

# Word of Mouth for Movies: Its Dynamics and Impact on Box Office Revenue

This article uses actual word-of-mouth (WOM) information to examine the dynamic patterns of WOM and how it helps explain box office revenue. The WOM data were collected from the Yahoo Movies Web site. The results show that WOM activities are the most active during a movie's prerelease and opening week and that movie audiences tend to hold relatively high expectations before release but become more critical in the opening week. More important, WOM information offers significant explanatory power for both aggregate and weekly box office revenue, especially in the early weeks after a movie opens. However, most of this explanatory power comes from the volume of WOM and not from its valence, as measured by the percentages of positive and negative messages.

**W**ord of mouth (WOM), or "buzz," involves informal communication among consumers about products and services. Two important features distinguish WOM from other information sources, such as advertising: WOM is usually perceived as more credible and trustworthy, and it is more readily accessible through social networks (Banerjee 1992; Brown and Reingen 1987; Murray 1991). A McKinsey & Company study found that 67% of the sales of consumer goods are based on WOM (Taylor 2003).

In the arena of new product development, WOM may play particularly important roles because awareness must be built, and consumers need information when deciding whether to purchase a product they do not know well (Mahajan, Muller, and Kerin 1984). In the movie industry, which has become a popular setting to examine various new product issues (e.g., Elberse and Eliashberg 2003; Krider and Weinberg 1998; Lehmann and Weinberg 2000; Sawhney and Eliashberg 1996), hundreds of new films are released annually by Hollywood and independent filmmakers. In general, it is believed that WOM strongly influences people's movie selection (Austin 1989; Bayus 1985; Faber and O'Guinn 1984; Neelamegham and Chintagunta 1999). Indeed, the box office success of several movies, such as *The Blair Witch Project*, *My Big Fat Greek Wedding*, and

*Star Wars: Episode 1—The Phantom Menace*, has been attributed to the WOM that these movies generated.

This study makes use of a data set containing actual WOM information to study the dynamic patterns of movie WOM, the explanatory power of WOM for box office revenue, and the potential antecedents of WOM. It adds to the growing literature on movie marketing and provides insights into new product development, entertainment marketing (Eliashberg and Shugan 1997), services marketing, and WOM research in general.

The WOM data were collected from the Yahoo Movies message board (see <http://movies.yahoo.com/>). It contains more than 12,000 posted messages, which were coded into weekly measures of volume and valence before being empirically examined. This study attempts to provide answers to the following questions: First, in markets in which the product has a low price and prerelease information is abundant (e.g., massive prerelease advertising, extensive professional reviews), how active is WOM before release, and is there any consistent shift in consumer evaluation of a new product before introduction (i.e., expectations) versus after introduction (i.e., experience based)? Second, to what extent do important measures of WOM help explain the sales of a new product, both periodically and in aggregation? Third, what factors consistently function as antecedents of WOM across time periods? If WOM is important for the success of a new product, firms should try to understand and manage these antecedents.

Advances in communications technology, especially the Internet, have made it extremely easy to share information with other people. Numerous Web sites provide message boards and information threads for users to post information and exchange opinions. This not only increases the likelihood of consumers using WOM in decision making but also provides an opportunity for researchers to gather actual WOM information. Nevertheless, few published studies have used these data, with the notable exception of Godes and Mayzlin (2004b), who study WOM of television shows from the Usenet newsgroups. Through regressions

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across weeks and shows, they empirically test the relationship between WOM (measured in volume and dispersion across different newsgroups) and weekly ratings. They find that the dispersion measure, but not volume, has significant explanatory power for ratings.

The current study differs from that of Godes and Mayzlin (2004b) in several ways. First, in addition to volume, the role of valence, which is coded on the basis of the content of each WOM message, is investigated in detail. Second, many of the results provide insights into the prerelease period of a new product, which is critical in markets, such as movies, in which early sales are of great concern. Third, in addition to the relationship between WOM and sales, the dynamic patterns of WOM (i.e., how it evolves and its potential antecedents) are investigated. Finally, the research context is different. Unlike network television shows, which normally run on a seasonal basis, movies have very short life cycle in theaters. They also have unique industrial features that offer interesting research questions and require special considerations in empirical analysis; for example, a lot of weight is placed on the opening week, and a minimum number of weeks are usually specified in exhibition contracts (De Vany and Walls 1999).

## Theoretical Background

Although successful movies can generate great box office revenue and profits, the movie industry is also known for high risks. Of any ten major films produced, six to seven are unprofitable (Vogel 2001, p. 35; see also Shugan 1995). Two characteristics of the movie industry contribute to the popular belief that WOM influences moviegoers. First, as a prime category of popular culture goods, movies tend to receive great public interest and attention. Therefore, active interpersonal communication about movies can be expected to exist and, as indicated by the theory of information accessibility and influences (Chaffee 1982), may influence the audience. Second, the intangible and experiential nature of movie consumption makes it difficult to judge movie quality before it is actually viewed. When the alternatives are difficult to evaluate before purchase, consumers often engage in WOM to gather more information (Bristor 1990; Harrison-Walker 2001; Rogers 1983).

Volume and valence are among the most important WOM attributes that have been examined (e.g., Mahajan, Muller, and Kerin 1984; Mizerski 1982; Neelamegham and Chintagunta 1999). Volume measures the total amount of WOM interactions. Valence captures the nature of WOM messages (i.e., whether they are positive or negative). Mainly because of data availability, most extant studies examine either volume or valence, but not both. For example, Anderson (1998) and Bowman and Narayandas (2001) focus exclusively on the volume of WOM.

Two previous studies use controlled laboratory settings to investigate how WOM is related to certain behavioral features of moviegoers. In particular, Faber and O'Guinn (1984) examine how much credibility and importance college students attach to WOM versus other information sources. Burzynski and Bayer (1977) study how WOM moderates people's liking of a film. Several studies that

focus on other issues of the movie market have included various proxy measures of WOM as covariates (e.g., Elberse and Eliashberg 2003; Neelamegham and Chintagunta 1999; Zufryden 1996). Two other independently conducted studies also use data from Yahoo Movies. Dellarocas, Awad, and Zhang (2004) use a Bass diffusion model to examine how user ratings posted in the opening week help explain the two Bass parameters ( $p$  = the external influence factor, and  $q$  = the internal influence factor), which are estimated from the box office history of a movie sample. They find that the volume of the first week's user ratings and their density (defined as a ratio between the volume of ratings and the first week's box office revenue), but not the numerical value of these ratings, are useful in explaining  $p$ . However, the value of user ratings becomes a significant explanatory variable for  $q$ . Duan, Gu, and Whinston (2005) use similar user-ratings data but focus on the correlation between the daily measures of these ratings and the daily box office revenue in the first two weeks. They find that user ratings have no explanatory power for box office revenue, but the volume of ratings does.

There are several important differences between the current study and those of Dellarocas, Awad, and Zhang (2004) and Duan, Gu, and Whinston (2005). First, this study disentangles the weekly effects of WOM in a way similar to Eliashberg and Shugan (1997) and Basuroy, Chatterjee, and Ravid (2003). This is useful given that different weeks are considered of different importance in the movie industry, and many managerial decisions are made on a weekly basis. Second, the data contain WOM information in the prerelease period, which can be used to explain and predict the movie's opening-week box office revenue. An important managerial value of prerelease WOM is that it can help improve the early forecast of opening-week box office and aggregate box office revenue. Third, this study investigates the potential antecedents of WOM, which provide useful implications for both WOM research and managerial practice. Finally, because the data are coded into weekly measures, it is possible to examine how WOM evolves over time.<sup>1</sup>

Extant studies have found that the volume of WOM correlates significantly with consumer behavior and market outcome (Anderson and Salisbury 2003; Bowman and Narayandas 2001; Van den Bulte and Lilien 2001). The reason that is often advanced to explain why the pure volume of WOM matters is consumer awareness. For example, Godes and Mayzlin (2004b) suggest that the more conversation there is about a product, the more likely someone is to be informed about it, thus leading to greater sales. On the basis of a similar rationale, research that uses diffusion models often examines WOM by either the number of

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<sup>1</sup>On a more technical level, the data are collected from the Yahoo Movies message board, which is characterized as a "community" site that allows bilateral discussions in a threaded manner (see <http://movies.yahoo.com/>). Dellarocas, Awad, and Zhang's (2004) and Duan, Gu, and Whinston's (2005) data come from the "User Review" section of Yahoo Movies, where users can post a numerical rating, a written review, or both.

adopters (Neelamegham and Chintagunta 1999) or the interaction between the number of adopters and that of non-adopters (Zufryden 1996). In this article, the effect of volume is called the “informative” effect on awareness.

Positive WOM typically gives either a direct or an indirect recommendation for product purchase. Negative WOM may involve product denigration, rumor, and private complaining. The reason valence matters is relatively straightforward; positive WOM enhances expected quality (and, thus, consumers’ attitudes toward a product), whereas negative WOM reduces it. In this article, the effect of valence is called the “persuasive” effect on attitude.

Although volume and valence are among the most important measures of WOM in the literature, other measures, such as duration, intensity, and dispersion, exist (Eliashberg et al. 2000; Godes and Mayzlin 2004b). Because these measures are difficult to construct from the current data, this study focuses on volume and valence.

The effects and potential antecedents of movie WOM are investigated by examining three important aspects of a movie’s run: the opening week, the weeks after opening, and aggregate box office revenue. Previous studies that have adopted similar approaches include those of Elberse and Eliashberg (2003), who separate the opening week from remaining weeks, and Eliashberg and Shugan (1997), who examine the effects of critical reviews in each of the first eight weeks after a movie’s release and on aggregate box office revenue.

### ***Comparison of WOM Before and After Release***

Opposite theories exist about the degree of WOM activities before a movie’s release. Several factors suggest that pre-release WOM is minimal. First, the price of watching a movie is relatively low for an average consumer; the average movie admission was \$6 in 2003 (Motion Picture Association 2003). The low cost, coupled with moviegoing often being an impulse decision, implies that potential moviegoers may not go through an intensive decision-making process in which a large amount of information, such as WOM, is needed. Second, most movies are released after intensive prerelease advertising. Advertising, which is mainly done in newspapers and on television, typically amounts to 50% of the production budget (Vogel 2001, p. 96). It provides information about the opening date, main cast, some of the storyline, critical opinions (in a selected fashion), and, in many cases, whether the movie is to be released nationwide “in a theater near you” or only “in selected cities.” Critical reviews also provide useful information to moviegoers and can be easily obtained from many media channels (Faber and O’Guinn 1984; Litwak 1986). Because movie critics are mostly independent from the studios, their reviews could offer supplementary value to advertising. If massive advertising and active critical reviews can meet potential moviegoers’ need for information and thus be an effective substitute for WOM, the amount of WOM in the prerelease period should be minimal (Chaffee 1982). Finally, it is conceivable that the actual experience with a product may function as an important stimulus for WOM communication (Anderson 1998). Thus,

the volume of WOM could be expected to be significantly large only after many moviegoers have seen the movie in the opening week.<sup>2</sup>

Conversely, as discussed previously, movies are popular cultural goods with an intangible/experiential nature, which increases the likelihood that prerelease WOM is active. Because WOM comes from other moviegoers, it may also be perceived as more trustworthy than advertising (Faber and O’Guinn 1984), and it may better reflect popular taste than critical reviews (Holbrook 1999). As a result, although abundant information about a to-be-released movie is provided by advertising and critical reviews, WOM may still be perceived as useful and thus serve as a complement to rather than a substitute for other information sources. This study relies on an empirical approach to examine how active WOM is during the prerelease phase of a movie and how it compares with WOM in the opening week.

By its very nature, advertising will be positive about a new movie. Notably, Eliashberg and Shugan (1997) find that critical reviews are also mostly positive. To the extent that these sources of information influence moviegoers, the valence of prerelease WOM for an average movie should be mainly positive. After a movie is released, actual experience will come into play to influence WOM valence further. Abundant research indicates that consumer satisfaction is influenced by the confirmation or disconfirmation of expectations (Anderson 1973; Oliver 1980; Olson and Dover 1979). Because the viewing public holds a comparatively high expectation for a to-be-released movie, the likelihood of disconfirmation is greater. In turn, this may result in a decrease in the positivity of WOM. Lieberman and Esgate (2002) make a similar argument for movie trailers and interactive games; that is, because trailers and games create high expectations before release, viewers are more likely to be disappointed after seeing the movie and talk unfavorably about it. Thus:

H<sub>1</sub>: The valence of prerelease WOM is mainly positive, and the valence of WOM in the opening week is less positive than that of prerelease WOM.

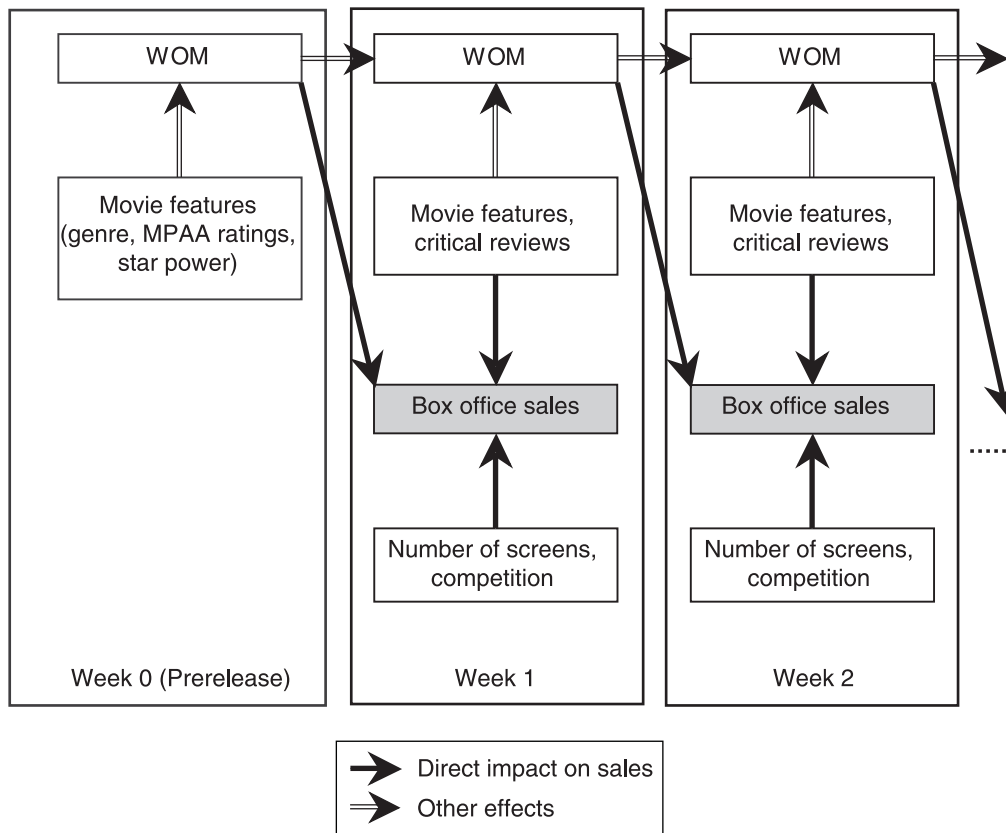
### ***Weekly Box Office Revenues***

Figure 1 presents a conceptual framework that integrates WOM into an otherwise familiar picture of the movie market (Elberse and Eliashberg 2003; Lehmann and Weinberg 2000). The extant literature consistently finds that the number of screens on which a movie is shown strongly influences box office revenue in a given week (e.g., Swami, Eliashberg, and Weinberg 1999). Evidence also indicates that critical reviews correlate with weekly box office revenue, though previous studies have reported mixed findings about the significant level of this correlation and when it exists in a movie’s run (Basuroy, Chatterjee, and Ravid

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<sup>2</sup>A caveat is that some audiences might have the chance to watch a sneak preview of a to-be-released movie. However, sneak previews are conducted only for selected movies, in few cities, and for a small number of people. The vast majority of moviegoers would not have experienced the movie before its release.

**FIGURE 1**  
**A Conceptual Framework of Movie Box Office Sales**



Notes: MPAA = Motion Picture Association of America.

2003; Eliashberg and Shugan 1997; Reinstein and Snyder 2005). Whereas the number of screens captures distribution intensity (and, thus, the audiences' accessibility to movies), critical reviews and WOM constitute most of the third-party information that moviegoers may use. Unlike critical reviews, which are static and occur mostly before the movie is released, WOM is a dynamic phenomenon that begins before release and spans the entire run. Thus, it is important to measure WOM periodically.

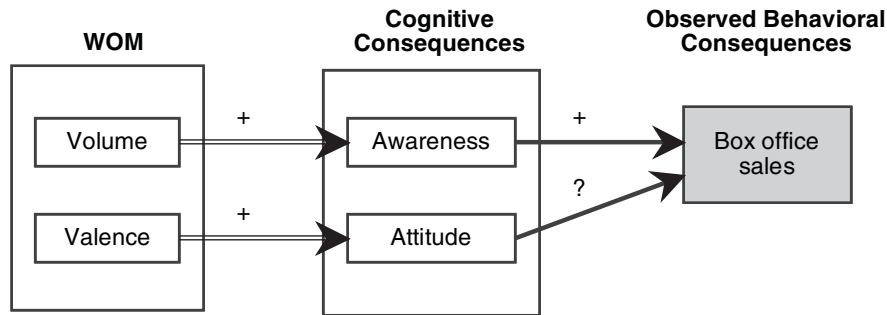
If WOM is able to influence consumer decisions, incorporating WOM into extant models that have the number of screens and critical reviews as explanatory variables (Basuroy, Chatterjee, and Ravid 2003; Eliashberg and Shugan 1997) will enhance the models' explanatory power for weekly box office revenue. This is especially true if WOM functions as a complement to critical reviews. An additional factor contributing to the explanatory power of WOM beyond that of the number of screens is the reality of overcapacity in movie theaters. The movie exhibition industry has been known for serious oversupply of theaters and seats. A series of articles that appeared in *Forbes* (Ackman 2001a, b; Schiffman 2000) estimate that the average capacity utilization of movie theaters is less than 20%. Although the number of screens picks up a large amount of variance in box office sales, the inclusion of additional factors that influence moviegoers (e.g., WOM) can explain more vari-

ance through capturing the increase in capacity utilization inside theaters.

The two measures of WOM, volume and valence, influence moviegoers through different cognition-behavior routes (Figure 2). As discussed previously, the volume of WOM mainly has an informative role to enhance consumer awareness.<sup>3</sup> The greater the volume of WOM, the more likely a consumer will be to hear about it. Not surprisingly, greater awareness tends to generate greater sales.

<sup>3</sup>A few studies have found that the number of arguments in a persuasive message may influence persuasion, but the nature of this influence depends on situational factors, such as the level of involvement and the strength of the arguments. For example, Petty and Cacioppo (1984) suggest that the number of arguments serves as a simple persuasive cue for low-involvement situations, but a larger number of arguments may enhance issue-relevant thinking when involvement is high. For WOM in general and for movie WOM in particular, the overall degree of consumer involvement and the factors that drive it remain to be studied. Moreover, it is an interesting issue whether the findings regarding multiple arguments in one persuasive message are applicable to a context similar to movie WOM, in which WOM messages come from different senders and usually advance different opinions. However, note that the informative effect proposed in the literature (e.g., Godes and Mayzlin 2004b; Neelamegham and Chintagunta 1999; Zufryden 1996) always occurs as moviegoers are exposed to WOM.

**FIGURE 2**  
**The Impact of WOM Measures on Potential Moviegoers**



Conversely, the role of WOM valence, because of its positive/negative nature, is more of a persuasive one that influences consumer attitude. Although it is relatively straightforward to postulate that positive WOM enhances attitude and negative WOM reduces it, whether this effect can be unambiguously transformed into actual box office sales is unclear. Indeed, behavioral research has found that attitude does not always predict behavior well (Ajzen and Fishbein 1980) and that situational factors may influence behavior beyond what attitude can explain.

In the movie market, the link between attitude and behavior is further weakened when moviegoing occurs impulsively. Moreover, unlike other consumer goods that remain in the market for a long time so that consumers have sufficient time to act on the desire to purchase them, movies are in theaters only for a short time. Along this line, Sawhney and Eliashberg (1996) distinguish between the time to decide whether to watch a movie and the time to act on this decision.

Therefore, a positive relationship between WOM volume and box office revenue is postulated. However, because of the weak link between attitude and behavior, the relationship between WOM valence and box office revenue may be insignificant.

H<sub>2</sub>: WOM has significant explanatory power for box office revenue in the subsequent period. Whereas the effect of WOM volume should be significantly positive, that of WOM valence may be insignificant.

### Aggregate Box Office Revenue

The overall performance of movies, as measured by aggregate box office revenue, is a critical issue in the industry. Beyond the weekly effects discussed in the previous section, it is useful to examine whether prerelease WOM (i.e., the buzz that accumulates before the opening week) can help explain aggregate box office revenue. The importance of accumulated buzz before a movie's release has attracted much interest in both academic research (Elberse and Eliashberg 2003) and the popular press (King 2003). If WOM is informative about weekly box office revenue and if WOM activities can correlate between adjacent weeks, prerelease WOM will help explain/predict aggregate box

office revenue. In line with previous discussions, the effect of the volume of prerelease WOM is expected to be significantly positive, but that of the valence may be insignificant.

As do studies that examine aggregate sales of movies and other entertainment products (Litman 1983; Reddy, Swaminathan, and Motley 1998), this study uses factors that are constant across the movies' run as explanatory variables. In addition to prerelease WOM, this study links a movie's aggregate box office revenue to factors including star power, genre, production budget, critical reviews, and the opening strength of the movie.<sup>4</sup> Eliashberg and Shugan (1997) examine the effects of critical reviews on aggregate box office revenue and find that though the percentage of positive reviews is a significant predictor, the volume of reviews is not. The role of star power, genre, and production budget has been examined in a few studies, but the results are mixed (Basuroy, Chatterjee, and Ravid 2003; Elberse and Eliashberg 2003; Litman 1983).

Opening strength refers to the number of screens in the first few weeks of a movie's run. A wide opening strategy may generate higher total sales because greater accessibility better appropriates the public interest in a movie that has accumulated before release. However, opening wide may also merely shift future demand into early weeks if the overall demand is not increased. If audiences are not stimulated enough by a wide opening to go to theaters early and if the number of screens drops quickly, total sales will be negatively influenced. The business press suggests that movies are increasingly opening wide (King 2001).

H<sub>3</sub>: Prerelease WOM offers significant explanatory power for aggregate box office revenue. However, most of the explanatory power comes from its volume, not its valence.

<sup>4</sup>Other variables, such as Motion Picture Association of America (MPAA) ratings, directors, distributors, and whether the movie is a sequel, are potential explanatory variables for aggregate box office revenue. However, most studies failed to find these variables to be significant (e.g., Elberse and Eliashberg 2003; Litman 1983). These were also included in the estimation and were found to be insignificant as well. Thus, they are not included in the analyses reported here.



### Potential Antecedents of WOM

The double-lined arrows in Figure 1 illustrate the factors that are potential antecedents of WOM. These include five groups of factors: movie genres, Motion Picture Association of America (MPAA) ratings, whether major stars are in the cast, critical reviews, and the WOM measures in the previous week. Movie genres (e.g., action, drama, horror) classify movies on the basis of their storyline, and MPAA ratings (G, PG, PG-13, and R) classify movies on the basis of content, primarily according to the suitability of the movie to different audience segments. As a communication process, WOM activities can be influenced by the strength, inherent interestingness, and possibly the controversy of the topic. Movies with certain genres (e.g., action, adventure) and MPAA ratings (e.g., R, which requires a parental guardian for moviegoers under the age of 17) may be associated with distinctive patterns of WOM behavior, especially during the prerelease period when the curiosity about movies is high.

The phenomenon of star power is substantial in the entertainment sector. Movie stars are the frequent topic of interpersonal communication among moviegoers. Thus, the existence of stars is likely to correlate with WOM activities. Because the literature is inconclusive about the role of movie stars on box office revenue and because Hollywood seems to promote a culture of stars despite the high pressure faced by studios to control production budgets (Vogel 2001), either a confirmation or a disconfirmation of the impact of star power on WOM would be valuable.

Critical reviews are usually published in major newspapers, in magazines, and, increasingly, on movie Web sites. They may influence moviegoers' expectations of a film and thus correlate with WOM. However, such influence may exist only if the majority of movie audiences read these reviews. Because there is no published evidence about the size or the demographic features of those who read critical reviews, it is difficult to speculate on the significance of the correlation between reviews and WOM.<sup>5</sup> Although most critical reviews begin circulating before a movie's opening week, the data do not contain information about the exact time the reviews became available. To reduce any ambiguity in the analysis for the prerelease period, critical reviews are included as a potential antecedent of WOM only in a movie's opening week and the weeks after it.

Extant studies advance the theory that WOM can be viewed as a consequence of social networks; thus, it is contagious and persistent (Banerjee 1992; Brown and Reingen 1987; Murray 1991). This indicates that on the aggregate level, WOM in adjacent weeks will be positively correlated. From a behavioral point of view, active WOM during a

period helps promote awareness and interest in a movie; therefore, more people will see the movie in the next period and subsequently talk about it. This can happen for two reasons: First, greater WOM makes the memory of the movie last longer, thus increasing the likelihood that a moviegoer will talk about the movie after seeing it. Second, the perceived social benefit of talking about a popular subject (i.e., movie) tends to be greater than talking about a less popular one (Brown and Reingen 1987).

The data can be used to examine the aggregate effect of this temporal correlation. That is, a week with greater WOM activities is more likely to be followed by another week of active WOM than is a week with less WOM. This phenomenon is called a "carryover" effect of WOM, which, in the context of this study, refers to the possibility that WOM activities in a week correlate with WOM in the subsequent week.<sup>6</sup>

H<sub>4</sub>: Movie genres, MPAA ratings, star power, and critical reviews are among the potential antecedents of movie WOM. A dynamic carryover effect exists between WOM activities in adjacent weeks.

## Empirical Analysis and Discussion of Results

### Data and Variables

The WOM data are collected from the Yahoo Movies message board (<http://movies.yahoo.com/>). There are several reasons Yahoo Movies serves as a good source of movie WOM. First, it is one of the most popular movie Web sites. *Variety* (Graser 2002) reports that Yahoo Movies has the largest number of unique visitors among its Web competitors. Second, Yahoo Movies requires no access fee for either browsing or posting a message. This helps reduce any possible bias in the demographic composition of the Web site's visitors. Third, the structure of the Web site is well designed so that finding and collecting information is straightforward, thus reducing possible errors during data collection. Finally, WOM messages are archived and indexed numerically by the dates when they were posted. Thus, it is possible to track the period in the movie's run to which a particular message belongs.<sup>7</sup> The prerelease period is from the date

<sup>5</sup>Movie advertisements also display critical reviews from time to time. However, such displays are highly selective; only positive evaluations, such as "two thumbs up," are displayed. To the extent that consumers understand this selective process, the impact of critical reviews through movie advertisements should decrease (Taylor 2003).

<sup>6</sup>Note that this carryover effect does not require the volume of WOM to keep increasing over time. There are other factors that may function as antecedents of WOM, such as weekly advertising spending and whether the movie is a sequel. The data do not contain sufficient information or variance to investigate these factors. This is an issue for further research.

<sup>7</sup>A few other Web sites (e.g., IMDB.com) also provide user comments about movies. However, these Web sites do not attract as many visitors as Yahoo Movies (Graser 2002). Furthermore, in general, they do not provide functions similar to Yahoo Movies, which allows threaded message posting and replying. Collecting and organizing the postings from these other sites are more difficult. For example, the user comments on IMDB.com are not numbered, thus increasing the difficulty of an already tedious data-processing task. To the extent that no significant difference exists

when the first WOM message about a movie is posted to the date before the official movie release. It captures the accumulation of WOM before the movie opens.

Coding WOM messages into valence is an extremely tedious task that poses serious constraint on the amount of data that can be studied. To cope with this difficulty, this study focuses on movies released during a five-month period (May–September) in 2002. After excluding titles for which there is no reliable information about all control variables, the final data set contains 40 movies, with 12,136 WOM messages to be coded.

Three judges independently read each of the 12,136 messages and assigned them to one of five categories: positive, negative, mixed, neutral, and irrelevant. The messages classified as positive or negative either show clear overall assessment of the movie or provide direct recommendations. A message is classified as mixed if it expresses positive opinions about some aspects of the movie but negative opinions about others and if there is no clear overall assessment. A message is classified as neutral if it talks about the movie but does not provide any positive or negative comments. Finally, a message is classified as irrelevant if it is not related to the movie itself. The three independent codings are integrated using the majority rule: If at least two judges assign the same category, that category is used for the message. If all three judges disagree, the message is coded as disagree. The level of disagreement among the three judges was very low (approximately 4% for all the weeks examined). For example, for WOM posted during the opening week, the judges did not achieve a majority agreement for only 4.1% of all messages. The data require the

in the demographic profiles of visitors to these movie Web sites, using data from Yahoo Movies can be fairly representative. Nevertheless, it is acknowledged that compiling data from different Web sites and examining their differences and the collective influence on product sales could be potentially useful.

use of aggregate measures for WOM valence. Consistent with previous studies that involve valence coding (Basuroy, Chatterjee, and Ravid 2003; Eliashberg and Shugan 1997), the valence of WOM is measured in two dimensions: the percentage of positive messages and the percentage of negative messages.<sup>8</sup>

Other data come from various public sources. The weekly box office revenue and number of screens are collected from *Variety* magazine, as are the critical reviews. Eliashberg and Shugan's (1997) method to calculate the total number of reviews, the percentage of positive reviews (CRPRO), and the percentage of negative reviews (CRCON) is used. Similar to their data, an extremely high correlation exists between CRPRO and CRCON ( $-0.878, p < .0001$ ). As a result, these data must be included separately in the estimation. Production budget comes from another popular movie Web site, The Numbers (see [www.the-numbers.com](http://www.the-numbers.com)), and MPAA ratings and movie genres are collected from the Internet Movie Database (<http://us.imdb.com>). Star power is based on the star list published annually by *Premier*; a movie is classified as having star power if at least one of its cast members appears in "The Power List 2002." Table 1 provides the basic summary sta-

<sup>8</sup>An alternative method is to use the absolute numbers of positive and negative messages, either individually or together with the volume of messages. However, note that doing so does not clearly separate the volume effect from the valence effect and may produce spurious results, because both numbers are significantly correlated with the total volume. For example, using the number of negative reviews to explain box office revenue always yields a positive sign, indicating that the effect of total volume may dominate the valence effect. Using the numbers of positive and negative messages together with the volume produces an unacceptable variance inflation factor, a strong signal for multicollinearity. Therefore, in this study, the analysis and discussion are restricted to the volume measure and the valence measures that are defined as percentages.

**TABLE 1**  
**Key Summary Statistics of the Movie Sample**

Variable	Median	M	SD
Box office (aggregate)	\$41,986,198	\$67,005,348	\$56,681,186
Ratio of opening week to aggregate box office	43.1%	41.0%	14.3%
Exhibition longevity (in weeks)	15.0	15.5	4.89
Production budget	\$48,000,000	\$51,650,000	\$30,955,344
Screens in opening week	2633.5	2518.9	890.3
Volume of total WOM messages	139.5	303.4	411.8
Volume of WOM (prerelease)	45.5	84.6	89.1
Percentage of positive WOM (prerelease)	27.3%	28.5%	12.5%
Percentage of negative WOM (prerelease)	9.1%	10.5%	8.2%
Volume of WOM (opening week)	49.0	94.8	134.5
Percentage of positive WOM (opening week)	20.3%	23.8%	11.9%
Percentage of negative WOM (opening week)	13.3%	16.1%	13.5%
Volume of critical reviews	16.5	16.3	4.1
Percentage of positive reviews	28.1%	36.9%	28.7%
Percentage of negative reviews	32.5%	37.6%	30.6%

Notes: Total number of movies = 40. Total number of WOM messages analyzed = 12,136.

tistics of the sample.<sup>9</sup> Following the work of Eliashberg and Shugan (1997) and Basuroy, Chatterjee, and Ravid (2003), and in light of the varying exhibition longevities among the 40 movies, empirical analyses are conducted for the first eight weeks in the movies' run. This covers most of the interesting periods for the movies; the first eight weeks account for 97% of the box office revenue in the data.

### Dynamic Features of Movie WOM

For illustrative purposes, Figure 3 plots how volume and valence change over time, beginning with the prerelease period (Week 0), then the opening week (Week 1), and so

<sup>9</sup>Note that for both WOM and critical reviews, the percentage of positive comments and the percentage of negative comments do not add up to 100%, because other categories (e.g., mixed) exist when the valence measures are constructed. It is also interesting that WOM is less often positive or negative than critical reviews. This happens because critical reviews tend to give clear overall assessments, but WOM is more likely to be ambiguous.

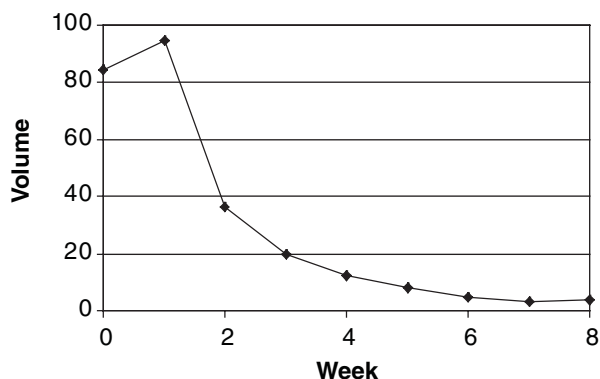
on. Figure 4 further provides plots for two specific movies, *xXx* and *Scooby-Doo*, to illustrate different patterns of the valence measures.

Figure 3, Panel A, reveals that movie WOM is the most active during the prerelease period and the opening week, and then gradually decreases. For the 40 movies in the sample, most movies (i.e., 23) have their greatest WOM volume during the prerelease period, and 15 movies have the most active WOM during the opening week. Compared with all other periods, the opening week has the greatest volume of WOM; on average, 94.8 WOM messages per movie are posted. The volume of prerelease WOM is slightly lower but is still very high; on average, 84.6 messages are posted during this period. The average volume drops significantly to 36.6 in the second week and continues to decrease.

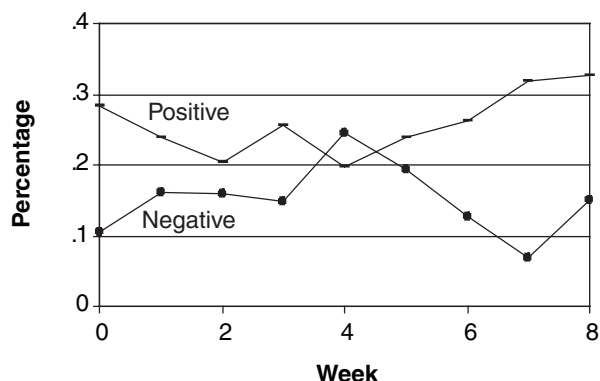
Therefore, although other information sources are abundant and most moviegoers have not watched the movies, **WOM is very active in the prerelease period.** It suggests that WOM is more of a complement to other information sources than a substitute. This finding lends direct support to the hypothesis that WOM can be a useful measure to explain box office sales. It also implies that instead of being

**FIGURE 3**  
**Dynamic Patterns of WOM for the Movie Sample**

**A: The Average Volume of WOM**

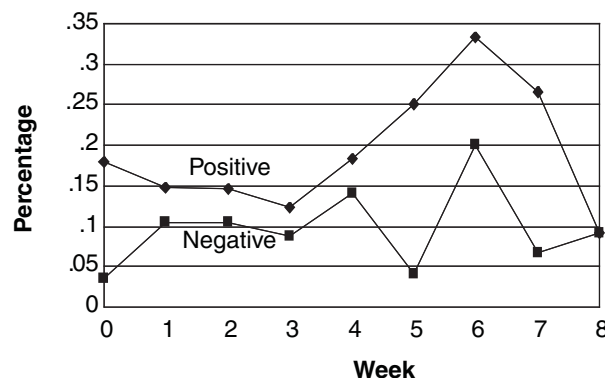


**B: The Average Valence Measures**

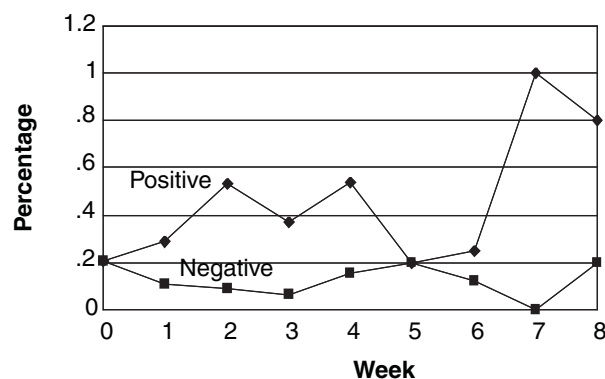


**FIGURE 4**  
**Valence of WOM for Movies *xXx* and *Scooby-Doo***

***xXx***



***Scooby-Doo***





based on actual experiences with a movie, prerelease WOM can be fairly speculative in nature.

Figure 3, Panel B, indicates that the valence measures have a different pattern from that of volume. Although there are variations in positive and negative percentages from week to week, such changes in terms of direction and magnitude appear to be rather random. Furthermore, the average percentage of positive WOM is greater than that of negative WOM in the early periods, especially during prerelease. To quantify this finding further, each movie is examined individually. During the prerelease period, the percentage of positive WOM is greater than the percentage of negative WOM by a margin of 5% for as many as 31 movies. These margins are within 5% of each other for 8 movies, and only in one case (for the movie *The Banger Sisters*) does the percentage of negative WOM exceed that of positive WOM by 5%.

Figure 3, Panel B, also indicates that movie audiences' expectations about a typical movie (before release) are usually higher than what they think in the opening week. In particular, the percentage of positive WOM begins at a comparatively high level during prerelease and drops to a lower level in the opening week. At the same time, the percentage of negative WOM begins at a comparatively low level during prerelease but increases to a higher level in the opening week. Among the movies in the sample, the WOM for about half (19 movies) drops by more than 5% from prerelease to the opening week. The other movies either have comparable levels of positive WOM between the two periods (11 movies) or have more positive WOM during the opening week (10 movies), and 17 movies have their negative WOM increase by more than 5% from prerelease to the opening week (e.g., *xXx*), whereas only 6 movies have noticeable decreases in negative WOM (e.g., *Scooby-Doo*).

Thus, there is support for  $H_1$ , which postulates that WOM tends to be positive in the prerelease period but

becomes less so in the opening week. In addition to illustrating the confirmation or disconfirmation theory of expectations in the context of movies, these results imply a potential drawback of intensive advertising. That is, advertising may generate awareness for new products, but it may also attract nontarget consumers who are more likely than others to spread negative WOM. In the movie market, these are the people who normally would not like a particular movie. This problem is of greater concern when retailers (theaters) would have kept the product longer if WOM were more positive. As a result, seeking ways to make advertising more targeted should be of considerable value. Without the concern about negative WOM, a firm would want the "wrong" buyers to buy because they still generate additional revenue.

The remaining part of this section discusses three sets of analyses of how the measures of WOM help explain weekly and aggregate box office revenue and what constitutes potential antecedents of WOM. To cope with potential nonlinearity, double log specifications are used for the regression equations; natural logarithms are taken for variables that could take unbounded positive values. The terms  $LNMSG_t$ ,  $POSIPER_t$ , and  $NEGPER_t$  are used to denote volume (in natural logarithms) and valence (in percentages) of WOM in week  $t$  ( $t = 0$  indicates the prerelease period). Two weekly variables are included to control for the effects of competition; one is the number of new releases among the top 20 movies, and the other is the average age, measured in weeks, of the top 20 movies (for a discussion about why these factors may capture the effect of competition, see Elberse and Eliashberg 2003). In all estimations, multicollinearity is tested for by calculating the variance inflation factor. The variables used produced acceptable variance inflation factor values. Table 2 lists all the variables, and Table 3 provides the correlation matrix among WOM measures for a movie's prerelease and opening week. Similar

**TABLE 2**  
**List of Variables Used in the Analyses**

Variable Name	Meaning
$t$ (subscript)	Week number in movie's life span ( $t = 0$ is prerelease)
CONST	The constant intercept in the regression models
CRCON	Percentage of negative critical reviews
CRPRO	Percentage of positive critical reviews
GACADV	Movie genre is action/adventure
GCOMEDY	Movie genre is comedy
GSCIFI	Movie genre is science fiction
$LNAGE_t$	Average age of the top 20 movies in week $t$ (in natural log)
$LNCRITIC_t$	Number of critical reviews (in natural log)
$LNMSG_t$	Number of WOM messages in week $t$ (in natural log)
$LNNEW_t$	Number of new releases among the top 20 movies in week $t$ (in natural log)
$LNPROD_t$	Value of production budget of the movie (in natural log)
$LNREV_t$	Box office revenue in week $t$ (in natural log)
$LNSCRN_{1-4}$	Number of screens in the first four weeks after opening (in natural log)
$LNSCRN_t$	Number of screens in week $t$ (in natural log)
MPAA-PG	Movie is rated PG in MPAA ratings
MPAA-R	Movie is rated R in MPAA ratings
$NEGPER_t$	Percentage of negative WOM in week $t$
$POSIPER_t$	Percentage of positive WOM in week $t$
STAR	There are major stars in the movie

**TABLE 3**  
**Correlation Matrix for Prerelease and Opening Week WOM**

	LNMSG <sub>0</sub>	POSIPER <sub>0</sub>	NEGP <sub>0</sub>	LNMSG <sub>1</sub>	POSIPER <sub>1</sub>	NEGP <sub>1</sub>
LNMSG <sub>0</sub>	1.000	—	—	—	—	—
POSIPER <sub>0</sub>	-.312 (.050)	1.000	—	—	—	—
NEGP <sub>0</sub>	.026 (.873)	-.265 (.098)	1.000	—	—	—
LNMSG <sub>1</sub>	.764 (.000)	-.034 (.835)	-.007 (.965)	1.000	—	—
POSIPER <sub>1</sub>	.053 (.746)	.211 (.191)	-.197 (.223)	-.025 (.880)	1.000	—
NEGP <sub>1</sub>	-.216 (.180)	.036 (.825)	.267 (.096)	-.071 (.664)	-.426 (.006)	1.000

Notes: *p* values are in parentheses.

patterns exist for the remaining weeks. The most significant correlation exists between LNMSG<sub>1</sub> and LNMSG<sub>0</sub>, implying the possibility of a carryover effect.

### **WOM and Weekly Box Office Revenue**

To examine the weekly effects of WOM, the following model is estimated:

$$\begin{aligned}
 (1) \quad \text{LNREV}_{it} = & \text{CONST} + a_1 \text{LNCRN}_{it} + a_2 \text{LNMSG}_{i,t-1} \\
 & + a_3 \text{POSIPER}_{i,t-1} + a_4 \text{NEGP}_{i,t-1} \\
 & + a_5 \text{LNCRITIC}_i + a_6 \text{CRPRO}_i + a_7 \text{LNNEW}_t \\
 & + a_8 \text{LNAGE}_t + \varepsilon_{it},
 \end{aligned}$$

for each week separately ( $t = 1, 2, \dots, 8$ ), where  $i$  indexes the movies ( $i = 1, 2, \dots, 40$ ) and is omitted hereafter to avoid notation clutter. The covariates include the number of screens (LNCRN<sub>*t*</sub>), critical reviews (LNCRITIC<sub>*i*</sub>), CRPRO<sub>*i*</sub>, and the degree of competition (LNNEW<sub>*t*</sub>, LNAGE<sub>*t*</sub>). This specification is similar to that of Eliashberg and Shugan (1997) and Basuroy, Chatterjee, and Ravid (2003), except for the additional (lagged) WOM measures and the two competition variables.<sup>10</sup>

Table 4 reports the weekly regression results. All the regressions achieved high levels of model fit, and all the significant parameters have expected signs. For the opening week, the joint *F* test shows that the measures of WOM have significant explanatory power for box office revenue. However, whereas the volume of WOM (LNMSG<sub>0</sub>) is highly significant ( $p < .001$ ), the valence measures (POSIPER<sub>0</sub> and NEGP<sub>0</sub>) are not. In other words, almost all the explanatory power that WOM brings to the estima-

tion comes from its volume but not its valence. The estimation for the next four weeks (Week 2–Week 5) yields the same results; that is, the volume of WOM (LNMSG<sub>*t-1*</sub>) is highly significant, but the valence (POSIPER<sub>*t-1*</sub> and NEGP<sub>*t-1*</sub>) is not. At Week 6, the effect of volume becomes marginal and then disappears. This happens because WOM activities are gradually reduced as people lose interest in a movie during subsequent weeks. Thus, the increasingly sparse and irregular WOM fails to provide informative measures for weekly box office revenue. For example, there are only 5.1 WOM messages posted per movie in Week 6, compared with 94.8 in the opening week. As a result, *H*<sub>2</sub> is supported, but only for the early weeks. This is particularly enlightening because most of the box office sales occur in these weeks; for the movies in the data, the first five weeks contribute to 91.3% of aggregate box office revenue.<sup>11</sup>

To examine the robustness of these results, especially the insignificance of valence, which might be particularly surprising, several further analyses were conducted. A typical reason for the lack of significance is that the sample size may not have been sufficiently large. Whereas the number of movies that can be analyzed is practically constrained by the labor-intensive coding process, the sample size is still comparable to those of extant studies. For example, Godes and Mayzlin (2004b) analyze 41 television shows; Lehmann and Weinberg (2000) use 35 movie and video titles; Eliashberg and Shugan (1997) analyze 56 movies; and Dellarocas, Awad, and Zhang (2004) use 25 movies in a ratings survey and then 80 movies for box office analysis (40 movies for estimation and 40 for prediction). Nevertheless, a pooled regression was conducted to examine whether

<sup>10</sup>In an effort to test and control for any effects that might be caused by unobservable variables, the estimation of a set of movie-specific information, such as movie genres, MPAA ratings, production budget, whether a movie is a sequel, and whether there are major stars or directors, is included. However, these variables are mostly insignificant. Thus, they are omitted from the final model of estimation.

<sup>11</sup>A question here is whether the volume of WOM is merely picking up the effects of advertising. To examine this issue, data on the advertising budget for each movie were collected and included in weekly regressions with WOM. The estimation results remain similar, and the volume of WOM is still highly significant. Thus, movie WOM offers explanatory power for weekly box office revenue beyond that of advertising.

**TABLE 4**  
**The Effects of WOM Communication on Weekly Box Office Revenue**

Week (t)	1	2	3	4	5	6	7	8
CONST	7.273 (.000)**	9.346 (.000)**	6.449 (.000)**	8.171 (.000)**	6.469 (.000)**	4.981 (.015)**	.594 (.000)**	4.067 (.317)
LNSCRN <sub>t</sub>	.566 (.000)**	.401 (.006)**	.673 (.000)**	.985 (.000)**	.973 (.000)**	1.050 (.000)**	1.379 (.000)**	1.185 (.000)**
LNMSG <sub>t-1</sub>	.592 (.000)**	.345 (.000)**	.366 (.000)**	.275 (.005)**	.387 (.000)**	.169 (.0103)	-.088 (.449)	.144 (.362)
POSIPER <sub>t-1</sub>	.784 (.257)	-.300 (.674)	.812 (.133)	.186 (.603)	.342 (.312)	.045 (.910)	-.185 (.497)	.118 (.715)
NEGPER <sub>t-1</sub>	.059 (.952)	-1.369 (.092)*	-.610 (.264)	.445 (.309)	.385 (.136)	-.173 (.620)	-.265 (.399)	-.605 (.655)
LNCRITIC	.759 (.018)**	1.106 (.001)**	.894 (.020)**	.343 (.323)	.421 (.137)	.657 (.192)	.358 (.228)	.561 (.369)
CRPRO	.695 (.019)**	.398 (.235)	.688 (.076)*	.728 (.047)**	.736 (.009)**	.340 (.336)	.386 (.288)	.307 (.454)
LNNEW	-.111 (.505)	.005 (.984)	.153 (.494)	-.251 (.127)	-.136 (.423)	-.086 (.738)	.073 (.711)	-.112 (.682)
LNAGE	.146 (.760)	-.339 (.516)	.022 (.972)	-1.378 (.045)**	-.681 (.140)	-.039 (.964)	-1.510 (.097)*	.060 (.963)
Model fit F	44.87	16.86	22.70	27.50	50.37	23.58	69.04	22.45
(p value)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Adjusted R <sup>2</sup>	.902	.765	.820	.855	.925	.862	.954	.905
Joint F test of WOM measures	14.01 (.000)	9.64 (.000)	10.87 (.000)	4.01 (.017)	10.48 (.000)	1.07 (.382)	.43 (.735)	.53 (.672)

\* $p < .10$ .

\*\* $p < .05$ .

Notes: The dependent variable is LNREV<sub>t</sub>.  $p$  values are in parentheses.

the insignificance of WOM valence can be attributed to sample size. To do so, all the weekly data of the 40 movies were pooled to regress weekly box office revenue on the explanatory variables. With 378 observations, the pooled regression achieved a high level of model fit (adjusted  $R^2 = .95$ ). However, the results remain the same; that is, the volume of WOM is highly significant, but valence is not.<sup>12</sup>

It is also possible that the valence of WOM works differently for movies that receive mostly positive WOM and those that receive mostly negative WOM. A relevant argument is the diminishing impact of incremental WOM messages. If the overall WOM information about a movie is positive, the addition of another positive message may not be as influential as the addition of a negative one. The reverse is true for a movie that has overall negative WOM. Thus, estimating all movies together might have neutralized the impact of the valence measures. This argument motivated an examination of the impact of WOM by conducting separate regressions on different movie groups (especially those that received mostly positive WOM and those that

received mostly negative WOM). The results of WOM volume and valence remain unchanged.

In addition to the examination of weekly box office revenue, an analysis was conducted for aggregate box office revenue using prerelease WOM and other control variables; valence measures were again found to be insignificant. Finally, various model specifications, such as linear and semilog, were examined, and all lead to qualitatively similar results.

Therefore, the results confirming  $H_2$  appear to be fairly robust. They suggest that though WOM is a useful information source in the movie market, it correlates with box office revenue mainly through an informative role on awareness but not a persuasive path of attitude changes. In addition to the theoretical reasons discussed previously regarding the weak correlation between attitude and behavior, whether a person likes a particular movie is (to a large extent) an issue of personal taste, which lends additional support to this finding. **It is clear that WOM increases awareness among potential moviegoers, which is confirmed by the highly significant effect of volume, but when it comes to deciding whether to watch a particular movie, to what extent should another person's subjective assessment be reflective of the WOM recipient's own taste?** If the belief that a bad (good) movie for one person may be enjoyable (not enjoyable) to another is sufficiently strong, or if the WOM receiver attributes the valence of WOM to the taste of the message sender (see Eagly, Wood, and Chaiken

<sup>12</sup>Note that a pooled regression, though it offers a greater number of observations and thus increases the chance of a parameter to be significant, has its limitations. It estimates the average effect across all periods. Thus, it is not particularly useful if there is a significant difference of the estimated effects in different periods.

[1978] and other studies on attribution theory), the valence will lose much of its influence. This explanation is consistent with several previous studies on WOM. For example, Russell, DeCarlo, and Ramaswami (2001) find that when message receivers attribute the negativity of WOM to the communicator, brand evaluations actually increase.

The finding that WOM operates mainly through increased awareness and the argument that the experiential/intangible nature of movie consumption enhances the need for WOM lead to an interesting prediction; namely, the effect of WOM on to-be-released sequel movies should be less than that on nonsequels because moviegoers have more information about and experience with sequels as a result of the mostly successful prequels. This difference should be the most obvious in the opening week when box office revenue is the greatest and when the WOM effect is highly significant.

To examine this prediction, regressions similar to those reported in Table 4 could be conducted for sequel and nonsequels separately. However, the small number of sequels in the data (there were only 3) prevents estimations for completely separated samples. Thus, a different test was used. In particular, the opening-week regression was conducted for nonsequels only (37 movies), and whether the effect of volume was greater than that based on all 40 movies was observed. The parameter  $LNMSG_{t-1}$  was .6044 for nonsequels but .5917 for all movies. Because the estimations are based on double log specifications, this seemingly small difference actually implies that the average volume of WOM during prerelease yields 6% more box office revenue in the opening week for nonsequels than for all movies combined (i.e.,  $84.6^{.6044} - .5917 = 1.06$ ). For the average opening-week revenue of \$27.01 million in the sample, this is a \$1.62 million difference. This difference is especially significant considering that the test is less powerful than a direct comparison between sequels and nonsequels and that it is based on merely 3 of the 40 movies.

For the early weeks, inclusion of the WOM measures produced noticeably better model fit than the previous studies that used only the remaining explanatory variables. From Week 1 to Week 5, the average enhancement of model fit measured by adjusted  $R^2$  is 17%.

### WOM and Aggregate Box Office Revenue

Table 5 presents the results of regressing aggregate box office revenue (LNGROSS) on prerelease WOM and other covariates. The opening strength of movies is measured as the total number of screens in the first four weeks; this accommodates the industry practice of adopting a minimum number of screens in exhibition contracts for the first few weeks (for similar issues, see De Vany and Walls 1999) and reduces any possible biases associated with the movies that do not achieve the widest distribution in the opening week. The  $LNSCRN_{1-4}$  turns out to be highly significant; the wider distribution a movie has in the first four weeks, the greater the aggregate box office revenue will be. The percentage of positive reviews (CRPRO) has a significant, positive impact. The volume of critical reviews (LNCRITIC) is also significant, but only marginally. These

**TABLE 5**  
**Prerelease WOM and the Aggregate Box Office Revenue (LNGROSS)**

Independent Variables	Parameter Estimates	t-Value (p Value)
CONST	8.875	3.95 (.000)**
$LNSCRN_{1-4}$	.516	2.50 (.018)**
LNPROD	-.015	-.10 (.921)
$LNMSG_0$	.589	4.65 (.000)**
$POSIPER_0$	.342	.44 (.667)
$NEGPERS_0$	-.515	-.44 (.665)
LNCRITIC	.579	1.74 (.093)*
CRPRO	1.069	3.21 (.003)**
STAR	.168	.96 (.346)
GSCIFI	-.194	-.84 (.409)
GACADV	-.164	-.86 (.394)

Joint test ( $LNMSG_0 = POSIPER_0 = NEGPERS_0 = 0$ ):  $F = 9.49$  ( $p < .001$ )

Model fit:  $F = 13.79$  ( $p < .001$ ), adjusted  $R^2 = .77$

\* $p < .10$ .

\*\* $p < .05$ .

results are similar to those that Eliashberg and Shugan (1997) report. Movie stars (STAR) or movie genres are not found to be informative of aggregate box office revenue.

The three measures of WOM are highly significant as a group, confirming the value of using prerelease buzz to explain overall box office performance. As with the weekly analysis, whereas the volume of WOM ( $LNMSG_0$ ) is the most significant among all explanatory variables, the valence measures ( $POSIPER_0$  and  $NEGPERS_0$ ) are not significant. Thus,  $H_3$  is strongly supported. An important managerial value of this finding is that the amount of prerelease buzz can be a useful indicator of the ultimate box office performance. The effectiveness of box office forecast models (e.g., Sawhney and Eliashberg 1996) can be improved by including actual prerelease WOM information.

### Potential Antecedents of WOM

As discussed previously, prerelease WOM can be related to three groups of factors: movie genres, MPAA ratings, and whether major stars are in the cast. Beginning with the opening week, WOM can also be related to critical reviews and the WOM in the previous week. Because volume is the most critical factor that correlates with box office revenue, it is the focus of the subsequent analyses. Analyses for the valence measures ( $POSIPER_t$  and  $NEGPERS_t$ ) were also conducted, but they could not be consistently explained by various models in almost all the periods. Table 6 summarizes the results.

All the regressions for prerelease and the eight weeks achieved significant model fit. During the prerelease period, it appears that action and adventure movies tend to receive higher-than-average WOM communication, whereas R-rated movies tend to receive less. Beginning with the opening week, the only explanatory variable that is consistently significant is the volume of WOM in the previous week ( $LNMSG_{t-1}$ ). This shows the carryover effect such that a



**TABLE 6**  
**Potential Antecedents of the Volume of WOM**

Week (t)	0 (Pre-release)	1 (Opening Week)	2	3	4	5	6	7	8
CONST	3.817 (.000)**	.615 (.680)	-.243 (.868)	1.380 (.323)	-.456 (.838)	-4.320 (.164)	4.086 (.133)	4.351 (.326)	.066 (.911)
GACADV	.555 (.045)**	-.143 (.615)	-.075 (.764)	-.448 (.046)**	-.152 (.688)	.295 (.444)	-.181 (.549)	.340 (.467)	—
GCOMEDY	-.330 (.279)	-.358 (.278)	.343 (.231)	-.633 (.008)**	.458 (.284)	.136 (.712)	.140 (.734)	.601 (.496)	—
MPAAPG	.668 (.104)	-.684 (.141)	.343 (.364)	.418 (.192)	-.303 (.597)	.618 (.258)	.095 (.892)	-1.823 (.237)	-.834 (.197)
MPAAR	-.913 (.009)**	-.322 (.370)	.753 (.028)**	-.346 (.165)	.408 (.377)	-.047 (.913)	-.098 (.811)	.225 (.720)	-.452 (.463)
STAR	.408 (.162)	.343 (.269)	-.109 (.694)	.469 (.068)*	.136 (.765)	-.145 (.762)	.806 (.095)*	.558 (.489)	—
LNMSG <sub>t-1</sub>	—	1.169 (.000)**	.929 (.000)**	.715 (.000)**	.986 (.000)**	1.037 (.000)**	.625 (.000)**	.915 (.001)**	.595 (.031)**
POSIPER <sub>t-1</sub>	—	1.997 (.125)	-1.148 (.309)	1.149 (.114)	.102 (.917)	1.984 (.048)**	-1.888 (.014)**	1.206 (.340)	2.067 (.049)**
NEGPER <sub>t-1</sub>	—	2.405 (.190)	-2.085 (.098)*	-1.988 (.008)**	-.735 (.602)	1.889 (.041)**	-.698 (.236)	2.603 (.349)	.512 (.781)
LNCRITIC	—	-.834 (.132)	-.115 (.810)	-.442 (.367)	.039 (.963)	.808 (.476)	-1.375 (.203)	-2.211 (.275)	—
CRPRO	—	.792 (.165)	.302 (.573)	.897 (.038)**	-.965 (.214)	.929 (.182)	1.099 (.220)	1.759 (.373)	—
Model fit F	4.36	7.53	9.78	16.22	3.69	5.78	5.75	3.41	2.89
(p value)	(.004)	(.000)	(.000)	(.000)	(.006)	(.001)	(.003)	(.094)	(.067)
Adjusted R <sup>2</sup>	.301	.626	.698	.813	.464	.648	.683	.617	.371

\* $p < .10$ .

\*\* $p < .05$ .

Notes: The dependent variable is LNMSG<sub>t</sub>.  $p$  values are in parentheses. In Week 8, movie genre, star power, and critical reviews are excluded because of high multicollinearity.

week of active WOM is likely to be followed by another week of active WOM. However, consistent patterns linking WOM valence in a previous week to WOM volume in the current week were not found. Table 6 also indicates that star power is insignificant in explaining the volume of WOM during the prerelease period and most of the subsequent weeks. In addition, WOM is not significantly influenced by critical reviews, confirming the previous result that WOM and critical reviews are more of complements to each other than substitutes.<sup>13</sup>

Regarding H<sub>4</sub>, consistent support was found for the carryover effect. The effects of other factors (e.g., movie genre, MPAA ratings) are mixed and mostly insignificant. Man-

agerially speaking, these results point to the challenge that studios may face when trying to create and manipulate WOM by working on factors such as star power and movie genres (Rosen 2000). They also point to the importance of managing WOM early on, preferably beginning in the prerelease period. After WOM is created, a high volume of WOM, which is beneficial to sales, tends to positively affect the volume of WOM in subsequent periods.

## Summary, Managerial Implications, and General Discussion

This study contributes to the movie-marketing and WOM literature by examining movie WOM. Among other things, the mechanism through which WOM functions and the extent to which WOM helps explain box office sales are investigated. The data and analyses show that movie WOM is active during a movie's prerelease period and that WOM is more of a complement to other information sources than a substitute. Movie audiences tend to hold comparatively high expectation before a movie is released but become more critical in the opening week. The volume of WOM (but not the valence) offers significant explanatory power for box office revenue, both in the aggregate and for the early weeks, in support of a theory that WOM functions in the movie market primarily through an informative effect on awareness.

<sup>13</sup>Although the existence of movie stars and the measures of critical reviews do not significantly predict WOM, there are caveats regarding the roles of stars and movie critics. For example, some movie stars and critics may be on television or radio shows to talk about a to-be-released movie, which may lead to greater WOM. Furthermore, some stars may have popular Web sites, which also may influence WOM. An indicator variable of star power, albeit a typical approach in the literature, may not completely capture the effects of these scenarios (e.g., whether a particular movie has been promoted by its stars on popular television shows).



The finding that WOM is very active during the pre-release period implies that at least for entertainment goods, such as movies, WOM communication about a to-be-released new product may not depend on actual experience. Many potential users talk about the product on the basis of speculations. In this sense, managing buzz should be treated as a multidimensional task that extends beyond the new product itself. That is, management needs to be conscious about additional things that influence speculations, such as the firm's other products (both new and extant), the firm's reputation, various events, and possibly "rumors" that occur during the new product development process.

These findings highlight the need for studio and theater managers to observe and respond to WOM communications actively, especially during a movie's early weeks when most of the box office revenue is generated. **However, what ultimately matters is the volume of WOM.** It may not be critical to track information similar to the valence measures. Practically, volume can be measured either directly by a precise number, as this study does, or indirectly by proxies, such as the degree of public interest a movie receives, how widespread the communication occurs across demographic groups, and so on. These findings offer considerable support to the idea that firms should try to create active WOM communication among potential users (Godes and Mayzlin 2004a; Rosen 2000).

Another important managerial value of these findings is that WOM can be a useful measure to help forecast box office sales. Among other things, good forecasts help studios and theaters better plan screening capacity and potentially optimize exhibition contracts. However, it is not the purpose of this study to develop a full forecasting system. Rather, this study can be used to illustrate how the performance of a forecasting model can be improved by including actual WOM information. To do so, this study used the set of independent variables and adopted the standard calibrating-forecasting approach. Because the sample size makes it difficult to split the data into an estimation sample and a prediction sample, a rotating method was used to conduct the calibration and forecasting tasks. Specifically, each of the 40 movies is taken in turn as the movie to be predicted, while the other 39 movies are used in the calibration process to generate parameter estimates. The absolute percentage errors of the 40 predictions are then averaged as the indication of prediction effectiveness. The calibration prediction is conducted for both aggregate box office revenue and the opening-week box office revenue. The WOM mea-

sures are included in the proposed model but not in the benchmark model. Other independent variables are the same as those that appear in Tables 4 and 5.

This analysis shows that including WOM in the forecasting system significantly reduces forecasting errors by 31% for a movie's opening week (from a 55% absolute forecasting error with the benchmark model to 38% with the proposed model) and 23% for the aggregate box office revenue (from 61% to 47%). Different from most extant studies, these forecasts are made purely on the basis of the prerelease information of a new movie. This is probably the most difficult forecast task for movies (Sawhney and Eliashberg 1996). It is similar to Sawhney and Eliashberg's (1996) BOXMOD-I model when no revenue data for the new movie are available and a meta-analysis procedure is employed. Sawhney and Eliashberg report an average 71.1% prediction error for the aggregate box office revenue. Although the actual improvement through incorporating WOM depends on what forecasting system is eventually used, the added value of WOM appears to be significant.

As in previous studies (Basuroy, Chatterjee, and Ravid 2003; Eliashberg and Shugan 1997; Godes and Mayzlin 2004b), **the current analysis focuses on statistical correlations between variables and uses these temporal relationships to infer how WOM may influence box office sales.** Although these correlations offer interesting insights and useful managerial implications, further research might investigate the degree of causality, perhaps with more disaggregated data and different methodologies. In this regard, lab experiments could be a useful approach to examine the relationships such as those that Figure 2 illustrates.

Online user-generated information offers unique opportunities for research in marketing. Such data come in different formats, which render them suitable for different research purposes. **Some data, such as the WOM messages used herein, are actual individual postings. Although their unstructured nature provides great flexibility for the analysis, coding them can be a difficult task. Other data, such as online user ratings, contain less flexibility but make it easier to conduct large-scale cross-sectional studies.** Another issue involved with this growing literature is how similar the online information is to what occurs in the physical world. There is evidence that the degree of such similarity can be very high (Dellarocas, Awad, and Zhang 2004). Nevertheless, further research examining the difference between online user data and that in the physical context appears to have potential.

## REFERENCES

- Ackman, Dan (2001a), "Disaster of the Day," *Forbes*, (January 23), (accessed March 21, 2006), [available at <http://www.forbes.com/2001/01/23/0123disaster.html>].
- (2001b), "Movie Theaters of the Absurd," *Forbes*, (March 2), (accessed March 21, 2006), [available at <http://www.forbes.com/2001/03/02/0302movies.html>].
- Ajzen, Icek and Martin Fishbein (1980), *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice Hall.
- Anderson, Eugene (1973), "Consumer Dissatisfaction: The Effect of Disconfirmed Expectancy on Perceived Product Performance," *Journal of Marketing Research*, 10 (February), 38–44.
- (1998), "Customer Satisfaction and Word of Mouth," *Journal of Service Research*, 1 (1), 5–17.
- and Linda Salisbury (2003), "The Formation of Market-Level Expectations and Its Covariates," *Journal of Consumer Research*, 30 (June), 115–24.

- Austin, Bruce (1989), *Immediate Seating: A Look at Movie Audiences*. Belmont, CA: Wadsworth.
- Banerjee, Abhijit (1992), "A Simple Model of Herd Behavior," *Quarterly Journal of Economics*, 107 (3), 797–817.
- Basuroy, Suman, Subimal Chatterjee, and S. Ravid (2003), "How Critical Are Critical Reviews? The Box Office Effects of Film Critics, Star Power, and Budgets," *Journal of Marketing*, 67 (October), 103–117.
- Bayus, Berry (1985), "Word of Mouth: The Indirect Effect of Marketing Efforts," *Journal of Advertising Research*, 25 (3), 31–39.
- Bowman, D. and D. Narayandas (2001), "Managing Customer-Initiated Contacts with Manufacturers: The Impact on Share of Category Requirements and Word-of-Mouth Behavior," *Journal of Marketing Research*, 38 (August), 281–97.
- Bristor, Julia (1990), "Enhanced Explanation of Word of Mouth Communications: The Power of Relationships," in *Research in Consumer Behavior*, E.C. Hirschman, ed. Greenwich, CT: JAI Press, 51–83.
- Brown, Johnson and Peter Reingen (1987), "Social Ties and Word-of-Mouth Referral Behavior," *Journal of Consumer Research*, 14 (December), 350–62.
- Burzynski, Michael and Dewey Bayer (1977), "The Effect of Positive and Negative Prior Information on Motion Picture Appreciation," *Journal of Social Psychology*, 101, 215–18.
- Chaffee, Steven (1982), "Mass Media and Interpersonal Channels: Competitive, Convergent, or Complementary?" in *Inter/Media: Interpersonal Communication in a Media World*, Gary Gumpert and Robert Cathcart, eds. New York: Oxford University Press.
- Dellarocas, Chrysanthos, Neveen Awad, and Michael Zhang (2004), "Exploring the Value of Online Reviews to Organizations: Implications for Revenue Forecasting and Planning," working paper, MIT Sloan School of Management.
- De Vany, Arthur and David Walls (1999), "Uncertainty in the Movie Industry: Does Star Power Reduce the Terror of the Box Office?" *Journal of Cultural Economics*, 23 (4), 285–318.
- Duan, Wenjing, Bin Gu, and Andrew Whinston (2005), "Do Online Reviews Matter? An Empirical Investigation of Panel Data," working paper, Department of Management Science and Information Systems, University of Texas at Austin.
- Eagly, Alice, Wendy Wood, and Shelly Chaiken (1978), "Causal Inferences about Communicators and Their Effects for Opinion Change," *Journal of Personality and Social Psychology*, 36 (April), 425–35.
- Elberse, Anita and Jehoshua Eliashberg (2003), "Demand and Supply Dynamics for Sequentially Released Products in International Markets: The Case of Motion Pictures," *Marketing Science*, 22 (3), 329–54.
- Eliashberg, Jehoshua, Jedit-Hah Jonker, Mohanbir Sawhney, and Berend Wierenga (2000), "MOVIEMOD: An Implementable Decision-Support System for Prerelease Market Evaluation of Motion Pictures," *Marketing Science*, 19 (3), 226–43.
- and Steven Shugan (1997), "Film Critics: Influencers or Predictors?" *Journal of Marketing*, 61 (April), 68–78.
- Faber, Ronald and Thomas O'Guinn (1984), "Effect of Media Advertising and Other Sources on Movie Selection," *Journalism Quarterly*, 61, 371–77.
- Godes, David and Dina Mayzlin (2004a), "Firm-Created Word-of-Mouth Communication: A Field-Based Quasi-Experiment," Harvard Business School Working Paper No. 05-023.
- and ——— (2004b), "Using Online Conversations to Study Word-of-Mouth Communication," *Marketing Science*, 23 (4), 545–60.
- Graser, Marc (2002), "Semel Gives Yahoo! the Business: Internet Portal Ratchets Up H'wood Links," *Variety*, (August 19–25), 11.
- Harrison-Walker, L. Jean (2001), "The Measurement of Word-of-Mouth Communication and an Investigation of Service Quality and Customer Commitment as Potential Antecedents," *Journal of Services Marketing*, 4 (1), 60–75.
- Holbrook, Morris (1999), "Popular Appeal Versus Expert Judgments of Motion Pictures," *Journal of Consumer Research*, 26 (September), 144–55.
- King, Tom (2001), "Will 'Harry' Have Legs? After Record Opening, Wizard Falls Off at the Box Office; Trying to Catch R2-D2," *The Wall Street Journal*, (November 30), W4.
- (2003), "Now Playing Somewhere Else: Studios Try to Build Buzz by Holding Films Back; in Muncie? Read a Book," *The Wall Street Journal*, (January 10), W10.
- Krider, Robert and Charles Weinberg (1998), "Competitive Dynamics and the Introduction of New Products: The Motion Picture Timing Game," *Journal of Marketing Research*, 35 (February), 1–15.
- Lehmann, Donald and Charles Weinberg (2000), "Sales Through Sequential Distribution Channels: An Application to Movies and Videos," *Journal of Marketing*, 64 (July), 18–33.
- Lieberman, Al and Patricia Esgate (2002), *The Entertainment Marketing Revolution: Bring the Mogul, the Media, and the Magic to the World*. Upper Saddle River, NJ: Financial Times/Prentice Hall.
- Litman, Barry (1983), "Predicting Success of Theatrical Movies: An Empirical Study," *Journal of Popular Culture*, 16 (Spring), 159–75.
- Litwak, Mark (1986), *Reel Power: The Struggle for Influence and Success in the New Hollywood*. New York: William Morrow.
- Mahajan, Vijay, Eitan Muller, and Roger Kerin (1984), "Introduction Strategy for New Products with Positive and Negative Word-of-Mouth," *Management Science*, 30 (12), 1389–1404.
- Mizerski, Richard (1982), "An Attribution Explanation of the Disproportionate Influence of Unfavorable Information," *Journal of Consumer Research*, 9 (3), 301–310.
- Motion Picture Association (2003), *U.S. Entertainment Industry: 2003 MPA Market Statistics*. Encino, CA: Motion Picture Association.
- Murray, Keith (1991), "A Test of Services Marketing Theory: Consumer Information Acquisition Activities," *Journal of Marketing*, 55 (January), 10–25.
- Neelamegham, Ramya and Pradeep Chintagunta (1999), "A Bayesian Model to Forecast New Product Performance in Domestic and International Markets," *Marketing Science*, 18 (2), 115–36.
- Oliver, Richard (1980), "Conceptualization and Measurement of Disconfirmation Perceptions in the Prediction of Consumer Satisfaction," in *Proceedings of Fourth Annual Conference on Consumer Satisfaction, Dissatisfaction, and Complaining Behavior*, H. Hunt and R. Day, eds. Bloomington: Indiana University School of Business.
- Olson, J. and P. Dover (1979), "Disconfirmation of Consumer Expectation Through Product Trial," *Journal of Applied Psychology*, 64 (April), 179–89.
- Petty, Richard and John Cacioppo (1984), "The Effects of Involvement on Responses to Argument Quantity and Quality: Central and Peripheral Routes to Persuasion," *Journal of Personality and Social Psychology*, 46 (January), 69–81.
- Reddy, Srinivas, Vanitha Swaminathan, and Carol Motley (1998), "Examining the Determinants of Broadway Show Success," *Journal of Marketing Research*, 35 (August), 370–83.
- Reinstein, David and Christopher Snyder (2005), "The Influence of Expert Reviews on Consumer Demand for Experience Goods: A Case Study of Movie Critics," *Journal of Industrial Economics*, 53 (1), 27–51.
- Rogers, Everett (1983), *Diffusion of Innovations*. New York: The Free Press.
- Rosen, Emanuel (2000), *The Anatomy of Buzz: How to Create Word-of-Mouth Marketing*. New York: Doubleday.

- Russell, Laczniak, Thomas DeCarlo, and Sridhar Ramaswami (2001), "Consumers' Responses to Negative Word-of-Mouth Communication: An Attribution Theory Perspective," *Journal of Consumer Psychology*, 11 (1), 57–73.
- Sawhney, Mohanbir S. and Jehoshua Eliashberg (1996), "A Parsimonious Model for Forecasting Gross Box-Office Revenues of Motion Pictures," *Marketing Science*, 15 (2), 113–31.
- Schiffman, Betsy (2001), "Movie Theaters Stuck in Stone Age," *Forbes*, (September 22), (accessed March 21, 2006), [available at <http://www.forbes.com/2000/09/23/0923newmedia.html>].
- Shugan, Steven (1995), *Service Strategy*. Homewood, IL: Richard D. Irwin.
- Swami, Sanjeev, Jehoshua Eliashberg, and Charles Weinberg (1999), "SilverScreener: A Modeling Approach to Movie Screens Management," *Marketing Science*, 18 (3), 352–72.
- Taylor, John (2003), "Word of Mouth Is Where It's At," *Brandweek*, (June 2), 26.
- Van den Bulte, Christophe and Gary Lilien (2001), "Two-Stage Partial Observability Models for Innovation Adoption," working paper, Wharton School, University of Pennsylvania.
- Vogel, Harold (2001), *Entertainment Industry Economics: A Guide for Financial Analysis*, 5th ed. Cambridge, UK: Cambridge University Press.
- Zufryden, Fred (1996), "Linking Advertising to Box Office Performance of New Film Releases: A Marketing Planning Approach," *Journal of Advertising Research*, 36 (July–August), 29–41.