Dividend Discount Model Study and Example Analysis

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Abstract. There is an urgent need for the Chinese market to conduct analytical research on the actual value of stocks rationally, and the issue of determining whether a store has investment value has become a hot topic. The dividend discounting model proposed by Williams is a method to calculate and study the intrinsic value of common stocks using the tip discounting method. With the help of this model, investors can make more accurate, objective, and rational judgments with the support of a large amount of data. In this paper, I will present basic information about the dividend discount model and analyze the advantages and disadvantages of the model and each derived formula in terms of applicability and limitations. To make my research more convincing, the paper will take the typical popular Internet companies iFLTTEK. Col.Ltd. and Tencent as examples. I will try to value these companies based on the dividend discount model with detailed data from the financial statements in a case study.

Keywords: divided discount model; stock value; Internet.

1. Introduction

Stock trading in China appeared in the late 19th century, at the end of the Qing Dynasty. After more than a hundred years of high-speed development, and continuous regulation by the government and economists, as of 2021, there are 468,5 listed companies in China, and the amount of stock raised is 542.654 billion yuan, which is a rapid growth rate. Compared to its initial starting point, China's stock market has grown considerably and reached a considerable size. In terms of the size of the stock market and its role in the economy, it has become a part of social and economic life that cannot be ignored. Since then, the increasingly sophisticated stock exchange market and the constant publicity related to it have led to the growing enthusiasm of the majority of small and medium-sized investors for stocks. The market is constantly flooded with institutional investors holding large amounts of funds and retail investors with large amounts of idle capital, hoping to gain benefits from dividend distributions or to gain greater benefits by buying and selling stocks with extremely volatile prices at different points in time. In recent years, the Internet has multiplied, with massive capital injections and numerous Internet companies of different sizes listed on various exchanges, pushing the Internet industry to the top. Behind this hot and crazy phenomenon, is there really such a high value, or is it false prosperity of hype, which is a question worthy of contemplation. It is well known that there was a six-year-long Internet bubble from 1995 to 2001. The crazy rise in stock prices was followed by a plunge that made countless Internet companies close down and bankrupt countless investors [1]. The revival of the Internet industry in China today urgently requires an analytical study using rational value analysis tools. Thus, determining whether or not a stock has investment value becomes a question they are eager to know, making the estimation of the intrinsic value of stock particularly important. Stock value analysis is not only answering this answer but also provides managers and investors with important bases related to financial management, investment decisions, etc. It is also a valuation tool for equity transactions and mergers and acquisitions, and its importance is self-evident. Related valuation methods and models were also naturally born and developed with high importance in the long term. Over the past hundred years, financial experts have proposed numerous models for valuing stocks, the most famous and widely used of which is Williams' dividend discounting model. It is a method of calculating and studying the intrinsic value of common stocks using the dividend discounting method. Investors can use this model to get more accurate, objective, and rational judgment with the support of a large amount of date [2].

Research will use the case of a typical emerging Internet company, Beijing FunPlus Technology Co. To make my research more convincing, I will try to value this company based on the dividend discount model and use detailed data from financial statements as a case study in the following.

2. Literature Review

For the Chinese stock market, calculating the real value of a stock is an old topic in finance. By understanding its definition, meaning, it can be further studied to deepen it and decide whether it is worth promoting.

2.1 Definition of the Dividend Discount Model

The dividend discount model, or DDM, is one of the most fundamental models for assessing the intrinsic value of stocks. The Dividend Discount Model (DDM) for assessing the value of a company (stock) was proposed by Williams and Gordon in their 1938 publication "The Theory of Investment Value", which provides a theoretical foundation for the quantitative analysis of virtual collateral, assets and the value of a company, as well as the primary analysis of portfolio investment. It also provides a strong academic foundation for the elemental theory of security investment[3].

2.2 Principle of the Dividend Discount Model

The intrinsic value of a stock is the value that the store itself should have, not its price in the market. A company produces goods or provides a service for profit, and the cash flow from its commercial operations defines the earnings power of the company and is reflected in its share price. The inherent value of a stock can be assessed as the sum of the present value of the annual dividend income from that stock. Dividend is the return given to shareholders by the joint-stock company which issues the store, and the bonus usually comes from the company's profits. The profits are distributed in proportion to the shareholders' shareholding, and the profit shared by each share is the dividend per share. The discounted dividend model is a quantitative analysis that measures the current fair value of a company's stock by discounting the sum of future dividends paid by the company. It is an attempt to calculate the fair value of the store without taking into account current market conditions, taking into account both dividend payout factors and expected market returns. This evaluation method is based on whether a person will always hold this stock. For instance, if he owns this company [4]. It is natural to always keep this stock). Then the discounted value of the dividends he receives from the company year by year is the value of this stock. If the value calculated by the DDM is higher than the stock's current trading price, then this stock is overvalued and worth buying. If the value that the DDM calculates is lower than the store's current trading price, then the stock is overvalued and not worth buying.

3. Main Dividend Discount Model

The dividend discount model has the advantage of simplicity and convenience, which is one of the fundamental reasons it can be widely disseminated. However, the dividend discount model also has some limitations due to some basic assumptions in the model design. DDM can only assume a constant dividend growth rate, so it is usually only applicable to mature companies with stable dividend payments but not to emerging companies with unstable dividend growth rates or no dividends [5]. This is because it is challenging for us to predict the dividend growth rate if the ratio and amount of dividends change dramatically, thus making the model inappropriate for the actual situation. In detail, rewards are usually discounted for companies that are growing at a high rate. Assuming that the discount rate is meaningless, setting any number, in this case, will be seen as an overestimate. There is no doubt that the company itself needs capital to invest in some operational projects during its high growth rate. The investment in this area is to help the company grow better.

During the growth process, it is better for the long-term value of the company's equity to use the funds for research, etc., than to return it to the shareholders [6].

Therefore, the existence of this significant flaw has also drawn the attention of many later researchers, who hope to reduce the constraints imposed by the dividend discount model assumptions on its use while at the same time improving the accuracy of the dividend discount model in evaluating the intrinsic value of stocks. Since it is difficult to predict future dividends for each period in the dividend discount model, later researchers have explored and improved on the general dividend discount model to address the difficulty of determining future dividends. The most classic and commonly used improved dividend discount models are single-stage models, which include zero-growth and fixed-growth models, and multi-stage growth models, which have two-stage growth models, three-stage growth models, and H models. In the following, we will focus on three categories of dividend discounting models, analyze the characteristics of different models, and explore the scope of application of other models [7].

3.1 Zero-growth models

The zero growth model can also be called the dividend discount constant growth model. The basic assumption of this model is that the growth rate of future dividends is equal to zero and that each future compensation is paid at a fixed amount. The zero growth model, like the discount model, is based on an infinite dividend payout and can be considered a particular case based on the dividend discount model. The zero-growth model can be used to estimate the intrinsic value of a company in stable growth, where the level of business volume remains stable over a long period without much change in the future, where sales earnings do not fluctuate much, and where the dividend policy is regular, and where no or little change in dividends per period is expected for an extended time in the future. Assuming that the expected reward in the first year is D0 and the stable growth rate is g, in other words, it is equal to zero, so the formula for the zero growth model is:

$$P_0 = D^1 / k\text{-}g = D_0 \text{-} k \tag{1}$$

3.2 Fixed-growth Models

The basic assumption of the fixed growth model is that the company's dividends are growing, and the growth rate of dividends is kept at a fixed value, i.e., g is a constant. Thus, in the fixed growth model, future dividends grow in an equiproportional series, and assuming that the dividend in the first year is D_0, it follows that the dividend in year t is

$$D_t = D_0 - (1+ g)^t \tag{2}$$

This leads to the following equation for the fixed growth model.

3.3 Multi-stage Growth Models

The multi-stage growth model is built based on the multiple stages presented in the development process of the enterprise. This divides the enterprise development progress by artificial means, which dramatically reduces the difficulty in the calculation process, simplifies the tedious calculation process, and overcomes the main drawbacks of the two models mentioned above: it only applies to companies that are stable and no longer growing at high speed, expands the scope of application to refer to companies that have switched from a high growth rate to a stable one, and requires less data, which is easily accessible and easy to calculate, and evaluates the stock's intrinsic value is also more reliable[8].

Because of the large number of DDM-related model derivatives, different characteristics and application scope, and the difficulty factor is too significant. So there is not much detailed introduction and analysis in this paper.

3.4 Application of Dividend Discounting Model- iFLTTEK.Col.Ltd.

iFLTTEK.Col.Ltd. was founded in 1999 and is a well-known intelligent voice and artificial intelligence listed enterprise in the Asia-Pacific region, specializing in intelligent agent and speech technology research, software and chip product development, and voice information services[9]. It is a national backbone software enterprise belonging to technology in various fields with broad applications. The enterprise achieved listing on the stock exchange in 2008, and its stock code is 002230.

The following table shows the financial data of this company from 2008 to 2012, including dividend payment policy, dividends per share, and earnings per share.

Table 1. Dividend and Earnings per share of iFLYTEK 2008-2012

Year	2008	2009	2010	2011	2012
Dividend Payment	free 3 shares and 0.355 RMB for every shares	null	null	null	free 6 shares and 1.7 RMB for every shares
Dividend Per Share	0.034	/	/	/	0.16
Earnings per share	0.71	0.50	0.63	0.53	0.48

It is not difficult to see from the table that in the first four years, the company does not pay dividends, and the shareholders do not receive corresponding profits, so we cannot use the dividend growth model to estimate the stock's intrinsic value. But this company has excellent prospects and a high growth rate [10].

Meanwhile, iFLTTEK, as a high-tech Internet company, has a high P/E ratio level, which shows that the company's model and stock discount model fit best with the two-stage growth model, so the model will be used below to calculate the approximate intrinsic value of the company's stock.

Since there is almost no dividend payment data from the IPO in 2008 to 2011, by continuing to review the audit reports, the dividend payment data is relatively stable between 2017 and 2021. Therefore, I chose the data for these five years to calculate the average dividend per share of 0.221 and obtained the dividend payout ratio of 0.37. In the following calculation, I continued to use the company's published data or speculated from the existing data to receive the equity to debt ratio of 36.77% and the capital growth rate of 0.089. By substituting these data into the two-stage growth model, the current value of KDDI is. The current value per share of KDDI is 37.62 RMB.

3.5 Application of Dividend Discounting Model- Tecent

Established since November 1998, Shenzhen Tencent Computer System Co., Ltd. is one of the leading value-added Internet service providers in China. For more than a decade since its establishment, Tencent has been committed to enriching the lifestyle of Internet users through technology and providing stable and high-quality services for hundreds of millions of people. The company consistently experiences steady growth. Tencent's multifaceted services include QQ and WeChat, social networking platforms, Qzone, QQ Games, Tencent News, Tencent Video and more. Tencent was listed on the Hong Kong Stock Exchange in 2004 under the ticker symbol 00700.

After analyzing the financial statements by reviewing them, just like the previous example of KDDI, we calculate the two indicators of earnings per share and dividends per share based on dividend payments and distributable profits, as well as the return on assets and the debt-to-equity ratio and interest rate on debt, so that we can calculate the capital growth rate of Tencent. As an important indicator to measure and evaluate the profitability of listed companies, the P/E ratio is indispensable. By combining the above data and calculating the two-stage growth dividend discounting model with

dividend ignoring, the intrinsic value of Tencent is calculated, and the inherent earnings per share are currently 301.2 RMB.

4. Conculsion

Thus, in terms of stock valuation, the above theory fully illustrates that the dividend discount model has considerable advantages and particular problems. The two-stage growth model of the dividend discount model is a very effective method for analyzing and evaluating the intrinsic value of high-tech Internet companies and can be applied more widely. Even for beginners, it is easy to estimate the approximate real value of a stock by simply getting the data needed for the model. In the above article, I calculated the stock prices of Xunfei Science and Technology and Tencent, two leading Internet companies, at $37.62 and $301.26, respectively. Reviewing the stock prices shows that the actual share prices are $37.15 and $307.00 (closing price on September 12, 2022).

The two data sets are very close, and the difference is negligible. For the differences that exist, analyzing the reasons for the differences is due to several reasons. First, some limitations of the dividend discounting model itself cause the differences. In the two-stage growth model, it is essential to determine the length of the growth stage because the growth rate is expected to decrease to a flat level after the growth stage, so the reduction of the growth period in the growth stage will lead to a decrease in the calculated intrinsic value of the stock. Second, the two-stage dividend discounting model assumes that the growth rate clusters after the growth period and decreases to a lower level. In practice, the growth rate of a company generally decreases gradually from a higher growth rate, a slow and gradual process, rather than a convergence process. Both reasons further contribute to the difference between the price calculated by the dividend discounting model and the actual market price. Considering the above, the reasons for the difference between the intrinsic value and the stock's market value calculated based on the dividend discount model can be explored.

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