

The Influence of Online Movie Rating on Box Office

Li Liu^{1,a,*}

¹College of Professional Studies, Northeastern University, Boston, MA., the U.S.A
a. liu.li3@husky.neu.edu

Keywords: Online Movie Rating, IMDb, Box Office

Abstract: The purpose of this paper is to study the impact of online movie rating on box office. Based on a movie dataset of IMDb, the relationship between IMDb rating, revenue and Metascore is analyzed. At the same time, through a case study analysis, the impact of other factors on the box office is also discussed. It is hoped that research results of this paper can provide some data support for the movie's business decisions.

1. Introduction

As a major cultural industry, the movie industry has attracted public's attention in the 21st century, and the box office is one of the criteria to measure the value of a movie. The box office is affected by many factors, such as the propaganda way, cast and online evaluation. Zou and Xie (2018) claimed that movie scoring is both artistic and technical, representing the audience's viewpoint about movies' quality [1]. Therefore, the audience will be influenced by the movie-scoring system when they decide whether watch a movie or which movie is worth to spend time. Moreover, Chintagunta, Gopinath and Venkataraman proposed that the online average user rating has a significant positive impact on box office revenue in 2010 [2]. Because audiences tend to watch movies with high ratings. However, films with high scores may be disliked by viewers and those with low scores are also likely to receive favorable reviews. Although it is possible that audiences are influenced by the online mean user rating, they consider different factors, such as the authority of rating platform, scoring criteria and the person giving the score. The purpose of this study is helping audience to be more familiar with the online movie rating system and letting the movie distributor to get to know the audience.

2. Literature Review

2.1 The relationship between online movie ratings and box office

Box office is one of the criteria to measure the film's quality, and many scholars focus on analyzing the factors that influence the box office. As the development of the Internet, online movie rating has also drawn the public's attention. Zhang, Li and Jie Zhang (2017) claimed that some scholars believed that the box office of imported films in China do not have relationship with IMDb ratings of movie [3]. However, Moon, Bergey and Iacobucci (2010) found that the ratings are associated with movie performance [4]. Obviously, even though their study subjects and variables are not completely the same, it can be seen that whether online scoring has a direct impact on the movie box office has

become the focus of many scholars. Thus, we have research question 1: what is the relationship between online movie rating and box office?

2.2 The attributes of online movie rating platform

In this era of information sharing, people are easily influenced by public comments. Zou and Xie (2018) believed that more digital word-of-mouth means better product sales [1]. This statement also can be applied in the movie industry. Some studies indicated that if movie ratings are positive, potential consumers are more likely to respond to the advertising and then the revenue will be increased [4]. Online comments and opinions spread faster and more widely, which may have a stronger impact on the audience. However, there are too many online movie rating platforms, such as douban, IMDb and rotten tomatoes. Therefore, it is impossible for audience to read all the opinions in these platforms. It is important to consider what are the key attributes which influence the audience choice when they decide to watch a movie, such as the authority of the network or the number of users. Clearly, when audiences consider more factors, the influence of movie online rating will be weakened. Therefore, other factors besides the online score also have a great impact on the box office. Thus, we have research question 2: what are the other factors will influence the box office, except the online rating?

3. Data

The research will be analyzed based on a dataset of one thousand popular movies on IMDb from 2006 to 2016. The dataset contains 12 variables and can be obtained on Kaggle. Only the seven variables that will be used are presented in Table 1.

Table 1: Descriptive Statistics

	N	Mean	SD	Min	Max	Skew	Kurtosis	SE
Rank	838	485.25	286.57	1.00	1000.00	0.06	-1.20	9.90
Year	838	2012.51	3.17	2006.00	2016.00	-0.58	-0.91	0.11
Runtime (Minutes)	838	114.64	18.47	66.00	187.00	0.79	0.61	0.64
IMDb Rating	838	6.81	0.88	1.90	9.00	-0.67	1.43	0.03
Votes	838	193230.25	193099.01	178.00	1791916.00	2.46	11.00	6670.49
Revenue (Millions)	838	84.56	104.52	0.00	936.63	2.55	10.22	3.61
Metascore	838	59.58	16.95	11.00	100.00	-0.12	-0.61	0.59

At first, the data preparing was required. As shown in the Table 1, after preprocessing and deleting the missing value, the sample size is 838. The main analyzed variables are revenue, IMDb rating and Metascore. It can be found that the maximum values of IMDb Rating and Metascore are 9.0 and 100 respectively, and the minimum values of them are 1.9 and 11. IMDb which stands for Internet movie database, is managed and operated by amazon. In this case, IMDb rating mainly refers to the movie rating given by users in IMDb online database. The average IMDb score in the dataset used is 6.81. According to Metacritic, a comprehensive online review platform, Metascore is a weighted score given by the world's leading critics. The average Metascore in the dataset analyzed is 59.58. When the votes are noticed, it can be found that the minimum value is 178, and the maximum is 1,791,916. That means at least 178 people voted for a movie. As such, the data can be seen as representing the views of the majority of the audience.

4. Results

According to the known dataset, three variables were analyzed with the SPSS statistics. This analysis is mainly based on the Bayesian inference about Pearson correlation coefficient which measures the linear relation between several scale variables. In this case, the IMDb rating, revenue(millions) and Metascore are main objects. As shown in Table 2, the correlation coefficient is 0.218 between IMDb rating and revenue, whereas the coefficient is 0.142 between Metascore and revenue. Before the two values are compared, the differences between IMDb rating and Metascore should be known. Although the Metascore and IMDb rating are always provided on the IMDb platform, they have the different system to calculate. Metacritic explained that Metascore is a weighted average of individual commentators' scores and the calculation process does not include user voting. On Metacritic, Metascore only represents the average score of well-known critics and does not include the viewpoints of ordinary users. However, IMDb's ratings are based on votes cast by registered IMDb users, and users can update their votes as needed. Obviously, IMDb rating indicates the audiences' opinions instead of Metascore. And whether the audience goes to the cinema or not, whether they buy the tickets can determine the final box office and revenue of movies. Therefore, it is reasonable the correlation between IMDb rating and revenue is stronger than the correlation between Metascore and revenue, according to the different grading criteria. At the same time, it also can be found that there is a strong relationship between IMDb rating and Metascore (0.632). Because a really great movie will be recognized by both critics and audiences.

Table 2 Pearson correlation coefficients for three main variables

	IMDb rating	Revenue	Metascore
IMDb rating		0.218	0.632
Revenue	0.218		0.142
Metascore	0.632	0.142	

Furthermore, other variables in the known dataset are also analyzed in the heatmap, which is given below. As shown in Figure 1, the dark blue means the high value of Pearson correlation, and the light blue represents the weak correlation. It can be found that the weakest correlation is between revenue and Metascore and the value is 0.14 which is same with the result of Table 2. Other factors we did not consider in last part, such as votes and runtime, also have the relationship with revenue. For example, there is a strong correlation (0.64) between the number of votes and the box office. If the movie receives more votes, it attracts attention by more audiences, and therefore, the box office will be higher. But more research is needed to see whether the bigger number of votes shows the higher movie rating. Based on this result, it can be seen that there are many other factors that can have a big impact on the movies' box office, in addition to online ratings.

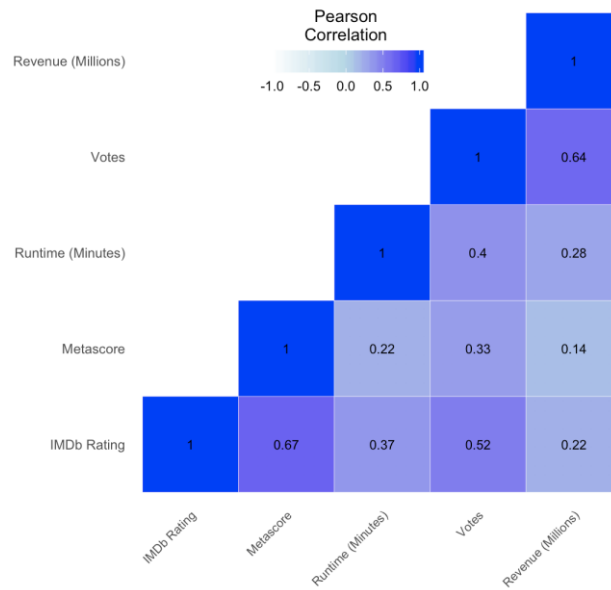


Figure 1: Pearson correlation coefficients for all five variables

5. A case study analysis

Factors beyond the above dataset, such as the influence of the director and actors, the publicity means of the film and the audience's own preference, may also have a great impact on the box office of movie. For example, the latest hit movie, "Wandering earth", has grossed four billion in less than a month. There is no doubt that part of the audience went to watch this movie because of its good reputation and high movie rating. At the same time, there are also audiences who decided to support this movie because it marks a milestone for Chinese science fiction films. The meaning of this movie determines many viewers' decision. Some audiences are attracted by the original work and watch it with curiosity. There may even be many unexpected influences. The impact of all these factors on the audience is inestimable.

Figure 2 shows the daily box office of three films in China (the Wandering earth, Pegasus and Alita: Battle Angel) in the first month after Wandering earth was released. It can be found that the box office of Pegasus is higher than that of Wandering earth only on the first released day, although the two films premiered on the same day. After the first day, the Wandering earth topped the box office until Alita was released. There are many reasons why the box office of Wandering earth is better than other films of the same period. Fan Guo, a director of the Wandering earth, pointed out in an interview that the film has many shortcomings, and the good box office is because of the audience's tolerance. Because the audience regarded it as the first Chinese science fiction film, it scored a lot of emotional points. Emotions and cultural feelings are the driving force of this film, according to this sentence. At the same time, the theme, publicity and effect of this movie have all played a positive role. Moreover, on the tenth day of release, box office stakes for both movies shot up. This may be because the tenth day is on weekend, so people have leisure time to watch a movie. At the time of the Alita released, lots of audiences had already seen the Wandering earth, so they went to watch the new movies. Obviously, sentiment, publicity, time and freshness may all be factors affecting the box office.

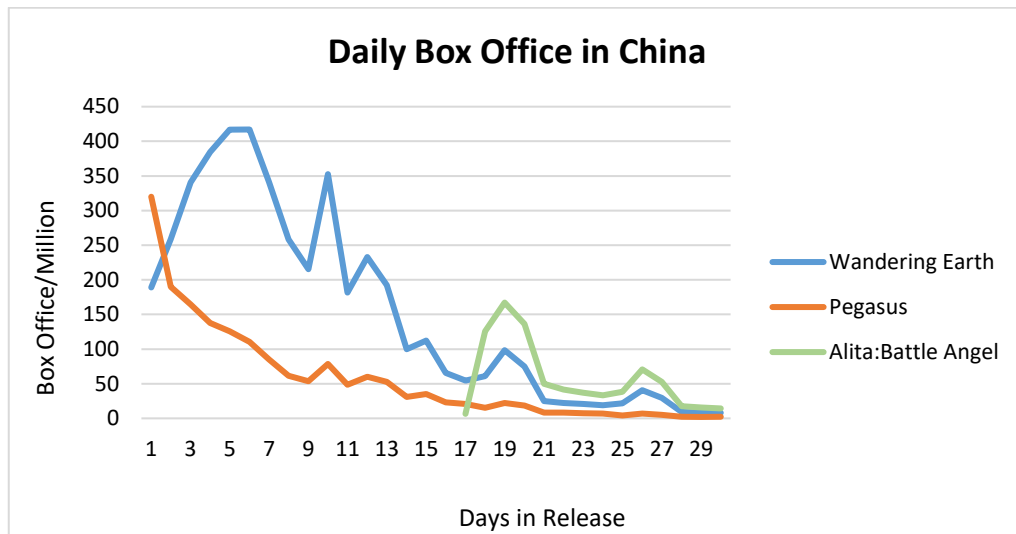


Figure 2: The daily box office of three films in China after Wandering earth was released

6. Conclusion and discussion

Obviously, IMDb rating has a stronger relationship with movies' box office than Metascore because it reflects the audiences' thoughts. The number of votes is also highly correlated with the box office. Except the variables given in the dataset, other factors should be considered when making the prediction of revenue for movies, such as propaganda, popularity of actors and director. There are many factors that influence the box office of a film. In the Internet age, online scoring shows a high degree of correlation with the box office. Movie score is an important factor in both box office analysis and box office prediction.

Although, the relationship between movie ratings and box office was found. There are still some defects and unresolved issues that need to be improved. Firstly, in the actual analysis process, less than 1,000 samples were analyzed. And those samples were concentrated between 2006 and 2016. However, the development of the internet is very fast. In the recent three years, more users may participate in the film online rating. If the updated dataset is available, the coefficient of relationship may change. Moreover, the data source only provides IMDb rating and Metascore, and the result shows that they have a high correlation, and both of them are provided on the IMDb official website. It is expected to analyze the relationship between more variables and box office. Movie ratings given by other platforms, such as rotten tomatoes and Fandango, should also be analyzed. Olteanu (2017) suggested that Fandango scores were least relevant to IMDb ratings and Metascore [5]. But he did not combine that with box office or other variables. Therefore, it can be regarded as the future research concern.

References

- [1] Zou, Xia., & Xie, Jinwen. (2018). A study on factors influencing the box office of Chinese films—based on an analysis of 340 films released between 2014 and 2016. *Chinese Film Market*, (6), 19-24. (in Chinese).
- [2] Chintagunta, P.K., Gopinath, S., & Venkataraman, S. (2010). The effects of online user reviews on movie box office performance: Accounting for sequential rollout and aggregation across local markets. *Marketing Science*, 29(5), 944-957.
- [3] Zhang, Lvshu., Li, Min., & Zhang, Jie. A study on the impact of online rating on the north American box office of Chinese films. *Film Art*, (5), 155-160. (in Chinese).
- [4] Moon, S., Bergey, P. K., & Iacobucci, D. (2010). Dynamic effects among movie ratings, movie revenues, and viewer satisfaction. *Journal of marketing*, 74(1), 108-121.
- [5] Olteanu,

- [6]A. (2017, April 10). *Whose ratings should you trust? IMDB, Rotten Tomatoes, Metacritic, or Fandango?* Retrieved from: <https://medium.freecodecamp.org/whose-reviews-should-you-trust-imdb-rotten-tomatoes-metacritic-or-fandango-7d1010c6cf19>
- [7]Bae, J., & Kim, B. D. (2013). *IS the electronic word of mouth effect always positive on the movie?*. *Academy of Marketing Studies Journal*, 17(1), 61.
- [8]Duan, W., Gu, B., & Whinston, A. B. (2008). *The dynamics of online word-of-mouth and product sales—An empirical investigation of the movie industry*. *Journal of retailing*, 84(2), 233-242.