WHAT DETERMINES BOX OFFICE SUCCESS OF A MOVIE IN THE UNITED STATES?

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ABSTRACT

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 shown in movie theaters across the U.S. in 2010. Some are successful and many are not. What determines box office success of a movie in the United States? In this paper we investigate the impact of genre, MPAA rating, budget, star power, adaptation from another medium , sequels and remakes on total U.S. box-office revenue. We use data from one hundred and fifty top grossing movies of 2010, and we present our multiple linear regression analysis results.

INTRODUCTION AND LITERATURE REVIEW

The movie industry in the United States has a tremendous importance for the United States 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. Movie industry aims to entertain millions of viewers and it depends on the preferences of the movie-goers. If viewers do not choose to see a movie millions of dollars can be lost, companies and producers can go bankrupt; therefore we can say that entertainment business is a serious business. For production companies it is very important to predict what movie is going to be a success or a flop. This paper investigates the determinant factors on a movie's success.

In the literature there are many research papers that explore the 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 [7]. 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 provides evidence 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) [9], Litman and Ahn (1998) [8], Terry et al. (2004) [18] and Brewer et al. (2009) [3] have replicated and expanded the initial work of Litman. Terry et al. (2009) did a similar analysis on English language movies in terms of their foreign box office revenue [20]. Terry and De'Armond (2008) analyzed determinants of movie video rental revenue [19]. Smith and Smith (1986) is another early study to examine the performance of movies [16]. They analyzed the determinants of successful films, as defined by all-time box-office revenues. They observed that movie have become increasingly more specialized as a result of television. Prag and Casavant (1994) found a positive impact of star power, praise by critics, sequels and Academy Awards on revenues when there is no marketing expenditures [11]. Star power, Academy Awards, and production costs are found to be positive determinants of advertising spending. One area of interest in the literature has been the role of critics (Weiman, 1991) [21]. The majority of the literature finds that critics play a significant role on the success of a movie. According to Eliashberg and Shugan (1997) [5] 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's results suggest that critics do have the ability to manipulate box office revenues based on their review. The predictor predicts the success of a movie but the review will not necessarily have an impact on how well the movie performs commercially. Eliashberg and Shugan find that the predictor role of a critic is statistically less important than the influencer role. King (2007) [6] 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 [14]. 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 releases and its revenue. Litman (1983) indicated that the most important time for a film release is the Christmas season [7]. However Sochay (1994) reported that the summer is the best season to release a movie [17]. 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.

Motion Picture Association of America (MPAA) ratings may also influence box office revenue of a movie. 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 best 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 [1]. 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 [7]. 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 [2]. However Ravid (1999) showed that G and PG rated films have a positive impact in the box office [12]. 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 [18].

In movie industry awards are very important as they are highly publicized in the media. Commercial effect of an award is first investigated by Litman (1983) [7]. 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 win in one of these major categories can translate into over $16 million at the box office. Nelson et al.(2001) [10] estimated that an Academy Award nomination in a major category is worth $4.8 million and a victory 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 monetary rewards. Dodds and Holbrook (1988) look at the impact of an Academy Award after the nominations have been announced and after the award ceremony [4]. The authors find 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 award ceremony the best actor award is worth $8.3 million, best picture is worth $27 million, and best actress award is not statistically significant. Simonoff and Sparrow (2000) find that for a movie opening on less than ten screens, an Academy Award nomination will increase the movies expected gross close to 250% more than it would have grossed if it had not received the nomination. For movies opening on more than ten screens, an Academy Award nomination will increase the movies gross by nearly 30%. [15]

Ravid (1999) examined film revenue and return-on- investment (ROI) as functions of production cost and star actors, among other variables [12]. Regressions show that large production costs significantly increase film revenue, but do not increase the ROI. The quantity of critic reviews, which is representative of exposure and availability to the public, is positively significant. Sequels are found to perform significantly better than non-sequels. While univariate tests suggest that movie stars increase revenue, regressions find star presence to be insignificant. This supports the 'rent-capture' hypothesis that stars earn salaries equivalent to their market value and do not impact the profitability of films. Ravid (2004) emphasized the risk associated with making movies by estimating a ROI model [13]. The study focuses on the strategies utilized by studio executives when choosing the films to be released.

Unlike many other studies, the effect of violence in R-rated films is examined. The results illustrate that high-violence films are expected to be financially 'safer' to produce. On average, the ROI of violent films falls within the middle of the sample's distribution.

DATA, MODEL and ANALYSIS

In movie theaters across the United States 123,340 films were shown in 2010 and these movies approximately grossed $10.5 billion in the box office. Our data set in this study is composed of 150 top grossing movies released in the year 2010. The movies in the sample include a range of movies from *Toy Story 3* (the top grossing movie of 2010) with $415 million to *Buried* (the 150th movie in our sample) with 1.03 million dollars US box office revenue. 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.

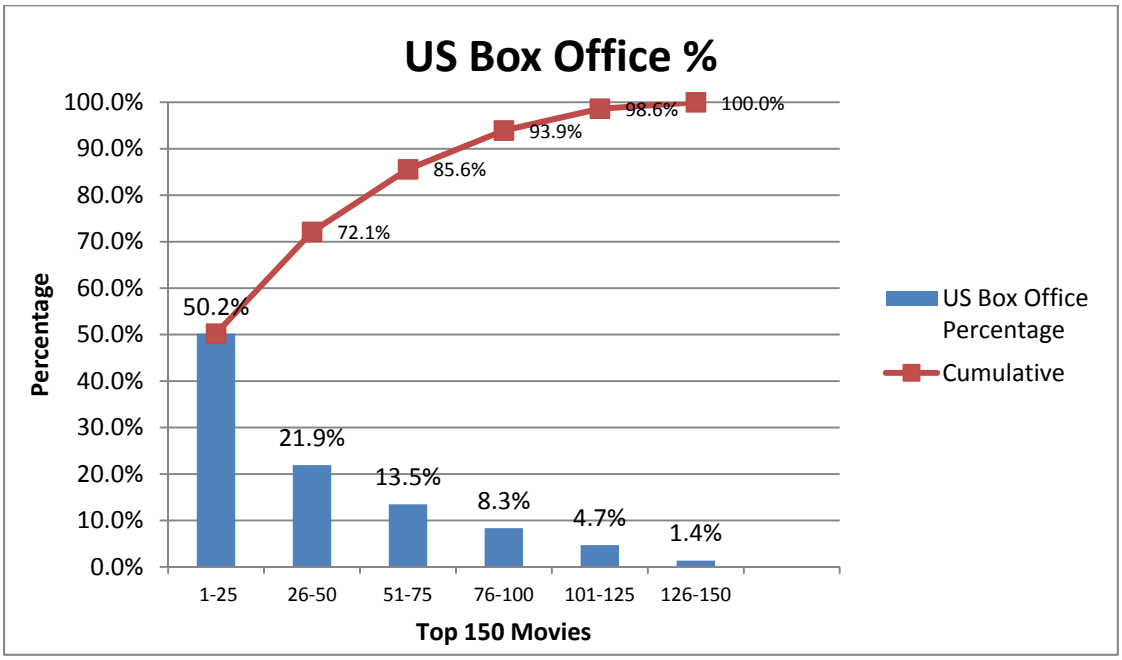

Figure-1: Approximately 50% of the box revenue comes from the top 25 movies.

Average revenue for a top-150 movie, in million dollars, is 65.4 with a standard deviation of 74. A remake makes 65.7 million on average. If a movie is a sequel then it averages 135 million; however a non-sequel averages 54.7 million. Movies with at least one *star* in them average 87.3 million; a movie without a star makes 45.2 million on average. (As a general rule we define a movie star as follows: A movie star is an actor/actress who has been paid at least $10M for a movie role in his/her career.) The Motion Picture Association of America (MPAA) ratings are G (general), PG (parental guidance suggested/some material might not be suitable for children), PG-13 (parents strongly cautioned/some material may be inappropriate for children under the age of 13), R (Restricted / Children Under 17 Require Accompanying Parent or Adult Guardian.), and NC-17 (No One 17 and Under Admitted). A movie with an R rating averages 39.2 million, a PG-13 movie makes 71.8 million, and movie with a PG or G rating earns 105 million on average. This largely explains why studios try hard to get a lower rating for their movie from MPAA.

Genre of movie can also be an important factor on its box office success. Examples of movie genre are: Comedy, Sci-Fi, Horror, Action, Romance, Drama, Adventure, Fantasy, Family, Crime, Thriller, Mystery, Musical, Crime. A movie can be in more than one single genre, like *romantic comedies* or *action comedies*. In our data genre of a movie is identified according the popular movie website, imdb.com. Based on our study we can say that most bankable movie genre is horror: On average a horror movie makes 7.27 times its production cost. For example the production cost of *Paranormal Activity 2* was only 2.8 million while it made 84.7 million dollars (30.8 times its cost) in the box office.

The following table shows the variables we use in our study:

VARIABLE	DEFINITION
USBoxOffice	US box office earnings of a movie in millions of dollars
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 *movie star* 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

In the following table we present correlation coefficient for all input variables with US Box Office and whether they are significant as a single variable. As it is seen below, Budget correlates with USBoxOffice the highest. R and Drama negatively correlate with the dependent variable. Apparently Horror, Sport, Romance, Musical, PG-13, Crime, War, Biography,

Comedy, Adaptation, Thriller, Mystery, Western, Documentary and Remake are not significant variables.

	Corr. Coeff. with US Box Office	p-value	Significant (α=.05)
Budget	0.706	0	YES
Adventure	0.528	0	YES
Animation	0.405	0	YES
Fantasy	0.387	0	YES
Sequel	0.37	0	YES
Family	0.34	0	YES
R	-0.294	0	YES
Star Power	0.285	0	YES
PG or G	0.274	0	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

The following three tables below depict the linear regression model that fits the data best when USBoxOffice is the dependant variable. Several input variables considered originally for the model are excluded because of problems such as statistical significance and multi-collinearity concerns.

	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	0.549	1.82
Sequel	46.845	11.792	0.216	3.973	0	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
Residual	315180.802	143	2204.062		
Total	816086.289	149			

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

Model Summary				
R	R Square	Adjusted R Square	Std. Error of the Estimate	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)

The model explains sixty percent of the variation in the domestic box office revenue. According to the model: 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 following table we present correlation coefficients for all input variables with Revenue/Budget and whether they are significant as a single variable.

	Correlation w/ Revenue to Budget ratio	p-value	Significant (α=.05)
Horror	0.385	0.000	YES
Budget	-0.2	0.007	YES
Adaptation	-0.164	0.023	YES
Star Power	-0.163	0.023	YES
Mystery	0.128	0.059	NO
Action	-0.124	0.066	NO
Comedy	-0.114	0.082	NO
Sequel	0.102	0.107	NO
Fantasy	-0.095	0.124	NO
Romance	-0.09	0.138	NO
PG	-0.087	0.145	NO
PG or G	-0.087	0.146	NO
Adventure	-0.087	0.145	NO
PG-13	0.086	0.147	NO
Thriller	0.086	0.148	NO
Family	-0.056	0.248	NO
Sci-Fi	-0.056	0.247	NO
Drama	-0.055	0.25	NO
Crime	-0.054	0.258	NO
Remake	-0.051	0.269	NO
Documentary	0.051	0.268	NO
Sport	0.039	0.317	NO
Musical	-0.037	0.326	NO
Animation	-0.036	0.333	NO
Western	-0.023	0.388	NO
Biography	0.022	0.395	NO
War	-0.02	0.404	NO
R	-0.014	0.431	NO
G	-0.006	0.473	NO

Table-6: Correlation of variables with Revenue/Budget

As it can seen above Horror is the only significant variable that positively correlates with Revenue/Budget. It is consistent with the fact that horror movies usually do not have stars in them, which increases costs significantly. The model that best fits the data is presented as follows:

Coefficients (Dependent Variable: Revenue/Budget)								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		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				
R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.423	0.179	0.168	3.934523	2.005

Predictors: (Constant), Horror, Remake

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

This model explains seventeen percent of the variation in Revenue/Budget variable. According to the model a Horror movie contributes to the Revenue/Budget ratio by 6.5 but a remake negatively impacts the ratio. Horror movies usually have low budgets but they generate strong revenue relative to their cost. Horror movie audience is usually young, story 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 making made horror movies an easy entry genre as their production cost decreased due to technology.

CONCLUSION AND RESEARCH DIRECTIONS

In terms of domestic box office success Sequel, Animation, Adventure, Star Power and Budget have statistically significant and positive effect based on our study. For example Star Power adds about $22 million, Adventure adds $31 million to the revenue. In our study we also observed that, in terms of revenue-to-budget ratio the most successful genre is horror. In terms of future research one can study worldwide box office revenue of movies. Another research extension can be to expand the domestic (or worldwide) revenue including earnings from DVD/Blu-Ray rentals (and sales), pay-per-view and TV.

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