

Analysis of the Impact of Investor Sentiment on IPO Underpricing: Perspective from GEM Manufacturing Firms

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Abstract. The IPO phenomenon is a hot issue based on the financial field of listed companies. China has the phenomenon of IPO underpricing, and the underpricing of new shares in China is much higher than that in other countries. Unlike western countries, China's financial repression phenomenon is stronger, the financial environment is special, and there are more retail investors in China's stock market, which are more obviously influenced by emotions and have a strong herd mentality. IPO underpricing has more negative impact on China's capital market. This paper analyzes the reasons for investors' emotional frenzy on the first day closing price of GEM new shares listed from the perspective of behavioral finance. From the perspective of investor sentiment, this paper selects the proxy variables of investor sentiment in different levels of markets and uses multiple regression method to study the impact of investor sentiment on IPO underpricing. It is found that the winning rate is adversely connected with IPO underpricing, while turnover rate is positively correlated with it, and corresponding policy suggestions are put forward. The results in this paper benefit certain investors in the financial market.

Keywords: IPO underpricing; investor sentiment; ChiNext; stock market.

1. Introduction

IPO, the initial public offering of stocks, has been widely studied and researched as a way to connect stock issuance and company listing. The IPO underpricing, which is the first of the three major anomalies of the "IPO puzzle", refers to the phenomenon that the issue price of new shares in the primary market is lower than the listing price in the secondary market. In order to study this anomaly, scholars at home and abroad have conducted extensive research on it but have not reached a consistent conclusion. The research has focused on two aspects: the primary market's low issue price contributes to IPO underpricing and IPO underpricing is due to the high trading price in the secondary market. Domestic scholars such as Li [1] have studied the IPO underpricing in China and believed that China's stock issuance system is also a cause of IPO underpricing.

In terms of financial environment, compared with western countries, China's securities market started late, the financial system is not sound, and the phenomenon of financial suppression is more serious. In terms of market participants, retail investors make up a significant share of China's stock market, which lack professional knowledge and mature investment awareness, causing frequent noise transactions. However, even in the western countries where the securities market is relatively mature, the phenomenon of IPO underpricing generally exists. The phenomenon of IPO underpricing will break the balance between the market supply and demand mechanism, weaken the efficiency of capital market resource allocation, cause capital hoarding, which is detrimental to the development of listed companies and affect the long-term healthy operation of capital market.

In order to mitigate the above negative effects, this paper analyzes the reasons for investors' frenzied sentiment towards the closing price of new stocks listed on the ChiNext Board on the first day of listing. The GEM was established to provide financing channels and growth space for those start-up growth enterprises that are difficult to issue new shares on the main board market in the short term. It has improved the system of China's securities market and is an indispensable part of China's economic system. Compared with the main board, the GEM listing is more flexible, and the threshold is relatively low. After the launch of the registration system pilot in 2020, companies are only required to undergo a formal review for listing, making it easier for companies to go public. Thus, more and more companies are choosing to IPO on the GEM. It seems to have become an inevitable phenomenon

for new shares to stop on the first day of listing. And the degree of underpricing of IPOs on the GEM is generally higher than that of the main board market. Since the establishment of GEM is relatively late, and the listed firms are typically small and mid-sized firms with strong growth prospects, the phenomenon of underpricing of their IPOs is worth studying.

2. Literature review

2.1 IPO Revenue Theory

IPO returns have been studied abroad since the 1960s, and many scholars have conducted the following studies on IPO underpricing. It can be specifically divided into two parts. The first is the underpricing explanation based on market efficiency, and the second is the underpricing explanation based on behavioral finance.

2.1.1 Explanation of Underpricing Based on Market Efficiency

Since Fama [2] put forward the efficient market hypothesis, many scholars began to study the anomalies in financial markets to refute it. Welch [3] proposed the information asymmetry hypothesis, which is based on the premise that secondary market is efficient, and the prices ultimately reflect value. He argues that since investors cannot easily distinguish the quality of IPO companies, high-quality firms tend to signal investors with discounted offerings, so that the actual value of the firm and the degree of discount are positively correlated.

Rock and Kevin [4] proposed the “winner’s curse theory”, in which there are investors with information and lack of information in the market. Investors with information will only buy those stocks whose issue price is lower than the intrinsic value of the enterprise, while the other part of the investors will buy any stock at the issue price. And the winner’s curse phenomenon will occur when investors lacking information later find that the issue price of the purchased stock is higher than the intrinsic value of the firm. In order to avoid such phenomenon, issuers usually lower the issue price to compensate investors for missing information.

Booth and Chua [5] proposed the equity diversification hypothesis, arguing that by issuing new shares at a low price can maintain their high liquidity and can protect the control of major shareholders from dilution. Brennan and Franks [6] proved this hypothesis through an empirical study.

2.2.2 Explanation of Underpricing Based on Behavioral Finance

EMH theory assumes that stock prices can respond quickly to all information in the market, and investors cannot obtain excess profits in the securities market. However, a large number of empirical results suggest that excess profits exist, and Ritter and Welch [7] suggest shifting the focus of IPO underpricing research to the field of behavioral finance.

2.2 Investor Sentiment Theory

Investor sentiment refers to an investor's emotional understanding and expectation of the development prospects of the stock market. It can be divided into positive sentiment, negative sentiment and neutral sentiment. Investor sentiment indicators are indicators that reflect investors' optimism or pessimism about investment prospects. Many studies have been conducted at home and abroad on the indicators and methods of measuring investor sentiment. The most famous one is the principal component analysis proposed by Baker and Wurgler [8], which synthesizes six market variables and constructs the BW sentiment index. Financial indicators and survey indicators were used by Qiu [9] to categorize investor sentiment indicators. Closed-end fund discount rate is one example of a financial indicator. And the survey indicators include consumer confidence index and other indicators derived from national statistical agencies.

Wang [10] et al. and Rao [11] et al. took the CCTV market reading data as a representative of investor sentiment, and also used it and CSI institutional market watching index to build a linear regression model with future returns. Cheng and Liu [12] used the sentiment indicator represented by

the good and bad index to reflect the bear-bull condition of the stock market. Chi [13] et al. constructed an investor indicator for filtering market noise for the first time based on the extended Kalman filter method.

3. DATA

3.1 Sample Selection

From January 2012 to December 2021, there are 815 manufacturing companies listed on the Growth Enterprise Market. This paper selects these 815 listed companies as the research samples. Figure 1 reflects how many manufacturing companies are listed on the ChiNext each year from January 2012 to December 2021, among which the IPO was suspended in 2013, so the data is vacant.

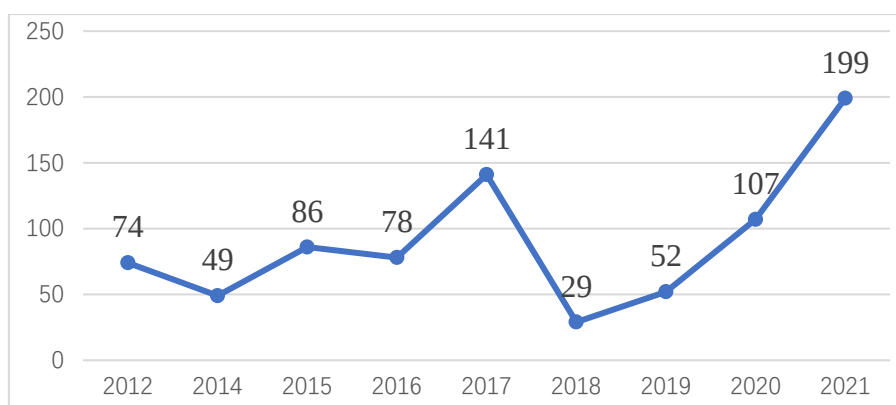


Fig. 1 Number of manufacturing companies listed on ChiNext from 2012-2021

From figure 1, it can be found that from 2012 to 2019 the number of manufacturing companies listed peaked at 141 in 2007, and the number in 2018 was the least. After the registration system was implemented on the ChiNext in August 2020, the number of manufacturing companies listed in 2020 and 2021 surged compared to 2019.

3.2 Variable Selection

This paper uses the excess return on the first listing day to measure the degree of IPO underpricing as the explained variable. The descriptive statistics are analyzed as follows.

Table 1. Descriptive statistical analysis of the IPO underpricing rate of the ChiNext manufacturing industry from 2021 to 2021

t	n	Mean	Median	Max	Min	SD
2012	74	21.13	16.73	93.63	-16.5	26.93
2014	49	43.71	44.00	46.2	18.67	3.69
2015	86	46.31	44.00	242.48	43.94	21.40
2016	78	44.00	44.00	44.06	43.95	0.02
2017	141	43.99	44.00	44.07	43.92	0.02
2018	29	44.00	44.00	44.03	43.93	0.02
2019	52	44.00	44.00	44.06	43.94	0.02
2020	107	157.87	88.77	1061.42	43.10	1.70
2021	199	218.70	175.08	1942.58	-13.18	220.45
2012-2021	815	99.76	44.00	1942.58	-16.5	147.58

Based on the above table, the annual IPO underpricing rate trend chart is drawn:

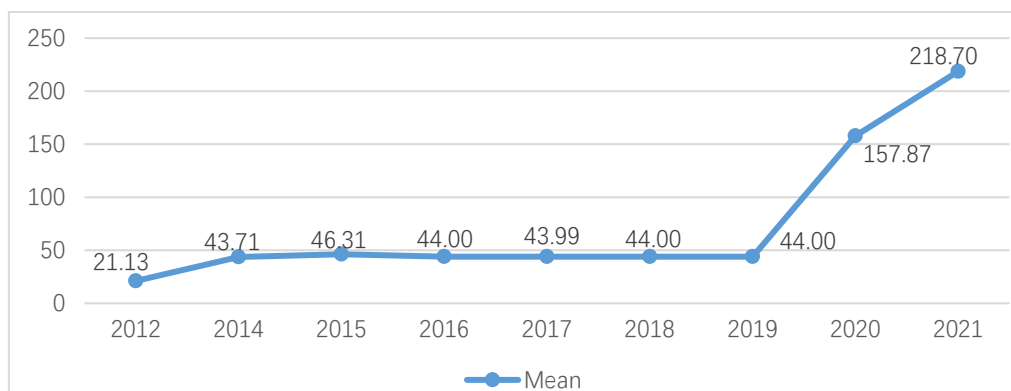


Fig. 2 Trend of average underpricing rate of manufacturing IPOs on ChiNext from 2012 to 2021

Table 1 and Figure 2 reflect the annual statistics and trends of the average underpricing rate of IPOs. 99.76% of the average IPO underpricing rate during 2012-2021 indicates that IPO underpricing is an extremely common phenomenon among GEM manufacturing enterprises in China, and the underpricing rate is extremely high. The maximum value of 1942.58% and the minimum value of -16.5% indicate that the IPO underpricing varies greatly among different enterprises. For each year, the average IPO underpricing rate in 2012 was relatively low, and the average IPO underpricing rate from 2014 to 2019 was relatively stable at around 44%. Since 2020, the underpricing rate of new shares on the ChiNext board has risen sharply, reaching 218.7% in 2021. This drastic trend makes it impossible not to associate this phenomenon with the gem reform and pilot registration system implemented in 2020. On August 24, 2020, the first batch of registered companies on the GEM went public. The companies listed only need to go through a formal review and no substantive audit. It is easier for the companies to go public. Therefore, more and more companies choose to IPO on the GEM. The investment sentiment in the market is high, and investors are actively purchasing new shares, which has pushed up the IPO underpricing rate. The daily limit on the first day of listing of new stocks on the GEM seems to have become an inevitable phenomenon.

Combined with the research and theoretical analysis of many domestic scholars, this paper chooses the turnover rate and the lottery winning rate on the first day of listing as explanatory variables to measure investor sentiment. The lottery winning rate can be used to measure the sentiment of investors in the primary market. There are many retail investors in China's stock market. Due to the lack of information and professional knowledge, they are prone to blindly follow the trend of buying, which drives up the share price in the secondary market and aggravates the degree of IPO underpricing. The lower the winning rate, the higher the investor demand for IPO shares. The excess demand will be shifted to the secondary market, resulting in higher transaction prices and underpricing. Therefore, it is hypothesized that the lottery winning rate is negatively correlated with IPO underpricing. The higher the turnover rate on the first day of listing, the stronger the "speculative" atmosphere of investors in the market, which leads to a higher closing price, making the IPO underpricing phenomenon prominent. Therefore, it is assumed that the turnover rate on the first day of listing is positively related to IPO underpricing.

To avoid the interference of other factors on the regression results, this paper selects control variables from two aspects: IPO characteristics and company characteristics. The IPO price cannot exist without the company's value, so two variables, the total amount of capital raised and first day of IPO P/E ratio, are selected to measure the company's value. To make the data more stable, regression is performed by taking the logarithm of the total amount of capital raised. First-day price volatility is selected as a control variable to reflect the characteristics of IPOs, and the data are obtained from the wind database. The variables are specified as shown in Table 2.

Table 2. Variable Definition Table

Category	Name	Symbol	Definition
Explained variable	First Day Excess Yield	UnP	(The first-day closing price - issue price) / issue price
Explanatory variable	The turnover rate	TR	First day trading volume/total shares outstanding
	The lottery winning rate	LR	Number of new shares issued/Number of valid subscriptions
control variable	The Initial price-earnings ratio	P/EPS	IPO share price/Earnings per share
	Issue size	LN(FD)	The natural logarithm of the actual total amount of funds raised
	First day price volatility	FR	(Highest price - lowest price)/opening price

Table 3. Descriptive Statistical Analysis of Variables

Variable	Full Sample				
	Mean	Mid	Max	Min	Std
TR	27.33	0.26	95.07	0.01	33.12
LR	0.36	0.03	10.91	0.01	0.93
FR	20.44	19.98	468.95	3.27	21.68
LN(FD)	19.85	19.75	23.36	17.94	0.67
P/EPS	26.27	22.98	156.93	7.11	12.13

From Table 3, it can be seen that the average turnover rate on the first day was 27.33%, and the maximum value was 95.07%, indicating that investors changed hands frequently. They were optimistic about the future situation and had high investment sentiment. The average online lottery winning rate is 0.36%, which is generally low, indicating that the demand for new shares from subscribers is relatively strong when the new shares are issued. The maximum price volatility on the first day is 468.95%, the minimum value is 3.27%, and the average value is 20.44%. Generally speaking, the fluctuation range of new shares on the day of issuance is relatively large, and the degree of volatility between different new shares is very different.

3.3 Model Regression Analysis

Based on the selection of variables above, the following multiple linear regression model can be constructed:

$$\text{UnP} = \alpha + \beta_1 \text{LR} + \beta_2 \text{TR} + \beta_3 \text{FR} + \beta_4 \text{LN(FD)} + \beta_5 \text{P/EPS} + \varepsilon \quad (1)$$

3.3.1 ADF Test and Cointegration Test

Firstly, ADF smoothness tests are conducted for first-day excess return UnP, first-day market turnover rate TR, winning rate LR, first-issue P/EPS, issue size LN(FD) and first-day price volatility FR. TR is smooth after first-order difference, and the rest of variables are smooth, as shown in Table 4.

Table 4. ADF test results

Variable	ADF	conclusion
UnP	-3.075242**	smooth
TR	-1.772414	Not smooth
D(TR)	-19.38793***	smooth
LR	-1.796409*	smooth
P/EPS	-3.749313***	smooth
LN(FD)	-5.682287***	smooth
FR	-15.28013***	smooth

The first-order difference is performed on TR to obtain D(TR), and the six variables are changed into homogeneous single-integer variables. The Johansen cointegration test is performed, leading to the conclusions in Table 5.

Table 5. Results of unrestricted cointegration test (Trace)

Number of assumptions for the covariance equation	Eigenvalues	Trace statistics	5% confidence value	P-value
None*	0.356558	674.9145	95.75366	0.0001
At most one*	0.159767	320.8526	69.81889	0.0001
At most two*	0.112428	181.0692	47.85613	0.0000
At most three *	0.053124	85.29930	29.79707	0.0000
At most four *	0.033339	41.46596	15.49471	0.0000

From Table 5, it can be seen that UnP, D(TR), LR, P/EPS, LN(FD) and FR have long-run cointegration relationships and cointegration equations exist, so regression equations can be established.

3.3.2 Regression Results of Equations

The explanatory variables were selected assuming that they are unrelated to each other, but in reality, there are often more or less correlations. In order to avoid the existence of multicollinearity among the explanatory variables and cause deviations, the multicollinearity test is carried out on the explanatory variables. The VIF values of the variables shown in the results are all occasionally less than 10, so there is no multicollinearity between the variables. Multiple linear regressions were performed on the above variables and table 6 displays the outcomes.

Table 6. Estimation results of the regression equation

Variable	Coefficient	T-value	Multicollinearity test VIF
D(TR)	2.368759	5.980951***	1.0781
LR	-14.47350	-2.991580***	1.0603
FR	3.055351	14.76853***	1.0702
LN(FD)	-17.59625	-2.451146**	1.2395
P/EPS	-0.743970	-1.845706*	1.2722
C	411.2044	2.968230***	
Adjusted R-squared: 0.298518		F-statistic: 70.10998***	

The following regression equation was obtained:

$$\text{UnP} = 2.37\text{D(TR)} - 14.47\text{LR} + 3.06\text{FR} - 17.6\text{LN(FD)} - 0.74\text{P/EPS} + 411.2 \quad (2)$$

4. Conclusions and policy suggestion

This paper adopts a combination of theoretical and empirical analysis. On the one hand, it sorts out domestic and foreign literature, and makes a theoretical analysis on the current status of China's stock market IPOs and the reasons behind underpricing. On the other hand, 815 manufacturing companies listed on GEM from 2012 to 2021 were selected as the research sample, and their IPO first-day excess return rate was used as the explanatory variable. Two indicators of investor sentiment, namely the turnover rate and the winning rate, were selected as explanatory variables. The price volatility, the total amount of capital raised and the price-earnings ratio were used as control variables to carry out an empirical test of multiple regression analysis to study whether investor sentiment had an impact on the underpricing of IPOs on the ChiNext and the extent of the impact.

Based on the above test results, we can draw the following conclusions: The increment of the turnover rate is positively correlated with the IPO underpricing rate. Conversely, the lottery winning rate is negatively correlated with it, which is in line with the above theoretical analysis. Therefore, the underpricing of China's GEM manufacturing companies in their IPOs is significantly influenced by investors' sentiment, and the investors' irrational behavior is an important factor leading to high underpricing of IPOs.

In addition, two conclusions can be drawn: one is that there is a serious underpricing phenomenon in ChiNext market. The above descriptive statistical analysis can already illustrate this point. The second is that one of the key elements contributing to the IPO underpricing is a company's intrinsic value. This can be seen from the regression results of the control variables. The price-earnings ratio on the first day of listing is positively correlated with the IPO underpricing ratio. A greater P/E ratio publicly communicates to investors the higher value of the company, letting them know that it has excellent governance and is experiencing rapid growth. The stock will therefore be known and desired by retail investors, and its underpricing will be greater. Meanwhile, high-quality listed companies will highlight their advantages by underpricing their shares heavily. The actual total amount of funds raised, and the underpriced IPO are significantly negatively correlated. The larger the size of the company, the greater the uncertainty and information asymmetry, and the lower the level of IPO underpricing. The rate of IPO underpricing increases with the degree of price volatility on the first day of listing. Finally, policy recommendations are proposed for the above results.

First, relevant departments and regulators.

When new shares are issued, the state must attach importance to the investor sentiment, and take relevant measures and mechanisms to curb the overly enthusiastic investor sentiment. There is serious information asymmetry in China's GEM market. During the issuance process, there is false propaganda, which prevents investors from obtaining real and valid information, resulting in deviations in their expectations for the future of the stock. Therefore, the national regulatory authorities should implement a stricter and more cautious supervision and audit system, increase the standards for information disclosure to combat insider trading, facilitate the fairness of investors' information and create a good premise for them to make rational decisions. At the same time, regulators should establish sound media financial indexation indicators, to monitor market trends, preventing malicious manipulation of stock prices.

Second, investors.

The proportion of retail investors in my country's stock market is high. Their knowledge reserves are limited, and they lack mature investment awareness. The irrational behavior of investors under irrational emotions is one of the important reasons for the high degree of GEM IPO underpricing. On the one hand, the state can regularly carry out investment knowledge popularization activities to popularize relevant investment knowledge. On the other hand, investors should establish the concept and habit of self-learning, learn systematic and comprehensive investment knowledge, reduce the herd mentality and maintain rationality. In addition, institutional investors should try to reduce speculative behavior and be more rational about the pricing of IPOs.

Third, capital market atmosphere cultivation.

China's capital market was established late, and the market mechanism is not yet perfect. One of the reasons for the low winning rate of GEM and investors' demand for new shares far outweighs the supply is that one of the high-yield financial products in China's capital market is relatively single and investors have fewer choices. Therefore, the country needs to encourage the innovation of financial products, enrich the variety of financial products to diversify investors' overheated demand for stocks and alleviate the irrational investment atmosphere. This can effectively alleviate the IPO underpricing rate, which has a profound impact on the development of the capital market.

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