Increasing Returns to Information and Its Application to the Korean Movie Market*

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Since movies are experience goods, consumers are easily influenced by other consumers' behavior. For moviegoers, box office rank is the most credible and easily accessible information. Many studies have found that the relationship between a movie's box office rank and its revenue departs from the Pareto distribution, and this phenomenon has been named *"increasing returns to information."*

The primary objective of the current research is to apply the empirical model proposed by De Vany and Walls (1996) to the Korean movie market in order to examine whether the same phenomenon prevails in the Korean movie market. The other purpose of the present study is to provide managers with useful implications about the release timing of a movie by finding different curvatures that depend upon seasonality.

The empirical test on the Korean movie market shows similar results as prior studies conducted on the U.S., Hong Kong, and U.K. movie markets. The phenomenon of increasing returns is generated by information transmission among consumers, which makes some movies become blockbusters and others bombs. The proposed model can also be interpreted in such a way that a change in the rank has a nonlinear effect on the movie's performance. If a movie climbs up the chart, it would be rewarded more than its proportion. On the other hand, if a movie falls down in the ranks, its performance would drop rapidly.

The research result also indicates that the phenomenon of increasing returns occurs differently depending on when the movies are released. Since the tendency of the increasing returns to information is stronger during the peak seasons, movie marketers should decide upon the release timing of a movie based on its competitiveness. If a movie has substantial potential to incur positive word-of-mouth, it would be more reasonable to release the movie during the peak season to enjoy increasing returns. Otherwise, a movie should be released during the low season to minimize the risk of being dropped from the chart.

Key words: increasing returns, information cascade, the Pareto distribution, seasonality, movie marketing

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I. Introduction

Movies are experience goods, and therefore, consumers are easily influenced by other consumers' behavior. Box office rank is one of the most credible and easily accessible indicators of movie choice. By examining the U.S. movie market, De Vany and Walls (1996) tested the hypothesis that box office rank affects the purchase decision of potential consumers. They proved that the top-ranked movies actually earn disproportionately larger revenues than those ranked lower. They found that the relationship between the movie's box office rank and its revenue is more polarized than predicted by the Pareto distribution, and they named this phenomenon "*increasing returns to information.*" Walls (1997) confirmed the existence of this phenomenon by using the Hong Kong box office data. Subsequently, Hand (2001) examined the phenomenon in the U.K. movie market. Many researchers further applied the model in other industries, including popular music (Giles, 2007), live theater (Maddison, 2004), and book publishing (Gaffeo, Scorcu and Vici, 2006).

Since the U.S. movie market is unarguably the world's largest movie market and Hollywood is the very home of the movie industry, prior research mainly focused on the U.S. market. To give further weight to De Vany and Walls (1996)'s argument, however, such a suggestion should be tested in a variety of different markets. The current research investigates the same phenomenon using data from the Korean movie box office. Since the Korean movie industry has been developed rapidly, it has unique characteristics in terms of market structure and technology advancement. In 2011, 439 movies were released and almost 160 million consumers bought a ticket. This number means each Korean watched a movie 3.15 times at a theater in this year. The total box office revenue was 1,151 billion KRW which was the highest record in history. Among 150 domestic movies 65 movies were considered as commercial films, and these products cost 4.8 billion KRW and marked -4.6% Return on Investment (ROI) on average. Only 16 movies, which is the one fourth of Korean commercial movies, made a profit by reaching the breakeven point. The domestic movies occupied 52% of market share. In the distribution part, the two major distributors, CJ E&M and Lotte Entertainment, occupied the half of market share by having 36.4% and 15.4%. In the year, there were 292 theaters, 1,982 screens, and approximately 340 thousands seats. The 82% of theaters were classed as multiplex because they are one of the four major multiplex franchises or because they have more than seven screens. These multiplex theaters dominated the market showing 98% of market share. Most of the screens, roughly 82%, changed into a digital screen.[1)]

1) Korean Film Council (www. kofic.or.kr).

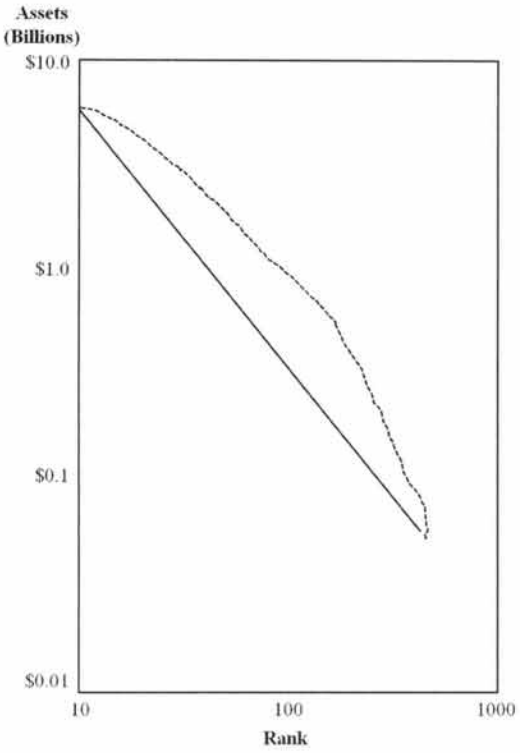
The empirical results of this paper confirm the arguments of prior research by corroborating increasing returns to information in the Korean movie market. Since Korean consumers have a strong tendency of herding behavior, which is one of the causes of increasing returns to information, the results of this research contribute to the understanding of increasing returns within a different social and cultural context. Furthermore, by identifying different patterns depending on seasonality, the present paper sheds useful managerial insights on the optimal release timing strategy.

Ⅱ. Literature Review

There are many studies on increasing returns to information in the economics and marketing fields. Since increasing returns result in the winner-takes-all phenomenon, this topic is often related to the Pareto law. The Pareto law, which is also known as the 80-20 rule, states that approximately 20% of the causes result in 80% of the effects. The Pareto distribution, named after Italian economist Vilfredo Pareto, is a power law probability distribution that was first used to describe the allocation of wealth in a society. Pareto found that the actual distribution of data on British income taxes is extremely skewed to the right, which means that the higher-income group occupies the greater part of the total income taxes. Because of this skewness, the Pareto distribution draws a nearly downward straight line on a log-log scale. The distribution is not limited to portray wealth or income, but to explain many cases in which a small portion of the population is associated with a large amount of the outcome. Many examples, such as the numbers of species per genus and frequencies of words in longer texts, have been found to be approximately Pareto-distributed. In the business field, the Pareto distribution has been applied to explain the common phenomenon that in a particular industry, only few companies make profits while others struggle to survive. The movie industry is not an exception. Since the actual box office observations are consistent with the Pareto law, researchers have developed empirical models to generalize this phenomenon.

One of the earliest studies that reported a departure from the Pareto distribution is a work by Ijiri and Simon (1974). They suggested an adjusted model of the Pareto law to explain why the empirical firm-size data illustrate concavity when size is marked against rank on a log-log scale (See Figure 1). They found that the *Fortune* data for 1969 based on the amount of assets of a firm showed a significant curvature for the size distribution. Such concavity implies that the actual firm-size distribution departs from the Pareto distribution, which should demonstrate a straight line on a log-log scale. The Pareto law has been used to explicate

〈Figure 1〉 Departure from the Pareto Distribution



The solid line depicts theoretical size-rank relationship (the Pareto distribution), while the broken Curve describes the actual size-rank relationship (increasing returns to information).

distributions in which one unit's share decreases exponentially from higher rank to lower rank: for instance, the distribution of household wealth in a society and that of workforce contribution in a firm. If any distribution departs from the Pareto distribution, it implies that the subject of analysis (i.e. society, firm) has unequal or polarized characteristics. The paper proposed two plausible explanations for the departure from the Pareto distribution: one based on the autocorrelation of growth and the other based on mergers and acquisitions. They provided a theoretical assumption that the probability of a firm enjoying future growth depends on its present size: there would be a higher chance of the firm experiencing further growth if it is relatively bigger than others. In other words, growth is autocorrelated. They additionally adopted detailed data about mergers to eliminate the effect of merger and acquisition from the *Fortune* data, and they proved that the concavity of the firm-size distribution is decreased when "mergerless" data is used. They further suggested an adjusted model of the Pareto law by adding a quadratic form of log rank, which made a considerable contribution in explaining concave empirical distribution in later works.

De Vany and Walls (1996) applied the model proposed by Ijiri and Simon (1974) to the movie industry. As firm-size data did in the empirical study of Ijiri and Simon (1974), the rank-revenue distribution of the U.S. box office departed from the log-linear Pareto distribution. The model contains a term that captures autocorrelated growth to explain rank-revenue relationship. Since the coefficient of the autocorrelated term is statistically significant and less than zero, De Vany and Walls concluded that autocorrelated growth, which implies the phenomenon of increasing returns due to information feedback, does exist in the box office revenues. This research was the first research to apply the adjusted Pareto distribution to

capture rank-revenue distribution in the movie market.

Following De Vany and Walls (1996), Walls (1997) provided additional evidence of increasing returns to information by analyzing the Hong Kong movie market. The major difference between the two studies is that the data set of Walls (1997) included both Chinese language movies and Hollywood movies while the data set of De Vany and Walls (1996) mainly consisted of Hollywood movies. The coefficients estimated by least-squares regression indicated that the null hypothesis of size-independent growth would be rejected. By finding the nonlinear effect of a rise in box office rank from the Hong Kong movie market, which has different characteristics from the U.S. movie market, Walls (1997)'s research contributed to generalizing the phenomenon of increasing returns to information to the movie market.

Using an identical model proposed by Ijiri and Simon (1974), Hand (2001) tested the hypothesis of the increasing returns to information in the U.K. movie market. He compared the results with those of previous studies that had used the same model in different countries. Hand (2001) also found that the British box office rank-revenue relationship does depart from the Pareto distribution in a direction that again supports the existence of autocorrelated growth. The results of Hand (2001) were very similar not only to those of De Vany and Walls (1996), but also to those of Walls (1997). Hand (2001) conclusively stated that increasing returns is a general characteristic of the movie industry.

The primary objective of the current research is to apply the empirical model proposed by De Vany and Walls (1996) to the Korean movie market in order to examine whether the same phenomenon exists in the Korean movie market. The Korean movie market, in fact, has many unique aspects compared to other markets. That is, Korean consumers illustrate strong herd behavior. Lee, Kim, and Cha (2012) proved that a generalized Bass model forecasts box office performance much better when the model contains the term which reflects the herd behavior of consumers. Hahn, Kang, and Kim (2010) assumed that the herd behavior may affect the performance of movies. This research found that this interesting behavior increases the total number of viewers of domestic movies, while has no impact on the first week performance or on the final performance of imported movies. They considered the herd behavior as an interaction effect of the scale factor and the evaluation factor. If the Korean movie market also shows the pattern of increasing returns to information, the current research would provide further evidence of such a phenomenon in the movie market. Otherwise, it would provide a case of exception.

The other purpose of the present study is to provide managers with useful implications about the release timing of a movie by finding dif-

ferent curvature depending on seasonality. Ko and Kim (2005) showed that the attendance pattern of Korean consumers varies according to seasonality. They found that the summer and winter vacation periods are the peak season for both domestic and foreign movies. However, national holidays, such as the Chuseok, could be considered as the peak season only for domestic films. Ahn and Kim (2003) divided success potential of a movie into attracting power and holding power and found marketing variables that affect each power. They proved that movies released in the peak season show stronger holding power than those released in the low season. Since prior research related to seasonality are limited to show the circumstance that releasing in the peak season attracts more consumers, capturing dissimilar pattern of increasing returns may provide the reason why such consequence happens in the movie market.

Ⅲ. Model

Steindl (1965) found a systematic pattern between the firm size S and its rank R, which is in accordance with the Pareto law $SR^{\beta}=A$, where β and A are constants. As Walls (1997) found, the relationship also holds between box office revenues and the movie rankings. The Pareto formula can be transformed into the following equation in the context of box office revenue and rank:

$$\log \text{Revenue} = \log A - \beta \log \text{Rank} \quad (1)$$

If the movie market can be characterized by increasing returns to information, movie revenues would be autocorrelated. The more consumers who have watched the movie, the more information there is accessible to potential viewers. One can understand this process as an information cascade, in which individuals place relatively more weight on information shared by those who have seen the movie. Because of increasing returns, some movies are hits, while others are bombs. It is commonly believed in the movie industry that word-of-mouth is one of the crucial factors that determine a movie's fate.

By confirming the empirical distributions deviated from the Pareto distribution, De Vany and Walls (1996), Walls (1997), and Hand (2001) all tested whether movie revenues are autocorrelated or not. The following equation provided by these studies models a departure from the Pareto distribution:

$$\log \text{Revenue} = \log A - \beta \log \text{Rank} + \gamma (\log \text{Rank})^2 \quad (2)$$

If γ is statistically significant when equation (2) is estimated, it would prove a departure from the Pareto distribution. If γ is negative,

it suggests that growth of revenue is auto-correlated and that the distribution is drawn to be concave and downward. Because of the squared term in the equation, log Rank and $(\log \text{Rank})^2$ will be closely correlated, possibly bringing about a multicollinearity problem. However, to be exact, multicollinearity only leads to a critical problem when the variables are linearly related. The current research uses the total number of viewers instead of revenue in order to control for the effect of varied ticket fares. Thus, the equation can be expressed as follows:

$$\log(\text{Viewer}) = \beta_1 + \beta_2 \log(\text{Rank}) + \beta_3 [\log(\text{Rank})]^2 \quad (3)$$

To add more realism to the proposed model, seasonality is considered as a factor that would potentially affect the pattern of increasing returns. Numerous studies validated the effect of seasonality on box office performance. Among others, Radas and Shugan (1998) found that the average box office performance increased during the peak season. They discovered that the product life cycle of a movie could be shortened if a movie occupies too many screens during the early stage. Since a few blockbuster movies are released during the peak season, it can be assumed that the increasing returns to information occur more strongly during the peak season than during the low season. Thus the empirical model that accommodates seasonality becomes the following.

$$\log(\text{Viewer}) = \beta_1 + \beta_2 (\text{Peak Season}) + [\beta_3 + \beta_4 (\text{Peak Season})]\log(\text{Rank}) + [\beta_5 + \beta_6 (\text{Peak Season})]\log(\text{Rank})]^2 \quad (4)$$

Ⅳ. Data

The data set contains the titles, rankings, number of viewers, and seasonality of the top 10 movies each week between July 1 2009 and November 2 in 2010.[2] Over the span of 70 weeks, 249 unique movies appeared on the charts. Movies survived on the top ten chart 2.8 weeks on average. The weekly number of viewers for each movie ranged from 4,354 (*Splice*) to 2,998,546 (*Haeundae*). The longest period of showing was 14 weeks (*Avatar*), 12 weeks (*Take Off*), and 10 weeks (*Haeundae* and *This Man*).

This study uses the number of viewers rather than box office revenue as a dependent variable. It is because the average ticket price per viewer significantly differs among genres due to various screen types (i.e., IMAX, 3D, 4D, Sweet Box, and Gold Class) and complex pricing policies (i.e., special membership, morn-

2) The data set was collected from the Korean Film Council database (www.kobis.or.kr).

ing discount). Box office revenue can no longer provide objective information on the performance of a movie. As for seasonality, dummy variables were used. Each dummy variable is assigned a value of 1 if the film ran in July, August, December, January or any national holiday, and 0 otherwise.

Out of 249 movies released during the period of observation, 60 movies were excluded from the analysis with cumulative data because they were released before July 1, 2009 or remained on the top 20 list after November 2, 2010. The total number of viewers for each of the 189 movies was sorted out in descending order. The average number of viewers was 1,020,359 and the number of viewers for each movie ranged from 97,908 (*Experiment*) to 13,353,973 (*Avatar*). 36.18% of the total number of viewers viewed the top 10 movies.

V. Results

Equation (3) was estimated by least-squares regression. The results are shown in Table 2. The left column of each aggregation shows the estimates of the model when the independence of rank and viewers is assumed. The right column reports the estimates when the term for autocorrelated growth--i.e., $\log(\text{rank})^2$--is added to the model. The weekly box office dataset includes 700 observations because the data set consists of the top 10 movies for each of the 70 weeks. The cumulative box office dataset includes 189 movies that were released during the observation period. By analyzing two different aggregations, this research verified increasing returns to information in the Korean movie market not only in weekly box office but also in long term box office. Without the

〈Table 1〉 Top 10 Movies in Terms of the Total Number of Viewers

Rank	Title	Viewers in Total
1	*Avatar*	13,353,973
2	*Haeundae*(해운대)	11,397,749
3	*Take Off*(국가대표)	8,092,676
4	*This Man*(아저씨)	6,224,468
5	*Jeon Woochi: The Taoist Wizard*(전우치)	6,108,834
6	*Inception*	5,872,215
7	*Secret Reunion*(의형제)	5,461,540
8	*2012*	5,437,873
9	*Iron Man 2*	4,451,760
10	*Moss*(이끼)	3,379,131

(01 Jul 2009 ~ 02 Nov 2010)

term for autocorrelated growth, β_2 is statistically significant and negative in both datasets. These results indicate that the Pareto law can be adopted to explain the rank-viewer relationship. However, when the autocorrelated term is added to the model, the model fits better with real data than the original Pareto model does, thereby yielding bigger adjusted R^2. Since β_3 differs from zero at a 1% significance level in both cases, the null hypothesis that the rank and growth are independent is rejected. Also, the negative signs of the parameters confirmed the existence of autocorrelated growth in the Korean movie market.

Interaction terms are included in equation (4) so that the researchers can check the interaction effects between rank and seasonality. During the peak season, market demand increases with the total number of screens being constant. Therefore, the size of autocorrelated growth would be greater during the peak season than during the low season, resulting in stronger concavity in the rank- viewer distribution. The estimated results in Table 3 are consistent with the hypothesis. All the coefficients are statistically significant at the 5% significance level. The positive and statistically significant coefficient β_2 for dummy variable Peak Season indicates a substantial increase in the number of viewers during the peak season. With the estimate being 0.591, we can predict that the number of viewers gets 80% higher during the peak season ($e^{0.591} = 1.808$). As for the coefficients β_3 and β_4, although they are significant, they only influence the location of the central axis, not the curvature of the graph that the present study focuses on. The coefficient β_6 on Peak Season × (Log Rank)^2 is -0.298. It suggests that the level of autocorrelated growth during the peak season (-0.704) is higher than that during the low season (β_5 = -0.406). As assumed, the movie market ex-

〈Table 2〉 Estimates of the Rank-Viewer Relationship

Aggregation	Weekly Box Office Data		Cumulative Box Office Data	
Constant	14.166**	13.684**	18.081**	15.839**
(β_1)	(0.059)	(0.067)	(0.105)	(0.071)
log(Rank)	-1.536**	-0.208	-1.177**	0.298**
(β_2)	(0.035)	(0.117)	(0.024)	(0.041)
[log(Rank)]^2	-	-0.551**	-	-0.212**
(β_3)	-	(0.047)	-	(0.006)
Adj - R^2	0.731	0.776	0.927	0.991
Observations	700	700	189	189

Note: Estimated standard errors are in parentheses.
**: $p < 0.01$
*: $p < 0.05$

〈Table 3〉 Estimates of the Rank-Viewer Relationship with Seasonality Dummy Variable and its Interaction Variables

		β	Standard Error	Standardized β	t	p-value
Constant	(β_1)	13.397	0.083		161.131	0.000
Peak Season	(β_2)	0.591	0.119	0.236	4.950	0.000
log(Rank)	(β_3)	-0.446	0.144	-0.248	-3.089	0.002
Peak Season × log(Rank)	(β_4)	0.490	0.207	0.352	2.362	0.018
$[\log(\text{Rank})]^2$	(β_5)	-0.406	0.058	-0.567	-7.049	0.000
Peak Season × $[\log(\text{Rank})]^2$	(β_6)	-0.298	0.083	-0.439	-3.603	0.000

Note: The weekly box office data are used for the estimation.

pands during the peak season and the market shows a stronger pattern of autocorrelated growth during this time of year. That is, the tendency of the increasing returns to information is more distinct during the peak season. This consequence may be incurred not only because the most of blockbusters are released in the peak season but also because the ticket purchase of infrequent moviegoers, who are more complaisant, is concentrated in the season.

The empirical test on the Korean movie market shows similar results as those of previous studies on the U.S., Hong Kong, and the U.K. movie markets (See Table 4 for comparison). However, the bigger absolute value of $(\log \text{Rank})^2$ coefficient means that the level of in-

〈Table 4〉 Comparison of the Rank-Viewer (Revenue) Relationships

	De Vany and Walls (1996) U.S.	Walls (1997) Hong Kong	Hand (2001) U.K.	Kim and Lee (2013) Korea
Constant	14.8405	13.5601	14.533	13.684
	(0.0759)	(0.1096)	(0.0494)	(0.067)
Log Rank	0.1859	-0.0402	-0.4174	-0.208
	(0.0435)	(0.0644)	(0.0636)	(0.117)
$(\text{Log Rank})^2$	-0.4033	-0.4430	-0.339	-0.551
	(0.0089)	(0.0257)	(0.0208)	(0.047)
R^2	0.9397	0.8717	0.9134	0.776
Observations	2,000	710	780	700

Note: Estimated standard errors are in parentheses.
The weekly box office data are used for the estimation.

creasing returns to information is higher in the Korean market than in other markets. This difference may be caused by the salient tendency of Korean to follow other's choice to minimize risk of poor choice as well as to stick with majority to get a sense of belonging.

VI. Conclusion

This research proves that the rank-viewer relationship for movies in Korea does depart from the Pareto distribution in a way that supports the pattern of autocorrelated growth: the coefficient of $(\log \text{Rank})^2$ is statistically significant and negative. This research also shows that the law of increasing returns works differently according to when the movies are released. The results suggest that autocorrelated growth is stronger during the peak season.

Unlike Lee et. al. (2012) and Hahn et. al. (2010), this research does not measure the herd behavior. Instead, we try to show increasing returns to information, which is an outcome of the herd behavior, by finding departure of box office distribution from the Pareto distribution. Each movie can be affected differently by the herd behavior in micro level. At the same time, the entire distribution of a movie market can be varied by the increasing returns to information in macro level. Thus, finding additional evidence of the increasing returns is as much vital as capturing dissimilar effects of the herd behavior.

The phenomenon of increasing returns is generated by information transmission among consumers, which result in some movies becoming blockbusters and others bombs. The proposed model can also be interpreted in such a way that a change in the rank has a non-linear effect on the movie's performance. If a movie climbs up the chart, it would be rewarded more than is proportionate. On the other hand, if a movie falls down in the ranks, its performance would rapidly drop. Since the tendency of the increasing returns to information is stronger during the peak season, movie marketers should decide upon the release timing of a movie based on its competitiveness. If a movie has substantial potential to lead to positive word-of-mouth, it is more reasonable to release the movie during the peak season so that it may enjoy increasing returns. Otherwise, a movie might as well be released during the low season to minimize its risk of being dropped from the chart. However, the competitiveness cannot always lead a movie to huge success. Since a number of movies are planned to be released to reap the benefits of peak season, it is hard to attract consumer's attention and to secure enough screens. Because of these reasons, considering additional factors, such as market competition and the number of screens, is inevitable to seek the optimal release timing.

The increasing returns to information may

also depend on the advancement of information technology. The phenomenon may be enhanced due to the acceleration of word-of-mouth through online services. Since the usage of mobile Internet and the speed of online network have grown ast, more information is accessible than ever before. Therefore, it can be assumed that the recent box office record may show stronger increasing returns than that of couples of years earlier. Another research is needed to compare two periods considering the improvement of technology.

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