Predicting Box Office Success: Do Critical Reviews Really Matter?
By: Alec Kennedy

Introduction:

Information economics looks at the importance of information in economic decision-making. Consumers that hold more information, it theorizes, will make decisions that yield higher expected payoffs.

So when a consumer decides to go see a movie, he or she should want to get as much information about the movie beforehand as possible. So where can they get this information? Well, movie trailers offer much information but only for the ones that spend enough money to have the trailer widely distributed. And these trailers only reach the people who actually go to the theater or watch television enough to catch them. Some movies start their advertising campaign a year in advance in order to guarantee that their movie is well known by the time of its release. But, how much can these trailers tell the consumer about the quality of the movie? They can't really. This is where the movie critics come in.

In order to obtain the best information about the quality of a movie before a movie is actually released, consumers must rely on movie critics as their guide. Movie critics act as advisors to consumers telling them which movies will be worth their money. Their reviews can tell their readers, before they decide to see a movie or not, how funny, entertaining, well-acted, and gripping a variety of movies are. Readers can then take this information and use it to decide whether to spend their money on a movie or a more worthwhile alternative.

Looking at this situation from the movie industry's perspective, if there is a link between critical reviews and getting people out to see a movie, this could help with distribution decision-making. If a movie does well in test screenings or if they anticipate good reviews from the critics then they can decide to release it on opening weekend in more theaters in hopes of bringing in more revenue. Even though it may be hard to predict the reviews of critics, some movies often come with "Oscar Buzz" where they are expected, very early, to gain very good critical reviews. Also, some movies give advance screenings to critics to test their reactions to it. Movies that gain glowing reviews from these advance screenings (such as 2008's "The Curious Case of Benjamin Button" which has already been pegged as a sure-thing Best Picture nomination when it has not even been released) may want to spend the extra money to release it in more theaters if they believe that these positive reviews can lead to a more profitable movie.

My Sources for the Data:

I must first acknowledge Timothy King's article "Does film criticism affect box office earnings? Evidence from movies released in the U.S. in 2003." Most of the ideas presented in this study are based on the ideas from this article.

For this study I took data from 220 movies released in 2007. I looked at domestic box office grosses, opening weekend theaters, production costs (when given), and domestic weekly box office grosses (for 22 selected movies). All of these were collected from boxofficemojo.com. Critical reviews scores were taken from metacritic.com.

Metacritic is a website that aggregates critical reviews for music albums, games, books, and movies. What they do is they look at reviews from various sources (listed on their site) and assign a score to them (from a 100 point scale). The conversions are given on their website, but for example, if a film receives 3.5 stars out of 4 stars it would receive 88 points out of 100. Metacritic also adds greater weights to scores given by certain reviewers who generally write more detailed reviews. This adds greater weight to a reviewer from *The New Yorker* as opposed to *TV Guide*. This adds a bit of subjectivity to their scores, but when plotted against scores given

by the less subjective rottentomatoes.com we see that they are highly correlated suggesting that this subjectivity does not have much effect on distorting metacritic scores. A more detailed explanation can be found in King's article.

Metacritic also gives Internet users a chance to weigh in their opinion on the movies as well ("The User Score"). Users are given the chance to rate a movie on a 10-point scale. These scores are then averaged and placed on the page next to the averaged critical score. I chose the 220 movies from 2007 by taking only the movies that had at least 10 reviews in both the critical and user categories in order to make sure these averages weren't too biased. Although, it seems, that this exclusion could have an effect on some of my later results.

User and Critical Scores:

If we are trying to look at whether critical reviews are giving valuable information to moviegoers we might first want to take a look to whether they typically agree on the quality of movies. Using R we can plot the user scores vs. the critical scores:
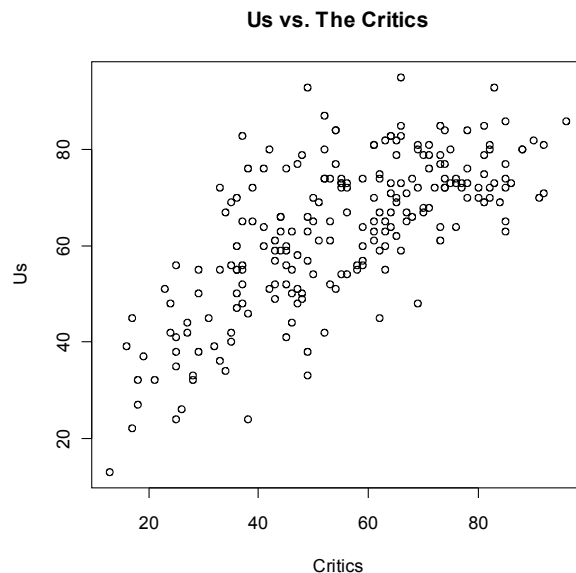

We see from the plot that there is an obvious positive trend suggesting that higher critical reviews generally get higher user reviews. When calculating the correlation we find that r = 0.7, which suggests that there is a very strong relationship between these two scores. But when we look at the average difference between the two scores we see that users tend to be more generous (Average Differences (Users-Critics) = 8.13) than critics in their evaluations of movies. When applying a t-test we find a p-value of 1.190e-06. This small value suggests that these two scores do come from different distributions and that users are more generous than the critics. This difference does not seem to be large enough to say that the critics views and the user views differ that much, this is because 8 points corresponds to less than half of a star when looking at four star reviews.

We cannot conclude from this plot that critics and the general population totally agree on the quality of a film. Users on metacritic are self-selecting. We have to think about the type of people who would go onto metacritic and rate the movies themselves. It seems reasonable to believe that these users would include the people who are huge fans of the movies that they are rating (as well as huge "haters" of the film). Also it seems reasonable to believe that the people who have heard about metacritic and are an active part of its program are part of a younger

demographic. But the fact that there is such a high correlation is still very interesting, nonetheless. It suggests that still there is some relationship between critics and audiences and that they generally agree on the quality of a film. So, if this is true then critics should be able to influence people to go see a movie depending on their suggestion in the review. This is because if consumers recognize that they generally agree with critics then they will take the review as information that they can use when they are deciding to see a movie or not.

Metascores and Domestic Box Office Grosses:

So, if we believe that moviegoers look at movie reviews before deciding to go see a movie or not then we should expect there to be a strong positive correlation between the metacritic scores and domestic box office grosses. So what did Timothy King see when he looked at the relationship:
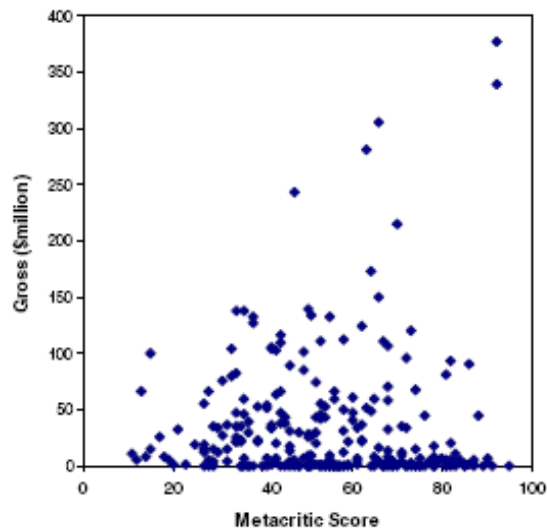

When looking at the plot of metacritic score and domestic box office gross, King found an almost non-existent correlation (r = -.00030). This surprising result is not so surprising when you study the plot. There seems to be a huge cluster along the x-axis. This would turn what appears to be a positive correlation more negative. So where do these low grosses come from? Well, most of them come from limited releases (for this paper we will define "limited releases" as films that opened on less than 1,000 screens). Critics often love the limited releases, but people generally do not go to see them (whether it's because it is not released in a theater nearby or they do not get enough information about it beforehand from television advertisements).

Looking at the correlation between first week box office gross and metacritic score we get an even more surprising result: a comparably larger negative correlation (r = -.13). A reasonable explanation behind this number is that advertising campaigns in the weeks leading up to a movie's release drown out the reviews that critics give. This would have more of an effect on the wide-release films (movies opening on more than 1000 screens) because these movies put a large portion of their production budget into marketing to get people excited about a movie's opening weekend. It would make sense that this would create a negative correlation because it seems as though the movies that get higher critical reviews will be limited releases that do not have a large production budget and do not get a lot of revenue during the opening weekend. And movies anticipating lower critical reviews may up their production budget in order to get as

many people to the theater in the first weekend before critics and word of mouth end its theater time.

   After the first weekend, King found a positive trend between metacritic scores and box office (r = .047). This shows that the marketing cannot completely eliminate the role critics play in getting consumers to go out and see a film. And we will see later that this correlation improves from week to week after the opening weekend.

   Comparing King's data (from films released in 2003) to my own data (from films released in 2007) we see some similar trends:
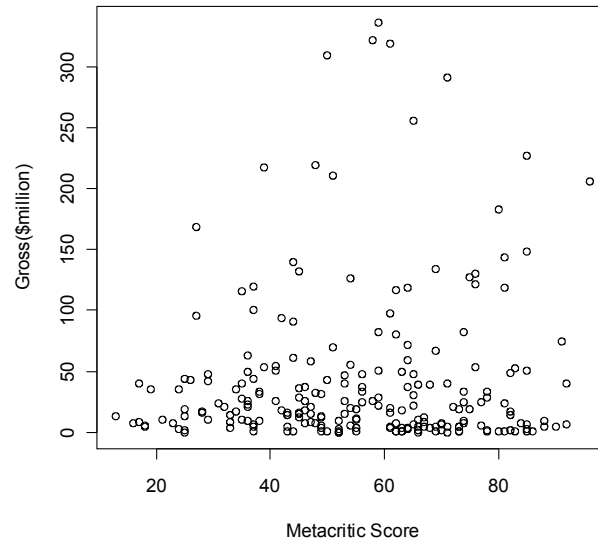
   I found a positive trend between these two variables (r = .080344). This is a surprising divergence from King's finding, until you realize that my data is missing much of the limited releases that King included in his plot. The limited releases would bring down the correlation making it more negative, but still the increase seems to be quite large. We would need to check the variance from year to year to see if this increase is significant or not, but this would take more time to check. But, if this increase does prove to be significant enough we could attribute it to a rising reliance on critical reviews as sites such as Rotten Tomatoes and Metacritic become more prevalent. These websites make it much easier for consumers to get the information of many critics before they go to see a movie. It then becomes less costly than actually going out and buying a paper and checking a local review. The Internet is making it easier for consumers to gain information when making purchasing decisions.

   Looking at the correlation between opening weekend box office and metacritic scores we find what we expect: a drop, although it is not as negative as before (r = -.01457). This once again can be attributed to advertisements hyping up movies before they are released. And the after first week correlation jumps up to a higher correlation just like before (r = .12063). So we see that there is a similar pattern in both years, with 2007 being slightly higher in every category. Whether this is because of natural variance (or missing data on limited releases) or the increasing popularity of critic ratings sites we will not know until more data across the years are studied.

Limited and Wide Releases:

It is hard to tell the effect of critics on moviegoers without separating the limited and wide releases. So we will try to find a linear model for both limited and wide releases.

When looking at the limited releases we will be looking at a few variables that we have good reason to believe would have an effect on the total domestic box office gross of these films. The first is the number of opening screens; if a film opens on more screens it definitely has a chance to make more money than the others. The next are dummy variables that tell us whether the film is a documentary or a foreign film. We have good reason to believe that these films will receive higher scores (only the good documentaries and foreign films get released onto the big screen) and they will probably receive lower box office because these films are not as popular with moviegoers. And lastly we will look at the effect of the metacritic score on box office of these limited releases, for the obvious reason: do critical reviews really matter when it comes to box office grosses. And here are the coefficients of the linear models, with King's data on the left and my own on the right (box office is given in thousands of dollars):

Constant	−4191 (−1.408)
Opening screens	19.8** (3.818)
Metacritic score	148.9** (3.093)
Documentary dummy	−6264** (−2.749)
Foreign language dummy	−4452* (−2.439)
r^2	.187
F	6.488**
n = 118	

Coefficients:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-8.483e+03	1.243e+04	-0.682	0.4971
Opening Screens	1.555e-01	1.005e+01	0.015	0.9877
Metacritic score	3.238e+02	1.763e+02	1.836	0.0704 .
Doc Dummy	-6.620e+03	1.301e+04	-0.509	0.6124
Foreign Dummy	-1.147e+04	6.682e+03	-1.717	0.0902 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 21820 on 73 degrees of freedom
Multiple R-squared: 0.07097,   Adjusted R-squared: 0.02006
F-statistic: 1.394 on 4 and 73 DF, p-value: 0.2445, n=78

We see that the metacritic score has the largest positive coefficient of all the variables among limited releases. The "**" in King's calculations indicate that the coefficients are significant at the 1% level and the values in parentheses are the t-values. This means that there would be about a 1% chance to get this estimate if the actual coefficient was equal to zero. When looking at my data we get similar values except with less significance. The number of opening screens had less effect while the metacritic score had a higher effect. In both studies we see negative coefficients for the dummy variables, which we expect because documentaries and foreign films should expect to get lower box office. Looking at the t-values though we can see that the metacritic score is the most significant of the coefficients. But we cannot conclude significantly from this that the critical ratings have a large effect on box office. But King's study suggests that 20 points gained from a critical score (equal to one star on all 5-star reviews) will lead to earning about an extra $3 million while in 2007, if it were significant enough, we could estimate to earn about $6.5 million.

Now we will look at the linear model for wide releases looking at different, but more relevant variables. First, we will look at the production budget. We suspect that a higher production budget will attract more people to the theater because they will use much of this budget to start an advertising campaign to attract more people to the theater (mostly in the opening weekend). Production budget, we hypothesize will affect only the wide releases seeing as most of the data is unavailable for smaller releases as well as the fact that limited releases do not rely as much on advertising than wide releases to get their movie known. And we will then look at opening screens and metacritic scores for the same reasons given above. Here are the coefficients of the linear models, with King's data on top and mine on the bottom (box office and production are both given in millions of dollars).

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Coefficients:
(Intercept)            9.70710       -84.085129***    -1.185e+02***
Production Budget      1.13904***      0.664359***     5.961e-01***
Opening Screens                        0.044665***     4.507e-02***
Metacritic Score                                       7.313e-01**
r²              . 6198          . 7019          . 7217
F                172.2           124.6            69.08
 n=142
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Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
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Most of the coefficients shown here are very significant. This means that we can be sure that these coefficients are not zero. Once again we see that the metacritic score (when it is included in the last column) has the highest coefficient. Although it is smaller in 2007 than it is in 2003 it is still larger than the production coefficient (which is larger than the one in 2003, which may have to do with the large number of big budget movies/sequels released during the summer in 2007 that generally received poor reviews). We can see that this coefficient suggests that with a 20 point increase in a metacritic score (one star in a 5-star review) will lead to an increase in box office of about $25.8 million in 2003 or about $14.6 million in 2007. When making these projections we must be very careful not to take it as fact. These increases are not exact and only represent a general trend. But it seems clear that the metacritic score has a positive effect on both the box office of wide releases and limited releases.

Weekly Box Office:

Correlations for Critic Reviews
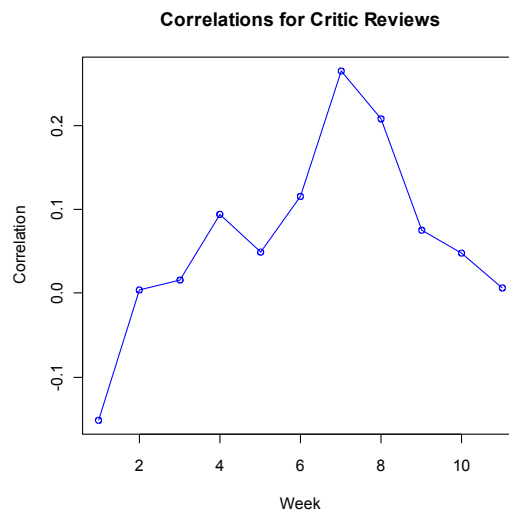
Looking at 22 movies released for 11 weeks (the largest group of movies released for the same period in theaters) I took down their weekly box office intakes (given on

boxofficemojo.com) and then calculated the correlation between the metacritic score and their box office for that week. Here is what I found:

We see a peak in the correlation in the 7th week. We should expect the first week to be very low seeing as there is a drowning out effect during the first week released in theaters. But why does it peak so late? There could be the argument that critics are only good at predicting future box office success rather than influencing it. This is because the first week has an incredibly low correlation and one would think that this is where the impact of the critics' influence would take place. Instead we see the peak later in its theater run suggesting that critics are only good at predicting whether people will like a movie and go see it later instead of influencing an overall box office success. Another scenario that could explain this graph could be that the critical reviews do not have much of an impact in the first week because of the marketing and advertising campaigns. The next week people read the reviews and decide whether they will see the film or not. Those that do use the information pass on this information to their friends until the critical review slowly works its way through networks until a later date when the most successful movies are generally the ones with the better reviews. This graph is open to interpretation and can be used to either support or refute consumer's use of the critical information.

Conclusion:

Movie reviews are rich with information about how well a viewer will enjoy a movie. Even though some reviewers may have different tastes than the people reading their reviews, consumers can still read the reviews and determine whether the movie is worth their money or not based on their own interpretation of the review. It seems obvious that there should be a positive effect between a glowing review and a box office success. And we do find this when looking at the linear model coefficients of the different variables. The coefficients are significantly positive for wide releases and similarly positive, yet less significant, when looking at limited releases. This suggests that most of the readers are looking at the reviews for the movies that they have heard of, mainly from marketing and advertisements. So when a person sees a trailer that interests them in the movie they go to look at the reviews for it to help them make the final decision. This is why there is a significant effect in the wide releases as opposed to the limited releases (where most people will not be interested in reading the review for films they have not been exposed to).

Looking at these results from the industry's perspective we cannot find a significant amount of information to show that it is profitable to release a film in more theaters if they anticipate good reviews. We can however show that production and marketing are very important in looking at box office. We can also make the connection that the marketing makes people want to read reviews about the movie which hopefully can be positive. So it seems the best way to get the highest box office is to make the best movie that you can while also having an incredible and hooking marketing campaign. Which is the way it should be, isn't it?

Works Cited:

King, Timothy. "Does film criticism affect box office earnings? Evidence from movies released in the US in 2003." Journal of Cultural Economics, 2007. Springer.