The Impacts of Online Word of Mouth on Motion Picture Revenue: An Analysis Based on Simultaneous Equation Model

Jianyu Chi[1,*], Ziheng Luo[2]

[1]School of Economics and Management, Communication University of China, Beijing, China
[2]HSBC Business School, Peking University, Shenzhen, China
*Corresponding Author: Jianyu Chi

Abstract:

In this research, we check the pattern of word of mouth and ways illustrating movie's success in China. We choose 120 movies released in China in 2017, with movie ratings and the number of ratings as the valence and volume of WOM respectively. We employ a simultaneous equation model to analyze the causal relationship between online WOM and success of movies. The results reveal that online WOM information affects movie box office through both persuasive and awareness effects. For movies achieving higher box office in China, WOM works mainly through awareness effect. However, for movies with lower revenue, the effect of WOM on revenues seems not important in China's motion picture industry.

Keywords: Online WOM, Movie box office revenue, Awareness effect, Persuasive effect.

I. INTRODUCTION

A movie is a typical experience-based product. As consumers do not know a movie's exact value before it is released, WOM becomes a key signal that reflects the quality of the movie. With social media and online interactive platforms, consumers have more opportunities to share their viewing experience and evaluation with others. Thus, box office revenues gradually become dependentheavily upononline WOM.

The first step to explore the impact of online word of mouth on movie success is to measure online WOM. Thus, quantifying the content of online WOM is necessary. Currently, in the movie industry, online WOM information is decoded mainly from three dimensions: the volume, the valence, and the dispersion of online WOM. For the first dimension, the number of scores or reviews on leading platforms of movie information and communication are the primary data resources [1,2]. There are many ways to decode the valence. The simplest one is using the movie's network rating. A more complicated means is analyzing specific online commentary content and using the proportion of positive comments to negative comments to

measure the reputation of online WOM [2,3]. As for the dispersion of distribution, many researchers count it by shares of different ratings. However, movie rating itself contains the valence of WOM. It means, the essence of this decoding method is to measure the distribution of a movie's WOM valence. Similarly, the measurement of WOM valence proportion also includes the dispersion of distribution.

In previous studies, scholars have studied the impacts of some factors on the box office, such as number of screenings, influence of directors and actors, genre and rating, budget, advertising, expert reviews, and movie production methods [4,5]. When it comes to the layout factor of a movie, the daily and weekly data are used frequently [6]. Some scholars attach importance to the impact of the screening schedule. In terms of the genre and rating, some foreign scholars believe that genres and ratings have significant impacts on box office, while others have concluded that there is no significant effect [7,8]. As China has not implemented the movie rating system yet, there is no research in related topics. Moreover, research on the impact of budgets and advertisements on movie success is lacking in China because the cost of production and promotion of a movie belong to commercial secrets. While the influence of actors and directors are widely discussed worldwide. To quantify the influence, some set dummy variables to represent actors' popularity. Elberse and Eliashberg (2003) studied whether the role played by an actor has been reported in influential magazines to present the actor's influence [9]. However, the conclusions of these studies are contradictory, and researchers have not yet reached an agreement on whether actors and directors affect movie success significantly. In addition, the study of the impact of expert reviews, has some progresses among foreign scholars. To test the impact of WOM in empirical analysis, we must control these variables carefully; otherwise, the result could be unconvincing.

Traditional WOM or online WOM has been proved to be a contributing factor of movie box office [9]. Accordingly, varied opinions have been proposed about the mechanism of WOM affecting box office. One of the ideas is that the effect of WOM is equivalent to those of other factors, which means that these factors affect movie box office simultaneously. By contrast, Rawal and Saavedra (2017) suggested that there is a hierarchical relationship between online WOM and other factors [10]. Some pre-launching factors, such as celebrity, budgets and screen number, do affect online WOM, which in turn affect the movie box office. In order to develop in-depth discussions about how WOM exerts influence on box office, some scholars have studied the internal factors which influence the impact of online WOM on movie box office. Liu (2006) divided the impact of online WOM into the awareness effect and the persuasive effect. Hsu and Jane (2016) established a bidirectional model of WOM and box office based on the theory proposed by Liu (Liu, 2006). They found that new understanding of a movie's content and quality plays a role through the awareness effect, guiding consumers to release their comments online, while the specific cognition of the quality of a movie is to influence consumers' grading and evaluation through the persuasive effect. Baek, Oh, Yang, and Ahn (2017) segmented sources of online WOM into mass media for public discussions and web-based platforms for interpersonal communications [11]. They found that Twitter, a major

platform that opens to the general public, has awareness effect. That is to say, the effect of WOM spread before a movie is launched is more significant than that of WOM published afterwards. Yahoo! Movies, which mainly provides interactive communications, has persuasive effect since the impact of WOM on this platform is stronger in the later part of the release period. In fact, consumers' reviews affect not only box office, but running time of a film [10].However, for platforms that combine the characteristics of these two kinds, such as Youtube and Blogs, there is no significant difference in the initial or later part of movie release. In addition, Duan et al. (2008) believed that motion picture revenue itself has awareness effect, for box office at the preliminary stage affects that of the later period [12].

Although the impact of WOM on motion picture revenues is proved true by most scholars, yet ambiguities can be identified in two aspects. First, it is not clear whether both the awareness persuasive effects of word of mouthplay effects simultaneously, or simply, it is not clear whether both effects are significant or not. Second, it is not clear whether an interrelationship exists between WOM and box office, i.e. whether WOM can serve as an explanation for box office or whether box office can lead to a change of WOM. Considering these problems, this study adopted a dynamic panel model and simultaneous equations with lagged terms to test the impact of volume and valence of WOM on motion picture revenues and examine the bidirectional relationship between them. We chose daily WOM of sample movies and box-office related information to examine the changing characteristics of the movie market on mainland China. We aimed to provide insights for investors and publishers in decision-making and lay a theoretical foundation to support further development of the movie industry.

II. THEORETICAL FRAMEWORK AND HYPOTHESES

Fig 1 shows the theoretical framework of this study. We think that there is a bidirectional relationship between online WOM and box office. Firstly, the impact of online WOM on movie box office is embodied in two effects. One is the persuasive effect of the valence of WOM, and the other is the awareness effect of the volume of WOM [2]. The valence of WOM can be roughly divided into two types: positive and negative. Positive contents encourage consumers to watch a movie with appreciation, while the negative contents discourage people to watch a movie or watch a movie with criticisms and averseness. Therefore, the persuasive effect of WOM has a positive impact on revenues. Due to the complexity of analyzing WOM contents, we used user ratings in Douban.com to represent the valence of WOM: a high rating represents positive valence, and a low rating stands for negative valence. At the same time, the volume of WOM reflects the level of consumers' awareness about relevant information of a movie. Intuitively speaking, when consumers know a movie better, it is easier to activate their consumption and usually leads to higher box office. Hence, the awareness effect resulted from the volume of WOM is also inclined to have positive impact on revenues Since the number of people publishing WOM is the most direct expression of the number of WOM, we used the votes of a movie on Douban.com each day to represent the volume of WOM.
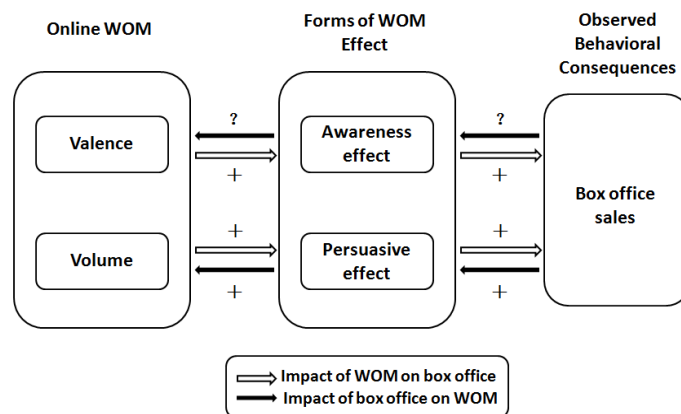
Fig 1: The two-way mechanism of online WOM and box office

And box office sale also has a certain impact on online WOM. Consumers who have watched the movie are most likely to publish their WOM. We hypothesized that the growth of movie box office brings about an increasing number of online WOM. However, as people may have different opinions on the same movie, the direction of box office's impact on WOM can not be simply concluded. Based on the point of view above, this paper delves into the hypotheses proposed below from two aspects: the impact of WOM on motion picture revenues and the impact of box office sales on WOM.

H1. WOM valence has positive impact on box office sales.

This presumption stands for the persuasive effect of WOM. To begin with, we analyzed the persuasive effect of online scores. We believe that the level of the ratings represents the valence of WOM. Higher rating means appreciation and recommendation, while lower rating signal less popularity in the consumer community. In general, people tend to purchase goods with good reputation and stay away from goods with bad reputation. In the context of the movie market, we believe that as a proxy of the valence of WOM, online movie ratings influence consumers' decision to buy a movie ticket. The mechanism works like this: higher ratings symbolize higher valence of WOM, which lead to stronger desires to watch the movie and naturally result in a better box office performance. On the contrary, lower ratings mean lower valence of WOM and less demand for the movie, which may cause unsatisfactory box office.

H2. WOM volume has positive impact on movie success.

This presumption is related to the awareness effect of WOM, another way WOM works to influence box office sales. The awareness effect is from the volume of word of mouth. The volume of WOM indicates the volume of discussion focusing on a movie and the extent of information. A larger number of WOM means wider spread of relevant information about a movie and a larger audience. As a result, the awareness effect of WOM can pull box office sales up as well as deliver relevant messages. Here, we used the votes for a movie on a given day as the symbol of the volume of WOM. More votes stand for more information sources, which helps WOM spread more widely, and therefore, the movie box office will increase. Conversely, when there are less votes, information regarding with the quality of movie are narrowly

disseminated. This results in less movie consumption due to the lack of information sources and references.

H3. Box office sales have significant impacts on WOM.

We presume that possibly there exists a bidirectional relationship between word of mouth and motion picture revenues which means they mutually affect each other. Box office contributors (consumers who have watched a movie), are potential WOM publishers. The number of increased audiences brought by the growth of revenues can also lead to changes of online movie ratings. There is a certain impact of box office sales on WOM's valence. Higher box office revenue triggers more topics and discussions, which results in significant changes of WOM.

III. RESEARCH MODELS AND DATA

3.1 Empirical Model Specification

This paper focuses on two effects of WOM on box office sales: persuasive effect and awareness effect. On one hand, the valence of WOM about the quality of movie content delivered by the online movie ratings affects the subjective evaluation of consumers and has persuasive effect on decision-making of ticket purchase. On the other hand, the continuous increase and proliferation of the volume of WOM bring more attention to a movie and generate stronger willingness of viewing. At the same time, WOM will also react to changes in box office. Based on the hypotheses mentioned above, an empirical model is proposed:

$$box = \alpha + X\beta + Z\gamma + \varepsilon \quad (1)$$

In this equation, the explained variable box denotes the box office revenue. *X* is a vector of variables that reflects WOM, *Z* is a set of controlled variables, and ε is an error term. Here, *X* and *Z* are defined in TABLE I.

TABLE I. Definition of variables

Types of variables	Variables	Definitions
Explained variable	box	Movie box office revenue (millions)
Independent variables (X)	valence	Online movie rating
	volume	Daily votes of a movie(one thousand)
Control variable (Z)	scene	Number of screenings (one hundred)
	seat	Movie seat(ten thousand)

Firstly, we used the single equation model to estimate Eq. (1) and analyzed the effect of word of mouth on movie success by examining the estimation of the coefficient vector β. Specifically we used valence to illustrate the persuasive effect and volume to explain the awareness effect. Considering the possible bidirectional relationship between WOM and box office, we established a simultaneous equation model with movie success and WOM as the explanatory variables respectively so that the relationship between movie success and word of mouth can be discussed more accurately.

3.2 Estimation Method

3.2.1 Single Equation Model: OLS Method

We used daily panel data and established a single equation regression model based on Eq. (2):

$$log(box)_{it} = \alpha_0 + \alpha_1 log(box)_{i,t-1} + \alpha_2 valence_{it} + \alpha_3 log(volume)_{it} + \alpha_4 Z_{it} + \phi_i + \lambda_t + \varepsilon_{it} \quad (2)$$

In Eq. (2), i = 1, ..., N indexes movies numbered 1, ..., 120. As there might exist auto-correlation, we took natural logarithms of relevant variables and introduced the one-day lagged variable $log(box)_{i,t-1}$ of the movie box office logarithm as an dependent variable. Moreover, in order to control the intrinsic characteristics that affect movie success (e.g. genre of movie, production costs, star effects), we introduced ϕ as the representative of entity fixed effect. By doing so, we managed to ensure the consistency of estimation and controlled other unobservable distinctions of each movie. We introduced λ as a time-fixed effect that is independent of the movie itself. We used the fixed-effect method of panel data to estimate Eq. (2), including the one-way fixed-effect method that only contains individual effects and the two-way fixed-effect method that includes both individual effect and time effect. Based on our previous hypotheses, we supposed that both movie scores and the daily number of scorers have significant positive impacts on movie box office, so both α_2 and α_3 are expected to be positive.

3.2.2 Simultaneous Equation: 3SLS Method

Serious problem of endogeneity might arise when we use the single-equation model to estimate the impact of WOM on movie success. The main reason is that there could be a bidirectional relationship between motion picture revenue and online WOM, which calculate estimated parameters biased. Therefore, we established a simultaneous equation model to solve the endogeneity and used the three-stage least squares method (3SLS). We used the movie rating logarithm (log(*valence*)) and daily movie votes logarithm (log(*volume*)) as the endogenous variables respectively to establish two simultaneous equation models. The model utilizes the daily movie votes as endogenous variable and then becomes:

$$log(box)_{it} = \alpha_0 + \alpha_1 log(box)_{i,t-1} + \alpha_2 log(volume)_{it}$$
$$+\alpha_4 Z_{it} + \phi_i + \lambda_t + \varepsilon_{it}$$
$$log(volume)_{it} = \beta_0 + \beta_1 log(box)_{it} + \beta_2 log(volume)_{i,t-1}$$
$$+\beta_3 log(volume\_cum)_{i,t-1}\phi_i + \lambda_t + \varepsilon_{it} (3)$$

The model which regards the movie rating as the endogenous variable is as follows:

$$log(box)_{it} = \alpha_0 + \alpha_1 log(box)_{i,t-1} + \alpha_2 valence_{it}$$
$$+\alpha_4 Z_{it} + \phi_i + \lambda_t + \varepsilon_{it}$$
$$valence_{it} = \beta_0 + \beta_1 log(box)_{it} + \beta_2 valence_{i,t-1}$$
$$+\beta_3 log(volume\_cum)_{i,t-1} + \phi_i + \lambda_t + \varepsilon_{it} (4)$$

In Eq. (3) and Eq. (4), volume_cum$_{i,t-1}$ represents users' cumulative votes of movie i during day 1 and day i-1 in Douban.com. Apart from this, the definitions of other variables in the simultaneous equation models are the same as explained in the single-equation model. We used

the 3SLS method to estimate these two simultaneous equation models to illustrate both the impact of WOM on movie success and the impact of the motion picture revenues on WOM separately. Following our previous hypotheses, we expected that α_2 in both simultaneous equation models are positive.

3.2.3 Data

Box office sales, movie screenings (*scene*) and the number of seats (*seat*), were all collected from entgroup.com. The data of three variables that reflect the information about WOM: daily online movie ratings (*valence*), the cumulative votes (*volume_cum*) and the daily votes (*volume*) were all extracted from Douban. At present, Entgroup is a reliable and leading website that reports box office data in China. Data listed in this website are detailed and easy to record, eliminating the possibility of deviation. Douban was chosen in this study as another source of data for three reasons. We used daily panel data for analysis. The sample in the paper covered 120 movies released on the Chinese mainland movie market from 12May to 30September of 2017, with 4559 observations in regression.

IV. RESULTS AND DISCUSSIONS

4.1 OLS Estimation Results

We first used the OLS method to regress Eq. (1). The results are shown in TABLE II.

TABLE II. Results of OLS

	(1)	(2)	(3)	(4)	(5)	(6)
L.log(*box*)	0.95***	0.42***	0.33***	0.92***	0.41***	0.32***
	(254.34)	(19.19)	(13.44)	(163.80)	(18.55)	(13.41)
valence	0.02***	0.123*	-0.09			
	(4.03)	(1.88)	(-1.61)			
log(*volume*)				0.04***	0.06***	0.04***
				(6.34)	(6.16)	(3.96)
log(*scene*)		0.06	0.09		0.05	0.08
		(0.62)	(0.78)		(0.54)	(0.76)
log(*seat*)		0.56***	0.60***		0.55***	0.60***
		(4.99)	(4.89)		(5.00)	(4.94)
constant	-0.18***	-0.27	-0.29	-0.14***	0.40***	-0.81***
	(-4.77)	(-0.73)	(-0.82)	(-6.10)	(4.42)	(-6.78)
individual effect	Yes	Yes	Yes	Yes	Yes	Yes
time effect	No	No	Yes	No	No	Yes
N	3085	3085	3085	3085	3085	3085
R^2	0.94	0.96	0.97	0.94	0.96	0.97

Notes: t statistics are in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

In column (1) - (3), we tested the persuasive effect of WOM. The independent variable representing WOM is valence. In column (4) - (6), we tested the awareness effect of WOM. The

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independent variable representing WOM is log (*volume*).

In column (1), we only made a regression on movie ratings (*valence*) and one-day lagged box office (L.log(*box*)), taking into account the individual effect when doing regression. In columns (2) and (3), we added control variables and fixed-time effect separately. In column (4) - (6), we changed the variable valence to log(*volume*). The regression results show that the significance of valence is robust. In column (1), valence is significant at the 5% level, whereas in column (2) the effect is only significant at the 10% level. Particularly, in column (3) valence is not significant, indicating that the persuasive effect of WOM does not always exist. However, the coefficients of log(*volume*) that reflect the awareness effect of WOM are significantly positive in all models. This means that the impact of word of mouth on movie success mainly comes into play through the awareness effect.

The main reason why the variable *valence* is not significant lies in its endogeneity. Obviously, many viewers rate a movie after watching it, and thereby WOM is formed. Thus, WOM affects box office, and movie success may change word of mouth. The interrelationship between word of mouth and movie success means that the variables that reflect WOM are actual endogenous variables. A serious endogeneity problem may make the results of OLS estimation unconvincing. In the following part, we used the simultaneous equation model to solve the endogeneity problem.

4.2 Simultaneous Equation Model: 3SLS Estimation Results

We used the 3SLS method to estimate simultaneous equation models Eq. (3) and Eq. (4). The results are shown in TABLE III.

TABLE III. Regression results of full sample

	(1)	(2)	(3)	(4)
Equation A: log(*box*) is an explained variable				
L.log(*box*)	0.77***	0.39***	0.92***	0.41***
	(49.29)	(28.67)	(152.11)	(31.54)
log(*volume*)	0.31***	0.10***		
	(10.31)	(4.05)		
log(*scene*)		0.06		0.06
		(1.53)		(1.45)
log(*seat*)		0.54***		0.57***
		(12.66)		(12.98)
valence			0.63***	0.70***
			(3.53)	(5.25)
constant	-0.03	0.39***	-3.63***	-3.59***
	(-0.29)	(3.98)	(-3.52)	(-4.65)
Equation B: log(*volume*) or *valence* is an explained variable				
log(*box*)	0.27***	0.27***	0.00**	-0.01***
	(18.97)	(20.86)	(2.13)	(-7.24)
L.log(*volume*)	0.32***	0.32***		

	(19.54)	(19.84)		
L. *valence*			0.23***	0.23***
			(28.42)	(28.38)
constant	0.23	0.20	4.35***	4.06***
	(1.48)	(1.31)	(82.02)	(35.09)
N	3085	3085	3085	3085
R^2	0.94	0.96	0.94	0.96

Notes: t statistics are in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

In TABLE III, log(*volume*) is an endogenous variable in columns (1) and (2), and *valence* is an endogenous variable in columns (3) and (4). The results show that the coefficients of log(*volume*) and valence are both significantly positive in the equation with log (*box*) as the explained variable, which verifies H1 and H2. These results indicate that in China WOM does have positive effects on movie success. The persuasive and the awareness effects of WOM play a part in the meantime. A high score convinces the public, prompting more consumers to go to the theater. Meanwhile, people scoring a film mean that WOM works via awareness effect, so that more consumers get to know about the movie and watch the movie at last.

In addition, the regression results with log(*volume*) and volume as explained variables show that the coefficients of log(*box*) are statistically significant at the 1% level except those negative in column (4), which is inconsistent with our expectation. For log(*volume*), it is consistent with our estimation that box office growth indicates the production and dissemination of a greater number of movie reviews because most consumers post personal reviews after watching a movie. However, for movie scores, box office growth does not necessarily lead to better reputation, and poor box office sale does not necessarily mean low quality. We can not easily draw the conclusion that motion picture revenue has a positive or negative impact on the valence of WOM. In fact, the fact that "high box office revenue with low WOM" is common in the Chinese movie industry. Some think that this is a rule of art transmission based on the artistic features of movies. Some stand from the perspective which treat movies as a product and attribute it to the outcome of marketing strategies. Although the influence of motion picture revenue on WOM is not completely consistent with our anticipation, movie success has a significant impact on WOM. This confirms H3.

4.3 Sub-Sample Regression: 3SLS Estimation Results

4.3.1 Estimation results for first week and second week

In general, a movie can run one month in China market. The motion picture revenue of first week and second week is crucial for the overall revenue. The success of a movie depends largely on movie layout and revenue in first week and second week. We used the data from the first two weeks to confirm the impact of word of mouth on movie success.

We first used the data from the first and the second week respectively for the 3SLS regression. The regression results are listed in TABLE IV. To save space, we only listed the regression results of the equation with log (*box*) as explained variables. Among them, columns (1)-(4) list the data regression results of the first week, and columns (5)-(8) list the regression

results of the second week.

TABLE IV.Results for the first week and second week

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.log(*box*)	0.19	0.18**	0.59***	0.39***	0.26***	0.11***	0.54***	0.17***
	(1.59)	(2.52)	(11.71)	(9.42)	(4.02)	(3.02)	(21.36)	(6.73)
log(*volume*)	0.99***	0.87***			0.74***	0.53***		
	(4.96)	(5.17)			(4.93)	(4.27)		
log(*scene*)		0.21***		0.37***		0.04		0.05
		(3.90)		(6.51)		(0.63)		(0.61)
log(*seat*)		0.19***		0.35***		0.42***		0.59***
		(4.91)		(6.42)		(6.92)		(7.92)
valence			3.32***	3.15***			3.70***	2.90***
			(4.22)	(4.81)			(3.59)	(3.67)
constant	0.90	6.47***	25.38***	-27.26***	0.59*	0.98***	20.13***	-15.04***
	(-1.31)	(-6.19)	(-3.89)	(-4.97)	(1.92)	(4.02)	(-3.42)	(-3.33)
N	478	478	478	478	776	776	776	776
R^2	0.94	0.95	0.96	0.97	0.94	0.97	0.95	0.97

Notes: t statistics are in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

The results show that the coefficients of valence and log (*volume*) were both positive and significant at the level of 1% with log (*box*) being the explained variable. This shows that WOM has a significant positive effect on motion picture revenues both in first week and in second week. In the first two weeks, both awareness effect and persuasive effect of WOM are of great significance to box office sales. This further verifies H1 and H2.

4.3.2 Estimation Results for Different Box Office Groups

There should be some variations between movies showing different box office performances when it comes to the effect of WOM on motion picture revenues. Thus, we subdivided movies into several groups according to their accumulated box office sales. Group one covers those movies with successful box office performance, which are among the top 25% of the box office ranking. Group two include movies with mid-level box office sales, which rank 25% -75% of all the movies. Group three are movies with failing box office performances, which are the remaining 25% on the list. We tested the effect of WOM on motion picture revenues in the three groups one by one using the simultaneous equation model. The regression results are illustrated in TABLE V. The same as in TABLE IV, the regression results of WOM (log(*volume*) and *valence*) were not listed as the explained variables in TABLE V.

TABLE V. Regression results for different box office groups

	(1)	(2)	(3)	(4)	(5)	(6)

L.log(*box*)	0.43***	0.45***	0.39***	0.42***	0.17***	0.22***
	(18.33)	(20.09)	(20.27)	(23.41)	(3.50)	(6.90)
log(*volume*)	0.10***		0.12***		0.23	
	(2.91)		(2.91)		(0.78)	
log(*scene*)	0.05	0.05	0.15**	0.15**	-0.68***	-0.86***
	(0.88)	(0.79)	(2.40)	(2.34)	(-2.68)	(-2.99)
log(*seat*)	0.53***	0.56***	0.43***	0.46***	1.29***	1.63***
	(8.23)	(8.75)	(7.04)	(7.28)	(3.34)	(5.48)
valence		0.66		0.39***		-1.50*
		(1.33)		(2.63)		(-1.92)
constant	-0.51**	-5.68	-0.41	-2.97**	0.55***	9.18**
	(-2.55)	(-1.33)	(-1.34)	(-2.30)	(4.44)	(2.06)

Notes: t statistics are in parentheses; *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

In TABLE V, columns (1) and (2) report the results of group one, columns (3) and (4) contain the results of group two, and columns (5) and (6) are the results of groups three. In columns (1) and (2), it can be seen that the coefficients of log(*volume*) are significantly positive, but the coefficients of valence are not significant. This shows that, for movies with high revenue, the effect of WOM on the revenue is mainly delivered by the awareness effect. In columns (3) and (4), the coefficients of log(*volume*) and valence are both positive and statistically significant at the 1% level. Thus, for movies with intermediate motion picture revenues, both the awareness effect and the persuasive effect have significant impact on box office sales. However, in columns (5) and (6), the coefficients of log(*volume*) are not significant, whereas the valence's coefficients are merely statistically significant at the 10% level, and the coefficient of valence is negative. This indicates that the word of mouth has a very limited effect on box office for movies with low revenues, and the impact is negative if the impact does exist.

4.4 Scatter Plots

Below we draw the scatter plots between box office sales and WOM separately according to different levels of box office sales to visually illustrate the impact of WOM on box office performance through the persuasive effect and the awareness effect.

In Fig 2, after controlling relevant variables, we draw the scatter gram and the fitted line between the total box office revenues and the total votes of the "success group". We can see that for movies in this group, the awareness effect of WOM had a significant positive impact on motion picture revenues. In addition, in Chinese movie market, foreign movies took up a large share in the high-box-office group, and the number of domestic movies that are outstanding both in WOM and box office were relatively small.

Fig 3 is the scatter gram of the average box office revenue and the average Douban movie rating of the third group. Contrary to the first groups, the average rating of movies in this group has a weak effect on the average revenue of these movies. Even if there was an impact, it could be a negative one. For one thing, these movies were less attractive to consumers and had a small

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number of screens, which resulted in lower box office and a smaller number of consumers with viewing experience. This leads to a relatively small number of WOM related to the movies. Also, the spread of WOM was also constrained in a narrow space. Although a few consumers published their reviews on social websites, these reviews might not be endorsed or recognized by other consumers because they were not representative and typical enough. This is to say, a small volume of WOM did not have referential value. Another reason is that some nice movies were recognized by a small proportion of consumers. However, positive WOM did not result in the growth of these movies' box office, so online movie ratings might have a negative impact on movie box office. These possibly explained why WOM for the movies in the failed box office group was weak and why both the awareness effect and the persuasive effect did not appear in the figure.
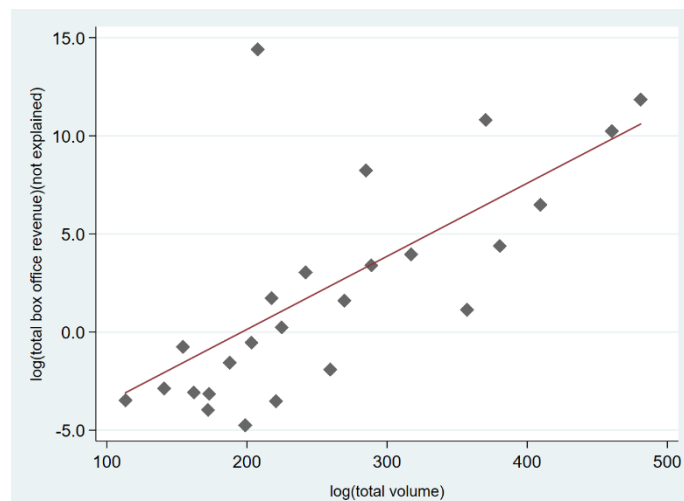

Fig 2: The scatter gram between the total box office and the total volume of the success group
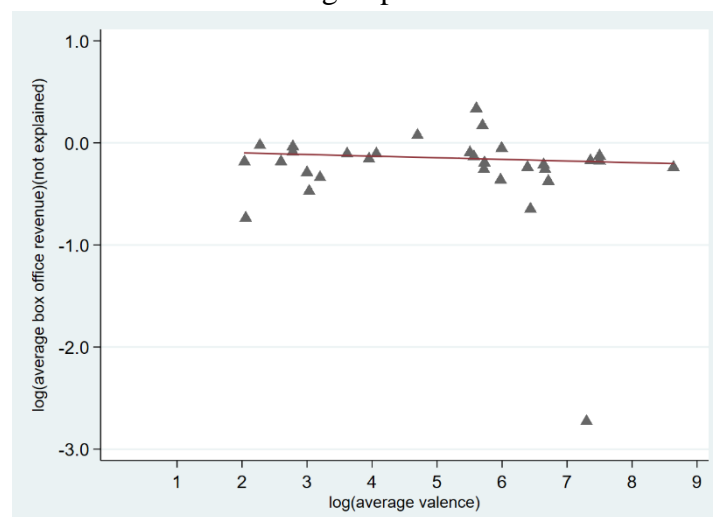

Fig 3:The scatter gram of average box office and average valence of low-box-office movies

V. CONCLUSIONS

According our work, we can draw the following threeconclusions.

First, online word of mouth has a significant positive effect on motion picture revenues in China. This impact works through the awareness effect and the persuasive effect. The impact is most significant in the first two weeks.

This can be explained by the following reasons. For one thing, as potential WOM publishers, consumers who have watched a movie might post personal reviews on social websites or interactive platforms. They might also discuss relevant issues of the movie with their surrounding consumers via social media or face-to-face communications. With the internet and interpersonal communications, WOM is spread and more consumers become aware of or familiar with the movie. The increased number of WOM means that the awareness effect plays its role more broadly and deeply, making a larger number of consumers wish to watch the movie. In addition, previous comments on the movie have an important referential value for other consumers to make decisions to purchase tickets. People tend to choose a movie with good reputation while avoiding a movie with bad comments, which indicate that the valence of WOM has persuasive effect on consumer behaviors. The logic of the virtuous cycle between good WOM and high box office sales is that under the influence of the large number of good WOM, more and more consumers decide to watch the movie and become new WOM publishers. Their positive comments then motivate other consumers to follow their recommendation, which further raises the box office sales.

Second, for movies with high box office sales, the WOM effect is mainly embodied in the awareness effect.

A feature of movies with high box office sales is that these movies can arouse widespread discussions and public attention across the whole society. When consumers are incessantly informed by WOM of a movie in short run, they are very likely to have the desire to watch the movies and take the action impulsively. In the era of information explosion, news and events are too diverse to count on and a hot topic is easily forgotten by the general public or is replaced by another one. However, if people browse the WOM information of a movie repeatedly, be it in the interactive platform or personal account of social media, the impression of a movie will be enhanced to create a sense of familiarity and intimacy. When everybody around talks about the movie, individuals can hardly block these messages and are eager to join in these discussions. In fact, the wide range of discussion triggered by movies with high box-office sales do not always team with favorable comments but are mixed with negative comments at times. Positive WOM often attracts people to appreciate the movie, which is consistent with common sense. The reason why movies with divergent views sometimes achieve continuous growth in box office sales is that under the impact of a large number of different WOMs, consumers are prone to making their own subjective judgments through personal viewing experience. Therefore, for movies with successful box office performance, the persuasive effect is not significant, while the awareness effect of WOM is extremely important.

Third, for movies with lower box office sales, online WOM usually has no significant effect

on their revenues.

Lacking competitiveness in content, production and necessary requisites for promotion, these movies usually have less screenings and lower box office sales at the beginning. The number of viewers is too small to form WOM on platforms like Douban.com, and such WOM is hard to be spread. Because of limitations in information dispersion, consumers can not get access to more useful messages. Thus, the awareness effect of WOM is not be able to work. Limited WOM can only represent the views of the minority, lacking credibility and persuasive effect. Therefore, the referential value is not worth mentioning in consumers' decision-making process. Based on the results of our empirical analysis, the motion picture revenue is not significantly affected by the persuasive effect.

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