



LUNDS UNIVERSITET
Ekonomihögskolan

Online Ratings – who decides what games you buy?

A study on the impact of online ratings on sales performance on
the Swedish video game market

Master thesis in Economics, spring 2015
Erik Artursson
Supervisor: Peter Jochumzen

Abstract

This study examines the relationship between online ratings and the sales performance of video games on the Swedish market. The thesis aims to fill a gap in the research within the fast growing field of video games and contribute to the theoretical understanding of how online ratings in a word-of-mouth framework can serve as a transaction cost reducer. It also aims to assist firms active in the video game market with input on how consumers value online ratings and how it affects the sales performance of a given game. The study finds several unique results and shows that, while sharing some key characteristics with other entertainment markets, the video game market stands out with some unique mechanics. User ratings have a positive but diminishing impact on sales performance while professional ratings does not seem to have any impact which highlights the effect of consumer Word-of-Mouth in relation to the power of professional critics. Strong evidence was also found for the effect of uncertainty costs as games with a higher deviation from the average rating showed lower sales performance. Furthermore, in opposition to most findings on other entertainment markets, the quantity of ratings posted for a given game has a negative impact on sales performance, possibly showing a strong “community-effect” that tends to warn other consumers of disappointing games. The community-effect overshoots any feasible awareness effect.

Keywords

Video game market, video game industry, word of mouth, transaction cost economics, uncertainty costs, awareness effect, online reviews, online ratings, sales performance, electronic word of mouth.

Acknowledgements

I would like to thank my supervisor Peter Jochumzen for valuable input when writing this thesis. I would also like to thank Gfk Sweden and Lars Sudow for assisting me with data necessary to complete the study.

Table of Contents

1. Introduction	4
1.1 Background	4
1.2 Aim of study	5
1.3 Research purpose	5
1.4 Theory	6
1.5 Methodology	6
1.6 Limitations	7
1.7 Outline of the thesis	8
2 Literature Review	9
2.1 Previous research	9
2.2 What sets this study apart from earlier work?	10
3. Theory	12
3.1 Transaction cost economics	12
3.2 Uncertainty reduction theory	13
3.3 Word of mouth	14
3.4 The awareness effect	15
3.5 Hypotheses	16
4. Method	18
4.1 Graphical analysis	18
4.2 Research Approach	20
4.3 Method of choosing explanatory variables	20
4.4 Econometric testing	20
4.5 Data collection method	21
4.6 Validation of data	21
5. Empirical Model	23
5.1 Assumptions of the model	23
5.2 The regression model	23
5.3 Measurement of sales performance	23
5.4 Variables	25
6. Results	28
6.1 Analysis	29
6.2 Hypotheses summary	30
7. Discussion	31
7.1 Hypotheses discussion	31
7.2 Conclusion	35
7.3 Research aims and objectives	35
7.4 Practical Implications	36
7.5 Suggestions for future research	36
8. References	38
9. Appendix	44
9.1 Equation estimations	44
9.2 Normality test	44
9.3 Multicollinearity	45
9.4 Excluded variables	45

1. Introduction

1.1 Background

Online communication through online media is often characterized by conversations based on user-created content (Pitt 2012; Plangger 2012). Depending on certain content-factors such as elements of surprise, the ability to trigger emotional response or facilitating new information can make such content spread to millions of users in fast speed (Reynolds 2010; Kietzmann & Canhoto 2013). In this thesis, I will turn to the type of content that facilitates information on a product through reviews and ratings¹ written online. Marketing studies show that negative or positive product information embedded in such content can spread rapidly online and have big effects on the sales performance of a certain product or company (Longart 2010; Khammash and Griffiths 2010; McCarthy 2010). A research carried out by Forrester Research found that about 50 per cent of young Internet users take product-information based content into heavy consideration when purchasing entertainment products, a number that very well might have increased since when the study was carried out in 2004 (Godes & Mayzlin 2004). The product examined in this study will be video games sold on the Swedish market.

The choice of the video game market² as platform for the study has some main reasons. I have for long carried a personal interest in video games and closely followed the growth of the industry both in Sweden and globally. By European measures, Sweden stands out as one of the most video-game loving nations (dataspelsbranch.se 1 2012). Swedish video game industry is furthermore well known internationally through companies such as King, Dice and Mojang and the industry has enjoyed an average annual turnover growth of 26% since 2006 (Widman 2014). As the significance of the video game industry grows, the importance of understanding its mechanisms follows as a consequence. As little research has been conducted on the market concerning the influence of online ratings and Word-of-Mouth, WOM, several interesting hypotheses

¹ A rating is the numerical score given to a game in a review.

² Video games are defined as electronic games that involve human interaction with a user interface. Simply put, all games sold for different tv-consoles, personal computers, portable consoles, etc. are included.

can be tested. Other reasons that make the video game market interesting for research include the widely discussed social impact of video games in medias today and the large number of reviews available for each game.

1.2 Aim of study

This study aims to investigate any relationship between product information in the form of online ratings and a product's sales performance with a focus on whether the rating is written by another user or by a professional³ game reviewer. This focus lets me investigate if consumers value information coming from other users differently than the same information coming from professionals. Professionals are defined as companies that rate video games as a business idea and therefore can be considered experts on the area. Examples would be gaming magazines such as IGN and PC-gamer. User ratings refer to the rating scores from written reviews by any individual user of a game without any intention of a monetary gain.

The study of the two categories of raters is interesting as it puts the accuracy of professional's views in perspective while aiming to assess if professional opinions reflects consumer behavior better than user opinions. The results should be interesting both from a theoretical consumer behavior point of view, as well as from an industrial point of view as it contributes to developers' and retailers' understanding of what impact WOM has on sales performance. The market chosen for the study is the Swedish video game market, where the intention is to estimate the effect of ratings during a game's first week on the market and its sales performance under a year to follow.

1.3 Research purpose

The purpose of this thesis is to contribute to the research areas of transaction cost economics by using WOM and uncertainty theory to explain changes in sales performance triggered by online ratings. This will in practice be done by using both previously tried and untried estimates of WOM, and applying them on a new market. As I have not been able to find any studies with related research purposes on the video game market, the study also aims to fill a gap in research on a market that globally grows in a fast pace (see for example Dring 2015; Team 2015; Basak 2014).

³ A professional game critic is defined as a company with a business idea of writing reviews, while being represented on Metacritic.com's list of professional game critics.

1.4 Theory

The theory of Word-of-Mouth has long been considered an important financial factor within the entertainment business as it serves to explain the variance in sales performance that depends on social interaction amid the target group (Delen et al. 2007). Reichheld (2003) even claims that WOM and a product's "referral value", i.e. what a customer is prepared to tell others about the product, are the most important factors of any modern business success. In his study, Reichheld also writes that a product's referral value has a greater impact as a performer predictor than traditional measures such as consumer satisfaction. This emphasizes the important WOM impact that online ratings might carry for the sales performance of video games, especially when assuming that video game players also are relatively Internet-oriented and active online. The effect ratings have on sales will be explained using WOM as an uncertainty reducer in a transaction cost economics framework.

This thesis takes some inspiration from the works done on the cinema and movie field where the relationship between WOM and movie sales has been widely discussed and accepted as an important factor for box office revenues (Duan et al. 2007). Several parallels will therefore be drawn to studies within the cinema scene as movies in its design can be somewhat related to the characteristics of video games.

1.5 Methodology

The effect of online ratings on sales will be measured by separating each game's average rating into several components such as quantity of ratings, standard deviation of ratings and whether a user or professional game reviewer wrote it. The estimates of the components will then be able to provide information regarding consumer behavior in a transaction cost and WOM theoretical framework.

The study will be made on ratings released before and until the release week of a game to capture the instant effect online ratings has on consumption. As a major part of the sales of a game is made in the first weeks, many consumers and writers can be assumed to visit the online forums intensely during release week. Using the release week's ratings also serves the purpose that new information on a market where the participants has little or no information on a given product tends to have a greater

impact on consumption behavior than information released later in a products life cycle (Duan et al. 2008). The research is done in a quantitative way, using the average rating scores and countable characteristics of reviews without taking into consideration qualitative measures of each review.

1.6 Limitations

Considering all video games that have been released for sale in Sweden, the amount of data available for analysis is larger than what can be included in this thesis. A sample of 250 games released from 2010 to 2014 will therefore be used. The sample should be representative for the total population of video games released and therefore be enough to draw conclusions from regarding my hypotheses. See chapter 4.4 for more information on collecting the sample.

My sales data only consists of physical sales made in stores and therefore does not include any sales made digitally online. As video games are increasingly being sold digitally today, a portion of the sales made is being left out from this study. This means that I miss out on a sales channel and must trust the physical sales to be a representative sub-sample of the total sales carried out in retail *and* digitally. In 2013, approximately 65 per cent of all video game sales were sold digitally, highlighting the growing importance of digital sales (dataspelsbranschen 2 N.D.). Although we can expect the same results from a study made on online ratings and digital sales, it is considered a limitation that digital sales are not included in this study.

As I look only at the aggregated rating score of several reviews, I do not take into account the written words, quality or popularity of each review. It is not farfetched to believe that consumers weigh in these factors when reading a review and not only the rating score, and these are therefore areas that ideally should be incorporated in the research (see for example Hu et al. 2008). The information regarding gender and age of the reviewer would most likely influence the sales as well and should preferably be included (see for example Dellarocas et al. 2007).

It is important to remember that this study examines only the effect of ratings available online in the end of a game's release week, and not the following. It is possible that a

part of the consumers that purchase the game during the release week are hard fans that will buy the game no matter what rating it receives. This would mean that the consumers that purchase the game in later weeks are further more influenced by ratings, as they per definition are not hard fans. However, any results in this study would still give a significant and important indication of the role online ratings play for the sales performance.

1.7 Outline of the thesis

In the chapter on Literature Review, I will first turn to the works already made in the area and explain what sets mine apart. In the chapter on theoretical review, I will examine theories that are relevant when answering my hypotheses. A thorough examination will be made on each theory and their viability for my study. I will also list each hypothesis and motivate why it is relevant to the objective of the thesis.

In the chapter on Methodical work, I will address the practical work of collecting data for my models, and testing it for statistical shortcomings. Closely related to the Method chapter is the chapter on the Empirical model. Here, I will bring up the layout of the model used as well as included variables. In the Results chapter I will present the results from the model and use them to answer my hypotheses. Finally in the Discussion chapter I will comment on the results and relate them to the aims and objectives of the study as well as report on suggestions for future research.

2 Literature Review

2.1 Previous research

Some work has been done on the potential impact online reviews might have on entertainment product sales, especially within the cinema and movie sector. However, the results are mixed with both support for a relationship between ratings and sales and studies that challenge such a view. There is no overall across market agreement on the effects of online ratings, increasing the interest to unveil unique characteristics of the video game market. Here I will present some of the earlier works that has contributed to the field of study.

An important article for this thesis has been “Do online reviews affect product sales? The role of reviewer characteristics and temporal effects” (Hu et al. 2008). The article investigates the impact of user ratings and reviews on books and movies sold on Amazon.com. Using transaction cost economics theory and a portfolio approach, they found that changes in user reviews have an impact on the sales of the reviewed product, and that consumers react differently to favorable reviews and unfavorable reviews. Not covered by my thesis, they also find that several measures on review quality are significantly related to sales performance, making their study both quantitative and qualitative. They do however not use real sales numbers but instead a top-selling list where only the sales ranks are showed and not the actual sale numbers. My thesis therefore partly aims to test their results by using real sales numbers.

In an article by Dellarocas, Zhang and Awad (2007) they attempt to construct a revenue-forecasting model for cinema movies. Revenue forecasting within the cinema sector is a well-studied area today, but what set aside this study was the inclusion of both professional and user grades in the model. Along with precise data on each movie’s budget costs, a functional prediction model was developed. The authors also found that user grades had a bigger explanatory power for the revenues of movies than professional reviews. Using Yahoo! Movies database, the authors were able to weigh the users reviews after age and gender and thereby get further information on the effects of user grades.

In an article by Duan, Gu, and Whinston (2008) on the cinema market, they conclude that online reviews have a predicting power on the quality of a movie but lack any kind of impact on the sales of the movie. The consumers are therefore able to understand the quality of a movie from reading reviews but are not influenced by the reviews indigenously. The authors instead found that the quantity of reviews a certain movie receives, being favorable or not, has a positive significant impact on the sales of a given movie. This shows that consumers are affected by some kind of awareness effect. The authors also find that the relation between online reviews and movie sales is not straight causal, but that both variables affect each other.

Using cross-sectional data on the cinema industry Liu (2007) also found the number of reviews being significantly correlated with weekly movie sales. Van den Bulte and Lilien (2001) however found while studying the drug market that marketing efforts by the companies played a dominant role in consumption patterns instead of effects from WOM. In a study on the market for books in the U.S, Sorensen and Rasmussen (2004) studied the relationship between reviews in the New York Times and sales performance. Their results concluded that any kind of publicity or criticism, good or bad, resulted in higher sales supporting the awareness effect.

There are also several studies on the psychological factors on why individuals publish reviews and how they interpret them. Chatterjee (2001) found that consumers respond differently to online reviews dependent on their earlier relationship with the producer. The more familiar a user is with a retailer or producer of a certain product, the less of an effect had negative reviews. Studying the automobile market, Chen et al. (2004) found that the inclination to write a review was highly affected by the automobile's quality and price rather than the desire to assist other consumers.

2.2 What sets this study apart from earlier work?

Studying previous research on online reviews and WOM, I cannot find any studies set in the video game market or any related game market. This is somewhat surprising as the video game industry is a fast growing business with an increasing customer population (Team 2015; Dring 2015; Basak 2014). It therefore puts this study in the forefront of consumer behavior research within the video game market with a hope of reaching out to agents such as developers, retailers as well as other consumer behavior researchers.

Furthermore it has been argued that the size of the video game market have surpassed those of both movie and music – highlighting the importance of market studies such as those carried out in this thesis (Sheckler 2014; Wallop 2009; Bronkhorst 2012).

While studies on online ratings have been carried out on the cinema market, my processes still differ in several ways. Instead of using sales rank (see for example Hu, et al. 2008), which only gives estimates of a possible marginal effect on sales performance, I use real sales numbers of physical games in Sweden from 2010 to 2014. This should increase the accuracy of the estimates by reducing the measurement errors. The lack of WOM research on the video game market also opens up for the question whether professional ratings and user ratings differ in their relationship to sales performance. My use of standard deviation as a measure of uncertainty and thus a transaction cost within the video game market also does not relate to any other studies I have been able to find within the entertainment industry. This opens up for an interesting theoretical approach on how consumers react when there is no gathered opinion to draw information from.

3. Theory

In this chapter, I will describe the theories used to explain the relationship between online ratings and sales performance. Using a framework of transaction cost economics, I will work with the theoretical effects of online ratings (uncertainty and awareness) to explain how they can impact sales performance through word-of-mouth.

3.1 Transaction cost economics

Derived from the works of Noble prize winner Ronald Coase, Williamson (1979) established the theory of Transaction cost economics (TCE). The theory offers an explanation to how transactions are carried out with the help of asset specificity and uncertainty (sometimes also transaction frequency is mentioned). Mainly used for examining the optimal governance structures to conduct transactions within organizational measures, the theory is also applicable on consumer reasoning when faced with a consumption decision. In classical economic theory, a common assumption is that the market is characterized by symmetric information, meaning that buyers and sellers have the exact same information on a given good. The assumption therefore implies that transactions can be conducted without any cost. There are however situations where the theory does not fully apply and consumers must take part in for example price-comparison, information search and post-sales service. Such actions or costs that are involved in making the transaction are called transaction costs.

Using these transaction costs, TCE argues that consumers will choose the channel with the smallest combined transaction and production costs in order to minimize the total price paid (see fourth level in figure 1). In summary, transaction costs are usually determined by uncertainty and asset specification where this thesis will focus on uncertainty as a transaction cost (see third level in figure 1). (Williamson 1970; Coase 1937).

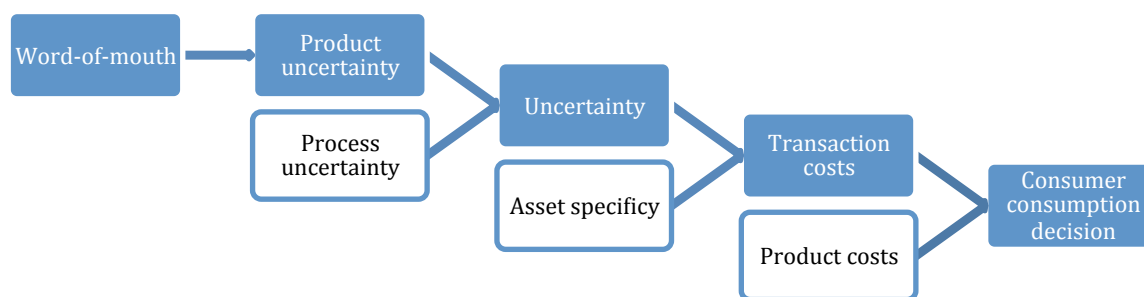


Figure 1. Depicting the depending relationships between online ratings (Word-of-Mouth) and sales performance (consumer consumption decision) that I wish to estimate. Blue symbols are the theories investigated in this thesis.

3.2 Uncertainty reduction theory

The uncertainty reduction theory refers to how a consumer acts when faced with a consumption decision that comprises of a grade of uncertainty in its outcome, for instance the risk of a product's quality not being in line with the consumer's expectations (Berger & Calabrese 1975). In such case, the consumer will participate in uncertainty reduction actions in order to reduce the costs associated with unexpected outcomes of the purchase. Ways to reduce the product uncertainty include gaining information on the producer, similar products, guarantee details, or how other customers rate the product (Liang & Huang 1998).

Practically, the theory suggests that products with high consumer uncertainty has high transaction costs and therefore should not generate high sales (Hu et al. 2008). In my model, this uncertainty will be explained by the standard deviation of given ratings – in other words, how much the opinions of the raters differ from the average for a given game. The theory therefore explains that, keeping all other sales affecting factors equal, games with high standard deviation should not sell as well since divided information would confuse a consumer and therefore increase the uncertainty rather than reducing it (Liang & Huang 1998; Dahlman 1979).

With the ever-increasing Internet participation of the average consumer, not least among consumers who play video games, online communication within a consumer group has become an important source of product information (Bickart & Schindler 2001; Oosterveer 2011). The average rating scores can therefore also serve as a source to reduce the product uncertainty by facilitating other customer's opinions regarding a certain product. Uncertainty costs can in turn be divided into two groups, process uncertainty and product uncertainty (see second level in figure 1), where this thesis will turn to the latter (Liang & Huang 1998).

3.3 Word of mouth

Online WOM can commonly be described as “any statement based on positive, neutral, or negative experiences made by potential, actual, or former consumers about a product, service, brand, or company, which is made available to a multitude of people and institutions via the Internet” (Kietzmann & Canhoto 2013). The power of WOM has been proved several times (see for example McFadden & Train 1996; Katz & Lazarsfeld 2006; Engel et al. 1969). Some studies have even proved WOM to carry greater credibility, empathy and relevance for consumers than traditional sources of product information (Bickart and Schindler 2001; Oosterveer 2011). Banerjee (1992) even proved that some consumers are so influenced by others opinions and recommendations that they almost fully set aside their own private preferences. The theory thereby offers a framework that explains how electronic information channels such as online ratings can serve as transaction cost reducers for product uncertainty.

The theory of WOM is widely accepted within most business sectors, and it is in most producers' and retailers' interest to understand the effects and consequences of WOM on their products. However, WOM is likely to be particularly influential within the entertainment business, where products naturally become a subject for discussion in social scenarios (Keller et al. 2008; Godes & Mayzlin 2004). WOM can also be assumed to play a greater role the more subjective the product described is, for instance video games. This assumption finds some support in a study by Dellarocas et al (2007) on how user and professional ratings impact cinema sales. The authors were surprised to find that user ratings had a greater explanatory power than professional ratings. Their theory was that a large number of user ratings (about 300) have the power to on

average be more accurate than a smaller number of professional critics (about 15). Although this is not linked to an established theory, I seek to prove the same relationship within video game sales but hopefully while offering new explanations. Based on research done on the movie market, I assume that the online rating scores correlates with the preferences of users who do not write reviews themselves (Dellarocas et al. 2007). The score of online ratings can therefore be considered a proxy for electronic WOM.

3.3.1 How WOM can explain differences in user and professional ratings

Several studies show that WOM outperforms traditional advertisement in key-areas such as carry over effects and elasticity, meaning that advertisement received via WOM is spread wider and more cost efficient for the company selling the product (Trusov et al. 2009; Bickart & Schindler 2001; Oosterveer 2011). By letting professional critics take the role of traditional advertisement and user grades as WOM, I can use the WOM framework to try to explain any differences in the relationships between user ratings, professional ratings and sales. The growth of the Internet as a forum for consumers and online ratings will thereby symbolize the increasing impact of WOM versus traditional advertisement or professional ratings.

In accordance with the present discussion on firms buying favorable reviews from professional critics (see for example Smith 2013), any differences between user and professional ratings could also be explained by an opportunism attribute to information asymmetry. As game reviews are relatively subjective, a special kind of information asymmetry on the video game market arises. Some therefore argue that developers try to influence the ratings given by professional critics in order to boost sales. Although examined in detail in this thesis, this theory can be used partly to explain any significant difference in sales between games that have received low user grades but high professional grades.

3.4 The awareness effect

As a proxy for WOM, online reviews have two main ways of affecting the outcome of a product sale, namely through the awareness and the persuasive effects (Duan et al. 2008). The awareness effect enlightens and makes a consumer aware of the product's existence, increasing the chance of it being in the choice set of the consumer. It also

serves as an explanation to the saying “any publicity is good publicity”, referring to that even unfavorable ratings might increase sales in the long run. The awareness effect is considered in this thesis by estimating the impact of measures on the quantity of ratings posted for any game. The persuasive effect, shaping consumers preferences about a certain product, is seldom found to be affected by WOM, and will therefore not be estimated in this study (Duan et al. 2008; Doraszelski et al. 2007).

3.5 Hypotheses

Hypothesis 1

There is no difference in sales performance for games that receive on average favorable ratings than for games that receive on average unfavorable ratings.

Under an assumption of causality (described in “Assumptions of the model” chapter 5.1), I will study whether the marginal change in sales performance in video games differ if the game receives favorable (a higher than average rating) or unfavorable (a lower than average rating). This is to test to assess if consumers value favorable ratings from unfavorable ratings differently when gathering information pre-consumption.

Hypothesis 2

There is no difference in the relationship between professional ratings and sales performance than between user ratings and sales performance.

This study aims to prove that consumers experience a higher sense of uncertainty if the opinions of the broad mass is divided rather than united. Such increased uncertainty should theoretically correlate with a lower sales performance.

Hypothesis 3

There is no difference in sales performance between games which ratings are characterized by high standard deviation and games which ratings are characterized by low standard deviation.

This hypothesis continues to examine the uncertainty theory to see whether video games where professional and user’s opinions strongly differ from each other experience a decrease in sales performance.

Hypothesis 4

Games with high difference between average professional and user ratings should show lower sales, as the difference should increase the uncertainty.

This hypothesis aims to investigate whether an uncertainty cost arises when games experience a large difference between user rating scores and average rating scores. An example would be a game that is well welcomed by consumers but is less liked by the professional critics or vice versa.

Hypothesis 5

The number of reviews during the initial week of a game's release positively correlates with the total sales of a game.

This hypothesis serves to indicate any awareness affect that affects sales through the quantity of ratings posted, whether they are favorable or unfavorable. As WOM-studies in other entertainment fields (see for example Dellarocas et al. 2007; Duan et al. 2008; Liu 2007) have found such a correlation with sales, I seek to find out if there is any difference with the video game market.

4. Method

In this chapter I will perform graphical analysis of the data before starting to develop the model in the next chapter. I will also present what that methods were used to reach the results and estimations.

4.1 Graphical analysis

It is important to note that statistical conclusions should not be drawn from a simple graphical analysis, however, a review of the data can give indications of trends and relationships that might show up later in the regression results. Difference in sales performance depicts the ratio between sales during release week and the following 51 weeks and therefore implies that a low percentage equals a high sales performance (see chapter 5.3 for more information). Sales performance is in other words inversely related to the difference in sales performance.

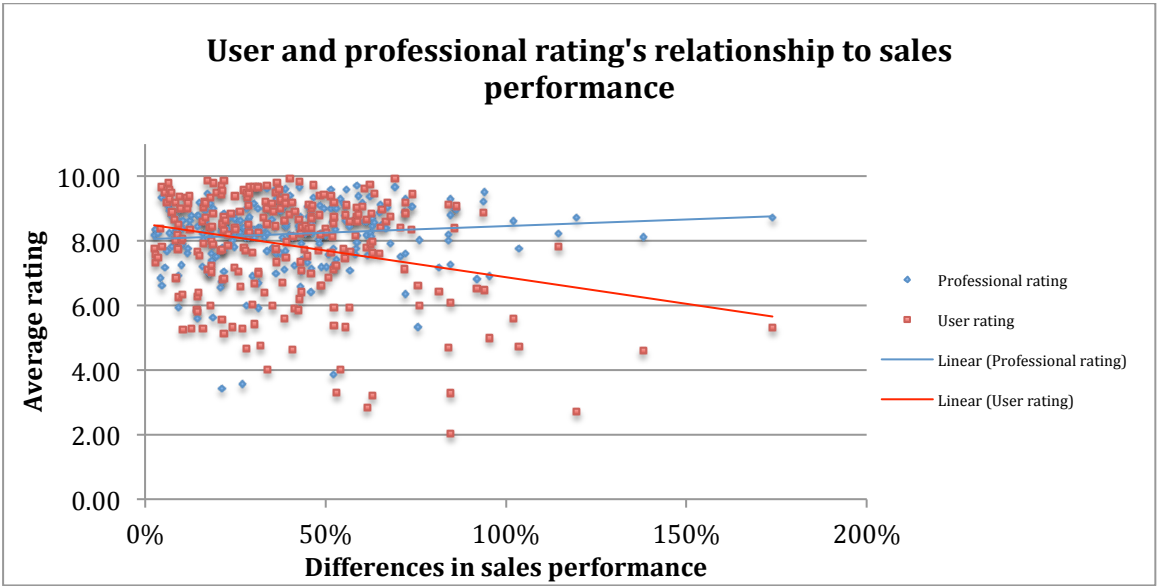


Figure 2. Depicting the relationship between professional and user ratings and differences in sales performance.

Plotting the ratings of both user and professionals against differences sales performance (a lower difference indicates better sales), professional ratings show a negative relation to sales performance while user ratings show a positive relation to sales performance.

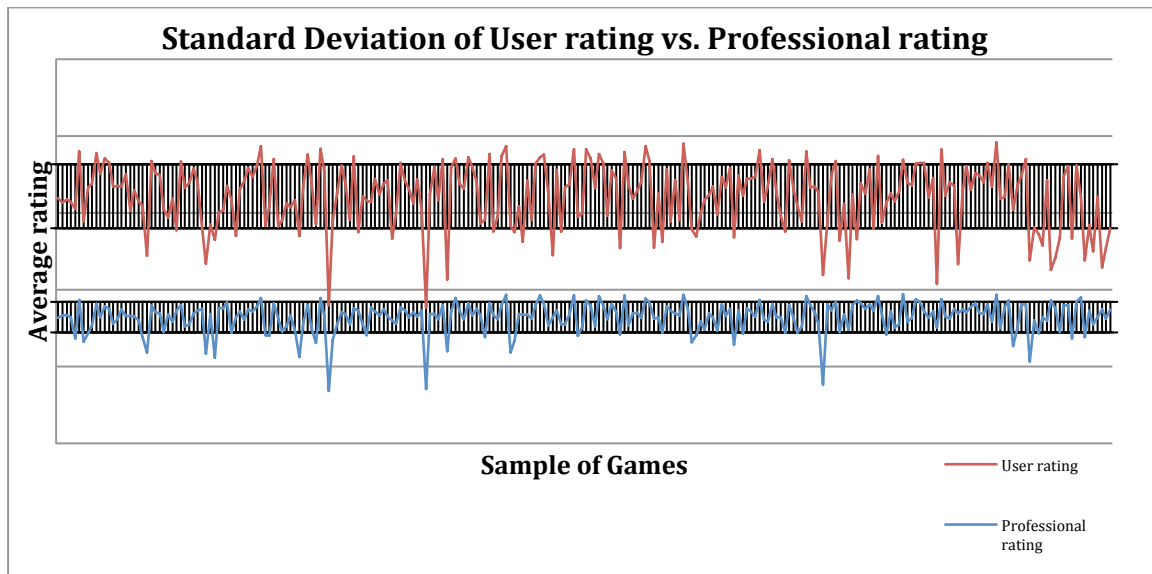


Figure 3. Depicting the standard deviation of user and professional online ratings.

Turning to the estimation of uncertainty through standard deviation, we see that user ratings display a significantly higher variation of rating scores than professional ratings do.

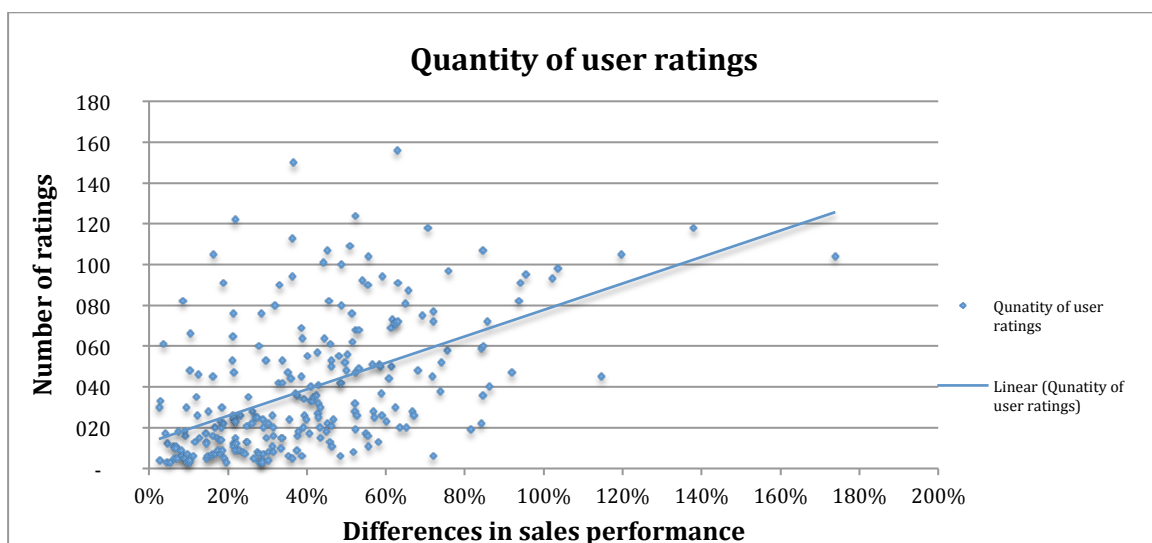


Figure 4. Depicting the relationship between quantity of published online ratings at the end of release week and differences in sales performance.

Challenging the theory of the awareness effect, the quantity of user ratings does not display a positive relation to sales performance in a graphical analysis. This would mean that the more people that post ratings, the worse will the game perform in sales.

4.2 Research Approach

Using multiple linear OLS regressions with a wide selection of potential explanatory variables, I will fit the best possible models in order to explain any variance in sales performance of video games (Dougherty 2011, pp. 153-164).

4.3 Method of choosing explanatory variables

When choosing variables to include in the final model, several aspects have been taken into consideration. The methods consist of econometric tests, validation of statistical significance and graphical analysis of the variables and residual distributions. As with regressions that aim to reject or disprove hypotheses, a level of significance of 5 per cent is common practice and will also be used in this thesis (Lantz 2006 pp. 45-50). Variables that met the significance criteria, increased the Adjusted R^2 and didn't increase the variance inflation factor (VIF) were candidates for inclusion in the model.

4.4 Econometric testing

As heteroscedasticity and multicollinearity can make OLS-estimates inefficient and standard errors inconsistent, I will investigate the occurrence of them and discuss their possible effect on the results.

Heteroscedasticity causes OLS standard errors to be biased in finite samples. Also, the estimates will no longer be blue as they are no longer efficient (Dougherty 2011 pp. 280-294). I have carried out White's test for heteroscedasticity where the null-hypothesis is that the error-terms are homoscedastic, meaning that all error-terms have the same variance. With a p-value of 0.000, however, I had to reject the null-hypothesis of homoscedasticity, and therefore adjusted the standard errors using White's method.

Multicollinearity means that two or more of the explanatory variables are strongly correlated. If the correlation is big enough to lead to a misleading regression model through bad estimates, the model suffers from multicollinearity (Dougherty 2011 pp. 165-176). As I have included the square of user ratings they show high correlation with their un-squared variables. This, however, is as expected. Even though the correlation is high, it is not high enough to cause any problems with the estimates. No further adjustments to the data have been made (see appendix 9.3 for correlation between explanatory variables).

Due to the fact that my dependent variable cannot take negative variables, the error term cannot be normally distributed. Even so, I would like to test if the errors follow a normal distribution in order to investigate the seriousness of this problem. As none of the p-values for skewness or kurtosis exceeded their thresholds and I have sufficient observations to hold for a high Jarque-Bera score, no adjustment was needed (for graphical details see appendix 9.2).

4.5 Data collection method

There are two main pieces of data collected for this study, sales details on video games and ratings for those games. Thanks to generous help from GfK Sweden (GfK) I have received detailed data on video games sold in Sweden reported on a weekly basis.

Online reviews are often divided into two parts. First, there is a rating part where the user can give the product a rating score denoted by a scale such as 1-10 or A-F, giving a very short and easy-to-interpret evaluation. Second, the rating is often followed by a motivation, where the user can write a motivation to the given rate. The rating data used in the study has been quantified from the website Metacritic (2015). Metacritic is a review-gathering site, which lets its members post reviews on video games, but also gathers reviews made on other sites internationally. The site has served my purpose well as it reports both professional ratings as well as user ratings.

For the study, 250 games released from 2010 to 2014 have been collected and analyzed. Besides having picked only games with both professional and user ratings available for the first week, no other discrimination has been made on the games collected.

4.6 Validation of data

GfK holds the most comprehensive data set on the Swedish video game market. It can therefore be considered one of the most reliable sources of sales information that is available when looking on games released by several developers. As commented on earlier, the data set does not however contain digitally sold games, imposing the assumption of identical consumer behavior both within traditional retail and digital retail.

The data from Metacritic is more difficult to validate by several measures. The externally collected reviews included at the site are picked from 145 professional raters after Metacritic's own criteria, making it difficult to assess the quality of the sub-population. Moreover, as with many review sites, it is difficult to know whether all information stated is true or has been tampered with, once again referring to the discussion on false reports (see for example Smith 2013). The site however has good reputation and is often considered one of the most covering review collecting- and summarizing sites available.

5. Empirical Model

Here I will cover the regression model that has been used during the study. Included and excluded variables will be motivated and other factors that might affect the goodness of fit will be mentioned. The chapter will begin with a presentation of the assumptions made during the study.

5.1 Assumptions of the model

- The data on video games sold at physical retailers is a random sample of the total population of sold video games, including online purchases and therefore holds the same characteristics as the total population.
- There is a causal relation between online ratings and sales performance where ratings impact sales. This assumption of exogeneity is encouraged to be tested in future research.

5.2 The regression model

In order to answer the hypotheses regarding the relationships between online ratings and sales performance, a multiple regression model has been fitted. Several variables have been examined in order to find the model with the best explanatory power. The included variables are summarized in table 1. As release dates for games might differ geographically, a small segment of the games have international ratings several weeks before release in Sweden.

5.3 Measurement of sales performance

A reoccurring challenge when measuring sales performance is to find a reference point for the *expected* sales performance. Raw sales numbers can of course not be used as dependent variable as expected sales performance differs from game to game. As I have not had access to any budget or cost planning for each game such data cannot be used. As a proxy of sales performance, I will instead use the ratio of sales during release week and the following 51 weeks.

The idea is that a game which generates relatively low sales numbers the first week in relation to following weeks can be considered a successful game, as it implies that consumers continue to buy the game past the first week's sales. Consequently, a game

that shows a big drop from the release week to the following 51 weeks can be considered a less successful game as consumers stop buying the game.

This builds on the logical assumption that games on average reach high sales numbers during the release week relative coming weeks, an assumption that is proved by graphical analysis of the data sample. The 52-week period is picked as many games have generated 85% or more of their lifetime sales within a year (Dobson 2007).

5.4 Variables

Table 1 depicts the variables included in the model. After the table follows a short motivation of each variable's assumed impact on sales performance.

Variable	Description
Sales performance (<i>sales</i>)	First week's revenues divided by total revenue $\frac{\text{Revenue week}_1}{\sum \text{Revenue week}_{2-52}}$
Average user rating (<i>urating</i>)	Average user rating scores posted no later than the last day of release week
Square of average user rating (<i>urating2</i>)	Square of <i>urating</i>
User rating standard deviation (<i>urating_se</i>)	Standard deviation of user reviews
Professional rating standard deviation (<i>prating_se</i>)	Average professional rating scores posted no later than the last day of release week
Number of user reviews (<i>unumber</i>)	Total number of user reviews posted no later than the last day of release week
Rating density (<i>density</i>)	The fraction of video game consumers who posted a rating during the first week $\frac{\text{unumber}}{\text{revenue week 1}}$
Revenue release week (<i>r1</i>)	Total market revenue during a game's first week
Pre-Christmas dummy (<i>pchrist_dummy</i>)	Games released week 46-49
Christmas dummy (<i>christ_dummy</i>)	Games released week 50-52
Small release dummy (<i>small_dummy</i>)	Games that sold for less than 100.000 SEK the first week

Table 1. Explanatory variables included in the final model

Earlier research has shone light on the issue of an independent measurement of WOM, even when it is logically clear that the effect exists (Duan et al. 2008). To capture the effects of WOM, I have therefore collected the best estimators from previous research as well as experimented with new measurements of the phenomenon. I have gathered data on several variables that have an effect on sales (see table 1).

Average user rating (*urating*)

The average rating of a game was included as it reflects the main opinion of the raters.

Square of average user rating (*urating2*)

The square of average user ratings was included to control for any diminishing marginal effects of rating's impact on sales performance.

Standard deviation of ratings (*urating_se*) & (*prating_se*)

To further capture all aspects that might cause a consumer uncertainty costs, also the standard deviation of these ratings was included. The argument is that if a game receives mixed ratings with a high deviation from the average, for instance many high scores and equally as many low scores, a consumer should experience some kind of uncertainty as the rating information does not offer any gathered opinion, or certain information, on the game.

Number of user reviews (*unumber*)

In common with the WOM-models of Dellarocas et al. (2007) and Chen et al. (2004) I also included the quantity of ratings available during the release week. As earlier explained, this variable was included to capture the awareness effect of a game through WOM.

Rating density (*density*) – control variable

To put the awareness factor under further assessment, I also included a density variable, capturing the ratio of number of ratings the first week through the revenue of a game during the first week. This is a version of Elberse and Eliashberg's (2003) proxy variable for WOM within the cinema market where they used revenues per screen. Or in my case easier put, "how many customers per bought game writes an online rating?"

Revenue release week (*r1*) – control variable

As sales performance is measured as the ratio between the release week and the following 51 weeks, the inclusion of the revenues during release week should have an impact.

Christmas dummies, (*prechrist_dummy* & *christ_dummy*) – control variable

Most video game sales experience a two-parted disturbance during the weeks before Christmas in form of reduced sales during week 46 to 49, and increased sales during week 50 to 52. One dummy has therefore been created to capture effects in week 46 to 49, and another for effects week 50 to 52.

Small release dummy (*small_dummy*) – control variable

As games might have different budgets and financial characteristics to use to impact their first week's revenues, dummies for big and small games (determined by the size of release week revenues as stated in table 1 and 2) was included. The dummy for big games was however excluded from the model as it wasn't proved statistically significant.

Excluded variables

Several variables were believed to carry explanatory power to the model, but were excluded due to high p-value or too low contribution to the adjusted R². See appendix 9.4 for more information.

6. Results

In this chapter, the results reached during the study will be presented along with short comments. Further remarks on the results will be made in the following “Discussion” chapter.

Statistical results

Independent variables	Standardized parameter estimates (standard errors in parenthesis)
Average user rating (<i>urating</i>)	-0.140 ** (-0.054)
Average user rating ² (<i>urating2</i>)	0.012 *** (0.004)
User rating standard deviation (<i>urating_se2</i>)	0.089 *** (0.024)
Professional rating standard deviation (<i>prating_se2</i>)	0.065 ** (0.027)
Number of user reviews (<i>unumber</i>)	0.003 *** (0.001)
Revenue release week (<i>r1</i>)	1.40e-08 *** (2.82e-09)
Rating density (<i>density</i>)	-5.810 *** (1.167)
Pre-Christmas dummy (<i>christ_dummt</i>)	-0.174 *** (0.024)
Christmas dummy (<i>christ_dummy</i>)	0.972 *** (0.080)
Small release dummy (<i>small_dummy</i>)	-0.100 *** (0.032)
Adj R2	0.61

Table 2. Statistical results from OLS regression.

Standard error in parentheses. ** 5% significance. *** 1% significance

6.1 Analysis

Important to remember when analyzing the model is that our dependent variable is a ratio of the first week's sales through the following 51 weeks' total sales. This means that a negative (positive) coefficient sign denotes a *positive* (negative) relationship with sales. Negative (positive) coefficient signs will therefore be interpreted as a positive (negative) relationship in the following analysis.

I find a positive significant relationship between user ratings and sales performance on the 5-per cent level, while professional ratings is excluded because of a high p-value. I can therefore reject hypothesis 1. The rejection of hypothesis 1 is however mixed. While I found a significant relationship between user ratings and sales, no such relationship could be found between professional ratings and sales. The non-significant relationship from professional rating scores also mean that we can reject hypothesis 2 as the user rating is significant and therefore displays a stronger relation to sales than professional ratings.

Also the relationship between squared user ratings and sales is negatively significant on the 1-per cent level, implying a diminishing marginal effect on consumer's valuation of ratings. As expected, the standard deviation of both user and professional ratings is negatively significant on the 1-per cent and 5-per cent level thus I can reject hypothesis 3.

As a variable that measured the difference between professional and user ratings failed to be statistically significant, we must reject hypothesis 4. The number of reviews posted within the week the game was released showed a negative relationship on a 1-per cent level. We therefore also have to reject hypothesis 5.

The dummies controlling for Christmas sales patterns are both significant on the 1-per cent level, confirming the visual analysis of a decrease followed by an increase in sales the weeks just before Christmas. Also the dummy controlling for smaller games is positively significant on the 1-per cent level, implying that smaller games have a tendency to have a smaller gap between the first week and the following 51 weeks than middle-sized and large games.

Considering the Adjusted R²-value of 0.61, a meaningful part of the variance in *sales* is still explained by variables not included in my model. This does not however undermine the importance of WOM but rather lets us know that factors such as budget, spending on advertising and marketing strategies would be interesting control factors to include for future research.

6.2 Hypotheses summary

Hypothesis	Description	Finding
Hypothesis 1	There is no difference in sales performance for games that receive on average favorable ratings than for games that receive on average unfavorable ratings.	Rejected
Hypothesis 2	There is no difference in the relationship between professional ratings and sales performance than between user ratings and sales performance.	Rejected
Hypothesis 3	There is no difference in sales performance between games which ratings are characterized by high standard deviation and games which ratings are characterized by low standard deviation.	Rejected
Hypothesis 4	Games with high difference between average professional and user ratings should show lower sales, as the difference should increase the uncertainty.	Rejected
Hypothesis 5	The number of reviews the initial week of a games release positively correlates with the total sales of a game.	Rejected

Table 3. Hypotheses summary

7. Discussion

7.1 Hypotheses discussion

Hypothesis 1

Reviewing the hypothesis findings, we can draw some interesting conclusions regarding online ratings and the video game market. First of all, we can conclude that user written online ratings has a significant relationship to the sales performance of a given game, and thereby reject hypothesis 1. This means that WOM is a factor that should be taken into consideration by companies when estimating marketing strategies and impact of online ratings and reviews. This is in line with earlier findings on online WOM becoming a more important factor within the entertainment industry, and proves that this might also be the case for the video game industry.

We can also conclude that professional ratings do not significantly affect sales performance. The result is interesting since professional critics for long has had a major influence over what entertainment products are in demand (Eliashberg et al. 1997). It also sets this study apart from similar studies done within the entertainment product market that found significant relationships between professional ratings and sales (Hu et al. 2008).

Interesting to note is the negative relationship between the squared value of user ratings and sales. This can be interpreted as user ratings having a diminishing effect on sales. In other words, a marginal increase in average ratings from 6 to 7 out of 10 has a bigger impact on sales than an increase from 8 to 9. Diminishing marginal effects is a common assumption within economic modeling and has a logical explanation in this model as it is likely that consumers have a subjective limit that a rating has to pass for the consumer to buy the game. When the game's average rating score pass the limit, a diminishing effect of each additional increase in rating score is created. (Bergh 2010 p. 44)

Hypothesis 2

What made me come up with the idea to write about ratings and video games was the thought of how many video gamers that really read the professional review pages. It is therefore extra interesting that user ratings show a significant relationship with sales performance while professional ratings do not. The result points to video markets as being less dependent on professional reviews than for example the movie or book markets (Hu et al. 2008; Sorensen & Rasmussen 2004). Reconnecting to the similar findings of Dellarocas et al. (2007) within the cinema market, their theory was that a large number of user ratings were on average able to reach a stronger relationship with sales than a small number of professional ratings. This theory is of course possible to apply to my findings, but I believe that more differences exist than solely the sheer number of observations. More likely is that consumers value user ratings over professional ratings as they describe the opinions of *users*, and not professional critics. The phenomenon is known from the film industry where it is not rare that professional critics and users disagree on movie ratings, usually because professionals use different measurements of quality. This might create a situation where users and professionals actually are rating different content in different ways, leading to the ratings not being representable for the opinions of the individual consumers. The finding also serves as a comment in the debate on how producers might pay professional critics to manufacture false reviews in order to boost sales numbers. Most of all however, it sheds a light on an issue that should be further investigated before making any drastic assumptions about the future and meaning of professional game critics.

A more careful comment is that while ratings released up to and including release week do not affect the sales, it is still possible that ratings released later weeks affect the sales. This opens up for future research to investigate on a weekly basis, past release week, if the pattern remains. However, on average more than half of the professional ratings (55%, own calculations) are released within the first week, further arguing for their weak relationship to total sales.

Hypothesis 3

Both standard deviation of user and professional ratings show a significant negative relationship with sales performance. We can therefore reject hypothesis 3 as it seems like the more divided opinions are on a given game, the more the uncertainty and therefore the transaction costs of the consumer increases. In other words, as the ratings do not share a common view, the consumer becomes unsure of the quality of the product. The standard deviation translates into an uncertainty transaction cost for the consumer, increasing the total price of the video game and thereby discouraging consumption of the game (Hu et al. 2008).

The finding that professional standard deviation has an affect on sales is interesting as professional ratings fail to explain any variance in sales patterns (see table 1). The finding implies that, even though the raw *ratings* of professionals do not matter to consumers, the arisen uncertainty when “even the experts disagree” on a game can cause transaction costs through uncertainty. This would, according to transaction cost economics decrease sales performance as the transaction cost, and thereby the total price, increases (Coase 1937).

Hypothesis 4

Though it might seem rather surprising in the light of transaction cost economics, we can reject a relationship between differences in professional and user ratings. We can however find an explanation in hypothesis 1 where we cannot find a correlation between professional ratings and sales but between user ratings and sales. This could be interpreted as consumers caring more about user ratings than professional ratings, and therefore do not value the difference in ratings between the two for a given game. It is somewhat difficult to put this finding into context, as no other study on the matter has been found, leaving to future research to further investigate the phenomenon.

Hypothesis 5

Perhaps most surprising and interesting is the negative relationship between the number of user reviews, measuring the awareness effect, and sales performance. In earlier studies on other entertainment sectors such as the cinema and book markets, the number of reviews has shown a positive correlation with sales performance (Duan et al.

2008; Dellarocas et al. 2007; Sorensen & Rasmussen 2004). This relationship however seems to be reversed in the video game market.

A possible explanation might lie in a “community-effect” where members try to save each other from buying a game that turned out to be disappointing in quality. According to a study on online hotel reviews, 90 per cent of all reviews were written in order to “to help other customers make good decisions” (Merritt 2013). On the online shopping site amazon.com however, a similar study showed that 25 per cent wrote ratings to “helping costumers” and 7 per cent wrote because they felt a “sense of community”, with the major reason to write reviews was because of “enjoyment” and “self-expression” (Vasquez 2014 p. 6)

According to my results, video game consumers are more related to the former study test group. This would build on a hypothesis that games which were expected to be good but ended up being a disappointment would incline users to write “warning-reviews” to other consumers before they set off to buy it. It also rests on an assumption that the urge to write about a game that was nothing like expected should be greater than that of a game that is in line with what is expected of it. The explanation is also supported by the result that user ratings has an impact on the sales performance, explaining how the large quantity of ratings lead to a low sales performance.

This would therefore explain how a larger number of reviews are related to a lower sales performance. It does not however necessarily argue against the awareness effect, but rather show that it is offset by a stronger community-effect.

Control variables

The control variables are also able to provide us with some interesting information. As expected, the revenue variable was negative as the higher the sales are in the first week, the smaller is the chance that the game will continue to perform as well in sales during the following 51 weeks. The density variable shows that the more users that post a rating per bought game, the better will the game perform in sales. This might be intriguing as the pure quantity of posted ratings showed a reverse relationship. However as density is a ratio of posted ratings and the revenues from the release week,

it is the revenues that has a stronger explanatory power and therefore results in a positive sign. From the Christmas dummies, we can see that games that are released during the weeks 46 to 49, weeks that are characterized by a decrease in entertainment sells while waiting for the holiday season, will not sell as well during the first week as if they were released later or sooner. The reverse is true for games released from week 50 to week 52, in other words during or just before the holidays. The dummy for small games shows that small games have a tendency to experience a more even sales cycle (i.e. not as steep fall in sales from the first to the following weeks). This could be explained by small games not having the budget or incentive to purchase an expensive marketing campaign to boost the initial sales.

7.2 Conclusion

Summarized from the discussions on the hypotheses above, we can conclude that the video game market is controlled by WOM-mechanics that partly share characteristics with other entertainment markets, and partly stands out with unique features. As expected, online ratings seem to matter for the sales performance of video games by measures such as average user rating score, quantity of ratings, and standard deviation of rating scores. However, the finding of no relationship between professional ratings and sales performance is surprising and highlights the fact that users value information differently depending on its source. Along with the finding that the quantity of sales negatively impacts sales performance, the video game market is thereby segregated from other entertainment markets. In short, user ratings show a significant relationship to sales performance while professional ratings do not while sales performance also varies negatively with standard deviation of rating scores and the quantity of ratings posted for a given game.

7.3 Research aims and objectives

The objective for this study was to assess whether there is a relationship between online ratings and sales performance. The subject is relevant as searching for product information on the Internet has become a natural part of many consumer's decision making process. At the same time, the global video game market is experiencing heavy growth numbers (Team 2015; Dring 2015; Basak 2014). The objective was further to investigate if the transacting cost theory could explain the relationship using WOM as a

trigger. The aim was that such a finding would contribute to the limited research field of WOM within the video game market.

Out of the previous work I was able to find, this thesis is the first to bring up the effect of online ratings on the video game market. Furthermore, it is the first to take up the consequence of diversified opinion's (standard deviation in ratings) implication on sales performance in any entertainment market. My hope is therefore that the results found in this study will bring some attention to the research gap and my models to be continually developed.

7.4 Practical Implications

I found that while user ratings have a direct impact on sales performance, the same could not be proved for professional ratings. This should have implications for the industry when trying to interpret online WOM as it signals that user ratings should be taken as a serious input when estimating revenues or sales, a finding already made within the cinema market (Duan et al. 2008). This thesis also shows that uncertainty is of significant importance for the performance of sales, implying that game developers that release games meant to apply to only a subset of the total audience, should bare in mind the effect of the mixed ratings such a game is probable to receive. I also hope that my findings on standard deviation and uncertainty can encourage more research within transaction cost economics where similar and more detailed studies in other markets can be made.

My findings also sends signals that the video game market cannot be treated as "any other" entertainment product market, as some of the relationships of online ratings differ from the results found in previous research. It should furthermore impact the marketing strategies of producers and retailers as it reveals rating forums as a possible effective channel to reach potential customers.

7.5 Suggestions for future research

There are several recommendations for future research, both in favor of consumer behavior research and of the video game market participants.

- Construct a revenue-forecasting model that includes both ratings and game specific financial data on areas such as budget and marketing expenses. With regard to the works on a similar model within the cinema industry, such a model carries potential to be a valuable tool for game producers and retailer's financial planning.
- Examine the causality of online rating scores and sales performance as has been done in the cinema industry (Duan et al. 2008). As the movies and video games share several key characteristics it is likely that the results will be related.
- Investigate the effect of ratings released post release week. The aim of this thesis was to assess the instant relationship between online ratings and sales. However, it would still be interesting to see if the pattern discovered in this study stretches further during a game's life cycle. Hu, Liu and Zhang (2008) for instance, showed that online reviews have an over time diminishing impact on movies and books bought online.

8. References

Banerjee, A., 1992. A Simple Model of Herd Behavior. *The Quarterly Journal of Economics*, 107(3), pp. 797-817.

Basak, S., 2014. *U.S. Video-Game Industry Sales Increase 8% on Consoles*. [online] Bloomberg.com. Available at: <http://www.bloomberg.com/news/articles/2014-09-11/u-s-video-game-industry-sales-increase-8-on-consoles> [Accessed 18 May 2015].

Berger, C. and Calabrese, R., 1975. Some explorations in initial interaction and beyond: Toward a developmental theory of interpersonal communication. *Human Communication Research*, 1(2), pp.99-112.

Bergh A. & Jakobsson N., 2010. *Modern Mikroekonomi: [marknad, Politik Och Välfärd]* Ed. 1. Norway: Norstedts Förlag.

Bickart, B. and Schindler, R., 2001. Internet forums as influential sources of consumer information. *J. Interactive Mark.*, 15(3), p.31.

Bronkhorst, Q., 2012. *Games vs. movies: who wins?*. [online] Businessstech.co.za. Available at: <http://businessstech.co.za/news/general/19901/games-vs-movies-who-wins/> [Accessed 19 May 2015].

Chen, Y. Fay, S. Wang, Q., 2004. Marketing implications of online consumer product reviews, Working paper, Department of marketing, University of Florida, 2004

Coase R.H., 1937. *The nature of the firm*. *Economica*, 4, 1937, pp. 386–405.

Dahlman, C., 1979. The Problem of Externality. *The Journal of Law and Economics*, 22(1), pp.141-162.

Dataspelsbranschen.se 1, 2012. *Dataspelsbranschen - Ny europeisk studie: Dataspel mest populärt i Sverige*. [online] Available at: <http://www.dataspelsbranschen.se/nyheter/2012/12/11/ny-europeisk-studie-dataspel-mest-populaert-i-sverige.aspx> [Accessed 18 May 2015].

Dataspelsbranschen.se 2, N.D, *Nordic game sales 2013: Retail & Digital*. [online] Available at: http://www.dataspelsbranschen.se/media/135759/nordic_game_sales_2013.pdf, [Accessed 18 May 2015].

Delen, D., Sharda, R. and Kumar, P., 2007. Movie forecast Guru: A Web-based DSS for Hollywood managers. *Decision Support Systems*, 43(4), pp.1151-1170.

Dellarocas, C., Zhang, X. and Awad, N., 2007. Exploring the value of online product reviews in forecasting sales: The case of motion pictures. *Journal of Interactive Marketing*, 21(4), pp.23-45.

Dobson, J., 2007. *SIG Analysts Examine The Deteriorating Video Game Life Cycle*. [online] Gamasutra.com. Available at: http://www.gamasutra.com/view/news/103540/SIG_Analysts_Examine_The_Deteriorating_Video_Game_Life_Cycle.php [Accessed 18 May 2015].

Doraszelski, U., Clark, C. and Draganska, M., 2007, Information or Persuasion? An Empirical Investigation of the Effect of Advertising on Brand Awareness and Perceived Quality Using Panel Data. *SSRN Journal*.

Dougherty, C., 2011, *Introduction to Econometrics*. Ed.4. New York: Oxford University press Inc.

Dring, C., 2015. *UK video game sales rose 7.5% in 2014*. [online] MCV UK. Available at: <http://www.mcvuk.com/news/read/uk-video-game-sales-rose-7-5-in-2014/0143433> [Accessed 18 May 2015].

- Duan, W., Gu, B. and Whinston, A., 2008. Do online reviews matter? — An empirical investigation of panel data. *Decision Support Systems*, 45(4), pp.1007-1016.
- Elberse, A. and Eliashberg, J., 2003. Demand and Supply Dynamics for Sequentially Released Products in International Markets: The Case of Motion Pictures. *Marketing Science*, 22(3), pp.329-354.
- Eliashberg, J. and Shugan, S., 1997. Film Critics: Influencers or Predictors? *Journal of Marketing*, 61(2), p.68.
- Engel, J.F., Kegerris, R.J. and Blackwell, R.D., 1969, Word of mouth communication by the innovator. *Journal of Marketing* 33, 15–19.
- Gfk.com, 2015. *Sweden*. [online] Available at: <http://www.gfk.com/se> [Accessed 18 May 2015].
- Godes, D. and Mayzlin, D., 2004. Using Online Conversations to Study Word-of-Mouth Communication. *Marketing Science*, 23(4), pp.545-560.
- Hu, N., Liu, L. and Zhang, J., 2008. Do online reviews affect product sales? The role of reviewer characteristics and temporal effects. *Information Technology and Management*, 9(3), pp.201-214.
- Katz, E. & Lazarsfeld, P. F., 2006, *Personal Influence: The Part Played by People in the Flow of Mass Communications* (2nd ed). New Brunswick, N.J.: Transaction Publishers.
- Khammash, M. and Griffiths, G., 2011. 'Arrivederci CIAO.com, Buongiorno Bing.com'— Electronic word-of-mouth (eWOM), antecedences and consequences. *International Journal of Information Management*, 31(1), pp.82-87.
- Keller, K., Apéria, T. and Georgson, M., 2008. *Strategic brand management*. Harlow [etc.]: Financial Times Prentice Hall. SIDA

Kietzmann, J. and Canhoto, A., 2013. Bittersweet! Understanding and Managing Electronic Word of Mouth. *J. Public Affairs*, 13(2), pp.146-159.

Lantz, B., 2006. *Lär lätt. Statistikkompedium*. ISBN 87A7681A019A4. Ventuz Publishing Aps

Liang, T. and Huang, J., 1998. An empirical study on consumer acceptance of products in electronic markets: a transaction cost model. *Decision Support Systems*, 24(1), pp.29-43.

Liu, Y., 2006. Word of Mouth for Movies: Its Dynamics and Impact on Box Office Revenue. *Journal of Marketing*, 70(3), pp.74-89.

Longart, P., 2010. What drives word-of-mouth in restaurants?. *Int J Contemp Hospitality Mngt*, 22(1), pp.121-128.

McCarthy C. 2010. *Nestle mess shows sticky side of Facebook pages*, CNET News

McFadden, D. and Train, K., 1996. Consumers' Evaluation of New Products: Learning from Self and Others. *Journal of Political Economy*, 104(4), p.683.

Merritt, J., 2013. *Why Do People Write Reviews?*. [online] Online Reputation Management. Available at: <https://www.reputationmanagement.com/blog/why-do-people-write-reviews> [Accessed 19 May 2015].

Metacritic.com, 2015. *Metacritic - Movie Reviews, TV Reviews, Game Reviews, and Music Reviews*. [online] Available at: <http://www.metacritic.com> [Accessed 25 May 2015].

Oosterveer D. 2011, *Tweets as online word of mouth: influencing & measuring ewom on Twitter*, School of Management. Radboud University Nijmegen, p. 60.

Patrali Chatterjee., 2001, Online Reviews: Do Consumers Use Them? *Advances in Consumer Research* 28, Association for Consumer Research, pp. 129-133

Pitt, L., 2012. Web 2.0, social media and creative consumers-implications for public policy; introduction to the special edition. *J. Public Affairs*, 12(2), pp.105-108.

Plangger K., 2012, The power of popularity: how the size of a virtual community adds to firm value. *Journal of Public Affairs* 12(2) pp. 145–153.

Reichheld, F.F., 2003, *The one number you need to grow*, Harvard Business Review 81(12), 46

Reynolds, J., 2010, *E-Business: A Management Perspective*. Oxford University Press, Oxford.

Sheckler, E., 2014. *When did Video Games Become Bigger than Movies?* - Saltsha. [online] Saltsha. Available at: <https://saltsha.com/video-games-become-bigger-movies/> [Accessed 19 May 2015].

Smith, M., 2013. *Fake reviews plague consumer websites*. [online] the Guardian. Available at: <http://www.theguardian.com/money/2013/jan/26/fake-reviews-plague-consumer-websites> [Accessed 18 May 2015].

Sorensen, A.T. Rasmussen, S.J., 2004 Is any publicity good publicity? A note on the impact of book review, NBER Working paper, Stanford University.

Trusov, M., Bucklin, R. and Pauwels, K., 2009. Effects of Word-of-Mouth Versus Traditional Marketing: Findings from an Internet Social Networking Site. *Journal of Marketing*, 73(5), pp.90-102.

Team, T., 2015. *Strong Demand For Next-Gen Consoles, Growth In Tech Brands Drive GameStop's 2014 Fiscal Revenue*. [online] Forbes. Available at: <http://www.forbes.com/sites/greatspeculations/2015/03/30/strong-demand-for-next-gen-consoles-growth-in-tech-brands-drive-gamestops-2014-fiscal-revenue/> [Accessed 18 May 2015].

Van den Bulte, C. and Lilien, G., 2001. Medical Innovation Revisited: Social Contagion versus Marketing Effort. *American Journal of Sociology*, 106(5), pp.1409-1435.

Vasquez, C., 2014. *The discourse of online consumer reviews*. Bloomsbury Publishing. p.6

Wallop, H., 2009. *Video games bigger than film*. [online] Telegraph.co.uk. Available at: <http://www.telegraph.co.uk/technology/video-games/6852383/Video-games-bigger-than-film.html> [Accessed 19 May 2015].

Widman, H., 2015. *Svenska dataspelsexporten växer - P1-morgon*. [online] Sverigesradio.se. Available at: <http://sverigesradio.se/sida/artikel.aspx?programid=1650&artikel=5892265> [Accessed 18 May 2015].

Williamson, O., 1979. Transaction-Cost Economics: The Governance of Contractual Relations. *The Journal of Law and Economics*, 22(2), p.233.

9. Appendix

9.1 Equation estimations

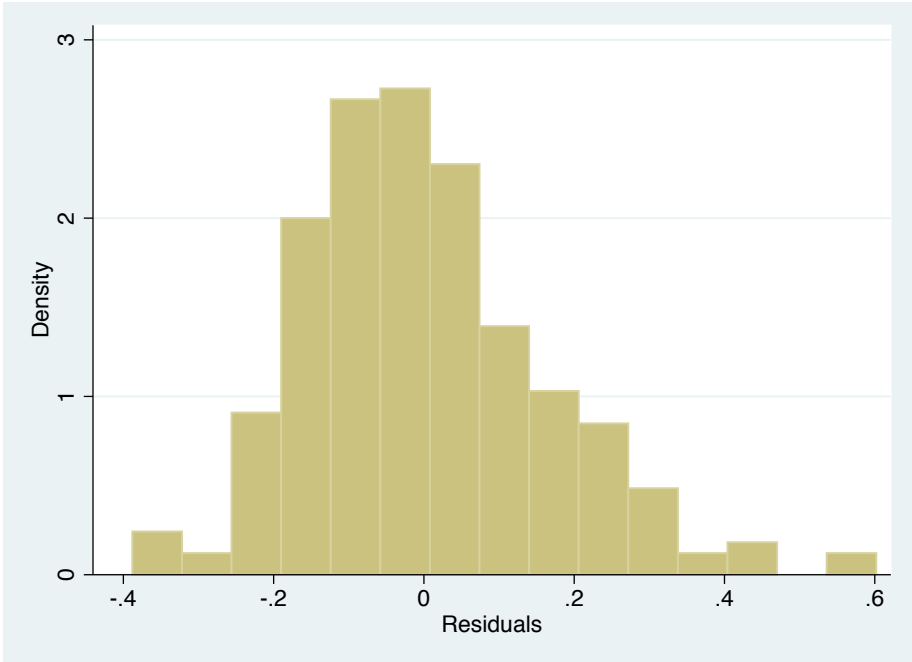
Linear regression

Number of obs = 250
 F(9, 239) = .
 Prob > F = .
 R-squared = 0.6063
 Root MSE = .16415

sales	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
users	.0030932	.0005899	5.24	0.000	.0019311	.0042553
urating	-.1396958	.0543844	-2.57	0.011	-.2468299	-.0325618
urating2	.0124687	.0043118	2.89	0.004	.0039747	.0209628
urating_se	.088924	.0242727	3.66	0.000	.0411082	.1367398
prating_se	.0645949	.0265906	2.43	0.016	.012213	.1169768
r1	1.40e-08	2.82e-09	4.95	0.000	8.40e-09	1.95e-08
density	-5.810145	1.167251	-4.98	0.000	-8.109559	-3.510731
pchrist_dummy	-.1737998	.0235418	-7.38	0.000	-.2201756	-.1274239
christ_dummy	.9718824	.0795499	12.22	0.000	.815174	1.128591
small_dummy	-.1003646	.0323554	-3.10	0.002	-.1641029	-.0366264
_cons	.3675648	.1695749	2.17	0.031	.0335126	.701617

Source: Stata.

9.2 Normality test



Histogram of residuals, source: Stata

9.3 Multicollinearity

	users	r1	urating	urating2	urating_se	prating_se	density	pchrist_dumy	christ_dummy	small_dummy
users	1.0000									
r1	0.2726	1.0000								
urating	-0.1954	-0.2904	1.0000							
urating2	-0.1730	-0.2516	0.9893	1.0000						
urating_se	0.2641	0.0990	-0.7623	-0.7917	1.0000					
prating_se	0.1699	0.2572	-0.1041	-0.1277	-0.2011	1.0000				
density	0.4526	-0.1469	-0.0440	-0.0561	0.1529	-0.0252	1.0000			
pchrist_dumy	-0.1049	-0.0641	0.0804	0.0839	-0.0969	-0.0347	-0.0333	1.0000		
christ_dummy	0.1286	0.1920	-0.1032	-0.1036	-0.0770	0.3088	-0.0217	-0.0264	1.0000	
small_dummy	-0.1712	-0.1599	0.0468	0.0413	-0.1186	-0.0633	0.2920	0.1318	-0.0207	1.0000

Correlation between explanatory variables. Source: Stata

9.4 Excluded variables

Several variables were believed to carry explanatory power to the model, but were excluded due to high p-value or too low contribution to the adjusted R². Some of them are reported on below.

Variable	Description
Average Professional rating	Average professional rating scores posted no later than the last day of release week.
Pre-orders proxy	Pre-orders for the games in North America
Difference between professional and user ratings.	Takes the percentage difference between the average grade a given game has received from professional ratings and user ratings.
Average spending on culture	Culture spending/capita during the quarter the game was released.
Average non-zero user rating	A measurement that took in consideration the possibility of coordinated users falsely giving the rating 0 out of 10 in order to handicap the sales performance.
Big release dummy	Games that sold for more than 1.000.000 SEK first release week

Explanatory variables that were excluded from the model