# Valuation of Internet companies based on user resources perspective

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**Abstract.** User resources are an important factor in measuring the market position as well as the competitiveness of Internet enterprises, and are the main source of the value of Internet enterprises. This paper overcomes the shortcomings of traditional valuation models and constructs a new real option method based on the real option method combined with Metcalfe's method, which not only reflects the importance of user resources to the value of Internet enterprises, but also quantifies the uncertainty in the dynamic decision-making process of Internet enterprises, providing a new way of thinking and solution for the valuation of Internet enterprises. A comparative analysis of the application of the traditional valuation model of the case enterprises and the new model is also presented as a way to show that the model constructed in this paper is effective and the valuation results are more advantageous compared to the real options model under the traditional method.

**Keywords:** Value assessment; black-scholes model; Metcalfe model

## 1    Introduction

The New Crown Pneumonia epidemic further stimulated the demand for online services, with a surge in Internet healthcare, online education and telecommuting businesses. Along with the reform and improvement of China's capital market system and further optimisation of the market environment, Internet companies have been very active in mergers, acquisitions and other transactions. According to statistics from the China Academy of Information and Communications Technology, by the end of 2021, there will be 155 listed Internet enterprises in China, with a total market capitalisation of RMB 12.4 trillion. An accurate valuation of Internet enterprises is therefore particularly important for all types of economic activities.

## 2    Analysis of Internet Enterprise Value

The profit models of Internet enterprises can be broadly divided into the following three categories: the advertising fee model in which Internet enterprises place advertisements

for advertisers. Most of the companies such as video clients and search engines choose this model; the value-added service model of providing products or services to users with personalised needs and charging them for them, such as paid games with virtual currencies and video sites with membership; and the platform-based Internet companies that integrate resources to improve the efficiency of their services and then collect commissions, such as Taobao, Jingdong etc.

From the above analysis, the number of customers represents the degree of recognition of the products or services provided by the company, and largely determines the size of the value and operational efficiency of Internet companies, which is an important factor in measuring the market position and competitiveness of Internet companies. Metcalfe R (1993), one of the founders of Ethernet[1], proposed that due to the openness of the Internet's coverage, the value of the network is proportional to the square of the number of Internet users, and how to obtain a large number of user resources to enhance the value of users is the core of the value creation of Internet enterprises.

# 3     New valuation model

Using traditional valuation methods does not allow for a proper estimation of the potential value of a company, such as business model innovation, product technology innovation, target user groups, policies and other factors, which can bring significant expected returns to the company. Therefore, new interpretations and new valuation theories need to be proposed to value Internet companies.

## 3.1     Physical option law

The real options approach allows flexibility in selecting useful values based on internal and external information that can reflect potential future earnings opportunities. The main ones are the Black-Scholes model for continuous time, and the binomial tree model for discrete cases. The latter is not used to assess the value of a company as the market prefers a continuous time state[2]. B-S models are more commonly used as they have the advantages of low subjective influence, easy availability of parameters and simplicity of operation when implemented in concrete terms[3]. For Internet companies, they need to constantly adjust their business strategies and profit models in the process of development. The use of real options theory can effectively quantify the risks brought about by the uncertainty of business or investment projects, but ignores the impact of user resources that determine the size of the value and operating efficiency of Internet companies. The Black-Scholes model is as follows.

$$C = SN(d_1) - Ke^{-rt}N(d_2) \tag{1}$$

$$d_1 = \frac{1}{\sigma\sqrt{t}}\left[\ln\frac{S}{K} + (r\frac{\sigma_2}{2})t\right]; \ d_2 = d_1 - \sigma\sqrt{t} \tag{2}$$

C-the value of the option; S-the present value of the underlying asset; K-the execution price of the option; r-the risk-free interest rate; σ-the annualized volatility of the underlying asset price; t-the exercise period of the option.

## 3.2    Metcalf method

This approach assumes that the value of a network is proportional to the square of the number of users on the Internet, also known as the value of a network is proportional to the square of the number of nodes on the network. Transactions increase as nodes interact with each other, so the more nodes there are, the more value there is, and this non-linear growth plays an important role in the development of the 'new economy'[4]. This approach quantifies the importance of user resources to the value of Internet companies and provides a new perspective for the in-depth study of user resources. However, some scholars argue that its blind focus on the number of users ignores the uncertainty of future investment in Internet enterprises, leading to an overestimation of enterprise value[5]. Its expression is:

$$V=K\times N^2 \tag{3}$$

$$Netoid=P/(1+e^{-v(t-h)}) \tag{4}$$

V-enterprise value; N-user scale; K-value coefficient; P-maximum number of users; v-speed when the maximum number of users; h-time of the maximum number of users.

Therefore, in this paper, from the perspective of user resources, the real option model is used as the basis for valuing Internet enterprises in combination with Metcalfe's method. This is done by firstly, using Metcalfe's Law to forecast and discount the number of future users and the revenue and costs of the Internet enterprise; secondly, using the discounted revenue and cost forecasts as the present value of the underlying assets and the exercise price in the real options B-S model; and finally obtaining the intrinsic value of the Internet enterprise through calculation.

# 4    Case analysis

## 4.1    Company overview

Weibo Inc. is a subsidiary of Sina, a Chinese-language social media based on the sharing of information about users' relationships. Since its launch in August 2009, it was officially listed on the NASDAQ in April 2014 and has grown by 685% from having 0.73 billion active users in 2012 to 573 million active users in 2021.

## 4.2    Modified valuation analysis of the physical option model

**Fit the operating revenue and the user number.**
According to the number of monthly active users given by the wind database, Metcalf's operating revenue and its monthly active users were analyzed by STATA by using Metcalf's software. The P-value was 0 and the $R^2$ was 99.2%, indicating a good

fit. (As shown in Figure 1). We can express the relationship between revenue and the number of monthly active users.   R: Annual operating revenue; X: Monthly active users.

$$R=0.0069\times X^2 \tag{5}$$

**Fit the operating costs and the number of users.**
  Similarly, STATA software was used to regression the microblog data from 2011 to 2021, and the fitting effect is shown in Figure 1. The P value was zero and $R^2$ was 97.1% with a good fit. It can be concluded that the relationship between microblog operating cost and the number of users is:

$$C=0.0013\times X^2 \tag{6}$$

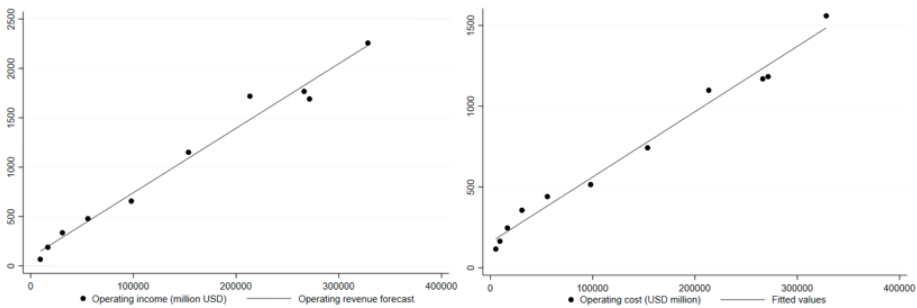C-Annual operating cost; X-number of monthly active users of company



**Fig. 1.** Fit map of operating income, operating cost and monthly active users

**Future user count, revenue, and cost forecasts.**
  According to the growth pattern of the number of users of Internet companies discovered by Professor Metcalfe, this paper uses stata software to process the number of monthly active users of microblogging companies from 2011-2021 in a non-linear regression analysis. As shown in Table 1, where the p-value is zero at 99.9%, indicating a good fit. The growth model for the number of Weibo users was derived as follows.

$$Y=626.4836/(1+e^{-0.4568(x-2015.939)}) \tag{7}$$

**Table 1.** Analysis of monthly active users

| Y | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| b1 | 626.4836 | 20.654 | 30.33 | 0 | 578.856 | 674.111 | *** |
| b2 | .4568 | .028 | 16.51 | 0 | .393 | .521 | *** |
| b3 | 2015.939 | .204 | 9895.02 | 0 | 2015.469 | 2016.409 | *** |
| Mean dependent var | | | 317.036 | SD dependent var | | | 185.302 |
| R-squared | | | 0.999 | Number of obs | | | 11 |
| F-test | | | 3191.126 | Prob > F | | | 0.000 |
| *** p<.01, ** p<.05, * p<.1 | | | | | | | |

**Table 2.** Forecast of operating revenue, operating costs, and monthly active users

| Predicted year | Monthly active user forecast | Income forecast | Income discount | cost forecast | Cost discount |
|---|---|---|---|---|---|
| 2022 | 589.52 | 2397.99 | 2114.26 | 451.79 | 398.34 |
| 2023 | 602.56 | 2505.26 | 1947.48 | 472.01 | 366.92 |
| 2024 | 611.08 | 2576.63 | 1765.97 | 485.45 | 332.72 |
| 2025 | 616.68 | 2624.02 | 1585.65 | 494.38 | 298.75 |
| 2026 | 620.22 | 2654.24 | 1414.14 | 500.07 | 266.43 |
| total | 3040.06 | 12758.13 | 8827.49 | 2403.70 | 1663.15 |

$$KE = Rf + (Rm - Rf) \times \beta \tag{8}$$

Rf: risk-free rate of interest, $\beta$: $\beta$ coefficient, Rm: risk-average return rate. This paper uses the 10-year yield of 2.84% on the Treasury bonds, as a risk-free interest rate. The 10-year S & P 500 index average yield is 12.15% as the average market yield. With the S & P 500 as the underlying index, the adjusted $\beta$ for five years from 2017 to 2021 was calculated as the company's risk factor of 1.136. Therefore, the discount rate of Weibo is 13.42%. With formula 8, the forecast value of Weibo's operating revenue, operating costs and monthly active users in the next five years is obtained, as shown in Table 2.

**Weibo valuation results.**

    t: the time until the expiry of the option. According to the research of relevant scholars, the average life span of Chinese internet companies is 3.51 to 6.70 years, The exercise period was therefore determined to be five years[6]; $\sigma$: the annualized volatility of the underlying asset. The closing price history data for a total of 1,259 trading days from 03/01/2017 to 31/12/2021 shown in the wind database was selected to find the standard deviation of the daily return, which is 3.2138%, and multiplied by the square root of the number of trading days per year, which is $\sqrt{251.5}$, to obtain the annual volatility, which was calculated to be 50.97%. The calculation process is as follows:

$$d_1 = \frac{1}{\sigma\sqrt{t}}\left[ln\frac{S}{K} + (r\frac{\sigma 2}{2})t\right] = \frac{1}{50.97\%\sqrt{5}}\left[ln\frac{8827.49}{1663.15} + \left(2.84\%\frac{50.97\%^2}{2}\right) \times 5\right] = 1.4806$$

$$d_2 = d_1 - \sigma\sqrt{t} = 0.3409; \quad N(d_1) = 0.9306; \quad N(d_2) = 0.6331$$

$$C = SN(d_1) - Ke^{-rt}N(d_2) = 8827.49 \times N(d_1) - 1663.15e^{-0.142}N(d_2) = 73.01$$

## 4.3    Use the uncorrected physical option model for valuation

S: the present value of the underlying assets, the total assets of Weibo's 2021 annual report were chosen instead. k: the exercise price of the option. Total liabilities to replace. As at 31 December 2021, S = US$7.52 billion and K = US$3.832 billion. The other parameters are the same as those used to construct the model in this paper.

    $d_1 = 0.6077$; $d_2 = -0.5320$; $N(d_1) = 0.7291$; $N(d_2) = 0.2981$. The result is: $4.492 billion.

### 4.4     Valuation results analysis

When compared to Weibo's announced market capitalisation of US$7,537 million on 31 December 2021, the deviation rate of the modified real option model assessment is less than that of the unmodified real option model.

According to the annual financial report, from 2018 to 2021, the net profits attributable to shareholders of microblog will be US $572 million, US $495 million, US $313 million and US $428 million, respectively. Even before the epidemic, the net profits of microblog will be in decline. For the cost, the total amount is 1.099 billion US dollars, 1.169 billion US dollars, 1.183 billion US dollars and 1.56 billion US dollars respectively, and the cost increases year by year. In recent years, there have been more and more competitors, including Tiktok, Kwaishou and other short video platforms. However, the microblog business model lacks innovation. Most of the revenue comes from advertising and marketing services. Value added services account for less than 15% of the total revenue. The revenue from advertising and marketing services in the four years accounted for 87.24%, 86.6%, 86.67% and 87.76% respectively. Moreover, according to the annual report data, most of the advertising and marketing service revenue comes from related parties. After analysis, the current market value of Weibo Co., Ltd. may be overestimated.

## 5     Conclusion

This paper takes into account the sources of value as well as uncertainties of Internet companies to form a modified real option valuation model, and uses Weibo as an example to value the company. Through analysis, it is concluded that the model constructed in this paper is effective and the results are more advantageous compared to the real option model under the traditional method.

## References

1. Metcalfe R,1995," Metcalfe's law", Infoworld, pp.17-53.
2. Li, Yinlong and Hu, Zhiying, 2021, 'Perceptions of the valuation of Internet companies from the perspective of real options', Investment Research, Vol. 40, 123-130.
3. Luo Aijun, 2020, The Value Evaluation of Cultural and Creative Companies Based on the Physical Options Method, Finance and Accounting Communications, No.12,131-133 + 146.
4. Qiao Yangjiao and Yue Guoqiang, 2020, The Type and Value Evaluation and Analysis of Digital Economy Enterprises, Finance and Economy, no. 9,60-67.
5. Liu Tingting, Wang Mingfeng, Zhang Yinghao, 2021, Research on the spatio-temporal Pattern and influencing Factors of Chinese Internet Enterprises, Progress in Geographic Science, no. 40,410-421.