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# The determinants of IPOs underpricing: evidence from the Internet industry on Chinese stock

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## Abstract

Considering the rapid development of the Chinese Internet economy in the twenty-first century, this study empirically investigates the determinants of China's IPOs underpricing on the Internet industry by analyzing the sample of 63 listed companies in Shanghai and Shenzhen stock exchanges. The regression results show that two factors, the issuing price of IPOs and stock retained earnings rate, have a significant impact on the IPOs underpricing rate of the Internet company. The result of robustness checks suggests the same results that the issuing price of IPOs and stock retained earnings rate are two determinants mainly driven the IPOs underpricing rate of the Internet company. This study explores several underlying theories of IPOs underpricing and provides scholars with a new outlook to understand IPOs underpricing theories.

*JEL Classification*: G15, G20

*Keywords*: IPOs underpricing, Determinants, the Internet industry

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# 1. Introduction

In the late 1990s, the rapid development of the Internet industry in the United States accumulated a serious economic bubble. The collapse of the high-tech bubble dominated by the Internet industry has finally adversely affected the US Internet industry and economic development. In recent years, China's Internet industry has developed rapidly. Similarly, with large amounts of capital, China's Internet sector faces a particular risk of an economic bubble.

In recent years, the rise of China's stock market has shown a series of unique phenomena, which makes it different from western financial markets. In emerging markets, some studies point out that the initial return rate of IPOs in China is the highest in the world. In other words, China's IPO underpricing rate is the most serious in the world. According to Tian (2010), the average underpricing of IPO in China is 247%, higher than the average initial return of IPO in any country in the world. He believes that China's IPO underpricing is mainly caused by the government's regulations in IPO pricing and IPO stock supply. Mok and Hui (1998) studied 101 IPOs from 1990 to 1993 and found that the average underpricing rate of China's stock market was 462%. They believe that the country's high equity retention rate and the long-time interval between issuance and listing lead to this excessive underpricing. Su and Fleisher (1999) surveyed 308 companies from 1987 to 1995 and recorded a first-day return of 231%. They interpret this extreme underpricing as a pricing strategy that allows companies to convey their value to investors and speculate on future earnings.

At the beginning of the 21st century, under the background that China's IPO was generally underpriced, the stock value of the Chinese market, especially the stock value of Internet companies, reached an unprecedented level. Internet IPO in the Chinese market generally has a considerable underpricing range and has remained high for a long time, adversely impacting the

development of China's capital market and national economy. For example, given that the subscription of new shares can obtain a very high risk-free income in China, the pursuit of risk-free returns has led to many funds entering the stock market, which has helped promote speculative internet bubbles and reduced the efficiency of capital allocation in society. As the new economy leader, the share prices of Internet companies such as Tencent, NetEase, and Ali have climbed all the way up. These substantial price surges have brought out questions about whether the traditional IPO underpricing theorems are still valid when facing the Internet IPOs and whether the influencing factors that drove the exorbitant internet IPO underpricing would foster the internet bubble to some extent.

Several studies have noticed that there are some differences in IPO underpricing between Internet companies and non-internet companies. According to Bhagat & Rangan (2004), for the influencing factors of IPO valuation of Internet companies, the value retained by insiders is higher. Still, surprisingly, the value of investment banker reputation is lower. Duchame et al. (2001) pointed out that Internet IPO underpricing mainly comes from media speculation to promote underpricing or brand promotion activities to improve consumers' awareness of Internet companies. According to Bartov et al. (2002), the differences in IPOs valuation between the Internet and non-internet companies results from the difference in the prospectus and the final IPOs stage. Internet companies also differ in positive cash flow, sales growth, R&D, and high-risk warnings.

Given the relatively high market valuation of China's Internet economy in the early 21st century, evaluating the IPO valuation of Internet companies would be a fascinating topic. Although many studies have been done to explore the primary causes of IPO Underpricing and the unique factors of IPO underpricing in the Chinese market, rare studies comprehensively

investigate the determinacies of IPO underpricing. Our study aimed to find the potential determinants of IPOs underpricing in the Internet Industry.

Based on the literature review, this study firstly selected seven variables possibly affecting to IPOs underpricing. Then, we built a regression model to explore which determinants have statistical significance on the IPOs underpricing rate. Third, we used the principal component analysis to find the principal components in our model. After that, three interaction terms were extracted and added to the interaction term regression model to check the initial regression results. Additionally, the robustness check was used to check our regression results by replacing return on assets into return on equity. Besides, the one-way ANOVA test was applied to analyze which variable alone is statistically significant on the IPOs underpricing rate.

We found that IPOs underpricing of Internet companies have some similarities and differences with IPOs underpricing in other industries. First, the oversubscription rate positively drives the IPOs underpricing rate, which is conflicted with the study of Chang et al. (2008). Secondly, we find that the profitability of Internet companies doesn't drive the IPOs underpricing, which is consistent with Wahyusari's study (2013). Thirdly, the reputation of underwriters is negatively correlated with the underpricing rate of IPOs in Internet companies. Still, such a relationship is not significant, which is consistent with Carter et al. (1998). In addition, the issuing price of IPOs actively drives the underpricing rate of IPOs, which is very consistent with the research results of song et al. (2014). For the robust check, ROE (return on equity) is used to replace ROA (return on assets). The results of the robust check suggest that the issuing price of IPOs and stock retained earnings rate are two determinants mainly driven the IPOs underpricing rate of the Internet company, which is consistent with the main regression results.

This study also explored the two possible explanations of IPOs underpricing rate by IPOs pricing theory and corporate value theory. For IPOs pricing theory, the company strategically sets a relatively low IPO price to encourage potential investors. Such actions result in speculative transactions and excessive demand for low-cost IPOs. For corporate value theory, the higher value of Internet companies sends a positive signal to investors about the actual value of the company, resulting in more severe IPO underpricing. Our research findings provide a new perspective for relevant scholars to find more potential dominants driving the IPOs underpricing rate on the Internet companies and explain the differences of determinants of IPOs underpricing rate between Internet industry and general industry.

The remainder of our paper is organized as follows. Section 2 introduces the potential determinants theories based on the literature. Section 3 describes the data. Section 4 presents our empirical methodology, our model estimation results, our regression results and our robustness checks. Section 5 gives our discussions, limitations and conclusions.

## 2. Literature Review and Hypotheses Development

The influencing factor of IPO underpricing has always been an essential and continuous debate topic in the securities trading literature. The determinants of Internet IPO underpricing are complex and broad in theory. We reviewed the relevant theoretical and empirical evidence in the following sections.

## 2.1 How does Traditional IPO underpricing theory works?

At present, many scholars have put forward the theory of IPO underpricing worldwide and tested it with the data of various stock markets.

Rock (1986) came up with the winner curse hypothesis. He believes that there is information asymmetry in the market. There are investors with information and investors without information in the market. Investors with information can often use their information advantages to buy stocks with investment value, while investors without information can only judge according to the behavior of other investors. Finally, they can only buy stocks that have no investment value and are avoided by investors who have information. When investors without information notice the "winner curse", they will withdraw from the market. Because the stock underwriters need to attract these public investors who do not know the information, they have to reduce the IPO price to make up for the risks borne by those who do not possess the information and ensure the smooth progress of the issuance. Therefore, this means that the underpricing is to reward informed investors who disclose private information.

Baron (1982) built up a model based on the buyer's monopoly of investment banks hypothesis. He demonstrates that when enterprises hand over the pricing power of new shares to investment banks with more information advantages, they tend to set the issue price of new shares below its value. On the one hand, this can reduce the risk of investment banks in underwriting or underwriting the stock, which is more conducive to the successful issuance of new shares and will not affect the reputation of investment banks due to the failure of new share issuance. On the other hand, discount issuance provides investors in investment banks with an "excess rate of return", which can establish a good relationship with investors. Considering that

the market lacks adequate supervision over investment banks, investment banks often adopt discount issuance strategies to achieve issuance success.

## 2.2 Characteristic for IPO underpricing in China's securities market

The rise of China's stock market shows some particularity, making it the highest IPO underpricing rate in the world. Scholars began to explore the reasons behind it. Tian (2010) used the supply and demand analysis framework to model this extreme underpricing. He pointed out that the widespread IPOs underpricing in the Chinese market is mainly because of the supervised IPOs pricing regulations and controlled IPOs stock supply. Su and Fleisher (1999) investigated IPO's first day returns from 1987 to 1995. They interpret this extreme underpricing as a pricing strategy that allows companies to convey their value to investors and speculate on future earnings. Chang et al. (2008) found that the average initial return of IPOs from 1996 to 2004 was 123%. They believe that considering investors know less about IPO stocks and realize the higher risk of buying IPO stocks, the abnormal return of IPO on the first trading day will be higher, which returns to the theory of information asymmetry.

## 2.3 Potential determinants for Internet IPO underpricing

Although many studies explore the primary causes of IPO Underpricing and the unique factors of IPO underpricing in the Chinese market, rare studies comprehensively investigate the determinacies of IPO underpricing. The following are some studies on the determinants of IPOs. These research results provide crucial guidelines for our research.

First, LizińSka et al. (2014) investigated the price of IPOs listed on the Warsaw stock exchange from 2004 to 2009 and found that the profitability and size of companies affect IPO underpricing. Smaller companies have higher IPOs returns. The higher the profitability of the company before issuance, the higher the IPO underpricing rate. Considering that the company's profitability before IPO will affect IPO underpricing to some extent, the company's profitability is regarded as a variable related to underpricing.

**Hypothesis 1: IPO underpricing rate is mainly driven by the profitability of an Internet company.**

Secondly, when exploring Internet IPO underpricing and the market value of Internet companies, retained capital is supposed to be taken into consideration. Downes and Heinkel (1982) examined the correlation between the capital retained within the company value. The study found that a high level of retained capital helps keep the interests of the company's management consistent with the interests of new shareholders. At the same time, the higher the proportion of retained capital means that the management has more confidence in the prospects of the IPO company. Considering that the company with higher earnings retained is more capable of setting higher pricing for IPO and thus signify the higher value of the company to potential investors, such high retained earnings will help increase IPO underpricing.

**Hypothesis 2: IPO underpricing rate is driven by the retained earnings rate of an Internet company.**

In addition, the reputation and quality of underwriters are essential considerations for Internet IPO underpricing. Beatty and Ritter (1986) and Kim and Ritter (1999) show a negative correlation between underwriter reputation and the initial performance of IPOs. This negative relationship is attributed to the certification role played by reputable underwriters. Reputable

underwriters often have more detailed financial reports and stricter evaluation procedures for listed companies. They help to reduce information asymmetry between owners and potential investors. Therefore, this dramatically weakens the underpricing of the IPOs.

Internet company's tactically high IPOs pricing strategy will affect IPOs underpricing to some extent. Slama Zouari et al. (2011) believe that the company will not arbitrarily set IPOs quotations. The company might charge a relatively low price to encourage potential investors to subscribe to company shares and ensure the success of the IPOs. Such a strategy will systematically lead to excessive demand for securities, resulting in greater underpricing. Also, Chowdhry and Sherman (1996) content that potentially high-priced IPOs may attract more investors seeking high potential capital returns. If the company discloses the IPO price before bidding, it is likely to involve vital information disclosure. This will lead to increased demand for the company's shares, especially when investors realize that the issue price is low.

**Hypothesis 3: IPO underpricing rate is driven by the issuing price of the IPO.**

The age of the issuing company is also one of the factors affecting IPO underpricing. Zhou (2012) analyzed the influencing factors of IPO underpricing in ChiNext and found a positive correlation between company age and IPO underpricing rate. The younger the company, the lower the underpricing rate. Although the enterprises listed in the ChiNext are generally young, and most are high-tech, investors prefer to choose a well-developed company stock. Also, a similar conclusion was drawn by Megginson et al. (1991) that the company's age negatively affects the IPOs underpricing. Compared with the old company, the newly established company shows higher prior uncertainty. Young companies with less experience are unlikely to be well evaluated by financial analysts because they do not have enough historical published financial data.

**Hypothesis 4: IPO underpricing rate is driven by the age of internet companies.**

Generally speaking, investors' demand for IPO will affect IPO underpricing, which is reflected in the subscription degree of IPO. Some studies use the oversubscription rate to represent investors' demand for IPO to explain the underpricing rate on the first day of IPO. Hanley (1993) found a positive correlation between subscription rate and initial performance scale in American IPO samples. Slama Zouari et al. (2011) analyzed the samples of IPOs in the Tunisian stock market and found that there was a positive correlation between the oversubscription rate and IPO underpricing, which was understood as that investors' overreaction in the short term affected IPO underpricing.

Media exposure might be an influencing factor that affects Internet IPO underpricing. Bajo & Raimondo (2017) investigated more than 2800 US IPOs and more than 27000 newspaper articles and found that positive media reports were positively correlated with IPO underpricing. Duchame et al. (2001) pointed out that the existence of high-quality underwriters and greater media exposure before IPO are uniquely related to Internet IPO underpricing. For popular Internet IPOs that received more media attention before the IPO date, the return performance on the first day after the IPO is often worse. Besides, three factors have a decisive impact on Internet IPO underpricing: (1) media speculation promotes underpricing; (2) Internet companies put their funds on the desktop so that they can follow up financing offers to follow up underpriced IPOs; (3) Underpricing is a brand promotion activity aimed at improving consumers' awareness of Internet companies. However, Bhattacharya et al. (2009) linked the Internet IPO and non-internet IPO from 1996 to 2000 and all the related news. They found that the media was more active in Internet IPO during the sharp rise in share prices, but the media hype could not explain the Internet bubble.

At the same time, the company's long listing time will also harm IPO underpricing. Mok and Hui (1998) and Su and Fleischer (1999), according to the IPO issuance data of the Shanghai Stock Exchange, it is found that there is a positive correlation between the average initial return of IPO and the listing time. When the company is listed for a long time, the market may modify the expectation of its future value, thus affecting the subsequent underpricing level.

Besides, the company scale may affect IPOs underpricing. Cassia et al. (2014) studied 182 IPOs in the Italian stock exchange and found that the company size is negatively correlated with the price update in IPOs, which means that smaller companies tend to have higher IPOs underpricing rates.

In short, based on various assumptions and explanations brought out by previous studies, influencing factors for Internet IPOs includes company profitability, company value represented by retained capital, underwriter reputation, the age of issuing company, the demand for the IPO, delay in listing time, excessive IPO pricing, and issuance scale may potentially impact Internet IPO underpricing. Therefore, this study will further explore the decisive factors of Internet IPO underpricing by integrating the conclusions of previous studies and using the evidence from China stock exchange.

# 3. Data and Methodology

## 3.1. Data and variables

This research adopts one data source: the Wind financial database.

By using the industry classification function in the Wind database, this study screened 63 Internet IPOs from 1991 to 2021. Many factors are affecting the IPOs underpricing of listed companies. According to previous studies, this study comprehensively considers seven possible

influencing factors: ROA, retained earnings rate, oversubscription rate, IPOs pricing, the reputation of the primary underwriter, company age and company size. The following is a specific description of the variable:

IPOs underpricing rate represents the closing price of new shares/issuance price of new shares - 1 on the first trading day. The IPOs underpricing rate of each Internet stock is gained directly from the wind database. The company age is calculated from the company's establishment time to the listing time in the Wind database. IPOs Pricing is the issuing price of the IPOs, which can be obtained directly from the wind database. The company's ROA the year before the IPO is collected and used to indicate the company's profitability before the IPO. Retained earnings rate is indices to measure the value of the company. It is calculated through retained earnings per share/issue price. Retained earnings per share are collected from the Wind database. The retained earnings per share here is the company's retained earnings per share in the year before the IPO. Oversubscription rate is the ratio of the number of subscribed shares to the number of issued shares. The number of subscribed shares and the number of issued shares are found in the Wind database. However, three company's oversubscription rates are missing. The reputations of the primary underwriter denote the popularity of the underwriter. This is a dummy variable, which is created according to the underwriter ranking in the wind database. If the underwriter responsible for IPO is within 20 in the ranking table of IPO year, it is a high-profile underwriter and marked as 1 in the datasheet; Otherwise, it is marked as 0. The enterprise size is a dummy variable made according to the classification of the company scale in the wind database. This study marks large and medium companies as one and small companies as zero.

## 3.2. Methodology

To analyze the correlation between the IPOs underpricing rate and determinants, this study takes the IPOs underpricing rate as a dependent variable and establishes a regression model. Based on the previous studies in the literature review section, this study selects the independent variables, including ROA, company age, capital retained rate, oversubscription rate, IPO pricing, underwriter reputation (dummy variable), and company size (dummy variable).

In order to study the determinants of Internet IPO underpricing rate, this study conducts multivariable regression. The regression is based on the following equation:

$$UNP_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 PRICE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 OVER_{i,t} + \beta_5 REAR_{i,t-1} + \beta_6 REPU_{i,t} + \beta_7 FSIZE_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $UNP$ is the underpricing rate of IPO; $ROA$ refers to company ROA in the prior-issuing year; $AGE$ refers to the natural logarithm of the age of the issuing company; $PRICE$ refers to the natural logarithm of the IPO pricing; $REAR$ refers to retained capital rate; $OVER$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE$ (dummy variable) refers to the size of the company; $REPU$ (dummy variable) refers to the reputation of the primary underwriter.

# 4. Results and Discussions

## 4.1. Main Results

In order to explore Internet IPO underpricing, this paper takes 63 A-share Internet companies as the research object and considers several possible influencing factors to investigate empirical analysis. In Table 2, we examine the correlation matrix of the variables used. The correlation matrix shows a weak correlation between the firm size and the oversubscription rate,

whose correlation coefficient is 0.696. However, there is no correlation among other explanatory variables.

In Table 3, KMO and Bartlett's test reveals that the principal component analysis is statistically significant, indicating that the fitting degree is good. Also, it shows that the obtained principal components have strong ability to concentrate the original variable information. The principal component matrix shows that there are three principal components in this model. In the first principal component, the value of the firm size is 0.85; the value of the oversubscription ratio is 0.769; the value of the age of company is 0.661, indicating that the firm size, the oversubscription rate and the age of company mainly constitute the first principal component. In the second principal component, the value of the issuing price of IPOs is -0.752 and the value of retained earnings rate is 0.690, indicating that the issuing prices and the retained earnings rate mainly constitute the second principal component. In the third principal component, the value of the retained earnings rate is 0.556 and the value of return on assets (ROA) is 0.649, indicating that the retained earnings rate and return on assets mainly constitute the third principal component.

In Table4, the regression results show that the issuing prices and the retained earnings rate are statistically significant at the 1% level. Other explanatory variables include ROA, company age, oversubscription rate, company size and underwriter reputation, which seem to have no impact on the underpricing level of IPOs. So, we can claim that the internet IPOs underpricing is mainly driven by issuing price and retained earnings, rather than ROA, company age, oversubscription rate, company size and underwriter reputation. Besides, the results also are economically significant. For example, the coefficient of the issuing price is -104.32, which means the higher IPOs pricing alleviates IPOs underpricing, and the lower IPOs pricing makes

IPOs underpricing more serious. Additionally, the coefficient on the retained earnings rate is 580.92, suggesting that higher retained earnings lead to a higher IPOs underpricing rate.

## 4.2. Additional Results

To investigate whether the interaction terms may affect the regression result, three interaction variables extracted from the principal component analysis are added into the previous regression model. The following is equation:

$$UNP_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 PRICE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 OVER_{i,t} + \beta_5 REAR_{i,t-1} + \beta_6 REPU_{i,t} + \beta_7 FSIZE_{i,t} + \beta_8 FSIZE_{i,t} \times OVER_{i,t} \times AGE_{i,t} + \beta_9 PRICE_{i,t} \times REAR_{i,t-1} + \beta_{10} REAR_{i,t-1} \times ROA_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

Where $UNP$ is the underpricing rate of IPO; $ROA$ refers to company ROA in the prior-issuing year; $AGE$ refers to the natural logarithm of the age of the issuing company; $PRICE$ refers to the natural logarithm of the IPO pricing; $REAR$ refers to retained capital rate; $OVER$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE$ (dummy variable) refers to the size of the company; $REPU$ (dummy variable) refers to the reputation of the primary underwriter. $FSIZE \times OVER \times AGE$ refers to the product of $FSIZE$, $OVER$ ,and $AGE$. $PRICE \times REAR$ refers to the product of $PRICE$ and $REAR$. $REAR \times ROA$ refers to the product of $REAR$ and $ROA$.

In Table 5, the interaction term analysis results exhibit that the issuing prices, the oversubscription rate, the retained earnings rate, and the product of the issuing prices and the retained earnings rate are statistically significant. The coefficients of the issuing price of IPOs are -103.337, indicating that the issuing price of IPOs is negative relative to the IPOs underpricing rate. The coefficients of the oversubscription rate are 0.086, indicating that the oversubscription ratio is positive relative to the IPOs underpricing rate. The coefficients of the retained earnings rate are 848.983, indicating that the retained earnings ratio is positive relative

to the IPOs underpricing rate. The coefficients of the product of the issuing prices and the retained earnings rate are -578.407, meaning that the product of issuing price and retained earnings ratio negatively affect the IPOs underpricing rate.

In Table5, VIF exhibits the degree of multicollinearity among each variable. The value of VIF for the firm size and the interaction term of the firm size, the oversubscription rate and the age of company is 23.052 and 24.757, respectively. Both two values are greater than 10, denoting that there is multicollinearity between each of these two variables and the underpricing rate. However, such multicollinearity will not affect the regression results because they are not statistically significant variables.

## 4.3. Robustness Checks

In order to study the robustness of the results, we replace the profitability index ROA of the company one year before listing with ROE. The regression is based on the following equation:

$$UNP_{i,t} = \beta_0 + \beta_1 ROE_{i,t-1} + \beta_2 PRICE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 OVER_{i,t} + \beta_5 REAR_{i,t-1} + \beta_6 REPU_{i,t} + \beta_7 FSIZE_{i,t} + \varepsilon_{i,t} \quad (3)$$

Where $UNP$ is the underpricing rate of IPOs; $ROE$ refers to the company's ROE in the prior-issuing year; $AGE$ refers to the natural logarithm of the age of the issuing company; $PRICE$ refers to the natural logarithm of the IPO pricing; $REAR$ refers to retained capital rate; $OVER$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE$ (dummy variable) refers to the size of the company; $REPU$ (dummy variable) refers to the reputation of the primary underwriter.

Table 6 robustness checks result notes that $ROE$ does not show statistical significance when ROA is replaced by ROE. This result can be construed as that the profitability of Internet

companies is not related to the degree of underpricing of IPOs. These results are consistent with those of Rodoni et al. (2018). Also, the issuing price and the retained earnings rate still exhibit statistical significance that is the same as the regression results in Table 4.

In further research, we performed one-way ANOVA on seven variables to test the impact of each variable on IPOs underpricing rate. The result of the issuing rice on the underpricing rate One-way ANOVA in Table 7 shows the statistical significance, implying that the higher issuing price, the more serious IPOs underpricing rate. The result of the oversubscription rate on the underpricing rate One-way ANOVA in Table 8 also shows statistical significance, suggesting that higher oversubscription rate, higher underpricing rate of IPOs.

# 5. Conclusions

## 5.1. Discussions and Findings

The regression results in Table4 show that there is a negative correlation between IPOs price and IPOs underpricing. The higher IPOs price alleviates IPOs underpricing, and the lower IPOs price makes IPOs underpricing more serious. In this regard, we believe that such a negative correlation is associated with the company's strategy in setting IPO quotations. The company sets relatively low IPOs prices to encourage potential investors. In addition, investors may have high uncertainty about the future performance of Internet companies with low-price IPOs. Considering that information uncertainty usually makes speculative transactions leading to investors' excessive demand for low-price Internet IPOs more attractive, it thus results in a more severe IPO underpricing rate. On the contrary, as investors have less uncertainty about high-price

Internet IPOs uncertainty, higher IPOs issuing prices, to some extent, is lessening IPO underpricing rate.

At the same time, the regression results show a positive correlation between retained earnings and IPOs underpricing. Higher retained earnings lead to more severe IPOs underpricing. Considering that the more confident the management is about its prospects, the more they tend to maintain higher retained earnings. Moreover, according to Jensen and Meckling (1976), the higher retained earnings help the interests of the company's management to be consistent with the interests of shareholders, promoting the value of Internet companies. Therefore, this positive correlation can also be construed as that the higher retained earnings make the management send a positive signal about the company's real value to investors, resulting in more severe IPO underpricing.

The additional regression results in Table 5 reveal that as the interaction terms are taken into account, the issuing price and the interaction term of the issuing price and the retained earnings rate is negative relative to the IPOs underpricing rate. The retained earnings rate and the oversubscription rate is positive relative to the IPOs underpricing rate. These results indicate that as the issuing price and retained earnings ratio are taken as a whole, this interaction term will negatively affect the IPOs underpricing rate, which means the retained earnings rate exceeds the issuing price in affecting the IPOs underpricing rate. In that case, the underlying theory can be interpreted that the investors attach much more importance in company value denoted as retained earnings rate than pricing setting of IPOs.

Robustness checks result in Table 6 points out that the profit indicators of Internet companies, whether ROA or ROE, have no significant relation with the underpricing rate of IPOs. These results are consistent with those of Rodoni et al. (2018) that ROA has not significant

effect on the underpricing rate of IPOs. In addition, no matter which profit indicators are used, the regression results always show that the retained earnings and the issuing prices are the determinants affecting the underpricing rate of IPOs.

## 5.2 Limitations

First, this study only collected 63 Internet IPOs of shares in China stock exchange from 1998 to 2021. Sixty-three observations may affect the accuracy of regression results. Secondly, considering the difficulties in obtaining relevant data, this study only investigated seven possible factors driven the underpricing rate of IPOs.

## 5.3 Conclusions

This study examines the degree of IPOs underpricing of 63 Internet companies from 1998 to 2021. According to the descriptive data in Table 1, the average initial return of Internet company IPOs is 136.936%. Based on the past literature, seven determinants affecting IPOs underpricing rate of Internet companies are taken into account and are used to conduct regressions, robustness check, and one-way ANOVA tests. The regression results show that two variables, retained earnings and issuance price, play a leading role in driving the underpricing rate of Internet company IPOs. The robustness check results suggest that the underpricing rate of Internet company IPOs are still driven by retained earnings and issuance price. In addition, the one-way ANOVA test shows that issue pricing and oversubscription rate also have a positive impact on Internet company IPOs.

We find that IPOs underpricing of Internet companies have some similarities and differences with IPOs underpricing in other industries. First, we find oversubscription rate is

positively driven the IPOs underpricing rate. However, Chang et al. (2008) found that there is a negative correlation between the initial stock return and the subscription ratio in China's primary market.

Secondly, we find that the profitability of Internet companies doesn't drive the IPOs underpricing, which is consistent with Wahyusari's study (2013) that the company's ROA has no significant impact on IPOs underpricing. Thirdly, we find a negative relationship between the reputation of underwriters and the underpricing rate of IPOs in Internet companies, but such a relationship is not significant. Our is consistent with Carter et al. (1998) that IPOs stocks performed poorly relative to the market for IPOs handled by well-known underwriters. In addition, we find that the IPO price of IPOs actively drives the underpricing rate of IPOs. This is very consistent with the research results of song et al. (2014) on IPOs underpricing in China, that is, the pricing rules of IPOs are positively correlated with underpricing.

We explore the possible explanation of IPOs underpricing rate by IPOs pricing theory. We believe that the company's strategic IPOs quotation and information uncertainty can explain the underpricing rate of IPOs in the Internet industry. Regarding strategic pricing, the company strategically sets a relatively low IPO price to encourage potential investors. For information uncertainty, investors may be highly uncertain about the future performance of Internet companies with low-cost IPOs, resulting in speculative transactions and excessive demand for low-cost IPOs. Besides, we also investigate the possible explanation of IPOs underpricing rate by corporate value theory. We believe that the more confident the management is about the prospects of the enterprise, the more they tend to maintain high retained earnings. These higher retained earnings are a reflection of the real value of Internet companies. Therefore, the higher

value of Internet companies sends a positive signal to investors about the actual value of the company, resulting in more severe IPO underpricing.

As for contributions, our research results are of great significance to the scholars and investors of IPOs in the Internet industry. First, we prove that two dominant factors are driving the IPOs underpricing rate of Internet companies. Secondly, this study's variable selection and correlation regression analysis process can provide relevant references for scholars to explore the potential impact on Internet company IPOs more comprehensively. In addition, this study reveals the similarities and differences of determinants of IPOs underpricing rate between Internet industry and general industry. Besides, we explore the potential theory of IPOs underpricing rate in the Internet industry, which provides a new perspective for relevant scholars.

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**Table 1 Descriptive Data**

Table 1 shows the brief descriptive statistical data of 63 IPO underpricing during 1998-2021. $UNP_{i,t}$ is the underpricing rate of IPO; $ROA_{i,t-1}$ refers to company ROA in the prior-issuing year; $AGE_{i,t}$ refers to the natural logarithm of the age of the issuing company; $PRICE_{i,t}$ refers to the natural logarithm of the IPO pricing; $REAR_{i,t-1}$ refers to retained capital rate; $OVER_{i,t}$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE_{i,t}$ (dummy variable) refers to the size of the company; $REPU_{i,t}$ (dummy variable) refers to the reputation of the primary underwriter. In the statistical data of IPO underpricing rate, the degree of IPO underpricing varies widely, ranging from 12% to 1500%. Moreover, the median is lower than the average, which indicates that the skewness of the sequence of IPO underpricing rate is on the right. Source: Wind financial database

| Variables | Obs. | Average | Median | StdDev | Kurtosis | Skewness | Min | Max |
|---|---|---|---|---|---|---|---|---|
| $UNP_{i,t}$ | 63 | 136.936 | 68.939 | 238.084 | 22.2208 | 4.4934 | -11.969 | 1498.000 |
| $PRICE_{i,t}$ | 63 | 20.031 | 18.000 | 13.966 | 0.8270 | 0.9830 | 1.000 | 63.700 |
| $AGE_{i,t}$ | 63 | 10.111 | 9.000 | 5.968 | 0.4394 | 0.7653 | 1.000 | 27.000 |
| $REPU_{i,t}$ | 63 | 0.683 | 1.000 | 0.469 | -1.3998 | -0.8036 | 0.000 | 1.000 |
| $FSIZE_{i,t}$ | 63 | 0.318 | 0.000 | 0.469 | -1.3998 | 0.8036 | 0.000 | 1.000 |
| $ROA_{i,t-1}$ | 63 | 19.787 | 16.890 | 14.531 | 5.1269 | -0.0860 | -39.940 | 64.330 |
| $REAR_{i,t-1}$ | 63 | 0.120 | 0.097 | 0.150 | 28.5921 | 4.4954 | -0.160 | 1.088 |
| $OVER_{i,t}$ | 60 | 2271.944 | 647.637 | 2703.901 | 0.0744 | 1.0848 | 18.297 | 9194.328 |

**Table 2 Correlation Matrix**

Table 2 shows the correlation among each variable selected in the study. $UNP_{i,t}$ is the underpricing rate of IPO; $ROA_{i,t-1}$ refers to company ROA in the prior-issuing year; $AGE_{i,t}$ refers to the natural logarithm of the age of the issuing company; $PRICE_{i,t}$ refers to the natural logarithm of the IPO pricing; $REAR_{i,t-1}$ refers to retained capital rate; $OVER_{i,t}$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE_{i,t}$ (dummy variable) refers to the size of the company; $REPU_{i,t}$ (dummy variable) refers to the reputation of the primary underwriter. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | $ROA_{i,t-1}$ | $PRICE_{i,t}$ | $AGE_{i,t}$ | $OVER_{i,t}$ | $REAR_{i,t-1}$ | $REPU_{i,t}$ | $FSIZE_{i,t}$ |
|---|---|---|---|---|---|---|---|
| $ROA_{i,t-1}$ | 1 | .275** | -0.036 | -0.195 | 0.013 | -0.164 | -0.188 |
| | | (-0.029) | (-0.781) | (-0.126) | (-0.921) | (-0.199) | (-0.139) |
| $PRICE_{i,t}$ | .275** | 1 | .309** | 0.043 | -.480*** | -0.141 | 0.228* |
| | (-0.029) | | (-0.014) | (-0.739) | (<.001) | (-0.271) | (-0.073) |
| $AGE_{i,t}$ | -0.036 | .309** | 1 | .254** | -0.018 | -0.211* | .382** |
| | (-0.781) | (-0.014) | | (-0.045) | (-0.887) | (-0.097) | (-0.002) |
| $OVER_{i,t}$ | -0.195 | 0.043 | .254** | 1 | 0.169 | -0.205 | .696*** |
| | (-0.126) | (-0.739) | (-0.045) | | (-0.185) | (-0.108) | (<.001) |
| $REAR_{i,t-1}$ | 0.013 | -.480*** | -0.018 | 0.169 | 1 | 0.074 | 0.017 |
| | (0.921) | (<.001) | (0.887) | (0.185) | | (0.564) | (0.897) |
| $REPU_{i,t}$ | -0.164 | -0.141 | -0.211* | -0.205 | 0.074 | 1 | -0.123 |
| | (0.199) | (0.271) | (0.097) | (0.108) | (0.564) | | (0.338) |
| $FSIZE_{i,t}$ | -0.188 | 0.228* | .382** | .696*** | 0.017 | -0.123 | 1 |
| | (0.139) | (0.073) | (0.002) | (<.001) | (0.897) | (0.338) | |

**Table 3 Factor analysis: KMO and Bartlett's Test and principal component Result**

This table shows the result for the principal component analysis: Where $ROA_{i,t-1}$ refers to company ROA in the prior-issuing year; $AGE_{i,t}$ refers to the natural logarithm of the age of the issuing company; $PRICE_{i,t}$ refers to the natural logarithm of the IPO pricing; $REAR_{i,t-1}$ refers to retained capital rate; $OVER_{i,t}$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE_{i,t}$ (dummy variable) refers to the size of the company; $REPU_{i,t}$ (dummy variable) refers to the reputation of the primary underwriter.

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.512 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 96.476 |
| | df | 21 |
| | Sig. | 1.21E-11 |

| Component Matrix | | | |
|---|---|---|---|
| | Component | | |
| | 1 | 2 | 3 |
| $FSIZE_{i,t}$ | 0.850 | 0.231 | -0.121 |
| $OVER_{i,t}$ | 0.769 | 0.412 | 0.068 |
| $AGE_{i,t}$ | 0.661 | -0.132 | 0.059 |
| $PRICE_{i,t}$ | 0.441 | -0.752 | -0.163 |
| $REAR_{i,t-1}$ | -0.098 | 0.690 | 0.556 |
| $ROA_{i,t-1}$ | -0.131 | -0.551 | 0.649 |
| $REPU_{i,t}$ | -0.398 | 0.250 | -0.562 |

**Table 4 Regression Result**

This table shows the result for the regression equation:

$$UNP_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 PRICE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 OVER_{i,t}$$
$$+ \beta_5 REAR_{i,t-1} + \beta_6 REPU_{i,t} + \beta_7 FSIZE_{i,t} + \varepsilon_{i,t}$$

Where $UNP_{i,t}$ is the underpricing rate of IPO; $ROA_{i,t-1}$ refers to company ROA in the prior-issuing year; $AGE_{i,t}$ refers to the natural logarithm of the age of the issuing company; $PRICE_{i,t}$ refers to the natural logarithm of the IPO pricing; $REAR_{i,t-1}$ refers to retained capital rate; $OVER_{i,t}$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE_{i,t}$ (dummy variable) refers to the size of the company; $REPU_{i,t}$ (dummy variable) refers to the reputation of the primary underwriter. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | **Model1** |
|---|---|
| Intercept | 328.713 |
| | (2.775) |
| $ROA_{i,t-1}$ | -0.168 |
| | (-0.091) |
| $PRICE_{i,t}$ | 104.315*** |
| | (-2.918) |
| $AGE_{i,t}$ | 5.149 |
| | (0.150) |
| $OVER_{i,t}$ | 23.931 |
| | (1.216) |
| $REAR_{i,t-1}$ | 580.930*** |
| | (3.031) |
| $REPU_{i,t}$ | -37.818 |
| | (-0.753) |
| $FSIZE_{i,t}$ | -48.702 |
| | (-0.643) |
| Obs. | 63 |
| Adj-$R^2$ | 0.394 |

**Table 5 Additional Result: interaction term Analysis**

This table shows the result for the interaction term regression equation:

$$UNP_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 PRICE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 OVER_{i,t} + \beta_5 REAR_{i,t-1} + \beta_6 REPU_{i,t}$$
$$+ \beta_7 FSIZE_{i,t} + \beta_8 FSIZE_{i,t} \times OVER_{i,t} \times AGE_{i,t} + \beta_9 PRICE_{i,t} \times REAR_{i,t-1} + \beta_{10} REAR_{i,t-1} \times ROA_{i,t-1} + \varepsilon_{i,t}$$

Where $UNP_{i,t}$ is the underpricing rate of IPO; $ROA_{i,t-1}$ refers to company ROA in the prior-issuing year; $AGE_{i,t}$ refers to the natural logarithm of the age of the issuing company; $PRICE_{i,t}$ refers to the natural logarithm of the IPO pricing; $REAR_{i,t-1}$ refers to retained capital rate; $OVER_{i,t}$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE_{i,t}$ (dummy variable) refers to the size of the company; $REPU_{i,t}$ (dummy variable) refers to the reputation of the primary underwriter. $FSIZE_{i,t} \times OVER_{i,t} \times AGE_{i,t}$ refers to the product of $FSIZE_{i,t}$ , $OVER_{i,t}$ ,and $AGE_{i,t}$ . $PRICE_{i,t} \times REAR_{i,t-1}$ refers to the product of $PRICE_{i,t}$ and $REAR_{i,t-1}$ . $REAR_{i,t-1} \times ROA_{i,t-1}$ refers to the product of $REAR_{i,t-1}$and $ROA_{i,t-1}$. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | Coefficients | Standard Error | t Stat | P-value | Tolerance | VIF |
|---|---|---|---|---|---|---|
| Intercept | 296.242 | 102.132 | 2.901 | 0.005 | | |
| $ROA_{i,t-1}$ | 2.642 | 1.707 | 1.547 | 0.128 | 0.651 | 1.535 |
| $PRICE_{i,t}$ | -103.337 | 31.835 | -3.246 | 0.002*** | 0.509 | 1.964 |
| $AGE_{i,t}$ | 40.602 | 31.155 | 1.303 | 0.198 | 0.668 | 1.496 |
| $OVER_{i,t}$ | 29.398 | 16.817 | 1.748 | 0.086* | 0.459 | 2.177 |
| $REAR_{i,t-1}$ | 848.983 | 267.473 | 3.174 | 0.003*** | 0.250 | 3.992 |
| $REPU_{i,t}$ | -55.381 | 45.645 | -1.213 | 0.231 | 0.762 | 1.312 |
| $FSIZE_{i,t}$ | -70.016 | 204.883 | -0.342 | 0.734 | 0.043 | 23.052 |
| $FSIZE_{i,t} \times OVER_{i,t} \times AGE_{i,t}$ | 6.951 | 21.330 | 0.326 | 0.746 | 0.040 | 24.757 |
| $PRICE_{i,t} \times REAR_{i,t-1}$ | -578.407 | 125.444 | -4.611 | 0.000*** | 0.532 | 1.879 |
| $REAR_{i,t-1} \times ROA_{i,t-1}$ | 1.218 | 13.195 | 0.092 | 0.927 | 0.358 | 2.790 |

**Table 6 Robustness Test Result**

This table shows the result for the regression equation:

$$UNP_{i,t} = \beta_0 + \beta_1 ROE_{i,t-1} + \beta_2 PRICE_{i,t} + \beta_3 AGE_{i,t} + \beta_4 OVER_{i,t}$$
$$+ \beta_5 REAR_{i,t-1} + \beta_6 REPU_{i,t} + \beta_7 FSIZE_{i,t} + \varepsilon_{i,t}$$

Where $UNP_{i,t}$ is the underpricing rate of IPO; $ROE_{i,t-1}$ refers to company ROE in the prior-issuing year; $AGE_{i,t}$ refers to the natural logarithm of the age of the issuing company; $PRICE_{i,t}$ refers to the natural logarithm of the IPO pricing; $REAR_{i,t-1}$ refers to retained capital rate; $OVER_{i,t}$ refers to the natural logarithm of the oversubscription rate of IPO; $FSIZE_{i,t}$ (dummy variable) refers to the size of the company; $REPU_{i,t}$ (dummy variable) refers to the reputation of the primary underwriter. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% |
|---|---|---|---|---|---|---|
| Intercept | 336.5156 | 119.7296 | 2.8106 | 0.0068 | 96.5721 | 576.4591 |
| $ROE_{i,t-1}$ | -0.5921 | 1.5187 | -0.3899 | 0.6981 | -3.6358 | 2.4515 |
| $PRICE_{i,t}$ | -102.1938 | 34.0160 | -3.0043 | 0.0040*** | -170.3635 | -34.0242 |
| $AGE_{i,t}$ | 5.1671 | 34.0745 | 0.1516 | 0.8800 | -63.1197 | 73.4538 |
| $OVER_{i,t}$ | 23.2871 | 19.6453 | 1.1854 | 0.2410 | -16.0830 | 62.6571 |
| $REAR_{i,t-1}$ | 599.8607 | 194.5621 | 3.0831 | 0.0032*** | 209.9495 | 989.7719 |
| $REPU_{i,t}$ | -39.8774 | 49.6738 | -0.8028 | 0.4256 | -139.4259 | 59.6711 |
| $FSIZE_{i,t}$ | -52.7362 | 76.0974 | -0.6930 | 0.4912 | -205.2387 | 99.7663 |

**Table 7 the issuing price of IPOs on IPOs underpricing rate one-way ANOVA**

| Origin Difference | One-way ANOVA Results | | | | |
|---|---|---|---|---|---|
| | SS | df | MS | F | P-value |
| Different Treatments | 3437793.098 | 57 | 60312.160 | 3.936 | 0.064 |
| Internal Treatments | 76621.029 | 5 | 15324.206 | | |
| Total | 3514414.126 | 62 | | | |

**Table 8 the oversubscription rate on IPOs underpricing rate one-way ANOVA**

| Origin Difference | One-way ANOVA Results | | | | |
|---|---|---|---|---|---|
| | SS | df | MS | F | P-value |
| Different Treatments | 2256326.603 | 22 | 102560.3 | 3.261 | <.001 |
| Internal Treatments | 1258087.523 | 40 | 31452.188 | | |
| Total | 3514414.126 | 62 | | | |