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The Differential Impact of Box Office and DVD Sale Drivers in the Motion Picture Industry

Mei Mei Zhang

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ABSTRACT

The Differential Impact of Box Office and DVD Sale Drivers in the Motion Picture Industry

Mei Mei Zhang

Although theatrical box office results have traditionally been considered the most important measures of movie performances, the fact that movie studios' revenues are more dependent on the DVD retail sales rather than box office ticket sales ascertains the importance of investigating the DVD retail sales performance. While numerous studies explore the key drivers in theatrical performance, little is known about the specific drivers of DVD retail market performance. Therefore, this thesis aims to investigate: (1) whether the factors that have an impact on theatrical market also impact on DVD sales market and (2) whether certain factors are more (or less) important in DVD retail markets.

The research questions are addressed by adopting a linear regression modeling and a quantile regression modeling approach. The results show that (1) theatrical performance is the key predictor of DVD performance and (2) DVD performance is more influenced by "reputation" factors, while theatrical performance is more influenced by "signaling" factors.

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I. Introduction

The motion picture industry has high economic importance in the global economy. In 2007, spending on theatrical tickets reached approximately $9.6 billion domestically and $17 billion internationally. This is in addition to the several times higher revenues generated from sequential distribution channels, particularly the home video market (MPAA 2007).

Such high stakes in this industry always involves high risks as well. The cost of making and launching a new movie in the U.S. averaged around $106.6 million in 2007, including $70.8 million in production costs and $35.9 million in marketing costs (MPAA 2007). In this same year, however, only 28 of the 590 newly released theatrical films in the U.S. reached the $100 million benchmark of domestic box offices, with 95% of films failing (MPAA 2007). Moreover, of the 28 films reaching the $100 million benchmark of domestic box offices, more than half were just in the range of $100 million to $199 million. Therefore, accurate forecasting while finding the fatal drivers to movies success is critical to every unit and to all individuals participating in the value chain of the motion picture industry: movie studio, distributor and exhibitor.

Industry practitioners rely heavily on their empirical wisdom to make business decisions, while few of these rules and decisions have been examined (Eliashberg, Elberse and Leenders 2006). The reason is that such forecasting is critical, but difficult. The movie industry is a business with a high uncertainty, as each movie is unique and has

a relatively short life cycle. Consumers' movie experiences are subjective, emotional and intangible. Meanwhile, consumers evaluate the quality of movie only after experiencing it (Holbrook and Hirschman 1982). Thus, a single movie can be the difference between millions of dollars of profits or losses for a studio in a few months. Moreover, there are many dynamic factors affecting its forecasting. Not only could movie characteristics such as star power, director power or genre have an influence on movie success, but also aspects such as critical reviews, marketing and distribution strategies, word-of-mouth spread, and even the current weather could impact consumers' decision-making.

The drivers that influence a movie's box office can be seen as a major contributor in aiding to lower the number of failures in the motion picture industry. Numerous researchers focus their attention on the theatrical motion picture industry (specifically the theatrical box office) and two methods are adopted in this research area. The first is a behavioral model (namely the psychological approach), which mainly concerns with consumer behavior on how movie-goers make decisions in choosing movie entertainment, as well as particular movies (e.g. Sawhney and Eliashberg 1996, Richins 1983 and Hirschman and Holbrook 1982). Another method is the econometric or quantitative model, which explores the drivers that influence movie success (e.g. Litman 1983, Litman and Kohl 1989, Radas and Shugan 1998, Neelamegham and Chintagunta 1999, Eliashberg, Jonker, Sawhney and Wierenga 2000a, and Sawhney and Eliashberg 1996).

Although theatrical box office records have been traditionally considered the most

important measure of movie performance, movie studios' revenues are more dependent on the DVD retail sales rather than box office ticket sales. As one of the important sequential distribution channels in motion picture industry, the home video market has even surpassed the domestic theatrical market. Based on the 2008 Annual Report on the Home Entertainment Industry, released by the Entertainment Merchants Association (EMA), consumers spent $24 billion on videos, renting 8.2 billion and buying 15.9 billion. This accounts for 49% of domestic consumer movie spending in 2007 and continued from previous years to be the largest segment of consumer movie spending. This fact establishes the importance of investigating the DVD retail sales performance. Although Lehmann and Weinberg (2000) found that movies with a strong opening in theaters generally perform well in the video market, what drives such a big market still remains mysterious. On the one hand, one can believe that theatrical performance can be a good indicator of DVD retail market performance since essentially a same product (movie) is offered to audiences through different channels. On the other hand, one can argue that audiences will go through a decision process for each movie and determine whether they will watch the movie in theatres or on DVD, or both. Under the scenario of choosing one of the watching options, the theatrical box office performance may not be a perfect predictor of the DVD retail market performance since DVDs can be perceived as both a supplement and an alternative to watching it in theatres.

However, so far not so much has been known about the specific drivers of DVD retail market performance, especially in comparison to those of theatrical box office

performance. Therefore, it is an important empirical question to address the relationship between theatrical performance and DVD sales. More specifically, it is important to address whether the factors that influence theatrical box offices also impact the DVD retail market and whether certain factors are more (or less) important in the DVD retail market. The findings on movie audiences' decisions whether to watch a certain movie in theaters or on DVD can be of great interest to marketing managers in the entertainment industry, as controlling the factors that affect customers' decision between the two options can assist in the allocation of strategic media spending between theatrical and DVD backing more effectively and efficiently.

Consequently, the major objectives of this study are to investigate: (1) whether the factors that have an impact on theatrical markets also impact DVD sales markets; (2) whether these certain factors are more (or less) important in DVD retail markets.

The remainder of this study is organized as follows. The next section reviews the conceptual foundation on drivers in the theatrical and DVD market. Meanwhile, it focuses on the differences between the theatrical market and the DVD market based on customer value analysis and the traits of the drivers. Then, hypotheses are put forward on different weight of drivers in theatrical and DVD markets. Section three supplies methodology by specifically referencing the data collection and variables measures used in this study. The empirical results are also shown and explained in this section. The last section of this study discusses theoretical contributions and managerial implications along with its limitations and further research directions.

II. Conceptual Foundation:

1. Drivers in the Theatrical Market

Numerous researchers have focused their attention on the theatrical market in the motion picture industry and three groups of movie-success drivers have been identified. These drivers are movie characteristics, post-filming marketing actions, and non-studio factors.

Movie characteristics discussed in the literature include star power, sequels, genre, a movie's production budget, and MPAA ratings.

To some degree, the qualities of both actors/actresses and directors might reflect some underlying qualities of the films. In order to keep up good reputations among critics, famous directors have to make efforts to create a final artistic product and movie stars have to carefully balance the benefits and risks of taking specific roles, and therefore their presence in the production of certain movies might implicate high movie quality. Meanwhile, the presence of movie stars and famous directors might attract fans to watch specific movies and make such movies easily successful. According to previous studies (Litman and Kohl 1989, Sawhney and Eliashberg 1996, Sochay 1994, and Neelamegham and Chintagunta 1999), star power has a positive and statistically significant influence on movie success, thus adding to the academic evidence of this finding. However, the relationship between star power and movie success seems more complex and some studies questioned this relationship. Prag and Casavant (1994) pointed out that a positive

relationship between star power and financial success does not apply for all movies. Basuroy, Chatterjee and Ravid (2003) claimed that star power did not directly impact box office revenues, but worked as a moderator to function on the relationship between other drivers such as critics review and box office revenue.

The next characteristic, sequels, is regarded as symbolic information of movies. By choosing an appropriately title such as "The Godfather Part III", sequels aid a studio to easily convey information about what particular tastes a film is designed to satisfy due to the connection between the sequel and its predecessor. At the same time, sequels allow studios to spend less market force on attracting viewers, as fans of the original movie may already be keen on viewing the follow up. It was found that films named by a serial number tend to spend less on advertising (Prag and Casavant 1994) and previous studies show that sequels have a positive impact on movie success (Prag and Casavant 1994, Sawhney and Eliashberg 1996 and Hennig-Thurau, Walsh and wruck 2001). Sawhney and Eliashberg (1996) reported that "awareness inherited by sequels serve to enhance a new movie's ultimate cumulative box office potential".

Like sequels, a movie's genre as well provides advance information on the movie before audiences watch it. At the same time, different genres connect audiences with different feelings, and therefore, those seeking specific sensations will be attracted to specific genres of movies. For example, a horror movie associated with a feeling of fear attracts audiences who love thrilling and stimulating experiences, yet alienates those who are easily scared. In Zufryden's (1996) study, the author supports that there is a good

relationship between genres and intention to watch a movie and discovered that comedy and action categories provide the most significant predictor of intentions to watch a movie. In previous studies, science fiction and horror movies have significantly positive impacts on motion picture performance (Litman 1983). However, the trends are not always the same, since audience tastes keep on changing. In Litman and Kohl's (1989) later study, they found that horror movies have no longer significant related to movie performance and drama is negatively associated with theatrical performance. In Prag and Casavant's (1994) study, they found that only one genre, drama, was significantly and also negatively associated with theatrical performance. In Sochay's (1994) study, only comedy had a significant impact on theatrical performance.

Turning to production budget, on the one hand, it leads to greater production value. A higher budget seems to implicate more elaborate sets and clothing, more special effects, more geographical locations, and greater care and skill in filming and editing the picture. All of these components should increase a film's entertainment value and hence its theatrical performance. However, it is really hard to ensure that a higher budget will lead to successful performance due to excessive salaries to stars, inordinate production delays or inefficient management. Two voices associated with the relationship between production budget and successful theatrical performance occurred in previous studies. Litman (1983), Litman and Kohl (1989), and Prag and Casavant (1994) reported that a movie's budget is positively related to box office performance. Litman and Ahn (1998) supported as well that budgets should increase a film's entertainment value and thus its

probability of box office success. However, Ravid (1999) showed that although big budgets are correlated with higher revenue, they are not correlated with returns. In fact, low-budget films appear to have higher returns. Basuroy, Chatterjee and Ravid (2003) found that budget as a key moderator enhances box office revenues for films that receive more negative critical reviews than positive ones but do little for films that receive more positive reviews than negative ones.

As for MPAA ratings, they are assigned by the Motion Picture Association of America (MPAA) and provide to parents advance information of an upcoming movie including the degree of sexual content, violence and adult language. A film's five possible rating categories are G, PG, PG-13, R and NC-17. A G rating means that the film is suitable for general audiences without any age restrictions, and there is nothing in theme, language, nudity, sex, violence or other matters that would offend parents whose younger children view the movie. PG (Parental Guidance) suggests that some material is not suitable for children and that parents should decide before permitting their children to view it. PG-13 means that the film is not appropriate for children under 13 and parents are strongly recommended to decide whether to allow their children to watch it. R means restricted and requires that children who are 17 and under be accompanied by a parent or adult. Previous studies show that movies with an "R" or a "PG-13" rating do not perform better compared with other ratings at theatrical performance (Sawhney and Eliashberg 1996, Prag and Casavant 1994). In Sochay's (1994) study, R rated movies are negatively related to theatrical performance.

Post-filming marketing actions discussed in the literature include the concepts of advertising expenditure, timing and the number of screens.

Like any new product introduced, a new film is always advertised to its potential audience through various mass media outlets, as advertising is often the key communication tool to attract moviegoers into the theaters. Later, word-of-mouth campaign tends to be more powerful during the rest of a film's run (Litman 1983). In Sawhney and Eliashberg's (1996) study, advertising expenditure was found to be an important determinant of box office performance. In Lehamnn and Weinberg's (2000) study, advertising expenditure was found to be positively correlated with a movie's opening strength, and directly impacted audiences. Prag and Casavant's (1994) study is not only concerned with the positive relationship between advertising expenditure and theatrical performance, but also the correlations between advertising expenditure and production cost, advertising expenditure and genre, advertising expenditure and star power and so forth. For example, Prag and Casavant pointed out that due to the specific genre's traits, action and adventure movies are likely to have more advertising expenditure since they are easily communicated by TV commercials, while movie sequels are advertised less since the sequel itself provides more information upfront about the movie.

With regards to timing, the movie industry shows its seasonality. There are three distinct periods of peak audience attendance for theatrical movies. The highest peak is the period between Christmas and New Year's from November until January. The second

peak period is during the summer months from June till August. The final peak time is around Easter from March until April (Litman 1983). On the one hand, movies released in peak seasons such as Christmas and New Year should attract more attention of audiences and movies released in an off-peak season should be bad for revenues. On the other hand, since peak seasons should have great office box potential, it attracts more competition. The high competition during peak seasons will counteract the peak season effects. Previous studies pointed out that movies released during the summer or holiday seasons have been found to have significantly high box office sales despite of intensive competition (Krider and Weinberg 1998, Litman 1983 and Sochay 1994).

In the motion picture industry, there are two distribution patterns: wide release and platform release. Wide release is characterized by a high level of exhibition intensity, and platform release is characterized by a low level of exhibition intensity (Sawhney and Eliashberg 1996). The objective of wide release is to obtain as many screens as are available, and therefore the two distribution patterns are captured by the maximum number of screens the movie played during its running period. Research has shown that the number of screens allocated to a movie is associated with movie revenue (Neelamegham and Chintagunta 1999, and Sochay 1994). Developing a Bayesian model to predict first-week viewership for new movies in both domestic and international markets, Neelamegham and Chintagunta (1999) found that the number of screens is the most important influence on viewership. In Sawhney and Eliashberg's (1996) study, the authors point out that platform release shows higher uncertainty on a movie's success

than wide release does. However, Prosser (2002) revealed that the number of screens does not explain significant variance in theater success after accounting for the effects of advertising, which indicated some correlation between the number of screens and advertising.

There are still other non-studio factors which impact movie revenue, such as critical reviews and awards. To the extent that the public relies on the critics for information on the artistic value of particular films, critics may help shape initial viewer preferences, at least until the enthusiastic moviegoers have begun the process of word-of-mouth reaction. Both positive and negative critical reviews are correlated with box office revenue. In a sense, good reviews tend to stir curiosity of potential audiences and push them to go to cinema. On the contrary, poor reviews can be expected to have a negative effect on the behavior of the influential early adopters. Sawhney and Eliashberg (1996) reported that positive reviews enhance cumulative box office performance, and Basuroy, Chatterjee and Ravid (2003) found that the negative influence of negative reviews outweighed the positive influence of positive reviews during opening week.

Being nominated for or winning awards such as the Academy of Motion Picture Arts and Sciences signifies relatively high movie quality and therefore has a positive impact on movie success. It is generally agreed that films nominated for the major categories such as Best Actor, Best Actress, and Best Picture will generate increased business prior to the awards ceremony since the nomination process becomes the prime motivating force for enthusiastic moviegoers. It is easily imagined that zealous moviegoers rush to

the theaters to see all the nominated films so they can compare their judgments with those of the critics and, of course, with the final results. Furthermore, those winning films can also expect increased business for a short period of time following the awards ceremony. According to Variety, and supported by previous studies, the Oscar luster can add $10 million in domestic box office revenues. Litman (1983) found that Academy Award nominations or winnings are significantly related to revenues, while Prag and Casavant (1994) similarly concluded that an Academy Award is a positive factor in determining a film's financial success. Prag and Casavant (1994) also mentioned, however, that the award became insignificant when advertising was added to the regression model and explained that becoming an insignificant predictor does not mean that the award lacks important, rather that it implied some correlation between awards and advertising. It is possible that the effects of the award might be covered up by advertising effects, thus leading it to appear insignificant.

2. *Drivers in Home Video Market*

Although it is found by Lehmann and Weinberg (2000) that movies with strong openings in theaters also perform well in the video market, not so much is known about the specific drivers of DVD retail market performance, especially in comparison to those of theatrical box office performance. Only three previous studies are found on this specific issue, though they focus on different objectives rather than specific drivers of the DVD retail market or differences between theatrical and video markets.

In Ravid (1999)'s study, the author focused on the relationship between stars and total revenues including domestic, international and video sales revenues. Using a multiple regression analysis, results indicate that a movie's budget, a G-rating, a PG-rating and sequels are the only variables that have significant impacts on video sales revenues. However, since the study was more concerned with star value, the explanation of the relationship between factors and video sales revenues was neglected.

In Lehmann and Weinberg (2000)'s study, the authors pay more attention to the optimal time to launch a movie from the theatrical market into the video market and suggest that movies should be released to video sooner than six months, which is the current practice. By using a non-random sample of 35 movies, Lehmann and Weinberg estimate exponential sales curves for both theater attendance and video rentals and demonstrate that advertising improves sales in the video rental market and that the number of screens does not have an impact on the video rental market. Since timing is the key point of this particular study, only two factors, advertising and number of screens were discussed.

In Prosser (2002)'s study, after conducting a correlation and regression analysis, factors including the second week box office, advertising intensity, the number of theater screens, critics ranking and genre were found to impact video rental and sell-through revenues. However, the author only selected the factors from industry managerial interviews and did not investigate other factors such as awards, holidays, star power, sequels and MPAA ranking and the difference between the theatrical market and the

video market.

3. *Differences in Drivers between Theatrical Markets and Video Markets*

The summary of drivers from previous studies (Table 1) shows that some factors impact both theatrical and video markets, such as sequels, MPAA rating, advertising expenditure, genre, etc. while others might specifically impact either the theatrical or video market. What causes the different effects of various drivers might be explained by customer value provided in the two diverse markets and the nature of the drivers.

Customer value is the difference between customer benefits and customer costs. Customer benefits include product benefits, service benefits, personal benefits, and image benefits (Kotler and Keller 2006). In the context of the motion picture industry, product benefits are the content of the movie. Moviegoers and video buyers have identical product benefits since the same movie is provided for both markets. This is not the case for service benefits, as they involve the whole environment where customers watch the movie. In general, theatres offer bigger screens, more comfortable seating, and improved sound and picture presentations. The service is expected to be grander in theatres compared to at home viewing. Personal benefits should be the experience obtained by the product (movie), and since it is based on individual expectations, it is hard to compare between moviegoers and video buyers. For example, video buyers who love video collections might receive higher personal benefits than movie-goers. Image benefits can be related to social image or social network. Generally, it is more popular for intimate

friends and family members to purchase videos and see it in a more informal setting, while going to the movie theatre is a social activity, since the theater is a more public place and thus should be more related to social image or social network.

Customer costs include purchase price, acquisition costs and usage costs. When compared with visiting a movie theater, buying a video is relatively less expensive, because video purchases are not priced on a per-seat basis. Acquisition costs include time, money and energy spent on watching a movie in theaters or on video. When comparing buying a movie ticket or a video, it is important to note that videos can be purchased by wider distribution channels such as online stores, supermarkets, video stores, etc. Furthermore, consumers do not need to consider the time schedule of the movies. Therefore, watching a movie on video should take less time, money and energy than buying a ticket and watching a movie in theaters. As to usage costs, both moviegoers and video buyers have to consider the additional costs such as transportation to the theaters or video stores. Video buyers, however, can order online or ask for delivery while moviegoers have to go to theaters alone.

In addition to the benefits and costs, there are two other factors that impact the consumer decision-making process as well. The first one is another person's attitude towards the product (movie) (Kotler and Keller 2006). That person's negative attitude towards a product (movie) might impact the consumer to switch to other options. For example, a potential consumer might give up watching a film in the theater due to his friend's negative review and might just wait to see it on video. Movie reviews perform

this same function. The second factor is the perceived risk including financial risk, social risk, and time risk (Kotler and Keller 2006). Financial risk is that the product is not worth the price paid. Since a video purchase is less expensive, it therefore bears the smallest financial risk. The social risk is that the product might lead to embarrassment from others. Since watching movies in theatres is a social activity, it therefore might have more social impact, and therefore should be prone to social risk. Time risk is related to the opportunity cost of finding other satisfactory alternatives. Purchasing a video involves less time risk because seeing a film on video allows the consumer to temporarily interrupt and resume or completely break off the showing, while leaving the theater during the screening is rather unusual due to the physical and social barriers related to such behavior.

Table 2 summarizes the difference of customer value between the theatrical and DVD markets. We find that compared with seeing a film by video, seeing it in theater has relatively higher benefits at the expense of relatively higher costs and perceived risks given both ways provide same personal benefits.

The nature of the drivers (genre, sequel, MPAA ratings, advertising expenditure, and the number of screens) can be seen as a movie's signals, as they provide general information before customers watch the movie. For example, we can suppose the movie must have more thrilling plots when its genre is horror and more adult content when the movie is rated as PG-13 or R. When we are bombarded by various advertisements of one movie or the movie is showing in almost all the theatres, we might assume that particular

movie to be a blockbuster and therefore have more interest in viewing it.

Other drivers such as critical reviews and award nominations/wins can influence the reputation of a movie. These types of drivers are obtained from a third party, who watched the movie, making the information they provide more reliable and independent of the studio.

These two groups, signaling drivers and reputation drivers, might possess different weights of their effects dependent on the market (theatrical or video). Generally speaking, theatrical performance might be more influenced by "signaling" factors since during the period of a movie's run, the quality of the movie is still unknown and customers heavily rely on the signaling factors to make decision. Later on, when the new movie has been showing in the theatrical market for around four to six weeks, the quality of the movie is not a secret at all, thus more independent and reliable information provided by reputation factors should be more powerful in sequential distribution channels such as the video market. Thus DVD sales might be more influenced by "reputation" factors. The detailed analysis by drivers and hypotheses are discussed in the following section.

First is the type of genre. As we mentioned before, genres as a signaling factor are associated with different feelings related to the movies and thus show various attractions to moviegoers as well as video buyers. One can expect more thrilling and stimulating feelings from action, adventure, horror and suspense movies, and more tender and pleasant feelings from romantic comedy and comedy movies. Thus for action, adventure, horror and suspend movies, consumers should prefer watching them in theaters due to

bigger screens and improved sound and picture presentations that can amplify the thrilling and stimulating feelings they seek out. Comedies and romantic comedies do not need advanced display technology or sound systems and are better to share with intimate friends or family members in a more informal setting. Hence, the first hypothesis is proposed:

H1: Different genres will have different impacts on theatrical and video markets.

1. *Action, adventure, horror and suspense movies will have a stronger impact on the theatrical market than on the video sales market.*

2. *Comedy and romantic comedy movies will have a stronger impact on the video sales market than on the theatrical market.*

MPAA ratings, determined by the movie content and style, provide advanced information on language, graphic violence and sexual content before audiences see the movie. Movies rated as "R" or "PG-13" show a signal that the movie may include hard language, nudity, drug abuse or other elements which may cause embarrassment or lower social reputation when seeing them in public places. Hence, people might prefer to see them by video due to the social risk attributed. In addition, age-restrictions of MPAA ratings can be violated more easily when buying a video than when visiting a movie theater since buying a video is separate from watching it, and thus does not require the movie buyer and the movie audience to be the same individual (as is the case in movie theatres). Therefore, the second hypothesis is proposed:

H2: R ratings and PG-13 ratings will have a stronger impact on the video sales market than on the theatrical market.

Movie advertising is another signal for consumers to predict a movie's overall quality. A film's trailer shows some of the highlights or best moments to encourage people to go and see the film when it releases. At the same time, by spending more money on movie advertising, studios express more confidence in the film. They are convinced of the film's quality and therefore increase customer awareness to increase the interest. They believe that when consumers see the movie, the good critics will bring more benefits than they spent on advertising. Therefore, movie advertising should be the key predictor for consumers to lower their financial risks for the theatrical market, especially for the first two or three weeks. However, with regards to the DVD market, the role is somewhat different. A movie's quality is not as mysterious as its theatrical launch. Reputation factors such as critical reviews and word-of-mouth become a more powerful and convincing tool to lower consumers' financial risk. Thus the third hypothesis is proposed:

H3: Advertising expenditure will have a stronger impact than critical reviews on the theatrical market, while critical reviews will have a stronger impact than advertising expenditures on the video market.

As for seasonality, based on a previous study, three distinct periods of peak season are present in the theatrical market: Christmas and New Year from November to January; the summer months from June to August; and Easter from March to April. Movies

released during the summer or holidays have been found to have significantly higher box office performance (Krider and Weinberg 1998, Litman 1983 and Sochay 1994). This is due to the fact that during the summer and holiday season, people would like to attend more social activities rather than stay at home and watching movies in theatres is definitely considered as a social activity. Meanwhile, during these periods, people have more flexibility in their schedules to enjoy leisure activities, which makes the time constraints of seeing a film in theater less dominant. With the video retail market, people can see a film more flexibly than in the theatre. Therefore it should have less seasonality. Thus the fourth hypothesis is proposed:

H4: Seasonality will have a stronger impact on the theatrical market than on the video sales market.

The number of screens in the motion picture industry is a signal to reveal two different distribution strategies: wide release and platform release. This is similar to shelf space in product retailing. The more screens showing a movie during its running period, the more attention the movie will receive by consumers and the media. It is supported by Neelamegham and Chintagunta (1999) that the number of screens is the most important influence on viewership. At the same time, the number of screens reflects the studio's confidence in the film, as with advertising expenditure. The studios hope to use a wide release strategy to rapidly increase the awareness of the movie and attract customers to see it. Addressing consumer value, more screens mean more convenient locations and

flexible time schedule, thus saving consumers' acquisition and usage costs to see the film. Thus the fifth hypothesis is proposed:

H5: The number of screens will have a stronger impact on the theatrical market than on the video sales market.

The influence of critical reviews has been discussed in the advertising expenditure section. When a film releases in the video market, approximately six month after its launch in theaters, it is not considered a "new" film anymore. As the content is no longer a mystery to consumers, reputation factors such as critical reviews and word-of-mouth should have more impact on consumers' purchase decision making in the video market than in the theatrical market. Thus we use H3 to propose the difference of the two markets in both advertising expenditure and critical reviews.

H3: Advertising expenditure will have a stronger impact than critical reviews on the theatrical market, while critical review will have stronger impact than advertising expenditure on the video market.

Nominated and/or winning films of awards such as the Academy of Motion Picture Arts and Sciences represent a relatively high quality and help to reduce consumers' financial risk. These award ceremonies attract the attentions of audiences from the beginning of the nomination process all the way to the actual announcement of winners. People are curious to see the movies that have high artistic reputations and are eager to compare their judgments with those of the critics, regardless as to whether they are seeing

the movies in theaters or on video or both. Some people might argue that awards should have a stronger impact on the theatrical market since nominated or winning films are worth the price to see them in the theaters, where higher service quality is provided. While this may be true, a peak period of a movie's theatrical run is most likely finished by the time the nomination lists are even announced, let alone a winner proclaimed. Take the Academy Awards for example. According to the official Academy Awards rules, a movie must have opened in the previous calendar year (January 1st to December 31st) in order to qualify. In late January, the nominations are announced to the public and six weeks later the major awards are presented at a televised ceremony. This means that even a movie released at the end of December of the previous year would have been showing for around one month before it is nominated. A movie's peak running period is approximately six weeks and afterwards, it may be released to other channels such as the video market. Therefore it is obvious that awards should have a stronger impact on the sequential channels than on the theatrical market. So the sixth hypothesis is proposed:

H6: Awards or award nominations will have a stronger impact on the video sales market than on the theatrical market.

Table 3 summarizes the proposed hypotheses and the possible underlying reasons based on consumer value and the nature of drivers.

III. METHODOLOGY

1. Sample

Based on the research objective of determining whether the factors that have an impact on theatrical markets also impact DVD sales markets, and in order to compare the drivers in both markets, a sample is needed consisting of films (1) with varying levels of success, (2) that have been released in theatrical markets first and subsequently to video markets, and (3) for which appropriate financial data in both theatrical and video markets is available. We satisfied criteria (3) by choosing movies that appeared at least once on www.the-numbers.com Top 30 video charts between August 2006 and April 2008. 23 films out of the 243 did not meet criteria (2) as they were released directly to video or were re-releases in the video market, and because of this they were dropped from the study. Most of the 23 dropped movies are children's movie. This left us with 220 films in our analysis, with complete total theatrical and DVD sales figures (see Appendix A for a listing of movies included in the analysis). Selected movies were domestically released in the theatrical market between February 10th, 2006 and January 18th, 2008, with their DVD domestically released between August 8th, 2006 and April 29th, 2008.

Since our movie sample was obtained from the Top 30 video charts, to avoid a sampling bias that only included successful films, we examined the distribution of theatrical sales and DVD sales. DVD sales ranged from 3.1 million to 326 million. The mean of DVD sales was around 45.5 million and the median around 27.9 million.

Theatrical sales ranged from 3 million to 423 million. The mean of theatrical sales was around 64.0 million and the median around 39.3 million. From the box plot of theatrical sales and DVD sales (Figure 1) and the histogram of theatrical sales and DVD sales (Figure 2), we found that theatrical sales and DVD sales were widely spread. Also, based on the $100 million benchmark of domestic box offices from MPAA 2007, only 20% of the movies in our sample reached the benchmark and thus we discovered that the sample included not just those successful films in both theatrical and DVD markets, but the less profitable as well. However, in our analysis, we still focused on the high performance movies since the small box office movies are not the major focus of movie studios.

2. Measures and Data Description

For each movie, the data set includes the official theatrical and DVD release date; the MPAA rating; the genre; awards and/or nominations; whether it is a sequel; the maximum number of screens the movie played on each week of its run; total theatrical sales, along with the corresponding theatrical release weeks; total DVD sales, along with the corresponding DVD release weeks; total advertising expenditure for each movie in both theatrical and DVD markets; critical ratings from Tomato-Meter members, top critics and Rotten Tomatoes community, along with the numbers of members who voted the critical ratings respectively; and the total run time. In addition, the data set also provides the weekly theatrical sales and weekly DVD sales from the first three weeks following the official release date of each movie. Advertising expenditure is divided by media and by

week beginning from the five weeks prior to the release date and ending on the release week.

The majority of the data was obtained from www.the-numbers.com with the exception of the advertising data, which was purchased from TNS Media Intelligence and critical reviews, which were obtained from www.rottentomatoes.com. The website, www.boxofficemojo.com was used as a supplemental source to provide data missing from www.the-numbers.com.

The following is detailed information of each dependent and independent variables, which are summarized in Appendix B:

1. Total DVD sales (DS) as the dependent variable were obtained from www.the-numbers.com.
2. Total theatrical sales (TS) as the dependent variable were obtained from www.the-numbers.com.
3. Weekly theatrical sales (TSW) were obtained from www.the-numbers.com and numbers were added as a postfix to represent the week number after release. For example, TSW2 would be written to represent the second week theatrical sales after release. In our study, the first week theatrical sales after release (TSW1) is used as the dependent variable to test seasonality in the theatrical market and the first three weeks of theatrical sales (TSW1+TSW2+TSW3) is used as the independent variable in total DVD sales model.
4. Weekly DVD sales (DSW) were obtained from www.the-numbers.com and numbers

were added as a postfix to represent the number of weeks after release. For example, DSW2 represents the second week DVD sales after release. In our study, the first week DVD sales after release (DSW1) are used as dependent variables to test seasonality in the video market.

5. Month of release

Seasonality was measured by 11 binary variables to represent the month of release of a movie, with exception to the benchmark month. That is, variables take the value one if a movie or its DVD is released in that month, zero otherwise. Release data of the movies and DVDs came from www.the-numbers.com. Based on previous studies, there are three distinct periods of peak audience attendance for theatrical movies. The most successful peak is experienced around the Christmas holidays, from November until January. The second peak period occurs during the summer months between June and August. The final peak period occurs around Easter from March until April (Litman 1983). Therefore, December as a significant holiday month is used as a benchmark to capture the seasonality for both theatrical and DVD markets, while the other months are represented by MD_JAN, MD_FEB, MD_MAR...MD_NOV for the month of DVD release and MT_JAN, MT_FEB, MT_MAR...MT_NOV for the month of theatrical release.

6. MPAA rating

Another commonly used variable in predicting the financial success of a movie is the rating assigned by the MPAA, which is used to assess the degree of sexual content,

violence and vulgar language of movies. The five possible rating categories are G, PG, PG-13, R and NC-17. The MPAA ratings were obtained from www.the-numbers.com, with only four categories (G, PG, PG-13 and R) showing in our sample. This means that the PG, PG-13 and R categories are represented by binary variables MPAA_PG, MPAA_PG_13 and MPAA_R respectively, compared with the benchmark G-general category. A movie rated in a PG category, for example, would receive a value of 1 and PG-13 and R receive a value of 0 in accordance with the binary encoding.

7. Movie genre:

   Movies were placed into eight genres according to our sample published at www.the-numbers.com. These genres include action, adventure, comedy, drama, horror, suspense, musical and romantic comedy. One important point to note is that genre is not mutually exclusive, and that one film could belong to more than one genre. For example, the film, the Wild is classified as both a comedy and an adventure. The eight genres are transformed into seven binary variables (G_ACT, G_ADV, G_COM, G_HORR, G_SUSP, G_MUSIC and G_ROM_COM), respectively representing action, adventure, comedy, horror, suspense, musical and romantic comedy. Based on Prag and Casava's (1994) study, drama is negatively related to film revenue and therefore it is chosen as the benchmark.

8. Sequels:

   Sequels as symbolic information convey details of a movie to audiences in advance.

At the same time, sequels make it easier for a studio to communicate a movie. Sequels were obtained from www.the-numbers.com. A dummy variable SEQUEL is used to represent sequels. Variables are assigned a value of one if the movie is a sequel, zero otherwise.

9. The maximum number of screens

In general, there are two distribution patterns in the motion picture industry. The first is a wide release distribution and the second is a platform release distribution. Wide release is characterized by a high level of exhibition intensity, while platform release is characterized by a low level of exhibition intensity (Sawhney and Eliashberg 1996). Distribution intensity is determined by the maximum number of screens in which a movie plays during its run, and this was taken from www.boxofficemojo.com. To better capture the distribution effect, the dummy variable SCREENS_3000 is used, and a value of one given if the maximum number of screens is greater than 3000, 0 otherwise.

10. Awards or nomination:

Winning or being nominated for awards such as the Academy of Motion Picture Arts and Sciences signalizes a relatively high movie quality and should positively influence a movie's success. Moreover, the nomination process for major awards is an efficient catalyst to lure audiences and hence increases the movie's revenue. Thus to capture these effects, binaries were created first for whether the sample movies were nominated in the categories of the Academy of Motion Picture Arts and

Sciences and secondly, for whether they actually won the award in any of these categories. A dummy variable AWARD_NOM takes a value of one if the movies were nominated or won awards, zero otherwise. The information of movie nominations and wins were obtained from www.boxofficemojo.com.

11. Advertising expenditure:

Advertising expenditure was purchased from TNS Media Intelligence, as it was unavailable from websites and industry magazines. It is provided by week and by media source. Total advertising expenditures were used as independent variables and are represented as ADV_THE for the theatrical market and ADV_DVD for the video market. To better capture the difference in advertising expenditure allocation of various media of both markets, total advertising expenditure by media source was used in the study as well. For example, NETTV_D_T represents the advertising expenditure of network television in the DVD market, while NETTV_T_T represents the advertising expenditure of network television in the theatrical market. Sixteen media sources are provided, including network television(NETTV), spot television(SPOTTV), Spanish language network television(SLNTV), cable TV(CTV), syndication(SYN), magazines(MAG), Sunday magazines(SUNDAY), Hispanic magazines(HISMAG), B-B magazines(BTB), national newspapers(NATNEW), newspapers(NEWS), Hispanic newspapers(NISNEW), network radio(NETRA), national spot radio(NATRA), US internet(INT) and outdoor(OD). To evaluate the best effects of advertising expenditure during a movie's release week and the weeks

prior to the release date, weekly advertising expenditure during the release week and up to five weeks prior to the release date was collected. For example, AD_D_P0 represents advertising expenditure of the release week in the DVD market, while AD_T_P2 represents advertising expenditure of the second week prior to release date in the theatrical market.

12. Critical reviews:

    Information on critics' ratings was collected from www.rottentomatoes.com, a nationally recognized source that gives movies numerical rankings. The three sets of critic ratings on the Rotten Tomatoes website are approved Tomato-Meter critics' ratings, top critics ratings and individual ratings from the Rotten Tomato community (the values range from 1 to 10). To capture the public's view more generally, weighted average ratings of the three sets of critic ratings were calculated and used as an independent variable REVIEW to predict both theatrical and DVD sales.

    REVIEW = sum of (percentages of number of rating people in each group in total rating number of people × their corresponding rating)

13. The running time (TIME) was obtained from both www.the-numbers.com and www.boxofficemojo.com

IV. RESULTS AND DISCUSSION

1. Descriptive Statistics of Variables

From the descriptive statistics for the dependent and independent variables (Table 4)

and the histograms of theatrical sales, DVD sales, and advertising expenditure in the DVD market (Figure 2 and 3), we found that DVD sales (DS), theatrical sales (TS), and DVD advertising expenditure (ADV_DVD) showed great trends of right skewness.

Because it is based on the central tendency, the linear regression analysis focuses on a conditional mean to summarize the relationship between dependent variables (DVs, hereafter) and independent variables (IVs, hereafter). This means that by describing the conditional mean of DV for each fixed value of IVs, we can summarize a linear function between DVs and IVs. However, when the variable distribution is highly skewed, the mean is more vulnerable to the outliers and then may not be appropriate and may be a misleading measure of central location. Therefore, quantile regression (especially the median regression) modeling will be used and the results for both modeling will be compared.

In addition, Table 5 reports a correlation matrix for key variables of interest. It shows that in the DVD market, total theatrical sales, the first three weeks of theatrical sales, DVD advertising expenditure, and number of screens has a high (over 0.5) and positive correlation with DVD sales. In the theatrical market, theatrical advertising expenditure and number of screens has a high (over 0.5), positive correlation with theatrical sales. According to previous studies, this correlation is not surprising. Table 6 shows more detailed data about the relationship between screens and sales in both the theatrical and DVD market. It shows that an obviously diagonal trend appears between screens and sales in both the theatrical and DVD market. Going along with the increase in number of

screens, both theatrical sales and DVD sales appear to exceed $16 million.

Examining Table 5's correlation matrix of key variables, we found some interesting correlations among independent variables. That is, advertising expenditure in both the theatrical and DVD markets seemed to have a high correlation with the maximum number of screens. This is reasonable, as the number of screens reflects the intensity of a movie's distribution, and both distribution and advertising expenditure as marketing tools should perfectly match each other. High advertising lures potential audiences to the cinema and intensive distribution provides more convenient locations for audiences to watch movies. Table 7 illustrates the positive correlation in a more direct way. Along with the increase in the number of screens, total media expenditure goes up in both the theatrical and DVD markets. Especially in main mass media outlets such as network television, cable television, and newspapers, advertising expenditure increases dramatically when the number of screens reaches beyond 4000.

2. Modeling Approach

Our modeling approach consisted of three stages. First, we adopted linear regression modeling, which is he key method to explore the relationships between the different factors and sales in the theatrical and DVD markets respectively. Second, we estimated a median regression model to examine the conditional median of DVs associated with changes in the co-variants. We compared the linear regression model and median regression model since both of the models aim to capture the relationship between the

central location of the response and a set of co-variants, and in cases where the distribution is highly skewed, the mean can be challenging to interpret while the median remains highly informative. Third, we estimated multiple quantile regressions to capture how the entire distribution of DVD sales and theatrical sales changes with certain co-variants across quantiles. In the first and the second stages, samples were randomly divided into two groups: estimation group and forecast group. 70% of sample data was used to estimate the regression models and rest of sample data was used to forecast.

1) Linear Regression Model

In order to complete the first step of the model analysis, two linear regression equations were assumed for DVD sales and theatrical sales based on previous studies:

$$\begin{aligned}\log(\mathrm{DS}_i) = c_i &+ \beta_1 \times \mathrm{AWARD\_NOM}_i + \beta_2 \times \mathrm{SCREENS\_3000}_i + \beta_3 \times \mathrm{SEQUEL}_i + \beta_4 \\ &\times \log(\mathrm{ADV\_DVD}_i + 1) + \beta_5 \times \log(\mathrm{TIME}_i) + \beta_6 \times \mathrm{G\_ACT}_i + \beta_7 \\ &\times \mathrm{G\_ADV}_i + \beta_8 \times \mathrm{G\_COM}_i + \beta_9 \times \mathrm{G\_MUSIC}_i + \beta_{10} \times \mathrm{G\_HORR}_i + \beta_{11} \\ &\times \mathrm{G\_SUSP}_i + \beta_{12} \times \mathrm{G\_ROM\_COM}_i + \beta_{13} \times \log(\mathrm{REVIEW}_i) + \beta_{14} \\ &\times \mathrm{MPAA\_PG}_i + \beta_{15} \times \mathrm{MPAA\_PG\_13}_i + \beta_{16} \times \mathrm{MPAA\_R}_i + \beta_{17} \\ &\times \mathrm{MD\_JAN}_i + \beta_{18} \times \mathrm{MD\_FEB}_i + \beta_{19} \times \mathrm{MD\_MAR}_i + \beta_{20} \times \mathrm{MD\_APR}_i \\ &+ \beta_{21} \times \mathrm{MD\_MAY}_i + \beta_{22} \times \mathrm{MD\_JUNE}_i + \beta_{23} \times \mathrm{MD\_JULY}_i + \beta_{24} \\ &\times \mathrm{MD\_AUG}_i + \beta_{25} \times \mathrm{MD\_SEP}_i + \beta_{26} \times \mathrm{MD\_OCT}_i + \beta_{27} \times \mathrm{MD\_NOV}_i \\ &+ \beta_{28} \times \log(\mathrm{TSW1}_i + \mathrm{TSW2}_i + TSW3_i) + \varepsilon_i \end{aligned} \quad (1)$$

Where DS is the total DVD sales; c intercepts; AWARD_NOM is a dummy variable which takes one if the movies were nominated or won awards, zero otherwise; SCREEBS_3000 is a dummy variable which take one if the maximum number of screens is greater than 3000, zero otherwise; SEQUEL is a dummy variable which takes one if movie is sequel, zero otherwise; ADV_DVD is advertising expenditure in the DVD

market; TIME is the running time of a movie; G_ACT, G_ADV, G_COM, G_HORR, G_SUSP, G_MUSIC and G_ROM_COM are dummy variables respectively representing action, adventure, comedy, horror movie, suspense, musical movie and romantic comedy; REVIEW is the weighted average ratings provided on the Rotten Tomatoes website; MPAA_PG, MPAA_PG_13 and MPAA_R are dummy variables respectively representing PG, PG-13 and R ratings; MD_JAN, MD_FEB, MD_MAR, MD_APR, MD_MAY, MD_JUNE, MD_JULY, MD_AUG, MD_SEP, MD_OCT, and MD_NOV are dummy variables representing for the month of DVD release; TSW1 is the theatrical sales in the theatrical release week; TSW2 is the theatrical sales in the second week after the theatrical release week; TSW3 is the theatrical sales in the third week after the theatrical release week; ε is random error in DS for observation i.

$$\begin{aligned}\log(\mathrm{TS}_i) = c_i' &+ \alpha_1 \times \mathrm{AWARD\_NOM}_i + \alpha_2 \times \mathrm{SCREENS\_3000}_i + \alpha_3 \times \mathrm{SEQUEL}_i + \alpha_4 \\ &\times \log(\mathrm{ADV\_THE}_i + 1) + \alpha_5 \times \log(\mathrm{TIME}_i) + \alpha_6 \times \mathrm{G\_ACT}_i + \alpha_7 \\ &\times \mathrm{G\_ADV}_i + \alpha_8 \times \mathrm{G\_COM}_i + \alpha_9 \times \mathrm{G\_MUSIC}_i + \alpha_{10} \times \mathrm{G\_HORR}_i + \alpha_{11} \\ &\times \mathrm{G\_SUSP}_i + \alpha_{12} \times \mathrm{G\_ROM\_COM}_i + \alpha_{13} \times \log(\mathrm{REVIEW}_i) + \alpha_{14} \\ &\times \mathrm{MPAA\_PG}_i + \alpha_{15} \times \mathrm{MPAA\_PG\_13}_i + \alpha_{16} \times \mathrm{MPAA\_R}_i + \alpha_{17} \\ &\times \mathrm{MT\_JAN}_i + \alpha_{18} \times \mathrm{MT\_FEB}_i + \alpha_{19} \times \mathrm{MT\_MAR}_i + \alpha_{20} \times \mathrm{MT\_APR}_i \\ &+ \alpha_{21} \times \mathrm{MT\_MAY}_i + \alpha_{22} \times \mathrm{MT\_JUNE}_i + \alpha_{23} \times \mathrm{MT\_JULY}_i + \alpha_{24} \\ &\times \mathrm{MT\_AUG}_i + \alpha_{25} \times \mathrm{MT\_SEP}_i + \alpha_{26} \times \mathrm{MT\_OCT}_i + \alpha_{27} \times \mathrm{MT\_NOV}_i + \varepsilon_i' \end{aligned} \quad (2)$$

Where TS is the total theatrical sales; c' is intercept; ADV_THE is advertising expenditure in the theatrical market; MT_JAN, MT_FEB, MT_MAR, MT_APR, MT_MAY, MT_JUNE, MT_JULY, MT_AUG, MT_SEP, MT_OCT, and MT_NOV are dummy variables representing the month of theatrical release; ε' is random error in TS for observation i.

First, we tested three assumptions made in the linear regression model; independence; homoscedasticity; and normality. Independence, which refers to IVs that have no correlations with each other, was tested by confidence ellipses. If the estimates were independent, the ellipses would be exact circles. Shown in the DVD sales model (Figure 4), we found that in general, most of the ellipses were circles, except for three ellipses in the middle of Figure 4 for DVD sales model and fifty five ellipses in the right corner of Figure 4 for DVD sales model. The three ellipses indicate that there are some correlations among PG, PG-13 and R ratings and the fifty five ellipses indicate that there are some correlations among release months. For the theatrical sales model, it was quite similar to the DVD model. Since PG, PG-13 and R ratings are exclusive to each other as well as monthly releases. That means when ID variable PG takes one, then PG_13 and R are zero. Thus there is no problem to separate the effect of different MPAA ratings as well as the release of months. Homoscedasticity, which assumes that the conditional variance is constant for all values of the co-variants, was tested by residual plot of each IDs. From Figure 5, for each IDs, residual plots do not appear to be major differences in the variability of the residual for different IDs, thus homoscedasticity is not violated for either models. The normality assumption, which assumes that residual is normal distributed, is tested by residual histogram (See Figure 6) and Jarque-Bera statistic. The Jarque-Bera statistic has a distribution with two degrees of freedom under the null hypothesis of normally distributed errors. Shown in Figure 6, the histogram is almost bell-shaped and the Jarque-Bera statistic is not significant for both models (For DVD

sales model, $Jarque - Bera = 2.040, p = 0.3606$; for theatrical sales model,$Jarque - Bera = 1.211, p = 0.5459$), thus the residuals are normally distributed for both regression models. Therefore, since all assumptions are satisfied, the results of the two models are valid.

Shown in the DVD sales linear regression model (Table 8) and the theatrical sales linear regression model (Table 9), we found that both models generally fit the data substantially. In the DVD sales model, R-squared was as high as 0.7695, which means that 76.95% of variance is captured by the current factors. For the theatrical sales model, the case is same. R-squared was as high as 0.8238, which means that 82.38% of variance is captured by the current factors.

Forecasting evaluation is shown in Figure 7. We used the Theil Inequality Coefficient to evaluate our model. If the forecast is good, bias proportion (BP, hereafter) and variance proportion (VP, hereafter) should be small so that most of the bias should be concentrated on covariance proportions (CP, hereafter). In our model, we found that for DVD sales, BP and VP are much smaller than CP ($BP = 0.0276, VP = 0.2173, CP = 0.7551$), which indicates that the mean of the forecasts does a good job of tracking the mean of the DVs. For theatrical sales, most of the bias also was concentrated on CP, which is 0.7777 compared with BP, 0.0390 and VP, 0.1834. So the theatrical sales model also does a good forecasting job.

2) Median Regression Model (MRM)

In order to find the best way to capture the central location, that the median regression model, a special case of quantile regression, was used in the second step in our study.

Quantile regression was introduced by Koenker and Bassett (1978), which models conditional quantiles as functions of predictors, and is a natural extension of the linear regression model. While the linear regression model specifies the change in the conditional mean of DV associated with a change in the co-variants, the quantile regression model specifies changes in the conditional quantile. Since any quantile can be chosen, it is possible to model a more complicated response distribution of DV affected by IVs.

The median regression model is a special case of the quantile regression model in which the conditional 50^{th} quantile is modeled as a function of the co-variants. The median regression model provides a natural alternative to linear regression since it also attempts to model the central location of DV distribution, yet in a different way. The linear regression model uses the conditional mean, while the median regression model uses the conditional median. Based on data description, we found that DVD sales, theatrical sales and DVD advertising expenditure show great trends of right skewness. Thus, we examined median regression models for both the theatrical and the DVD market to capture the central location and compared them with the corresponding linear regression models as well.

The two median regression models were assumed to be identical to the linear

regression models, though the coefficient is estimated in a different way. In the linear regression models, least-squares estimation was used, in order to minimize the sum of the squared vertical distances between the data points and the fitted model. In the median regression model, the least-absolute distance estimation was used to minimize the weighted sum of the vertical absolute distances, where the weight was 0.5 for the points below and above the fitted line.

Tables 10 and 11 report the results of the DVD sales median regression model and the theatrical sales median regression model. Quality of fit in the median regression model was measured by Pseudo R-squared. Pseudo R-squared is similar to R-squared used in linear regression and it is defined as below:

$$\text{Pseudo R} - \text{squared} = 1 - \frac{\ln L(M_{intercept})}{\ln L\,(M_{full})}$$

Where M_{full} = model with predictors, $M_{intercept}$ = model without predictor, and L = estimated likelood.

The sum of the weighted distances were minimized for the full fitted model, and therefore Pseudo R-squared fell between zero and one, and the greater Pseudo R-squared is, the better the model fits the data. In the DVD sales median regression model, Pseudo R-squared was as high as 0.5350 and in theatrical sales model, it was as high as 0.6102.

Forecast evaluation is shown in the Figure 8. We found that for the DVD sales median regression model, BP and VP were still smaller parts and bias still concentrates on CP ($BP = 0.0195, VP = 0.2368, CP = 0.7437$). The trend was more obvious in the

theatrical sales median regression model, in which BP is 0.0093, VP is 0.0638 and CP is 0.9270. Thus both two median regression models are good in sales forecasting. While comparing the MAPE between the linear regression model and the median regression model, we found that the MAPEs of the two linear regression models were smaller than those of the two median regression models, which indicates that the two linear regression models are better for forecasting DVD sales and theatrical sales since the smaller the error, the better of the forecasting ability of the model.

The different results of the linear regression model and the median regression model may attribute to the right skewness of distribution of DVs and IVs. That is, the results of the linear regression model are more vulnerable to outliers. In this case, due to the right skewness, the outliers should be good performance movies. Thus we are curious about the different responses of DVD and theatrical sales associated with various drivers across quantiles.

3) Multiple Quantile Regressions (MQR)

We begin the third step: multiple quantile regression models. First we tested whether there is statistically significant among quantiles. EView 6 provides quantile slope equality test process. Table 12 presents Wald tests of equivalence of estimates across quantiles. The Wald test statistic shows that Chi-Sq. Statistic value of 108.0528 is statistically significant at conventional test levels. So we conclude that coefficients differ across quantile values and that the conditional quantiles are not identical.

Then, we examined the trends of changes of coefficients across quantiles in both the DVD sales multiple quantile regressions and the theatrical sales multiple quantile regressions by the quantile table. Shown in Table 13, the quantile tables provide coefficients and p-values for each quantile.

3. *Hypotheses Test and Discussion*

The hypotheses were tested by combining the results of the linear regression models and quantile regression models for both DVD sales and theatrical sales to find the significant differences between both markets.

H1 suggested that different genres should have different performances between the theatrical market and the video market. Furthermore, action, adventure, horror and suspense movies should have a stronger impact on the theatrical market than on the video sales market, while comedy and romantic comedy movies should have an opposite impact. This was partially supported by the results from the linear regression models, median regression models and multiple quantile regression models.

When looking at the results for each genre, we found in Tables 9 and 11 (the linear and median regressions) that the horror genre had a significant and positive impact on theatrical sales with the highest coefficients (in linear regression$\alpha_{horr} = 0.6201, p = 0.0005$; in median regression$\alpha_{horr} = 0.7561, p = 0.0071$), though this was not the case for DVD sales (see Tables 8 and 10). This was consistent with our hypothesis. In the

multiple quantile regression (Table 13), we found the effect of the horror genre to be positive and significant from the 40^{th} quantile to the 90^{th} quantile in the theatrical sales model. This was not apparent in the DVD model, which indicates that for middle and high performance movies, the horror genre positively impacts theatrical sales, but not DVD sales.

As for the action genre, we found that it has a significant impact on DVD sales ($\beta_{action} = 0.3311, p = 0.0494$), but not on theatrical sales in linear regression. When examining further, we found its trend through multiple quantile regressions. Shown in the DVD sales multiple quantile regression (Table 13) from the 20^{th} quantile to the 40^{th} quantile, we found the effect of the action genre to be almost significantly and positively related to DVD sales, while in the theatrical sales multiple quantile regression from the 80^{th} quantile to the 90^{th} quantile, the effect of the action genre is almost significantly and positively related to theatrical sales. It indicates that consumers prefer watching "high performance" action movies in theaters rather than by video and prefer watching "low or medium performance" action movies by video rather than in theaters. This is partially consistent with what we expected in our hypotheses and can be explained that for high performance action movies, consumer would like to obtain relatively higher service benefits offered by a theater, as compared with low or medium performance action movies.

Although the adventure genre did not seem significant in both the linear regression and median regression models (Table 13), in the theatrical sales multiple quantile

regression models (in the 90^{th} quantile), the effect of the adventure genre is somewhat significantly and positively related to the theatrical sales, though there is no significant effect on the DVD sales model across quantiles. Thus, similar to the action genre, it indicates that consumers prefer watching "high performance" adventure movies in theaters, not by DVD, which partially supports our hypothesis.

As with the adventure genre, the suspense genre was not found to be significant in both the linear regression and median regression models, but in the theatrical sales multiple quantile regression models (in the 90^{th} quantile), the effect is somewhat significantly and positively related to the theatrical sales, though there is no significant effect in the DVD sales model across quantiles. This indicates that consumers prefer watching "high performance" adventure movies in theaters, but not on DVD, which partially supports our hypothesis.

The comedy genre was found to have significant impacts on both DVD sales and theatrical sales in the linear regression model (For the DVD sales linear regression model, $\beta_{comedy} = 0.3656, p = 0.0052;$ for the theatrical sales linear regression model, $\alpha_{comdey} = 0.4312, p = 0.0016$). Shown in the DVD sales multiple quantile regressions (Table 13), the effect of the comedy genre was positive and significant or somewhat significant across wide quantiles including the 10^{th}, 20^{th}, 50^{th}, 60^{th}, 70^{th} quantiles. In the theatrical sales multiple quantile regressions, the effect of comedy genre was only positive and significant in the 80^{th} and 90^{th} quantile. This indicates that with regards to the comedy genre, consumers mostly prefer to watch by video, but for the very high

performance movies they would like to enjoy them with the better environment offered by theaters, since it is worth the price.

As for romantic comedies, in contrast to our expectation, it appeared to be a positive and significant relation to the theatrical sales in the linear regression model. However, when looking at the multiple quantile regressions in Table 13, we found that the effect of romantic comedies was positively and significantly related to DVD sales in the 70^{th} and 80^{th} quantiles and only somewhat significantly related to the theatrical sales in 80^{th} quantiles. This might indicate that it is more likely for consumers to watch movies by DVD than in theaters, though for "high performance" romantic comedy movies, consumer might choose both. In conclusion, H1 was partially supported.

H2 proposed that due to social risks, consumers prefer watching restrictive movies rated R and PG-13 on video rather than going to the theatre. Therefore, R and PG-13 ratings should have a much stronger impact on DVD sales than on theatrical sales. Since none of MPAA ratings are statistically significant in our results, our hypotheses are not supported. The possible reason might be that MPAA rating is guideline mainly for parents who decide which movie their children are allowed to see. Based on movie attendance study in 2007 released by MPAA organization, most of moviegoers are 25 and order, which accounts for around 72% of total moviegoers from 2005 to 2007 and obviously do not need this guideline. Meanwhile with age increasing, the moviegoers' sensitivity of adult content in the movie decreases. Thus MP-13 and R ratings might not evoke the significant embarrassment compared with other MPAA ratings, leading to insignificant

results.

H3 proposed the different effects of advertising expenditure and critical reviews in both theatrical and video markets. Advertising expenditure should be more powerful in the theatrical market because it is a key predictor for consumers to estimate a movie's quality, thus lowering their financial risks. Later on, critical reviews become more powerful, convincing consumers to watch a movie. Therefore, critical reviews should have a larger impact on the video market. In the DVD sales linear regression model, although both critical reviews and advertising expenditure were shown to have significant and positive relationships with DVD sales, the coefficient of critical reviews was much higher than those of advertising expenditure (for review, $\beta_{review} = 0.4117, p = 0.0411$; for Advertising expenditure, $\beta_{adv\_dvd} = 0.0456, p = 0.0164$). This means that changing one unit of critical reviews generates higher DVD sales than changing one unit of advertising expenditure, holding other variables constant. Meanwhile, in the theatrical sales linear regression model, the condition is reversed. Advertising expenditure in the theatrical market was shown to have a significant and positive relationship with theatrical sales ($\alpha_{adv\_the} = 0.9840, p = 0.0000$) but critical review did not ($\alpha_{review} = 0.3542, p = 0.0965$). Thus H3 is supported.

H4 suggested that higher seasonality should be shown in the theatrical market compared with the DVD market. In order to make the results more meaningful, we changed the DV from total DVD sales (DS) to the first week of DVD sales (DSW1) and total theatrical sales (TS) to the first week of theatrical sales (TSW1). Shown in the

theatrical sales linear regression model (Table 15), June as a release month was significantly positively related to theatrical sales compared with a release date in December (α_{mt_june}=0.7963, p=0.0210). Shown in the DVD sales linear regression model (Tables 14), no release month was statistically significant. The hypothesis is supported since there is significant difference among release months in the theatrical market, but not in the DVD market. However, shown in the multiple regression models (Table 13), we found that in the DVD sales model, the effects of the release months of June, July and August in higher quantiles were significantly or almost significantly negatively related to the first week of DVD sales, while in the theatrical sales model, the effects of the release months of November in higher quantiles was almost significantly and negatively related to the first week of theatrical sales. Therefore, the hypothesis is partial supported, as theatrical market does have seasonality. That is, the first week theatrical sales in June is significantly higher than those in other months and the first week theatrical sales of high performance movies in November is significantly lower than those in other months. In the DVD market, however, high performance movies had some kind of seasonality since DVD sales from June to August are significantly lower than those in other months in higher quantiles. The possible explanation is that during the summer months, people prefer outside activities such as seeing high performance movies in theaters, thus leading to the lower DVD sales from June to August.

H5 proposed that the number of screens would have a stronger impact on the theatrical market than on the DVD market. This is due to the fact that a larger number of

screens showing a movie in the theatrical market will mainly reduce consumers' acquisition and usage costs. This hypothesis is supported with the findings. We found that the number of screens had a significant and positive impact on the theatrical sales in both the linear regression models and median regression models (In linear regression, $\alpha_{\text{screens\_3000}} = 0.6904, p = 0.0000$; in median regression, $\alpha_{\text{screens\_3000}} = 0.6475, p = 0.0005$). Moreover, shown in Table 13, the significant and positive effect of the number of screens on the theatrical sales is across quantiles in the theatrical sales model. This further proves that the number of screens showing a movie is an important distribution strategy for the theatrical market. Meanwhile, in the DVD sales linear regression models, median regression models and multiple quantile regressions, the number of screens is positive, but does not significantly impact DVD sales.

H6 proposed that award nominations or wins would have a stronger impact on the video market than on the theatrical market since most movies' peak running periods are passed before nominations are announced. This is supported by our findings. We found that awards or nominations have a significant and positive impact on DVD sales ($\beta_{\text{award\_nom}} = 0.3683, p = 0.0030$), but not on theatrical sales. When further examining the multiple quantile regressions shown in Table 13, although winning awards or being nominated had significant and positive impacts on DVD sales from the 60^{th} quantile to the 90^{th} quantile, we also found that it had positive and significant effects on theatrical sales in the 80^{th} and 90^{th} quantiles. This might suggest that award nominations or wins do not necessarily affect all movies in the theatrical market, but makes the successful movies

much stronger in theatrical sales performance.

Table 18 summarizes the entire tested hypothesis.

Moving on, we found that the first three weeks of theatrical sales were the key predictor to forecasting video sales. Shown in the DVD sales linear regression model (Table 8), the first three weeks of theatrical sales are the most significant predictor positively affecting DVD sales ($\beta_{tsw1+tsw2+tsw3} = 0.3229, p = 0.0000$). When we use only the first three weeks of theatrical sales to predict DVD sales, R-squared is still as high as 0.5505, which means 55.05% of variance is captured only by the first three weeks of theatrical sales. Moreover, shown in Table 13, the effects of the first three weeks of theatrical sales are significantly and positively related to DVD sales across quantiles. All of them provide convincing support that movies with strong openings in theaters also perform well in the video market (Lehmann and Weinberg 2000).

With regards to the theatrical market, we found that the number of screens and advertising expenditure are the most important drivers. Shown in Table 9's theatrical sales linear regression model, advertising expenditure is the most significant indicator positively affecting theatrical sales ($\alpha_{ad} = 0.9840, p = 0.0000$), followed by the number of screens ($\alpha_{screens} = 0.6904, p = 0.0000$). When we use only these two factors to predict theatrical sales, R-squared is still high at 0.7423, which means 74.23% of variance is captured only by the number of screens and advertising expenditure. In the multiple quantile regressions shown in Table 13, the effect of the number of screens is significantly positively related to theatrical sales across quantiles, as well as the effects of

advertising expenditure. All of the models support the importance of the number of screens and advertising expenditure in the theatrical market.

Meanwhile, we did further study on media expenditure in both the DVD market and the theatrical market. In order to compare the effects of various media on both markets, we replaced total advertising expenditure by advertising expenditure of the top eight media outlets out of total of sixteen for each market in its regression model. Shown in Table 19's advertising expenditure by media, we found that in the DVD sales model, advertising expenditure in network television and national spot radio are significantly and positively related to DVD sales ($\beta_{network\ tv} = 0.0684, p = 0.0104$; $\beta_{national\ spot\ radio} = 0.0401, p = 0.0471$), and that in the theatrical market, advertising expenditure in network television, syndication and Spanish language network television are significantly and positively related to theatrical sales ($\alpha_{network\ tv} = 0.0736, p = 0.0182$; $\alpha_{syndication} = 0.0651, p = 0.0228$; $\alpha_{spanish\ langague\ network\ tv} = 0.0745, p = 0.0008$).

In addition, we examined the effects of advertising expenditure during the release week and the fifth to the first week prior to the release date to test the best advertisement schedule. That is, weekly advertising expenditure during the release week and the five weeks prior to the release date were used to replace the total advertising expenditure. Shown in Table 20's advertising expenditure by time, we found that in the DVD market, advertising expenditure during the first week prior to the release date is significantly positively related to DVD sales ($\beta_{the\ first\ week} = 0.1032, p = 0.0253$). This is not

surprising, as most movies are released on Tuesdays in the DVD market and the previous week's advertisement should have the strongest power to attract audiences' attentions. Meanwhile, in the theatrical market, advertising expenditure during the release week is significantly positively related to theatrical sales ($\alpha_{the\ first\ week} = 0.5817, p = 0.0180$). This is reasonable as well, as most movies are released on Fridays in the theatrical market and the whole week's advertisements should have the strongest power to increase theatrical performance. Also advertising expenditure in the third week prior to the release date is almost significantly and positively related to theatrical sales. This might contribute to the advertising effects on increasing the awareness of the new movie.

V. IMPLICATIONS AND CONCLUSION

The video market is an important market, which accounted for 49% of domestic consumer movie spending in 2007 and continued to be the largest segment of consumer movie spending based on the 2008 Annual Report on the Home Entertainment Industry released by the Entertainment Merchants Association (EMA). However, there are not enough studies exploring this field compared with those concerned with the theatrical market. Our study sheds light on the video retail sales market, while further assessing the differential impact of drivers in both the video purchasing and theatrical market and how they might operate jointly to lead to more successful motion picture performance.

Our first set of results shows that different drivers have different impacts on DVD

market and the theatrical market. In DVD market, the first three weeks of theatrical sales are the key predictor to forecast video sales. Shown in the linear regression and median regression models, it is the most significant indictor positively affecting DVD sales, which capture 55.05% of variance without adding other co-variants. In the theatrical market, meanwhile, the number of screens and advertising expenditure provide a powerful mix, which captures 74.23% of variance without adding other co-variants. It might suggest that managers of video stores could control DVD stock by using the first three weeks of theatrical sales to forecast the DVD sales. Furthermore, for studios, wide distribution by increased number of screens and heavy advertising campaigns during a movie launching is definitely necessary for movie success.

Our second set of results shows that theatrical performance is more influenced by "signaling" factors, while DVD performance is more influenced by "reputation" factors. Since we found that variables that are significant in DVD sales model are mostly reputation factors (e.g. critical reviews and awards or nominations) and those in the theatrical sales model are mostly signaling factors (e.g. advertising expenditure and the number of screens). To empirically examine the underlying structure of these variables, we run the factor analysis (Table 21) and the factor analysis result confirms our conjecture. This suggests that in the context of a limited budget, studios should pay more attention to signaling factors in the theatrical market (e.g. using intensive advertising campaigns and wide distribution strategy). In the video market, however, it is most important to build up reputation factors (e.g. controlling damage and promoting positive

reviews).

Our third set of results shows that in the DVD market, there is some sort of seasonality. Contradictory to the theatrical market, DVD sales from June to August are significantly lower than those in other months for high performance movies. This suggests that it might be wise to avoid launching new videos or promote DVD sales in the summer months. In the theatrical market, however, June and December seem to be a peak season as mentioned in previous studies and it should be a good opportunity to launch new movies. On the contrary, November seems to be off peak and therefore it might be wise to avoid launching new movies during this period.

Our fourth set of results focused on detailed media scheduling. In our sample data, the total weekly advertising expenditure from the fifth week prior to a release date up until the release week is increasing in both markets, though the advertising strategy is not same. Shown in Table 21 advertising expenditure by time and percentage, advertising expenditure in the DVD market focuses mainly on the first week prior to a movie's release date and the release week, which accounts for approximately 90% of total media expenditure. In the theatrical market, advertising expenditure spreads from the third week prior to a movie's release date and the release week, which accounts for approximately 93% of total media. In our study, our findings support this media strategy in practice. We found that in the DVD market, the first week before the release date is more powerful. This suggests that studios should concentrate its money on that week in the context of limited budgets. Meanwhile, in the theatrical market, the situation is opposite.

Advertising expenditure in the release week and the third week before a movie's release date is more efficient than the other previous weeks. This indicates that in the theatrical market, advertising expenditure should be spread from the third week before a movie's release date to the release week. A possible reason for this is that in the theatrical market, advertising in previous weeks before a release aims to increase the awareness of new movie, while later the goal of advertising transfers to persuading customers to watch the movie. Meanwhile in the DVD market, since the awareness of the movie was built up in the theatrical market, the only goal of advertising is to lure customers to watch the movie. Therefore, advertising should concentrate more on the first week before a movie's release date.

VI. Limitation and Further Research

There are some limitations in our study, which can be improved with further study.

The first obvious limitation is the representative issue of our sample. Because of the constraint in data availability, the movies included in our sample are from Top 30 video charts listed at www.the-numbers.com between August 2006 and April 2008, which means that the sample movies should be relatively successful compared to all movies released from 2006 to 2008. Although we examined the selected films to avoid sampling only successful films, the difference found between the DVD market and the theatrical market might be more applicable for relatively high performance movies, rather than all

kind of movies.

In addition, our sample does not include those movies whose theatrical performances are not satisfactory and thus are not introduced into the video market. This may raise the sample selection issue mentioned by Heckman (1979). The DVD sales in our model are based on the specific sampling rule that DVD sales are observed only when the theatrical performance is greater than a satisfied benchmark before the movie is released in the video market. In further research, this sample selection bias should be corrected. The parameters of the model should be estimated by Heckman's (1979) two-step estimation procedure and maximum likelihood.

The second limitation is that only two markets, the theatrical market and the DVD market, are examined in our study. We do not consider other markets such as pay television, network television, syndication and so forth. Meanwhile, we assume that other markets do not impact the theatrical or DVD markets. But in reality, the impacts occur through different pattern of cannibalization across markets. Even in the video market, we do not consider the video rental market, which account for 34.1% of total domestic consumer spending on videos based on the 2008 Annual Report on the Home Entertainment Industry released by the Entertainment Merchants Association (EMA). In the further studies, more channels and the interaction among channels should be considered.

The third limitation is that only the U.S. market is considered in our sample. We do not take worldwide markets into consideration. In future research, it would be interesting

to determine the effects of the five dimensions of national culture on both video and theatrical markets.

The fourth limitation is that not all factors discussed in literature are present in our study. For example, star power and production budget might be seen as signal drivers of a movie and might have a more significant effect on the theatrical market than on the video market. Intense competition during peak season might dilate the affect of seasonality. Science fiction movies might have more of an impact on the theatrical market since special effects should be more enhanced in theaters, while children's movies might have more of an impact on the video market because children never tire from watching the same film over and over. Meanwhile, other interesting topics associated with discussed factors in this study can be explored in the future. For example, individuals might determine whether they will watch the movie in theatres or on DVD or both based on different genres, and these people might have something in common. Sequels can be further divided based on whether the story is continued (e.g. movie "Back to Future") or independent (e.g. movie "007") of the previous movie. Continued sequels might have more of an impact on both the theatrical and the video market than independent sequels, since the former might easily arouse curiosity of customers.

The fifth limitation is the measurement of seasonality used in our study. In our study, monthly units are measured for seasonality in both the theatrical and DVD markets. However, in the U.S. calendar, almost every month has at least one holiday. Therefore, using monthly unit measurement might not capture the significant sales changes in the

theatrical and DVD markets. To better capture the seasonality, weekly units as measurement might be better than monthly units. Another reason for using weekly units is that holidays in the U.S. fall primarily on Mondays. The long weekend effects might change people's consumption behavior on Sunday, compared with short weekend, which might boom both theatrical and DVD sales on Sunday or increase the difference between both markets. Therefore, weekly unit measurement might be better to capture the holidays' effect on the DVD market and the theatrical market.

The sixth limitation is that in our model, we do not consider the interaction relationships among independent variables. However, it might have some interactions among them. For example, advertising might enhance the effects of action and adventure movies since the traits of those movie genres make them relatively easier to highlight and attract viewers. Thus more advertising spent on action movies or adventure movies, the more powerful the effects of those types of movies have on the theatrical or DVD market as compared with other genres. The same case can be applied for the driver, award nominations or wins. Winning awards should be a big appeal for people to see the movie and can be effectively promoted through advertising. Therefore, more advertising for a movie with this appeal, the more powerful the effects of award nominations or wins have on the theatrical or DVD markets.

REFERENCES:

Academy Awards, Retrieved March 11, 2009, from Wikipedia, the free encyclopedia Web site: http://en.wikipedia.org/wiki/Academy_Award#Ceremony

Basuroy, Suman and Chatterjee, Subimal, and Ravid, Abraham S. (2003), "How Critical Are Critical Reviews? The Box Office Effects of Film Critics, Star Power, and Budgets", Journal of Marketing; Oct2003, Vol. 67 Issue 4, p103-117, 15p, 8

Eliashberg, Jehoshua; Elberse, Anita; Leenders, Mark A. (2006), "The Motion Picture Industry: Critical Issues in Practice, Current Research, and New Research Directions", Marketing Science, 25(6), 638-661.

----------; Jonker, Jedid-Jah; Sawhney, Mohanbir S.; Wierenga, Berend (2000), "MOVIEMOD: An implementable decision-support system for prerelease market evaluation of motion pictures", Marketing Science, 19(3), 226-243.

Heckman, James J. (1979), "Sample selection bias as a specification error", Econometrica (pre-1986), Jan 1979;47,1 153

Hennig-Thurau, Thorsten; Walsh, Gianfranco; Wruck, Oliver (2001), "An Investigation into the Factors Determining the Success of Service Innovations: The Case of Motion Pictures", Academy of Marketing Science Review, 2001, 1.

Hirschman, Elizabeth C. and Holbrook, Morris B. (1982), "Hedonic consumption: emerging concepts, methods and propositions", Journal of Marketing, 46 (Summer), 92-101.

Koenker, Roger and Gilbert Bassett. (1978), "Regression Quantiles." Econometrica.

January, 46:1, pp. 33–50.

Kotler, Philip and Keller, Kevin Lane, "Marketing management", Prentice-Hall: 2006, chapter 6 pp206

Krider, Robert E. and Weinberg, Charles B. (1998), "Competitive dynamics and the introduction of new products: the motion picture timing game", Journal of Marketing Research, 35 (February), 1-15.

Lehmann, Donald R, Weinberg, Charles B. (2000), "Sale through sequential distribution channels: An application to movies and videos", Journal of Marketing, 64(3), 18-33.

Litman, Barry R. and Ahn, Hoekyun (1998), "Predicting Financial Success of Motion Pictures," in The Motion Picture Mega-Industry, Barry R. Litman, ed. Needham Heights, MA: Allyn Bacon, 172–97.

--------- and Kohl, Linda S. (1989), "Predicting financing success of motion pictures: the '80s experience", Journal of Media Economics, 2, 35-50.

Litman, Barry R.(1983), "Predicting success of theatrical movies: an empirical study", Journal of Popular Culture, 16, 159-175.

MPAA (2007), "The 2007 Theatrical Market Statistics Report", [www.mpaa.org].

Neelamegham, Ramya and Chintagunta, Pradeep (1999), "A Bayesian model to forecast new product performance in domestic and international markets", Marketing Science, 18(2), 115-136.

Prag, Jay and Casavant, James (1994), "An empirical study of the determinants of

revenues and marketing expenditures in the motion picture industry", Journal of Cultural Economics, 18, 217-235.

Prosser, Elise K. (2002), "How early can video revenues be accurated predicted?" , Journal of Advertising Research, 42 (March/April), 47-55.

Radas, Sonja; Shugan, Steven M. (1998), "Seasonal marketing and timing new product introductions", Journal of Marketing Research, 35(3), 296-315.

Ravid, Abraham B. (1999), "Information, blockbusters, and stars: A Study of the film industry", The Journal of Business, 72(4), 463-492.

Richins, Marsha L. (1983), "Negative Word-of-Mouth by Dissatisfied Customers: A Pilot Study", Journal of Marketing, Winter83, Vol. 47 Issue 1, p68-78

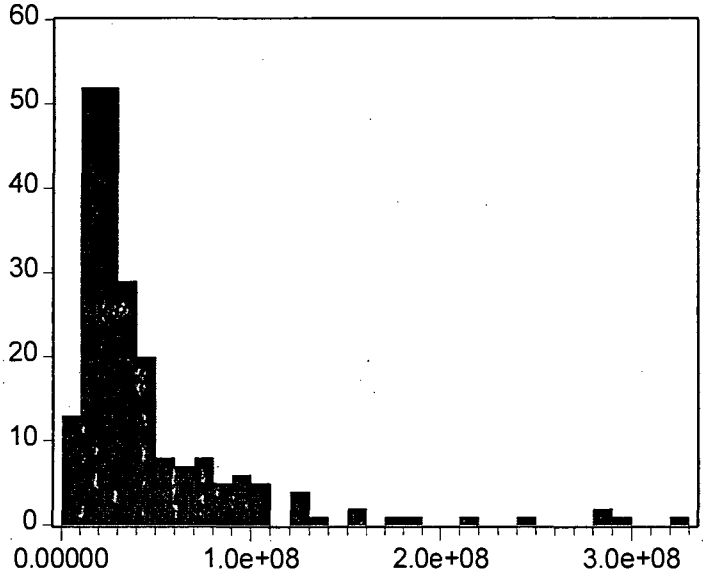
Sawhney, Mohanbir S.; Eliashberg, Jehoshua (1996), "A Parsimonious Model for Forecasting Gross Box-Office Revenues of Motion Pictures", Marketing Science, Vol. 15, No. 2 (1996), pp. 113-131

Sochay, Scott (1994), "Predicting the performances of motion pictures", Journal of Media Economics, 7 (4), 1-20.

Zufryden, Fred S. (1996), "linking advertising on box office performance of new film releases: a marketing planning model", Journal of Advertising Research 36, 4 (1996), 29-41.

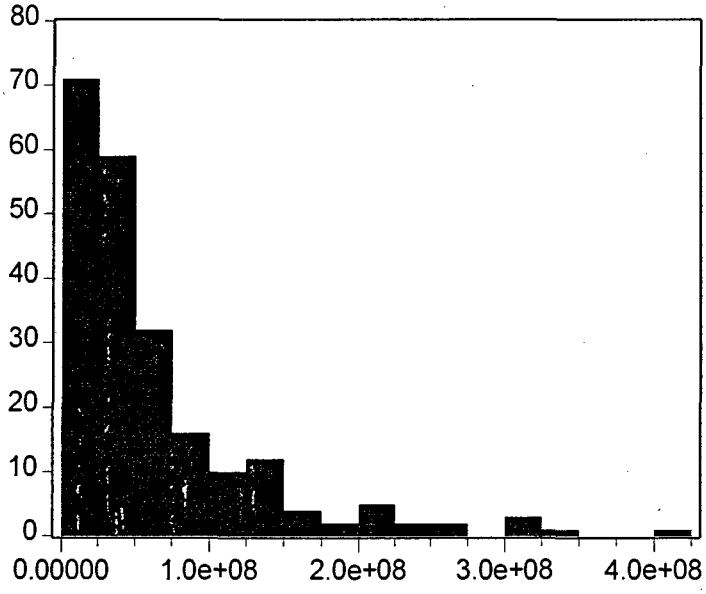
Figure 1 Histogram of DVD sales (DS) and theatrical sales (TS)

For DVD sales



Series: DS	
Sample 1 220	
Observations 220	
Mean	45486636
Median	27867004
Maximum	3.26e+08
Minimum	3076835.
Std. Dev.	50319905
Skewness	3.065823
Kurtosis	14.14279
Jarque-Bera	1482.789
Probability	0.000000

For theatrical sales



Series: TS	
Sample 1 220	
Observations 220	
Mean	64042036
Median	39253635
Maximum	4.23e+08
Minimum	3005605.
Std. Dev.	68605987
Skewness	2.268686
Kurtosis	8.952820
Jarque-Bera	513.5516
Probability	0.000000

Figure 2 Box plot of theatrical sales (TS) and DVD sales (DS)

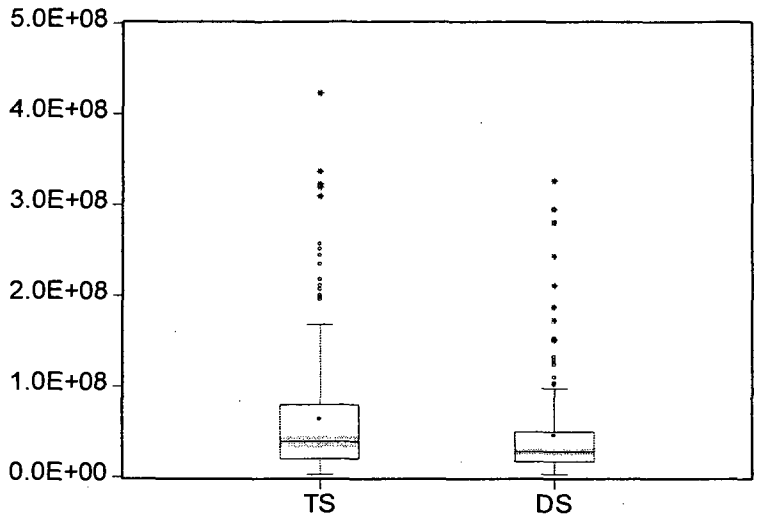


Figure 3 Box plot of advertising expenditure in DVD market (ADV_DVD)

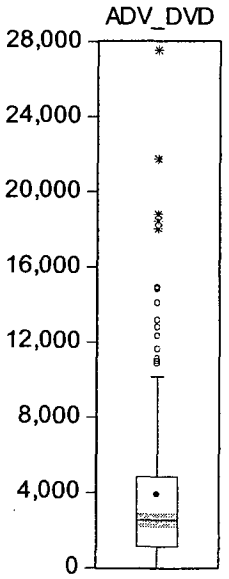


Figure 4 Confidence ellipses figure for DVD sales and theatrical sales linear regression model

For DVD sales model

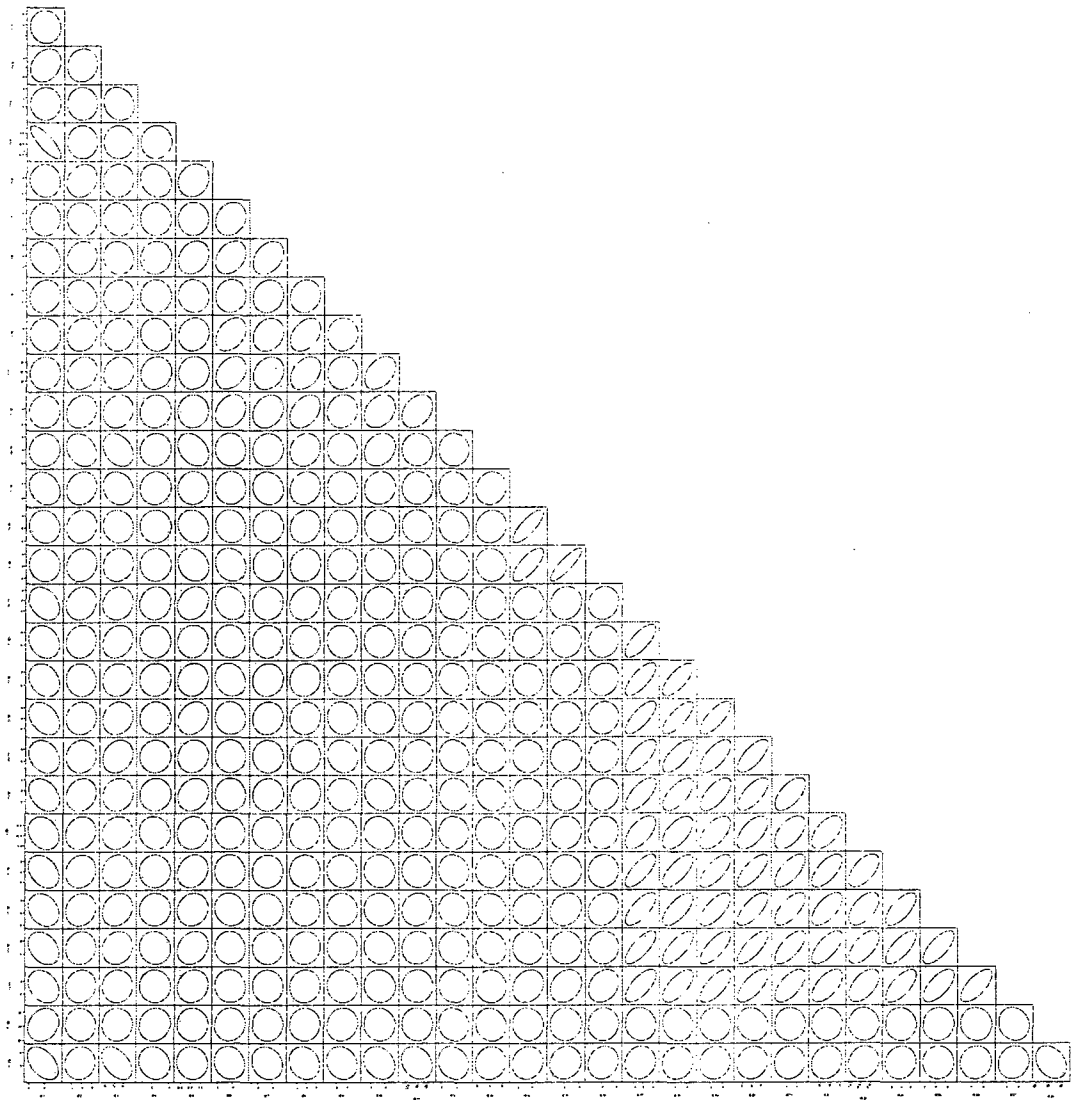


Figure 4 (continued) Confidence ellipses figure for DVD sales and theatrical sales linear regression model

For the theatrical sales model

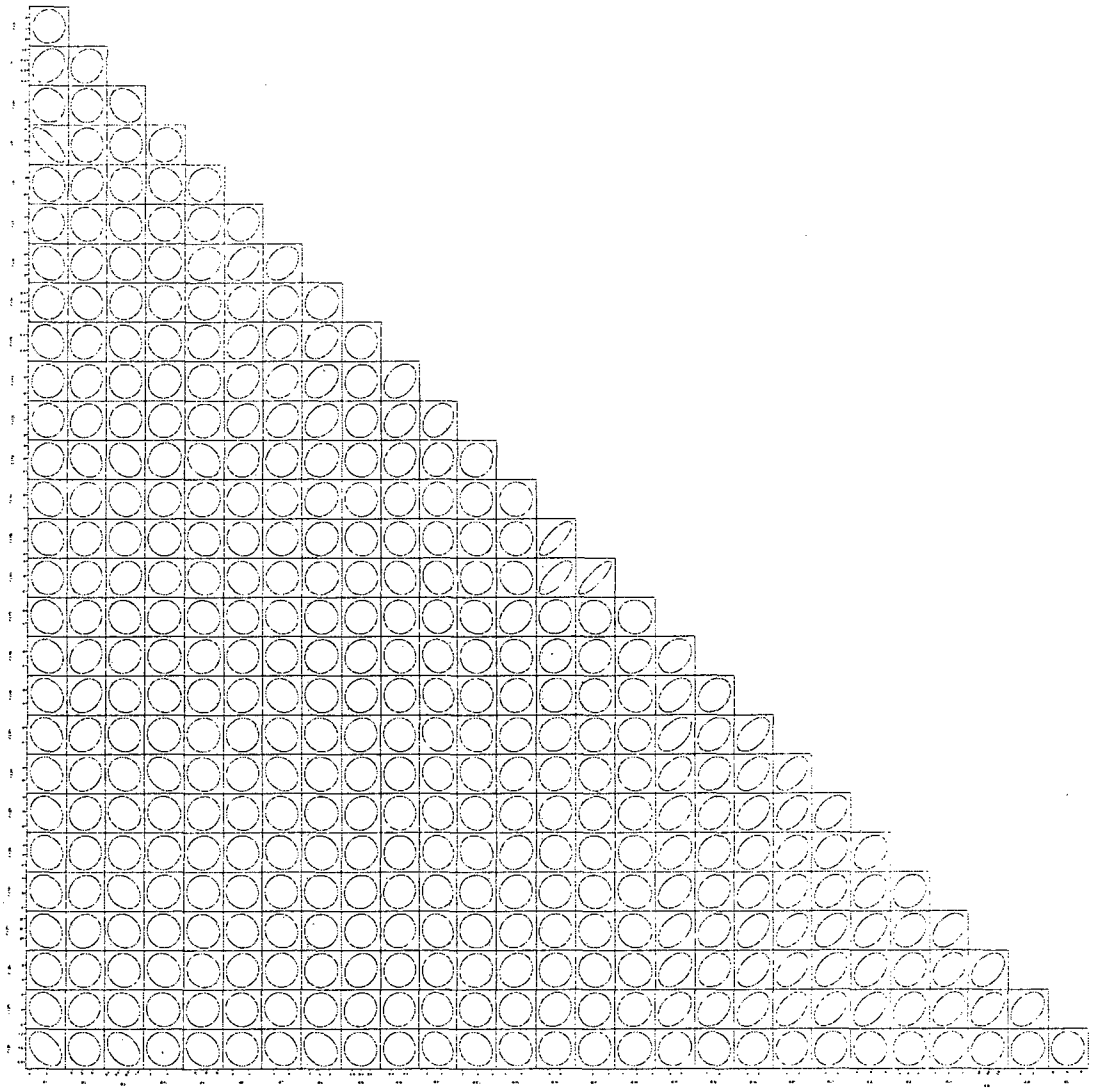


Figure 5 Homoscedasticity assumption tests of main IVs

For DVD sales linear regression model

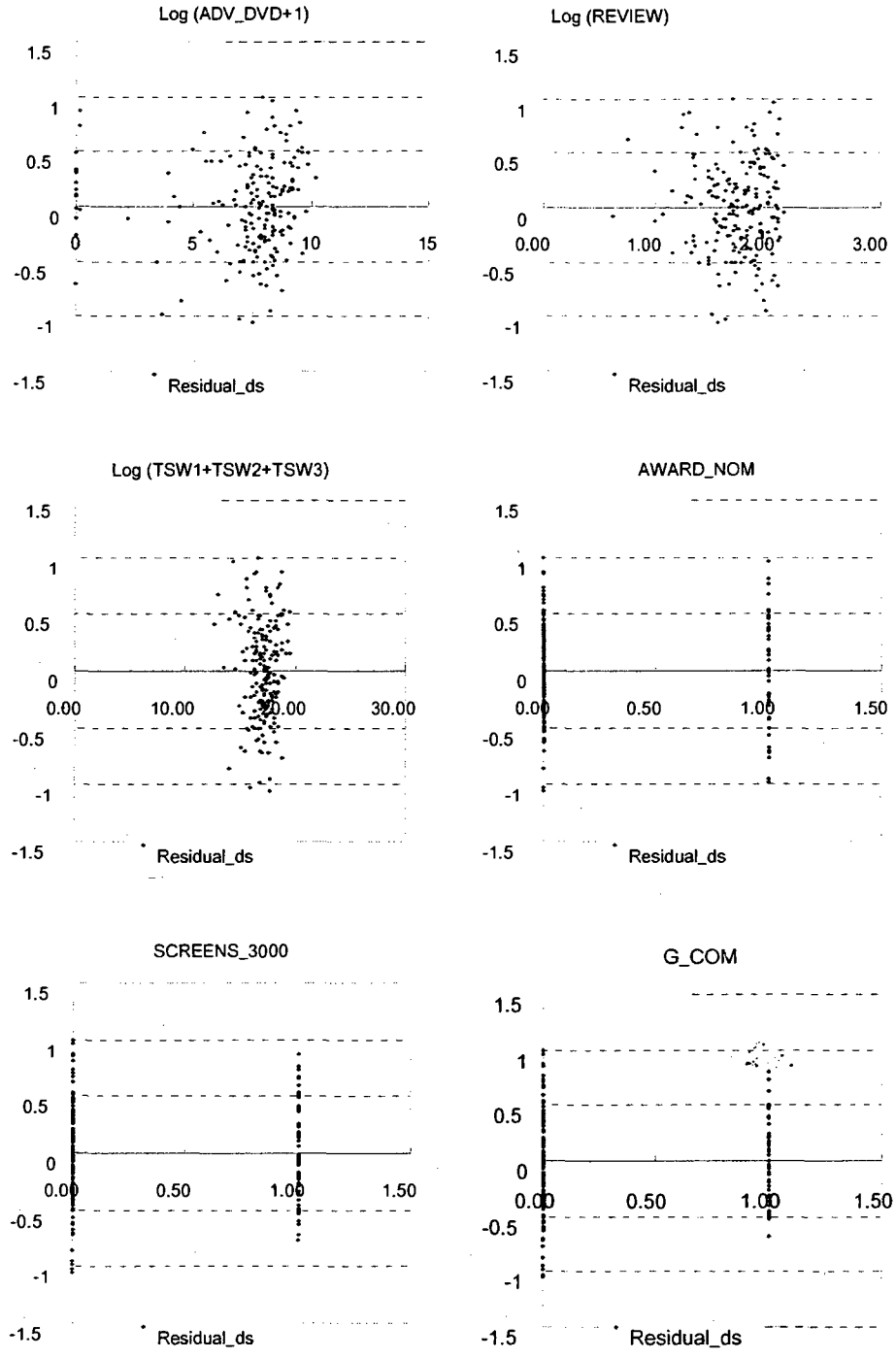


Figure 5 (continued) Homoscedasticity assumption tests of main IVs

For theatrical sales linear regression model

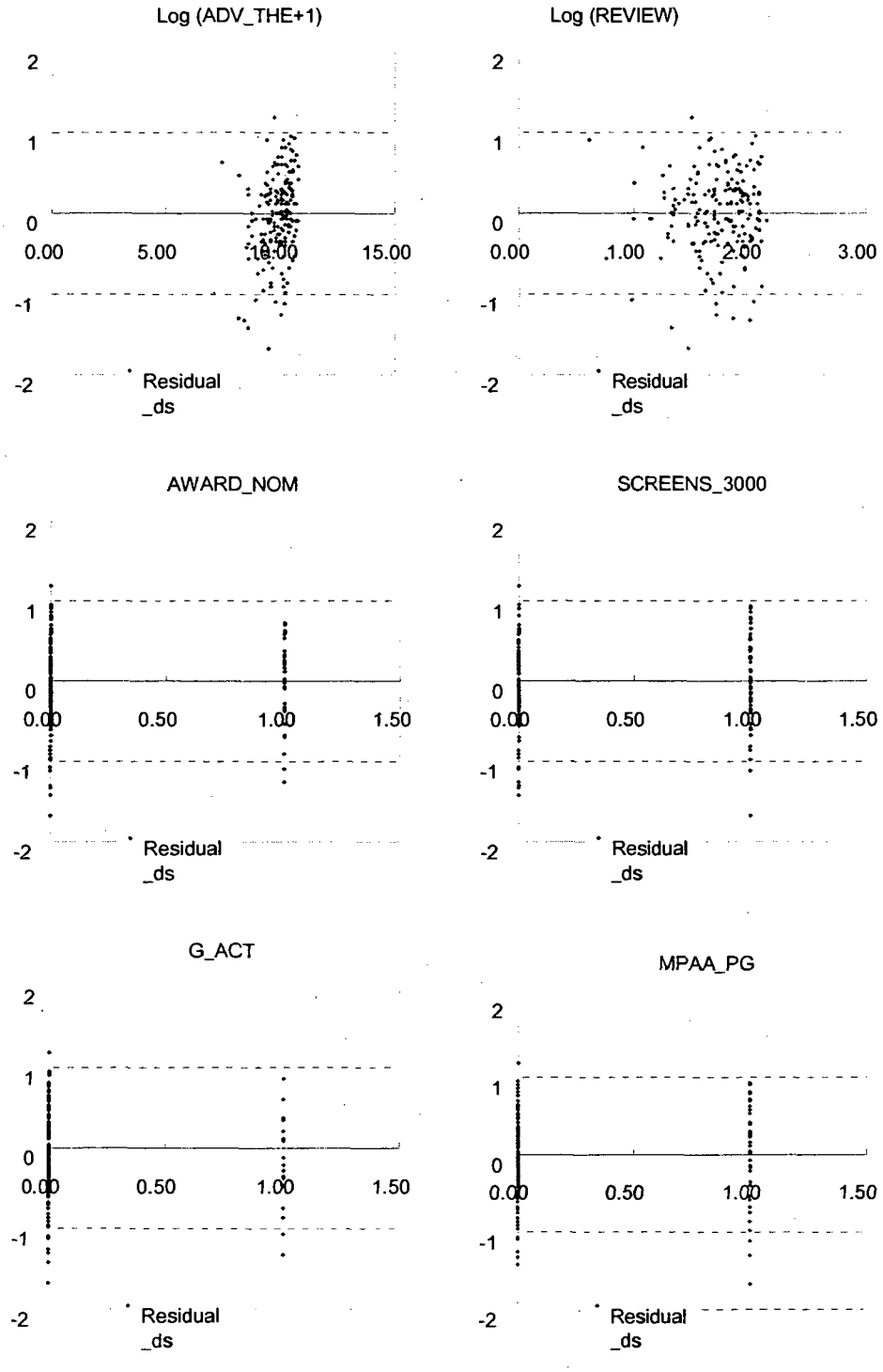
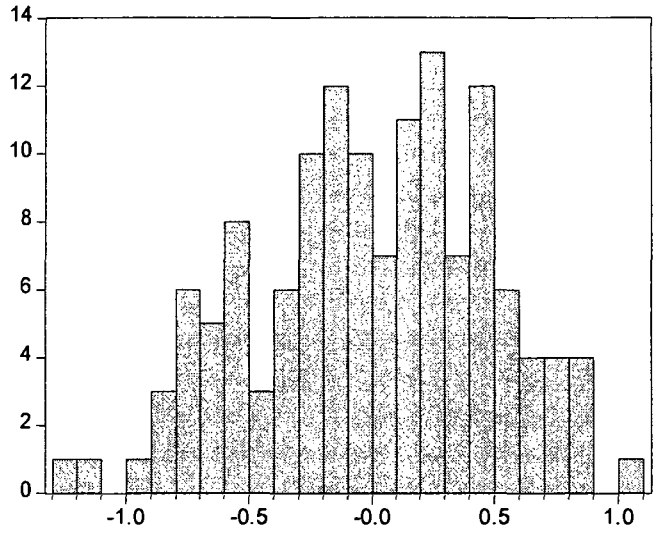


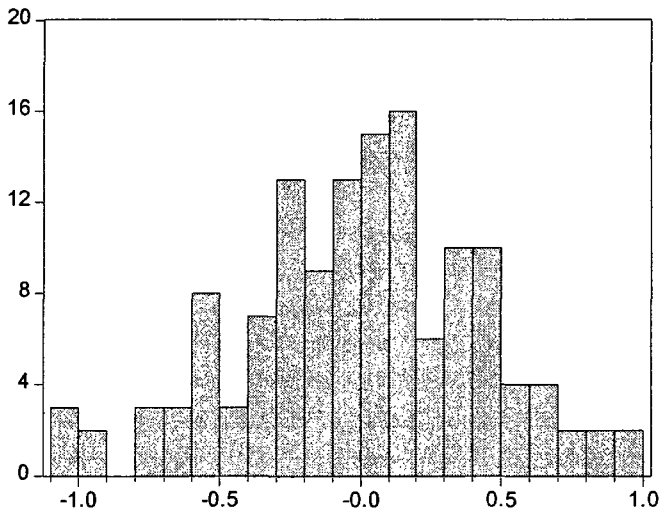
Figure 6 Normality assumption test for DVD sales and theatrical sales linear regression model

DVD sales residuals



Series: Residuals	
Sample 1 220 IF RN>0.3	
Observations 135	
Mean	-6.46e-16
Median	0.002863
Maximum	1.092262
Minimum	-1.256563
Std. Dev.	0.475806
Skewness	-0.202953
Kurtosis	2.555174
Jarque-Bera	2.039795
Probability	0.360632

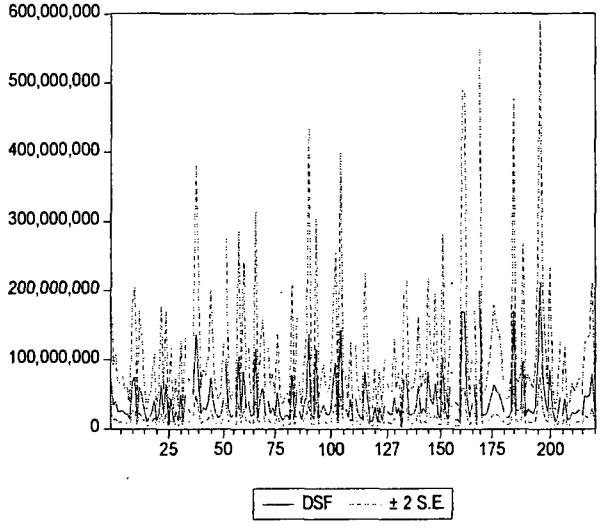
Theatrical sales residuals



Series: Residuals	
Sample 1 220 IF RN>0.3	
Observations 135	
Mean	-8.88e-16
Median	0.031649
Maximum	0.963381
Minimum	-1.094889
Std. Dev.	0.423273
Skewness	-0.231959
Kurtosis	2.999099
Jarque-Bera	1.210616
Probability	0.545906

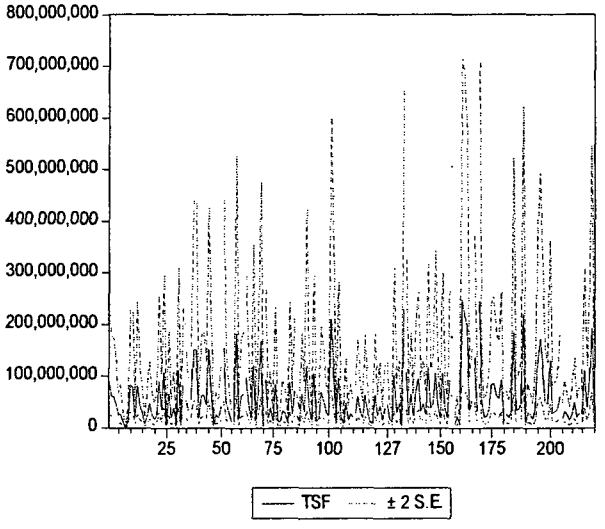
Figure 7 DVD sales and theatrical sales forecast graph in linear regression model

For DVD sales



Forecast: DSF	
Actual: DS	
Forecast sample: 1 220	
Adjusted sample: 1 220	
Included observations: 199	
Root Mean Squared Error	30114546
Mean Absolute Error	15626306
Mean Abs. Percent Error	36.14556
Theil Inequality Coefficient	0.248999
Bias Proportion	0.027590
Variance Proportion	0.217314
Covariance Proportion	0.755096

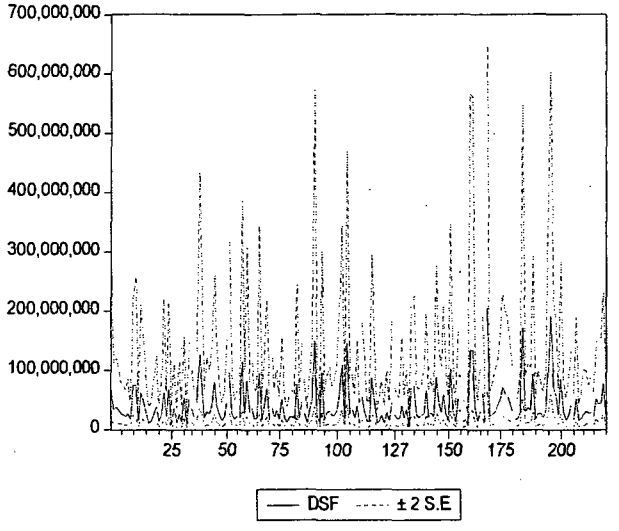
For theatrical sales



Forecast: TSF	
Actual: TS	
Forecast sample: 1 220	
Adjusted sample: 1 220	
Included observations: 200	
Root Mean Squared Error	37030287
Mean Absolute Error	20857718
Mean Abs. Percent Error	38.25920
Theil Inequality Coefficient	0.217237
Bias Proportion	0.038958
Variance Proportion	0.183351
Covariance Proportion	0.777690

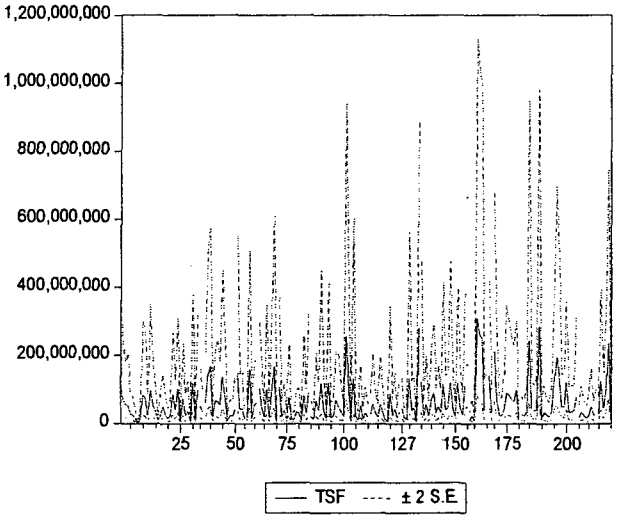
Figure 8 DVD sales and theatrical sales forecast graph in median regression model

For DVD sales



Forecast: DSF	
Actual: DS	
Forecast sample: 1 220	
Adjusted sample: 1 220	
Included observations: 199	
Root Mean Squared Error	32238776
Mean Absolute Error	15662741
Mean Abs. Percent Error	37.00620
Theil Inequality Coefficient	0.268075
Bias Proportion	0.019489
Variance Proportion	0.236790
Covariance Proportion	0.743721

For theatrical sales



Forecast: TSF	
Actual: TS	
Forecast sample: 1 220	
Adjusted sample: 1 220	
Included observations: 200	
Root Mean Squared Error	35481054
Mean Absolute Error	19422474
Mean Abs. Percent Error	40.03743
Theil Inequality Coefficient	0.199305
Bias Proportion	0.009267
Variance Proportion	0.063815
Covariance Proportion	0.926918

Table 1 The summary of drivers in previous studies

Groups	Drivers	Results of previous studies		paper
		The theatrical market	DVD market	
Movie charact eristics	Star power	1.Star power has positive and statistically significant influence on movie success 2. Star power moderates the relationship between critics review and box office revenue.		Litman and Kohl (1989), Sawhney and Eliashberg (1996), Sochay (1994), Neelamegham and Chintagunta (1999), Prag and Casavant (1994), Basuroy, Chatterjee and Ravid (2003)
	Sequel	Sequel has a positive impact on movie success	Sequel has a significant impact on video sales revenues	Prag and Casavant (1994), Sawhney and Eliashberg (1996), Hennig-Thurau, Walsh and wruck (2001), Ravid (1999)
	Genre	1. Comedy and action genres provide the most significant predictor of intention to watch a movie. 2. Science fiction and horror movie have significantly positive impact on motion picture performance 3. Horror movie has no longer significant related to movie performance and drama is negatively associated with theatrical performance. 4. Only comedy has significant impact on theatrical performance.	Genre impacts video rental and sell-through revenues	Zufryden (1996), Litman (1983), Litman and Kohl (1989), Prag and Casavant (1994), sochay (1994), Prosser (2002)

Groups	Drivers	Results of previous studies		paper
		theatrical market	DVD market	
Movie characteristics	Production budget	1. Production budget is positively related to box office performance. 2. Although big budgets are correlated with higher revenue, they are not correlated with returns. 3. Production budget moderate the relationship between box office revenues and critical reviews.	A movie's budget has a significant impact on video sales revenues	Litman (1983), Litman and Kohl (1989), Prag and Casavant (1994), Litman and Ahn (1998), Ravid (1999), Basuroy, Chatterjee and Ravid (2003), Ravid (1999)
	MPAA ratings	1. R and MP-13 rated movies do not perform better compared with other ratings at theatrical performance.	Both G-rating and PG-rating have a significant impact on video sales revenues.	Sawhney and Eliashberg (1996), Prag and Casavant (1994), sochay (1994)
Post-filming marketing actions	Advertising expenditure	1.The positive relationship between advertising expenditure and theatrical performance 2. The correlations between advertising expenditure and production cost, advertising expenditure and genre, advertising expenditure and star power	1. Advertising improves sales in the video rental market. 2. Advertising intensity impacts video rental and sell-through revenues.	Litman (1983), Sawhney and Eliashberg (1996), Lehamnn and Weinberg (2000), Prag and Casavant (1994), Prosser (2002)
	The number of screens	1. The number of screens is associated with movie revenue. 2. The correlation between the number of screens and advertising.	1. The number of screens does not work on video rental market. 2. The number of theater screens impacts video rental and sell-through revenues.	Neelamegham and Chintagunta (1999), Sochay (1994), Sawhney and Eliashberg (1996), Prosser (2002), Lehmann and weinberg (2000)

Groups	Drivers	Results of previous studies		paper
		theatrical market	DVD market	
Post-filming marketing actions	timing	Movies released during the summer or holidays have significantly high box office sales		Krider and Weinberg (1998), Litman (1983) and Sochay (1994)
Non-studio factors	Critical reviews	1. Positive reviews enhance cumulative box office performance. 2. The negative influence of negative reviews overweighs the positive influence of positive reviews during the opening week.	Critics ranking impacts video rental and sell-through revenues.	Sawhney and Eliashberg (1996), Basuroy, Chatterjee and Ravid (2003), Prosser (2002)
	Awards or nomination	1. Academy Award nominations or winnings are significantly related to revenues. 2. The correlations between advertising and award.		Litman (1983), Prag and Casavant (1994)

Table 2 The difference of customer value between theatrical and DVD market

		Comparison between theatrical and DVD market
Customer benefits	Product benefits	See a film in theater = see a film in video
	Service benefits	See a film in theater > see a film in video
	Personal benefits	Based on personal expectations
	Image benefits	See a film in theater > see a film in video
Customer costs	Purchase price	See a film in theater > see a film in video
	Acquisition costs	See a film in theater > see a film in video
	Usage costs	See a film in theater > see a film in video
Person's attitude		Depend on other person's attitude
Perceived risk	Financial risk	See a film in theater > see a film in video
	Social risk	See a film in theater > see a film in video
	Time risk	See a film in theater > see a film in video

Table 3 The summary of proposed hypotheses and the possible underlying reasons

Proposed Hypotheses	**Underlying reasons**
H1: Different genres will have different impacts on the theatrical and the video market. a) Action, adventure, horror and suspense movies will have stronger impact on the theatrical market than on the video sales market. b) Comedy and romantic comedy movies will have stronger impact on the video sales market than on the theatrical market.	Personal benefits service benefits Signaling nature of genre
H2: R rating and PG-13 rating will have stronger impact on the video sales market than on the theatrical market.	Social risks Signaling nature of MPAA rating
H3: Advertising expenditure will have stronger impact than critical review on theatrical market, while critical review will have stronger impact than advertising expenditure on the video sales market.	Financial risks Signaling nature of advertising and reputation nature of critical review
H4: Seasonality will have stronger impact on the theatrical market than on the video sales market.	Acquisition cost Usage cost
H5: The number of screens will have stronger impact on the theatrical market than on the video sales market.	Acquisition cost Usage cost Financial risks Signaling nature of the number of screens
H6: Awards or nomination will have stronger impact on the video sales market than on the theatrical market.	Financial risks reputation nature of awards or nomination

Table 4 Descriptive statistics for the dependent and independent variables

	DS	TS	TSW1	TSW2	TSW3	ADV_DVD	ADV_THE	REVIEW
Mean	45486636	64042036	1978714	16694696	1025302	3886	21198	6
Median	27867004	3925363	12004898	1008307	603870	253	2155	6
Maximum	32600000	423000000	15100000	123000000	6353446	2756	46108	9
Minimum	307683	3005605	965	129132	156003	0	0	2
Std. Dev.	50319905	6860598	2453809	18880104	11461338	4280	1055	1
Skewness	3	2	3	2	2	2	0	0
Observations	22	22	22	22	219	22	22	20

Table 5 Correlation matrix of key variables

	DS	TS	TSW1	TSW2	TSW3	ADV_DVD	ADV_THE
DS	1.0000						
TS	0.8755	1.0000					
TSW1	**0.7649**	0.9087	1.0000				
TSW2	**0.8557**	0.9582	0.9244	1.0000			
TSW3	**0.8074**	0.9313	0.7895	0.8784	1.0000		
ADV_DVD	**0.6275**	0.6987	0.5511	0.6376	0.7052	1.0000	
ADV_THE	0.5945	**0.6865**	0.5675	0.6563	0.6754	0.6872	1.0000
AWARD_NOM	0.2219	0.1924	0.0355	0.0897	0.1491	0.1932	0.2590
REVIEW	0.2529	0.2326	0.0668	0.1581	0.2055	0.3203	0.3323
TIME	0.2421	0.2255	0.1968	0.2053	0.1529	0.1175	0.2348
SEQUEL	0.2524	0.3604	0.4698	0.3973	0.2510	0.1166	0.0905
SCREENS_3000	**0.5532**	**0.6395**	0.6021	0.6520	0.6205	**0.5331**	**0.5907**

Table 6 Relationship between screens and sales

Relationship between screens and theatrical sales

	SCREENS					
theatrical sales	[100, 1000)	[1000, 2000)	[2000, 3000)	[3000, 4000)	[4000, 4400)	Total
[0, 1000000)	11	8	2	1	0	22
[1000000, 2000000)	1	16	14	4	0	35
[2000000, 3000000)	1	7	24	2	0	34
[3000000, 4000000)	0	7	21	1	0	29
[4000000, 5000000)	0	2	9	11	0	22
[5000000, 6000000)	0	0	11	10	0	21
[6000000, 7000000)	0	0	7	5	0	12
[7000000, 8000000)	0	0	2	10	0	12
[8000000, 9000000)	0	0	2	7	0	9
[9000000, 10000000)	0	0	0	4	1	5
[10000000, 11000000)	0	0	0	3	1	4
[11000000, 12000000)	0	0	0	2	0	2
[12000000, 13000000)	0	0	0	2	1	3
[13000000, 14000000)	0	0	0	2	0	2
[14000000, 15000000)	0	0	0	1	0	1
[15000000, 16000000)	0	0	0	2	0	2
[16000000, 17000000)	0	0	0	0	1	1
[17000000, 18000000)	0	0	0	0	1	1
[19000000, 20000000)	0	0	0	0	1	1
[21000000, 22000000)	0	0	0	0	1	1
[26000000, 27000000)	0	0	0	0	1	1
Total	13	40	92	67	8	220

Relationship between screens and DVD sales

	SCREENS					
DVD sales	[100, 1000)	[1000, 2000)	[2000, 3000)	[3000, 4000)	[4000, 4400)	Total
[0, 1000000)	3	0	0	0	0	3
[1000000, 2000000)	4	7	18	6	0	35
[2000000, 3000000)	5	16	25	8	0	54
[3000000, 4000000)	0	9	20	12	0	41
[4000000, 5000000)	0	4	16	8	0	28
[5000000, 6000000)	1	3	7	3	0	14
[6000000, 7000000)	0	1	0	6	1	8
[7000000, 8000000)	0	0	2	5	1	8
[8000000, 9000000)	0	0	4	3	0	7
[9000000, 10000000)	0	0	0	3	0	3
[10000000, 11000000)	0	0	0	4	0	4
[11000000, 12000000)	0	0	0	6	2	8
[12000000, 13000000)	0	0	0	1	1	2
[13000000, 14000000)	0	0	0	1	1	2
[14000000, 15000000)	0	0	0	0	1	1
[15000000, 16000000)	0	0	0	1	0	1
[30000000, 31000000)	0	0	0	0	1	1
Total	13	40	92	67	8	220

Table 7 Relationship between screens and advertising expenditure

Relationship between screens and advertising expenditure in theatrical market

	SCREENS					
AD in theatrical market	[100, 1000)	[1000, 2000)	[2000, 3000)	[3000, 4000)	[4000, 4400)	Average
nettv_t_t	467	3085	6493	9939	13298	6814
ctv_t_t	850	2631	4013	5824	7132	4240
news_t_t	3614	3417	3505	5411	7965	4238
spottv_t_t	950	1481	1987	2866	2629	2125
natnew_t_t	1120	905	718	1017	1364	890
syn_t_t	75	282	980	989	1255	812
int_t_t	563	579	494	746	2101	649
slntv_t_t	44	195	323	911	1254	496
natra_t_t	101	251	422	606	457	429
mag_t_t	153	187	146	179	147	164
btbt_t	262	338	77	84	84	138
netra_t_t	0	8	106	291	39	136
od_t_t	10	9	20	55	68	30
sunday_t_t	12	8	9	46	0	20
hisnew_t_t	14	13	11	23	33	16
hismag_t_t	0	0	0	0	0	0
average	8235	13391	19305	28988	37825	21198

Relationship between screens and advertising expenditure in DVD market

	SCREENS					
AD in DVD market	[100, 1000)	[1000, 2000)	[2000, 3000)	[3000, 4000)	[4000, 4400)	Average
nettv_d_t	324	569	1026	2962	6149	1677
ctv_d_t	323	661	770	1717	3045	1095
syn_d_t	74	95	159	380	547	224
int_d_t	42	264	157	304	161	214
mag_d_t	62	115	107	280	525	174
spottv_d_t	2	22	61	184	517	105
news_d_t	15	125	84	98	37	90
natra_d_t	25	49	53	131	132	77
slntv_d_t	0	28	39	105	241	62
btb_d_t	39	58	39	63	92	52
natnew_d_t	8	58	49	34	63	44
sunday_d_t	37	16	24	70	41	38
netra_d_t	0	5	9	72	18	27
hisnew_d_t	0	0	0	9	0	3
od_d_t	0	0	1	3	33	3
hismag_d_t	0	0	0	0	0	0
average	949	2067	2578	6415	11601	3886

Table 8 Result of DVD sales linear regression model

	Coefficient	Std. Error	t-Statistic	Prob.
C	7.6103	1.5993	4.7585	0.0000
AWARD_NOM	0.3683	0.1212	3.0400	0.0030
SCREENS_3000	0.2513	0.1393	1.8047	0.0740
SEQUEL	0.0701	0.1476	0.4752	0.6356
LOG(TIME)	0.5949	0.3087	1.9274	0.0566
G_ACT	0.3311	0.1665	1.9882	0.0494
G_ADV	0.2617	0.1691	1.5480	0.1246
G_COM	0.3656	0.1281	2.8532	0.0052
G_MUSIC	0.2576	0.2909	0.8856	0.3779
G_HORR	0.2441	0.1746	1.3981	0.1650
G_SUSP	-0.0330	0.1691	-0.1953	0.8455
G_ROM_COM	0.3353	0.1714	1.9566	0.0530
LOG(REVIEW)	0.4117	0.1991	2.0683	0.0411
MPAA_PG	0.3540	0.2246	1.5761	0.1180
MPAA_PG_13	0.0661	0.2089	0.3166	0.7522
MPAA_R	0.0490	0.2203	0.2223	0.8245
MD_JAN	-0.1058	0.2575	-0.4110	0.6819
MD_FEB	-0.3571	0.2520	-1.4170	0.1594
MD_MAR	-0.2912	0.2518	-1.1563	0.2502
MD_APR	-0.3983	0.2572	-1.5490	0.1244
MD_MAY	-0.2980	0.2743	-1.0863	0.2798
MD_JUNE	-0.1838	0.3054	-0.6020	0.5485
MD_JULY	-0.3551	0.3306	-1.0739	0.2853
MD_AUG	-0.3721	0.2545	-1.4621	0.1467
MD_SEP	0.1402	0.2704	0.5185	0.6052
MD_OCT	-0.2548	0.2524	-1.0092	0.3152
MD_NOV	0.3182	0.2645	1.2030	0.2317
LOG(ADV_DVD+1)	0.0456	0.0187	2.4381	0.0164
LOG(TSW1+TSW2+TSW3)	0.3229	0.0490	6.5952	0.0000

R-squared	0.7695	Mean dependent var	17.2147
Adjusted R-squared	0.7080	S.D. dependent var	0.8362
S.E. of regression	0.4519	Akaike info criterion	1.4382
Sum squared resid	21.4407	Schwarz criterion	2.0653
Log likelihood	-67.3571	Hannan-Quinn criter.	1.6930
F-statistic	12.5158	Durbin-Watson stat	1.8021
Prob(F-statistic)	0		

Table 9 Result of theatrical sales linear regression model

	Coefficient	Std. Error	t-Statistic	Prob.
C	7.6176	1.4802	5.1464	0.0000
AWARD_NOM	0.2336	0.1270	1.8399	0.0686
SCREENS_3000	0.6904	0.1329	5.1957	0.0000
SEQUEL	0.3220	0.1617	1.9922	0.0489
LOG(TIME)	-0.1949	0.3073	-0.6342	0.5273
G_ACT	0.2378	0.1625	1.4630	0.1464
G_ADV	0.2139	0.1791	1.1938	0.2352
G_COM	0.4312	0.1329	3.2437	0.0016
G_MUSIC	0.3807	0.3009	1.2655	0.2084
G_HORR	0.6201	0.1735	3.5743	0.0005
G_SUSP	0.2971	0.1702	1.7460	0.0837
G_ROM_COM	0.3749	0.1789	2.0954	0.0385
LOG(REVIEW)	0.3542	0.2113	1.6767	0.0965
MPAA_PG	-0.1444	0.2192	-0.6588	0.5115
MPAA_PG_13	0.0764	0.2103	0.3634	0.7170
MPAA_R	-0.0572	0.2258	-0.2532	0.8006
MT_JAN	-0.1982	0.2171	-0.9130	0.3633
MT_FEB	-0.1656	0.2428	-0.6823	0.4965
MT_MAR	-0.1642	0.2073	-0.7917	0.4303
MT_APR	-0.1923	0.1850	-1.0395	0.3009
MT_MAY	0.2011	0.2171	0.9263	0.3564
MT_JUNE	-0.0455	0.1843	-0.2471	0.8053
MT_JULY	0.0911	0.2760	0.3301	0.7420
MT_AUG	0.0349	0.2311	0.1512	0.8801
MT_SEP	-0.0601	0.1740	-0.3454	0.7305
MT_OCT	-0.1434	0.1910	-0.7508	0.4544
MT_NOV	-0.4007	0.1828	-2.1916	0.0306
LOG(ADV_THE+1)	0.9840	0.0972	10.1259	0.0000

R-squared	0.823812	Mean dependent var	17.47277
Adjusted R-squared	0.779354	S.D. dependent var	1.008399
S.E. of regression	0.473675	Akaike info criterion	1.525779
Sum squared resid	24.0074	Schwarz criterion	2.128355
Log likelihood	-74.9901	Hannan-Quinn criter.	1.770649
F-statistic	18.52988	Durbin-Watson stat	1.954597
Prob(F-statistic)	0		

Table 10 Result of DVD sales median regression model

	Coefficient	Std. Error	t-Statistic	Prob.
C	8.2436	2.4798	3.3243	0.0012
AWARD_NOM	0.3126	0.2409	1.2979	0.1972
SCREENS_3000	0.2236	0.1991	1.1230	0.2640
LOG(TIME)	0.4661	0.4605	1.0121	0.3138
SEQUEL	0.1147	0.2564	0.4473	0.6556
G_ACT	0.2406	0.2314	1.0394	0.3010
G_ADV	0.1961	0.2637	0.7435	0.4589
G_COM	0.4504	0.2192	2.0551	0.0423
G_MUSIC	0.2989	0.3409	0.8769	0.3825
G_HORR	0.1528	0.2503	0.6106	0.5428
G_SUSP	-0.0805	0.2420	-0.3326	0.7401
G_ROM_COM	0.2362	0.3023	0.7811	0.4365
LOG(REVIEW)	0.4727	0.3175	1.4888	0.1395
MPAA_PG	0.3978	0.3582	1.1105	0.2693
MPAA_PG_13	0.1503	0.3656	0.4111	0.6818
MPAA_R	0.3216	0.4374	0.7353	0.4638
MD_JAN	-0.0781	0.4431	-0.1763	0.8604
MD_FEB	-0.3847	0.4038	-0.9527	0.3429
MD_MAR	-0.2261	0.4462	-0.5068	0.6134
MD_APR	-0.2718	0.4260	-0.6380	0.5249
MD_MAY	-0.2962	0.4599	-0.6441	0.5209
MD_JUNE	-0.1890	0.4593	-0.4115	0.6815
MD_JULY	-0.4354	0.4987	-0.8731	0.3846
MD_AUG	-0.2837	0.4035	-0.7031	0.4835
MD_SEP	0.1783	0.4630	0.3851	0.7010
MD_OCT	-0.1360	0.4441	-0.3063	0.7600
MD_NOV	0.4706	0.4311	1.0915	0.2775
LOG(ADV_DVD+1)	0.0486	0.0308	1.5782	0.1175
LOG(TSW1+TSW2+TSW3)	0.3063	0.1020	3.0016	0.0034

Pseudo R-squared	0.5350	Mean dependent var	17.2147
Adjusted R-squared	0.4110	S.D. dependent var	0.8362
S.E. of regression	0.4797	Objective	20.3130
Quantile dependent var	17.1210	Objective (const. only)	43.6826
Sparsity	0.9475	Quasi-LR statistic	197.3158
Prob(Quasi-LR stat)	0.0000		

Table 11 Result of theatrical sales median regression model

	Coefficient	Std. Error	t-Statistic	Prob.
C	7.1897	2.4149	2.9773	0.0036
AWARD_NOM	0.2193	0.2116	1.0364	0.3024
SCREENS_3000	0.6475	0.1812	3.5743	0.0005
LOG(TIME)	-0.1881	0.4970	-0.3785	0.7058
SEQUEL	0.3672	0.2640	1.3909	0.1671
G_ACT	0.3324	0.2191	1.5167	0.1323
G_ADV	0.3451	0.2386	1.4465	0.1510
G_COM	0.3439	0.2067	1.6641	0.0990
G_MUSIC	0.3561	0.2729	1.3050	0.1947
G_HORR	0.7561	0.2753	2.7465	0.0071
G_SUSP	0.1916	0.2273	0.8429	0.4012
G_ROM_COM	0.2450	0.2213	1.1068	0.2708
LOG(REVIEW)	0.2094	0.4378	0.4783	0.6334
MPAA_PG	-0.1263	0.3511	-0.3599	0.7196
MPAA_PG_13	0.0941	0.2882	0.3266	0.7446
MPAA_R	-0.0388	0.3045	-0.1272	0.8990
MT_JAN	-0.1929	0.2960	-0.6516	0.5161
MT_FEB	-0.1143	0.3310	-0.3453	0.7305
MT_MAR	-0.0661	0.4015	-0.1645	0.8696
MT_APR	-0.1815	0.2749	-0.6601	0.5106
MT_MAY	0.1967	0.3547	0.5544	0.5804
MT_JUNE	-0.1163	0.3705	-0.3139	0.7542
MT_JULY	0.0674	0.3849	0.1751	0.8614
MT_AUG	0.0067	0.3410	0.0198	0.9843
MT_SEP	-0.1250	0.2656	-0.4707	0.6388
MT_OCT	-0.2227	0.2966	-0.7508	0.4544
MT_NOV	-0.4855	0.2945	-1.6483	0.1022
LOG(ADV_THE+1)	1.0561	0.1463	7.2208	0.0000

Pseudo R-squared	0.6102	Mean dependent var	17.4728
Adjusted R-squared	0.5119	S.D. dependent var	1.0084
S.E. of regression	0.4924	Objective	21.2096
Quantile dependent var	17.4368	Objective (const. only)	54.4131
Sparsity	0.9152	Quasi-LR statistic	290.2407
Prob(Quasi-LR stat)	0.0000		

Table 12 Quantile slope equality test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Wald Test	108.0528	56	0

Table 13 The quantile table of DVD sales and theatrical sales multiple quantile models

DVD sales mutliple quantile regression model

	Quantile	Coefficient	Prob.
G_ACT	0.1	0.4224	0.3203
	0.2	0.7030	**0.0528**
	0.3	0.4938	**0.0609**
	0.4	0.4525	**0.0669**
	0.5	0.2406	0.3034
	0.6	0.1708	0.4788
	0.7	0.2488	0.2705
	0.8	0.1928	0.3925
	0.9	-0.0175	0.9412
G_ADV	0.1	0.0343	0.9168
	0.2	0.3367	0.2471
	0.3	0.2056	0.4455
	0.4	0.2381	0.4025
	0.5	0.1961	0.4619
	0.6	0.1431	0.6112
	0.7	0.1747	0.5615
	0.8	0.3372	0.2549
	0.9	-0.0442	0.8784
G_COM	0.1	0.5925	**0.0045**
	0.2	0.3574	**0.0565**
	0.3	0.1680	0.3982
	0.4	0.2851	0.1996
	0.5	0.4504	**0.0434**
	0.6	0.3883	**0.0790**
	0.7	0.4078	**0.0674**
	0.8	0.2977	0.1604
	0.9	0.1104	0.5841

Theatrical sales multiple quantile regression model

	Quantile	Coefficient	Prob.
G_ACT	0.1	0.3755	0.2384
	0.2	0.1629	0.5428
	0.3	0.0554	0.8385
	0.4	0.0549	0.8422
	0.5	0.3324	0.2185
	0.6	0.3067	0.1952
	0.7	0.3151	0.1390
	0.8	0.3846	**0.0871**
	0.9	0.4433	**0.0854**
G_ADV	0.1	-0.3541	0.5098
	0.2	0.0912	0.8280
	0.3	0.2597	0.4758
	0.4	0.3068	0.3284
	0.5	0.3451	0.2328
	0.6	0.3569	0.1698
	0.7	0.2867	0.2386
	0.8	0.3926	0.1153
	0.9	0.5045	**0.0645**
G_COM	0.1	0.4052	0.1058
	0.2	0.3258	0.2083
	0.3	0.2330	0.3000
	0.4	0.2388	0.2765
	0.5	0.3439	0.1267
	0.6	0.3694	0.1235
	0.7	0.3548	0.1143
	0.8	0.5886	**0.0168**
	0.9	0.7260	**0.0022**

Table 13 (continued) The quantile table of DVD sales and theatrical sales multiple quantile models

DVD sales mutliple quantile regression model

	Quantile	Coefficient	Prob.
G_HORR	0.1	0.4555	0.2058
	0.2	0.0733	0.7801
	0.3	-0.0122	0.9617
	0.4	0.0500	0.8506
	0.5	0.1528	0.5420
	0.6	0.1562	0.5174
	0.7	0.0928	0.7187
	0.8	0.1565	0.5476
	0.9	0.2197	0.4594
G_SUSP	0.1	0.0638	0.8529
	0.2	-0.0131	0.9687
	0.3	-0.0731	0.8062
	0.4	-0.0057	0.9837
	0.5	-0.0805	0.7437
	0.6	-0.1030	0.6544
	0.7	0.0897	0.6633
	0.8	0.1198	0.5451
	0.9	-0.0670	0.7447
G_ROM_COM	0.1	0.5489	0.0493
	0.2	0.2703	0.2613
	0.3	0.0634	0.8087
	0.4	0.0965	0.7294
	0.5	0.2362	0.4186
	0.6	0.3343	0.2828
	0.7	0.7058	**0.0214**
	0.8	0.6850	**0.0363**
	0.9	0.5134	0.1152

Theatrical sales multiple quantile regression model

	Quantile	Coefficient	Prob.
G_HORR	0.1	0.2651	0.4859
	0.2	0.3087	0.4231
	0.3	0.3593	0.3279
	0.4	0.7117	**0.0347**
	0.5	0.7561	**0.0044**
	0.6	0.8423	**0.0003**
	0.7	0.7219	**0.0006**
	0.8	0.8097	**0.0002**
	0.9	0.8291	**0.0013**
G_SUSP	0.1	0.4947	0.0575
	0.2	0.3852	0.1055
	0.3	0.2863	0.1993
	0.4	0.2934	0.2134
	0.5	0.1916	0.4239
	0.6	0.3349	0.1627
	0.7	0.1904	0.4590
	0.8	0.3440	0.2008
	0.9	0.5916	**0.0482**
G_ROM_COM	0.1	0.3673	0.2167
	0.2	0.3104	0.2634
	0.3	0.1336	0.5789
	0.4	0.3357	0.1707
	0.5	0.2450	0.2985
	0.6	0.1959	0.4178
	0.7	0.1306	0.5851
	0.8	0.5583	**0.0632**
	0.9	0.5311	0.1313

Table 13 (continued) The quantile table of DVD sales and theatrical sales multiple quantile models

DVD sales mutliple quantile regression model			
	Quantile	Coefficient	Prob.
MD_JUNE	0.1	0.0537	0.9263
	0.2	0.7271	0.2388
	0.3	0.0893	0.8822
	0.4	0.0210	0.9625
	0.5	-0.1890	0.6777
	0.6	-0.2743	0.5267
	0.7	-0.3832	0.3468
	0.8	-0.4887	0.3919
	0.9	-0.8462	**0.0832**
MD_JULY	0.1	-0.0873	0.8818
	0.2	0.2368	0.6420
	0.3	-0.3776	0.4555
	0.4	-0.4061	0.4306
	0.5	-0.5698	0.2616
	0.6	-0.6532	0.2165
	0.7	-0.9912	**0.0599**
	0.8	-0.1078	0.8482
	0.9	-0.4820	0.4106
MD_AUG	0.1	-0.3007	0.5879
	0.2	0.2885	0.6148
	0.3	-0.2892	0.6026
	0.4	-0.2848	0.4978
	0.5	-0.2837	0.4811
	0.6	-0.2595	0.4975
	0.7	-0.6798	**0.0623**
	0.8	-0.6212	0.2078
	0.9	-0.8202	**0.0238**
MD_NOV	0.1	0.0167	0.9749
	0.2	0.8149	0.1704
	0.3	0.4170	0.4719
	0.4	0.4177	0.3283
	0.5	0.4706	0.2625
	0.6	0.3633	0.4030
	0.7	-0.2010	0.6429
	0.8	0.1104	0.8371
	0.9	0.1478	0.7477

Theatrical sales multiple quantile regression model			
	Quantile	Coefficient	Prob.
MT_JUNE	0.1	0.6815	0.1245
	0.2	-0.0761	0.8559
	0.3	-0.0351	0.9151
	0.4	-0.0260	0.9387
	0.5	-0.1163	0.7351
	0.6	-0.1280	0.7216
	0.7	0.0449	0.9038
	0.8	0.1423	0.7054
	0.9	-0.0127	0.9763
MT_JULY	0.1	1.0894	0.0439
	0.2	0.4261	0.3290
	0.3	0.3046	0.4257
	0.4	0.2340	0.5585
	0.5	0.0674	0.8709
	0.6	0.0823	0.8374
	0.7	-0.0544	0.8973
	0.8	0.0880	0.8414
	0.9	-0.0970	0.8127
MT_AUG	0.1	0.5739	0.2262
	0.2	0.0916	0.8163
	0.3	0.1924	0.6028
	0.4	0.1551	0.6524
	0.5	0.0067	0.9866
	0.6	-0.0543	0.8959
	0.7	-0.1067	0.7904
	0.8	-0.1473	0.6723
	0.9	-0.1134	0.7261
MT_NOV	0.1	0.2379	0.5526
	0.2	-0.3075	0.4473
	0.3	-0.3280	0.3781
	0.4	-0.3416	0.3212
	0.5	-0.4855	0.1659
	0.6	-0.4002	0.2301
	0.7	-0.4506	0.1786
	0.8	-0.5286	0.1265
	0.9	-0.7020	**0.0554**

Table 13 (continued) The quantile table of DVD sales and theatrical sales multiple quantile models

DVD sales mutliple quantile regression model

	Quantile	Coefficient	Prob.
AWARD_NOM	0.1	0.1896	0.4786
	0.2	0.2733	0.2448
	0.3	0.3139	0.1593
	0.4	0.3414	0.1234
	0.5	0.3126	0.1995
	0.6	0.5579	**0.0205**
	0.7	0.6158	**0.0034**
	0.8	0.6505	**0.0009**
	0.9	0.5979	**0.0054**
SCREENS_3000	0.1	0.5292	0.0753
	0.2	0.3012	0.2439
	0.3	0.2345	0.3279
	0.4	0.2800	0.1925
	0.5	0.2236	0.2664
	0.6	0.2026	0.3050
	0.7	0.2693	0.2223
	0.8	0.3452	0.1331
	0.9	0.1539	0.5292
LOG(ADV_DVD+1)	0.1	0.0320	0.5099
	0.2	0.0416	0.2909
	0.3	0.0445	0.2236
	0.4	0.0488	0.1317
	0.5	0.0486	0.1194
	0.6	0.0358	0.2436
	0.7	0.0497	**0.0707**
	0.8	0.0409	**0.0813**
	0.9	0.0273	0.1939
LOG(TSW1+TSW2+TSW3)	0.1	0.3574	**0.0021**
	0.2	0.3943	**0.0010**
	0.3	0.3907	**0.0002**
	0.4	0.3664	**0.0008**
	0.5	0.3063	**0.0035**
	0.6	0.2924	**0.0023**
	0.7	0.3094	**0.0002**
	0.8	0.2931	**0.0001**
	0.9	0.3538	**0.0000**

Theatrical sales multiple quantile regression model

	Quantile	Coefficient	Prob.
AWARD_NOM	0.1	0.2445	0.4130
	0.2	0.0006	0.9977
	0.3	0.0800	0.7163
	0.4	0.1955	0.3789
	0.5	0.2193	0.3126
	0.6	0.2127	0.3492
	0.7	0.2370	0.2987
	0.8	0.5214	**0.0217**
	0.9	0.6653	**0.0047**
SCREENS_3000	0.1	0.7807	**0.0085**
	0.2	0.5254	**0.0559**
	0.3	0.6626	**0.0070**
	0.4	0.7331	**0.0018**
	0.5	0.6475	**0.0051**
	0.6	0.6396	**0.0031**
	0.7	0.6924	**0.0003**
	0.8	0.6248	**0.0030**
	0.9	0.5966	**0.0030**
LOG(ADV_THE+1)	0.1	1.1962	**0.0000**
	0.2	1.0570	**0.0000**
	0.3	1.0859	**0.0000**
	0.4	1.0543	**0.0000**
	0.5	1.0561	**0.0000**
	0.6	0.9149	**0.0000**
	0.7	0.9551	**0.0000**
	0.8	0.9800	**0.0000**
	0.9	0.9400	**0.0000**

Table 14 Seasonality in DVD sales linear regression model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.2742	1.7509	2.4411	0.0163
AWARD_NOM	0.4265	0.1327	3.2150	0.0017
SCREENS_3000	0.3424	0.1525	2.2462	0.0268
SEQUEL	0.1301	0.1616	0.8054	0.4224
LOG(TIME)	0.7989	0.3379	2.3643	0.0199
G_ACT	0.3912	0.1823	2.1456	0.0342
G_ADV	0.1932	0.1851	1.0435	0.2991
G_COM	0.3467	0.1403	2.4714	0.0151
G_MUSIC	0.2882	0.3184	0.9052	0.3674
G_HORR	0.1443	0.1912	0.7550	0.4519
G_SUSP	0.0577	0.1851	0.3115	0.7560
G_ROM_COM	0.2650	0.1876	1.4123	0.1608
LOG(REVIEW)	0.4841	0.2179	2.2214	0.0285
MPAA_PG	0.1683	0.2459	0.6843	0.4953
MPAA_PG_13	-0.0803	0.2287	-0.3510	0.7263
MPAA_R	-0.0960	0.2411	-0.3981	0.6914
MD_JAN	0.0998	0.2820	0.3540	0.7241
MD_FEB	-0.2482	0.2759	-0.8997	0.3703
MD_MAR	-0.3357	0.2757	-1.2176	0.2261
MD_APR	-0.2584	0.2815	-0.9176	0.3609
MD_MAY	-0.1692	0.3003	-0.5632	0.5745
MD_JUNE	-0.4042	0.3343	-1.2091	0.2293
MD_JULY	-0.3059	0.3620	-0.8452	0.3999
MD_AUG	-0.4337	0.2786	-1.5567	0.1225
MD_SEP	0.0501	0.2960	0.1692	0.8660
MD_OCT	-0.4449	0.2764	-1.6100	0.1104
MD_NOV	-0.1071	0.2896	-0.3699	0.7122
LOG(ADV_DVD+1)	0.0671	0.0205	3.2741	0.0014
LOG(TSW1+TSW2+TSW3)	0.3958	0.0536	7.3856	0.0000

R-squared	0.7932	Mean dependent var	16.2260
Adjusted R-squared	0.7381	S.D. dependent var	0.9667
S.E. of regression	0.4947	Akaike info criterion	1.6193
Sum squared resid	25.6988	Schwarz criterion	2.2465
Log likelihood	-79.4941	F-statistic	14.3861
Durbin-Watson stat	1.7758	Prob(F-statistic)	0.0000

Table 15 Seasonality in theatrical sales linear regression model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.4665	2.7121	2.7530	0.0065
AWARD_NOM	-0.5573	0.2366	-2.3556	0.0196
SCREENS_3000	1.1087	0.2216	5.0029	0.0000
SEQUEL	0.8434	0.2846	2.9633	0.0035
LOG(TIME)	0.4920	0.5985	0.8220	0.4122
G_ACT	0.6261	0.3048	2.0542	0.0415
G_ADV	0.5855	0.3145	1.8617	0.0644
G_COM	0.1871	0.2489	0.7518	0.4532
G_MUSIC	-0.0098	0.5783	-0.0169	0.9866
G_HORR	0.8340	0.3302	2.5254	0.0125
G_SUSP	0.7356	0.3071	2.3952	0.0177
G_ROM_COM	0.4875	0.3402	1.4328	0.1537
LOG(REVIEW)	-1.1880	0.3771	-3.1502	0.0019
MPAA_PG	-0.1825	0.4066	-0.4487	0.6542
MPAA_PG_13	-0.0684	0.4055	-0.1686	0.8663
MPAA_R	-0.1477	0.4221	-0.3499	0.7268
MT_JAN	0.3784	0.4131	0.9161	0.3609
MT_FEB	0.6160	0.3897	1.5804	0.1158
MT_MAR	0.3436	0.3493	0.9838	0.3266
MT_APR	0.3428	0.3350	1.0232	0.3077
MT_MAY	-0.0651	0.3731	-0.1744	0.8617
MT_JUNE	0.7963	0.3418	2.3301	**0.0210**
MT_JULY	0.4352	0.4336	1.0038	0.3169
MT_AUG	0.6495	0.4055	1.6015	0.1111
MT_SEP	-0.1068	0.3388	-0.3151	0.7531
MT_OCT	0.3389	0.3405	0.9951	0.3211
MT_NOV	0.4509	0.3450	1.3071	0.1929
LOG(ADV_THE+1)	0.7612	0.1362	5.5896	0.0000

R-squared	0.5725	Mean dependent var	16.0803
Adjusted R-squared	0.5054	S.D. dependent var	1.5198
S.E. of regression	1.0688	Akaike info criterion	3.1002
Sum squared resid	196.4861	Schwarz criterion	3.5619
Log likelihood	-282.0152	F-statistic	8.5322
Durbin-Watson stat	1.7900	Prob(F-statistic)	0.0000

Table 16 Seasonality test in DVD sales median regression model

	Coefficient	Std. Error	t-Statistic	Prob.
C	3.4735	2.4528	1.4162	0.1597
AWARD_NOM	0.3833	0.1904	2.0132	0.0467
SCREENS_3000	0.3057	0.1621	1.8861	0.0620
SEQUEL	0.3523	0.2629	1.3399	0.1832
LOG(TIME)	1.0214	0.4087	2.4989	0.0140
G_ACT	0.2167	0.1490	1.4537	0.1490
G_ADV	0.0756	0.2081	0.3635	0.7170
G_COM	0.1777	0.3207	0.5541	0.5807
G_MUSIC	0.1554	0.4204	0.3697	0.7123
G_HORR	-0.0481	0.2744	-0.1752	0.8613
G_SUSP	0.0327	0.2424	0.1350	0.8929
G_ROM_COM	0.1231	0.1997	0.6164	0.5390
LOG(REVIEW)	0.4045	0.2777	1.4565	0.1482
MPAA_PG	0.1070	0.3653	0.2929	0.7702
MPAA_PG_13	-0.2175	0.3267	-0.6659	0.5069
MPAA_R	-0.2081	0.3412	-0.6099	0.5433
MD_JAN	0.0184	0.4857	0.0378	0.9699
MD_FEB	-0.2818	0.4439	-0.6349	0.5269
MD_MAR	-0.3746	0.4849	-0.7725	0.4415
MD_APR	-0.5360	0.5466	-0.9806	0.3290
MD_MAY	-0.4006	0.4821	-0.8310	0.4079
MD_JUNE	-0.5677	0.4620	-1.2288	0.2219
MD_JULY	-0.6106	0.5625	-1.0856	0.2801
MD_AUG	-0.5331	0.4636	-1.1500	0.2528
MD_SEP	-0.0622	0.4809	-0.1294	0.8973
MD_OCT	-0.6172	0.4344	-1.4208	0.1583
MD_NOV	-0.1984	0.4610	-0.4303	0.6679
LOG(ADV_DVD+1)	0.0658	0.0232	2.8399	0.0054
LOG(TSW1+TSW2+TSW3)	0.4102	0.0809	5.0674	0.0000

Pseudo R-squared	0.5855	Mean dependent var	16.2260
Adjusted R-squared	0.4750	S.D. dependent var	0.9667
S.E. of regression	0.5189	Objective	21.3803
Quantile dependent var	16.1641	Objective (const. only)	51.5860
Sparsity	0.8845	Quasi-LR statistic	273.1852
Prob(Quasi-LR stat)	0.0000		

Table 17 Seasonality test in theatrical sales median regression model

	Coefficient	Std. Error	t-Statistic	Prob.
C	5.8396	3.8418	1.5200	0.1303
AWARD_NOM	-0.3458	0.4080	-0.8476	0.3978
SCREENS_3000	0.7515	0.1864	4.0315	0.0001
SEQUEL	0.5387	0.3660	1.4718	0.1429
LOG(TIME)	0.1605	0.6989	0.2296	0.8186
G_ACT	0.3951	0.2920	1.3529	0.1779
G_ADV	0.2142	0.2741	0.7816	0.4355
G_COM	0.1473	0.2196	0.6707	0.5033
G_MUSIC	0.0311	0.9367	0.0332	0.9736
G_HORR	0.6548	0.2580	2.5380	0.0120
G_SUSP	0.3093	0.2200	1.4061	0.1615
G_ROM_COM	0.0930	0.2328	0.3996	0.6899
LOG(REVIEW)	-0.5026	0.4084	-1.2306	0.2202
MPAA_PG	0.0189	0.4477	0.0422	0.9664
MPAA_PG_13	0.1131	0.4801	0.2356	0.8140
MPAA_R	0.0459	0.5054	0.0908	0.9278
MT_JAN	0.4959	0.4638	1.0693	0.2864
MT_FEB	0.5563	0.4474	1.2436	0.2154
MT_MAR	0.5450	0.4427	1.2312	0.2199
MT_APR	0.3753	0.4739	0.7920	0.4294
MT_MAY	0.2917	0.5603	0.5206	0.6033
MT_JUNE	0.5783	0.5072	1.1401	0.2558
MT_JULY	0.5941	0.5331	1.1144	0.2667
MT_AUG	0.6107	0.5197	1.1750	0.2416
MT_SEP	0.2241	0.4610	0.4860	0.6276
MT_OCT	0.4693	0.4665	1.0060	0.3158
MT_NOV	0.2681	0.5674	0.4726	0.6371
LOG(ADV_THE+1)	0.9840	0.3375	2.9159	0.0040

Pseudo R-squared	0.3744	Mean dependent var	16.0803
Adjusted R-squared	0.2762	S.D. dependent var	1.5198
S.E. of regression	1.1648	Objective	63.9271
Quantile dependent var	16.3047	Objective (const. only)	102.1864
Sparsity	1.4490	Quasi-LR statistic	211.2366
Prob(Quasi-LR stat)	0.0000		

Table 18 The summary of tested hypothesis

Proposed Hypotheses	**Linear regression results**
H1: Different genres will have different impacts on theatrical and video market. a) Action, adventure, horror and suspense movies will have stronger impact on the theatrical market than on the video sales market. b) Comedy and romantic comedy movies will have stronger impact on the video sales market than on the theatrical market.	Partial supported
H2: R rating and PG-13 rating should have stronger impact on the video sales market than on the theatrical market.	Not supported
H3: Advertising expenditure should have stronger impact than critical review in theatrical market, while critical review should have stronger impact than advertising expenditure in DVD market.	Supported
H4: Seasonality will have a stronger impact on the theatrical market than on the video sales market.	Supported
H5: The number of screens will have stronger impact on the theatrical market than on the video sales market.	Supported
H6: Awards or nomination will have stronger impact on the video sales market than on the theatrical market.	Supported

Table 19 Advertising expenditure by media

For DVD market

	Coefficient	Std. Error	t-Statistic	Prob.
C	9.9103	1.7226	5.7532	0.0000
AWARD_NOM	0.2586	0.1250	2.0681	0.0413
SCREENS_3000	0.2492	0.1345	1.8525	0.0670
SEQUEL	0.1869	0.1427	1.3098	0.1933
LOG(TIME)	0.4560	0.3195	1.4274	0.1567
G_ACT	0.2107	0.1633	1.2902	0.2000
G_ADV	0.3044	0.1630	1.8671	0.0649
G_COM	0.2957	0.1273	2.3235	0.0222
G_MUSIC	0.2793	0.3020	0.9248	0.3574
G_HORR	0.1747	0.1692	1.0329	0.3042
G_SUSP	-0.0028	0.1665	-0.0171	0.9864
G_ROM_COM	0.3172	0.1673	1.8957	0.0609
LOG(REVIEW)	0.3303	0.1984	1.6645	0.0992
MPAA_PG	0.3010	0.2129	1.4139	0.1606
MPAA_PG_13	0.0733	0.2024	0.3620	0.7181
MPAA_R	0.0121	0.2154	0.0562	0.9553
MD_JAN	-0.1503	0.2530	-0.5943	0.5537
MD_FEB	-0.4304	0.2438	-1.7653	0.0806
MD_MAR	-0.3446	0.2424	-1.4218	0.1583
MD_APR	-0.4736	0.2541	-1.8641	0.0653
MD_MAY	-0.4009	0.2679	-1.4965	0.1377
MD_JUNE	-0.3044	0.3006	-1.0124	0.3138
MD_JULY	-0.2344	0.3325	-0.7052	0.4824
MD_AUG	-0.4597	0.2574	-1.7862	0.0772
MD_SEP	0.0560	0.2614	0.2142	0.8308
MD_OCT	-0.3407	0.2539	-1.3414	0.1829
MD_NOV	0.1658	0.2562	0.6470	0.5191
LOG(TSW1+TSW2+TSW3)	0.2451	0.0511	4.7948	0.0000
LOG(NETTV_D_T+1)	0.0684	0.0262	2.6118	**0.0104**
LOG(CTV_D_T+1)	-0.0566	0.0314	-1.8022	0.0746
LOG(SYN_D_T+1)	-0.0179	0.0239	-0.7513	0.4543
LOG(INT_D_T+1)	0.0287	0.0280	1.0273	0.3068
LOG(MAG_D_T+1)	-0.0060	0.0172	-0.3493	0.7276
LOG(SPOTTV_D_T+1)	0.0489	0.0277	1.7623	0.0811
LOG(NEWS_D_T+1)	0.0385	0.0274	1.4057	0.1630
LOG(NATRA_D_T+1)	0.0401	0.0199	2.0112	**0.0471**

R-squared	0.8101	Mean dependent var	17.2147
Adjusted R-squared	0.7423	S.D. dependent var	0.8362
S.E. of regression	0.4245	Akaike info criterion	1.3485
Sum squared resid	17.6580	Schwarz criterion	2.1271
Log likelihood	-54.3523	Hannan-Quinn criter.	1.6649
F-statistic	11.9469	Durbin-Watson stat	1.8722
Prob(F-statistic)	0.0000		

Table 19 (continued) Advertising expenditure by media

For the theatrical market

	Coefficient	Std. Error	t-Statistic	Prob.
C	12.1051	1.6017	7.5576	0.0000
AWARD_NOM	0.4171	0.1456	2.8646	0.0051
SCREENS_3000	0.7462	0.1591	4.6910	0.0000
SEQUEL	0.3353	0.1828	1.8344	0.0696
LOG(TIME)	0.1242	0.3579	0.3469	0.7294
G_ACT	0.0701	0.1876	0.3736	0.7095
G_ADV	0.2294	0.2070	1.1085	0.2703
G_COM	0.4904	0.1483	3.3061	0.0013
G_MUSIC	0.3492	0.3348	1.0432	0.2994
G_HORR	0.2822	0.1994	1.4150	0.1602
G_SUSP	0.3019	0.1946	1.5517	0.1239
G_ROM_COM	0.3715	0.1985	1.8713	0.0642
LOG(REVIEW)	0.5702	0.2590	2.2016	0.0300
MPAA_PG	0.0614	0.2492	0.2463	0.8060
MPAA_PG_13	0.3228	0.2431	1.3277	0.1873
MPAA_R	0.1989	0.2561	0.7766	0.4392
MT_JAN	-0.1659	0.2483	-0.6679	0.5057
MT_FEB	-0.0881	0.2687	-0.3280	0.7436
MT_MAR	-0.0942	0.2313	-0.4072	0.6847
MT_APR	-0.2333	0.2112	-1.1044	0.2721
MT_MAY	0.1202	0.2445	0.4916	0.6241
MT_JUNE	-0.0544	0.2147	-0.2532	0.8006
MT_JULY	0.1653	0.3188	0.5185	0.6052
MT_AUG	-0.0260	0.2678	-0.0970	0.9229
MT_SEP	-0.2023	0.1965	-1.0299	0.3055
MT_OCT	-0.1277	0.2165	-0.5899	0.5566
MT_NOV	-0.3177	0.2053	-1.5477	0.1249
LOG(NETTV_T_T+1)	0.0736	0.0306	2.4013	**0.0182**
LOG(CTV_T_T+1)	-0.0451	0.0518	-0.8689	0.3870
LOG(SYN_T_T+1)	0.0651	0.0282	2.3125	**0.0228**
LOG(INT_T_T+1)	0.0426	0.0396	1.0762	0.2844
LOG(SLNTV_T_T+1)	0.0745	0.0216	3.4467	**0.0008**
LOG(SPOTTV_T_T+1)	0.1370	0.0708	1.9363	0.0557
LOG(NEWS_T_T+1)	0.0909	0.0553	1.6429	0.1035
LOG(NATNEW_T_T+1)	0.0334	0.0344	0.9712	0.3338

R-squared	0.8009	Mean dependent var	17.4728
Adjusted R-squared	0.7332	S.D. dependent var	1.0084
S.E. of regression	0.5208	Akaike info criterion	1.7516
Sum squared resid	27.1257	Schwarz criterion	2.5048
Log likelihood	-83.2331	Hannan-Quinn criter.	2.0577
F-statistic	11.8332	Durbin-Watson stat	2.2444
Prob(F-statistic)	0.0000		

Table 20 Advertising expenditure by time

For DVD market

	Coefficient	Std. Error	t-Statistic	Prob.
C	8.6567	1.5908	5.4418	0.0000
AWARD_NOM	0.3038	0.1216	2.4992	0.0141
SCREENS_3000	0.1886	0.1383	1.3636	0.1757
SEQUEL	0.1319	0.1458	0.9047	0.3678
LOG(TIME)	0.5152	0.3034	1.6982	0.0926
G_ACT	0.3178	0.1731	1.8354	0.0694
G_ADV	0.1913	0.1651	1.1585	0.2494
G_COM	0.2664	0.1293	2.0602	0.0420
G_MUSIC	0.2772	0.2858	0.9700	0.3344
G_HORR	0.1811	0.1712	1.0579	0.2926
G_SUSP	-0.0260	0.1673	-0.1557	0.8766
G_ROM_COM	0.3107	0.1672	1.8586	0.0660
LOG(REVIEW)	0.3692	0.1961	1.8831	0.0626
MPAA_PG	0.1874	0.2309	0.8115	0.4190
MPAA_PG_13	-0.0238	0.2056	-0.1155	0.9083
MPAA_R	-0.0328	0.2217	-0.1481	0.8826
MD_JAN	-0.0164	0.2591	-0.0632	0.9498
MD_FEB	-0.3238	0.2565	-1.2624	0.2098
MD_MAR	-0.3368	0.2515	-1.3390	0.1836
MD_APR	-0.3717	0.2585	-1.4382	0.1535
MD_MAY	-0.2388	0.2738	-0.8721	0.3852
MD_JUNE	-0.2198	0.3010	-0.7302	0.4670
MD_JULY	-0.3164	0.3275	-0.9661	0.3363
MD_AUG	-0.3907	0.2548	-1.5336	0.1283
MD_SEP	0.0873	0.2725	0.3205	0.7492
MD_OCT	-0.2157	0.2540	-0.8491	0.3978
MD_NOV	0.2702	0.2639	1.0235	0.3085
LOG(TSW1+TSW2+TSW3)	0.2969	0.0484	6.1336	0.0000
LOG(AD_D_P0+1)	-0.0671	0.0449	-1.4951	0.1381
LOG(AD_D_P1+1)	0.1032	0.0454	2.2709	**0.0253**
LOG(AD_D_P2+1)	0.0256	0.0228	1.1262	0.2628
LOG(AD_D_P3+1)	0.0315	0.0313	1.0079	0.3159
LOG(AD_D_P4+1)	0.0023	0.0319	0.0715	0.9431
LOG(AD_D_P5+1)	0.0232	0.0315	0.7361	0.4634

R-squared	0.7962	Mean dependent var	17.2147
Adjusted R-squared	0.7290	S.D. dependent var	0.8362
S.E. of regression	0.4353	Akaike info criterion	1.3894
Sum squared resid	18.9525	Schwarz criterion	2.1247
Log likelihood	-59.0922	Hannan-Quinn criter.	1.6882
F-statistic	11.8395	Durbin-Watson stat	1.8289
Prob(F-statistic)	0.0000		

Table 20 (continued) Advertising expenditure by time

For the theatrical market

	Coefficient	Std. Error	t-Statistic	Prob.
C	11.2040	1.7632	6.3545	0.0000
AWARD_NOM	0.3620	0.1579	2.2920	0.0240
SCREENS_3000	0.8680	0.1599	5.4284	0.0000
SEQUEL	0.3531	0.1969	1.7939	0.0758
LOG(TIME)	0.0307	0.3709	0.0827	0.9343
G_ACT	0.2501	0.2003	1.2485	0.2147
G_ADV	0.4497	0.2241	2.0068	0.0474
G_COM	0.6539	0.1602	4.0830	0.0001
G_MUSIC	0.3852	0.3778	1.0196	0.3103
G_HORR	0.5393	0.2133	2.5287	0.0130
G_SUSP	0.3774	0.2083	1.8117	0.0730
G_ROM_COM	0.5986	0.2183	2.7426	0.0072
LOG(REVIEW)	0.8213	0.2628	3.1260	0.0023
MPAA_PG	-0.1037	0.2689	-0.3858	0.7005
MPAA_PG_13	0.1472	0.2679	0.5496	0.5838
MPAA_R	-0.0061	0.2844	-0.0215	0.9829
MT_JAN	-0.5605	0.2785	-2.0129	0.0468
MT_FEB	-0.3044	0.3045	-0.9998	0.3198
MT_MAR	-0.4813	0.2586	-1.8613	0.0656
MT_APR	-0.5601	0.2395	-2.3381	0.0213
MT_MAY	-0.0953	0.2687	-0.3545	0.7237
MT_JUNE	-0.2054	0.2275	-0.9031	0.3686
MT_JULY	-0.1728	0.3371	-0.5126	0.6094
MT_AUG	-0.3731	0.2918	-1.2787	0.2039
MT_SEP	-0.3235	0.2179	-1.4848	0.1407
MT_OCT	-0.4354	0.2332	-1.8671	0.0648
MT_NOV	-0.6138	0.2310	-2.6565	0.0092
LOG(AD_T_P0+1)	0.5817	0.2418	2.4053	**0.0180**
LOG(AD_T_P1+1)	-0.0803	0.1966	-0.4083	0.6839
LOG(AD_T_P2+1)	-0.0624	0.0594	-1.0496	0.2964
LOG(AD_T_P3+1)	0.0738	0.0409	1.8059	**0.0739**
LOG(AD_T_P4+1)	-0.0221	0.0264	-0.8378	0.4041
LOG(AD_T_P5+1)	0.0090	0.0232	0.3887	0.6983

R-squared	0.7536	Mean dependent var	17.4728
Adjusted R-squared	0.6764	S.D. dependent var	1.0084
S.E. of regression	0.5737	Akaike info criterion	1.9351
Sum squared resid	33.5687	Schwarz criterion	2.6453
Log likelihood	-97.6182	Hannan-Quinn criter.	2.2237
F-statistic	9.7511	Durbin-Watson stat	2.1757
Prob(F-statistic)	0.0000		

Table 21 Result of the factor analysis

	Unrotated Loadings	
	F1	F2
ADV_DVD	**0.7864**	-0.0446
ADV_THE	**0.8630**	-0.0231
AWARD_NOM	0.3124	**0.5951**
SCREENS_3000	**0.6764**	-0.3582
SEQUEL	0.1515	-0.2514
REVIEW	0.4290	**0.5493**

Table 22 Advertising expenditure by time and percentage

Ad by time and percentage in theatrical market In DVD market

	AD_D_P0	AD_D_P1	AD_D_P2	AD_D_P3	AD_D_P4	AD_D_P5	total
Sum	347,032	340,336	55,069	14,894	11,806	7,992	777,129
percentage	45%	44%	7%	2%	2%	1%	100%

Ad by time and percentage in theatrical market

	AD_T_P0	AD_T_P1	AD_T_P2	AD_T_P3	AD_T_P4	AD_T_P5	total
Sum	1,233,436	934,950	616,323	405,674	163,923	60,806	3,415,112
percentage	36%	27%	18%	12%	5%	2%	100%

Appendix A

Sample Movie lists

No.	title	No.	title
1	300	51	Curse of the Golden Flower
2	1408	52	Da Vinci Code, The
3	27 Dresses	53	Dan in Real Life
4	28 Weeks Later	54	Dead Silence
5	30 Days of Night	55	Death Sentence
6	Across the Universe	56	Deja Vu
7	Akeelah and the Bee	57	Delta Farce
8	Aliens vs. Predator - Requiem	58	Departed, The
9	Alpha Dog	59	Descent, The
10	Alvin and the Chipmunks	60	Devil Wears Prada, The
11	American Gangster	61	Disturbia
12	American Haunting, An	62	Dragon Wars
13	Ant Bully, The	63	Dreamgirls
14	Apocalypto	64	Elizabeth: The Golden Age
15	Are We Done Yet?	65	Employee of the Month
16	Assassination of Jesse James by the Coward Robert Ford, The	66	Enchanted
17	Astronaut Farmer, The	67	Epic Movie
18	Atonement	68	Eragon
19	August Rush	69	Evan Almighty
20	Awake	70	Facing the Giants
21	Babel	71	Fantastic Four - Rise of the Silver Surfer
22	Barnyard - The Original Party Animals	72	Fast and the Furious, The: Tokyo Drift
23	Because I Said So	73	Firehouse Dog
24	Bee Movie	74	Flags of Our Fathers
25	Before the Devil Knows You're Dead	75	Flicka
26	Beowulf	76	Flushed Away
27	Black Christmas (Unrated)	77	Flyboys
28	Black Dahlia, The	78	Fountain, The
29	Black Snake Moan	79	Fracture
30	Blades of Glory	80	Freedom Writers
31	Blood and Chocolate	81	Friends with Money
32	Blood Diamond	82	Game Plan, The
33	Borat - Cultural Learnings of America for Make Benefit Glorious Nation of Kazakhstan	83	Georgia Rule
34	Bratz - The Movie	84	Ghost Rider
35	Brave One, The	85	Golden Compass, The
36	Breach	86	Gone Baby Gone
37	Break-Up, The	87	Good Luck Chuck
38	Bridge to Terabithia	88	Good Year, A
39	Cars	89	Gridiron Gang
40	Casino Royale	90	Grindhouse Presents, Death Proof - Extended and Unrated
41	Catch and Release	91	Hairspray
42	Charlie Wilson's War	92	Hannibal Rising
43	Charlotte's Web	93	Happily N'Ever After
44	Children of Men	94	Happy Feet
45	Click	95	Hills Have Eyes 2, The
46	Cloverfield	96	Hitman
47	Condemned, The	97	Holiday, The
48	Covenant, The	98	Hoot
49	Crank	99	Hostel - Part II
50	Curious George	100	Hot Fuzz

No.	title	No.	title
101	I am Legend	161	Pirates of the Caribbean - At World's End
102	I Now Pronounce You Chuck and Larry	162	Pirates of the Caribbean - Dead Man's Chest
103	I Think I Love My Wife	163	Poseidon
104	Ice Age: The Meltdown	164	Premonition
105	Illusionist, The	165	Prestige, The
106	In the Name of the King: A Dungeon Siege Tale	166	Protector, The
107	Inside Man	167	Pursuit of Happyness, The
108	Into the Wild	168	Queen, The
109	Invincible (2006)	169	R.V.
110	Invisible, The	170	Ratatouille
111	Jet Li's Fearless	171	Reaping, The
112	John Tucker Must Die	172	Reign Over Me
113	Juno	173	Reno 911! - Miami
114	Just My Luck	174	Resident Evil - Extinction
115	Kite Runner, The	175	Rocky Balboa
116	Knocked Up	176	Santa Clause 3, The - The Escape Clause 3745
117	Lake House, The	177	Saw III
118	Larry the Cable Guy - Health Inspector	178	Saw IV
119	Last King of Scotland, The	179	Scary Movie 4
120	Last Mimzy, The	180	See No Evil
121	Letters From Iwo Jima	181	Seeker, The
122	License to Wed	182	Sentinel, The
123	Lions for Lambs	183	Shoot 'Em Up
124	Little Miss Sunshine	184	Shooter
125	Live Free or Die Hard	185	Shrek the Third
126	Lucky Number Slevin	186	Silent Hill
127	Man of the Year	187	Smokin' Aces
128	Marie Antoinette	188	Snakes on a Plane
129	Marine, The	189	Spider-Man 3
130	Meet the Robinsons	190	Stay Alive
131	Messengers, The	191	Step Up
132	Michael Clayton	192	Stick It
133	Miss Potter	193	Stomp the Yard
134	Mission: Impossible III	194	Stranger Than Fiction
135	Mist, The	195	Superbad
136	Monster House	196	Superman Returns
137	Mr. Brooks	197	Surf's Up
138	Mr. Magorium's Wonder Emporium	198	Sweeney Todd - The Demon Barber of Fleet Street
139	Mr. Woodcock	199	Take the Lead
140	Music and Lyrics	200	Talladega Nights: The Ballad of Ricky Bobby
141	Nacho Libre	201	Texas Chainsaw Massacre - The Beginning, The
142	Nancy Drew	202	Thank You for Smoking
143	Nativity Story, The	203	There Will Be Blood
144	Next	204	TMNT
145	Night at the Museum	205	Transformers
146	No Country for Old Men	206	Tyler Perry's Daddy's Little Girls
147	No Reservations	207	United 93
148	Norbit	208	Vacancy
149	Notes on a Scandal	209	Waist Deep
150	Number 23, The	210	Waitress
151	Ocean's Thirteen	211	Walk Hard - The Dewey Cox Story
152	Omen, The (2006)	212	War
153	One Missed Call	213	Water Horse - Legend of the Deep
154	Open Season	214	We Are Marshall
155	Orphanage, The	215	We Own the Night
156	Over the Hedge	216	Wild Hogs
157	Pan's Labyrinth	217	Wild, The
158	Pathfinder	218	World Trade Center
159	Perfect Stranger	219	X-Men: The Last Stand
160	Phat Girlz	220	Zodiac

Appendix B

Summary of Variables

Variable category		sources	# variable	Symbol
DVD sales	DV	www.the-numbers.com	1	DS
Theatrical sales	DV	www.the-numbers.com	1	TS
weekly theatrical sales (TSW)	IV/ DV	www.the-numbers.com	3	TSW1, TSW2, TSW3
weekly DVD sales (DSW)	DV	www.the-numbers.com	1	DSW1
Month of release	IV	www.the-numbers.com	22	MT_JAN, MT_FEB...MT_NOV MD_JAN, MD_FEB... MD_NOV
MPAA ratings	IV	www.the-numbers.com	3	MPAA_PG, MPAA_PG-13, MPAA_R
Major genre	IV	www.the-numbers.com	7	G_ACT, G_ADV, G_COM, G_HORR, G_SUSP, G_MUSIC and G_ROM_COM
Sequel	IV	www.the-numbers.com	1	SEQUEL
the maximum number of screens	IV	www.boxofficemojo.com	1	SCREENS_3000
Award or nomination	IV	www.boxofficemojo.com	1	AWARD_NOM
Advertising expenditure	IV	TNS media intelligence	2	ADV_DVD, ADV_THE
Advertising expenditure by media	IV	TNS media intelligence	32	NETTV_D_T, NETTV_T_T, SPOTTV_D_T,...
Weekly advertising expenditure in releasing week and prior to release date five weeks	IV	TNS media intelligence	12	AD_D_P0, AD_D_P1... AD_D_P5; AD_T_P0, AD_T_P1... AD_T_P5
Critical reviews	IV	www.rottentomatoes.com	1	REVIEW
Running time	IV	www.the-numbers.com www.boxofficemojo.com	1	TIME