Does Media Sentiment Shape the Underpricing of IPO In China?

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Abstract. In the information economy epoch, the network media, as an information intermediary plays a guiding role in the operation of the Chinese stock market, causing strong incitement to investors. This paper aims to explore the impact of online media attention on initial public offering (IPO) underpricing from the double perspective of investor sentiment and behavioral finance through empirical research. Particularly, we studied a representative stage of China's stock market, with 756 valid IPO samples. The empirical result indicates that the IPO underpricing degree of the Growth Enterprise Market (GEM) is significantly lower than that of the Mainboard and Small and Medium Enterprise Board (SME); Turnover rate (Tnov) and price-earnings ratio (Pe) on the first day of listing will deepen IPO underpricing, while return on equity ($\overline{\text{ROE}}$) and offering size (Size) will mitigate the problem of IPO underpricing.

Keywords: Media sentiment, IPO underpricing, China's stock market

1 Introduction

The efficiency of IPO pricing directly determines the efficiency of resource allocation in the market."The Mystery of IPO Underpricing" not only exist in developed countries, but also troubled Chinese capital market in very long time (Tian, 2011)[1]. Investors in the secondary market to follow the trend and pursue profits, which fueling the stock market bubble and creating the so-called "irrational prosperity" in Chinese stock market.

The media plays the role of information intermediary in the investment market, which can alleviate information asymmetry and reduce friction cost to a certain extent (Zou, Li and Meng, 2019)[2]. With the rapid development of the Internet, media gradually deviate from the "fourth power". In the capital market, the media also conceal the guiding effect which been catalyzed by the media (Fu and Chen, 2022)[3]. The information orientation and the number of reports affect the investment sentiment and decision-making behavior of investors in the secondary market to a certain extent, aggravate the stock volatility and asset mispricing in the capital market, and finally push up the IPO underpricing rate (Chen, Goyal and Veeraraghavan, 2019)[4].

Scholars are studied on relationship between media and IPO underpricing mostly based on the traditional financial underpricing theory (Yu and Tse, 2006[5]; Yatim, 2011[6]), whereas behavioral finance is relatively few. This paper selects the most representative period of China's stock market, with 756 valid IPO samples in the Chinese stock market, based on both

ICBBEM 2023, May 19-21, Hangzhou, People's Republic of China

DOI 10.4108/eai.19-5-2023.2334397

investor sentiment and behavior theory, conducts an empirical analysis of the relationship between online media attention and IPO underpricing, and attempts to divide media attention into two time periods: the pre-listing period and the listing day, respectively demonstrating the impact trend of different stages on IPO underpricing in each sector of China's stock market.

2 Particularity of China’s IPO pricing policy

Compared with the mature securities markets in Euroamerican coutries, China has its own particularity: First of all, in terms of issuing system, China has undergone tremendous changes in just over 3 decades. China stock market originally adopted strict examination and approval system from year 1989, then slowly transition to approval system in year 2000. China has been continuously and steadily promoting the issuing system into a registration system until now. Secondly, in IPO inquiry pricing mechanism, China's securities market officially entered the era of Accumulative bidding inquiring until 2009. However, the Accumulative bidding system still with certain Chinese characteristics. Compared with the American cumulative bidding system, the biggest difference is that, in China's pricing system, underwriters play a single role in the inquiry and issuance stages, and do not have any right to distribute new shares.

In the past two decades, with the dual reform of China's issuance system and pricing mechanism, the problem of IPO underpricing has not been effectively solved (Zou *et al*, 2020)[7], conversely, it presents new phenomena and features. The secondary market has appeared the "new three highs" phenomenon of high stock price, high rise and high turnover. These phenomena all reflect that, there has extreme differences between investors in the primary market and secondary market on the IPO pricing.

3 literature review

Early scholars had different views on whether news media could play a role in the capital market as an important information intermediary. Roll (1988)[8] believed that financial reports did have a real explanatory power on market fluctuations,even though they are no significant impact on stock returns and trading volume.

With the development of information age and research of behavioral financial theory, media information seems to play an increasingly important role in capital market. Coval & Moskowitz (1999[9], 2000[10]), from the "limited attention" aspect of psychology and concluded that investors would prefer to invest in companies they know better because of their limited cognition.

As for the impact of media attention on IPO underpricing. Scholars represented by Galpin, Ray&Yu (2009)[11] believe that media attention has no significant impact on IPO underpricing. On the opposite side, Liu, Sherman & Zang (2009)[12], from the perspective of traditional finance, and stated that media information will have a long-term impact on new shares because its reduce the cost for investors to obtain information. Such viewpoint is also underpinned by Derrien (2005)[13], Cook, Kieschnick & Van Ness (2006)[14], from the

perspective of behavioral finance, they found that media news indirectly affects stock prices by influencing investor sentiment.

However, in China, the research on media information and capital market is still in its infancy. Most of their main research focus on media governance, so there is little research on the relationship between media and asset returns, and empirical analysis is also rare. Xu and Chen (2005)[15] found that institutional investors showed strategic behavior in order to affect public attention. On this basis, Sun (2019)[16] confirmed that rising investor sentiment can promote IPO underpricing, and media rent-seeking will aggravate the role of investor sentiment in promoting IPO underpricing.

4 Research Hypothesis

China's stock market is divided into the main board, the SME board and the GEM. As mentioned before, China's stock market is heavily affected by state intervention and national policies. At present, there is a basic consensus in the academic and investment circles that China's stock market is a typical "policy market". Therefore, online media will also pay more attention to the listing news of large enterprises such as central enterprises and state-owned enterprises. Accordingly, the following assumptions are made:

H1: The network media pay the highest attention to the main board market, followed by the SME, and the GEM is the least.

In China's stock market, the vast majority of investors are individual investors, and their information collection and ability are limited. The opinion leaders with the attributes of official media and online media have absolute influence on the public, so they become a reliable information source for individual investors. Therefore, the following assumptions are proposed:

H2: Network media attention will have a positive impact on IPO underpricing.

H3: The impact of online media attention on IPO underpricing on the day of listing is much higher than that in the previous period.

Based on the above two factors, the research hypothesis is further proposed:

H4: Influenced by the attention of online media, the IPO underpricing of GEM will be significantly lower than that of the main board and SME board.

5 Measurement and variables

5.1 Selection of research variables

a) . Setting of IPO underpricing indicators

IPO underpricing refers to the situation that the trading price of the initial public offering shares after listing (generally the first day) is much higher than the issue price. The performance of the individual stock return rate (Retn) on the first day of listing or the market adjusted individual stock return rate (Retna) on the first day of listing can be used:

The return on individual shares (Retn) on the first day of listing is:

$$r_{n1} = (P_{n,1}/P_{n,0}) - 1 \quad (1)$$

Where $P_{n,1}$ is the closing price of stock n on the first day, and $P_{n,0}$ is the issuing price of stock n.

The market return on the first day of listing (Mretn) is:

$$r_{m1} = (P_{m,1}/P_{m,0}) - 1 \quad (2)$$

Where, $P_{m,1}$is the composite index on the first day of listing and $P_{m,0}$ is the composite index on the offering day.

Market adjusted individual stock return on the first day of listing (Retna):

$$Retna = (1 + r_{n,1})/(1 + r_{m,1}) - 1 \quad (3)$$

b) network media attention index construction

Media attention is an abstract concept, according to previous studies, the choice of this indicator is not unified. In the research on investor awareness, Bakek, Nofsinger and Weaver (2002)[17] first adopted the number of securities analysts who pay attention to the company's stock and the frequency of media reports as proxy indicators of the company's popularity; Mitchell (1994)[18] used the number of Dow Jones announcements as a measure of the amount of information; Engelberg (2011)[19] used Google search volume before IPO to build investor attention indicators. Combined with the research methods of previous scholars and the actual situation of China's stock market, this paper uses the number of times that the stock security code (security name) appears in Baidu's news headlines within the set time as the indicator data to measure media attention.

At the same time, considering that the IPO underpricing is due to the low pricing in the primary market and the high transaction price in the secondary market, it is necessary to decompose the online media attention accordingly: set the number of Baidu news from the initial offering date to the day before listing as the media attention($lnnews_1$) in the early stage, corresponding to the primary market; The number of Baidu news on the day of listing is the media attention ($lnnews_2$) of the day, which corresponds to the secondary market and reflects investor sentiment. Such decomposition method express the purpose of examining the impact of online media attention on IPO underpricing in different periods of time.

C). Selection of other control variables

Other control variables selected include age of the company (*Age*), registered capital of the Company at the time of offering ($Asset_1$), registered capital at the time of listing ($Asset_2$), number of issues (*Num*), size of the issue(*Size*), winning lot rate of online issuance (*Plotonln*), actual per share issuance expenses (*Isexps*), turnover rate on the first day of listing (*Tnov*), price earnings ratio on the first day of listing (*Pe*), price to book ratio on the first day of listing (*Pna*), asset-liability ratio($\overline{DA}$), return on net assets($\overline{ROE}$), net profit per share($\overline{Npps}$), and 2 sector market dummy variables ($Infor_1$ and $Infor_2$).

5.2 Sample data

a). Sample period

This paper selected sample data is based on the listing date of enterprises, including all listed companies in Shanghai and Shenzhen Stock Exchanges from January 2010 to February 2014. The number of effective samples used for empirical analysis is 756, excluding the samples with missing indicators.

It should be noted that although China's stock market experienced the eighth IPO suspension on November 16, 2012, and the number of IPOs in 2013 and 2014 was relatively limited, so far, the IPO system has not changed compared with that before the suspension. Therefore, the empirical analysis of this paper includes the IPOs after November 2012 in the sample period.

b). Data Resource

The data of online media attention is derived from Baidu News, and the number of occurrences that the securities code (securities name) appears in the news title within the set time is taken as the indicator data, which processed with logarithm.

The market adjusted individual stock return (Retna) and all control variable data on the first day of listing are from the CSMAR research database.

6 Empirical analysis

6.1 Descriptive statistics

Table 1. Description of sample statistical characteristics

	Mean	*Median*	*Maximum*	*Minimum*	*Std. Dev*
Retna	0.309100	0.204275	6.080247	-0.20939	0.414892
$lnnews_1$	4.879334	4.859812	7.170120	1.609438	0.446433
$lnnews_2$	3.815482	3.828641	6.638568	1.098612	0.663855
Age	3110.806	3082.500	10016.00	18.00000	1855.726
$Asset_1$	6.04E+08	81000000	2.70E+11	26000000	9.85E+09
$Asset_2$	7.00E+08	1.08E+08	2.96E+11	34670000	1.08E+10
Num	9363.612	2700.000	2223529.	867.0000	83081.08
Size	113083.9	66750.00	5959059.	3870.000	269574.5
Plotonln	1.578759	0.829801	65.52084	0.000000	3.275643
Isexps	1.762440	1.630000	7.700000	0.000000	0.988426
Tnov	0.688413	0.760000	2.690000	0.060000	0.226318
Pe	58.59238	51.70500	369.9200	0.000000	32.95547
Pna	15.82036	13.96500	78.67000	0.000000	9.995838
$\overline{DA}$	48.85732	50.12000	98.30000	0.000000	15.65447
$\overline{ROE}$	29.57153	26.77533	108.7667	0.126667	13.62724
$\overline{Npps}$	0.751679	0.563333	51.17000	0.063333	2.110932
$Infor_1$	0.407407	0.000000	1.000000	0.000000	0.491677
$Infor_2$	0.473545	0.000000	1.000000	0.000000	0.499630

It can be seen from the Table 1, IPO underpricing has been serious problem since 2010, with an average of 30.91% and a median of 20.43%. It can be seen that most IPOs have been underpricing, and the most serious IPO underpricing rate has been as high as 608.02%. At the same time, there have been appearance of break on the day of listing. The online media attention of different IPOs is also very different. The number of IPO news with the highest attention in the early stage is up to 1300, and the minimum number is only 5. On the day of listing, the number of IPO news with the most attention is 764, and the minimum number is only 3.

6.2 Empirical Analysis of the Impact of Internet Media Attention on IPO Underpricing

Before analyzing on the relationship between online media attention and IPO underpricing, this paper analyzed the influencing factors of online media attention, and verify it is very reasonable to divide media attention into two periods, namely, there are different significant factors affecting media attention in different periods.

6.2.1 Direct and joint impact of online media attention on IPO underpricing in the early stage and on the day of listing

First of all, the direct impact of media attention in the early stage is analyzed separately to verify the relationship between the primary market and IPO underpricing; Secondly, it analyzes the direct impact of media attention on the day of listing, and indirectly verifies the impact of investors' pursuit of new shares on IPO underpricing; Finally, the joint impact of media attention in the early stage and on the day of listing is investigated.

Mode 1: Direct impact of Early stage of media attention (lnnews_1)

$$Rntna = C + \partial_1 lnnews_1 + \mu \tag{4}$$

Model 2: Direct impact of Media attention on the day of listing (lnnews_2)

$$Rntna = C + \partial_1 lnnews_2 + \mu \tag{5}$$

Model 3: Test of Joint influence

$$Rntna = C + \partial_1 lnnews_1 + \partial_2 lnnews_2 + \mu \tag{6}$$

Table 2. Test Results of Direct and joint impact of online media attention on IPO underpricing

Method: Least Squares	Model 1	Model 2	Model 3	
	lnnews_1	$lnnews_2$	lnnews_1	$lnnews_2$
Coefficient	0.136678	0.145717	0.044842	0.129597
Prob.	0.0000	*0.0000*	0.3256	0.0000

As showing in Table 2, the impact of media attention ($lnnews_1$) on IPO underpricing rate (Retna) in the early stage is no longer significant, and the coefficient is also reduced from 0.136678 to 0.044842. Not only that, the joint impact model is even lower than the correction decision coefficient of the single impact model of media attention ($lnnews_2$) on the day of listing. This problem can be attributed to the multicollinearity between $lnnews_1$ and

$lnnews_2$. Therefore, according to the principle of "gradual regression" in econometrics, in the following empirical research on IPO underpricing, only the impact of online media attention on the day of listing ($lnnews_2$) is considered, and early stage ($lnnews_1$) is considered as a less "important" explanatory variable and is eliminated. From this point, it can be seen that the secondary market rather than the primary market plays a greater role in IPO underpricing.

6.2.2 Test of adding other control variables

In order not to omit important variables, in consideration of sufficient data and guaranteed degree of freedom, and eliminate the problem of multicollinearity, so the "stepwise regression" method is used to correct it. The stepwise regression equation is as follows:

$$Retna = C + \partial_1 lnnews_2 + \partial_2 Tnov + \partial_3 Pe + \partial_4 \overline{ROE} + \partial_5 Size + u \quad (7)$$

Table 3. Test Results of adding other control variables

Dependent Variable: Retna				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.863436	0.084792	-10.18303	0.0000
lnnews_2	0.153352	0.018708	8.196918	0.0000
Tnov	0.669832	0.055321	12.10803	0.0000
Pe	0.003973	0.000373	10.63879	0.0000
$\overline{\text{ROE}}$	-0.003150	0.000882	-3.570020	0.0004
Size	-1.14E-07	4.64E-08	-2.458507	0.0142

As showing in the Table 3, that factors from the secondary market (Tnov & Pe) will promote IPO underpricing, while financial indicators/profitability ($\overline{ROE}$) of listed companies and issuance size (Size) of the primary market can curb IPO underpricing, which again reflects the importance of the secondary market to IPO underpricing.

6.2.3 Test of adding plate variables

After considering the feasibility and necessity of adding dummy variables, this section will only introduce segment variables by adding, focusing on the impact of segment types on intercept terms. The introduction process follows the steps of separate before joint.

Model 1: Investigation on IPO Underpricing on the GEM: Only Add Infor_1 Variable

$$\text{Retna} = C + \partial_1 lnnews_2 + \partial_2 Tnov + \partial_3 Pe + \partial_4 \overline{ROE} + \partial_5 Size + \partial_6 Infor_1 + \mu \quad (8)$$

Model 2: Investigation on IPO Underpricing of SME: Only add Infor_2 Variable

$$Retna = \text{C} + \partial_1 \text{lnnews}_2 + \partial_2 \text{Tnov} + \partial_3 \text{Pe} + \partial_4 \overline{\text{ROE}} + \partial_5 \text{Size} + \partial_6 \text{Infor}_2 + \mu \quad (9)$$

Model 3: Joint influence of plate type variables: Add both Infor_1 and Infor_2 Variable

The regression model is:

$$\text{Retna} = \text{C} + \partial_1 \text{lnnews}_2 + \partial_2 \text{Tnov} + \partial_3 \text{Pe} + \partial_4 \overline{\text{ROE}} + \partial_5 \text{Size} + \partial_6 \text{Infor}_1 + \partial_7 \text{Infor}_2 + \mu \quad (10)$$

Table 4. Test Results of adding plate variables

	Model 1	Model 2	Model 3	
	$Infor_1$	$Infor_2$	$Infor_1$	$Infor_2$
Coefficient	-0.059925	0.047321	-0.059303	0.047321
t-Statistic	-2.671213	1.978978	-1.305105	1.978978

From Table 4, it illustrate that after adding the two sector type variables at the same time, both of them have no significant impact on IPO underpricing, and the modified determinability coefficient is also lower than when adding Infor_1alone. It is normal theoretically for such a result to occur. From the perspective of information asymmetry, both the main board and the SMG belong to the market with low degree of information asymmetry, while the GEM has relatively high degree of information asymmetry due to its own characteristics. Therefore, it is sufficient to only add the sector variable $\mathrm{Infor}_1$to distinguish the GEM from the main board and small and medium-sized board, and the regression results show that only adding Infor_1 has the highest degree of explanation for IPO underpricing.

To sum up, it can be determined that the final multiple linear regression model is:

$$\widehat{\mathrm{Retna}} = -0.832545 + 0.146821\mathrm{lnnews}_2 + 0.671227\mathrm{Tnov} + 0.004105\mathrm{Pe} - 0.002789\overline{\mathrm{ROE}} - 1.24 \times 10^{-7}\mathrm{Size} - 0.059925\mathrm{Infor}_1$$

$$R^2 = 0.394789 \quad \bar{R}^2 = 0.389914 \quad F = 80.9958 \quad DW = 1.617014 \tag{11}$$

The white method was used to test the heteroscedasticity of the above model results, and the results showed that there was indeed a serious heteroscedasticity. Therefore, the weighted average least squares (WLS) method was used to correct it. The final model results are as follows:

$$\widehat{\mathrm{Retna}} = -0.82099 + 0.144285\mathrm{lnnews}_2 + 0.665477\mathrm{Tnov} + 0.004158\mathrm{Pe} - 0.002872\overline{\mathrm{ROE}} - 1.21 \times 10^{-7}\mathrm{Size} - 0.05845\mathrm{Infor}_1 \tag{12}$$

7 Conlusion

Through the above empirical analysis, the following conclusions are mainly drawn: First of all, there are indeed differences in the attention paid by online media to different sectors of the market. The main board market receives the most attention, followed by the SMG, and the GEM market receives the least attention. Secondly, the online media attention on the day of listing has a much higher impact on IPO underpricing than the media attention in the early stage, which also shows that although the issuance of the primary market will affect IPO underpricing, the main reason for its high underpricing rate is the high investment enthusiasm in the secondary market, and the turnover rate (Tnov) on the first day of listing in the final model also support this viewpoint. Third, the degree of IPO underpricing in the GEM market is significantly lower than that in the main board and SMG, which is contrary to the traditional view that "the higher the degree of information asymmetry, the more serious the IPO underpricing". Based on the above analysis, the higher the degree of information asymmetry, the lower the media attention of the market (Growth Enterprise Market), and the higher the

media attention will promote IPO underpricing. The empirical research conclusions are consistent. Fourth, online media attention (including early stage and the day of listing), turnover rate (Tnov) on the first day of listing, and price earnings ratio (Pe) on the first day of listing will promote IPO underpricing by guiding investor sentiment: The higher the return on equity (ROE) in the three years before listing, the lower the degree of IPO underpricing, which indicates that good financial conditions can restrain the "anomaly" of IPO underpricing; The larger the issuance size(Size), the lower the degree of underpricing.

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