Predicting Box Office Revenue

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**Abstract**

With the rise of streaming services and the shift of audience habits, how much can an Academy Award bump up the box office of its winners? Do critics reviews have more impact on the revenue than the audience reviews of a movie? This paper examines the determinants of box office revenue by 20 Oscar winning motion pictures from 2000-2019. Besides the prestigious award, other significant factors were critics and audience reviews, MPAA ratings, and budget. The analysis only include revenue from theatre release of the film. Revenues from rental, DVD sales, streaming revenue and pay-per-view are not included.

Keywords: Movie’s revenue; box office; Academy Awards; Critics reviews; ratings

Predicting Box Office Revenue

Many researchers have attempted to develop a model that predicts the financial success of a film. In his study developed in 1983, Litman said that winning an Academy Award is a significant determinant of the success of a theatrical movie (Litman, 1983). Dodds and Holbrook’s study (1988) pointed out that even with just an Oscar nomination, films remained on the chart for almost three months longer than non-nominated films. However, according to Box Office Mojo, none of the top 10 lifetime grosses are the best picture winners.

When Parasite made history by becoming the first non-English language film to win the Academy Award for Best Picture (Hoad), the movie distributor, Neon, doubled the film theaters showings in the following week and brought home $5.5 million in revenue (D'Alessandro). According to Box Office Mojo, the film eventually grossed a total of $258.85 million despite having a budget of only $11.4 million and featuring no Hollywood big star. On the contrary, The Departed, which won the Oscar in 2006, featured a cast of familiar Academy Awards red carpet faces such as Leonardo DiCaprio, Matt Damon, Jack Nicholson, and directed by Martin Scorsese grossed $291.5 on a $90 million budget. Both films scored high among critics and audience.

There are many other significant factors which affect the revenue at the box office. Some factors are difficult to visualize by data due to the ever-changing dynamics in movie goers demand and taste. The regression analysis of this paper aims to determined factors that

correlates with box office returns using publicly available data from the 20 most recent winners at the Academy Awards.

## Data

The data for this paper were collected from several sources. The data on revenue, budget and MPAA ratings are provided by Box Office Mojo. The ratings from IMDb, Metacritic, Rotten Tomatoes were pulled from their respective sources. Star power was not considered as a factor due to it bias nature and lack of information on salaries.

Dependent variable—Revenue

Box Office Mojo recorded revenue in million US dollar. distribution. This is sole the data from theatre release and taken from the worldwide records not domestic US. The data does not include DVD rentals, streaming profits or merchandise sales.

Independent variables.

Budget

Budget data for this paper is collected from Box Office Mojo and IDMb. Budget controls for the estimated production and promotion costs for each movie. The mean budget of the sample is $33.62 million.

IMDB ratings

Internet Movie Database (IMDb) ratings is ranging from 0-10, 0 being the lower and 10 is the highest. The database is provided by volunteer contributors, the totals are converted into a weighted mean-rating. It is considered as audience ratings in this paper.

Metacritic ratings

Metacritic’s Metascore for each movie is the weighted average score from reviews from critics and publications. The score is ranging from 0-100, 0 is the lowest and 100 is the highest. Scores are weighted according to the critic's fame, stature, and volume of reviews.

Rotten Tomatoes ratings

Rotten Tomatoes critics scores are collected from writers who are certified members of various writing guilds or film critic-associations. The audience reviews calculate the percentage of registered users who in additional to rate the movie must verify their ticket purchase. The rating scale is in percentage.

MPAA ratings

Motion Picture Association of America (MPAA)-ratings classify films in the following ways: general audience (G), parental guidance suggested for young children (PG), parents strongly cautioned for children under 13 (PG13), audience under 17 should be accompanied by an adult (R), no one under 17 is permitted (NC17). The films included in the data are only belong to two ratings: R and PG-13. Hence, the data type for this variable will be binary with R = 1 and PG-13 = 0.

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| --- | --- | --- | --- | --- |
| Summary Statistics: Box office Revenue of Oscar winners (2000-2019)  n = 20 | | | | |
| Variable | Mean | Min | Max | Standard Dev. |
| Revenue | 273.08 | 49.26 | 1142.63 | 236.7472 |
| Budget | 33.62 | 4.00 | 103.00 | 29.8896 |
| IMDb | 7.99 | 7.20 | 8.90 | 0.4475 |
| Metacritic | 85.55 | 66.00 | 99.00 | 9.9339 |
| R-critic | 0.90 | 0.74 | 0.98 | 0.0801 |
| R-audience | 0.87 | 0.72 | 0.94 | 0.0573 |
| MPAA | 0.80 | 0 | 1 | 0.4104 |

## Methodology

Uncertainty and volatility in demand in the movie industry provides obstacles to construct a relatively good model to examine the factors that determine the financial success of a specific film (Selvaretnam & Yang, 2015). The OLS is used to ensure the analysis is unbiased and consistent. The regressions are run with robust standard errors. The decision to transform Budget into natural log form provides a closer fit to the model if the dependent variable. The first empirical model specified as equation (1):

The model contains all the variables based on empirical evidence discussed in previous section. However, after running regression analysis, the model gives an R-squared of 0.688. The model (2) as follow:

Comparing to the first model, the second model has a better fit R-squared at 0.806. However, there are large changes in the estimated regression coefficients when adding or deleting a variable, suggesting that there is strong evidence of multicollinearity. This problem is solved when remove the Metacritic variable. R-square is at a decent 0.769. The best fit model is:

## Empirical Analysis

OLS Regression Results

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coef std err t P>|t|

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Intercept -0.5139 2.248 -0.229 0.822

Lnb 0.3144 0.135 2.326 0.036

Imdb 1.1601 0.324 3.577 0.003

MPAA -0.9018 0.265 -3.408 0.004

Raudience -3.9998 2.277 -1.757 0.101

Rcritics -0.2176 1.272 -0.171 0.867

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The relevant results of R-squared in the Ordinary Least Squares regression analysis of equations (3) indicate that 76.9% of the dependent variable is explained by the independent variables. Because the p-value of Ln(Budget), IMDb scores and MPAA ratings are less than 0.05, there is a strong evidence that these variables correlated with the box office revenue of a movie. On the other hand, Rotten Tomatoes ratings from both critics and audience do not show a strong linear association with the financial success of the movie.

The results are robust even after dropping control variables Rcritics and Raudience. The analysis finds that besides the prestigious Oscar, films with high IMDb score and moderate budget generate more revenue. Because the revenue used in this paper is worldwide records, films that rated R earn more than films that rated otherwise by the MPAA. This is not the case when only US domestic market is considered (Scott, 2019).

## Conclusion

The ever-changing dynamic of consumer’s taste and influence of streaming services in the past decade made predicting box office revenue a challenge for filmmakers and studios. The aim of this paper is to predict the gross revenue of a movie from publicly available data and by using Ordinary Least Squares (OLS) method. 20 samples were considered in the model for this project dated from 2000-2019. Big budget or generous reviews do not guarantee the financial success, but the model showed that these factors certainly elevate a minimum a film can make.

The model developed in this project is not perfect. Many other complex variables could have been considered for the prediction process such as genre, social media attraction, advertisement, release time, word-of-mouth etc. Future study can also consider the power of franchise like Marvel or Star Wars. Many movies from these two franchises have made more than $1 billion each.

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