

## **WHEN TO GREENLIGHT: Examining the Pre-release Factors that Determine Future Box Office Success of a Movie in the United States**

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### **ABSTRACT**

*The motion picture business in the United States is a multi-billion dollar industry which is an important part of the country's economy. There were over 120,000 movies that were produced and shown in movie theaters across the U.S. in 2010. Some were successful and many were not. Given the amount of risk and investment required to produce a movie, it is essential to investigate the factors that can be selected prior to release (production phase) to determine box office success of a movie. In this paper we examine the impact of twenty-nine variables on total U.S. box-office revenue as well as the revenue-to-budget ratio. We use data from one hundred and fifty top grossing movies of 2010, and found that genre, MPAA rating, budget, star power, adaptation from another medium, sequels and remakes are significant predictors in determining box office revenue and/or profitability of movies.*

**Keywords:** *Movie industry, Box office success, Pre-release factors*

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### **1. INTRODUCTION AND LITERATURE REVIEW**

The movie industry in the United States has a tremendous importance for its economy. In the U.S., movies made more than 10 billion dollars in 2010 and the U.S. movie industry employs more than half a million people. The GDP contribution from Arts, entertainment and recreation recovered in 2010, increasing 5.4% after declining for two years prior (Gilmore et al., 2011). The movie industry's aim is to entertain millions of viewers and its success depends on the preferences of the movie-goers. If viewers do not choose to see a movie, millions of dollars can be lost, causing production companies and/or producers to go bankrupt. Therefore, the entertainment business is a serious and high-stakes process where there are high risks and rewards. In 2010, the average production costs for the top 50 grossing movies were \$98 million. For production companies it is very important to predict what movie is going to be a success or a flop prior to making the decision of investing millions of dollars into the project. This paper focuses the determinant factors of a movie's success during the production process. The goal of this study is to better quantify the elements that are significant determinants when a making the decision to fund a motion picture production.

Eliashberg, Elberse, and Leenders (2006) posit that a motion picture is created in three key phases: production, distribution, and exhibition. The production phase is where the movie idea is translated (and funded) into a finished product. It is during the production phase where the decision to adequately fund a motion picture is determined. In this phase several decisions can be made such as casting, genre, MPAA rating, etc. Similar to any manufacturing process, this phase is the most critical step in ensuring that the consumer's needs, wants and/or specifications are met. With a motion picture production, the ability to design the script with the right actors, genre and adequate theatrical resources are all the elements that have been shown in prior research that ultimately will determine a movie's success.

In the literature there are many research papers that explore the production and post-production determinants of motion picture box office revenue. Litman (1983) was the first to develop a multiple regression model to predict the commercial success of movies. The independent variables in this work were movie genre (science fiction, drama, action-adventure, comedy, and musical), Motion Picture Association of America (MPAA) rating (G, PG, R and X), superstar in the cast, production costs, release company (major or independent), Academy Awards (nominations and winning in a major category), and release date (Christmas, Memorial Day, Summer). Litman's model demonstrates that the independent variables of production costs, critics' ratings, science fiction genre, major distributor, Christmas release, Academy Award nomination, and winning an Academy Award are all significant in the success of a film. Litman and Kohl (1989), Litman and Ahn (1998), Terry et al. (2004) and Brewer et al. (2009) have conducted similar studies expanding the initial work of Litman. Terry et al. (2009) did an analysis on English language movies in terms of their foreign box office revenue. Terry and De'Armond (2008) analyzed determinants of movie video rental revenue. Smith and Smith (1986) is another early study to examine the performance of movies analyzing the determinants of successful films. They observed that movies have become increasingly more specialized because of television. Prag and Casavant (1994) determined a positive impact of star power, praise by critics, sequels and Academy Awards on revenues when there is no advertising spending. Star power, Academy Awards, and production costs are found to be positive determinants of marketing expenditure.

MPAA ratings may also affect box office success of a film. Movie production companies usually try hard to get a better rating for their movies. To that end they frequently reshoot or reedit scenes numerous times in order to get their preferred ratings which are usually the coveted PG or PG-13 ratings. These two ratings are the preferred ratings for producers as, practically, they will not keep anyone from seeing the movie. Anast (1967) was the first to study the relationship between film genre and movie attendance. His results showed that films with violence and eroticism had a positive correlation while action-adventure genre had negative correlation with movie attendance. Litman (1983) concluded that that film ratings do not have significant effect on a film's box office success unless the movie's genre is science fiction. Austin (1984) also looked at film ratings to see if there is a correlation between ratings and movie attendance but could not find a significant relation. However Ravid (1999) showed that only G and PG ratings correlate with return-on-investment (ROI). Furthermore, Terry et al. (2004) found that the negative effect of the R rating on box office revenue is in the amount of \$10 million on average.

Ravid (1999) also examined film revenue and ROI as functions of several variables such as production cost and star actors. Using regression modeling, the author found that large production costs significantly increase film revenue, but do not increase the ROI. He also determined the quantity of critic reviews is positively significant, and sequels perform significantly better than non-sequels. According to univariate tests movie stars increase revenue, but according to regressions star power is insignificant. This is in line with the 'rent-capture' hypothesis that a movie star earns a salary in the amount of their market value hence does not impact the profitability of a film. Ravid (2004) studied the effect of violence in R-rated films, illustrating that highly violent films are financially 'safer' to make. His results indicate that a movie's ROI is expected to be within the middle of the sample's distribution when there is violence in the movie.

Several research papers have examined the effect of post-production success. One area of interest in the literature has been the role of critics (Weiman, 1991). The majority of the literature finds that critics play a significant role on the success of a movie. According to Eliashberg and Shugan (1997) there are two types of critics: the influencer and the predictor. The influencer is a critic that will influence the box office results of a film based on his or her review. Eliashberg and Shugan show that critics can indeed manipulate box office revenues based on their review. The critic predicts the success of a movie but the review will not necessarily affect the movie's commercial success. Eliashberg and Shugan find that the predictor role of a critic is statistically less important than the influencer role. King (2007) also explores the power of critics on revenue of movies. He concludes that there is no correlation between critical ratings for movies and their commercial success when all releases are considered because of the affinity most critics have for foreign movies and documentaries compared to the average movie-goer, and if one considers only the films released to a wide audience (more than 1,000 theaters) then critical ratings have a significant positive impact on revenue. Reinstein and Snyder (2000) investigate impact of the critics Siskel and Ebert's reviews on commercial success. They conclude that positive reviews have a large impact on box office success. Reinstein and Snyder also report that entire critic population' influence on box office is not necessarily significant but only a few critics' reviews can influence a movie's revenue significantly.

Research has also shown a there is significant relation between season of film's release date and its revenue. Litman (1983) indicated that the most important time for a film release is the Christmas season. However Sochay (1994) reported that the summer is the best season to release a movie. Sochay, referencing Litman (1983), explains the conflict in these two results is based on competition. Sochay mentions that the successful season can shift from the summer to Christmas from year to year based on film distributors' effort to avoid strong competition.

Lastly, movie industry awards are very important as they are highly publicized in the media. Commercial effect of an award was first investigated by Litman (1983). He found that an Academy Award nomination in the categories of best actor, best actress, and best picture is worth \$7.34 million, while a victory in one of these major categories can translate into over \$16 million at the box office. Nelson et al. (2001) estimated that an Academy Award nomination in a major category is worth \$4.8 million and a win brings in \$12 million on average. They indicate that in the movie industry it is a common practice to delay film releases toward the end of the year as it improves the chances of receiving nominations and increasing box-office revenue. Dodds and Holbrook (1988) study the effect of an Oscar after the announcement of nominations and after the award ceremony finding that a nomination for best actor is worth about \$6.5 million, best actress is worth \$7 million and best picture is worth \$7.9 million. After the Oscar night the best actor award is worth \$8.3 million, best picture is worth \$27 million, and best actress award is statistically insignificant. Simonoff and Sparrow (2000) determined that an Oscar nomination will increase a movie's expected revenue about 250% if the movie opens on less than ten screens. Movies that open on more than ten screens will increase their box-office revenue by nearly 30% with an Oscar nomination.

In summary, prior research shows that genre has played a significant role in predicting economic box office success. However, selection of the type of genre appears to be influenced by trends in the American culture at the time of the release and therefore maybe tautological. MPAA ratings also have shown to be significant in some studies, but the specific rating that generates positive results appears to be ambiguous. The majority of the research focused on either the top grossing movies, movie releases that spanned multiple years, included non-US (foreign) releases, and/or failed to consider the effect of budget as predictors for success. This paper introduces the budget variable along with 28 other variables found in past research for the top 150 movies of 2010 to offer a clearer picture of the predictors of box office success. Our Box Office variable was calculated from movie theater revenue only and did not include rental, on-demand or any other post-box office channel. Lastly, we focused on a single release year, 2010, to minimize any political, cultural and/or economic effects. Although critical reviews, release dates and award nominations have been shown to provide insight into box office success, they are all post-production determinants which can only occur after a movie is funded. Our research question asks what elements are endogenous to the idea / production phase of the movie. Our focus is to capture the significant variables and to develop a model that can help make the decision to 'greenlight' a movie

## 2. METHODOLOGY AND ANALYSIS

In movie theaters across the United States 123,340 films were shown in 2010 and grossed approximately \$10.5 billion in the box office. The movies in the sample (i.e. top 150 movies of 2010) include a wide range of genres from *Toy Story 3* (the top grossing movie of 2010) with \$415 million to the mystery-thriller, *Buried* (the 150<sup>th</sup> movie in our sample) with \$1.03 million in US box office revenue. In Figure-1 it can be seen that approximately 50% of the box revenue comes from the top 25 movies. These top 150 movies grossed about 9.8 billion dollars which makes up around 94% of the total domestic box office revenue for movies of 2010.

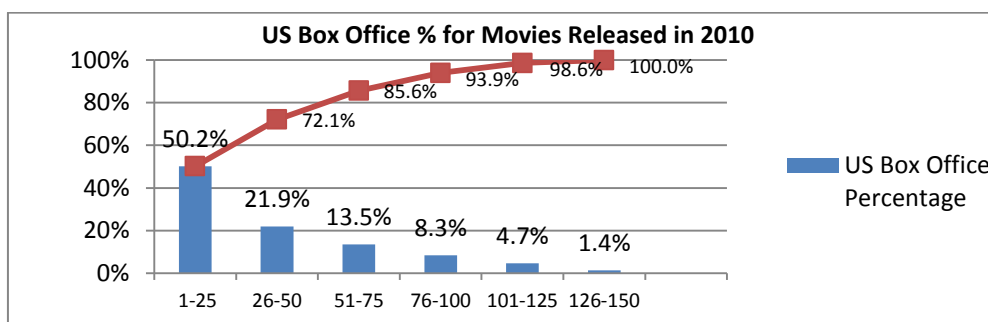


Figure-1: Box office percentage for top 150 movies

There are many factors that contribute to a box office success. However, the decision to fund or 'greenlight' a film is determined at a very early stage in the process. Often, films that go on to be nominated for an academy award can reap as much as \$27 million in revenue (Dodds & Holbrook, 1988). The ability to win an Oscar as well as other factors, such as release date and critical acclaim have also has shown to play a significant role in ticket sales. But, these variables are post-release factors that are exogenous to the initial decision whether or not to fund a production. This paper is interested in facilitating the decision-making process of the producer or studio that must decide if a film is a viable investment that will bring a satisfactory return. By examining only the pre-release factors, we can get a better idea of what drives box office sales and a more direct picture of what are the important factors in determining if a proposal is worthy of investment.

### 2.1 Variables and Model

Table-1 shows the variables used in our study. These variables were found to be significant in one or more of prior research studies. Although genre has been found to be significant, it has multiple categories. And it is unclear if all of the categories have been tested. Furthermore, we introduce the variable Revenue/Budget, which is the ratio of box office receipts to total production costs. This variable is similar to ROI, but uses revenue instead of profit in the numerator. Because of the costs associated with promotion and distribution of a production, we opted to use a simpler approach to assess the role of profit in predicting revenue.

VARIABLE	DEFINITION
USBoxOffice	US box office earnings of a movie in millions of dollars (Dependent)
Revenue/Budget	Ratio of USBoxOffice to Budget
Budget	Production cost of a movie
Sequel	categorical variable for movies that follow a previously released film
Star Power	categorical variable for films that have a <i>movie star</i> <sup>1</sup> in a leading role
Remake	categorical variable for movies that are remake of another film
Adaptation	categorical variable for movies that are adapted from another medium
R	categorical variable for movies that are rated R
PG-13	categorical variable for movies that are rated PG-13
G	categorical variable for movies that are rated G
PG	categorical variable for movies that are rated PG
PG or G	categorical variable for movies that are rated PG or G
Comedy	categorical variable for movies that can be categorized as comedy
Sci-Fi	categorical variable for movies that are science fiction
Horror	categorical variable for horror movies
Action	categorical variable for action movies
Romance	categorical variable for romantic movies
Drama	categorical variable for dramas
Adventure	categorical variable for adventure genre
Fantasy	categorical variable for fantasy movies
Family	categorical variable for family movies
Crime	categorical variable for crime movies
Thriller	categorical variable for thrillers
Mystery	categorical variable for mysteries
Musical	categorical variable for musicals
Crime	categorical variable for crime movies
War	categorical variable for war movies
Biography	categorical variable for biographies
Western	categorical variable for westerns
Documentary	categorical variable for documentaries

**Table-1:** Definition of variables

<sup>1</sup> *Movie Star is defined as an actor / actress who has been paid at least \$10 million for a role in a prior film.*

To obtain a better understanding of these variables we conducted a simple correlation test to determine what variables are significant predictors of US Box Office. The results are presented in Table-2. Understandably, the Budget variable correlates the highest with USBoxOffice. Both R and Drama negatively correlate with the dependent variable while genre-related variables represent six of the 13 significant predictors. Some genres including Horror, Sport, Romance, Musical, Crime, War, Biography, Thriller, Mystery, Documentary, Comedy and Western were not found to be significant. Other variables that were not found to be significant predictors were PG-13, Adaptation, and Remake.

Variable	Corr. Coefficient. With US Box Office	p-value	Significant ( $\alpha=.05$ )
Budget	0.706	0.000	YES
Adventure	0.528	0.000	YES
Animation	0.405	0.000	YES
Fantasy	0.387	0.000	YES
Sequel	0.37	0.000	YES
Family	0.34	0.000	YES
R	-0.294	0.000	YES
Star Power	0.285	0.000	YES
PG or G	0.274	0.000	YES
G	0.245	0.001	YES
Drama	-0.227	0.003	YES
PG	0.21	0.005	YES
Action	0.18	0.014	YES
Sci-Fi	0.154	0.03	YES
Horror	-0.111	0.089	NO
Sport	0.087	0.146	NO
Romance	-0.087	0.146	NO
Musical	0.086	0.147	NO
PG-13	0.069	0.202	NO
Crime	-0.065	0.213	NO
War	-0.048	0.279	NO
Biography	-0.039	0.319	NO
Comedy	0.025	0.382	NO
Adaptation	-0.025	0.382	NO
Thriller	-0.02	0.405	NO
Mystery	-0.013	0.439	NO
Western	0.011	0.445	NO
Documentary	-0.008	0.464	NO
Remake	0.001	0.493	NO

**Table-2:** Correlation of variables with US Box Office

Next we examined the overall model by employing the ordinary least squares approach using the stepwise procedure. The final model is listed in Table-3, Table-4 and Table-5. It explains approximately 60% of the variation in the US Box Office variable. The significant predictors are Budget, Sequel, Animation, Sport, Adventure and Star Power. It is interesting to note that the coefficient of the Budget variable is 64%, which helps quantify the magnitude of the high risk / high return decision process that is a stake when determining whether to greenlight a production.

Coefficients (Dependent Variable: USBoxOffice)							
	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	3.884	6.141		0.632	0.528		
Budget	0.641	0.099	0.454	6.481	0.000	0.549	1.82
Sequel	46.845	11.792	0.216	3.973	0.000	0.914	1.094
Animation	52.205	17.83	0.168	2.928	0.004	0.82	1.22
Sport	70.194	27.532	0.133	2.55	0.012	0.989	1.011
Adventure	30.82	11.508	0.173	2.678	0.008	0.647	1.547
Star Power	21.968	8.221	0.149	2.672	0.008	0.871	1.148

**Table-3:** Model coefficients (dependent variable: USBoxOffice)

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	500905.487	6	83484.248	37.877	0.000
Residual	315180.802	143	2204.062		
Total	816086.289	149			

**Table-4:** ANOVA Table (dependent variable: USBoxOffice)

Model Summary				
<i>r</i>	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error	Durbin-Watson
0.783	0.614	0.598	46.947	1.37

Predictors: (Constant), Adventure, Star Power, Sport, Sequel, Animation, Budget

**Table-5:** Model summary (dependent variable: USBoxOffice)

Having Adventure as a genre adds \$31 million to the box office earnings while Star Power adds \$22 million. Having Sport as genre contributes \$70 million, having animation contributes \$52 million to the box office. Being a sequel improves box office success by \$47 million.

Alternatively we also used the ratio of revenue-to-budget of a film as a dependent variable. In the Table-6 we present correlation coefficients for all input variables with Revenue/Budget and whether they are significant as a single variable. As it can be seen in the table, Horror is the only significant variable that positively correlates with Revenue/Budget. It is consistent with the fact that horror movies rarely have stars in them, which increases costs significantly. The model that best fits the data is presented in Table-7, Table-8 and Table-9. This model explains seventeen percent of the variation in Revenue/Budget variable. According to the model a Horror movie contributes over \$6 of revenue for every dollar spent but a remake negatively impacts the ratio by 2.448.

Coefficients (Dependent Variable: Revenue/Budget)							
Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	1.801	0.35		5.153	0		
Horror	6.517	1.159	0.441	5.62	0	0.907	1.102
Remake	-2.448	1.038	-0.185	-2.359	0.02	0.907	1.102

**Table-7:** Model coefficients (dependent variable: Revenue/Budget)



ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Regression	496.143	2	248.071	16.025	0
Residual	2275.63	147	15.48		
Total	2771.772	149			

**Table-8:** ANOVA Table (dependent variable: Revenue/Budget)

Model Summary				
<i>r</i>	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error	Durbin-Watson
0.423	0.179	0.168	3.934523	2.005

Predictors: (Constant), Horror, Remake

**Table-9:** Model summary (dependent variable: Revenue/Budget)

### 3. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

The results of this study provide evidence that specific variables are factors in determining box office success. The intent of this paper was to help facilitate the decision making process in determining whether to greenlight a production. The data was truncated to 2010 to help eliminate exogenous economic, political, and cultural factors that may influence genre or other categorical variables in this study. Funding a movie is a high risk / high return proposition as is any production decision in the field of entertainment. Although the results would encourage one to treat these decisions as formulaic, there is clearly a consumer bias towards movies of a particular genre (animation, sport and adventure), but no significance in regard to MPAA rating. Sequel and Star Power also play a significant role in a film's success and this shows the residual value of past success (original release) or performance (Star Power) in drawing consumers to the box office.

When using the Revenue/Budget variable, the significant predictors are Horror and Remake. Horror was shown to provide a positive return on investment, while Remake was negative. This leaves only the Horror variable as the viable option when assessing the financial return of a movie. Horror movies usually have low budgets but they generate strong revenue relative to their cost (Terry, 2010). Horror movie audience is usually young, and special effects are more important than seeing a Hollywood star in a movie (e.g. *Paranormal Activity* and *Saw* series, *Insidious*, *The Last Exorcism*). Advances in digital film production techniques allow horror movies to substitute special effects for Star Power while maintaining a lower production cost.

A future research direction would be to expand the data beyond 2010 to determine the longitudinal significance of the predictor variables. This would also provide another research extension that can be used to expand the domestic (or worldwide) revenue including earnings from DVD/Blu-Ray rentals (and sales), pay-per-view and TV, and would provide a more comprehensive picture of the revenue draw of each movie.

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