THE POWER OF STARS:

DO STAR ACTORS DRIVE THE SUCCESS OF MOVIES?

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ABSTRACT (215 WORDS)

Is the involvement of star actors critical to the success of motion pictures? Film studios, which they regularly pay multimillion-dollar fees to star actors, seem driven by that belief. I shed light on the returns on this investment using an event study that considers the impact of over 1,200 casting announcements on trading behavior in a simulated and real stock market setting. I find evidence that the involvement of stars impacts movies' expected theatrical revenues, and I provide insight into the magnitude of that effect. For instance, my estimates suggest that, on average, stars are worth about $3 million in theatrical revenues. In a cross-sectional analysis grounded in the literature on group dynamics, I also examine the determinants of the magnitude of stars' impact on expected revenues: among other things, I show that the stronger a cast already is, the greater is the impact of a newly recruited star with a track record of box office successes or with a strong artistic reputation. Finally, in an extension to the study, I do not find that the involvement of stars in movies increases the valuation of film companies that release those movies, thus providing insufficient grounds to conclude that stars add more value than they capture. I discuss implications for managers in the motion picture industry.

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"'A guy stranded on an island' without Tom Hanks is not a movie. With another actor, [the movie Cast Away] would gross $40 million. With Tom Hanks it grossed $200 million. There's no way to replace that kind of star power."

Bill Mechanic, Former Chairman of Twentieth Century Fox (Variety 2002)

"Had Troy opened impressively, one can be sure [Brad] Pitt would have gotten the credit. In this way, movie stars are like chief executives fattened on stock options. If the stock price goes up, the boss reaps the rewards (…). If the stock price goes down, well, then there must be some other reason."

Dan Ackman, Reporter (Forbes 2004)

The importance of stars permeates the motion picture industry. While there are thousands of aspiring actors and actresses, the small group that has risen to the top of their profession can command fees of millions of dollars per movie in salaries, perks, and profit participation deals. A handful of high-profile stars—including Jim Carrey, Tom Cruise, Tom Hanks, Brad Pitt, and Julia Roberts—have been paid salaries as high as $25 million per picture. Profit participation arrangements, so-called back-end deals, can sometimes amount to yet higher fees. Tom Cruise, for example, reportedly earned more than $70 million—a 22% share of the total receipts—for the movie *Mission Impossible*, and another $92 million for the sequel (Epstein 2005). Moreover, high-profile stars can have a powerful influence on movie development: some even trigger the "greenlight" by generating commitments from investors, producers, distributors, and exhibitors.

Is the involvement of star actors critical to the success of motion pictures? Are they worth the star treatment? The returns on the investments in stars are heavily debated in the trade and popular press. While some practitioners argue that stars are the "locomotives behind some of Hollywood's biggest blockbusters" (Variety 2002), many others doubt whether the high level of compensation for stars is justified. A Forbes (2004) article entitled "The Myth of Brad Pitt", which compared more than 200 recent films, revealed that fewer than half of the highest-grossing hits featured an actor who had top billing in at least one hit movie previously. The top three movies—

Star Wars, *E.T. the Extra-Terrestrial* and *Titanic*—had no stars. This shows, some insiders claim, that "it is the movie itself—not the star—that makes the hit" (Forbes 2002). There are signs that the doubts regarding the returns on investments are causing existing contractual arrangements with talent to come under pressure, making the relationship between the involvement of stars and the success of movies a critical research issue (Eliashberg, Elberse and Leenders forthcoming, Wei forthcoming). The stakes are high—not just because of the high fees paid to stars, but also because movies themselves are enormous financial bets.

An extensive academic literature exists on the question whether star creative talent impacts the financial performance of movies, but the findings to date are mixed. Even when extant research finds star power to be significantly related to movie performance, it is difficult to draw conclusions about the direction of causality, because that research typically does not account for the possibility that studios may employ bigger stars for those movies that are *expected* to generate higher revenues, or that the most powerful stars may be able to *choose* the most promising movie projects. Moreover, motion pictures are the result of the work of many actors and other workers, and research to date has largely ignored the effect of *individual* stars and the *interdependencies* between stars.

I re-examine the relationship between star participation and movie revenues in a setting that addresses these limitations in extant research, and build on those findings by considering the determinants of that relationship. I use an *event study* that revolves around more than 1,200 casting announcements that cover a total of about 600 stars and 500 movies. I assess the impact of those announcements on the behavior of participants of the Hollywood Stock Exchange (HSX, www.hsx.com), a popular online market simulation in which players (or "traders") predict box office revenues. HSX's reasonably high accuracy makes it a suitable setting for an examination of this kind.

The event study reveals that HSX prices respond significantly to casting announcements, and thus provides support for the hypothesis that the involvement of stars positively affects *revenues*.

For instance, my estimates suggest that the average star in the sample is "worth" about $3 million in theatrical revenues. In an extension of the analysis involving the "real" stock market performance of film studios listed on the NYSE, I examine whether stars also impact the *valuation* of film companies that recruit them. I fail to find support for this idea. I use a cross-sectional analysis, grounded in relevant literature on group dynamics, to assess whether certain characteristics of the star and the other cast members are determinants of stars' impact on revenues. I find that a star's economic and artistic reputations are positively related to his impact, and show that the roles of a newly recruited star and the other cast members are linked—the more "A-list" a cast already is, the greater is the impact of a star with a track record of box office successes or with wide recognition among critics and peers. This result contributes to the group dynamics literature by providing an example of increasing returns to recruiting stars in the context of the motion picture industry. The study draws attention to the multiplicative nature of the production process and the existence of a classic team problem (Alchian and Demsetz 1972) in recruiting and compensating stars (Caves 2000; 2003).

HYPOTHESES

The Impact of Stars on Revenues

Several researchers have studied the effect of star power on revenues. The findings are mixed: some studies have not detected a relationship between revenues and talent involvement (Austin 1989; Litman 1983; Litman and Ahn 1998; De Vany and Walls 1999; Ravid 1999), while others have found evidence that a movie's likely cumulative, weekly, or opening-week revenues increase with the rank of the star talent associated with it (Faulkner and Anderson 1987; Litman and Kohl 1989; Wallace, Seigerman and Holbrook 1993; Prag and Casavant 1994; Sochay 1994; Sawhney and Eliashberg 1996; Albert 1998; Neelamegham and Chintagunta 1999; Basuroy, Chatterjee and Ravid 2003; Elberse and Eliashberg 2003; Ainslie, Drèze and Zufryden 2005).

The role of stars in the performance of their team or organization is also a general theme in the academic literature on group dynamics. The prevalent view is that, all else equal, groups with more talented individual members should outperform groups with less talented members. For instance, Tziner and Eden (1985), who studied military tank crews, show that group productivity relates positively to the summed abilities of the group members. Groysberg, Polzer and Anger Elfenbein (2006), who examined Wall Street equities research analysts, find that groups benefit from having members who achieved high individual performance. They note that stars' contributions could directly increase the team's performance, but may also indirectly drive success, for example by enhancing the group's perceived standing in the eyes of external constituents.

The latter observation fits the context of motion pictures. As Albert (1998) indicated, actors can be characterized as "stars" for a number of reasons: they may have critically acclaimed acting skills, possess personality traits that appeal to the movie-going audience, attract a lot of free publicity, have the ability to secure investment, or simply have been lucky. Accordingly, academic researchers have measured "star power" in different ways. For example, Sawhney and Eliashberg (1996) use a dummy that is based on a list of stars possessing "marquee value" published by trade magazine *Variety*. Elberse and Eliashberg (2003) and Ainslie et al. (2005) measure star power using *The Hollywood Reporter*'s *Star Power Survey*, in which executives and other insiders were asked to rank talent. Ravid (1999) classifies stars based on, among other things, whether they have been nominated for or won an Academy Award, or have participated in a top-grossing film in the previous year.

Ravid's (1999) measures directly relate to the two kinds of reputations that can generally be the source of stars' power: an economic reputation, derived from their box office success, and an artistic reputation, derived from the recognition of critics or peers (Delmestri, Montanari and Usai 2005). A star's historical box office record has been found to be an indicator of his future potential in some studies (e.g., Litman and Kohl 1989, Sochay 1994, Ravid 1999, Lampel and Shamsie 2003)[1], and is a valued source of information for studio executives (Chisholm 2004). A star's artistic reputation, which in the motion picture industry is primarily revealed by means of awards or nominations, is a sign of quality for audiences, executives, the media, and other constituencies (e.g., Wallace et al 1993), and thus also a likely predictor of that star's future box office record.

Both reputations can be viewed as dimensions of "status" as commonly defined in the literature on group dynamics: "the amount of respect, influence, and prominence stars enjoy in the eyes of others" (Anderson, John, Keltner, and Kring 2001). Status is an integral element of team composition (West and Allen 1997) but has received surprisingly little attention as a possible predictor of team performance (Groysberg et al 2006). I test both dimensions, and hypothesize:

H1: The impact of a star on a film's box office revenues positively depends on (a) the star's economic reputation, reflected by his or her historical box office performance, and (b) the star's artistic reputation, reflected by his or her awards or award nominations.

The Role of Other Cast Members

Movies are "complex creative goods" that are the result of teams of creatives working together (Caves 2000), which makes it worthwhile to consider the role of one star in relation to other cast members. Managers face important questions in this area, for instance whether a film producer can successfully economize with a lower-ranked "B-list" lead actress after paying a high fee for a higher-ranked "A-list" lead actor, or whether it makes economic sense to further invest in "A-list" stars.

Again, the body of work on group dynamics and group composition offers useful theoretical considerations. In their study of tank crews, Tziner and Eden (1985) find significant interaction effects: each member's ability influenced crew performance differently depending on the ability levels of the other members. Specifically, they find that a high-ability member achieves more in combination with other uniformly high-ability members than in combination with low-ability members. Furthermore, uniformly high-ability crews impressively surpassed performance effectiveness anticipated on the basis of members' ability. Egerbladh (1976) reported similar findings in a laboratory setting. Groysberg et al (2006) also note that the benefits to group performance of assembling talented individuals could extend beyond the simple aggregation of their separate contributions. However, in their recent study of Wall Street analysts, they find that the marginal benefit of stars decreased as the proportion of individual stars in a research group increased, and that the slope of this curvilinear pattern becomes negative when teams reached a high proportion of star members, leading them to conclude that the outcome of a group of highly-ranked interdependent stars may be *less* than the sum of its parts.

What could explain the divergent findings? On the one hand, Groysberg et al (2006) offer a number of reasons for *decreasing* returns to recruiting stars. For instance, once a team has an expert who, to put it simply, "knows the right answers," more experts may add little value. Also, for a star-studded group that is already highly visible to stakeholders, adding an additional star may add only a negligible increment of visibility to the group. Expectations or egos may even impede the willingness to share information or engage in other behaviors that are necessary for the team as a whole to work together and succeed (Hambrick 1994). Groysberg et al (2006) find specific evidence of dysfunctional team processes in environments with too many stars.

On the other hand, there are valid reasons to expect *increasing* returns: individuals may benefit from working with talented colleagues (Cummings and Oldham 1997), for example because they are motivated to maintain informal esteem among highly productive team members (Zuckerman 1967) or may be stimulated by ideas and suggestions that arise from close contact with talented peers (Allison and Long 1990). Highly-ranked individuals make their teams more visible: if an individual is prominent in the eyes of others, and others associate the individual with a particular group, then that group should be more prominent by virtue of their association. The individual star effectively acquires free advertising for his or her team. This, in turn, may increase the group's ability to secure resources and therefore help it succeed, particularly in contexts in which groups compete for resources (e.g., Podolny 1993, Groysberg et al 2006).

In the context of the motion picture industry, increasing returns may be more likely than decreasing returns. For instance, Tziner and Eden (1985) largely attribute their finding to the nature of the group task at hand. Like in their setting of military tank crews, the tasks of individual movie cast members are complex, require a close synchronization, and are difficult to evaluate in isolation (also see Porter, Lawler and Hackman 1975, Wageman 2001). The hedonic nature of the product is important in this respect. Caves (2000) claims that differences in various films' gross rentals can be explained by the number of well-known actors in each film and a combined measure of the performance of those actors (also see Baker and Faulkner 1991, Faulkner and Anderson 1987, Zuckerman 1967). The core idea here is that a project may be no better than the least capable participant involved. In other words, the effects of individual talents' qualities may be multiplicative: if a B-list participant is replaced by one from the A-list in an otherwise A-list project, its value rises by more than if the replacement had occurred in a B-list project (Caves 2000).

One underlying premise may be that two superstars are cast in the hopes that their joint cachet will pay off, which one studio executive referred to as the "one plus one equals three" model (Variety 2002). It may also be that each actor exerts effort proportional to the efforts exerted by others—actress Renée Zellweger has to raise her game if she is playing opposite, say, Tom Cruise instead of a less skilled actor. The intuition here is in line with Taggar (2002) who, in his work on the relationship between individual and group creativity, argued that involving others may improve social facilitation and increase the production pressure coming from other group members (Hackman and Morris 1975). This is also supported by Fisher and Boynton (2005), who studied "virtuoso teams" comprised of the elite experts in their fields which are specifically convened for certain projects, including the Broadway musical *West Side Story* and the 1950s era television hit *Your Show of Shows*. They ascribe the latter team's success partly to its tendency to engage in high-energy contests that raised their performance levels: "[E]very day, each [writer] tried to top the others for the "best of the best" title" (p. 116). Consequently, I hypothesize:

H2: *The impact of a star on a movie's box office revenues positively depends on (a) the number of other stars cast for the movie, (b) the economic reputations of those other stars, and (c) the artistic reputations of those other stars.*

DATA

The Hollywood Stock Exchange

The primary data source is the *Hollywood Stock Exchange* (HSX, www.hsx.com), an online market simulation focused on the movie industry. As of January 2005, it had over 500,000 registered users ("traders"), a frequent trader group of about 80,000 accounts, and approximately 19,500 daily unique logins. New users receive 2 million 'Hollywood dollars' (denoted as "H$2 million") and can increase the value of their portfolio by, among other things, strategically trading "MovieStocks" and "StarBonds". The trading population is fairly heterogeneous, but the most active traders tend to be heavy consumers and early adopters of entertainment products, especially films.

HSX is not a real stock market: it revolves around fake money, all traders start with the same capital when they first join, the pricing of "stocks" is governed by a "market maker" based on computer algorithms (as opposed to pure supply and demand dynamics), and "stocks" have a finite horizon in that trading comes to an end when the movie has played in theaters for some time. However, the simulated market appears reasonably efficient and accurate in its predictions, which makes it a suitable setting for this study. For instance, Pennock, Lawrence, Giles and Nielsen (2001a; 2001b), who comprehensively analyzed HSX's efficiency and forecast accuracy immediately before a movie's release, find that arbitrage closure on HSX is quantitatively weaker, but qualitatively similar, relative to a real-money market. They also show that HSX forecasts perform competitively in direct comparisons with expert judges. Elberse and Eliashberg (2003), Spann and Skiera (2003), and, for a larger pre-release period, Elberse and Anand (2005) provide further evidence that HSX traders collectively produce relatively good forecasts of actual box office returns (also see Hanson 1999, Gruca 2000, and Wolfers and Zitzewitz 2004).[2] (I return to HSX's predictive validity and efficiency in the context of this study after describing the data in more detail below.)

The Market for "Moviestocks". I illustrate the MovieStock trading process for the movie *Cold Mountain* ("*CLDMT* "on HSX). Trading dynamics are depicted in the top graph in Figure 1.

- - - - - Figure 1 - - - - -

HSX MovieStock prices reflect expectations of box office revenues generated in the first four weeks of a movie's release. For example, a price of H$45 corresponds with cumulative grosses of $45 million at the end of the fourth week. Each trader, provided he or she has sufficient funds, can own a maximum of 50,000 shares of an individual MovieStock, and buy, sell, short or cover securities at any given moment. Trading starts when the MovieStock has its official IPO on the HSX market, which usually happens months, sometimes years, prior to the movie's theatrical release. *CLDMT* began trading in March 1998, well over four years prior to its theatrical opening. Initially, traders may have little information to base their betting decisions on. When *CLDMT* debuted on the market, they may have known only that *United Artists* had bought the screen rights to the debut novel by Charles Frazier, the book was a love story set in the Civil War, and Tom Cruise was one of the actors considered for the male leading role. More information will reach traders in subsequent months. Trading usually peaks in the days before and after the movie's release. For instance, the day before its opening on December 25, 2003, over 14 million shares of *CLDMT* were traded.

Trading is halted on the day the movie is widely released. The halt price thus is the latest available expectation of the movie's success prior to its release. *CLDMT*'s halt price was H$44.68. Immediately after the opening weekend, MovieStock prices are adjusted based on actual box office grosses. Here, a set of standard multipliers come into play.[3] *CLDMT*'s holiday weekend box office was over $19 million, and its multiplier was 2.4, leading to an 'adjust' price of H$46.55. Once the price is adjusted, trading resumes. MovieStocks for widely released movies are delisted four weekends into their theatrical run, at which time their delist price is calculated and stockholders receive their payout. When *CLDMT* delisted on January 20, 2004, the movie had collected $65.97 million in box office revenues; its delist price therefore was H$65.97. The movie eventually earned over $95 million in its run in U.S. theaters.

The Market for "Starbonds". HSX traders can also buy and sell Starbonds for individual movie actors and actresses. Each time the MovieStock for an actor's movie is delisted, HSX formally adjusts that actor's StarBond price according to that movie's box office performance. The key metric here is the star's total box-office performance averaged over (at most) his or her last five credited films: beginning with an actor's second film, his or her StarBond price is adjusted to match this trailing average.[4] That is, if an actor's last five movies have generated $50 million, $50 million, $150 million, $100 million, and $150 million, respectively, his StarBond value will most recently have been adjusted to H$100, based on the trailing average of ((50+50+150+100+150)/5=) $100 million. If his next movie generates $250 million, the adjustment will be to ((50+150+100+150+250)/5=) H$140. To put these figures in context: adjustments for Tom Cruise's StarBond *TCRUI* varied from H$91 (when *Minority Report* was included) to H$126 (when *Collateral* was incorporated) between

November 2001 and December 2004. In the periods between these adjustments, HSX players can bet on the star's future box office record by trading StarBonds. They can own a maximum of 20,000 shares of one StarBond.

Casting Announcements in the "Market Recap" Report. Published on the HSX site at the end of the day each Friday, the "Market Recap" report is an important information source for HSX players. The "Casting News" section, which is based on information obtained from trade magazines and other industry sources, describes the preceding week's casting decisions and rumors. The news takes the form of short statements that contain links to relevant MovieStocks and StarBonds. For example, the report for the week of January 18, 2002 included the following:

- *Tom Cruise* (TCRUI) dropped out of *Cold Mountain* (CLDMT).
- *Jason Isaacs* (JISAA) joined the cast of *Harry Potter and the Chamber of Secrets* (HPOT2).
- *Robert Downey, Jr.* (RDOWN) is attached to *Six Bullets From Now* (SXBLT).
- *Russell Crowe* (RCROW) is in negotiations to star in *Master and Commander* (MCMDR).

The bottom graph in Figure 1 shows fluctuations in the MovieStock price for *CLDMT* in a period in which several such casting announcements were made. The figure suggests that casting news significantly affected trading dynamics for *CLDMT*. That is, around the time of each announcement, trading volume noticeably increases, and the price appears to first react negatively to the news that Tom Cruise has dropped out, and later, although to a lesser extent, positively to the news that Nicole Kidman, Jude Law, and Renée Zellweger have joined the cast. The news that Natalie Portman has also joined the cast does little to increase the price.

Sample and Variables

The sampling frame for this study consists of all casting announcements that appeared in the HSX Market Recap report between November 2001 and January 2005—a little over three years. To prevent complications in the event study methodology, I excluded five announcements that named the same MovieStock and appeared within two weeks of each other, leaving a total of 1258 announcements. Taken together, they cover 496 movies and 602 stars.

For the purposes of this study, I regarded each of the actors and actresses listed on the StarBond market as a "star". Their presence on the StarBond market sets them apart from the thousands of hopefuls without a movie career. HSX continuously researches the marketplace to identify new star actors. In order for an actor to qualify for a StarBond, he or she must have had at least two leading roles in movies theatrically released by a major studio in the US, or a larger number of supporting roles or roles in smaller, independent films. I coded each announcement as either positive (e.g., "Star X is in negotiations to star in movie Y" or "Star X has joined the cast of Y") or negative (e.g., "Star X has dropped out of movie Y" and "Star X's negotiations to star in movie Y have stalled").[5] The large majority of announcements in the sample are positive; only 36 are negative.

Most descriptive variables are directly based on the HSX MovieStock and StarBond market:

- *Star_Economic_History*: To express a star's historical economic performance at the time of an announcement, I opt for the average box office gross over the star's five most recent movies (expressed in millions of dollars), which is equivalent to the latest StarBond adjustment before the announcement.[6] If an announcement lists multiple stars, I opt for their average value. For example, at the time of their announced participation in *Cold Mountain* (see Figure 1), Nicole Kidman, Jude Law, and Renée Zellweger had trailing box office averages of $52 million, $37 million, and $46 million, respectively, leading to a score of ((52+37+46)/3=) $45 million.
- *Star_Artistic_History:* To measure a star's artistic performance up to the time of the announcement, I count the number of Academy ("Oscar") and Golden Globe awards and nominations he or she has collected in the preceding five years.[7] For instance, before the *Cold Mountain* announcement, Nicole Kidman had been nominated for two Golden Globes and had won both, and had just collected her first Oscar nomination, leading to a score of 5.

- *Cast_Count*: To construct a measure of the number of other star cast members for a movie at the time of an announcement, I add the number of stars mentioned in *positive* announcements and subtract the number of stars mentioned in *negative* announcements in that movie's history. In the example for *Cold Mountain* (Figure 1), the number of other cast members is three (Jude Law, Nicole Kidman, and Renée Zellweger), at the time of the news about Natalie Portman.
- *Cast_Economic_History*: To obtain a measure of the historical economic power of the other cast members at the time of the announcement, I calculate the average of each of those cast members' average box office record over their five most recent movies. Thus, in the *Cold Mountain* example, at the time of Natalie Portman's announcement, I average the latest StarBond adjustments for Jude Law, Nicole Kidman, and Renée Zellweger.
- *Cast_Artistic_History*: To express the other cast members' historical artistic performance, I divide the number of Golden Globe and Oscar nominations and wins collected by the cast by the number of cast members at the time of the announcement.

- - - - - Table 1 - - - - -

Table 1 provides descriptive statistics. Two data-related observations are worth highlighting.

Star Power Dynamics. A star's box office record—which industry insiders often use as the primary indicator of a star's power—changes dramatically over the course of just a few years. For example, StarBond values in December 2001 are only weakly correlated with such values exactly three years later—the Pearson correlation coefficient is 0.43—which underscores the downside of relying on stars' historical performance when forecasting their future performance.

HSX's Predictive Validity. A comparison of HSX MovieStock prices before and after release confirms that HSX produces reasonably accurate forecasts of theatrical revenues. For the

192 movies in the sample (nearly 40%) that had been widely released as of January 2005, the correlation between HSX halt and adjust prices (i.e. the prices immediately before versus after the opening weekend) is strong, with a Pearson coefficient of 0.94, and mean and median absolute prediction errors of 0.23 and 0.17, respectively. [8] The correlation between HSX halt and delist prices (i.e. the prices before versus four weeks after the release) is nearly as strong, with a Pearson coefficient of 0.89, and mean and median absolute prediction efforts of 0.29 and 0.21, respectively. Furthermore, while HSX does not consider revenues generated after a widely released movie's first four weeks (which is admittedly a disadvantage of the study's setting), it turns out that four-week revenues on average make up about 85% of the total theatrical revenues of a movie and explain 96% of the variance in those revenues. Figure 2 plots the relationships between these sales metrics.

- - - - - Figure 2 - - - - -

These are critical observations in light of the modeling approach—the event study would be less meaningful if HSX traders' expectations regarding box office revenues would *not* be a good predictor of actual sales. The predictive power of the HSX market increases as the theatrical launch draws nearer and more information on production and marketing factors becomes available (Elberse and Anand 2005), which is also in line with the premise underlying this study.

MODELING APPROACH

Methodological Challenges

Investigating the central question in this study—whether star talent drives the financial performance of motion pictures—is a difficult methodological challenge. The majority of extant studies considers a measure of talent involvement as one of the independent variables, and box office revenues or profits as the dependent variable, either in a regression model (e.g. Austin 1989; Litman 1983; Litman and Kohl 1989; Prag and Casavant 1994; Sochay 1994; Litman and Ahn 1998; Wallace et al 1993; Ravid 1999; Elberse and Eliashberg 2003) or a probability model (e.g. Sawhney and Eliashberg 1996; De Vany and Walls 1999; Neelamegham and Chintagunta 1999). However, the findings of existing research need to be approached with care for several reasons. Most notably:

- It is problematic to draw conclusions about the direction of causality, as studios may employ bigger stars for movies that are *expected* to generate higher revenues (Lehmann and Weinberg 2000 made a similar argument for the effect of advertising).
- It is difficult to control for a selection bias introduced by the possibility that the most powerful stars (the highest-ranked stars in terms of their historical box office record, for example) are able to *choose* the most promising movie projects.
- It is challenging to isolate the effect of an individual actor or actress on a movie's performance, as motion pictures are complex, holistic, creative goods that are the result of the activities of many creative workers (Caves 2000; 2003).

The Choice for an Event Study Methodology

I use an event study in an attempt to address these potential methodological problems. Specifically, I re-examine the impact of talent on movies' theatrical revenues by analyzing how casting announcements affect the prices of HSX MovieStocks, and extend current research by analyzing what determines the magnitude of that effect. Event studies are a popular methodology in several fields of business research (e.g., Campbell, Lo and MacKinlay 1996). In marketing, event studies have been used to understand the impact of, among other things, company name changes (Horsky and Swyngedouw 1987), new product introductions (Chaney, Devinney and Winer 1991), brand extensions (Lane and Jacobson 1995), celebrity endorsements (Agrawal and Kamakura 1995), and online channel additions (Geyskens, Gielens and Dekimpe 2002) on firm valuation.

Here, an event study approach has important advantages over existing research in the area:

- Most notably, the event study framework allows for a comparison of a movie's expected performance *before* and *after* the casting announcement. Before the announcement, HSX traders can be assumed to have no information on which actor will be used—they will assess the value of a movie based on other characteristics such as the budget, the storyline, and moviegoers' familiarity with central characters. After the decision to cast a particular star is made public, traders can also take into account how much that star will draw moviegoers, and should adjust their trading behavior accordingly. The event study thus allows for a comparison of the likely performance of a particular movie *with* and *without* the involvement of the star mentioned in the announcement, where the difference reflects the impact or "worth" of that star. As such, it helps to address the potential lack of clarity on causality and the possible selection bias present in existing research that only considers the actual performance (i.e. the "outcome" of the marketing process) without controlling for the expected performance without the star. [9]
- When announcements involve only one star, the event study approach enables the examination of the impact of an *individual* actor or actress. Consider the situation of the actress Natalie Portman in *Cold Mountain* (Figure 1). As the announcement regarding her recruitment was made at a different time that the other casting announcements for the movie, it is possible to assess the effect of her involvement in the movie on an individual basis. In contrast, studies that simply regresses box office revenues (the "outcome" variable) on talent participation cannot differentiate between the effect of Natalie Portman and that of the other *Cold Mountain* cast members. Such studies typically attribute success to either the first-billed actor only or the combined cast (e.g., Litman 1983, Faulkner and Anderson 1987, Ravid 1999), but in reality they cannot determine whether one cast member should be valued higher than another.

A significant effect of casting announcements on HSX MovieStock prices could reflect several dimensions of star power: among other things, it could capture a star's (perceived) ability to attract the attention of audiences and convince them to buy tickets; his aptitude in attracting other talent to a project; his influence in muscling competing movies out of the market place; and his knack for generating commitments from investors, producers, and other interested parties.[10]

The intuition behind the event study methodology is straightforward. When carried out in the context of financial markets, it is assumed that the price of a stock reflects the time- and risk-discounted present value of all future cash flows that are expected to accrue to the holder of that stock—all publicly available information is reflected completely and in an unbiased manner in the price of the stock, making it impossible to earn economic profits on the basis of this information. Therefore, only an unexpected event can change the price of the stock, which is equal to the anticipated changes in the future cash flows of the firm adjusted for the risk of those cash flows. Information resulting in a positive (negative) change in expected future cash flows will have a positive (negative) effect on the stock's price (Brown and Warner 1985, Srinivasan and Bharadwaj 2005). Event studies assume that markets are efficient—in essence, they test both whether the event has an impact on the stock price *and* whether the market is efficient (Campbell et al 1996, Srinivasan and Bharadwaj 2005). Whether individual traders can integrate all the information pertaining to an event is significant in that regard. However, research shows that even when some traders have better access to information than others, markets aggregate information in such a way that investors collectively act as if they have all the relevant information (Srinivasan and Bharadwaj 2005).

In the context of the HSX event study, it is important that traders incorporate new information as it becomes available and leave no major arbitrage opportunities unaddressed. While there have been few studies on the efficiency of simulated markets in general, as discussed earlier, research has revealed that HSX is reasonably efficient immediately before a movie's release date

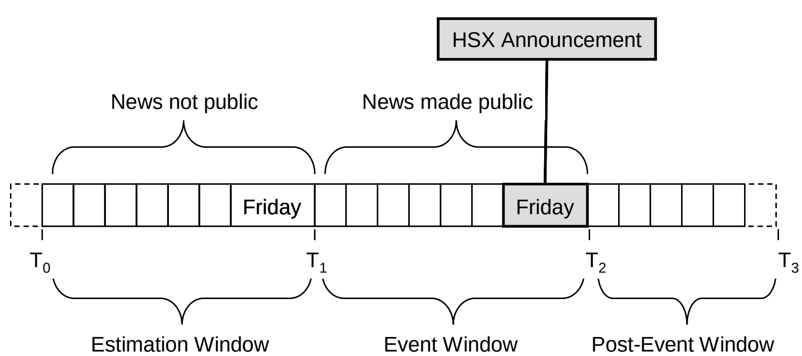
(Pennock et al 2001a, 2001b). In further explorations of the data used in this study, I find no reason to assume the HSX's efficiency is weaker at earlier stages of the trading process.[11]

The Event Study

Due to HSX's unique nature, the design of the event study discussed here differs from those commonly used in the context of "real" stock markets. The details are as follows:

The Event and Event Window. The focal event is the announcement regarding a star's involvement (or discontinuation of a star's involvement) in a movie. I know with certainty when the announcement appeared in the weekly HSX Market Recap report, which is always published on a Friday. However I do not know the exact day the news was first made public—it could have been any day of the week in which the report appears. Traders could thus have acquired information about the involvement of stars in the days leading up to the Market Recap report.

The schematic below depicts my perspective on the event and estimation window.



Following Campbell, Lo and MacKinlay (1996), I index returns in event time using τ, and define $\tau = T_1$ to $\tau = T_2$ as the *event window*. For an announcement made on a given Friday, the event window starts with the HSX closing price on the previous Saturday, T_1, and ends with the HSX closing price on the Friday the announcement appears in the Market Recap report, T_2. My choice for a relatively long event window (event studies using real stock market data typically opt for one or two days) follows from the uncertainty about the day of the week on which the news was made public.

Normal and Abnormal Returns. Abnormal returns are the movie's actual ex post returns of the security over the event window minus its normal return over the event window; normal returns are the returns that would be expected if the event did not take place. That is, for each announcement i and time period t:

$$AR_{it} = R_{it} - E(R_{it}) \tag{1}$$

where AR_{it} are the abnormal returns, R_{it} the actual returns, and $E(R_{it})$ the normal returns. In modeling the normal return, I opt for the constant-mean-return model where returns are given by:

$$R_{it} = \mu_i + \delta_{it} \qquad \text{with } E[\delta_{it}] = 0, Var[\delta_{it}] = \sigma^2_{AR_i} \tag{2}$$

I calculate the cumulative abnormal return (CAR) by aggregating abnormal returns across time. Specifically, $CAR_i(\tau_1, \tau_2)$ is the CAR for announcement i from τ_1 to τ_2, where $T_1 < \tau_1 \le \tau_2 \le T_2$:

$$CAR_i(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} AR_{it} \qquad \text{with } Var[CAR_i(\tau_1, \tau_2)] = \sigma_i^2(\tau_1, \tau_2) \tag{3}$$

I generate a 7-day CAR for each announcement under investigation—one calculated over the week preceding the Market Recap announcement.

Estimation and Testing Procedure. Estimation of the normal performance model parameters is usually done using the period prior to the event window. I define the normal return as the average closing price in the week running from Saturday until Friday exactly one week before the announcement was made on the HSX site. The *estimation window,* defined as $\tau = T_0$ to $\tau = T_1$, thus consists of 7 days. Two key reasons underlie my choice for a relatively short estimation window: (1) the limited availability of long series (in some cases, the MovieStock's IPO is relatively close); and (2) the slight upward trend in HSX MovieStock prices in general (which, with a longer window, would lead to an overestimation of the more prevalent positive shocks—the 7-day window is a conservative choice in that respect). [12] I test for the significance of daily abnormal returns using the t-statistic described by Brown and Warner (1985). I also verify the significance of the CARs (the t-statistic is calculated by dividing the average CARs by its standard deviation) and the differential impact of positive versus negative announcements (Campbell et al 1996).

Cross-Sectional Analysis

Building on the results of the event study, I identify what determines the magnitude of the impact of casting announcements using a cross-sectional regression analysis (see Asquith and Mullins 1986, Campbell et al 1996, Geyskens et al 2002). The CAR, $CAR_i(\tau_1, \tau_2)$, is the dependent variable in these cross-sectional analyses.[13] Characteristics of the announcement, the star, and the other cast members are independent variables. I estimate a linear regression:

$$CAR_i = \alpha + \beta_1 A_i S_i + \varepsilon_i \qquad (4)$$

where A_i denotes the type of announcement, and S_i represents the vector of characteristics of the star mentioned in the announcement. The dependent variable is the 7-day CAR. A_i denotes whether the announcement is positive (e.g., "star X has joined movie Y,") with a score of 1, or negative (e.g., "star X has dropped out of movie Y,") with a score of -1. The S_i vector consists of the variables

Star_Economic_History, *Star_Artistic_History*, *Cast_Count*, *Cast_Economic_History,* and *Cast_Artistic_History*, as well as the interaction terms (*Star_Economic_History * Cast_Count*), (*Star_Artistic_History * Cast_Count*), (*Star_Economic_History * Cast_Economic_History*), and (*Star_Artistic_History * Cast_Artistic_History*). I estimate the regression using ordinary least squares, and generate heteroskedasticity-robust standard errors using MacKinnon and White's (1985) 'HC3' method.

FINDINGS

Stars and Revenues

Table 2 and Figure 3 present the results of the event study. Table 2 lists the average and cumulative average abnormal returns over the two weeks before and three weeks after the casting news, both for positive (N=1222) and negative announcements (N=36). Note that event time is measured in days relative to the announcement date. Figure 3 graphically displays the trends in the CARs.

- - - - - Table 2 and Figure 3 - - - - -

The primary insight jumps out. HSX prices, the measure of expected box office revenues, responded to casting announcements. *Positive* announcements triggered an increase in expected revenues. The average CAR at the close of the day of the HSX Market Recap announcement was 2.94. Thus, in the week the news was made public, prices rose with an average of nearly H$3. Given that each Hollywood dollar (H$) represents $1 million in box office revenues over the first four weeks of a movie's release, this finding implies that the average star is "worth" $3 million in theatrical revenues.[14] The increase in the "event week", i.e. from day -6 to 0, was considerably higher than the increase in the week prior, i.e. from day -13 to -7, when prices only increased with H$0.19.

The opposite pattern emerges for *negative* announcements. The average CAR at the close of the announcement day was -3.17. In other words, in the week the news was publicized, prices dropped with an average of well over H$3. Again, the difference with the week before, when prices increased with H$0.07, is noticeable.

Figure 3 shows that average returns started to move in the expected direction from approximately day -5 onwards. That is, HSX traders started to respond to casting news before the Market Recap announcement day. This scenario is in line with the assumptions underlying the conceptualization of the event window—the "true" event day at which the casting news is first made public is not always the same day it is published on the HSX site. In fact, the figure suggests that, on average, the market had largely absorbed the news by the time it was confirmed in HSX's Market Recap report. The figure further shows that the CAR for positive announcements continued to increase in the week after the announcement. One explanation is that it took a few days for some traders to become aware of the news; another that other positive information emerged that further increased the likelihood of a successful launch.

Significance levels for the daily average abnormal returns reported in Table 2 confirm this pattern. For the positive announcements (N=1222), the average abnormal returns are significantly different from zero at a 1% significance level from day -4 to day 5, i.e. from four days before to five days after the announcement is published on the HSX site. For the negative announcements (N=36), the average abnormal returns are significantly different from zero at a 1% significance level on the event day only. Descriptive statistics for the 7-day CARs are:

Announcement Type	**N**	**Mean**	**Median**	**SD**	**Min**	**Max**
Negative Announcement	36	-3.17	-1.30	6.74	-21.50	9.00
Positive Announcement	1222	2.94	2.60	5.95	-16.01	62.50

A two-sample t-test reveals that the difference in CARs for positive and negative announcements is statistically significant, at a 1% significance level. The findings thus support the notion that star participation indeed impacts movies' expected box office revenues.[15]

Table 3 shows the announcements with the 10 highest and 10 lowest CARs. It also lists 10 announcements that, judging by the abnormal returns, hardly had an impact.

- - - - - Table 3 - - - - -

The highest ranking announcements contain a number of established, often highly-paid stars—including Tom Hanks, Mike Myers, Tom Cruise, and Mel Gibson. Tom Hanks appears twice: once for starring in *The Da Vinci Code*, which with H$43.43 was the largest CAR overall, and once for *The Terminal*. The list also contains a few actors that were typically not included at the very top of most power rankings, such as Johnny Knoxville and Seann William Scott. Furthermore, as expected, the list of announcements that generated the lowest-ranked CARs contains a number of negative announcements. Jim Carrey and Nicole Kidman dropping out of the *Untitled Jim Carrey Ghost Story*, a project apparently in an early stage of development, led to a drop of H$21.50, the largest negative market reaction. Tom Cruise leaving *Cold Mountain*, the example discussed earlier, ranks as the third-lowest. Interestingly, the list contains just as many positive as negative announcements. In the case of positive announcements, it appears the actor chosen did not meet the expectations of the HSX traders. For example, the results suggest that Alfred Molina might not have been the villain moviegoers hoped to see in *Spider-Man 2*.

Stars, Revenues and Additional Characteristics

The results thus strongly indicate that stars impact revenues, and that some stars contribute more to revenues than others. But what are the determinants of stars' impact on revenues? Table 4 presents the results of the cross-sectional analysis with 7-day CARs as the dependent variable, and the announcement and talent characteristics as independent variables.

- - - - - Table 4 - - - - -

The estimates for Model I suggest that *Star_Economic_History* is positively related to the CAR—the higher a star's historical box office record, the greater is his or her impact on expected revenues for an upcoming movie. This result supports H1. The coefficient is 0.04, which indicates that a star with an average historical box office performance of $100 million is "good for" about $4 million in additional box office revenues. The same is true for *Star_Artistic_History*: the higher a star's recognition among its peers in the form of Oscar or Golden Globe awards, the greater is his or her impact on a movie's expected revenues. The coefficient here is 0.421, which suggests an award nomination represents about $400,000 in additional box office revenues. Note, however, that the model explains just over 21% of the variance in the CARs. The low R^2 and Adjusted R^2 correspond with a high volatility in stars' box office records. An F test ($F=55.14$, $p<1\%$) reveals that the independent variables together explain a significant share of the variance in the dependent variable.

Model II includes the three independent variables that reflect characteristics of the cast. With 0.27, the Adjusted R^2 for model II is higher than for Model I. *Cast_Count*, *Cast_Economic_History*, and *Cast_Artistic_History* are all significant, albeit the former only at the 5% significance level. That is, supporting H2, it appears that the number of other cast members as well as their average box office record and their artistic reputation all positively affect a star's impact. The coefficient for *Cast_Economic_History* is 0.009, which means that an actor joining a cast with a combined average historical box office performance of $100 million is likely to bring in revenues of about $900,000 more than an actor who joins a cast without any box office power. Similarly, the coefficient for

Cast_Artistic_History is 0.525, which means that an actor joining a cast where the other members average one Oscar or Golden Globe nomination can be expected to generate revenues of about $500,000 more than an actor who joins a cast without any nominations.

These observations take on more meaning in Model III, which includes interaction terms. The interaction term *Star_Economic_History* * *Cast_Economic_History* is positive—and highly significant. That is, the more "A-list" a cast already is in terms of their box office power, the greater is the impact of a star with a track record of box office successes. The coefficient is 0.0003 (it rounds off to the 0.000 reported in Table 4) which may seem small, but it suggests that the interaction effect "accounts" for (0.0003 * 45.59 * 46.80 =) over $600,000 in additional revenues at average levels of *Star_Economic_History* and *Cast_Economic_History* (also see Table 1). The interaction term *Star_Artistic_History* * *Cast_Artistic_History* is also positive, although at a 5% significance level, which indicates that the more recognized the cast already is for its artistic prowess, the greater is the impact of a star with a strong artistic reputation. Both findings are line with the idea of increasing returns to recruiting stars, or with a multiplicative production function. With an Adjusted R^2 of 0.28, Model III is the model with the highest explained variance.

Responses to Casting Announcements and Forecast Accuracy

Are the responses to the casting announcements meaningful? That is, do they help move the expected revenues closer to the subsequent actual revenues? Given the close scrutiny that abnormal movements in returns receive throughout this study, it seems important to consider this question. I can only do so for announcements involving the movies that had been released as of January 2005—this was the case for 192 movies, i.e. almost 40% of the sample. I compare whether an announcement moves the movie's closing price (a measure of expected revenues) closer to the subsequent adjust or delist price (both measures of the actual revenues). A comparison of absolute prediction errors (APEs) suggests this is indeed the case:

- For adjust prices (which are based on opening-week revenues): The mean APE calculated using the closing price on the Friday before the announcement is 1.19; the mean APE calculated using the closing price on the day of the announcement is 1.06; an improvement of over 10%. Similarly, the median APE drops from 0.85 to 0.75; again an improvement of over 10%.
- For delist prices (which are based on cumulative revenues): The mean APE calculated using the closing price at the start of the event week is 1.13, while the APE calculated using the closing price at the end of the event week is 1.03; an improvement of about 8%. Similarly, the median APE decreases from 0.85 to 0.75; an improvement of about 9%.

Paired t-tests reveal that the improvements in APEs are significant at the 1% significance level.

EXTENSION: DO STARS IMPACT THE VALUATION OF MOVIE STUDIOS?

The finding that the involvement of stars drives expected revenues bodes the question whether it also impacts other financial metrics. In, to my knowledge, the only investigation to date of the relationship between star involvement and film profitability, Ravid (1999) found no evidence for such a relationship. He concluded that "stars capture their economic rent", meaning that they capture the value they add. In an extension of my analysis, I focus on a different metric, and examine whether the involvement of stars in a film impacts the financial *valuation* of the studio that is producing and distributing that film.

Data

I again use an event study that revolves around the casting announcements. My measure of profitability is based on the "real" stock market's valuation of movie studios listed on the New York Stock Exchange (NYSE).[16] I focus on those studios—or the conglomerates to which they belong—that were consistently listed on the NYSE from January 2001 to December 2004 and for which I have announcement data: Disney (DIS), Lions Gate (LGF), News Corp. (NWS), Sony (SNE), Time

Warner (TWX), and Viacom (VIA).[17] To measure overall market dynamics, I also employ data for the S&P500 Composite Index, again for the period from January 2001 to December 2004.

Event Study Approach

As Ravid (1999) pointed out, using an event study with real stock market data to study the impact of star participation on the financial performance of film studios has some disadvantages. Specifically, first, the timing of casting announcements can be hard to gauge and, second, events affecting movie projects may not be sufficiently significant to warrant discernable changes in studios' stock prices, especially when those studios are part of media conglomerates. These are important problems which arguably cannot be solved completely, but the HSX event study may offer opportunities to lessen the disadvantages. That is, first, by carefully examining when HSX traders responded to an announcement, one may be able to better determine the true event day, and second, by focusing only on announcements that had a noticeable impact on HSX prices, one could increase the chance of detecting an effect of star power. Both modifications affect the event window definition.

The Event and Event Window. The focal event remains the announcement regarding a star's involvement (or discontinuation of a star's involvement) in a movie, as it appears in the weekly HSX Market Recap report. To address the above-described problems, I made two modifications.

First, in order to increase the likelihood of the event being able to affect film studios' valuation, I run the event study for a sample of the 100 announcements that ranked highest (in a positive or negative sense) according to their 7-day CAR in the HSX study. In selecting announcements for the sample, I made sure that no other same-movie-related events occurred during the estimation and event window, and that no other studio-related events occurred in a six-week window centered on the event day. I have also been careful to exclude announcements if they coincided, within a four-week window, with the studio or parent company's profit statements, or with other major financial news involving the company.

Second, in order to come to a sufficiently narrow event window, I define the event day as the event weekday with the biggest change in HSX closing prices. I manually verified the appropriateness of this method for 25% of the sample of 100 highest-ranked announcements. Specifically, I performed an extensive search of the offline and online versions of the trade sources that HSX uses to compile its reports (e.g. *Variety* and *The Hollywood Reporter*) to trace the dates the casting news was first made public. As far as I could verify, opting for the day with the biggest movement in HSX prices led to the correct event day in 22 cases (88%). In two cases, the largest shock was one day after the announcement; in one case it was one day before the announcement.

Normal and Abnormal Returns. Returns are expressed as daily movements in stock prices for each of the studios' securities. In modeling the normal return, I estimate both the constant-mean-return model (as in equation 2) and the market model, a common choice in event studies. The latter can be represented as follows:

$$R_{it} = \mu_i + \lambda_i R_{mt} + \delta_{it} \qquad \text{with } E[\delta_{it}] = 0, Var[\delta_{it}] = \sigma^2_{AR_i} \tag{5}$$

where R_{it} are the returns for the studio securities and R_{mt} are the returns for the market portfolio, measured by the S&P500 index, for each announcement i for time t.

Estimation and Testing Procedure. I estimate the normal performance model parameters over the period from 250 trading days before the announcement day to 21 days before that day. The estimation window thus consists of approximately 6 months. I use t-tests to verify the significance of the abnormal returns, and for the differential impact of positive versus negative announcements.

Findings

Using both the constant-mean-return and market models, I fail to find evidence that would suggest that the participation of stars in movies affects the valuation of studios that produce or distribute those movies, or of the media conglomerates to which those studios belong. In the constant-mean-return model specification, the CARs for positive and negative announcements were not significantly different from zero (mean=0.27, t=0.67 and p>10%, and mean=-0.11, t=-0.71 and p>10%, respectively), and there was no significant difference between returns for both types of announcements (pooled, t=0.44, p>10%). The same is true in the market model specification (mean=-1.03, t=-0.12 and p>10%, mean=-0.56, t=-0.81 and p>10%, and t=0.09, p>10%, respectively). Robustness checks with (1) a wider event window definition that includes the event day and the subsequent day (also a common choice in event studies) and (2) a smaller set of announcements (again based on their CARs in the HSX study) corroborate the key results. All in all, I find no evidence to reject the null hypothesis that the involvement of stars is unrelated to film studios' valuation. Thus, like Ravid (1999), I infer that stars may not add more value than they capture.[18]

CONCLUSION AND DISCUSSION

Is the involvement of star actors critical to success in the motion picture industry? To what extent are the—often significant—investments in stars justified? And what determines the value of stars? We will never know for sure whether the movie *Cold Mountain* would have made more money if actor Tom Cruise had not dropped out, nor how the hundreds of other movies in this study would have performed with a different cast. The complex, one-off nature of motion pictures makes it extremely difficult to test hypotheses about the factors that drive success.

I addressed this challenge using an event study approach, and analyzed the impact of over 1,200 casting announcements on simulated and real stock market trading. I found strong support for the view that star participation indeed positively impacts movies' revenues—the results suggest that stars can be "worth" several millions of dollars in revenues. Moreover, I uncovered important determinants of the magnitude of that effect, namely the stars' past performance in an economic and artistic sense (expressed as box office success and awards or nominations collected, respectively), as well as the number and the past performance of other star cast members. However, while stars appear to impact film-level revenues, I failed to find support for the idea that stars also drive the valuation of film studios or the media conglomerates to which they belong.

What are the implications of these findings? The result that star participation positively affects movies' revenues is in line with conventional wisdom. Because the approach developed here addresses methodological limitations in the relevant extant academic literature, it is encouraging to note that this study confirms the important role that is usually attributed to star talent. Although this study represents only an initial exploration of the impact of stars on the valuation of film studios, the lack of evidence to support a significant relationship is also noteworthy. There is insufficient reason to support the hypothesis that stars add more value than they capture. This alludes to "the curse of the superstar" (De Vany and Walls 2004). Stars may fully capture their "rent," the excess of expected revenue over what the film would earn with an ordinary talent in the role (Caves 2003), making ordinary talent and stars equally valuable for a studio that aims to maximize shareholder value instead of revenues. If firm valuation is a key objective, studio executives may benefit from altering their talent compensation schemes.

This study's insights into the determinants of stars' impact on revenues could help studios in their talent recruitment and management efforts. For example, while a star's past box office record and his artistic reputation provides guidance about his future box office performance, this study suggests that the expected contribution of a newly recruited star also positively depends on the number and, particularly, the strength of the other star cast members attached to the project. In that respect, the adage that it is all about combining the right star with the right cast still appears to hold. One implication for studio executives is that betting solely on one "A-list" star is not necessarily the best strategy—they need to consider each star in light of the other cast members that have signed on to the project.

This result is compatible with the idea of complementarity among high-quality inputs, for instance because a better leading actress induces a better performance from the leading actor. The observation that A-list talents work with one another on film projects more commonly than would result from random assignment (Baker and Faulkner 1991) is in line with this view. The result also corresponds with the so-called "O-rings theory," which states that every input needs to perform at least up to some level of dedication and proficiency to result in a work of unified quality. Named after a key component on the space shuttle Challenger whose failure contributed to the shuttle's explosion, it reflects a core property of multiplicative production processes: that an output's quality depends on all inputs performing up to some standard (Kremer 1993, Caves 2003).

These findings draw attention to a classic Alchian-and-Demsetz-type team problem: film making is essentially a team effort that brings together a range of creative workers, and identifying and rewarding the relative contribution of the individuals involved is intrinsically difficult as the product is not a sum of separable outputs of each of its members (Alchian and Demsetz 1972; also see Lampel and Shamsie 2003). Rather, one member's expected contribution to a project is a function of the strength of the other talent working on that project. These interdependencies severely complicate talent recruitment and compensation decisions.

By uncovering an interaction effect between the contributions of team members, this study contributes to the group dynamics literature, and builds on Tziner and Eden's (1985) work. Although more work is needed to understand the factors that create contexts in which high-ability members perform better in the presence of other high-ability members, the highly integrative nature of the film production process—the tasks of cast members require a close synchronization and are impossible to complete or evaluate in isolation—may be a key driver of this interaction effect. The fact that, in this study, it occurs for different types of group members' "abilities" (or, specifically, for both economic and artistic reputations) sheds light on the importance of status in group settings.

Important future research avenues remain. First, especially if the objective is to develop recommendations on talent compensation schemes, one logical extension would be to examine the impact of stars using data on movie-level profits—ideally talent salaries, profit shares, as well as other fees—and examine the optimal compensation mix from the perspective of the studios that employ stars (see Chisholm, 1997). A second avenue might be to take the perspective of the stars themselves, and investigate what determines a star's lifecycle as well as how stars can best manage their careers for success (also see Eliashberg et al 2005). There is evidence that the length of star actors' careers has decreased significantly since the mid 1960s, the competition for roles in big-budget movies has intensified, and the process of bringing together creative talent has become more difficult with the breakdown of the system of long-term studio contracts for talent (Miller and Shamsie 1996, Lampel and Shamsie 2003). Given that the odds are stacked against success, actors should embrace insights that can help them better manage their careers, and find the right balance in their efforts to improve their economic and artistic reputation. Third, while it is arguably one of this study's strengths to allow for a broad definition of stardom, this manuscript leaves open the question *why* some actors are bigger stars than others. Some stars may simply have superior skills that help raise the quality of a movie, and therefore improve the odds of box office success, while other actors may be better (or perceived to be better) at helping advance movies through the development process and secure free publicity, investments, or other types of commitments (also see Forbes 2002, 2003). Future research could explore each of these aspects, thereby advancing our knowledge on the origins of stardom (e.g., Rosen 1981, Adler 1985).

[1] John, Ravid and Sunder (2003) found that optimal hiring of movie *directors* is based on their performance over the entire career path rather than their recent performance, and that their contribution is positively related to career length.
[2] This fits with recent evidence that markets based on fake money can be just as accurate as those based on real money (e.g. Servan-Schreiber, Wolfers, Pennock and Galebach 2004).
[3] For a regular Friday opening, the opening box office gross (in $ millions) is multiplied with 2.8 to compute the adjust price (the underlying assumption is that, on average, this leads to four-week totals).
[4] The process starts when MovieStocks credited to that actor delist, and continues until the final theatrical gross is known. The contribution for any one film is capped at $250 million. The minimum StarBond price is H$5.
[5] I explored whether it was worthwhile to separate speculative ("Actor X may star in movie Y") and definite ("Actor X will star in movie Y") statements; this did not result in substantively different results.
[6] Because it involves an adjustment (and not a StarBond price determined by trading in periods between adjustments), this is purely a backward looking measure, and does not incorporate any speculation.
[7] The Academy Awards are granted by the Academy of Motion Picture Arts and Sciences (which counts many actors among its members), while the Golden Globes are given out by the Hollywood Foreign Press Association.
[8] Absolute prediction errors are calculated as the absolute difference between predicted and actual values, divided by the predicted values. For example, for halt versus adjust prices, the APE is [(|halt price-adjust price|)/halt price].
[9] The "reverse causality" problem might not be fully overcome: some traders may believe that studios hire better actors if they perceive the movie to have a higher chance of success, making the announcement for them at least partly a signal of the movie's overall potential, and their response to that announcement an indirect reflection of the star's strength.
[10] The absence of a significant effect of a casting announcement does not necessarily imply that the actor in question has no star power—rather, it implies that the casting decision was in line with what traders expected.
[11] Specifically, an examination of the slope of the best-fitting line in a plot with closing prices at various times before the release on the x-axis and either adjust or delist prices on the y-axis, revealed the slope parameter is statistically indistinguishable from one. While not a conclusive test of market efficiency in all its dimensions, the analysis suggests there are no obvious anomalies that traders could exploit.
[12] I have experimented with different estimation windows and different normal return estimation models. Because the returns did not change substantively, I only report the findings for the simplest solution.
[13] Analyses with standardized CARs lead to similar findings.
[14] Given HSX's focus on a movie's first four weeks, the calculated star worth is a relatively conservative estimate.
[15] Alternative event window definitions (e.g. a specification that includes the Saturday after the announcement (day +1), or only considers the weekdays up to the announcement (day -4 through 0) also generate significant abnormal returns.
[16] Another approach is to incorporate the total costs for each movie. However, while information on the production and marketing expenditures is relatively easy to obtain, information on back-end deals is typically not in the public domain.
[17] As *Universal* partly changed ownership as a result of the merger between NBC and Vivendi Universal Entertainment in October 2003, I excluded it from the analysis.
[18] I acknowledge that I cannot definitively rule out Ravid's (1999) concern that the effect of a single announcement is simply negligible in the midst of other factors influencing the share price of a media conglomerate. However, I believe it is not unrealistic to expect an effect could have been uncovered, for three reasons. First, a recent study by Joshi and Hanssens (2006) offers evidence that the drivers of movie performance also affect the share price of studios and the conglomerates to which they belong. Specifically, they show that marketing expenditures for a movie affect the direction and magnitude of the movie studio's stock return post launch. Particularly for major movies that recruit top-ranked stars, the expenditures on star salaries may be comparable to the marketing costs. Second, the fortunes of one blockbuster movie often make or break a studio's annual profitability, and thereby impact the valuation of the conglomerate to which the studio belongs. *Spider-Man*'s impact on Sony is one example (e.g. Elberse 2005). Third, several major investment banks employ analysts dedicated to the film industry, whose job it is to predict the performance of movies and, by extension, of studios and conglomerates). Those analysts closely monitor casting announcements.

Table 1: Descriptive Statistics

	N	Announcement Type: Positive	Announcement Type: Negative
Announcements	1258	1222	36
Stars	602	597	32
Movies	496	494	30

Variable	**Description / Measure**	**N**	**Mean**	**Median**	**SD**	**Min**	**Max**
Star_Economic_History	The average box office revenues for the star's five latest movies at the time of the announcement	1258	45.59	38.57	32.44	1.59	224.45
Star_Artistic_History	The total number of Oscar and Golden Globe awards and nominations for the star in the five years before the announcement	1258	0.34	0.00	0.69	0.00	5.00
Cast_Count	The number of other cast members at the time of the announcement	1258	2.62	2.00	1.78	0.00	10.00
Cast_Economic_History	The average of each cast member's average box office revenues for his or her five latest movies at the time of the announcement	1258	46.80	42.33	28.02	0.00	224.45
Cast_Artistic_History	The average number of Oscar and Golden Globe awards and nominations for those members in the five years before the announcement	1258	0.37	0.25	0.95	0	11.00

Correlation Coefficients [a]	*Star_Economic_History*	*Star_Artistic_History*	*Cast_Count*	*Cast_Economic_History*	*Cast_Artistic_History*
Star_Economic_History	--	0.15 **	0.22 ***	0.72 ***	0.26 ***
Star_Artistic_History	0.15 **	--	0.00	0.06 **	0.50 ***
Cast_Count	0.22 ***	0.00	--	0.18 ***	0.07 **
Cast_Economic_History	0.72 ***	0.06 **	0.18 ***	--	0.16 ***
Cast_Artistic_History	0.26 ***	0.50 ***	0.07 **	0.16 ***	--

[a] Probabilities are reported in the table: *** denotes significant at p=0.01, ** significant at p=0.05, and * significant at p=0.10.

Table 2: Average Abnormal Returns for Casting Announcements

Event Day	Negative Announcements (N=36) (e.g. "has dropped out")		Positive Announcements (N=1222) (e.g. "has joined")	
	AR	*CAR*	*AR*	*CAR*
-10	-0.17	-0.37	0.11	-0.06
-9	0.55	0.17	0.04	-0.02
-8	0.00	0.17	0.05	0.03
-7	**-0.17**	**0.00**	**-0.03**	**0.00**
-6	0.21	0.21	0.01	0.01
-5	-0.09	0.12	0.15 **	0.15 ***
-4	-0.70 *[a]	-0.57	0.44 ***	0.59 ***
-3	-0.31	-0.88	0.85 ***	1.44 ***
-2	-0.51 **	-1.40	0.64 ***	2.08 ***
-1	0.06	-1.33	0.62 ***	2.70 ***
0	**-1.83 *** **	**-3.17 *** **	**0.24 *** **	**2.94 *** **
1	0.24	-2.93 ***	0.19 ***	3.12 ***
2	0.04	-2.89 ***	0.17 ***	3.29 ***
3	0.24	-2.65 ***	0.21 ***	3.50 ***
4	-0.45 **	-3.10 ***	0.11 ***	3.61 ***
5	0.10	-3.01 ***	0.19 ***	3.80 ***
6	-0.04	-3.05 ***	0.01	3.81 ***
7	-0.15	-3.19 ***	0.02	3.83 ***
8	0.11	-3.08 ***	-0.06	3.77 ***
9	0.15	-2.94 ***	0.05	3.82 ***
10	0.04	-2.89 ***	0.05 *	3.87 ***
11	0.00	-2.90 ***	0.08 **	3.94 ***
12	0.20	-2.70 ***	-0.02	3.92 ***
13	-0.16	-2.85 ***	0.05	3.98 ***
14	-0.08	-2.94 ***	-0.04	3.94 ***
15	-0.45 **	-3.39 ***	-0.06	3.88 ***
16	-0.05	-3.43 ***	0.01	3.89 ***
17	0.33	-3.10 ***	0.05 *	3.94 ***
18	0.05	-3.06 ***	0.00	3.94 ***
19	-0.05	-3.11 ***	-0.01	3.93 ***
20	0.04	-3.07 ***	0.10	4.04 ***

[a] T-test probabilities are reported in the table: *** denotes significant at p=0.01, ** significant at p=0.05, and * significant at p=0.10.

Table 3: Announcements with the Highest and Lowest-Ranked Cumulative Abnormal Returns

#	The 10 Announcements With the Highest CARs	CAR
1	Tom Hanks (THANK) is in negotiations to star in The Da Vinci Code (DVINC).	43.43
2	Mike Myers (MMYER) will star in The Cat in the Hat (CATHT).	31.75
3	Johnny Knoxville (JKNOX) and Seann William Scott (SWSCO) have been cast in The Dukes of Hazzard (DUKES).	29.60
4	Tom Cruise (TCRUI) is in talks to star in The Last Samurai (LSMUR).	28.49
5	Johnny Depp (JDEPP) is poised to star in Charlie and the Chocolate Factory (CFACT).	22.61
6	Dustin Hoffman (DHOFF) has been cast in Meet the Fockers (MPRN2).	22.00
7	Tom Hanks (THANK) has signed to star in Terminal (TRMNL).	21.24
8	Michael Keaton (MKEAT) is in the driver's seat on Herbie: Fully Loaded (LVBUG).	20.39
9	Mel Gibson (MGIBS) will return as Mad Max in Fury Road (MMAX4).	19.25
10	Nicole Kidman (NKIDM) and Brad Pitt (BPITT) are in negotiations to star in Mr. and Mrs. Smith (SMITH).	19.02

#	The 10 Announcements With the Lowest CARs	CAR
1	Jim Carrey (JCARR) and Nicole Kidman (NKIDM) have dropped out of Untitled Jim Carrey Ghost Story (UJCGS).	-21.50
2	Leonardo DiCaprio (LDCAP) will not star in Martin Scorsese's (MSCOR) Alexander the Great (ALEXN).	-16.01
3	Tom Cruise (TCRUI) dropped out of Cold Mountain (CLDMT).	-10.00
4	Alfred Molina (AMOLI) has been cast in The Amazing Spider-Man (SPID2).	-8.82
5	Ice Cube (ICUBE) is set to star in the XXX sequel (XXX2), replacing Vin Diesel (VDIES).	-8.75
6	Nicole Kidman (NKIDM) and Brad Pitt (BPITT) are separating from Mr. and Mrs. Smith (SMITH).	-7.25
7	Jessica Biel (JBIEL) will star in The Texas Chainsaw Massacre (TXCSM).	-5.76
8	Hank Azaria (HAZAR) has joined the cast of Untitled John Hamburg Comedy (UJHAM).	-5.74
9	Viggo Mortensen (VMORT) drops out of Borgia (LUCRE) to star in Hidalgo (HDLGO).	-5.25
10	Alec Baldwin (ABALD) is in negotiations to star in The Cat in the Hat (CATHT).	-5.04

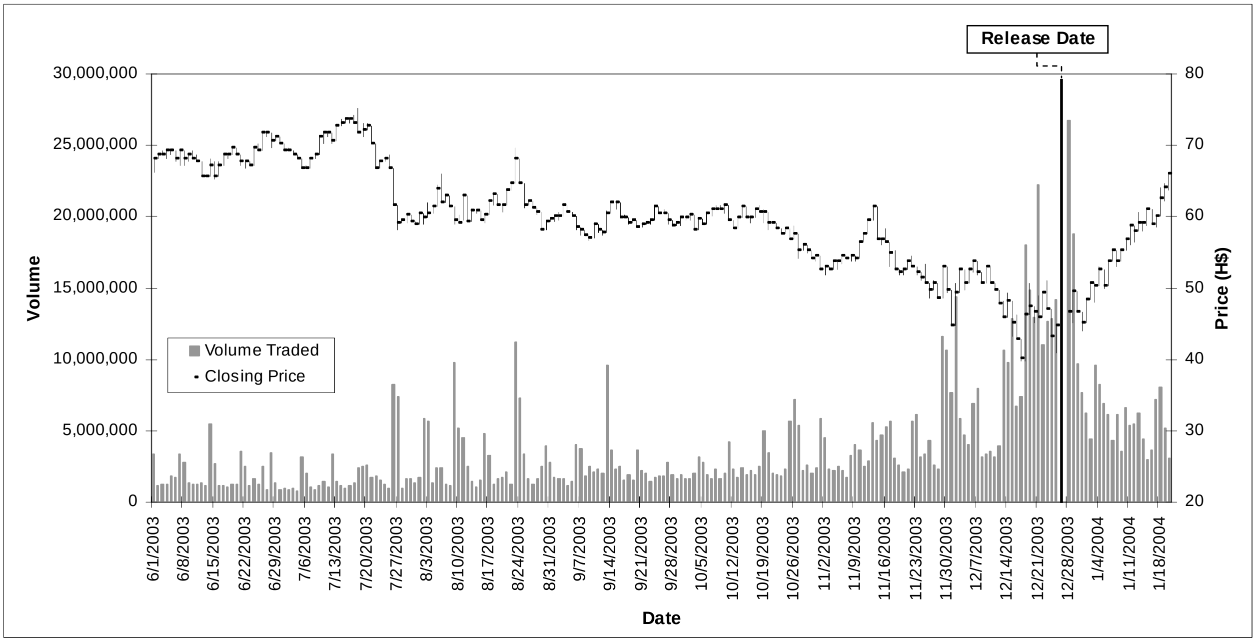
	Some Announcements with Insignificant CARS	
--	Scarlett Johansson (SJOHA) and Colin Firth (CFIRT) will star in Girl with a Pearl Earring (GPRLE).	-0.10
--	Josh Lucas (JLUCA) will star in Secondhand Lions (2NDLN).	0.01
--	Rosario Dawson (RDAWS) and Jared Leto (JLETO) are in negotiations to star in Alexander (ALXND).	0.01
--	Maria Bello (MBELL) and John Leguizamo (JLEGU) are circling roles in Assault on Precinct 13 (ASP13).	0.04
--	Val Kilmer (VKILM) is in negotiations to join Collateral (COLAT).	0.05
--	Kim Basinger (KBASI) is in negotiations to star in Door in the Floor (DRFLR).	0.05
--	Robert Patrick (RPATR) is set to star in Ladder 49 (LAD49).	0.07
--	Bruce Greenwood (BGREE) joins The World's Fastest Indian (WFSIN).	0.11
--	Kirsten Dunst (KDUNS) may star opposite Ralph Fiennes (RFIEN) in The Girl with a Pearl Earring (GPRLE).	0.13
--	Matthew McConaughey (MMCCO) will star in Sahara (SAHAR).	0.13

Table 4: Cross-Sectional Regression Analysis—All Announcements (N=1258)

	Coefficient of…	I Estimate	I SE [a]		II Estimate	II SE		III Estimate	III SE	
α	*Intercept*	1.360	(0.261)	*** [b]	1.232	(0.369)	***	1.201	(0.308)	***
β_1	A_i * *Star_Economic_History*	0.042	(0.004)	***	0.035	(0.013)	***	0.018	(0.005)	***
β_2	A_i * *Star_Artistic_History*	0.421	(0.141)	***	0.406	(0.158)	***	0.398	(0.162)	**
β_3	A_i * *Cast_Count*	--	--		0.128	(0.089)	**	0.189	(0.099)	*
β_4	A_i * *Cast_Economic_History*	--	--		0.009	(0.008)	***	0.011	(0.004)	***
β_5	A_i * *Cast_Artistic_History*	--	--		0.525	(0.202)	***	0.469	(0.233)	***
β_6	A_i * *Star_Economic_History * Cast_Count*	--	--		--	--		0.003	(0.002)	
β_7	A_i * *Star_Artistic_History * Cast_Count*	--	--		--	--		0.176	(0.142)	
β_8	A_i * *Star_Economic_History * Cast_Economic_History*	--	--		--	--		0.000	(0.000)	***
β_9	A_i * *Star_Artistic_History * Cast_Artistic_History*	--	--		--	--		0.145	(0.063)	**
		R^2 = 0.22, Adjusted R^2 = 0.21			**R^2 = 0.27, Adjusted R^2 = 0.27**			**R^2 = 0.29, Adjusted R^2 = 0.28**		

[a] Reported standard errors are heteroskedasticity robust.
[b] Probabilities: *** denotes significant at p=0.01; ** significant at p=0.05, and * significant at p=0.10.

Figure 1: Trading Dynamics and Casting Announcements for "*Cold Mountain*"



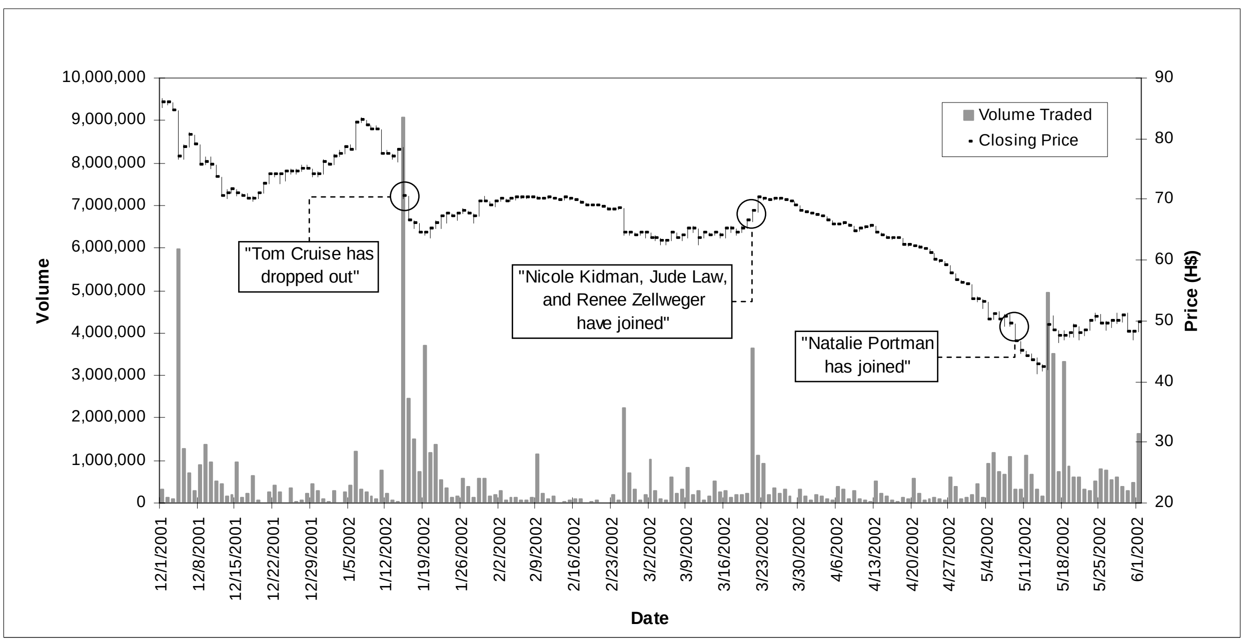
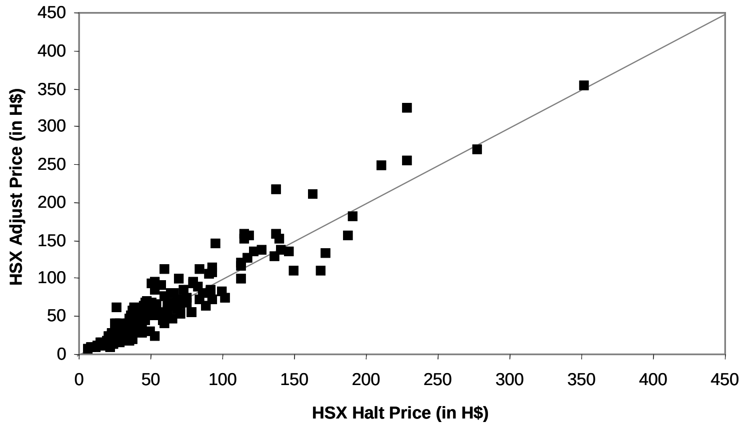
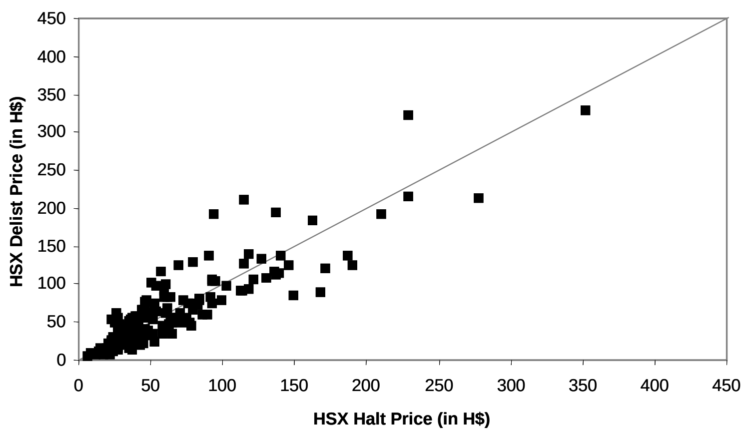


Figure 2: Predictive Validity for HSX





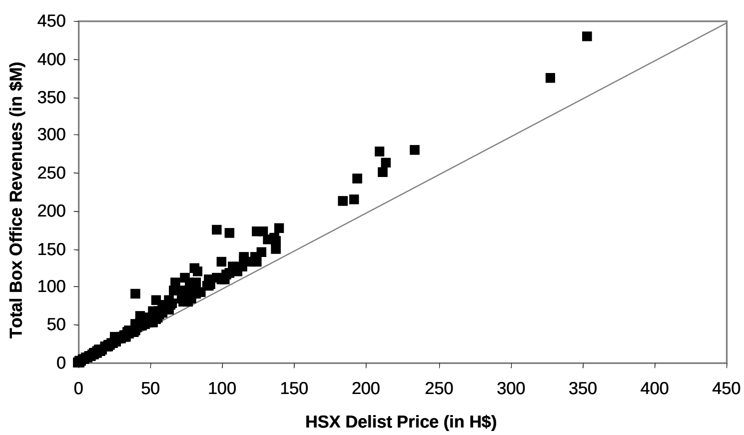
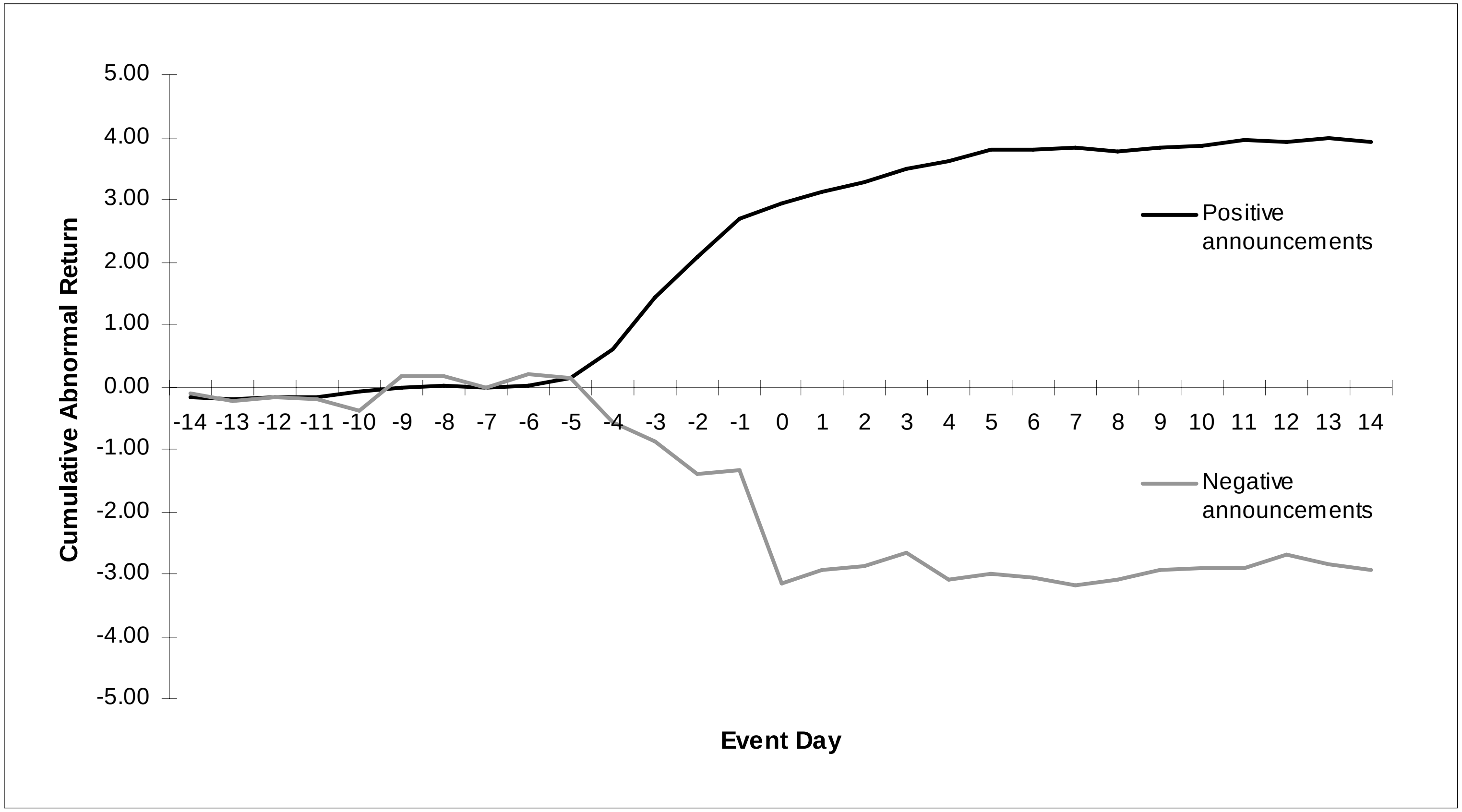


Figure 3: Plot of Cumulative Average Abnormal Returns for Casting Announcements



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