

# *Analysis of the Factors Influencing the Box Office of Domestic Animated Films*

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**Abstract:** This paper mainly discusses the influencing factors of domestic animation film box office. In the early days, the domestic animation market was mainly occupied by American animated films. Although development was difficult, domestic animation films have undergone many changes in the 21st century. To help people better understand the development status and market situation of domestic animated films, this experiment aims to study the influencing factors of box office. This experiment takes 5 influencing factors that are easy to quantify as research objects: genre, production method, duration, release schedule and rating. Data on these factors can be found online and processed. Preliminary processed data is then drawn into charts. To be rigorous, this experiment also makes linear regression analysis on some influencing factors to see the relationship between box office and factors. The study finds a moderate correlation between box office and duration, and a weak correlation between rating. 3D animated films generally outperform 2D films at the box office. Animated films that focus on "family" have lower box office receipts than films in other genres. Movies released during the summer and Spring Festival outperform those released during other seasons.

**Keywords:** domestic animation film, box office, influencing factors

## 1. Introduction

On July 30, 1999, a Chinese animated movie called "Lotus Lantern" was released in China. The film was made on a budget of 12 million yuan (RMB), and it made 25 more than 22.79 million yuan at the box office [1]. At the time, it was a huge commercial success. What's more, the release of "Lotus Lantern" is also the beginning of the commercialization of Chinese films [2]. From 1999 to 2004, domestic animated films embarked on a steady development road. Since 2004, China's State Administration of Radio, Film and Television (SARFT) has officially started to issue relevant policies on the animation industry, such as "Some Opinions on the Development of Film and Television Animation industry in China". Among them, Special funds were set up to increase long-term support for cartoons and other films, and tax exemption policies were sought for professional production institutions of domestic cartoons, which clearly gave attention to cartoons within the scope of the film industry [3]. Undoubtedly, the promulgation of the policy and national funding have made continuous progress in the quantity and quality of domestic animated films. Consequently, in the 16 years from 2004 to 2019, the box office of domestic animated films increased from 32 million yuan at the beginning to 7 billion yuan, and showed an overall trend of steady growth.

The box office is more than just statistics. The rising box office of domestic animated films reflects the fact that Chinese people increasingly like to watch domestic animated films. The most fundamental reason for this is that Chinese animated films are getting better in all aspects. In terms of content production, the development of domestic animated films shows three major trends [4]. Firstly, the audience for domestic animated films has become more diverse. With the development of the "second dimension" culture in China, animators and animation lovers have realized that animation is not only for children. As a result, domestic animated films are developing towards the whole age. Just like the popular movie "Nezha: Birth of the Demon Child", its story is not childish, but can provoke adults to think a lot. Secondly, in terms of technology, the technology used in domestic animated films is also constantly innovating. Demand leads to productivity. For the requirements of flexible movements and vivid expressions of characters, front-end animation manufacturers are working hard to polish the technology [5]. Both 2D and 3D animation have achieved technological breakthroughs over the years. Thirdly, in terms of the choice of genres, Chinese animated films are no longer limited to the presentation of fairy tales, nor are they entangled in the dispute between local national plots and international elements. Today's domestic animated films have a richer range of genres, such as light-hearted comedy, magic adventure, hot-blooded combat and so on [6]. Domestic animated films are becoming more and more mature in terms of promotion, and marketing. In the past, since information communication technology was still underdeveloped, film promotion mainly depended on news dailies and posters in cinemas. With the popularization of electronic products, trailers, advertisements and publicity campaigns have become more and more common [7]. In the aspect of talent training, China has gradually realized the change from the traditional teaching mode to the education mode under the new media. In the traditional training mode, it was difficult for students to get practical opportunities. Students were also learning courses that are out of step with the market. Fortunately, today's animation production education pays more and more attention to students' practical ability. Students' individuality is also respected and they can acquire professional knowledge through multiple channels [8].

Of course, Chinese animated films are in a constant process of progress. But behind the beautiful box office figures, there are more problems that should be seen and that are worth studying. In terms of the number of films, the number of domestic animated films from 2015 to 2020 shows a downward trend on the whole [9]. Only 18 Chinese animated films were released in 2020. Of course, the poor data of domestic animated films in 2020 is closely related to the epidemic. Then, the number of high-grossing films from 2018 to 2020 also tells some facts. In 2018 and 2019, there were three domestic animated films that earned more than 100 million yuan each, while there was only one such film in 2020. It is not difficult to discover the fact that there are so few popular animated films in China. 2019 "Nezha: Birth of the Demon Child" is special. Its success shows that China can make great movies, but not that it can make great movies very often. Therefore, it is of great significance to better judge what kind of domestic animated films are popular films, so as to make more popular animated films. Box office is a measure of a good or bad movie index, which is not absolute, but has a very clear direction. By classifying domestic animated films with different box office, the impact of different features of different films on box office can be more clearly compared. There are many factors affecting the box office of domestic animated films, and it is impossible to analyze all of them in this experiment. Several factors that are easy to quantify are selected for analysis in this study. At present, there is not much research on the box office of animated films. But referring to the article that studies box office for non-animated films can give this experiment a lot of reference. Yu selected eight factors affecting film box office as the research objects: duration, genre, popularity of production team, rating, content familiarity, first-day box office, schedule, and film row piece rate [10]. Animated films do not have live actors, but use 2D drawing and 3D modeling to show characters and scenes. Considering the particularity of animated films and the convenience of factors'

quantification, this experiment finally studies five influencing factors: genre, production method, duration, release schedule and rating. By analyzing the influence of different factors on the box office of domestic animated films, this experiment aims to help people understand the domestic animation market and audience preferences. This experiment also hopes to give people some inspiration to create good animated movies.

## 2. Methodology

The research is about exploring what are the effects of different factors on the box office of Chinese animated films. Some factors have a direct impact on the box office, while the changes of some factors have no obvious connection with the level of the box office. How to compare the data and analyze the results will be detailed in the paper.

### 2.1. Variable Description

The purpose of this experiment is to study what factors have an impact on the number of box office, and the extent of the impact. On the one hand, the box office is the center of attention, which is be used as the dependent variable in the experiment. On the other hand, 5 influencing factors are selected as independent variables in the experiment: genre, production method (2D or 3D), duration, release schedule and rating. These factors are likely to have an impact on the results of the movie box office. Whether these factors have an impact on the box office and the extent of the impact are analyzed in the experiment. The method of production is simply referred to as "PM".

Table 1: Descriptive statistics of explanatory variables.

| Variables | Obs | Min | Max | Mean  | Std.Dev |
|-----------|-----|-----|-----|-------|---------|
| PM        | 60  | 0   | 1   | 0.85  | 0.13    |
| Duration  | 60  | 75  | 131 | 90.92 | 117.21  |
| Rating    | 58  | 6   | 9.6 | 8.49  | 0.43    |

Data on production method, duration, and ratings are listed: sample size, mean, maximum, standard deviation. Since the two variables of film genre and schedule cannot be easily quantified, they are not listed in the table.

### 2.2. Data Descriptions

There are 6 items of data in this experiment, namely 1 dependent variable and 5 independent variables. This experiment studies the data of the top 20 domestic animated films in each year from 2018 to 2021. The data information of box office, movie duration, release schedule, genre and production method can be collected on the China Film Data Analysis platform. First of all, box office and movie duration are objective data and not controversial, so the official data can be used directly. Secondly, the production method is a variable with only two outcomes. There are two kinds of production methods: 2D production and 3D production. In this experiment, the corresponding value of 2D production is 0, and the corresponding value of 3D production is 1. In this way, the two variable of production method can be converted into a digital form. Finally, the two variables of release schedule and genre are variables with multiple fixed results. In this experiment, the genres of animated films are divided into four categories: comedy, adventure, fantasy and family. Unlike popular movies, popular genres such as love, war, horror and suspense are not common in animated films. The release period is divided into 5 categories: Spring Festival, summer holiday, New Year, general holidays and other periods. As for the "rating" data, analyzing ratings on just one rating site is not rigorous. In this

experiment, ratings from three professional movie rating websites are comprehensively considered. Each platform is given a weighting of one third to calculate the overall rating. The calculated results are the data needed for this experiment.

### 2.3. Research Methods

This experiment studies the influence of different factors on the box office of domestic animated films, and it is necessary to compare different factors and different degrees of the same factor, mainly using comparative analysis method to analyze the data. Through comparative analysis, the influence degree of different factors on the film box office can be more clearly revealed. Among them,  $x_0$  is the mean of each sample data,  $x_1, \dots, x_n$  are samples,  $n$  is the sample size.

Of course, the data needs to be pre-processed before each item can be compared. Due to the large number of variables and sample size in this experiment, it is unrealistic to directly compare and analyze a large number of data, so data preprocessing is very important. Data preprocessing, in fact, is to simplify data through calculation to facilitate comparison, or eliminate the negative impact of irrelevant factors on data comparison. When comparing the box office of two films in different categories, the average box office is compared rather than the total box office of the two categories. This is where the averaging formula comes in:

$$\mu = (x_1 + \dots + x_n)/n \quad (1)$$

Among them,  $\mu$  is the mean of each sample data,  $x_1, \dots, x_n$  are samples,  $n$  is the sample size.

## 3. Results and Discussion

After introducing the variables and methodology, it's time to analyze the data and chart it. The detailed process of processing the data, presentation of the charts, and analysis of the charts will be carried out below.

### 3.1. Analysis of the Movie Duration

The box office of domestic animated films is the dependent variable, so it should be used as the Y-axis. There are two kinds of X-axis data: year and movie duration. Given that the study here is not about the changes in the box office of domestic animated films over the years, the data on the X-axis should be related to time. However, the sample number of film length is 60 in total, and it is necessary to use several plots to classify films of different length into several categories.

Here, the movie duration is divided into three categories: short length (SL), medium length (ML), and long length (LL). The 60 animated movies are divided into three evenly divided parts by dividing them into 85 minutes and 95 minutes. Movies with a length of 85 minutes or less are classified as "SL", which includes 26 films. Films that are longer than 95 minutes are classified as "LL", which includes 17 films. The remaining 17 films, ranging in length from 85 to 95 minutes, were classified as "ML".

It is worth noting that among the "LL" category, there is one film that earned 5.035 billion yuan. That's more than the rest of the box office, more than the rest of the top 10 combined. Therefore, this sample size is regarded as the extreme value and excluded from the experiment.

Whether a movie is "SL", "ML", or "LL", the minimum box office value of a movie is negligible compared to the maximum. In order to show the data on the graph more clearly, this experiment expands the minimum data to 10 times the original value when drawing the graph.

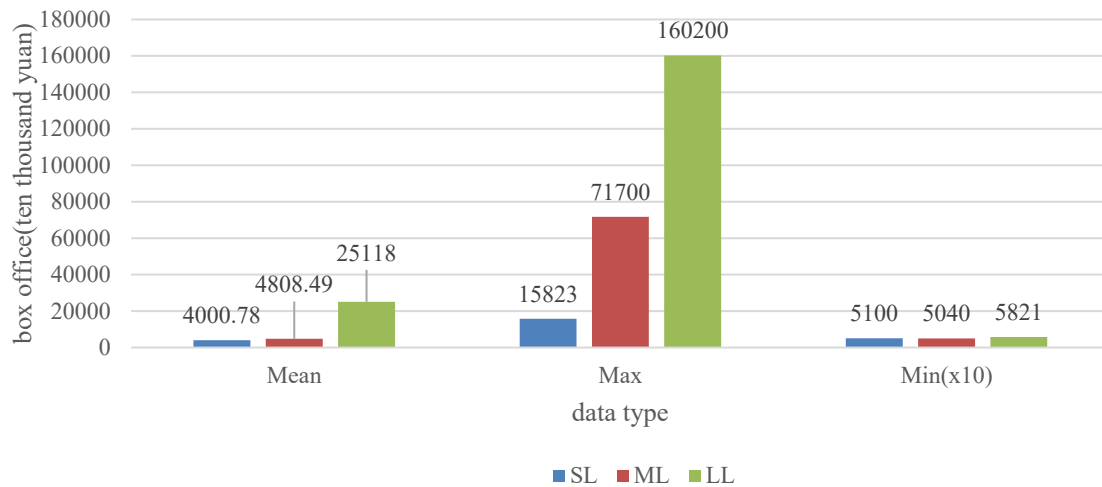


Figure 1: Box office of three different films of different length.

From Figure 1, it can be seen that the mean and maximum value of the movie box office are increasing from "SL" to "ML" and then to "LL". The average box office of domestic animated films in the "LL" category is 251.18 million yuan, less than five times larger than the average box office of "SL" films, which is 4000.78 million yuan. The smallest box office figures for each category are 5.1 million yuan, 5.04 million yuan and 5.821 million yuan respectively. It can be seen that domestic animated films with low box office have little to do with the length of the film. But high-grossing domestic animated films also tend to have longer show time.

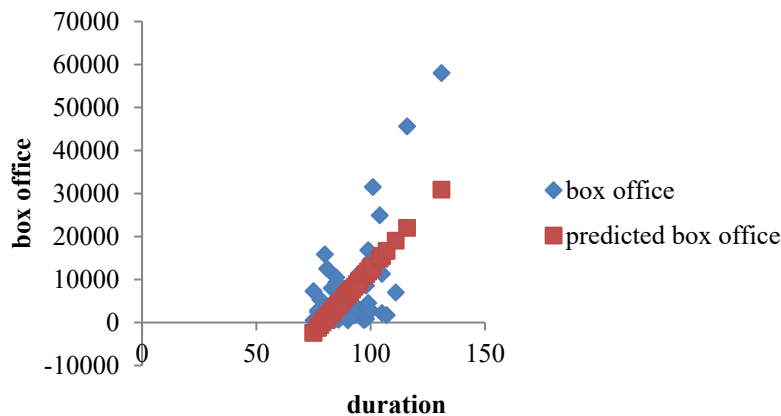


Figure 2: Linear fitting plot of movie duration and box office.

Only comparing the maximum and mean values of each type of data cannot yield rigorous results. On this basis, the data should also be used to do linear regression to test the correlation between duration and box office. Looking at Figure 2, the box office of movies with different durations can be clearly seen. In general, the longer the movie runs, the higher the box office. However, there are also some long films that do not do well at the box office. Through calculation, the complex correlation coefficient of this group of data is 0.64, between 0.5 and 0.8. The complex correlation coefficient is greater than 0.8, which means that the independent variable is strongly correlated with the dependent variable. The complex correlation coefficient is 0.64, which means that there is a certain correlation between the film box office and the duration, but the correlation is not strong.

### 3.2. Analysis of Production Method (2D or 3D)

In this experiment, 2D animated films and 3D animated films are compared for each year from 2018 to 2021. This can not only visually compare the box office gap between 2D domestic animated films and 3D films, but also see the trend of domestic animated films in the way of production.

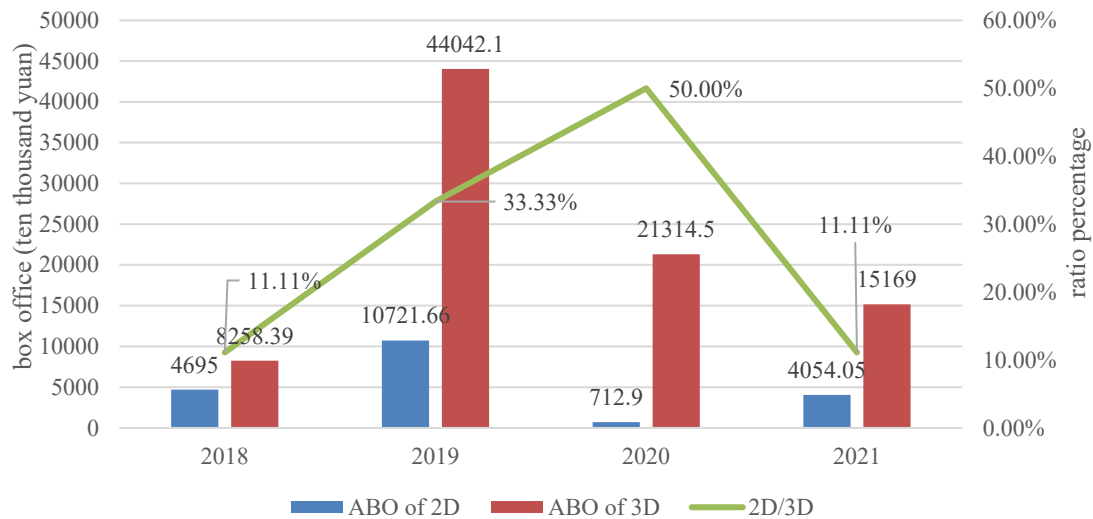


Figure 3: The box office of 2D and 3D domestic animated films.

From 2018 to 2021, the average box office of domestic animated films produced in 3D is higher than that of 2D animations every year. And the average 2D animation box office in 2020 and 2021 is even lower than the previous two years. In terms of the quantity ratio of 2D animation and 3D animation, 2D animation films experienced a process of first rising and then falling. 2D animated films, which once accounted for 50% of 3D animated films in 2020, still declined in 2021.

### 3.3. Analysis of the Film Genre

As mentioned in 2.1, this experiment divides the themes of domestic animated films into four categories: adventure, fantasy, family and comedy. Due to the limitations of the current theme of domestic animated films, sci-fi, tears and other themes are not enough to be classified as a single category, so they are excluded from the experiment. Calculate the average box office of animated films of four genres, and then compare them.

Table 2: Box office data of different animated films.

| Genre     | Obs | Min   | Max    | Mean    | Std.Dev |
|-----------|-----|-------|--------|---------|---------|
| Adventure | 44  | 504   | 160200 | 11408.9 | 27483.4 |
| Comedy    | 30  | 524.1 | 71700  | 10598.7 | 19198.7 |
| Family    | 13  | 582.1 | 12500  | 3470.1  | 3044.7  |
| Fantasy   | 25  | 504   | 58000  | 12282.4 | 16019.2 |

Different themes of animated films, their box office minimum value is very close, and the maximum value is very different. The highest-grossing film is in the "adventure" category. The highest box office for an animated film in the "family" category is only 125 million yuan. Then, looking at the box office average, it is clear that there is a big difference between the "family" animated films and the other three categories. The standard deviation analysis shows that the box

office difference of "adventure" films is large, while the box office difference of "family" films is small.

### 3.4. Analysis of Movie Rating

The same movie is rated differently on different websites. The calculated comprehensive rating is more convincing and can be directly used for comparative analysis. Similarly, movies are still divided into 4 categories according to the size of box office: "LBO", "MBO", "HBO" and "EHBO". By comparing the mean, maximum and minimum score of each category, the relationship between box office and score of domestic animated films can be found.

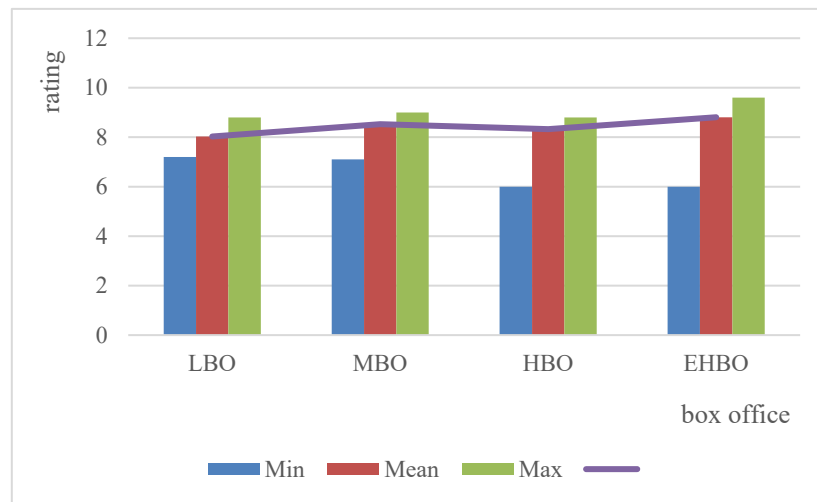


Figure 4: Ratings of movies at different box offices.

From Figure 4, it can be seen that compared with films with local box office, the difference in ratings of domestic animated films with high box office will be larger. In the "HBO" and "EHBO" categories of animated films, the difference between the highest and lowest ratings of a film is larger. Then, analysis of the mean of each category of animated film ratings shows an increasing trend.

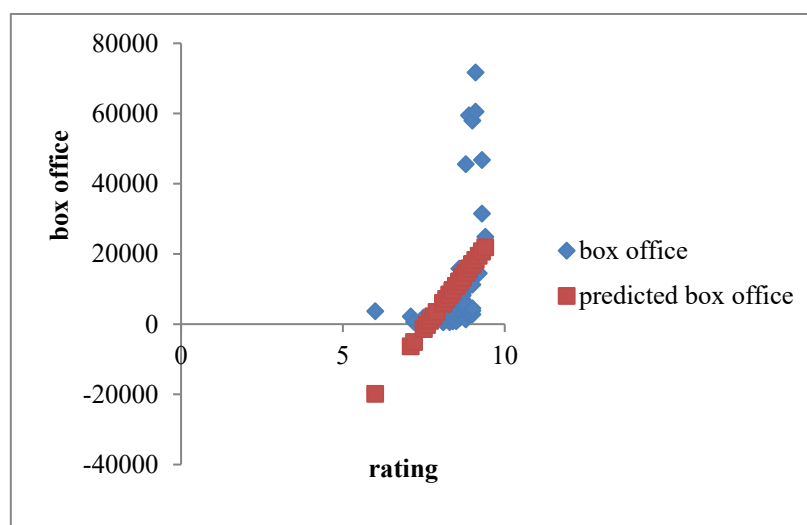


Figure 5: Linear fit plot of movie box office and rating.

Similarly, no rigorous result can be obtained by analyzing only the most and the mean data. Taking the film box office as the dependent variable and the rating as the independent variable, the linear

regression analysis needs to be done. In general, the box office of a movie tends to go up with the increase in the score. However, as observed in Figure 5, the degree of fit between the predicted value and the actual value is not particularly high. After calculation, the complex correlation coefficient of this group of data is 0.47, which is less than 0.5. As a result, there is a weak correlation between box office and ratings.

### 3.5. Analysis of Release Schedule

In this experiment, the release dates of domestic animated films are divided into five categories: summer holiday, Spring Festival, New Year, holiday and other time periods. Because compared with the summer, Spring Festival and New Year, there are not many Chinese animated films screened during other holidays, and all other holidays are lumped together. The remaining domestic animated films, which were released on non-holiday days, are also grouped together. The summer break is simply referred to as "SH". The Spring Festival is simply known as "SF". The New Year is simply called "NY". General holidays are simply referred to as "HF". The rest of the time is simply denoted as "OP". Similarly, domestic animated films are divided into four categories according to their box office.

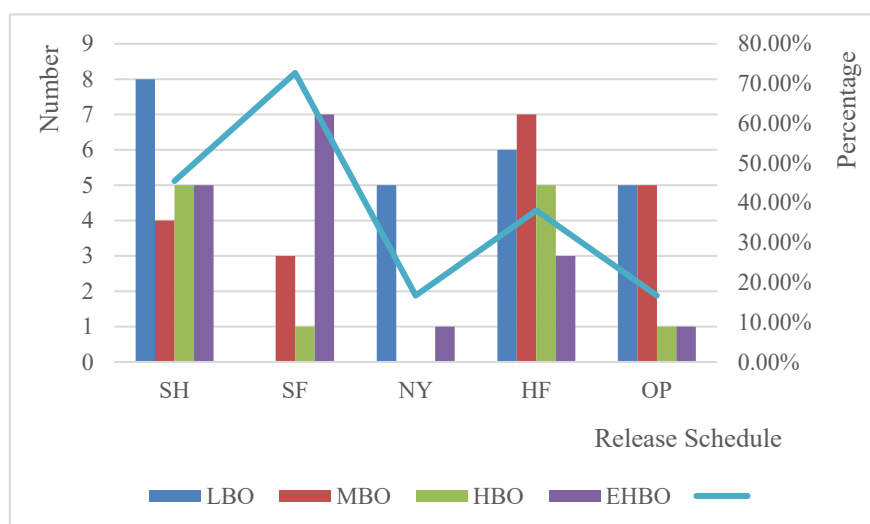


Figure 6: The number of different kinds of films at different times.

From Figure 6, it can be seen that "HBO" and "EHBO" animated movies tend to appear in such schedules as "SH", "SF" and "HF". However, domestic animated films with high box office rarely appear in the schedules of "NY" and "OP". The highest percentage of high-grossing animated films among all films appears in the "SF" schedule.

## 4. Conclusion

There is only one dependent variable in this experiment, while there are many independent variables. Therefore, tables and graphs need to be built up during the experiment to better analyze the data. The simplified data is then used to chart. The main research method in this experiment is the comparative analysis method. It sounds simple, but it plays a role in every variable analysis, making experimental conclusions more intuitive.

At the beginning of this experimental design, the influencing factors to be studied are film duration, production method, film genre, rating and release schedule. In fact, through experimental analysis, some factors are closely related to the box office, while others do not have a strong impact on the box



office. After analysis, it can be found that there is a certain correlation between the box office and the duration of a film. In terms of the overall trend, movies that run longer tend to do better at the box office, both on average and at best. And the top five films at the box office are all over 95 minutes long. However, there are also animated films that run for a long time and don't do well at the box office. This suggests that, by and large, longer films are more popular, but it's not always true.

Comparing the average box office of the two types of animated films, 3D animated films are much higher than 2D animated films. In the number of 2D animated films and 3D animated films released each year, 3D films also have the upper hand. This shows that in today's domestic animated film market, 3D animated films are more easily accepted by fans. Domestic 2D animated films are not without high box office, but they are few. And the number of 2D animated films released in China every year is also small. This shows that domestic animated films still have a long way to go in 2D production.

In the analysis of film genre, the average box office of domestic animated films of "family" category is low, while the average box office of animated films of other genres is similar. And the standard deviation of the box office of films of "family" category is also low. It can be concluded that the box office of "family" animated films is generally not high. This shows that animated films of "family" category have not been very popular in recent years. People are more interested in fantasy stories about adventures in other wonderful worlds.

Movies that do well at the box office tend to get better ratings. But there are some highly rated films that don't do well at the box office. After linear regression of the data, the experiment finds that there is a correlation between the box office and the score, but the correlation was weak. This shows that popular animated films are not the same as highly recognized films.

High-grossing domestic animated films are more likely to appear during the summer, Spring Festival and general holidays. And box office of New Year's and non-holiday season movies is generally low. This shows that during the New Year and non-holidays, not many people go to the cinema to see domestic animated films. In addition, during the Spring Festival, the proportion of high-grossing domestic animated films is the highest. And among the films during the Spring Festival, there are few films with low box office. This shows that people are more willing to go to the cinema to watch domestic animated films during the Spring Festival.

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