

The Revenue Forecasting and Exploration of the Causes for the Changes in Bilibili's Performance

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Abstract: As the field of social media has made progress so far, Bilibili, which is one of these outstanding platforms or enterprises concentrating on social media, has adopted profitable strategies contributing to Bilibili's success of operation. Nevertheless, taking these potential negative factors into account, Bilibili can recently face these underlying difficulties which can be common in other similar firms and even the entire industry of social media. Therefore, it can be beneficial for related organizations to analyze performances of Bilibili or other platforms to find out these solutions to cope with these potential issues efficiently. In this paper, research has been done to analyze the changes of price of Bilibili by WMA, SES and LR models. Furthermore, these prospective reasons to explain these changes of price in different periods, which are relatively climbing, rocketing, reaching a peak and plummeting, have been further analyzed according to the most accurate model. After having finished this step, these potential solutions for latent issues faced by Bilibili in the future are expressed at the same time.

Keywords: Bilibili, quantitative analysis, business model.

1. Introduction

With the development of the Internet and social media, the Bilibili video platform has become one of the most popular video platforms in China due to its diversified and pluralistic videos, which cater to the mainstream audience of video platforms today. In the process of Bilibili's development, its profitability and earnings have also changed over time.

Based on this, this article will use all available stock data of Bilibili video platform provided by Yahoo Finance[1], establish different models, and select the model with the smallest error to evaluate Bilibili's earnings for the next day. This article will also evaluate the risks of Bilibili's operations and explore the reasons for changes in Bilibili's platform revenue through the relevant operating models implemented by Bilibili.

2. Literature Review

The rapid growth of the social media landscape has brought Bilibili to the forefront, emphasizing the importance of investigating its unique business model. According to Ou et al., as a leading online entertainment platform in China, Bilibili has successfully combined elements of content creation, community engagement, and diverse revenue streams to drive its expansion[2]. After 14 years

development, Bilibili can be one of the most typical examples of successful operations related to social media in China.

Regarding the research on Bilibili's operation or issues, according to Yuan et al., SWOT analysis has been adopted to analyze Bilibili's business model[3]. Moreover, Bilibili had made big successes with its business model but was still faced with a range of issues such as how to restrict so-called Watermelon Videos.

Furthermore, taking the heated popularity of social media among people into consideration, it is worthwhile for related researchers and managers to figure out what types of strategies can create enough income and reduce potential risk effectively.

Nevertheless, these previous studies mainly analysis the stock based on basic principles and literal statements. There was a lack of quantitative analysis aiming at the price of Bilibili, which can lead to more solid conclusions.

This article analyzes Bilibili's pricing data to uncover strategies contributing to its success. By examining various data sources, this study aims to identify key factors enabling Bilibili's growth in the competitive social media market. Insights from this analysis will deepen our understanding of Bilibili's trajectory and offer valuable industry lessons.

3. Methodology

3.1. Object of Study

In order to utilize the accurate data of Bilibili, the second hand data from the website of Yahoo Finance[1], which is one of the most well-known financial platforms providing data of various organizations, was selected. Furthermore, to collect an appropriate amount of data, the targeted data should be in suitable intervals to neglect the influences of potential incidents and enhance the efficiency of data analysis and cover the whole period of operation of Bilibili as much as possible. Thus, the data at monthly intervals from 2018 to 2024 is the main range of the targeted object of study.

3.2. The Process of Data Collection

Utilizing the Yahoo Finance platform, Bilibili's historical pricing data was extracted for analysis. To ensure relevance and manageability, the constraints of "Max" and "monthly" were applied before downloading the data in Excel format. Subsequently, the extracted dataset was systematically analyzed using established principles and procedures to identify key trends and strategic insights.

3.3. The Process of Data Analysis

In order to find out the most appropriate or effective means or model of Forecasting, after the previous data had been summarized in a suitable format, the data was analyzed in three types of models, which are relatively WMA(Weighted Moving Average), SES(Simple Exponential Smoothing) and LR(Linear Regression) by Excel.

3.3.1. WMA Model

In terms of the principle of WMA, five recent numbers, which were set as X_i ($i=1,2,\dots$). Then, five different weights which were named as W_i ($i=1,2,\dots$) were allocated to five different former numbers. And we assume that $\sum X_i = 1$ After finishing these basic assumptions, there is a formula to forecast the price of the sixth day after the targeted five days:

$$P(E)_{\text{Day6}} = \sum X_i W_i (*), i = 1, 2 \dots$$

In the format of Excel, we can define the $MAD = |P - P(E)|$ and P is equal to the actual price of a day in the data and $P(E)$ is equal to the forecasted price of a day according to the (*) formula. Then we can also define $MSE = MAD^2$ and $MAPE = \frac{MAD}{P} \times 100\%$. Having accomplished these steps, we can use the tool of programming solver in Excel to achieve optimization which can make the amount of MSE equal to the potential minimum. In programming solver, the zone of these five different weights was selected as the changeable zone and the table cell of MSE was chosen as the targeted number which needed to be the minimum. Then we add the constraints of $\sum X_i = 1$ and $W_i \geq 0$ and select the means of calculation of GRG. After these procedures, we can figure out the targeted numbers of weights and then finish forecasting in this model.

3.3.2.SES Model

In terms of principle of SES, we should predict the sixth day's number of the entire data as the average number of the sum of the former five days' numbers. In the predicted numbers of these following days, we can define a formula as

$$P(E)_i = P(E)_{i-1} + \alpha(P_{i-1} - P(E)_{i-1}), \quad i = 7, 8 \dots \quad (0 \leq \alpha \leq 1)$$

In the format of Excel, we can input the predicted numbers of different days by the former principle. Then we can define MAD, MSE and MAPE as the WMA model. Furthermore, in programming solver, the table cell of α was selected as the changeable zone and the table cell of MSE was chosen as targeted zone which needed to be the minimum. Then we add the constraint of $0 \leq \alpha \leq 1$ and select the means of GRG. Then we can gain the ideal α and accomplish the forecasting in SES model.

3.3.3.LR Model

In terms of LR, to establish an effective linear regression model, we need to define these dates of the different days as natural numbers from 1 to 76. Then we should use the function of data analysis and choose the option of regression. After this step, the zone of dates should be chosen as variable X and the zone of prices should be selected as variable Y. Having confirmed former information, we can acquire the result of forecasting in LR model.

Then, we define a formula as

$$P(E)_i = \alpha + \beta * P_i, \quad i = 6, 7 \dots$$

and α is equal to the number of Intercept-Coefficients and β is equal to X Variable-Coefficients. After using this formula to calculate all these predicted prices of everyday, we can also define MAD, MSE and MAPE as these two former models to check the error of this LR model.

3.4. Underlying Causes for Errors

In reality, there are various factors which can lead in these subtle errors especially in WMA and SES models. Supply and demand in the related capital market, irrational anticipations from users which can be originated from people's mental conditions and can affect the usage of Bilibili and other elements can impact the price of Bilibili as well. But, we can also make forecasting and make effective analysis regardless of these unstable points.

4. Results

4.1. Forecasting

After completing forecasting by these previous models, we could find out that in SES model the MSE was equal to 76.01667 which was lower than the 76.02095 in WMA and the 1024.704 in LR, which indicates that SES model can make the most precise forecasting in the price of Bilibili. And according to the SES model, the predicted price of Bilibili in June 22nd, 2024 (The last day of the data is June 23rd, 2024) was 18.14 which was approximately equal to the day before. This phenomenon might be caused by the α which is equal to 1. And the amount of α can also explain that the price in future of Bilibili could be obviously affected by the day before.

4.2. Summary of Previous Data

Furthermore, after making out the chart which demonstrates the actual data and predicted data in SES model,

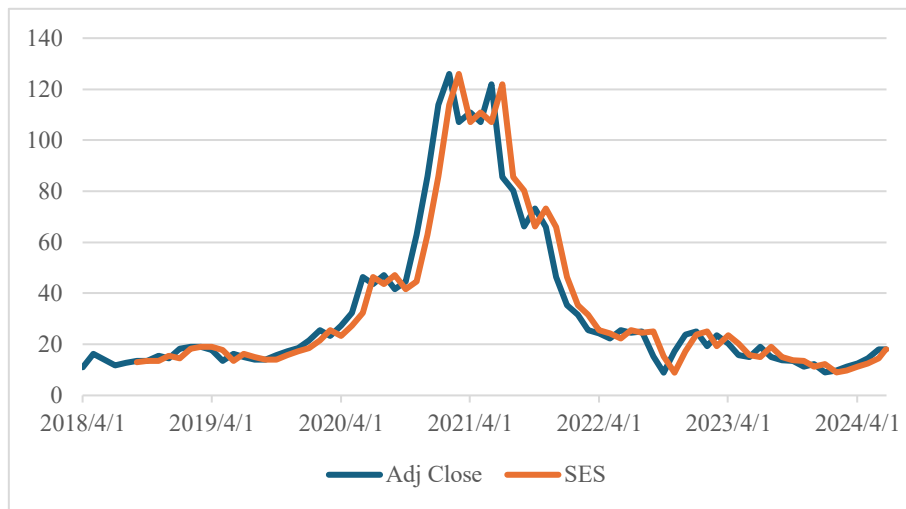


Figure 1: Changes of price in reality (Adj Close) and in SES

we can spot that the price of Bilibili generally climbed before April, 2020 then generally rocketed before it used to reach a peak around April 1st, 2021. Then the price began to plummet before April 1st, 2022 and then has stayed stable generally until now.

5. Discussion

5.1. Deeply Explanation towards Results

In forecasting, the α whose number is equal to 1 indicates that the potential price of Bilibili in the coming future might be similar with the recent number and largely impacted by the day before. The main reason might lie in that taking the designed formula

$$P(E)_i = P(E)_{i-1} + \alpha(P_{i-1} - P(E)_{i-1}), \quad i = 7, 8 \dots \quad (0 \leq \alpha \leq 1)$$

into consideration, if the α is equal to 1, the $P(E)_i$ can be directly equal to P_{i-1} which stands for the price of the day before, which means that the predicted price cannot be influenced by the unstable factors in the previous process of forecasting. By the way, regarding this phenomenon, we might also figure out that the price and even the conditions of operation of Bilibili might be stable

and encounter less risks regardless of other factors such as the demand and supply in the financial market and national policies, which cannot be shown in these mathematical models.

Therefore, we can also try to analyze the previous situation of Bilibili, so that the information related to Bilibili's effective strategies might be revealed.

5.2. Period 1: Climbing

According to Zhu's opinion, Generation Z, which mainly stands for these people born in 1995s and 2000s, used to utilize these electronic devices and these technologies such as the Internet frequently as they grew up[4]. Taking the familiarity of Generation Z towards these devices into consideration, these people might be attracted by the various resources on social media more easily by its interesting videos and convenient technologies. Especially after 2018, as people of Generation Z was getting older, they might acquire more rights to use electronic devices according to their personal habits and interests. Bilibili, which was one of these social platforms, provided more chances for these people to appreciate impressive videos and compose their individual vlogs and so on freely. Therefore, owing to the profit from Generation Z, Bilibili can make progress initially.

Furthermore, Zhu also supposed that it was also beneficial for Bilibili to climb to adopt various policies towards online videos. For instance, thanks to PUGV (Professional User Generated Video), video creators or so-called Ups could select their video partitions according to their talents, hobbies or other types of factors. And it was also helpful for Bilibili to adopt OGV (Occupationally Generated Videos), so that it could purchase plenty of high quality resources while maintaining its own flexible and creative features. Thus, these unique models of operation also contributed to the climbing of Bilibili.[4]

5.3. Period 2: Rocketing and Reaching the Peak

After the beginning of 2020, the epidemic of COVID-19 extremely influenced daily routines of citizens. As people could not do several outdoor activities such as doing exercise regularly, people might be isolated due to the less frequency of communications between people. So, the demand from people to suitable indoor entertainments could be larger than before.

Bilibili, which is a platform providing diverse and valuable video resources, not only helped people entertain at their spare time by its videos, but also gave chances to people to chat with more strangers. According to Jian, by the channel of bullet comments, users in Bilibili might gain emotional energy from others, and promote the formation of a moral community among people, as when users chatted with other people through bullet comments, they tended to consider what attitudes of other people towards themselves are and expressed their inner feelings[5]. Therefore, by many techniques such as bullet comments, Bilibili could help people overcome these difficulties led by the epidemic. So the demand to use Bilibili from people might be larger and then the price of Bilibili could rocket.

In terms of the peak, it can also be related to Bilibili's behaviors. In the first place, Bilibili was willing to collaborate with celebrities and establish plenty of activities. For instance, in 2021, to compensate for the regret of graduates for graduation ceremonies led by the epidemic, Bilibili designed an online summer graduation singing party with People's Daily New Media and invited celebrities involving Zhou Shen, Xu Song, Pu Shu and so on. Furthermore, these added resources in various aspects in Bilibili can promote the development of Bilibili. For example, Qi et al. claimed that, as these fields related to electronic sports had made great progress, in order to find more profit growth points, Bilibili collaborated with a lot of firms such as Tencent and created plenty of channels of live streaming of electronic sports[6]. And in 2021, Bilibili also provided live streaming of the moment of gaining the world championship of League of Legend of Edward Gaming, which brought tons of audiences. Therefore, these two aspects can make great contributions to the peak of Bilibili.

5.4. Period 3: Plummeting

However, following a period of growth, Bilibili's stock price experienced a notable decline in 2022, eventually stabilizing around 2023. This phenomenon might be led by these potential issues faced by Bilibili.

Firstly, as the epidemic came to an end, the daily lives of people came back to normal routines. People might do several outdoor activities such as hanging out with friends or travelling instead of merely staying at homes and being absorbed in these videos. These factors might sharply reduce the demand to videos among people. Therefore, the price of Bilibili can reduce obviously.

Secondly, the qualities of these originated resources cannot be as good as before. Due to the high frequency of updating videos and the flow of time, the inspirations encouraging video creators such as Laofanqie to create unique videos can also reduce. Due to the lack of inspiration, these new videos might not meet the demand of audiences effectively. So this challenge the price of Bilibili as well.

Furthermore, as the time goes by, there are more and more new potential audiences younger than Generation Z recently. On one hand, other types of social platforms such as Tiktok, Little Red Book and so on might be more attractive for these audiences due to their flexibility generated by the short videos or blogs. On the other hand, faced with coming pressure from jobs or lives, people of Generation Z might also not pay too much attention to appreciating these videos in Bilibili due to reduced spare time. Therefore, this aspect also threatens the development of Bilibili.

5.5. Possible Solutions

In order to handle these issues, there are several potential solutions for Bilibili.

In the first place, it is of significance for Bilibili to find out more profit growth points and collaborate with more organizations. For instance, as the pressure in study of students is greater because of the reduced positions of job market led by the epidemic, the demand towards videos related to education might be fiercer than before. So, this situation can provide a chance for Bilibili to seek growth points. For example, Song Hao, who is a professor in Shandong University of Finance and Economics, has become well-known for his videos about mathematics teaching on Bilibili. And according to the survey of Chen et al., plenty of universities such as Tsinghua University and Xiamen University has collaborated with Bilibili to provide online learning resources and gain positive results[7]. So, it is essential for Bilibili to try to seek more related growth points according to the situation, fashion and other aspects.

Furthermore, it is also beneficial for Bilibili to capture these interests of new audiences and even influence their tastes. As these new audiences have more chances to touch with modern technologies than the Generation Z due to the rapid development of modern society, their interests towards online resources might also be really different than before. So, digging out these new interests among new audiences, not only can help Bilibili become more attractive to these people, but also can provide more inspirations for these old video creators so that they might update more high quality compositions. And according to Zhao's research, within the development of modern society, plenty of cultural resources such as National Treasure originated by CCTV and cultural elements related to Chinese culture have been displayed on Bilibili[8]. So, Bilibili can also play an important role in guiding the correct tastes among these new audiences.

6. Conclusions

Overall, according to the SES model, which is the most precise model among these previous models, the potential price of Bilibili can be extremely affected by the recent situation and is stable in the mathematical aspect.

In the climbing period of Bilibili, the increased demand from Generation Z and unique models of platform promoted the development of Bilibili. After 2020, the higher demand to online videos led by the epidemic and new profit growth points made Bilibili rocket and reach a peak. But after 2023, plenty of factors such as the end of epidemic, the lack of inspiration, the interests of new young audiences threaten the development of Bilibili.

In terms of how to deal with these issues, these potential solutions might lie in finding novel profit growth points and attracting and affecting these new audiences appropriately.

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