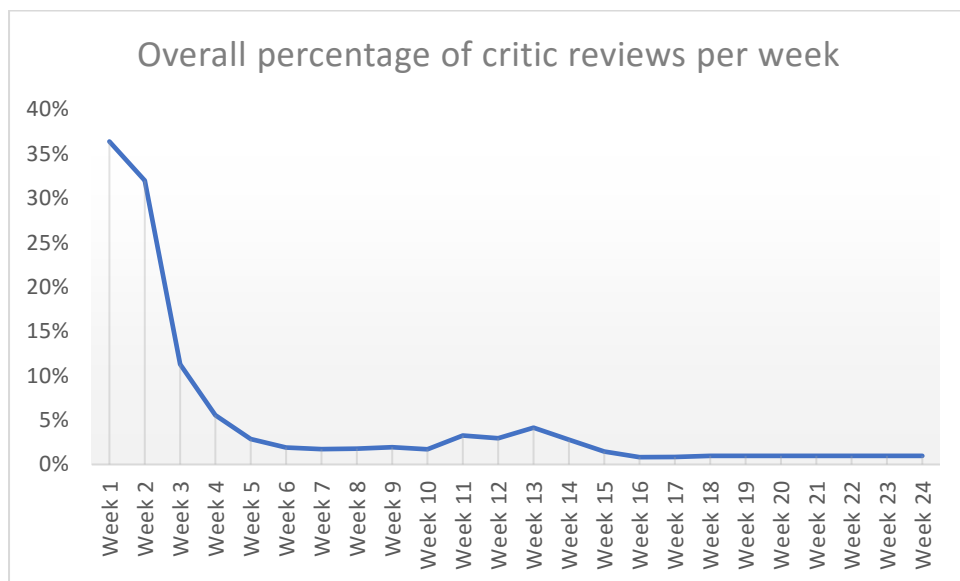


Figure 4. Percentage of critic reviews per week. Source: (Metacritic, 2019n). Processed by the author

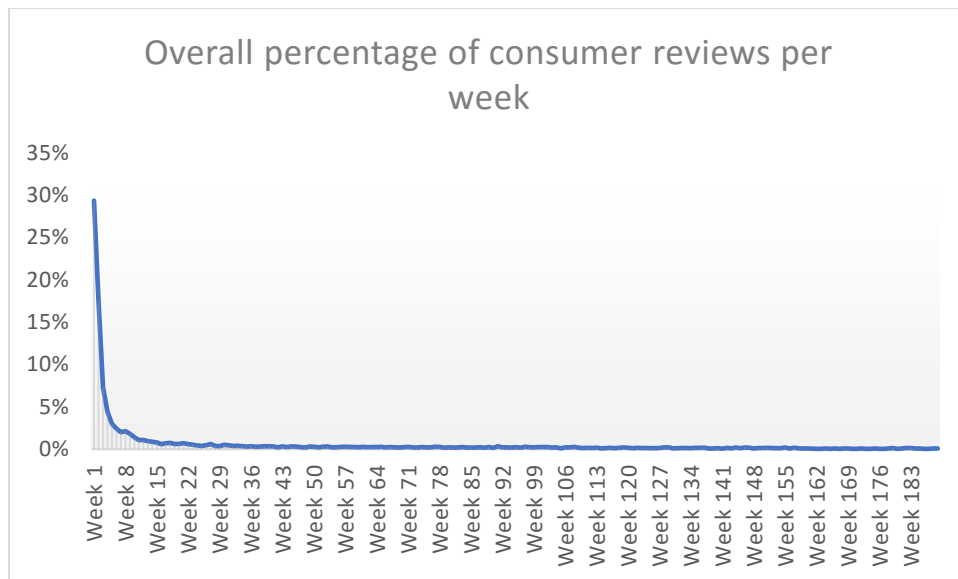


Figure 5. Percentage of consumer reviews per week. Source: (Metacritic, 2019n). Processed by the author

It is worth mentioning that there are some cases where the analysed video games were released as exclusives for a certain console and were later released for others. In these cases, the reviews from the re-release on the rest of the consoles was excluded of the analysis. The reason behind this is that the analysis of this research is only on newly launched video games, not on re-releases or remakes.

Regarding the stock price of the publishing companies, the data was obtained using the Google Finance function from Google Sheets (Google, 2019) by obtaining the share closing price historic since 2014. As the stock exchange does not operate on weekends and holidays, there were some days when reviews were written but there was no stock closing price for that day. For these special cases, the last known stock closing price was utilised.

Once the video game reviews were scrapped and the stock closing price was obtained, the independent variables were obtained. The daily accumulated average rating of critic reviews, the daily accumulated average rating of consumer reviews, the daily volume of consumer reviews, the daily volume of critic reviews and the average of the daily accumulated average rating of both critic and consumer reviews for each of the selected video games. The calculated variables were then connected to the closing price for the day the reviews were written. Finally, after gathering this information, it was then input into SPSS to analyse the descriptive statistics and the *Pearson's* correlation. The *Pearson's* Correlation produces a correlation coefficient, which measures the strength and direction of linear relationships between pairs of continuous variables (Yeager, 2019). This statistical tool evaluates whether evidence for a linear relationship in pairs of variables in the population exists (Yeager, 2019)

3.5. *Ethics*

This research was conducted under the most ethical scrutiny, having integrity and objectivity all the time and conducting the data research and analysis as accurately as possible. The author was always responsible of the analysis and accurate reporting of the findings. The data will not be altered nor made up, as well as the results will not be falsified. The research process ethical considerations will be followed by planning and conducting the research with no aims to cause harm, adapting the research strategy and choice of methods when appropriate, maintaining objectivity throughout the duration of the research process and being responsible to verify the gathered and resulting data.

4. Results

4.1. Introduction

This section provides the results of the data analysis conducted on the sample chosen. The objective of this research was to examine whether a relationship exists between the reviews from critics and consumers of the video games and the market capitalisation of the game publishing firm. The hypotheses that were considered as the main focus of the research were that the daily accumulated rating and the daily volume of the reviews have an effect on the share value of the companies.

Twenty-three games from Activision Blizzard, Electronic Arts and Take-Two Interactive were selected to be analysed and the data from the reviews was gathered from the aggregator website Metacritic. These twenty-three games were selected based on the restrictions detailed in the methodology, which are that the games must have been released in the last five years, they must have been released for the current generation of consoles and that they must have at least 100 critic and consumer reviews.

The cross-sectional Pearson's correlation analysis was conducted taking the reviews data from the first week since the first reviews are written.

4.2. Video Game Market

As discussed in the Methodology chapter, this research had decided to focus on the population of the video game publishing companies and the reviewers analysed that has the following characteristics.

4.2.1. Market capitalisation of the chosen companies

The companies that have been chosen for study in this research are:

- Activision Blizzard;
- Electronic Arts; and
- Take-Two Interactive

These companies are the top three companies by market capitalisation at 31st December 2018, according to the characteristics defined in the Methodology (Yahoo Finance, 2019a, 2019b, 2019c). The market capitalisation of the companies selected up to the 19th of August (Yahoo Finance, 2019a, 2019b, 2019c), is shown in Figure 6 below:

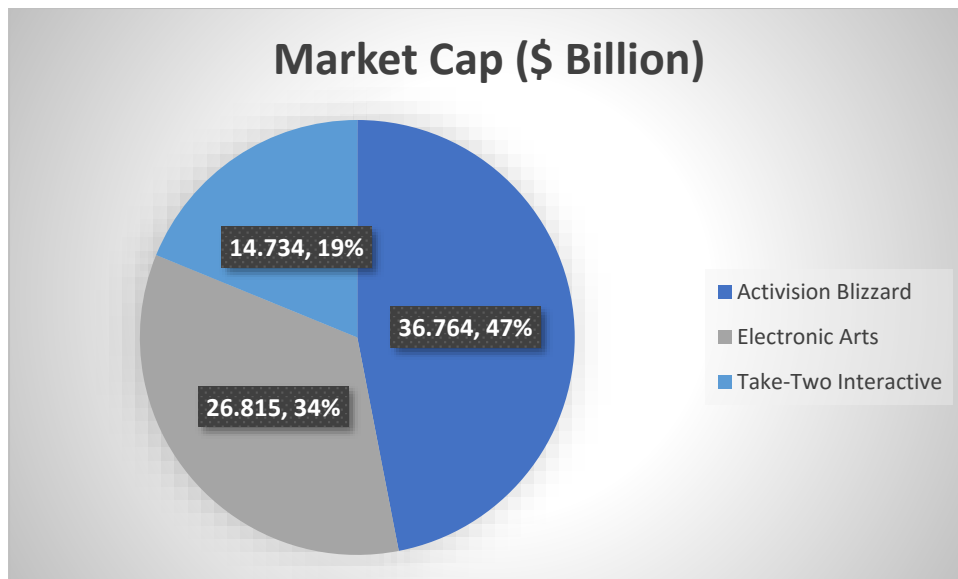


Figure 6. Video game publishing companies market cap. Source: (Yahoo Finance, 2019b, 2019a, 2019c)

Activision Blizzard is the company with the highest market capitalisation, with a total of \$ 36.764 billion, as shown in figure 6, followed by Take-Two Interactive and then Electronic Arts.

The market capitalisation growth of these companies over the last five years, calculated from August 2014 to August 2019, is shown in Figure 7 below:

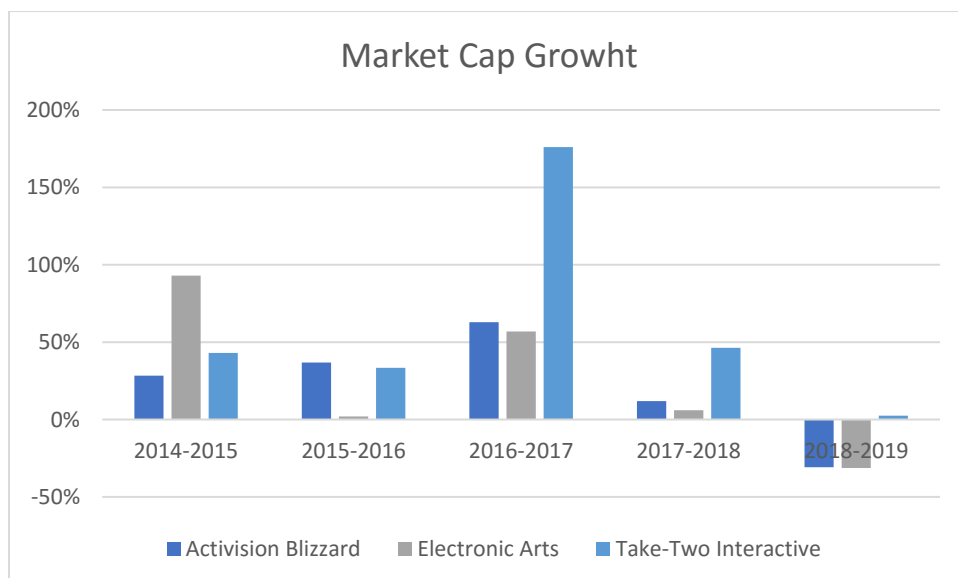


Figure 7. Video game publishing companies market cap growth. Source: (YChartz, 2019b, 2019a, 2019c)

Figure 7 shows that 2017 was the year when the publishing companies analysed had the highest growth and since then, they have not been recovered. Take-Two Interactive is the only company that currently has a positive growth rate and at the moment this company is the only one which its stock price is on the rise, shown in figure 21. Take-Two Interactive, a company with less than half of the market capitalisation of Activision Blizzard and barely more than half of Electronic Arts, in 2017

had a massive growth of more than 100%, as shown in Figures 6 and 7. Also, in 2018, Take-Two Interactive still had almost four times the growth of Activision Blizzard and eight times the growth of Electronic Arts, as shown in Figure 7. With a relative smaller market capitalisation, Take-Two is the company that has been growing the most in the last five years, as shown in Figure 7.

4.2.2. Video game firm share price

According to Yahoo finance, none of the companies had a stock split in the period analysed (Yahoo Finance, 2019a, 2019b, 2019c).

Share price change is a good analogue for market capitalisation as market cap equals share price multiplied by number of shares in the issue (The Money Fool, 2019).

Figure 8 shows the closing share price of the companies and their relation with the market, followed by the individual movement over time of each company:

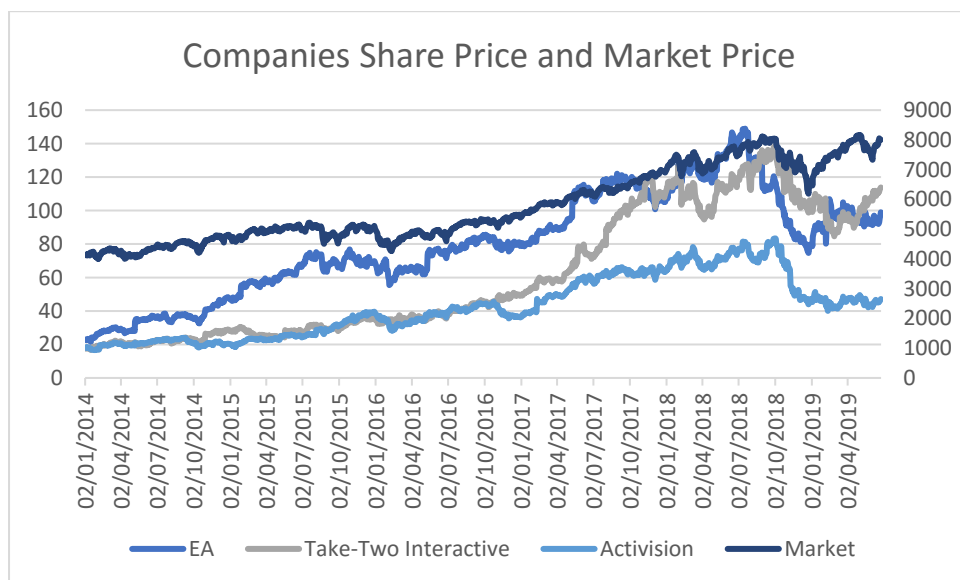


Figure 8. Stock price of the video game publisher companies and market historic. Source: (Yahoo Finance, 2019a, 2019b, 2019c)

4.2.3. Comparison of share movements including comparison with the market

The following table (Table 3), shows the descriptive statistics of the stock price of each company and the market, as well as the *Beta* of the shares (Yahoo Finance, 2019a, 2019b, 2019c):

Table 3. Descriptive statistics for the stock price of the video game publishing companies

| Variable | Mean | Standard Deviation | Low Price | High Price | Std Dev as % of mean | Beta (3Y Monthly) |
|--|-------------|--------------------|-------------|-------------|----------------------|-------------------|
| Activision Blizzard Stock Price | 42.62 | 18.26 | 16.67 | 83.39 | 43% | 0.95 |
| Electronic Arts Stock Price | 80.28 | 30.66 | 21.54 | 148.93 | 38% | 1.17 |
| Take-Two Interactive Stock Price | 61.72 | 37.72 | 16.68 | 137.99 | 61% | 0.72 |
| NASDAQ Composite closing price | 5787.0 1 | 1245.32 | 3996.9 6 | 8202.5 3 | 22% | |

Table 3, which has the stock prices mean, standard deviation, low price and high price of the video game publishing companies, shows that Electronic Arts is the company with the highest price of the stock, closely followed by Take-Two Interactive. The standard deviation of Take-Two Interactive is the highest followed by Electronic Arts and then Activision Blizzard. In addition, Take-Two Interactive has the highest standard deviation compared to the mean. Electronic Arts has the highest Beta with a value higher than 1, followed by Activision Blizzard very close to 1 and then Take-Two Interactive.

The correlation between the movement of an individual company with the rest of the competing companies in the industry that were analysed and with the market as a whole is the following:

Table 4. Correlation table for stock price of the publisher companies and market historic

| Variable | Activision Blizzard Stock Price Historic | Electronic Arts Stock Price Historic | Take-Two Interactive Stock Price Historic | Market Historic |
|--|--|--|--|-----------------|
| Activision Blizzard Stock Price Historic | 1 | 0.95** | 0.92** | 0.86** |
| Electronic Arts Stock Price Historic | 0.95** | 1 | 0.88** | 0.87** |
| Take-Two Interactive Stock Price Historic | 0.92** | 0.881** | 1 | 0.96** |
| Market Historic | 0.96** | 0.87** | 0.963** | 1 |

Table 4 shows that the publishing companies move on par with the market, in this case NASDAQ.

4.3. Video game reviews

The system used in reviews from professional critics goes from 0 to 100 units, from enthusiast consumers goes from 0 to 10, which is normalised to the measuring units used in the critic reviews, and the overall rating is the average of critic and enthusiast reviews (Metacritic, 2019a).

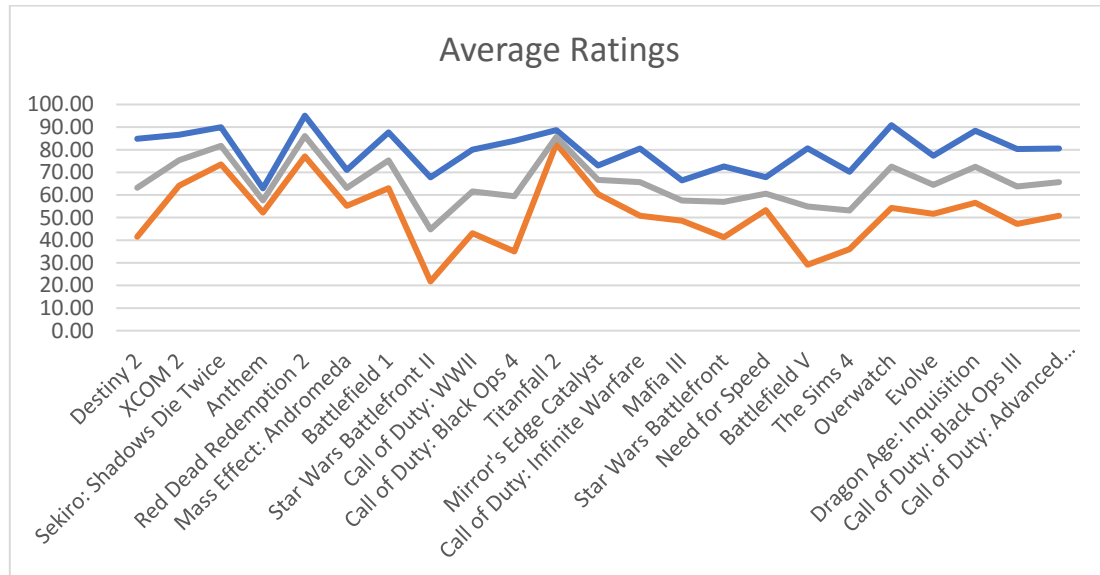


Figure 9. Average critic, consumer and overall ratings. Source:(Metacritic, 2019n). Processed by the author

Table 5. Average critic, consumer and overall video game grade

| Name | Average critic rating | Average consumer rating | Average overall rating (50:50) |
|--------------------------------|-----------------------|-------------------------|--------------------------------|
| Destiny 2 | 84.81 | 41.52 | 63.17 |
| XCOM 2 | 86.58 | 64.14 | 75.36 |
| Sekiro: Shadows Die Twice | 89.95 | 73.54 | 81.74 |
| Anthem | 62.93 | 52.20 | 57.57 |
| Red Dead Redemption 2 | 95.06 | 77.04 | 86.05 |
| Mass Effect: Andromeda | 71.06 | 55.21 | 63.13 |
| Battlefield 1 | 87.68 | 62.97 | 75.32 |
| Star Wars Battlefront II | 67.77 | 21.76 | 44.77 |
| Call of Duty: WWII | 80.02 | 43.07 | 61.54 |
| Call of Duty: Black Ops 4 | 83.92 | 35.03 | 59.47 |
| Titanfall 2 | 88.65 | 82.60 | 85.63 |
| Mirror's Edge Catalyst | 73.01 | 60.33 | 66.67 |
| Call of Duty: Infinite Warfare | 80.51 | 50.78 | 65.65 |

| | | | |
|--------------------------------|-------|-------|-------|
| Mafia III | 66.47 | 48.58 | 57.53 |
| Star Wars Battlefront | 72.60 | 41.30 | 56.95 |
| Need for Speed | 67.84 | 53.29 | 60.57 |
| Battlefield V | 80.60 | 29.15 | 54.88 |
| The Sims 4 | 70.28 | 36.02 | 53.15 |
| Overwatch | 90.83 | 54.30 | 72.56 |
| Evolve | 77.33 | 51.63 | 64.48 |
| Dragon Age: Inquisition | 88.41 | 56.52 | 72.46 |
| Call of Duty: Black Ops III | 80.29 | 47.20 | 63.74 |
| Call of Duty: Advanced Warfare | 80.51 | 50.78 | 65.65 |

Aside from the daily rating averages and the standard deviations, from Table 8 and Figure 9 it is shown that the lowest reviewed video games from each company by the critics are Anthem from Electronic Arts, Mafia III from Take-Two Interactive and Call of Duty: WWII from Activision Blizzard. However, the difference between the worst game from Electronic Arts and Activision Blizzard is 17.09 units.

Table 8 and Figure 9, shows that Electronic Arts has 6 video games with critic reviews under 80, Take-Two Interactive only has 2 games under that score and Activision Blizzard has none. On the other hand, the consumer reviews show a different scenario, where the worst games by company are Star Wars Battlefront II from Electronic Arts, Mafia III from Take-Two Interactive again and Call of Duty Black Ops 4 from Activision Blizzard. On the contrary to the critic reviews, every game is under the consumer rating of 8 except for Titanfall 2 from Electronic Arts.

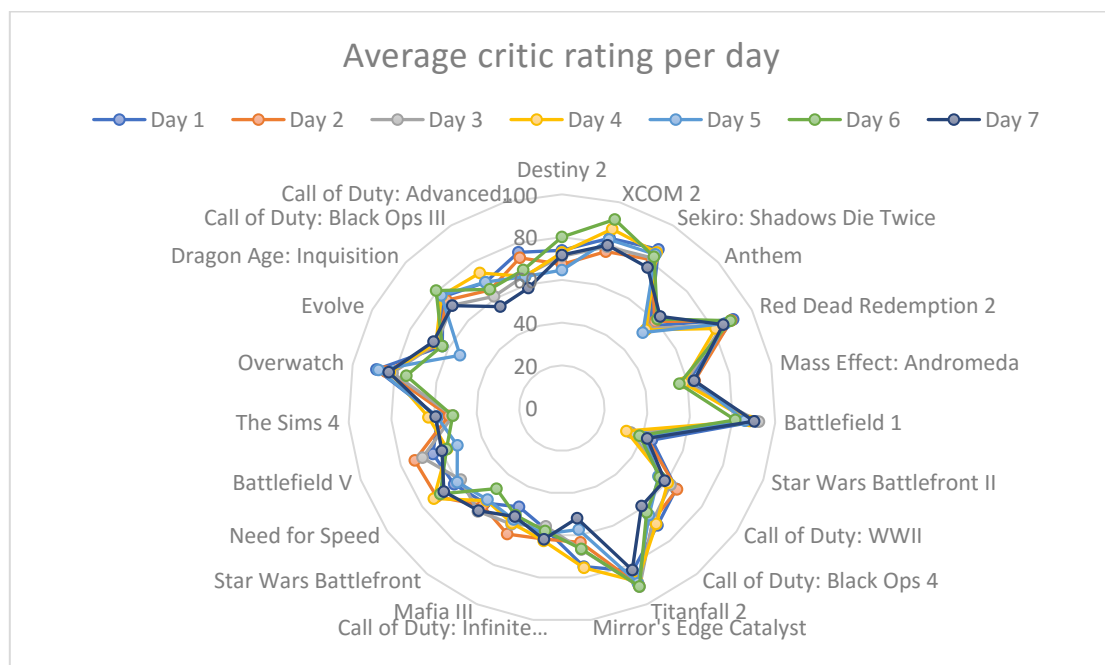


Figure 10. Average critic rating per day. Source: (Metacritic, 2019n). Processed by author.

Figure 12, shows that overall there is no pattern on high and low ratings for the video games. However, the games Battlefield 1, Mass effect Andromeda, Red Dead Redemption 2 have the closest high and low ratings over the period of the seven days.

Table 6. Average critic rating per day

| Name | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Destiny 2 | 73.8 | 67.25 | 71.1 | 72.8 | 64.55 | 80.05 | 71.65 |
| XCOM 2 | 82.55 | 76.05 | 78.4 | 87 | 81.9 | 91.65 | 79.15 |
| Sekiro: Shadows Die Twice | 86.9 | 81.2 | 82.1 | 85.25 | 84.15 | 82.9 | 77 |
| Anthem | 56.25 | 59.35 | 54.5 | 53.7 | 51.75 | 61.1 | 62.85 |
| Red Dead Redemption 2 | 90.2 | 89.1 | 84.85 | 80.95 | 86.15 | 88.8 | 84.95 |
| Mass Effect: Andromeda | 59.85 | 63.4 | 58.85 | 58 | 62.9 | 56.1 | 63.15 |
| Battlefield 1 | 91.15 | 86.6 | 92.4 | 88.1 | 85.8 | 81.25 | 90.1 |
| Star Wars Battlefront II | 44.65 | 42.2 | 34.2 | 32 | 41 | 38.55 | 42.3 |
| Call of Duty: WWII | 65.45 | 65.9 | 62.2 | 60.6 | 55.25 | 56 | 58.85 |
| Call of Duty: Black Ops 4 | 70.75 | 67.6 | 67.55 | 69.85 | 64.55 | 62.75 | 59 |
| Titanfall 2 | 83.1 | 90.4 | 91.1 | 88.4 | 89.25 | 90.95 | 82.6 |
| Mirror's Edge Catalyst | 74.85 | 63.4 | 66.75 | 75.4 | 57.35 | 66.5 | 52 |
| Call of Duty: Infinite Warfare | 57.05 | 61.8 | 55.85 | 62.7 | 59.35 | 58 | 61.95 |
| Mafia III | 50.35 | 64.25 | 59.2 | 58.7 | 56.8 | 54.6 | 55.35 |
| Star Wars Battlefront | 57.2 | 58.8 | 62.3 | 55.75 | 55.2 | 48.6 | 61.85 |
| Need for Speed | 61.75 | 71.8 | 58 | 73.4 | 60 | 69.65 | 67.65 |
| Battlefield V | 64.05 | 73.1 | 69.25 | 57 | 51.95 | 57.35 | 59.6 |
| The Sims 4 | 58.3 | 53.05 | 51.1 | 62.6 | 58.7 | 51.25 | 59.25 |
| Overwatch | 88.7 | 84.15 | 80.95 | 82.25 | 87.7 | 74.4 | 82.8 |
| Evolve | 63.05 | 65 | 66 | 66.35 | 53.75 | 63.15 | 67.7 |
| Dragon Age: Inquisition | 76.25 | 73.9 | 70.45 | 77.1 | 77.25 | 80.55 | 70.25 |
| Call of Duty: Black Ops III | 68.9 | 64.7 | 61.2 | 74 | 68.95 | 65.05 | 55.6 |
| Call of Duty: Advanced Warfare | 75.7 | 73.05 | 64.45 | 64 | 63.95 | 67.15 | 58.35 |

4.3.2. Rating – professional critic versus enthusiast reviews

For a sample of the video games analysed, the total number of reviews from both the professional critic and consumers and the distribution in percentage of the reviews is the following:

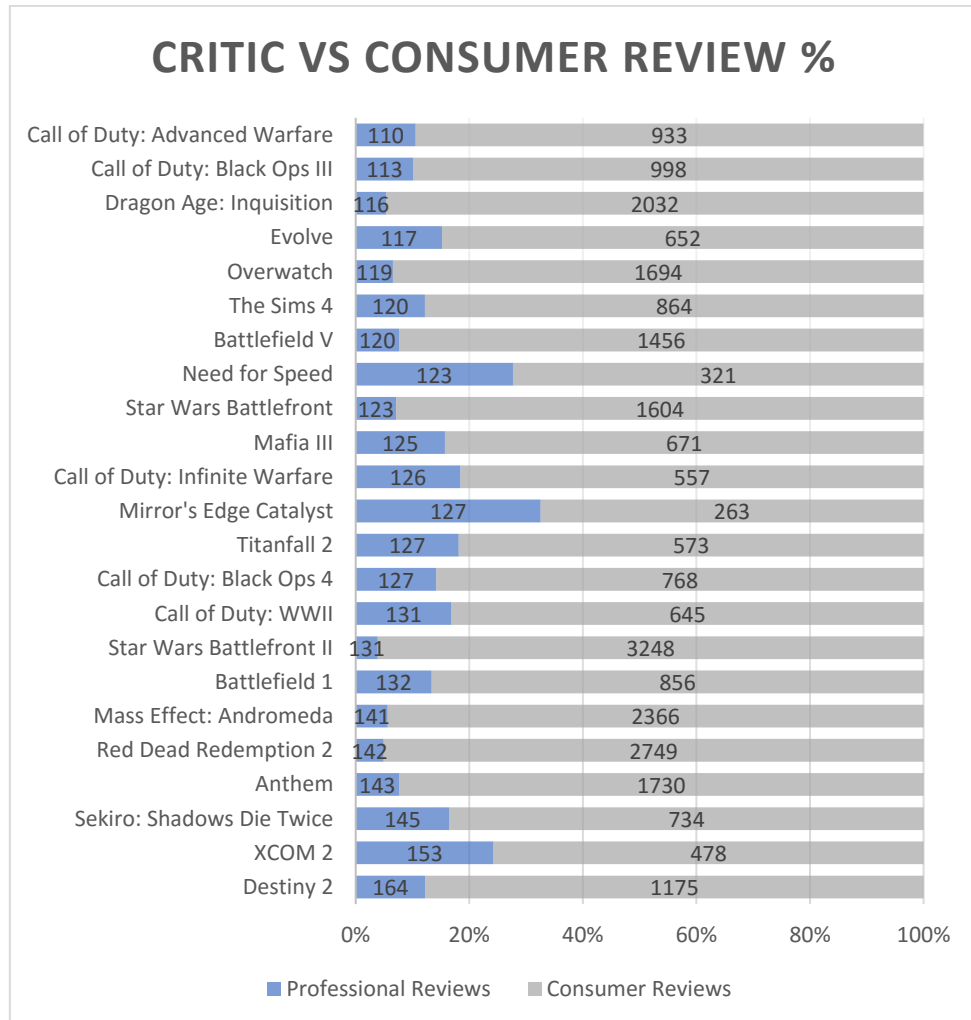


Figure 11. Critic and consumer reviews percentage. Source: (Metacritic, 2019n). Processed by the author

On the volume of reviews, figure 10 shows that the population of the reviews is comprised of the 9.80% of critic reviews and 90.2% consumer reviews of all the reviews sampled.

Professional Marks

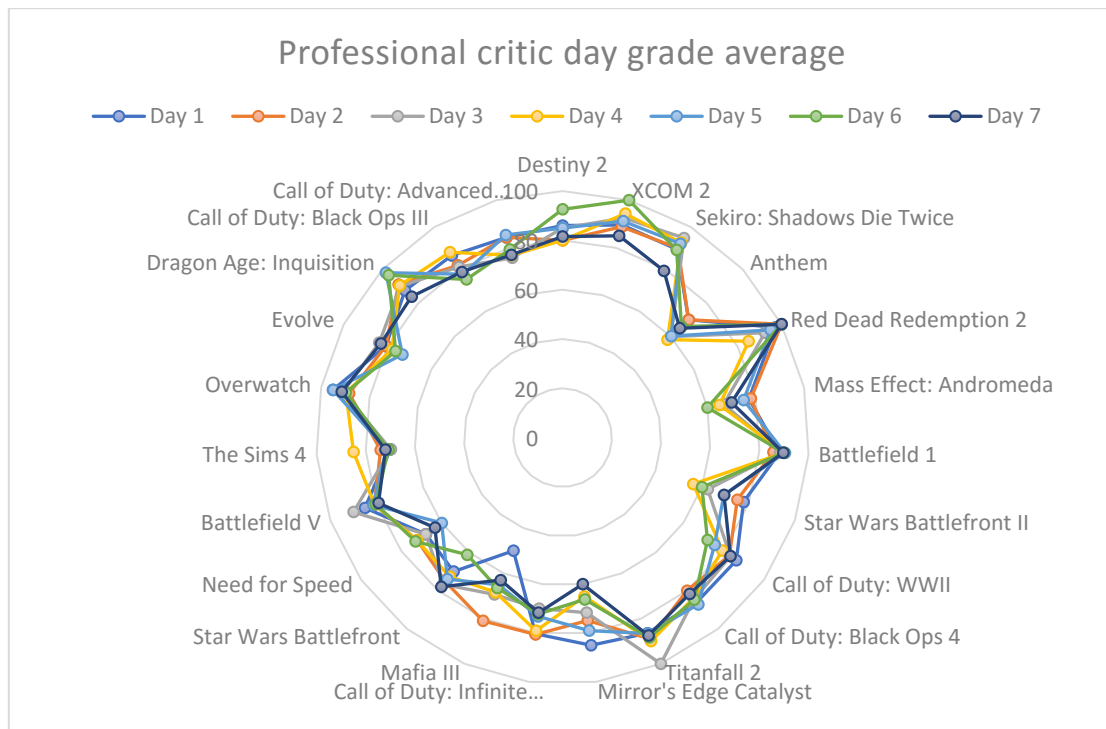


Figure 12. Professional critic day grade average. Source: (Metacritic, 2019n). Processed by author

Table 7. Professional critic day average

| Daily critic grade average | | | | | | | |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Name | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 |
| Destiny 2 | 86 | 80 | 85 | 80 | 85 | 92.6 | 81.6 |
| XCOM 2 | 89.6 | 88.8 | 92.5 | 94.3 | 91.2 | 100 | 85 |
| Sekiro: Shadows Die Twice | 89.4 | 90 | 94.8 | 92.5 | 92 | 89.1 | 79.2 |
| Anthem | 70 | 70 | 60 | 58.2 | 60.3 | 66 | 65 |
| Red Dead Redemption 2 | 97.2 | 100 | 92.5 | 85 | 95 | 100 | 100 |
| Mass Effect: Andromeda | 77.2 | 78 | 66.8 | 65 | 75 | 60 | 70 |
| Battlefield 1 | 88.2 | 85.7 | 88.6 | 90 | 90.4 | 90 | 89.8 |
| Star Wars Battlefront II | 77.9 | 75.2 | 62.5 | 56.3 | 69.4 | 60 | 69.5 |
| Call of Duty: WWII | 86.3 | 82.9 | 83.3 | 79.3 | 75.5 | 72 | 83.3 |
| Call of Duty: Black Ops 4 | 86.1 | 80 | 84.5 | 84 | 87.2 | 84.7 | 81.7 |
| Titanfall 2 | 86.5 | 89 | 100 | 90 | 86.6 | 88.3 | 87.5 |
| Mirror's Edge Catalyst | 85 | 74.9 | 71.7 | 65 | 79 | 66.3 | 60 |
| Call of Duty: Infinite Warfare | 80.3 | 80.6 | 70 | 79.1 | 73.2 | 72.2 | 71.7 |
| Mafia III | 50 | 81 | 69.3 | 68.4 | 65.1 | 66.5 | 63 |
| Star Wars Battlefront | 70 | 75.3 | 76.7 | 72.6 | 74 | 61.3 | 78 |
| Need for Speed | 67.9 | 72.1 | 68 | 72.3 | 60 | 73 | 63.3 |
| Battlefield V | 85.1 | 81 | 90 | 81 | 81.5 | 80.5 | 79.2 |
| The Sims 4 | 70 | 74 | 69.8 | 85 | 71.7 | 70.8 | 72 |

| | | | | | | | |
|--------------------------------|------|------|------|------|------|------|------|
| Overwatch | 95.2 | 88.4 | 91 | 89.8 | 95 | 89.8 | 91.5 |
| Evolve | 80.8 | 80.8 | 83.8 | 77.9 | 73.2 | 76.3 | 83 |
| Dragon Age: Inquisition | 87.4 | 91 | 90 | 90.4 | 98 | 96.5 | 83.8 |
| Call of Duty: Black Ops III | 86.5 | 81.8 | 81 | 88 | 77.6 | 75.1 | 78.6 |
| Call of Duty: Advanced Warfare | 84.3 | 84.4 | 75.8 | 76.8 | 85.3 | 79.3 | 77 |

Enthusiast marks

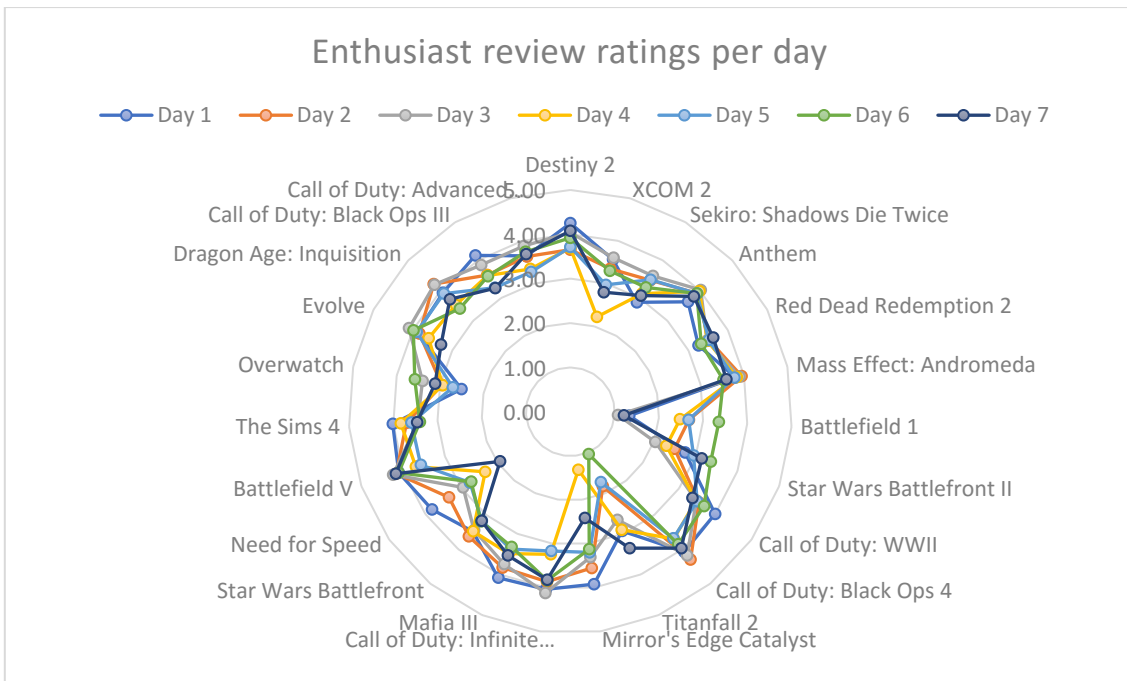


Figure 13. Enthusiast review ratings per day. Source (Metacritic, 2019n). Processed by author

Table 8. Enthusiast review ratings per day

| Name | Daily consumer grade average | | | | | | |
|---------------------------|------------------------------|-------|-------|-------|-------|-------|-------|
| | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 |
| Destiny 2 | 6.16 | 5.45 | 5.72 | 6.56 | 4.41 | 6.75 | 6.17 |
| XCOM 2 | 7.55 | 6.33 | 6.43 | 7.97 | 7.26 | 8.33 | 7.33 |
| Sekiro: Shadows Die Twice | 8.44 | 7.24 | 6.94 | 7.8 | 7.63 | 7.67 | 7.48 |
| Anthem | 4.25 | 4.87 | 4.9 | 4.92 | 4.32 | 5.62 | 6.07 |
| Red Dead Redemption 2 | 8.32 | 7.82 | 7.72 | 7.69 | 7.73 | 7.76 | 6.99 |
| Mass Effect: Andromeda | 4.25 | 4.88 | 5.09 | 5.1 | 5.08 | 5.22 | 5.63 |
| Battlefield 1 | 9.41 | 8.75 | 9.62 | 8.62 | 8.12 | 7.25 | 9.04 |
| Star Wars Battlefront II | 1.14 | 0.92 | 0.59 | 0.77 | 1.26 | 1.71 | 1.51 |
| Call of Duty: WWII | 4.46 | 4.89 | 4.11 | 4.19 | 3.5 | 4 | 3.44 |
| Call of Duty: Black Ops 4 | 5.54 | 5.52 | 5.06 | 5.57 | 4.19 | 4.08 | 3.63 |
| Titanfall 2 | 7.97 | 9.18 | 8.22 | 8.68 | 9.19 | 9.36 | 7.77 |
| Mirror's Edge Catalyst | 6.47 | 5.19 | 6.18 | 8.58 | 3.57 | 6.67 | 4.4 |

| | | | | | | | |
|--------------------------------|------|------|------|------|------|------|------|
| Call of Duty: Infinite Warfare | 3.38 | 4.3 | 4.17 | 4.63 | 4.55 | 4.38 | 5.22 |
| Mafia III | 5.07 | 4.75 | 4.91 | 4.9 | 4.85 | 4.27 | 4.77 |
| Star Wars Battlefront | 4.44 | 4.23 | 4.79 | 3.89 | 3.64 | 3.59 | 4.57 |
| Need for Speed | 5.56 | 7.15 | 4.8 | 7.45 | 6 | 6.63 | 7.2 |
| Battlefield V | 4.3 | 6.52 | 4.85 | 3.3 | 2.24 | 3.42 | 4 |
| The Sims 4 | 4.66 | 3.21 | 3.24 | 4.02 | 4.57 | 3.17 | 4.65 |
| Overwatch | 8.22 | 7.99 | 7.09 | 7.47 | 8.04 | 5.9 | 7.41 |
| Evolve | 4.53 | 4.92 | 4.82 | 5.48 | 3.43 | 5 | 5.24 |
| Dragon Age: Inquisition | 6.51 | 5.68 | 5.09 | 6.38 | 5.65 | 6.46 | 5.67 |
| Call of Duty: Black Ops III | 5.13 | 4.76 | 4.14 | 6 | 6.03 | 5.5 | 3.26 |
| Call of Duty: Advanced Warfare | 6.71 | 6.17 | 5.31 | 5.12 | 4.26 | 5.5 | 3.97 |

Tables 5 and 6, summarise the daily average review ratings don't have a clear pattern as the figures of both the critic and consumer ratings can vary upward or downwards every day.

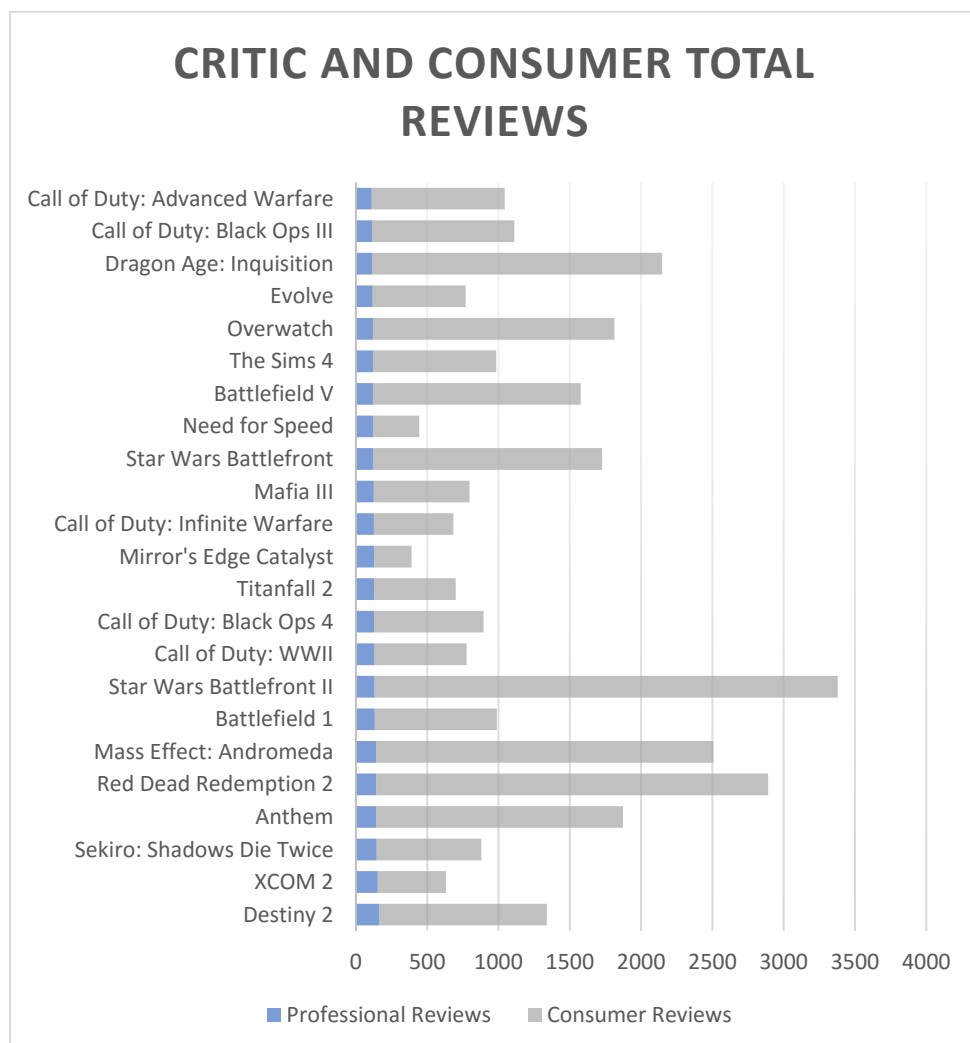


Figure 14. Total number of reviews. Source: (Metacritic, 2019n). Processed by the author.

Table 9. Total number of reviews

| Game | Professional Reviews | Consumer Reviews |
|--------------------------------|----------------------|------------------|
| Destiny 2 | 164 | 1175 |
| XCOM 2 | 153 | 478 |
| Sekiro: Shadows Die Twice | 145 | 734 |
| Anthem | 143 | 1730 |
| Red Dead Redemption 2 | 142 | 2749 |
| Mass Effect: Andromeda | 141 | 2366 |
| Battlefield 1 | 132 | 856 |
| Star Wars Battlefront II | 131 | 3248 |
| Call of Duty: WWII | 131 | 645 |
| Call of Duty: Black Ops 4 | 127 | 768 |
| Titanfall 2 | 127 | 573 |
| Mirror's Edge Catalyst | 127 | 263 |
| Call of Duty: Infinite Warfare | 126 | 557 |
| Mafia III | 125 | 671 |
| Star Wars Battlefront | 123 | 1604 |
| Need for Speed | 123 | 321 |
| Battlefield V | 120 | 1456 |
| The Sims 4 | 120 | 864 |
| Overwatch | 119 | 1694 |
| Evolve | 117 | 652 |
| Dragon Age: Inquisition | 116 | 2032 |
| Call of Duty: Black Ops III | 113 | 998 |
| Call of Duty: Advanced Warfare | 110 | 933 |

The game with the most amount of professional critic reviews is Destiny 2 with 164 reviews, followed by XCOM 2 with 153 reviews and Sekiro: Shadows Die Twice with 145 reviews. The game with the least amount of professional reviews is Call of Duty: Advanced Warfare with 110 reviews.

The game with the most amount of enthusiast critic reviews is Star Wars Battlefront II with 3248 reviews, followed by Red Dead Redemption 2 with 2749 reviews and in third place Dragon Age Inquisition with 2032 reviews. The game with the least amount of enthusiast critic reviews is Mirror's Edge Catalyst with 263 reviews.

4.3.3. Game reviews Standard Deviation pre and post-release

The following figure (Figure 15) shows the standard deviation of the professional critic game ratings in the period prior to the release of the game, if available, after the game release and the overall standard deviation for those games that did have pre-release reviews.

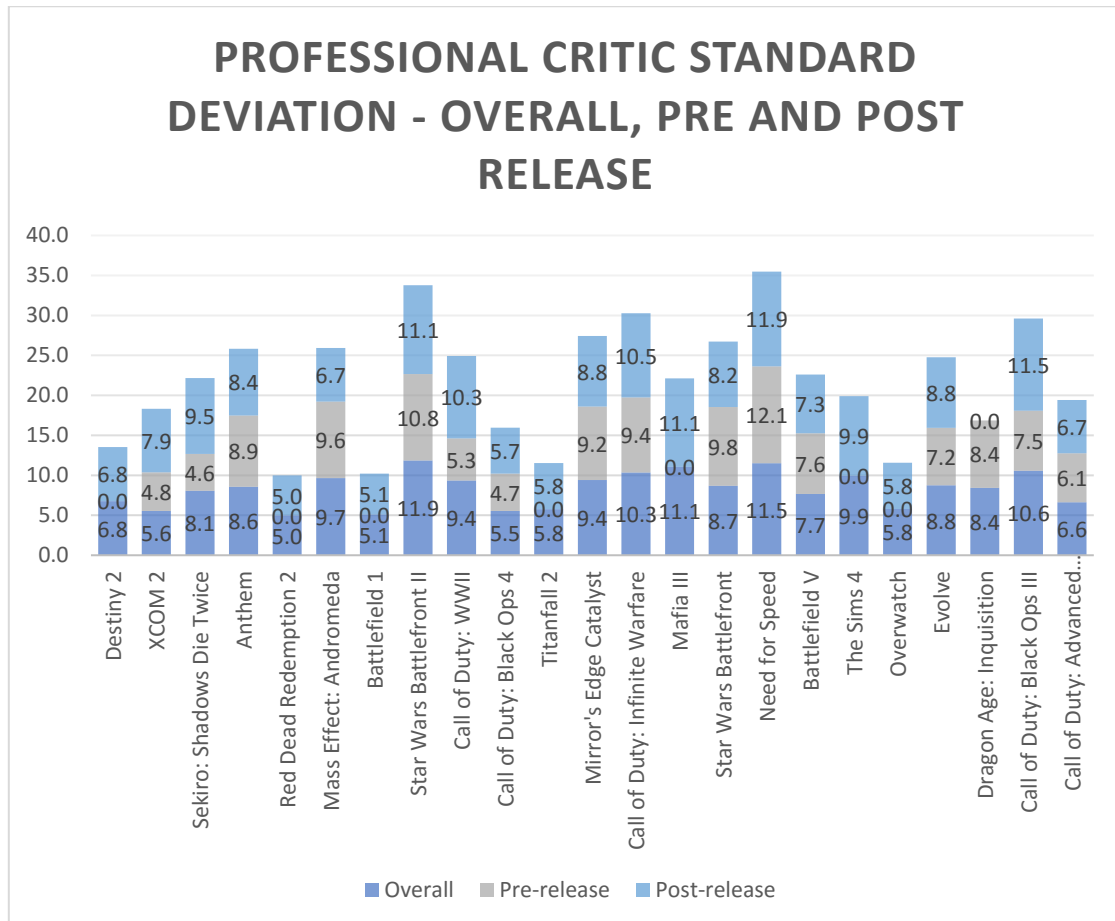


Figure 15. Professional critic reviews standard deviation - overall, pre and post release. Source: (Metacritic, 2019n). Processed by author.

Figure 15 shows that the highest overall, pre and post-release standard deviation is for Need for Speed, closely followed by Star Wars Battlefront II. The games Destiny 2, Red Dead Redemption, Battlefield 1, Titanfall 2, Mafia II, The Sims 4 and Overwatch didn't have reviews published during the pre-release window. A very particular case is Dragon Age: Inquisition, which had all the professional critic reviews published before the release date, therefore the overall and the pre-release standard deviations are the same.

4.3.4. Reviews by professional reviewers – daily Standard Deviation

The following figure (Figure 16) shows the standard deviation of the reviews from professional critics during the seven-day period analysed:

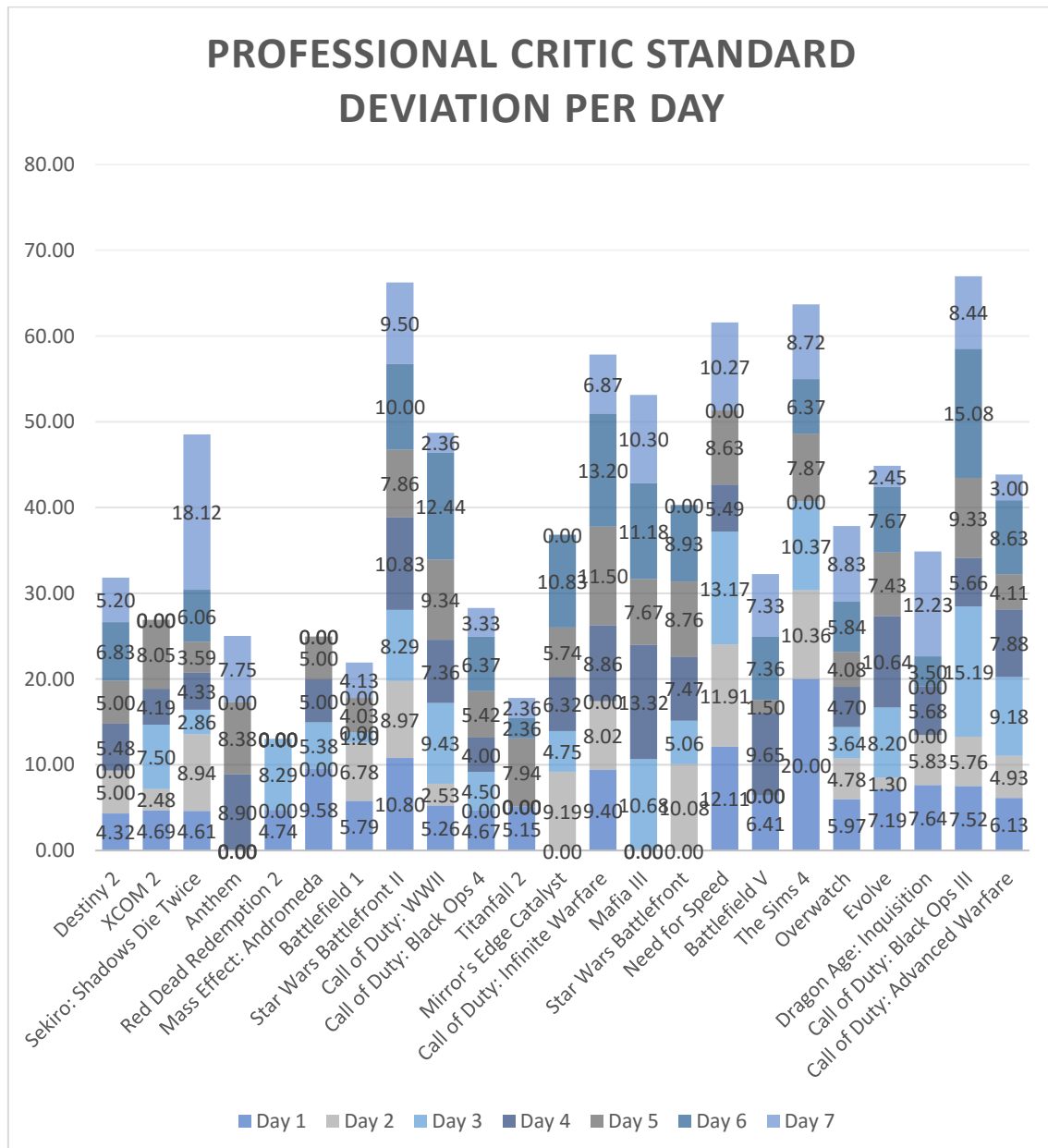


Figure 16. Professional critic reviews standard deviation per day. Source: (Metacritic, 2019n). Processed by author.

Figure 16 shows that Call of Duty: Black Ops III and Star Wars Battlefront II have the highest rating standard deviation per day over the period, closely followed by The Sims 4, Need for Speed and Call of Duty: Infinite Warfare. On the other hand, Red Dead Redemption 2 has the lowest standard deviation per day over the period, followed by Titanfall 2.

4.3.5. Reviews by enthusiast critics – daily Standard Deviation

The following figure (Figure 17) shows the standard deviation of the reviews from professional critics during the seven-day period analysed:

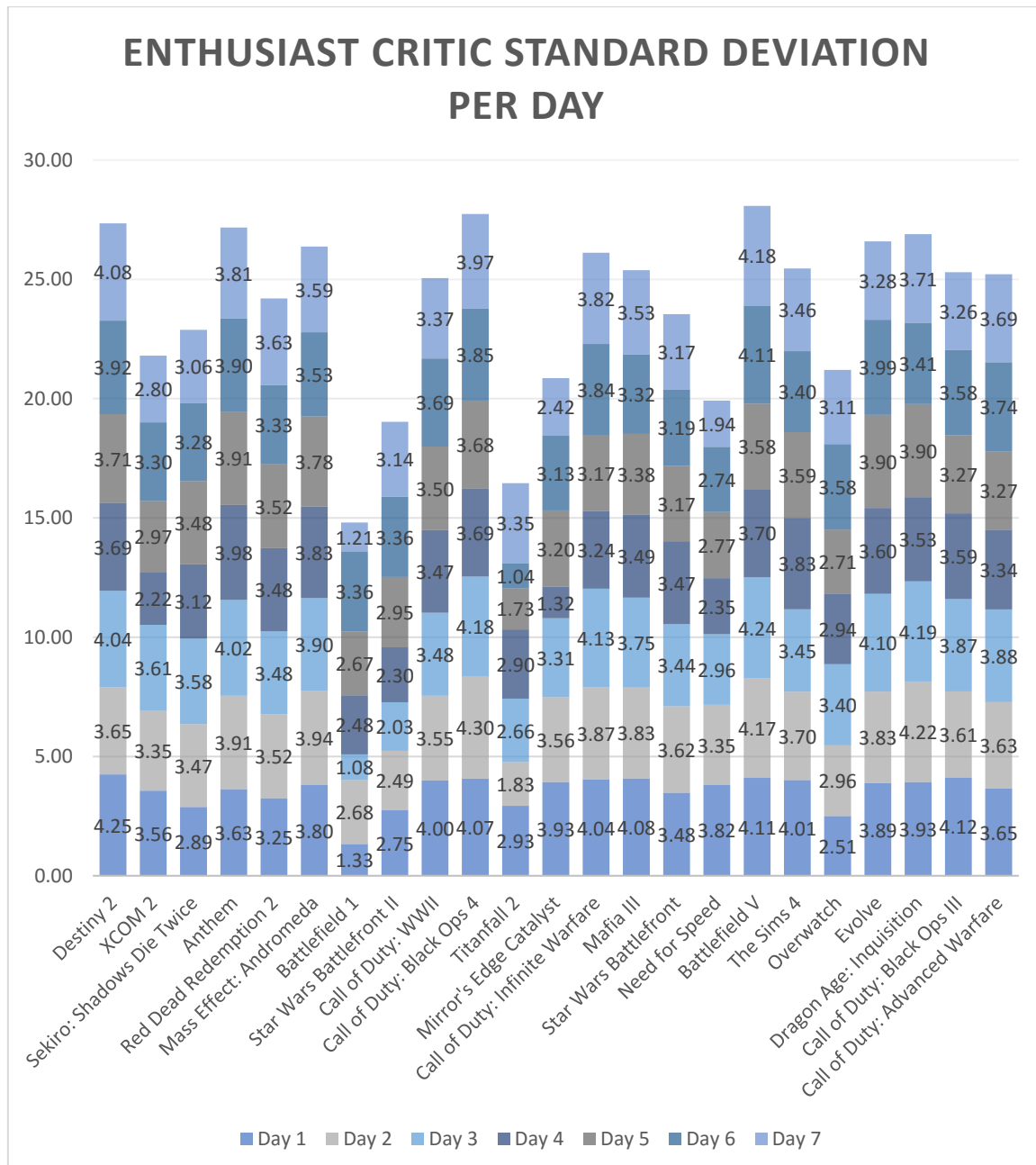


Figure 17. Enthusiast critic reviews standard deviation per day. Source: (Metacritic, 2019n). Processed by author.

Figure 16 shows that the games with the lowest standard deviation per day over the period analysed are Battlefield 1 and Titanfall 2. Differently to the daily standard

deviation of the professional critic review ratings, most of the games have a high standard deviation per day in the period analysed.

4.4. *Reviews and Market Capitalisation*

In 2018, Electronic arts lost 25% of their market capitalisation (Ballard, 2018, 2019). The reason behind why the market capitalisation and the reviews of the games is important, is to understand whether or not the reviews that the games receive have a direct relationship with the market value of the companies. This relation is explored in detail for the games and companies analysed in the following subsections.

4.4.1. *Relationship between game review mark and market capitalisation*

The hypotheses of the research are that there is a relationship between the rating of the reviews with the market capitalisation of the publishing companies. This was tested by analysing the rating of the video game reviews gathered against the stock price of the companies.

The overall correlation and co-variance of the professional critic, consumer review marks and the average between the two, with the stock price are the following:

Table 10. Game review marks correlation and co-variance

| Variable | Correlation | Co-variance |
|---|-------------|-------------|
| Critic review mark | -0.05 | 22.49 |
| Consumer review mark | 0.06 | -0.01 |
| Critic and consumer review mark average | 0.01 | 0.28 |

The correlation between the overall professional critic review mark and the price of the stock of the publishing companies shows a very low negative relationship. This means that the marks from professional critics for the twenty-three games do not have a significant effect on the market capitalisation of the three companies analysed.

The correlation between the overall enthusiast critic review mark and the price of the stock of the publishing companies shows a very low positive relationship. This means that the marks from enthusiast critics for the twenty-three games do not have a significant effect on the market capitalisation of the three companies analysed.

The correlation between the overall average of review marks and the price of the stock of the publishing companies shows a very low positive relationship. This means that the marks from professional and enthusiast critics for the twenty-three games do not have a significant effect on the market capitalisation of the three companies analysed.

The following figure (Figure 18) shows the movement of the overall review mark for all the games against the overall stock price for all the companies:

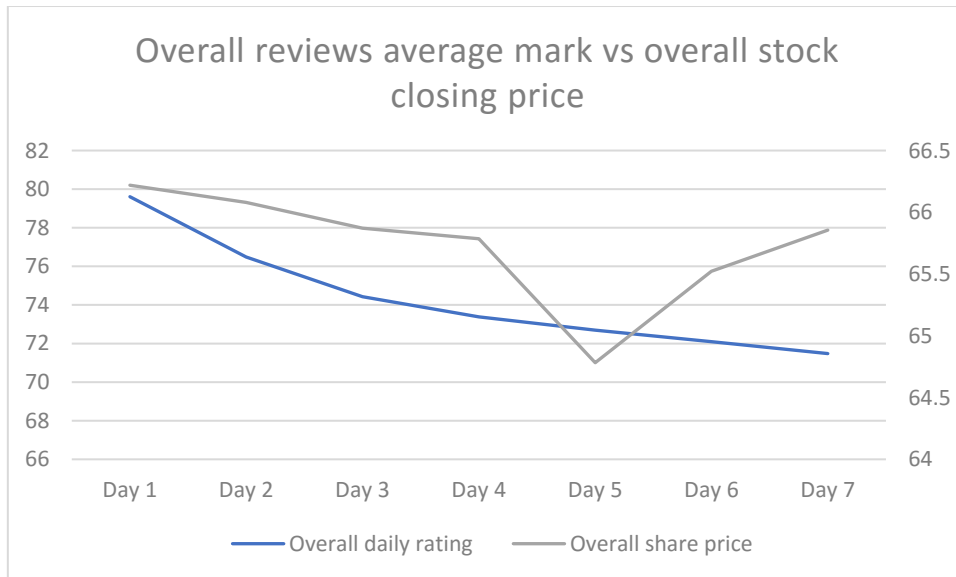


Figure 18. Overall reviews average mark vs overall stock closing price. Source:(Metacritic, 2019n).
Processed by author.

Figure 18 shows that the overall reviews average mark consistently go down from 79 to 71, while the stock price goes slightly down, the has an abrupt fall and recovers, but not to the initial value.

The following section shows the figures regarding a sample of three video games randomly selected, that even though being random, these games belong to one of the analysed companies each.

4.4.2. Call of Duty: Advanced Warfare

Call of Duty: Advanced Warfare was selected randomly from the sample of the twenty-three games.

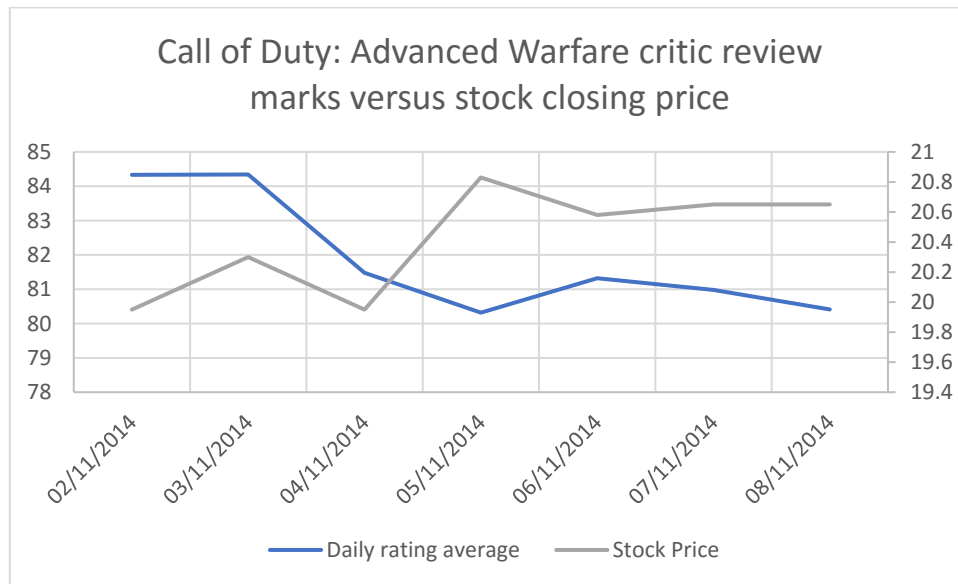


Figure 19. Call of Duty: Advanced Warfare critic reviews marks versus stock price

Figure 19 shows the movement of the average of the rating of the professional critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 84 and at the subsequent days lowered to 81 approximately. The stock of Activision Blizzard started in a low of 19.8 and went up to 20.6 in the end of the period.

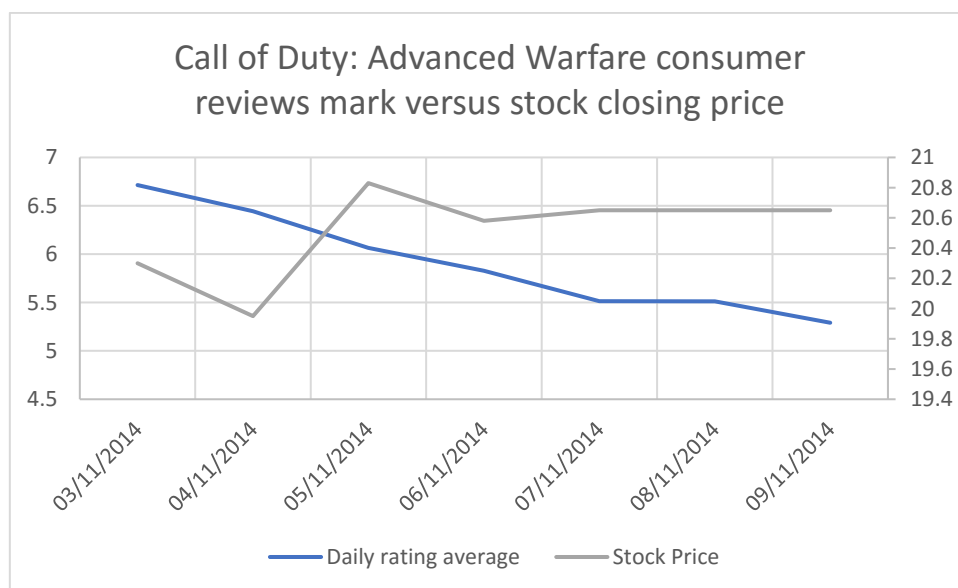


Figure 20. Call of Duty: Advanced Warfare consumer reviews marks versus stock price

Figure 20 shows the movement of the average of the rating of the enthusiast critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 6.5 and consistently went down to 5 approximately. The stock of Activision Blizzard started at a low of 20.2, went down, to finally going up and stabilising at 20.6 in the end of the period.

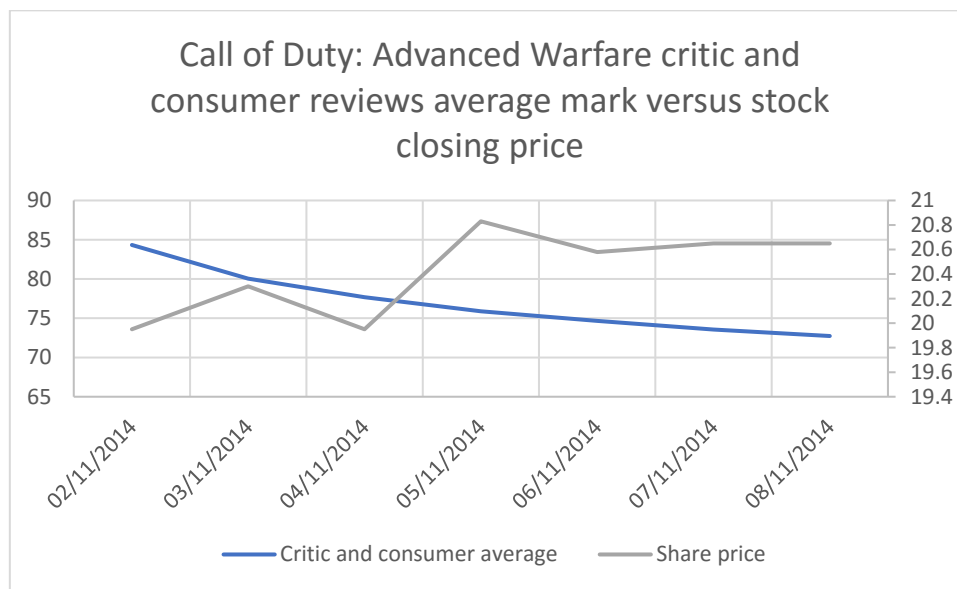


Figure 21. Call of Duty: Advanced Warfare critic and consumers review marks average versus stock price

Figure 21 shows the movement of the overall average of the rating reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 85 and consistently went down to 73 approximately. The stock of Activision Blizzard started at a low of 19.8, went up and down, to finally going up and stabilising at 20.6 in the end of the period.

Table 11. Call of Duty: Advanced Warfare review marks correlation and co-variance

| Call of Duty: Advanced Warfare | | |
|---|-------------|-------------|
| Variable | Correlation | Co-variance |
| Critic review mark | 0.02 | 0.05 |
| Consumer review mark | -0.67 | -0.09 |
| Critic and consumer review mark average | -0.77 | -0.96 |

The correlation between the overall professional critic review mark and the price of the stock of the publishing company shows a very low positive relationship. This means that the marks from professional critics for Call of Duty: Advanced Warfare do not have a significant effect on the market capitalisation of Activision Blizzard.

The correlation between the overall enthusiast critic review mark and the price of the stock of the publishing company shows a high negative relationship. This means that the marks from enthusiast critics Call of Duty: Advanced Warfare have a significant effect on the market capitalisation of Activision Blizzard. Hence, if the rating of enthusiast critic reviews of the game goes down, the price of the share will go up.

The correlation between the overall average of review marks and the price of the stock of the publishing company shows a high negative relationship. This means that the marks from professional and enthusiast critics Call of Duty: Advanced Warfare have a significant effect on the market capitalisation of Activision Blizzard. Hence, if the rating of the reviews of the game goes down, the price of the share will go up.

4.4.3. Red Dead Redemption 2

Red Dead Redemption 2 was selected randomly from the sample of the twenty-three games.

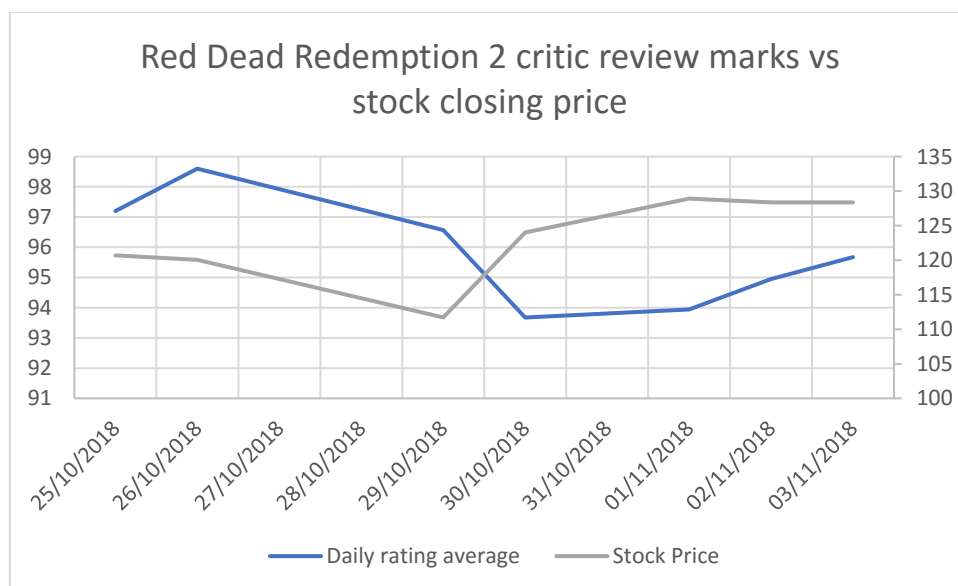


Figure 22. Red Dead Redemption 2 critic reviews marks versus stock price

Figure 22 shows the movement of the average of the rating of the professional critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 97, went up and down, to finally go up to 95, below the initial rating. The stock of Take-Two Interactive started in at 119, went down and up, to stabilise at 127 in the end of the period.

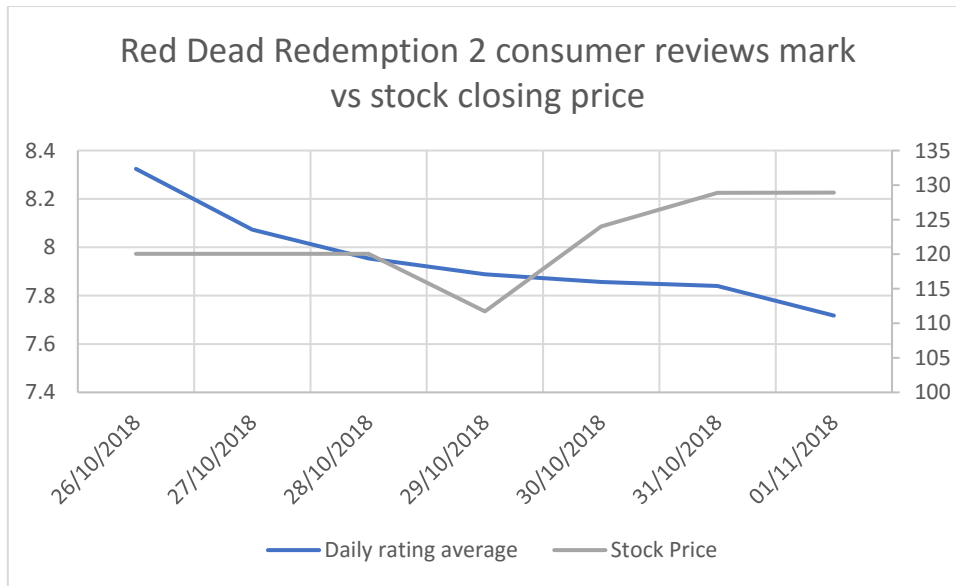


Figure 23. Red Dead Redemption 2 consumer reviews marks versus stock price

Figure 23 shows the movement of the average of the rating of the enthusiast critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 8.3 and consistently went down to 7.7 approximately. The stock of Take-Two Interactive started at 120, went down, to finally going up to 129 in the end of the period.

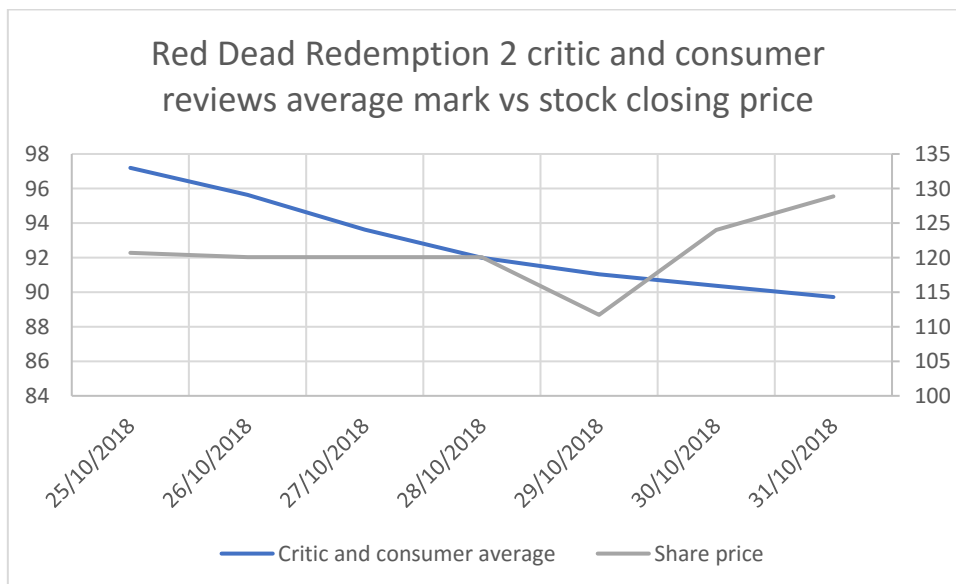


Figure 24. Red Dead Redemption 2 critic and consumers review marks average versus stock price

Figure 24 shows the movement of the overall average of the rating reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 97 and consistently went

down to 92 approximately. The stock of Take-Two Interactive started at 120, went down and up, to finally going up to 128 in the end of the period.

Table 12. Red Dead Redemption 2 review marks correlation and co-variance

| Red Dead Redemption 2 | | |
|---|-------------|-------------|
| Variable | Correlation | Co-variance |
| Critic review mark | -0.57 | -5.50 |
| Consumer review mark | -0.41 | -0.41 |
| Critic and consumer review mark average | -0.22 | -2.74 |

The correlation between the overall professional critic review mark and the price of the stock of the publishing company shows a high negative relationship. This means that the marks from professional critics for Red Dead Redemption 2 have a significant effect on the market capitalisation of Take-Two Interactive. Hence, if the rating of the professional critic reviews of the game goes down, the price of the share will go up.

The correlation between the overall enthusiast critic review mark and the price of the stock of the publishing company shows a medium negative relationship. This means that the marks from enthusiast critics Red Dead Redemption 2 have a significant effect on the market capitalisation of Take-Two Interactive. Hence, if the rating of enthusiast critic reviews of the game goes down, the price of the share will go up, although not so abruptly.

The correlation between the overall average of review marks and the price of the stock of the publishing company shows a low negative relationship. This means that the marks from professional and enthusiast critics Red Dead Redemption 2 have a significant effect on the market capitalisation of Take-Two Interactive. Hence, if the rating of the reviews of the game goes down, the price of the share will slightly go up.

4.4.4. Anthem

Anthem was selected randomly from the sample of the twenty-three games.

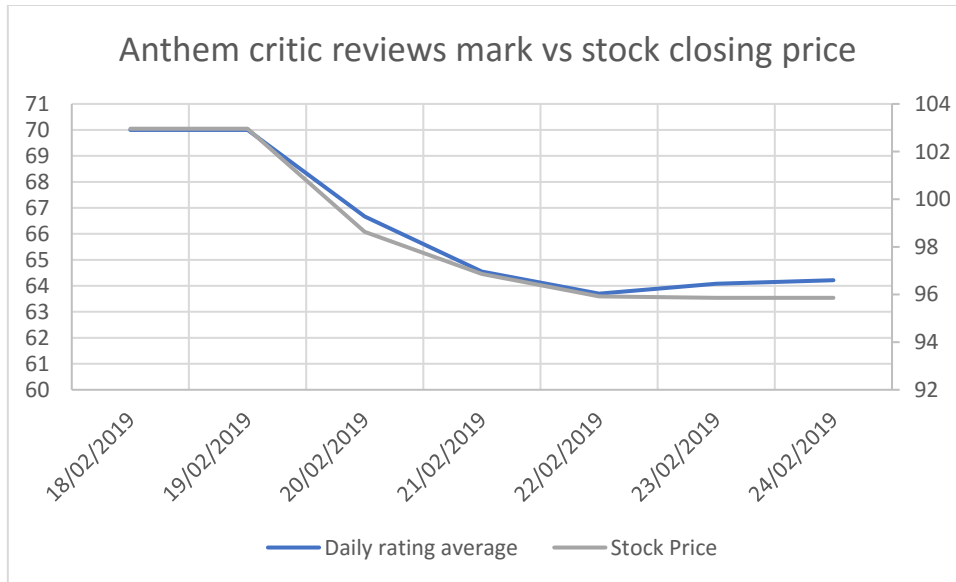


Figure 25. Anthem critic reviews marks versus stock price

Figure 25 shows the movement of the average of the rating of the professional critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 70, and plunged below the initial rating to 64. The stock of Electronic Arts started in at 103, and plunged equally to 96 approximately in the end of the period.

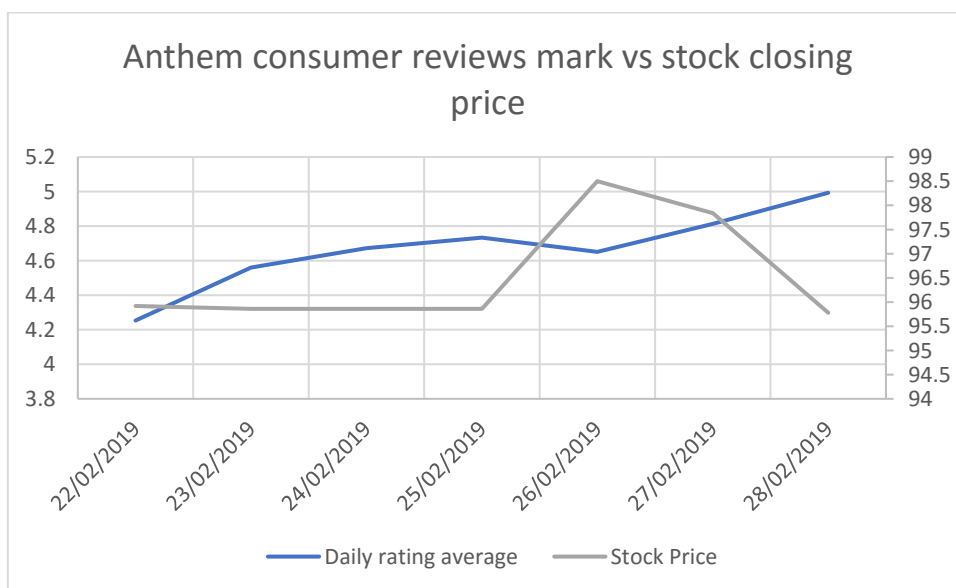


Figure 26. Anthem consumer reviews marks versus stock price

Figure 26 shows the movement of the average of the rating of the enthusiast critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 4.2 and consistently went up to 5 approximately. The stock of Electronic Arts started at 95.5 and consistently went up to 98 in the end of the period.

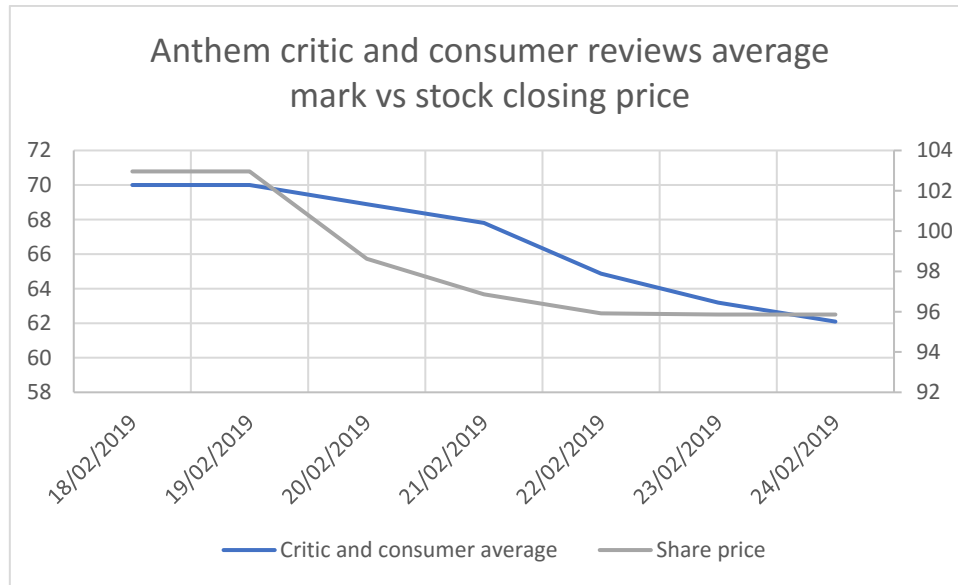


Figure 27. Anthem critic and consumers review marks average versus stock price

Figure 24 shows the movement of the overall average of the rating reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial average rating for this game was of 70 and consistently went down to 64 approximately. The stock of Electronic Arts started at 102 and consistently went down to 96 in the end of the period.

Table 13. Anthem review marks correlation and co-variance

| Anthem | | |
|---|-------------|-------------|
| Variable | Correlation | Co-variance |
| Critic review mark | 1.00 | 7.70 |
| Consumer review mark | 0.12 | 0.03 |
| Critic and consumer review mark average | 0.85 | 7.72 |

The correlation between the overall professional critic review mark and the price of the stock of the publishing company shows a very high positive relationship, being of 1 it is the highest it can be and this can be observed in Figure 25. This means that the marks from professional critics for Anthem have a completely significant effect on the market capitalisation of Electronic Arts. Hence, if the rating of the professional critic reviews of the game goes up, the price of the share will go up.

The correlation between the overall enthusiast critic review mark and the price of the stock of the publishing company shows a low positive relationship. This means

that the marks from enthusiast critics Anthem do not have a significant effect on the market capitalisation of Electronic Arts. Hence, if the rating of enthusiast critic reviews of the game goes up, the price of the share will barely go up.

The correlation between the overall average of review marks and the price of the stock of the publishing company shows a high positive relationship. This means that the marks from professional and enthusiast critics Anthem have a significant effect on the market capitalisation of Electronic Arts. Hence, if the rating of the reviews of the game goes up, the price of the share will go up.

4.5. *Relationship between game reviews volume and market capitalisation*

The hypotheses of the research are also that there is a relationship between the volume of the reviews with the market capitalisation of the publishing companies. This was tested by analysing the volume of the video game reviews gathered against the stock price of the companies.

The overall correlation and co-variance of the professional critic and consumer reviews volume, with the stock price are the following:

Table 14. Game reviews volume correlation and co-variance

| Variable | Correlation | Co-variance |
|------------------------|-------------|-------------|
| Critic review volume | -0.11 | 2.84 |
| Consumer review volume | -0.17 | -15.24 |

The correlation between the professional critic reviews volume and the price of the stock of the publishing companies shows a low negative relationship. This means that the volume of professional critic reviews for the twenty-three games have a slightly significant effect on the market capitalisation of the three companies analysed. This means that the as the volume of the reviews decreases, the price of the stock of the companies will slightly go up.

The correlation between the enthusiast critic reviews volume and the price of the stock of the publishing companies shows a low negative relationship. This means that the volume of enthusiast critic reviews for the twenty-three games have a slightly significant effect on the market capitalisation of the three companies analysed. This means that the as the volume of the reviews decreases, the price of the stock of the companies will slightly go up.

The following figure (Figure 28) shows the movement of the overall reviews volume of professional and enthusiast critics for all the games against the overall stock price for all the companies:

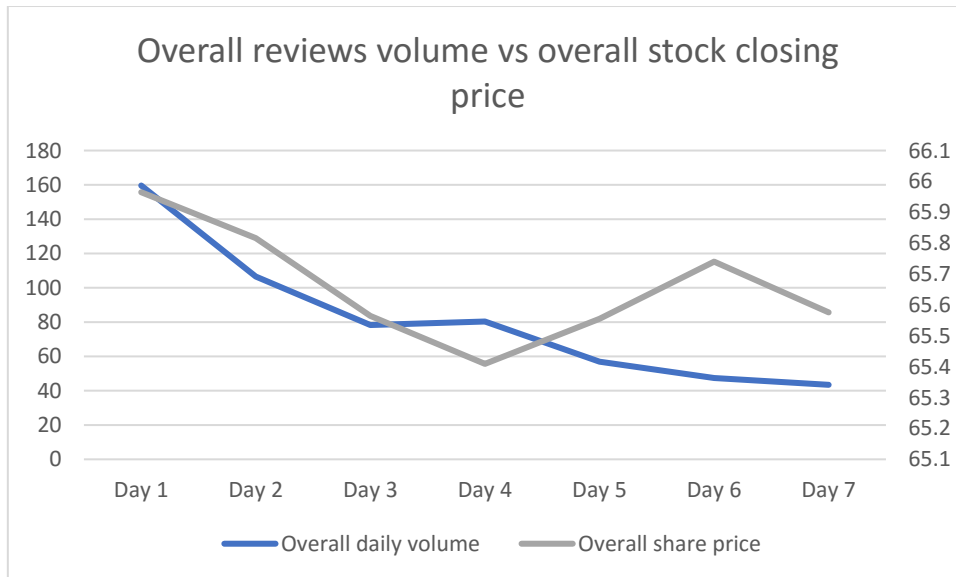


Figure 28. Overall reviews volume vs overall stock closing price. Source:(Metacritic, 2019n). Processed by author.

Figure 28, shows that the overall reviews volume of professional and enthusiast critics goes down from 160 on the first day to 40 on the seventh day and the stock price goes down in par with the volume until the fourth day, after which it goes up and down in the seventh day.

The following section shows the figures regarding the same sample of three video games randomly selected, as used for the average review marks plotted against the stock price.

4.5.1. Call of Duty: Advanced Warfare

Call of Duty: Advanced Warfare was selected randomly from the sample of the twenty-three games.

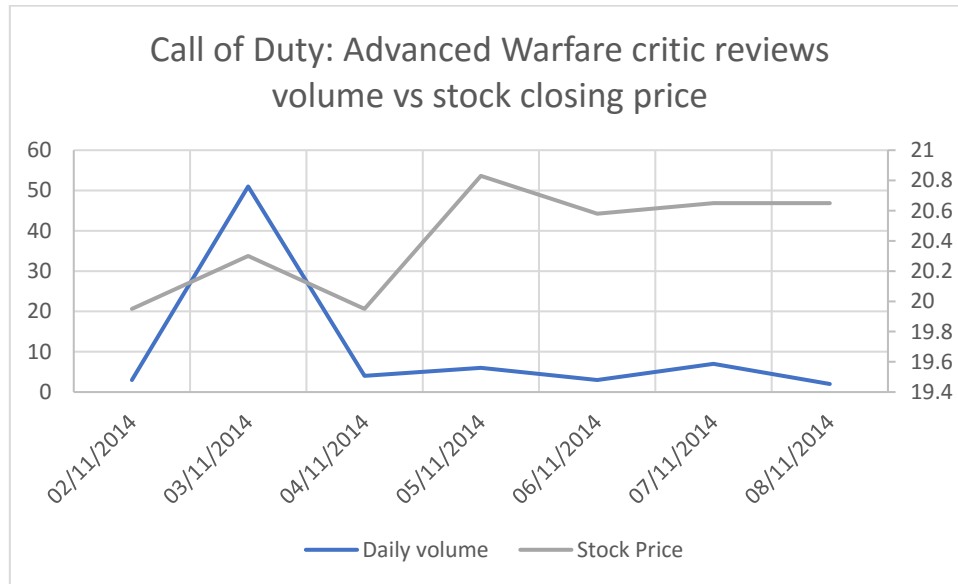


Figure 29. Call of Duty: Advanced Warfare critic reviews volume versus stock price. Source:(Metacritic, 2019n). Processed by author.

Figure 29 shows the movement of the volume of professional critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial volume on day one is of less than 5 reviews but abruptly goes down to 50 reviews in the second day, which steadily continues with a number of reviews between five and ten for the rest of the period. The stock of Activision Blizzard goes up as the amount of the reviews per day decreases, going from almost 20 up to 20.6.

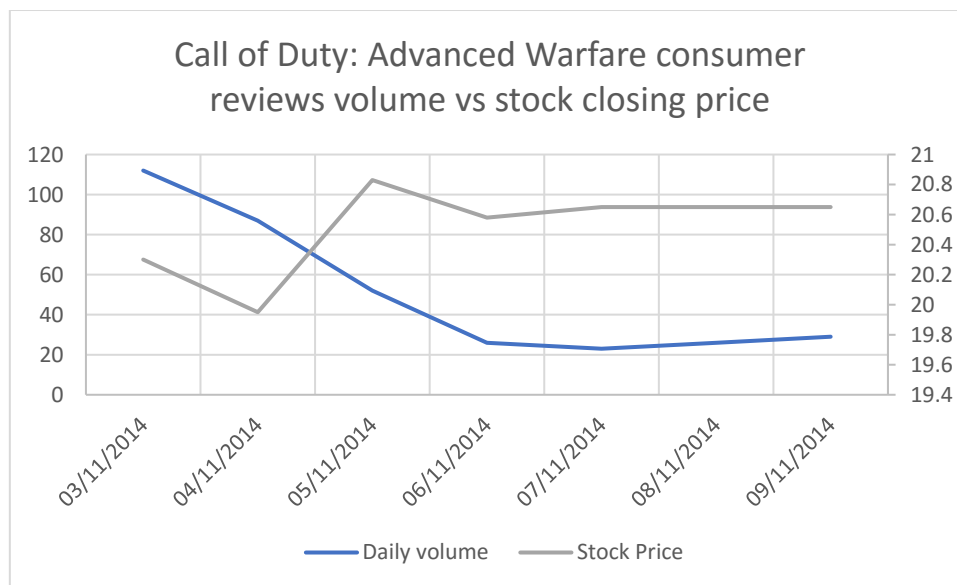


Figure 30. Call of Duty: Advanced Warfare consumer reviews volume versus stock price

Figure 30 shows the movement of the volume of enthusiast critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial number of reviews on the first day is of more than 100 reviews and goes down to a number between 20 and 30 reviews per day at the end of the period. The stock of Activision Blizzard goes from 20.3, has a slight fall and then goes up and stabilises at 20.6.

Table 15. Call of Duty: Advanced Warfare reviews volume correlation and co-variance

| Variable | Correlation | Co-variance |
|------------------------|-------------|-------------|
| Critic review volume | -0.11 | -0.58 |
| Consumer review volume | -0.71 | -6.41 |

The correlation between the overall professional critic reviews volume and the price of the stock of the publishing company shows a low negative relationship. This means that the volume from professional critics for Call of Duty: Advanced Warfare has a slightly significant effect on the market capitalisation of Activision Blizzard. Hence, if the volume of professional critic reviews goes down, the price of the share will slightly go up.

The correlation between the overall enthusiast critic reviews volume and the price of the stock of the publishing company shows a high negative relationship. This means that the volume from enthusiast critics Call of Duty: Advanced Warfare has a significant effect on the market capitalisation of Activision Blizzard. Hence, if the volume of enthusiast critic reviews of the game goes down, the price of the share will go up.

4.5.2. Red Dead Redemption 2

Red Dead Redemption 2 was selected randomly from the sample of the twenty-three games.

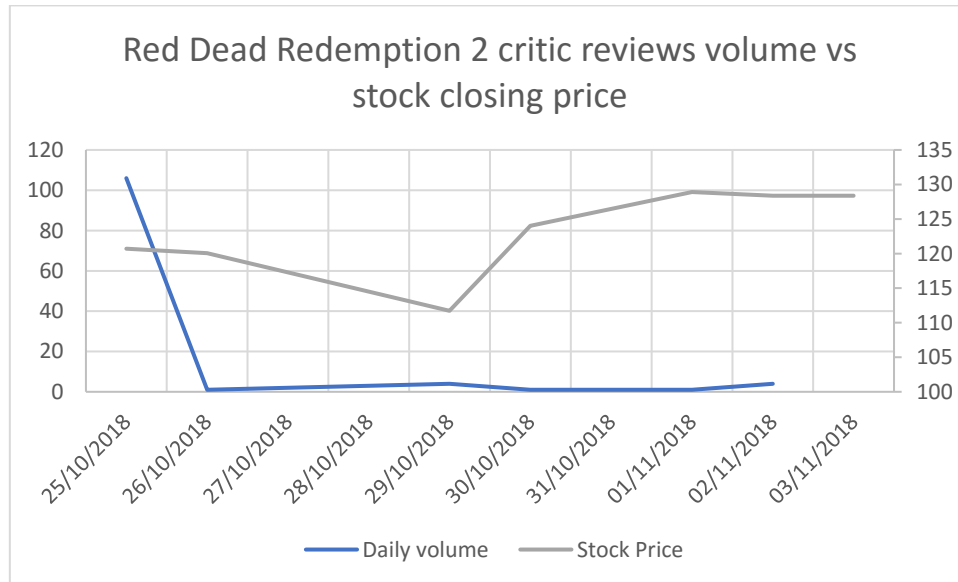


Figure 31. Red Dead Redemption 2 critic reviews volume versus stock price

Figure 31 shows the movement of the volume of professional critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial volume on day one is of more than 100 reviews and abruptly goes down to less than five reviews after the second day. The stock of Take-Two Interactive goes down and then up, after a slight fall, going from 120 to almost 130.

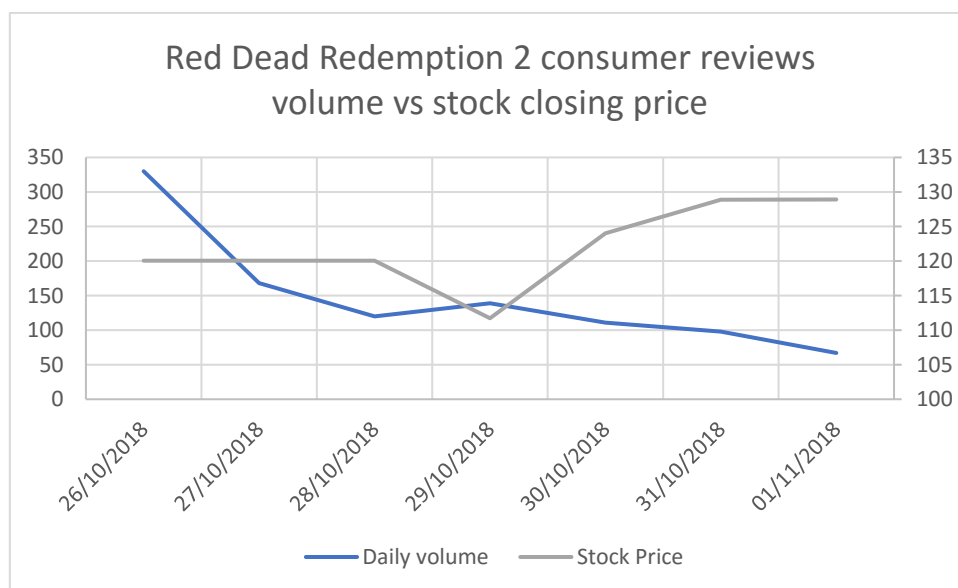


Figure 32. Red Dead Redemption 2 consumer reviews volume versus stock price

Figure 32 shows the movement of the volume of enthusiast critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial number of reviews on the first day is of almost 300 reviews and goes down to a number between 50 and 150 reviews per day at the end of the period. The stock of Take-Two Interactive goes from 120, has a slight fall and then goes up to almost 130.

Table 16. Red Dead Redemption 2 reviews volume correlation and co-variance

| Variable | Correlation | Co-variance |
|------------------------|-------------|-------------|
| Critic review volume | -0.19 | -39.62 |
| Consumer review volume | -0.39 | -174.68 |

The correlation between the overall professional critic reviews volume and the price of the stock of the publishing company shows a low negative relationship. This means that the volume from professional critics for Red Dead Redemption 2 has a slightly significant effect on the market capitalisation of Take-Two Interactive. Hence, if the volume of professional critic reviews goes down, the price of the share will slightly go up.

The correlation between the overall enthusiast critic reviews volume and the price of the stock of the publishing company shows a medium negative relationship. This means that the marks from enthusiast critics Red Dead Redemption 2 has a significant effect on the market capitalisation of Activision Blizzard. Hence, if the volume of enthusiast critic reviews of the game goes down, the price of the share will go up, although not much.

4.5.3. Anthem

Anthem was selected randomly from the sample of the twenty-three games.

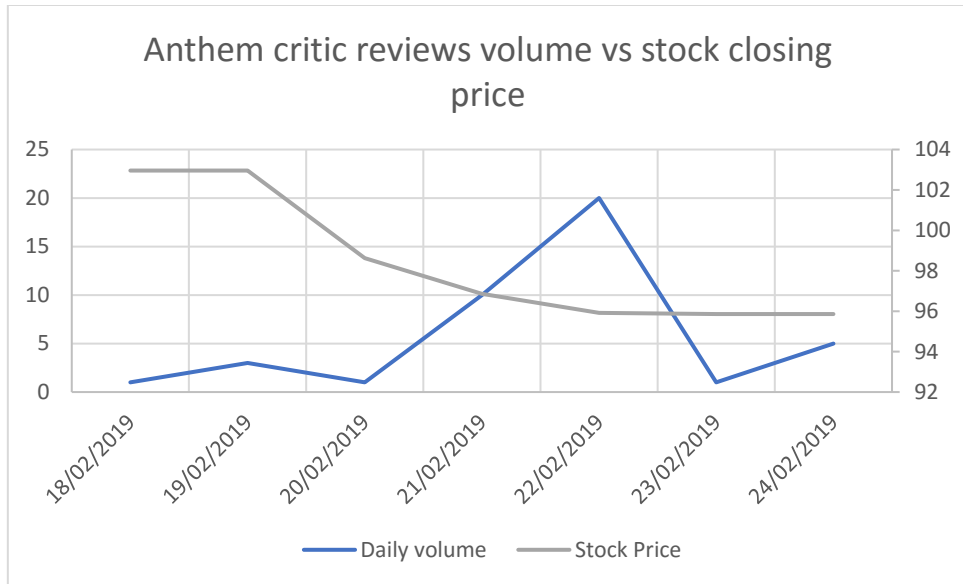


Figure 33. Anthem critic reviews volume versus stock price

Figure 33 shows the movement of the volume of professional critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial volume on day up to day three is minimum, with less than 5 reviews, but it goes up to 20 reviews in the fifth day, and then it falls to the initial volume. The stock of Electronic Arts starts at 103 and steadily goes down to 96.

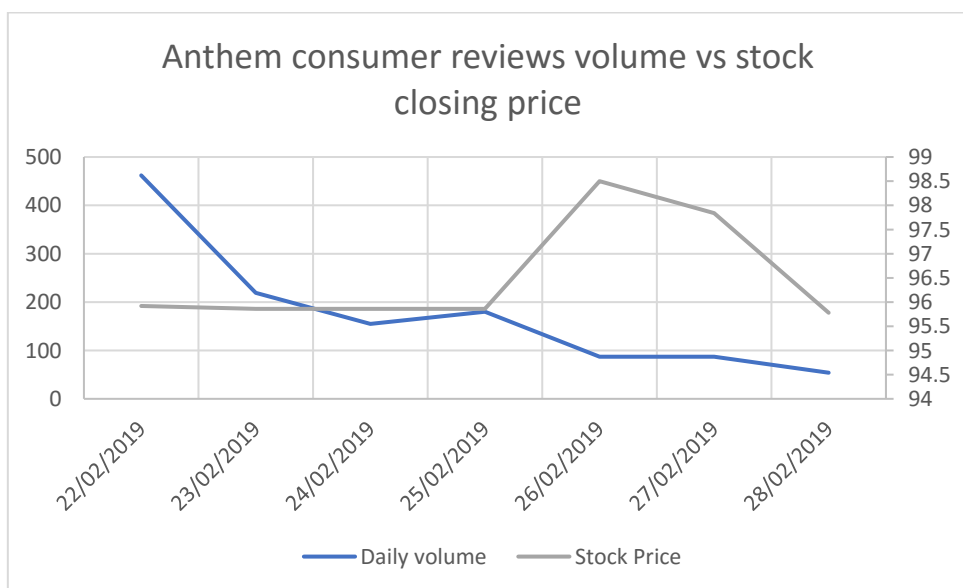


Figure 34. Anthem consumer reviews volume versus stock price

Figure 34 shows the movement of the volume of enthusiast critic reviews plotted against the movement of the stock of the publishing companies over a period of seven days. The initial number of reviews on the first day is of almost 500 reviews and goes down to around 200, to finally end between 50 and 50 reviews per day at the end of the period. The stock of Electronic Arts maintains a price of almost 96, then goes up to 98.5, only to go down again to 96.

Table 17. Anthem review volume correlation and co-variance

| Variable | Correlation | Co-variance |
|------------------------|-------------|-------------|
| Critic review volume | -0.46 | -9.03 |
| Consumer review volume | -0.41 | -56.02 |

The correlation between the overall professional critic reviews volume and the price of the stock of the publishing company shows a medium negative relationship. This means that the volume from professional critics for Anthem has significant effect on the market capitalisation of Electronic Arts. Hence, if the volume of professional critic reviews goes down, the price of the share will go up, although not much.

The correlation between the overall enthusiast critic reviews volume and the price of the stock of the publishing company shows a medium negative relationship. This means that the marks from enthusiast critics Anthem has a significant effect on the market capitalisation of Electronic Arts. Hence, if the volume of enthusiast critic reviews of the game goes down, the price of the share will go up, although not much.

5. Discussion

5.1. *Findings on review statistics*

The findings of the statistics of all the game reviews, shown in Table 4 and Figure 9, are that overall the ratings or grades from critics are higher than those of consumers and that for none of the analysed video games the average ratings of the critics are lower than the consumers rating.

Although there is no clear pattern, most of the post-release standard deviations are higher than the pre-release counterparts, as shown in Figures 16 and 17. The same figures (16 and 17) doesn't show a regular pattern regarding the standard deviation for both the critic and consumer review ratings.

The Figure 9 and Table 4, also show that overall Activision Blizzard has the best reviewed games with the least standard deviation, while Electronic Arts has the worst reviewed games and Take-Two Interactive have the highest standard deviation.

On the volume of reviews, Figure 14 and Table 8 shows that the population of the reviews is comprised of the 9.80% of critic reviews and 90.2% consumer reviews of all the reviews sampled.

5.2. *Findings on market capitalisation*

Figure 8 and Table 4 show that overall, the stock price of the publishing companies are not significantly affected by the critic or consumer reviews, as more importantly Table 4 shows that the individual movement of the stocks of the companies move on par with the market, as indicated in the literature from Stancu et al. (2017).

5.3. *Findings on the relationship between game review mark and market capitalisation*

For the sampled games, Call of Duty: Advanced Warfare from Activision Blizzard shows a negative large correlation between the review rating and the average of the critic and consumer ratings the stock price, while the critic reviews do not show a significant correlation, as shown in Table 10.

Red Dead Redemption from Take-Two Interactive show a high negative correlation between the critic reviews and the price, a medium negative correlation between the consumer reviews and the price and a low negative correlation between the average of both types of reviews and the price, as shown in Table 11.

Finally, for Anthem from Electronic Arts, there is a positive correlation of 1 between the critic reviews and the price, simply the highest from the samples, a low positive correlation between the consumer ratings and the price and for the average of the reviews from critics and consumers, there is a large positive correlation, as shown in Table 12.

However, the overall correlation between the reviews of all the games with the stock market value for the critic, consumer and the average between both, as shown in Table 9, is very low, while the highest covariance comes from the critic review ratings and for the consumers and the average of both is almost 0.

5.4. *Findings on the relationship between game reviews volume and market capitalisation*

For the samples of the video games, similarly with the previous findings, the correlations of the volume of reviews and the stock price, for Call of Duty there is a negative low correlation between the volume of critic reviews and a negative high correlation between the volume of consumer reviews with the stock price, as shown in Table 14.

Red Dead Redemption has a low negative correlation between the volume of critic reviews and a medium negative correlation between the volume of consumer reviews with the stock price, as shown in Table 15.

For Anthem, there is a medium negative correlation between the volume of critic and consumer reviews with the stock price, as shown in Table 16.

However, as with the findings between the game review marks and the stock market value, the overall correlation between the volume of critic and consumer reviews is negative low one, as shown in Table 13.

5.5. *Summary of the findings*

After the process of gathering, analysing the data and interpreting the results, it is found that for the video games industry, the relation between the reviews is not large enough to be significant. According to Arnold (2013) using the discounted cash flow valuation method, it is possible to evaluate the share price of the publisher companies and help the investors decide to buy or sell based on the estimated game sales returns.

However, that fact that the data analysed in this dissertation showed that the stock prices of publisher companies move on par with the market, even more so, these authors state that the process *per se* of the buy and sell operations move the market price towards the intrinsic value of the shares (Stancu *et al.*, 2017). Although the hypotheses of this dissertation could not be proven by analysing raw data and had to be rejected, there is ground for future research, which will be discussed later on.

This research was not able to prove that reviews influence the value of the video game publisher companies and subsequently of the development companies. However, these businesses as any other company need to make profit in order to continue operating and for that they need to sell their products or services. Therefore, the performance of sales of video games is of critically importance for these companies.

However, as mentioned in the introduction, there have been many cases throughout the history of the video game industry where development studios and even publishers have gone bankrupt. Just in 2018, ten development studios closed, being *Visceral*, *Capcom Vancouver*, *Telltale Games* and others amongst them, due to the lack of sales (Lanier, 2018). On one hand, established game franchises or games that come from the companies that usually develop and publish blockbusters, it is expected that these games will sell, for example, the media experts in the industry already know which games are possibly going to be successful (Gilbert, 2019a). However, it is not always like this, such is the case of *Anthem*, which is a video game that was expected to be a big hit, but it did not sold successfully and became a commercial failure (Kain, 2019; Webb, 2019a).

5.6. *Contribution to the literature*

This dissertation adds up to the research regarding the effect of product reviews on the firm value. The independent variables that were considered for the quantitative analysis were the daily volume of critic and consumer reviews, the daily accumulated average rating of the critic and consumer reviews and finally, an average of the daily average rating of both critic and consumer reviews, all explained in the Findings section.

The dependent variable was the stock price of the video game publisher companies. While the literature from Chen et al. (2012) find that reviews do influence the firm value for the movie production companies in the films industry in the early stage of the movies lifecycle, the contrary was proven for the publisher companies in the video games industry, being that in the games industry there is no correlation between reviews and market capitalisation. The hypotheses were rejected, accepting the null hypotheses, concluding that the elements of the reviews do not have an effect on the share price of the video game publisher companies.

5.7. *Strengths or limitations of the study*

This study was conducted by gathering thousands of reviews for a couple dozen video games from three of the most profitable game publisher companies in the industry. The research made use of statistical analysis tools to analyse quantitatively the hundreds if not thousands of reviews that are created for the video games during the first week after the game release. However, in the design and data selection lies the limitations of the study.

First not every company that publishes video games trades in public exchange markets. Secondly, not every company that does trade in public stock exchange markets, operates in the same market. Finally, not every company that publishes video games and trades in the same market, is only dedicated to publishing games; some of the mayor publishing companies also produce video game consoles and even other products. Therefore, only a few of all the game publisher companies fall under the criteria established in the methodology of the research.

The limitations regarding the selection of the games were that first, the games must have been produced by the selected companies. Secondly, the video games must have had a minimum amount of reviews. While the minimum requirement of reviews did not reduce the number of games based on the number of consumer reviews, it did limit the number of games selected based on the number of critic reviews.

5.8. Potential areas of future research

While this dissertation was not able to prove the hypotheses as the null hypotheses had to be accepted, future research can be conducted in order to try to prove this from another perspective.

The proposed future research must apply a qualitative approach, that use surveys targeted for investors that have stocks in video game publisher companies. The survey can ask the investors in which publisher companies they decide to invest. Then it can either ask if they take in consideration the reviews from critic or consumers and variables related to the reviews, which are the rating and the volume, or the survey can directly ask if their decision to buy or sell the stocks are influenced by the change in the variables.

Once the surveys have been sent to the investors and the results gathered, the data could be analysed and interpreted. Following this method, future research can investigate how the reviews from video game can affect the decisions making process of investors and in turn, if these decisions have an effect on the share price of the video game publisher companies.

5.9. Conclusion

The analysis conducted on the data from the reviews of twenty-three of the video games from Activision Blizzard, Electronic Arts and Take-Two Interactive released over the last five years, shows that while individually some of the games have a correlation between the elements of the reviews and the price of the shares of these companies.

However, the overall average of the individual correlations shows that while there are still some low correlations, from a test conducted to control for the correlation between the publishing companies' stocks and the market, the result was that there is a high correlation between the stock of the companies and the market. Therefore, as the correlation between the stocks and the market was much higher than the correlations for the hypotheses, these had to be rejected.

With a market capitalisation of \$28 billion and 9,300 employees (Forbes, 2019), Electronic Arts is the publisher of the Battlefield Franchise. In 2018, EA released Battlefield, which far from being the worst (Avard, 2018), it did not meet expectations as currently has an average critic rating of 77 and an average user score of 2.5 in Metacritic (Batchelor, 2018a; Tassi, 2018a; Metacritic, 2019e, 2019c, 2019b). According to MarketWatch (Cherney, 2019) EA had the "worst decline in more than a decade" with the loss of 13.3% of its value. The case of the latest iteration in the

Battlefield franchise, where the failure of a video game affects the value of the publishing and consequently the developing companies, to the point where the EA had to cut the revenue forecast for the quarter (Panchadar, 2019).

Furthermore, other examples of economic unsuccessful video games are *Destiny 2*, *Fallout 76*, *Call of Duty: Black Ops 4* and *Battlefront II*, which share a similar impact on the equity of their publishing companies (Morris, 2017; Machkovech, 2019; Tassi, 2019). *Destiny 2* currently has an average critic and user scores of 85 and 4.3 respectively (Metacritic, 2019h, 2019i, 2019j), *Fallout 76* has 51 for critic score and 3 for user scores (Metacritic, 2019k, 2019l, 2019m), *Call of Duty: Black Ops 4* has 84 and 3.7 respectively (Metacritic, 2019f, 2019g, no date) and finally, *Battlefront II* has average critic and user scores of 66 and 1 (Metacritic, 2019r, 2019s, 2019t).

Being the production costs so high, for example the intro alone of *Battlefield V* was estimated to be approximately of \$3 million (Mahmood, 2018), sometimes games are 'make or break' for the companies that develop and publish them. With unsuccessful video games being the cause for some development or even publishing companies to go out of business. Although most of these cases are small independent companies, there have been examples of video game development studios that have permanently closed. An example is *Visceral*, a development studio owned by Electronic Arts that closed in 2017 (Schreier, 2017).

While the findings from the research conducted point that there is no effect of the reviews on the market capitalisation of the publishing companies, the cash flows of these companies are dependent on the sale of the games. Even though the company that publishes the *Fallout* franchise doesn't trade publicly, the CFO of Bethesda (Makuch, 2018) stated: "Obviously, you can see in the market what the Metacritic scores are around *Fallout 76*, and that's impacted its sell-through. I'll probably just leave it at that". Therefore, the managers in the publishing companies are aware of the effect that reviews have on the games sales.

As there have been games that fail to sell and meet the expectations, there are other games that are successful. The games video games: *God of war 4* and *Marvel's Spider-Man*, which sold 3.1 million and 3.3 million copies respectively and accounted for sales figures of \$186 million and \$198 million, all in just a period of three days (Tassi, 2018b). *Red Dead Redemption 2* sold \$725 million, also in the first three days after release (Tassi, 2018c). However, the most important example of success in the industry is *Grand Theft Auto V* released in 2013, which up to this day has sold 90 million copies generating a revenue of \$6 billion and as it continues to be sold it is considered the most successful entertainment product ever (Batchelor, 2018c).

The companies Activision Blizzard, Electronic Arts and Take-Two Interactive have been facing underwhelming earnings are due to disappointing sales and this has had an effect of loss of equity and workforce cuts (Morris, 2017; Howley, 2019; Machkovech, 2019; Tassi, 2019; Thibault, 2019). Hence, the importance of understanding how the video game reviews can or cannot affect the company valuation.

In order for the publishing and development companies to generate profit and maximise their value, they need to make the right decisions while creating video games so that these games become commercially successful.

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Appendix

Table 18. List of analysed video games

| NAME | COMPANY |
|---------------------------------------|----------------|
| ANTHEM | EA |
| BATTLEFIELD 1 | EA |
| BATTLEFIELD V | EA |
| CALL OF DUTY: ADVANCED WARFARE | Activision |
| CALL OF DUTY: BLACK OPS 4 | Activision |
| CALL OF DUTY: BLACK OPS III | Activision |
| CALL OF DUTY: INFINITE WARFARE | Activision |
| CALL OF DUTY: WWII | Activision |
| DESTINY 2 | Activision |
| DRAGON AGE: INQUISITION | EA |
| EVOLVE | Take-Two |
| MAFIA III | Take-Two |
| MASS EFFECT: ANDROMEDA | EA |
| MIRROR'S EDGE CATALYST | EA |
| NEED FOR SPEED | EA |
| OVERWATCH | Activision |
| RED DEAD REDEMPTION 2 | Take-Two |
| SEKIRO: SHADOWS DIE TWICE | Activision |
| STAR WARS BATTLEFRONT | EA |
| STAR WARS BATTLEFRONT II | EA |
| THE SIMS 4 | EA |
| TITANFALL 2 | EA |
| XCOM 2 | Take-Two |

Descriptive statistics

Activision Blizzard.

Table 19. Descriptive Statistics of Call of Duty: Advanced Warfare

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 10.86 | 17.79 |
| Daily Accumulated Rating Average of Critic Reviews | 81.88 | 1.73 |
| Stock Closing Price per Daily Critic Reviews | 20.41 | 0.35 |
| Daily Volume of Consumer Reviews | 50.71 | 35.44 |
| Daily Accumulated Rating Average of Consumer Reviews | 5.91 | 0.53 |
| Stock Closing Price per Daily Consumer Reviews | 20.51 | 0.29 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 89.24 | 0.48 |
| Stock Closing Price per Critic and Consumer Reviews | 82.89 | 0.54 |

Table 20. Descriptive Statistics of Call of Duty: Black Ops III

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 10.71 | 10.16 |
| Daily Accumulated Rating Average of Critic Reviews | 83.4 | 1.77 |
| Stock Closing Price per Daily Critic Reviews | 35.6 | 2.73 |
| Daily Volume of Consumer Reviews | 51.14 | 39.3 |
| Daily Accumulated Rating Average of Consumer Reviews | 5.03 | 0.2 |
| Stock Closing Price per Daily Consumer Reviews | 34.64 | 0.5 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 74.04 | 6.07 |
| Stock Closing Price per Critic and Consumer Reviews | 35.6 | 2.73 |

Table 21. Descriptive Statistics of Call of Duty: Infinite Warfare

| Variable | Mean | Standard Deviation |
|--|--------|--------------------|
| Daily Volume of Critic Reviews | 13.17 | 9.24 |
| Daily Accumulated Rating Average of Critic Reviews | 77.97 | 1.95 |
| Stock Closing Price per Daily Critic Reviews | 41.22 | 0.61 |
| Daily Volume of Consumer Reviews | 36.71 | 37.47 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.02 | 0.33 |
| Stock Closing Price per Daily Consumer Reviews | 40.86 | 1.11 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 62.233 | 8.42 |
| Stock Closing Price per Critic and Consumer Reviews | 41.29 | 0.59 |

Table 22. Descriptive Statistics of Overwatch

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 10.14 | 5.4 |
| Daily Accumulated Rating Average of Critic Reviews | 92.07 | 1.39 |
| Stock Closing Price per Daily Critic Reviews | 39.2 | 0.17 |
| Daily Volume of Consumer Reviews | 77.71 | 62.12 |
| Daily Accumulated Rating Average of Consumer Reviews | 7.78 | 0.3 |
| Stock Closing Price per Daily Consumer Reviews | 39.2 | 0.17 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 86.38 | 1.34 |
| Stock Closing Price per Critic and Consumer Reviews | 39.2 | 0.17 |

Table 23. Descriptive Statistics of Call of Duty: Black Ops 4

| Variable | Mean | Standard Deviation |
|----------|------|--------------------|
|----------|------|--------------------|

| | | |
|--|-------|-------|
| Daily Volume of Critic Reviews | 9.43 | 7.93 |
| Daily Accumulated Rating Average of Critic Reviews | 84.18 | 0.99 |
| Stock Closing Price per Daily Critic Reviews | 77.19 | 1.76 |
| Daily Volume of Consumer Reviews | 38.86 | 29.52 |
| Daily Accumulated Rating Average of Consumer Reviews | 5.26 | 0.28 |
| Stock Closing Price per Daily Consumer Reviews | 76.9 | 2.44 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 75.37 | 5.23 |
| Stock Closing Price per Critic and Consumer Reviews | 77.19 | 1.76 |

Table 24. Descriptive Statistics for Call of Duty: WWII

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 9.71 | 9.66 |
| Daily Accumulated Rating Average of Critic Reviews | 82.81 | 2.35 |
| Stock Closing Price per Daily Critic Reviews | 63.06 | 1.7 |
| Daily Volume of Consumer Reviews | 37.43 | 22.67 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.36 | 0.2 |
| Stock Closing Price per Daily Consumer Reviews | 32.75 | 1.35 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 72.31 | 6.86 |
| Stock Closing Price per Critic and Consumer Reviews | 63.06 | 1.69 |

Table 25. Descriptive Statistics of Destiny 2

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 3.67 | 1.97 |
| Daily Accumulated Rating Average of Critic Reviews | 83.9 | 1.25 |
| Stock Closing Price per Daily Critic Reviews | 65.55 | 0.55 |
| Daily Volume of Consumer Reviews | 41.29 | 19.91 |
| Daily Accumulated Rating Average of Consumer Reviews | 5.87 | 0.16 |
| Stock Closing Price per Daily Consumer Reviews | 65.27 | 0.79 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 65.62 | 2.21 |
| Stock Closing Price per Critic and Consumer Reviews | 65.27 | 0.79 |

Table 26. Descriptive Statistics of Sekiro: Shadows Die Twice

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 9.86 | 7.65 |
| Daily Accumulated Rating Average of Critic Reviews | 90.66 | 1.07 |
| Stock Closing Price per Daily Critic Reviews | 96.29 | 1.38 |
| Daily Volume of Consumer Reviews | 49.33 | 15.43 |

| | | |
|--|-------|------|
| Daily Accumulated Rating Average of Consumer Reviews | 7.77 | 0.34 |
| Stock Closing Price per Daily Consumer Reviews | 95.82 | 0.67 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 86.72 | 1.59 |
| Stock Closing Price per Critic and Consumer Reviews | 96.29 | 1.38 |

Electronic Arts.

Table 27. Descriptive Statistics of The Sims 4

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 5 | 3.03 |
| Daily Accumulated Rating Average of Critic Reviews | 72.6 | 1.81 |
| Stock Closing Price per Daily Critic Reviews | 37.68 | 0.24 |
| Daily Volume of Consumer Reviews | 59.43 | 23.68 |
| Daily Accumulated Rating Average of Consumer Reviews | 3.97 | 0.32 |
| Stock Closing Price per Daily Consumer Reviews | 37.76 | 0.23 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 53.22 | 1.51 |
| Stock Closing Price per Critic and Consumer Reviews | 37.68 | 0.22 |

Table 28. Descriptive Statistics of Dragon Age: Inquisition

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 9.14 | 13.52 |
| Daily Accumulated Rating Average of Critic Reviews | 90.07 | 1.6 |
| Stock Closing Price per Daily Critic Reviews | 41.37 | 0.14 |
| Daily Volume of Consumer Reviews | 82.86 | 31.94 |
| Daily Accumulated Rating Average of Consumer Reviews | 6 | 0.24 |
| Stock Closing Price per Daily Consumer Reviews | 43.37 | 0.26 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 88.98 | 0.92 |
| Stock Closing Price per Critic and Consumer Reviews | 41.37 | 0.14 |

Table 29. Descriptive Statistics of Star Wars Battlefront

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 11 | 6.52 |
| Daily Accumulated Rating Average of Critic Reviews | 72.82 | 1.65 |
| Stock Closing Price per Daily Critic Reviews | 69.1 | 1.34 |
| Daily Volume of Consumer Reviews | 92.86 | 60.52 |

| | | |
|--|-------|------|
| Daily Accumulated Rating Average of Consumer Reviews | 4.3 | 0.15 |
| Stock Closing Price per Daily Consumer Reviews | 70.55 | 1.99 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 66.09 | 3.56 |
| Stock Closing Price per Critic and Consumer Reviews | 70.04 | 1.96 |

Table 30. Descriptive Statistics of Need for Speed

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 9.83 | 10.28 |
| Daily Accumulated Rating Average of Critic Reviews | 69.03 | 0.94 |
| Stock Closing Price per Daily Critic Reviews | 72.83 | 1.06 |
| Daily Volume of Consumer Reviews | 13.43 | 12.47 |
| Daily Accumulated Rating Average of Consumer Reviews | 6.12 | 0.31 |
| Stock Closing Price per Daily Consumer Reviews | 72.62 | 1.18 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 66.61 | 1.05 |
| Stock Closing Price per Critic and Consumer Reviews | 72.78 | 0.98 |

Table 31. Descriptive Statistics of Titanfall 2

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 6.43 | 8.1 |
| Daily Accumulated Rating Average of Critic Reviews | 89.67 | 1.92 |
| Stock Closing Price per Daily Critic Reviews | 81.53 | 2.01 |
| Daily Volume of Consumer Reviews | 23.28 | 10 |
| Daily Accumulated Rating Average of Consumer Reviews | 8.51 | 0.26 |
| Stock Closing Price per Daily Consumer Reviews | 79.19 | 0.84 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 88.12 | 0.98 |
| Stock Closing Price per Critic and Consumer Reviews | 81.53 | 2.01 |

Table 32. Descriptive Statistics of Mirror's Edge Catalyst

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 15.25 | 22.6 |
| Daily Accumulated Rating Average of Critic Reviews | 79.06 | 4.61 |
| Stock Closing Price per Daily Critic Reviews | 76.65 | 0.42 |
| Daily Volume of Consumer Reviews | 14.57 | 10.44 |
| Daily Accumulated Rating Average of Consumer Reviews | 6.12 | 0.3 |
| Stock Closing Price per Daily Consumer Reviews | 75.69 | 0.97 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 77.26 | 4.93 |

| | | |
|---|------|------|
| Stock Closing Price per Critic and Consumer Reviews | 76.2 | 0.71 |
|---|------|------|

Table 33. Descriptive Statistics of Battlefield 1

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 10.33 | 10.95 |
| Daily Accumulated Rating Average of Critic Reviews | 88.04 | 0.69 |
| Stock Closing Price per Daily Critic Reviews | 82.89 | 0.59 |
| Daily Volume of Consumer Reviews | 23 | 10.39 |
| Daily Accumulated Rating Average of Consumer Reviews | 9.01 | 0.29 |
| Stock Closing Price per Daily Consumer Reviews | 83.15 | 0.65 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 89.24 | 0.48 |
| Stock Closing Price per Critic and Consumer Reviews | 82.89 | 0.54 |

Table 34. Descriptive Statistics of Star Wars Battlefront II

| Variable | Mean | Standard Deviation |
|--|--------|--------------------|
| Daily Volume of Critic Reviews | 8.86 | 9.1 |
| Daily Accumulated Rating Average of Critic Reviews | 70.97 | 4.6 |
| Stock Closing Price per Daily Critic Reviews | 110.09 | 1.6 |
| Daily Volume of Consumer Reviews | 309.86 | 160.61 |
| Daily Accumulated Rating Average of Consumer Reviews | 1 | 0.11 |
| Stock Closing Price per Daily Consumer Reviews | 109.92 | 1.81 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 54.72 | 11.57 |
| Stock Closing Price per Critic and Consumer Reviews | 110.09 | 1.6 |

Table 35. Descriptive Statistics of Mass Effect: Andromeda

| Variable | Mean | Standard Deviation |
|--|--------|--------------------|
| Daily Volume of Critic Reviews | 11.86 | 24.01 |
| Daily Accumulated Rating Average of Critic Reviews | 73.36 | 3.04 |
| Stock Closing Price per Daily Critic Reviews | 88.99 | 0.4 |
| Daily Volume of Consumer Reviews | 154.71 | 80.3 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.74 | 0.26 |
| Stock Closing Price per Daily Consumer Reviews | 88.97 | 0.39 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 66.31 | 5.26 |
| Stock Closing Price per Critic and Consumer Reviews | 88.99 | 0.4 |

Table 36. Descriptive Statistics of Battlefield V

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 6.17 | 5.56 |
| Daily Accumulated Rating Average of Critic Reviews | 84.11 | 0.97 |
| Stock Closing Price per Daily Critic Reviews | 87.91 | 1.25 |
| Daily Volume of Consumer Reviews | 65.28 | 27.97 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.59 | 0.54 |
| Stock Closing Price per Daily Consumer Reviews | 85.18 | 1.91 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 83.94 | 1.31 |
| Stock Closing Price per Critic and Consumer Reviews | 87.96 | 1.15 |

Table 37. Descriptive Statistics of Anthem

| Variable | Mean | Standard Deviation |
|--|--------|--------------------|
| Daily Volume of Critic Reviews | 5.86 | 7.03 |
| Daily Accumulated Rating Average of Critic Reviews | 66.17 | 2.78 |
| Stock Closing Price per Daily Critic Reviews | 98.43 | 3.24 |
| Daily Volume of Consumer Reviews | 177.71 | 138.33 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.67 | 0.23 |
| Stock Closing Price per Daily Consumer Reviews | 96.52 | 1.14 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 66.69 | 3.70 |
| Stock Closing Price per Critic and Consumer Reviews | 98.43 | 3.24 |

Tale-Two Interactive.

Table 38. Descriptive Statistics for Evolve

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 7 | 4.28 |
| Daily Accumulated Rating Average of Critic Reviews | 80.2 | 1.08 |
| Stock Closing Price per Daily Critic Reviews | 28.06 | 0.55 |
| Daily Volume of Consumer Reviews | 55.86 | 34.23 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.72 | 0.13 |
| Stock Closing Price per Daily Consumer Reviews | 28.02 | 0.49 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 73.88 | 5.14 |
| Stock Closing Price per Critic and Consumer Reviews | 28.06 | 0.55 |

Table 39. Descriptive Statistics for XCOM 2

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 10.2 | 13.95 |
| Daily Accumulated Rating Average of Critic Reviews | 91.27 | 2.23 |
| Stock Closing Price per Daily Critic Reviews | 33.87 | 0.94 |
| Daily Volume of Consumer Reviews | 25.58 | 14.38 |
| Daily Accumulated Rating Average of Consumer Reviews | 7.15 | 0.26 |
| Stock Closing Price per Daily Consumer Reviews | 33.97 | 0.7 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 88.57 | 2.67 |
| Stock Closing Price per Critic and Consumer Reviews | 33.73 | 0.8 |

Table 40. Descriptive Statistics for Mafia III

| Variable | Mean | Standard Deviation |
|--|-------|--------------------|
| Daily Volume of Critic Reviews | 9 | 6.42 |
| Daily Accumulated Rating Average of Critic Reviews | 63.82 | 6.8 |
| Stock Closing Price per Daily Critic Reviews | 43.37 | 1.16 |
| Daily Volume of Consumer Reviews | 45.14 | 23.05 |
| Daily Accumulated Rating Average of Consumer Reviews | 4.89 | 0.9 |
| Stock Closing Price per Daily Consumer Reviews | 43.56 | 1.17 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 52.98 | 2.27 |
| Stock Closing Price per Critic and Consumer Reviews | 43.56 | 1.17 |

Table 41. Descriptive Statistics for Red Dead Redemption 2

| Variable | Mean | Standard Deviation |
|--|--------|--------------------|
| Daily Volume of Critic Reviews | 28 | 52.02 |
| Daily Accumulated Rating Average of Critic Reviews | 96.51 | 2.07 |
| Stock Closing Price per Daily Critic Reviews | 119.12 | 5.23 |
| Daily Volume of Consumer Reviews | 147.57 | 86.43 |
| Daily Accumulated Rating Average of Consumer Reviews | 7.95 | 0.20 |
| Stock Closing Price per Daily Consumer Reviews | 121.95 | 6.00 |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 7.95 | 0.20 |
| Stock Closing Price per Critic and Consumer Reviews | 121.95 | 6.00 |

Inferential Statistics

Activision Blizzard.

Table 42. Correlation table for Call of Duty: Advanced Warfare

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.108 |
| Stock Closing Price per Daily Critic Reviews | -0.108 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.688 |
| Stock Closing Price per Daily Critic Reviews | -0.688 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.715 |
| Stock Closing Price per Daily Critic Reviews | -0.715 | 1 |

| Variable | Daily Accumulated Rating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Consumer Reviews | 1 | -0.667 |
| Stock Closing Price per Daily Consumer Reviews | -0.667 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.774* |
| Stock Closing Price per Critic and Consumer Reviews | -0.774* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

Table 43. Correlation table for Call of Duty: Black Ops III

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.941** |
| Stock Closing Price per Daily Critic Reviews | 0.941** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.821* |
| Stock Closing Price per Daily Critic Reviews | 0.821* | 1 |

* . Correlation is significant at the 0.05 level (2-tailed)

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.426 |
| Stock Closing Price per Daily Critic Reviews | 0.426 | 1 |

| Variable | Daily Accumulated Rating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Consumer Reviews | 1 | -0.490 |
| Stock Closing Price per Daily Consumer Reviews | -0.490 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.937** |
| Stock Closing Price per Critic and Consumer Reviews | 0.937** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

Table 44. Correlation table for Call of Duty: Infinite Warfare

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.253 |
| Stock Closing Price per Daily Critic Reviews | 0.253 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.733 |
| Stock Closing Price per Daily Critic Reviews | 0.733 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.253 |
| Stock Closing Price per Daily Critic Reviews | 0.253 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.733 |
| Stock Closing Price per Daily Consumer Reviews | 0.733 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.423 |
| Stock Closing Price per Critic and Consumer Reviews | 0.423 | 1 |

Table 45. Correlation table for Overwatch

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--------------------------------|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.534 |

| | | |
|--|--------|---|
| Stock Closing Price per Daily Critic Reviews | -0.534 | 1 |
|--|--------|---|

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.518 |
| Stock Closing Price per Daily Critic Reviews | -0.518 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.922** |
| Stock Closing Price per Daily Critic Reviews | -0.922** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.858* |
| Stock Closing Price per Daily Consumer Reviews | -0.858* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.888** |
| Stock Closing Price per Critic and Consumer Reviews | -0.888** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

Table 46. Correlation table for Call of Duty: Black Ops 4

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.446 |
| Stock Closing Price per Daily Critic Reviews | -0.446 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|---|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.789* |
| Stock Closing Price per Daily Critic Reviews | -0.789* | 1 |

*. Correlation is significant at
the 0.05 level (2-tailed)

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-------------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.285 |
| Stock Closing Price per Daily Critic Reviews | 0.285 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.554 |
| Stock Closing Price per Daily Consumer Reviews | 0.554 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|---|---|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.758* |
| Stock Closing Price per Critic and Consumer Reviews | -0.758* | 1 |

*. Correlation is significant at
the 0.05 level (2-tailed)

Table 47. Correlation table for Call of Duty: WWII

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-----------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.314 |
| Stock Closing Price per Daily Critic Reviews | 0.314 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|----------|---|--|
|----------|---|--|

| | | |
|---|-------|-------|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.594 |
| Stock Closing Price per Daily Critic Reviews | 0.594 | 1 |

| | | |
|---|-------------------------------------|--|
| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
| Daily Volume of Consumer Reviews | 1 | 0.064 |
| Stock Closing Price per Daily Critic Reviews | 0.064 | 1 |

| | | |
|--|--|--|
| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.048 |
| Stock Closing Price per Daily Consumer Reviews | -0.048 | 1 |

| | | |
|---|---|---|
| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.621 |
| Stock Closing Price per Critic and Consumer Reviews | 0.621 | 1 |

Table 48. Correlation table for Destiny 2

| | | |
|---|-----------------------------------|--|
| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
| Daily Volume of Critic Reviews | 1 | 0.803 |
| Stock Closing Price per Daily Critic Reviews | 0.803 | 1 |

| | | |
|---|---|--|
| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.023 |
| Stock Closing Price per Daily Critic Reviews | 0.023 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.094 |
| Stock Closing Price per Daily Critic Reviews | -0.094 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.456 |
| Stock Closing Price per Daily Consumer Reviews | -0.456 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.887** |
| Stock Closing Price per Critic and Consumer Reviews | 0.887** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

Table 49. Correlation table for Sekiro: Shadows Die Twice

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.842* |
| Stock Closing Price per Daily Critic Reviews | 0.842* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.235 |
| Stock Closing Price per Daily Critic Reviews | -0.235 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.495 |
| Stock Closing Price per Daily Critic Reviews | 0.495 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.157 |
| Stock Closing Price per Daily Consumer Reviews | 0.157 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.778* |
| Stock Closing Price per Critic and Consumer Reviews | 0.778* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

Electronic Arts.

Table 50. Correlation table for The Sims 4

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.005 |
| Stock Closing Price per Daily Critic Reviews | -0.005 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.038 |
| Stock Closing Price per Daily Critic Reviews | -0.038 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.277 |
| Stock Closing Price per Daily Critic Reviews | 0.277 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.668 |
| Stock Closing Price per Daily Consumer Reviews | 0.668 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.155 |
| Stock Closing Price per Critic and Consumer Reviews | -0.155 | 1 |

Table 51. Correlation table for Dragon Age: Inquisition

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.749 |
| Stock Closing Price per Daily Critic Reviews | -0.749 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.770* |
| Stock Closing Price per Daily Critic Reviews | 0.770* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|----------|----------------------------------|--|
|----------|----------------------------------|--|

| | | |
|--|----------|----------|
| Daily Volume of Consumer Reviews | 1 | -0.885** |
| Stock Closing Price per Daily Critic Reviews | -0.885** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.643 |
| Stock Closing Price per Daily Consumer Reviews | -0.643 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.786* |
| Stock Closing Price per Critic and Consumer Reviews | 0.786* | 1 |

* . Correlation is significant at the 0.05 level (2-tailed)

Table 52. Correlation table for Star Wars Battlefront

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.750 |
| Stock Closing Price per Daily Critic Reviews | -0.750 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.226 |
| Stock Closing Price per Daily Critic Reviews | -0.226 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|----------------------------------|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.728 |

| | | |
|--|--------|---|
| Stock Closing Price per Daily Critic Reviews | -0.728 | 1 |
|--|--------|---|

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.348 |
| Stock Closing Price per Daily Consumer Reviews | -0.348 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.752 |
| Stock Closing Price per Critic and Consumer Reviews | -0.752 | 1 |

Table 53. Correlation table for Need for Speed

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.518 |
| Stock Closing Price per Daily Critic Reviews | -0.518 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.458 |
| Stock Closing Price per Daily Critic Reviews | 0.458 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.087 |
| Stock Closing Price per Daily Critic Reviews | -0.087 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.072 |
| Stock Closing Price per Daily Consumer Reviews | -0.072 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.158 |
| Stock Closing Price per Critic and Consumer Reviews | -0.158 | 1 |

Table 54. Correlation table for Titanfall 2

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.461 |
| Stock Closing Price per Daily Critic Reviews | 0.461 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.397 |
| Stock Closing Price per Daily Critic Reviews | -0.397 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.165 |
| Stock Closing Price per Daily Critic Reviews | -0.165 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|----------|--|--|
|----------|--|--|

| | | |
|--|--------|--------|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.149 |
| Stock Closing Price per Daily Consumer Reviews | -0.149 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|---|---|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.439 |
| Stock Closing Price per Critic and Consumer Reviews | -0.439 | 1 |

Table 55. Correlation table for Mirror's Edge Catalyst

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-----------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.217 |
| Stock Closing Price per Daily Critic Reviews | -0.217 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|---|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.024 |
| Stock Closing Price per Daily Critic Reviews | 0.024 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-------------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.916** |
| Stock Closing Price per Daily Critic Reviews | 0.916** | 1 |

** . Correlation is significant at
the 0.01 level (2-tailed)

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.284 |

| | | |
|--|-------|---|
| Stock Closing Price per Daily Consumer Reviews | 0.284 | 1 |
|--|-------|---|

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.666 |
| Stock Closing Price per Critic and Consumer Reviews | 0.666 | 1 |

Table 56. Correlation table for Battlefield 1

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.356 |
| Stock Closing Price per Daily Critic Reviews | -0.356 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.641 |
| Stock Closing Price per Daily Critic Reviews | -0.641 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.106 |
| Stock Closing Price per Daily Critic Reviews | 0.106 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.045 |
| Stock Closing Price per Daily Consumer Reviews | -0.045 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.383 |
| Stock Closing Price per Critic and Consumer Reviews | 0.383 | 1 |

Table 57. Correlation table for Star Wars Battlefront II

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.099 |
| Stock Closing Price per Daily Critic Reviews | -0.099 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.303 |
| Stock Closing Price per Daily Critic Reviews | 0.303 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.373 |
| Stock Closing Price per Daily Critic Reviews | 0.373 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.034 |
| Stock Closing Price per Daily Consumer Reviews | 0.034 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|---|--|---|
| Average of Daily Accumulated Rating Average | 1 | 0.074 |

of Critic and Consumer
Reviews
Stock Closing Price per Critic
and Consumer Reviews

0.074

1

Table 58. Correlation table for Mass Effect: Andromeda

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.166 |
| Stock Closing Price per Daily Critic Reviews | 0.166 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.534 |
| Stock Closing Price per Daily Critic Reviews | -0.534 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.877** |
| Stock Closing Price per Daily Critic Reviews | -0.877** | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.782* |
| Stock Closing Price per Daily Consumer Reviews | 0.782* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.180 |
| Stock Closing Price per Critic and Consumer Reviews | -0.180 | 1 |

Table 59. Correlation table for Battlefield V

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.644 |
| Stock Closing Price per Daily Critic Reviews | -0.644 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.547 |
| Stock Closing Price per Daily Critic Reviews | 0.547 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.355 |
| Stock Closing Price per Daily Critic Reviews | -0.355 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.440 |
| Stock Closing Price per Daily Consumer Reviews | 0.440 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.017 |
| Stock Closing Price per Critic and Consumer Reviews | 0.017 | 1 |

Table 60. Correlation table for Anthem

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--------------------------------|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.462 |

| | | |
|--|--------|---|
| Stock Closing Price per Daily Critic Reviews | -0.462 | 1 |
|--|--------|---|

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.996** |
| Stock Closing Price per Daily Critic Reviews | 0.996** | 1 |

** . Correlation is significant at the 0.01 level (2-tailed)

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.412 |
| Stock Closing Price per Daily Critic Reviews | -0.412 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.121 |
| Stock Closing Price per Daily Consumer Reviews | 0.121 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.881** |
| Stock Closing Price per Critic and Consumer Reviews | 0.846* | 1 |

* . Correlation is significant at the 0.05 level (2-tailed)

Take-Two Interactive.

Table 61. Correlation table for Evolve

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|----------|--------------------------------|--|
|----------|--------------------------------|--|

| | | |
|--|--------|--------|
| Daily Volume of Critic Reviews | 1 | -0.671 |
| Stock Closing Price per Daily Critic Reviews | -0.671 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.136 |
| Stock Closing Price per Daily Critic Reviews | -0.136 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.815* |
| Stock Closing Price per Daily Critic Reviews | -0.815* | 1 |

*. Correlation is significant at the 0.05 level (2-tailed)

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.220 |
| Stock Closing Price per Daily Consumer Reviews | 0.220 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.378 |
| Stock Closing Price per Critic and Consumer Reviews | 0.378 | 1 |

Table 62. Correlation table for XCOM 2

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|--|--------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.433 |
| Stock Closing Price per Daily Critic Reviews | 0.433 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|---|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | 0.270 |
| Stock Closing Price per Daily Critic Reviews | 0.270 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-------------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.739 |
| Stock Closing Price per Daily Critic Reviews | -0.739 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.350 |
| Stock Closing Price per Daily Consumer Reviews | 0.350 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|---|---|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | 0.388 |
| Stock Closing Price per Critic and Consumer Reviews | 0.388 | 1 |

Table 63. Correlation table for Mafia III

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-----------------------------------|--|
| Daily Volume of Critic Reviews | 1 | -0.875* |
| Stock Closing Price per Daily Critic Reviews | -0.875* | 1 |

*. Correlation is significant at
the 0.05 level (2-tailed)

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|----------|---|--|
|----------|---|--|

| | | |
|---|--------|--------|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.613 |
| Stock Closing Price per Daily Critic Reviews | -0.613 | 1 |

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-------------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | 0.879** |
| Stock Closing Price per Daily Critic Reviews | 0.879** | 1 |

** . Correlation is significant at
the 0.01 level (2-tailed)

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | 0.711 |
| Stock Closing Price per Daily Consumer Reviews | 0.711 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|---|---|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.907** |
| Stock Closing Price per Critic and Consumer Reviews | -0.907** | 1 |

** . Correlation is significant at
the 0.01 level (2-tailed)

Table 64. Correlation table for Red Dead Redemption 2

| Variable | Daily Volume of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|-----------------------------------|--|
| Daily Volume of Critic Reviews | 1 | 0.176 |
| Stock Closing Price per Daily Critic Reviews | 0.176 | 1 |

| Variable | Daily Accumulated Rating Average of Critic Reviews | Stock Closing Price per Daily Critic Reviews |
|---|---|--|
| Daily Accumulated Rating Average of Critic Reviews | 1 | -0.345 |

| | | |
|--|--------|---|
| Stock Closing Price per Daily Critic Reviews | -0.345 | 1 |
|--|--------|---|

| Variable | Daily Volume of Consumer Reviews | Stock Closing Price per Daily Critic Reviews |
|--|----------------------------------|--|
| Daily Volume of Consumer Reviews | 1 | -0.393 |
| Stock Closing Price per Daily Critic Reviews | -0.393 | 1 |

| Variable | Daily Accumulated Dating Average of Consumer Reviews | Stock Closing Price per Daily Consumer Reviews |
|--|--|--|
| Daily Accumulated Dating Average of Consumer Reviews | 1 | -0.407 |
| Stock Closing Price per Daily Consumer Reviews | -0.407 | 1 |

| Variable | Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | Stock Closing Price per Critic and Consumer Reviews |
|--|--|---|
| Average of Daily Accumulated Rating Average of Critic and Consumer Reviews | 1 | -0.221 |
| Stock Closing Price per Critic and Consumer Reviews | -0.221 | 1 |