**Our Hypotheses & Findings**

* Production Cost vs. Worldwide Sales

Our first hypothesis is that higher production costs would result in higher worldwide sales. We argue that the more money a production company puts into a movie, the higher the return they will see (thinking of action movies like The Avengers or Barbie). The null hypothesis in this instance would be that higher production costs do not result In higher or lower worldwide sales.

A graph with red dots and a blue line

Description automatically generated

An r-value of 0.55 between production cost and worldwide sales indicates a moderate positive correlation. This suggests that as production costs increase, worldwide sales tend to increase as well, but the relationship is not extremely strong.

The p-value in this instance is 3.29e-38. With a p-value significantly less than .05, we can safely reject the null hypothesis.

* Profit Margin vs. Genre

Our second hypothesis is that action movies would have lower profit margins because they cost more to make. We define profit margin as (Worldwide Sales – Production Cost).

A graph with green and white lines

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The p-value indicates whether or not we reject the null hypothesis. In this instance, our p-value of .005 allows us to reject the null hypothesis, telling us that genre does have an impact on profit margin.

The f-statistic indicates whether or not there are statistically significant differences (variances) between the groups (genres). In this instance, our f-statistic of 2.757 (greater than 1.938 critical value) tells us there are statistically significant differences between genres.

* Opening Weekend Sales vs. Worldwide Sales

Our third hypothesis is that there is a strong correlation between a movie’s opening weekend sales and its overall worldwide sales. In other words, movies that do well on opening weekend show a greater likelihood of doing well overall.

A graph with orange dots and a blue line

Description automatically generated

An r-value of 0.81 between opening weekend sales and worldwide sales indicates a strong positive correlation. This suggests that movies with higher opening weekend sales tend to have higher worldwide sales.

In this instance, we have a p-value of 1.17e-107. With a p-value significantly less than .05, we can safely reject the null hypothesis.

* Release Date vs. Opening Weekend Sales

Our fourth hypothesis is that the release date plays a significant role in determining a movie’s opening weekend sales. In particular, summer movies have higher opening weekend sales. This hypothesis is based on our understanding that going to the movies is more popular during the summer.

A graph of a number of different seasons

Description automatically generated with medium confidence

We conducted in independent t-test. The p-value of 0.0994 is greater than the commonly used benchmark of 0.05. This means that the difference in opening weekend sales between summer and non-summer movies is not statistically significant. Thus, we fail to reject the null hypothesis.

Although not statistically significant, the t-statistic of 1.65 and a p-value of 0.0994 indicate a trend that summer movies might have higher opening weekend sales compared to non-summer movies. This trend is approaching significance and may warrant further investigation with a larger sample size or additional data.

The p-value suggests that other factors beyond just the release season may be influencing opening weekend sales. These factors could include marketing efforts, competition from other movies, the popularity of the franchise, star power, etc.

* MPAA Rating vs. Worldwide Sales

Our fifth and last hypothesis is that MPAA Rating has a significant impact on worldwide sales. G & PG-rated movies have higher worldwide sales compared to PG-13 & R-rated movies because they appeal to a wider audience (i.e. their audience includes children).

A graph of a bar chart

Description automatically generated with medium confidence

We conducted an ANOVA test. The p-value of 0.00234 is well below the common threshold of 0.05. This indicates that there is a statistically significant difference in worldwide sales across different MPAA ratings. The low p-value suggests that the variation in worldwide sales is unlikely to be due to random chance, and the MPAA rating likely has a real impact on the sales. Therefore, we can reject the null hypothesis.

A screenshot of a table

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The f-statistic measures the ratio of the variance explained by the model to the unexplained variance. We referenced an F distribution critical values chart to find that our critical value for the F-statistic is 2.0947 (we had 4 groups and 460 observations). An F-statistic value of 4.89 in this instance suggests that the MPAA rating explains a meaningful portion of the variance in worldwide sales.

The statistically significant f-statistic and p-value indicate that MPAA ratings have a meaningful impact on worldwide sales. Studios can leverage this insight for strategic decision-making in movie production, marketing, and distribution to maximize their financial returns.

Additional Analysis

A graph of a number of actors

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A graph of blue dots and a red line

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A graph with yellow dots and a purple line

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Both duration graphs have statistically significant p-values, which tell us that the duration of the film does have a positive correlation with a movie’s financial success and popularity.

We could use this information to conduct additional analysis for many of the questions that we have above. As duration is positively related to worldwide sales, we can imagine it is also positively related to opening weekend sales as opening weekend sales has already been proven to be related to worldwide sales. We can also use this to further explain the relationship between a movie’s MPAA rating and worldwide sales, as well as its IMDB rating.

A green and purple line graph

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In the graph above, you can see that a movie’s IMDB rating is a good indicator of its profit margin. A p-value of 4.82e-17 proves that this relationship is statistically significant.

While worldwide sales are a great indicator of a movie’s financial success, movie executives and the people who profit from the movie are more concerned with profit margin. Most of our analysis focuses on worldwide sales, but if we were interested in optimizing a movie’s return on investment, we could add more to our analysis by including more graphs that use profit margin as the independent variable instead of worldwide sales.