Analysis of Film Revenues: Saturated and Limited Films

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Abstract:

This paper analyzes film revenues of limited and saturated films. It focuses on the forces that differentiate a film in theatre count both from the studio and the theatres. The forces of the studio and theatre differentiate films pre-release. They are two distinctly different types of films.

Introduction

Since Thomas Edison recorded a man sneezing, the reproduction of life on film has grown and expanded. The film industry makes and spends at minimum tens of millions of dollars each and every week. Some of the questions I analyzed include: which characteristics make a movie successful, what drives a box office smash or flop, how a film studio shows confidence through the film, and which factors influence success.

Films are goods that are not consumed solely due to quality—they are consumed based on a perception of entertainment. A film trailer tells the prospective audience what a film is about. The audience picks films that interest them in some way. The audience chooses the films they watch based on what they feel will entertain them. It is a highly individualized market based on personal taste. Factors such as which actors are casted, who directs the film, and the ratings a critic gives a film influence how many attendees go to a film. Ultimately, box office revenue is how many people go to see the movie in theatres.

The study will be analyzing film statistics, budget, revenue, rating, and genre. Social factors like ratings and star popularity will be excluded because any movie with a good rating can get someone to see a movie at least once. Movies with good word-of-mouth get audience members to go multiple times, which will drive up revenue. There is no good metric for word-of-mouth. While star-power can drive up the revenue of a film, it will also drive up costs and does not always guarantee a successful film (Ravid, 2004). Typically, films earn about a third of their lifetime gross in the opening weekend. Not all films make back the money it cost to produce, advertise, and promote them (Ravid, 1999).

Most of the current literature on films use only domestic gross as an independent variable. This accounts for the cost of the film through the production budget, not all of the revenues generated. However, using only revenues also obscures the success of a film. The award-winning

movie, *Avatar*, made over two billion dollars worldwide, but it easily cost over three hundred million dollars just in production costs. There was an additional aggressive advertising campaign, which likely cost over one hundred million dollars. Even if the revenue was just double the cost of the film, there are additional values in the merchandise and intellectual property provided by the movie. Disney has a deal with James Cameron to create an Avatar-themed theme park (Brigante, 2011). This could provide a constant profit stream for the production studio, 20th Century Fox, as well as Disney.

Review of Literature

Data on film characteristics is readily available. The magnitude of money spent and earned in the film industry is quite large. Naturally, many individuals have performed analysis on film earnings. Many of these analyses focus on the effect of cast popularity and critic ratings for movies.

Julianne Treme's "Effects of Celebrity Media Exposure on Box-Office Performance" measures the exposure of celebrities in a pop culture magazine before a film is released in respect to film revenues (2010). The conventional wisdom suggests that casting a high-profile actor will bring in additional revenue, but largely the results are mixed. Casting an "A-list" actor does not guarantee the success of a film. The convention was to measure their effective star power, while Treme measured the appearance in celebrity media. Treme also suggests that a popular actor will be able to choose better projects more apt to succeed. She measures their value as a celebrity, not as an actor, through *People* magazine.

She finds that the appearance of celebrities in *People* for the 21 months previous to the film's release positively influences the film's success, while the 3-month period is not greatly significant. The way in which Treme measures star power has a positive predictive power on a

movie's revenue. She concludes that celebrities do increase revenues, and that critic ratings positively affect revenues.

Martin A. Koscat published "The Impact of Movie Reviews on Box Office" in 2012. His purpose was to analyze the effect of third-party endorsements on film earnings. He points out that the success of media is a function of consumer choice. He also points out that different genres have different elasticities for critic reviews; meaning that a review on a horror film would carry different weight than a review on a drama. He expresses that word-of-mouth reviews are highly correlated with critic reviews.

To evidence how a film is an individual choice, the explanatory variables differ greatly among genres. This means that movies are differentiated in more than just themes and stories on the basis of genre. As for reviews, Koscat finds reviews have a strong effect initially, but fade over time. He attributes the films that continue to do well to positive word of mouth. Ultimately, Koscat points out that as technology advances, our metrics for measuring word-of-mouth will advance as well.

The most common model used to analyze box office revenues is a hedonic model that takes the form of a log linear model (Ravid, 1999). The continuous variables are logged in this model. Occasionally, the dependent variable is not lifetime revenue, but opening weekend revenue or opening number of screens.

Model

My models are based off of the current literature. Theatre saturation has been filtered out to compare the values. The models are as follows:

Revenue=f (Budget, Theatre count, opening theatres, Opening weekend, Genre, Days in release, length of film, sequel, source material, genre, rating, studio size)

The data has been segmented into three sets, a full model, and a limited model of theatres 1-2,500 theatres, a saturated model of 2,500 theatres or more. On average, films are designed for their market size. There are the occasional bombs that were aimed for large audiences, but only reached limited ones. However, these factors are believed to be signs of confidence the theatre has in a particular film. In large, it is expected more independent films will be in the limited model, while box office smashes will be in the saturated model. A theatre pays to show the film, and the theatre revenue is about fifty percent of the ticket sale. They will not pay for a movie that they do not expect to do well in theatres and recoup the same or more back in ticket sales.

Table 1 contains the variables and their expected signs. It is expected the production budget will have a positive effect on revenues. While an increase in budget increases the risk of a film, it also shows the confidence of the film studio. If a film has a large budget, the studio expects to receive more in revenue. The number of theatres both in opening and in widest release should have positive effects on the revenues. The number of theatres represents theatre confidence, which is in turn an estimate of consumer interest in the film. The opening weekend is most often the highest grossing weekend. If its value is high, the overall gross of the film should be high as well. The period of time a film is in theatres exhibits confidence as well; if a theatre continues to make money with a film, they will keep it in their theatre because it increases their revenue. If the film is a sequel in a current franchise, it is expected the revenues will be larger. This is consistent with source material. The variable “book” indicates previous

source material; a book, if the film is a remake or based on a true story. As these two variables indicate a previous fan base, I suggest that the effect on revenue will be positive.

Independent studios is measured as not being owned by a big studio; Fox, Buena Vista, Universal, Paramount, or Sony. Included under the large independent studios are Weinstein, and Lionsgate. Also included are the auxiliary studios that produce smaller budget films such as Sony Pictures Classic, Fox Searchlight and Screen Gems. They will be considered with the major studios because they fall under their umbrella.

It is expected that during the winter and summer months there will be the greatest positive effect on revenue, while fall and spring will slightly decrease the revenue. This is partially due to the holidays taking place during these months. Additionally, most big budget films are released in May, June, July, November and December.

Regarding genre, I expect that the more niched genres, such as horror, science fiction, fantasy, documentaries, and romances, will have a negative effect on revenue. It is expected the wider genres, like action, suspense, and drama, will have a positive effects on revenue. Comedy's expected sign is negative mostly because few movies are solely comedy, and the ones that are tend to be vehicles for actors and have poor critic reviews.

Table 1: Variables, Definitions and Expected Signs

Variables	Definition	Expected Sign
gross	Domestic gross of film in dollars	
netgr	Domestic gross minus cost in dollars	
budget	Production budget of film	+
theatres	Number of theatres at widest release	+
opening	Opening weekend gross in dollars	+
opentheatres	Number of theatres film opened with (confidence)	+
days	Number of days in release	+
length	Length of film in minutes	+
sequel	Indicator if film is a sequel	+
book	Indicator for based on previous material	+
indie	Indicator for independent studio	-
rating	*MPAA Rating:*	
	G	-
	PG	+
	PG-13	+
	R	-
season	*Season film is released in:*	
	Spring: March -April	-
	Summer: May – August	+
	Fall: September – November	-
	Winter: December – February	+
genre	Action	+
	Suspense	+
	Childrens	-
	Comedy	-
	Drama	+
	Sci-Fi & Fantasy	-
	Romance	-
	Horror	-
	Documentary	-

Data

Data obtained for box office revenues, production budget data, film length, genre, theatre counts, days in theatre, Motion Picture Association of America (MPAA) rating and opening weekend gross are from *BoxOfficeMojo.com*. For additional data on sequels, source material, and production budget, I utilized *TheNumbers.com* and *IMDb.com*, two Internet movie database. The data collected from films released in at least one theatre, grossing over one million dollars in the box office during the years 2009, 2010, and 2011, which total to 425 films.

Tables 2, 3 and 4 contain the various summary statistics. Table 2 has the summary statistics for continuous variables for the full model; Table 3 has the summary statistics for continuous variables for the limited and saturated model, mostly to compare their differences and similarities as data pools. Table 4 has the means for the dummy variables for the full, limited, and saturated models.

Table 2: Summary Statistics - Full Model

Variables	Mean	Std.	Min.	Max
gross	$67,800,000	$79,600,000	$1,008,098	$750,000,000
netgr	$14,200,000	$57,400,000	-$129,000,000	$513,000,000
budget	$53,600,000	$52,700,000	$15,000	$260,000,000
theatres	2,514.379	1,159.375	51	4,468
opening	$19,800,000	$23,800,000	$24,587	$169,000,000
opentheatres	2,350.48	1,317.157	1	4,468
days	100.4424	48.73941	13	585
length	107.4329	16.55867	40	163

The average domestic gross of a film is fairly low given the amount of money put into the industry at $67.8 million, but there is a large standard deviation of $79.6 million. The minimum

gross is slightly more than $1 million. The maximum domestic gross is $750 million, which is for *Avatar*. The average film nets $14.2 million, this also has a large standard deviation of $57.4 million. *Mars Needs Moms* lost $129 million and *Avatar* netted an estimated $513 million domestically. The average film costs $53.6 million, with a large standard deviation of $52.7 million. The large standard deviations indicate a large amount of variance in the data. The minimum budget is $15,000, which was for *Paranormal Activity*, grossed over $100 million, which makes it the most successful film based on initial budget. The maximum film budget is an estimate for *Avatar* with $260 million. The average number of theatres at widest release is 2,514.379, a slightly large standard deviation of 1,317.157 theatres. The minimum number of theatres at widest release is 53, while the largest is 4,468. The average film opened in the "very-wide" saturation level, 2,350.48 theatres, which puts the average film in the limited model. Because the mean for widest release is larger, it indicates that many films grow in release. Further evidence that some films grow into releases: the minimum opening theatre count is 1; the maximum is 4,468. Films with limited releases are likely to get larger based on word-of-mouth. If the film has a saturated opening, it is played in less theaters as time goes on.

A film is in theatres for an average of 100 days with a minimum of 13 and a maximum of 585. The average length of film is 107 minutes long. The shortest film was a slight outlier at a 40-minute documentary; the next shortest film was 70 minutes. The longest film was 163 minutes, or 2 hours and 43 minutes. The full model's summary statistics represents the average film.

Table 3: Summary Statistics – Limited and Saturated Model

Limited	Mean	SD	Min	Max
gross	$25,800,000	$32,600,000	$1,008,098	$209,000,000

netgr	-$495,202	$28,400,000	-$129,000,000	$120,000,000
budget	$26,300,000	$27,600,000	$15,000	$150,000,000
theatres	1,497.608	1,145.995	51	3,870
opening	$6,017,246	$8,807,144	$24,587	$65,100,000
opentheatres	917.3165	1,028.879	1	2,483
days	100.3101	47.86431	13	315
length	107.1456	15.33275	73	152

Saturated	**Mean**	**SD**	**Min**	**Max**
Gross	$92,800,000	$88,500,000	$8,305,970	$750,000,00
netgr	$22,900,000	$67,700,000	-$114,000,000	$513,000,000
budget	$69,900,000	$57,200,000	$1,500,000	$260,000,000
theatres	3,126.996	599.4892	319	4,468
opening	$28,100,000	$26,100,000	$182,885	$169,000,000
opentheatres	3,201.105	444.5765	2,503	4,468
days	98.69925	39.42664	21	308
length	107.8571	16.79382	76	163

Of the sampled films, a saturated film typically earns about four times as much as a limited film, and it costs about three times as much. The average limited film loses money, partially because theatres can chose if they want a film in their theatre. The limited-release movies are lower risk because they cost less. However, they are a lower reward because they typically make less as well. The average days in release and length of movie are roughly the same across the markets.

However, a film could belong to more than one genre. The means indicate the proportion of the sampled films fall into a specific genre. The most striking mean is the difference in sequels between limited and saturated releases. Only 3.16 percent of limited releases are sequels of

current franchises, while 21.43 percent of saturated releases are sequels. A sequel essentially lowers the risk of filming. If a film was successful enough to generate a sequel, then logic serves that the sequel will be successful as well (Ravid, 2004).

Table 4: Means of Dummy Variables

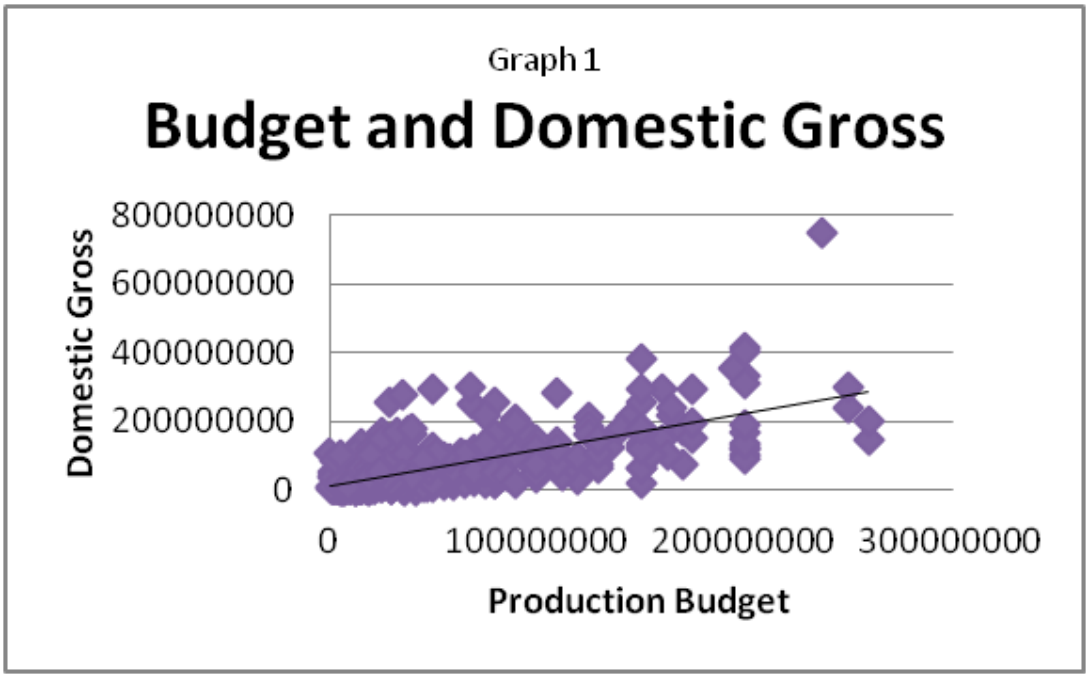
	Full	Limited	Saturated
sequel	0.1459	0.0316	0.2143
book	0.3929	0.3228	0.4361
ratg	0.0329	0.0380	0.0263
pg	0.1859	0.0823	0.2481
pg13	0.4000	0.3608	0.4248
ratr	0.3788	0.5127	0.3008
summer	0.3129	0.2341	0.3609
winter	0.2447	0.3038	0.2105
spring	0.1718	0.1582	0.1767
fall	0.2682	0.3038	0.24891
indie	0.5600	0.5190	0.5865
action	0.3835	0.1962	0.4962
suspense	0.2118	0.2405	0.1955
childrens	0.1365	0.0696	0.1729
comedy	0.3906	0.3246	0.4323
drama	0.4329	0.6404	0.3308
scifan	0.1624	0.0439	0.2143
romance	0.1318	0.0877	0.1466
horror	0.1059	0.0439	0.1128
docu	0.0188	0.0439	0.0075

The percentages of films based on books, rated G, PG-13, suspense, horror, or documentaries are roughly the same for limited release and saturated release. The seasons films are released in are roughly the same as well. There are much more limited release R-rated films

and much less PG-rated films. There are much more action movies in the saturated release category.

Graph 1 further demonstrates the relationship between production budget and domestic gross is fairly linear. There is some variance around the trend, and *Avatar* is an outlier. This scatter plot paints a picture but a slightly incomplete one. One of the higher costing films is *Pirates of the Caribbean on Stranger Tides*, which did not make back its money in the United States, but it made a lot of revenues overseas- over $800 million dollars. The data only expresses domestic gross-which in this case is misleading.

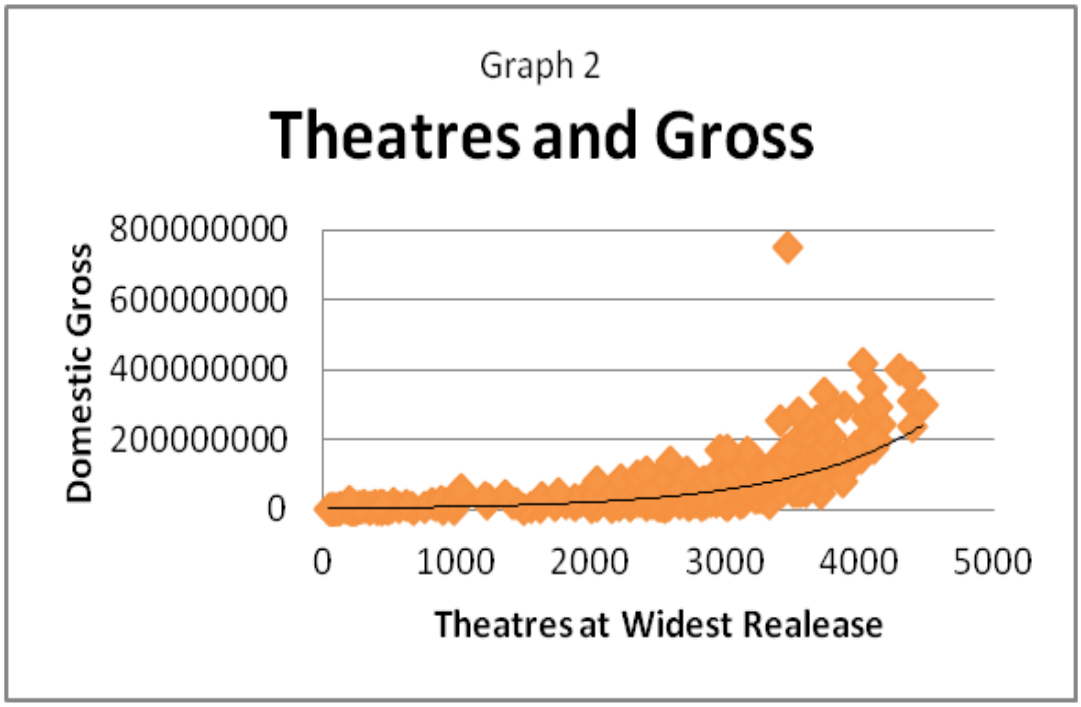
Figure 1: Relationship Between Budget and Domestic Growth



Graph 2 shows the relationship between domestic gross and number of theatres. The number of theatres at the widest release has a nonlinear positive relationship with domestic gross sales. The relationship is nearly perfect up to 2,500 theatres, then it spikes upward at 2,500

theatres, showing essentially two linear relationships that separate the limited releases from the saturated releases.

Figure 2: Relationship Between Domestic Gross and Number of Theatres



Empirical Results

Several log-linear OLS regressions have been generated. In Table 6, the natural logarithm of domestic gross is used as the dependent variable. Also, the natural logarithms of budget, theatres, opening weekend gross, and the number of theatres on opening weekend for compression have been used. All three models are statistically significant, and their R-squared values are very high. The full model has the most significant variables.

Table 6: Empirical Results (log of gross is dependent)

	Full	Limited	Saturated
Lbudget	0.027327	-0.0600044	0.0800632**
	(0.92)	(-1.03)	(2.46)
ltheatres	0.840431***	1.022375***	-0.063788
	(18.04)	(14.51)	(-0.45)
lopening	0.278849***	0.0600446	0.5736805***

	(10.01)	(1.1)	(14.88)
lopentheatres	-0.080689***	-0.0691641**	0.6384166***
	(-5.19)	(-2.26)	(3.070
days	0.009434***	0.0060144***	0.0090086***
	(18.73)	(4.22)	(15.59)
length	0.00604***	-0.0000225	0.0012803
	(3.52)	(-0.01)	(0.81)
sequel	0.187473***	0.4911402	-0.0131163
	(2.81)	(1.34)	(-0.24)
book	0.034538	0.1414774	-0.0467204
	(0.71)	(1.03)	(-1.09)
ratg	0.030322	0.2715178	0.1228485
	(0.21)	(0.79)	(0.95)
pg13	0.323387***	0.7457092***	0.2128134***
	(3.85)	(2.86)	(3.17)
ratr	0.311071***	0.8899175***	0.2117889***
	(3.57)	(3.5)	(2.92)
summer	0.138971*	-0.0063274	0.105882*
	(2.08)	(-0.03)	(1.87)
winter	0.224488***	0.1437394	0.2155981***
	(3.18)	(0.84)	(3.41)
fall	-0.018164	-0.2592742	0.0724523
	(-0.26)	(-1.5)	(1.2)
indie	-0.012687	-0.037423	-0.0217041
	(-0.28)	(-0.35)	(-0.54)
action	0.047646	0.0705116	-0.0122579
	(0.84)	(0.42)	(-0.26)
suspense	-0.030148	0.303063*	-0.0487337
	(-0.49)	(1.94)	(-0.86)
childrens	0.229526*	0.7364853**	0.707462
	(2.23)	(2.19)	(0.85)
comedy	-0.00784	0.01802	0.0037863
	(-0.13)	(0.12)	(0.07)
drama	0.078658	0.018539	0.1144977
	(1.3)	(0.11)	(2.15)
scifan	-0.066973	-0.1241701	-0.0726203
	(-0.96)	(-0.39)	(-1.32)
romance	0.058786	0.253685	0.0794103
	(0.83)	(1.29)	(1.34)
horror	-0.072011	0.008221	-0.0595973
	(-0.8)	(0.03)	(-0.77)
docu	-0.239914	0.5303018	-0.2525762
	(-1.31)	(1.5)	(-1.12)
_cons	4.679959***	8.279212***	1.034732
	(10.35)	(7.27)	(0.66)
n	425	114	158
R2	0.8911	0.8727	0.8633
F Statistic	136.4***	25.42***	59.77***

Note: T values are in brackets. *, ** and *** indicate significance at the 0.1, 0.05 and 0.01 levels respectively. PG is used as a base for the ratings, spring is used as a base for seasonality.

PG was used as the base rating, and all other ratings have a positive effect on the domestic gross. Spring is used as a base for season. This is because fall and spring tend to have the lowest grosses. If a saturated film were released in the summer instead of the spring, it would increase gross revenues by 10 percent. There is some selection bias with seasonality; higher

grossing movies tend to come out in the summer and winter holiday months. We can assume that the intention of releasing a movie in the spring or non-holiday fall months do not break box office records, but to earn revenue. A base was not used for genre because a film could be considered to have more than one genre. Because of this, there were no multicollinearity issues in the findings.

The most striking difference is the importance of total theater count and opening theater count for limited and saturated films. The relationships are inverse of each other and so are the significances of the variables coefficients. Each percentage increase in opening theatres decreases revenue for limited films and increases revenues for saturated films. This relationship is reversed with total theater count. As the total theater count increases by one percent, limited films do better and saturated films do worse. The coefficient for total theater count on saturated films is not significant here.

PG-13 and R ratings are significant in all three models at the 0.01 level. They both increase the gross of the movie. R rated movies tend to have a lower variance in gross than PG-13 movies, but they tend to not grow as high. The most significant variable is the number of theatres at widest release.

Conclusion

The film industry is constantly producing and releasing films. It is not uncommon for a film to cost over one hundred million dollars, and it is not uncommon for a film to generate over one hundred million dollars in a single weekend. This is a big industry with a lot of money. Films

are somewhat risky investments, because they cost millions of dollars and a lot of them lose money. Of the 425 films data was collected on, 186 of them lost money domestically. Being able to predict which films will be successful is useful to the film industry, and they employ many analysts for these purposes.

The separation between saturation levels is both designed and defined by confidence in the film. If a studio is confident they will push to release wider; if theatres are confident the film will make them money, they will pay to have the film in their theatre. Both the forces of the studio and the movie theatres decide the saturation level. It is a choice variable made pre-release. Based upon the summary statistics and the data, limited and saturated films are two different types of films that have different structures for what makes them profitable.

All the regressions were significant with fairly high R-squared values, despite the fact that many of the variables themselves were not statistically significant. The strongest predictors of a film's domestic gross or net were the budget, the number of theatres, the opening weekend, the days in release, and if the film is a sequel, PG-13 rating and R-rating.

There are distinct differences in the characteristics of films in the different sizes of release. There are far more sequels in the saturated market, and far more action, which could be done to reduce risk of a film. A saturated film on average earns four times more than a limited film; it also costs three times as much. Saturated films are bigger in almost every way. A film's budget has a strong and positive effect on the domestic gross of a film, but it also increases the risk. The budget of a film has a negative effect on the net of a film.

Films are designed for a type of release; they can either flood the market, as with the saturated films, then slowly creep back, or they can test the waters, as with limited films. If the film gains success, the number of theatres will expand. Successful limited release films gain

additional theatres because they are successful. A film being in the saturated market does not guarantee success; it merely indicates confidence that a film can do well. The shorter a film is in release typically means the film is underperforming.

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~~Data Sources~~

~~Boxofficemojo.com~~

~~IMDB.com~~

~~Thenumbers.com~~