



Exploring Detriments of China IPO Underpricing: An Empirical Evidence from A-share IPO

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Abstract. As an important method for the financing purpose of listed companies, an initial public offering (IPO) is a vital connection between companies and investors and is also the necessary foundation for the development of financial markets. However, since the 1970s, IPOs are observed consistently being underpriced around the world. This article selects China which is one of the most underpriced countries as the sample. With the empirical support from the ordinary least square regression method (OLS) based on the Chinese A-share IPO figure, aiming to explore the sources of the IPO market underpricing phenomenon. Besides, this article also discusses China-specific financial market characteristics and assesses the effect of past Chinese stock market policy changes.

Keywords: IPO Underpricing · Information Asymmetry · Corporate Governance · China Stock Market Policy Changes

1 Introduction

A large amount of IPO literature attempts to investigate the reasons why there usually exists abnormal returns on the first trading day on the global capital markets. Ritter and Welch's research presents that IPOs are consistently underpriced in both mature and emerging stock markets [1]. The average price-suppression in Chinese initial public offerings is particularly significant. According to Banerjee, Dai, and Shrestha, China's average first return ratio was 57.14 percent from 2000 to 2006, whereas Norway's lowest initial return ratio was only 4.33 percent [2]. Between 2006 and 2016, the typical initial return ratio in China's small and medium-sized company market was 116.62 percent, much higher than the ratio in other sized financial markets. However, owing to shifting institutional restrictions, Ritter predicts that price suppression will be substantially lower in the future than it has been in the previous twenty years [3]. The fundamental causes of high Chinese IPO underpricing are examined in this article, as well as how a regulation adjustment by the Chinese Securities Regulatory Commissions (CSRC) affects this phenomenon.

The research proposed by Zou et al. discloses the reasons causing IPO underpricing contains deliberate pricing of issuing corporations in the primary market and market failure (i.e., mis-valuation) in the secondary market owing to overpowering investor enthusiasm [4]. Deliberate underpricing results in a lower IPO offering price which cannot precisely reflect the firm's intrinsic value, whereas market mis-valuation results in an IPO closing price becoming higher than its intrinsic value on the first trading day. This article discovers which variables are the source of Chinese market mis-valuation factors and evaluates whether the factors exist after a series of CSRC policy changes.

China's IPO pricing method was a restricted P/E system when the first IPO was launched on the SME board in May 2004, requiring an offering price P/E ratio of no more than 20. Although this approach is straightforward for managing reasons, it does not allow individual enterprises to completely represent their intrinsic values, which are often substantially greater, and thereby prevent efficient resource allocation. It's no doubt that many of these IPOs had astronomically large first-day returns during this time. In January 2005, the book-building method replaced the controlled P/E system to address these flaws and achieve market-driven pricing. Gao's research presents that based on this system, IPO price is established initially by institutional investors, and afterward shares can be applied by individual investors at the set price [5].

Since then, the market force has begun to influence IPO pricing; nonetheless, the offering price has been pushed to a high level, and the market price has been driven up even higher, resulting in robust first-day returns followed by negative long-term returns.

However, deemed by hidden government influence, IPO pricing has not yet been totally market-driven. The CSRC issued a notice in June 2009 titled "Guidance on More Reforming and Perfecting the Issuance System of New Shares", with the goal of achieving further market orientation and loosening the prior unseen control of the P/E ratio. This approach has had a demonstrated impact on reducing IPO underpricing: first, trading prices have begun to be lower than the offering price; meanwhile, for the ChiNext and SME boards, the mean P/E ratios reached a high level of 53 and 69, and the mean turnover proportion rose to 144% and 198% respectively. It is clearly indicated that policy reform is unable to achieve the expected objectives.

Following that, in January 2014, a notice referred to as "Measures to Strengthen the Supervision of Issuance of New Shares" in issued by CSRC, aiming to improve IPO governance, which not only requires issuers but also underwriters to report a special announcement about investment risks when the offering-price-based P/E ratio is higher than the industrial average in the secondary market, therefore, such risk absorbs investors' attention. Despite the fact that the CSRC does not establish a P/E ratio cap, issuers and underwriters are not likely to determine a high offering price, preferring instead to keep it at or near the industry average, so instituting an implicit P/E ratio restriction.

Furthermore, on December 16, 2013, a notice published by Shenzhen Stock Exchange introduces a trading halt system for the first trading day, requiring that the first-day effective range of bid be adjusted to 20% of the offering price, aiming to strengthen the constraints of speculative behaviour on new shares. These legislative changes have had a substantial influence on IPO issuers' and investors' behaviour.

This article provides a comprehensive analysis of China IPO underpricing phenomenon, examining the relationship between underpricing rate and ‘information asymmetry factor’, ‘corporate governance factor’, ‘CEO background factor’, and ‘company profitability factor’. By running single variable and multivariable regression using OLS estimate to test the correlation between variables. This article finds out that information asymmetry, corporate governance, CEO background affect firms’ IPO while company profitability seems to have less impact in the Chinese financial market. Besides, even though regulations in China’s financial market changed, the detriments still have influence over underpricing. In Sect. 2, some related literature will be reviewed. In Sect. 3 and 4, the research method will be clarified, after that, the result will be summarised and discussed.

2 Literature Review

Since 1970s, Ibbotson noticed that IPOs are consistently underpriced (traded at discount) during the period of their initial offerings, indicating a market failure that directly contradicts traditional economic theory [6]. Boulton, Smart, and Zutter find out that IPO underpricing appears to be widespread throughout capital markets around the world, with IPO underpricing ranging from 3.5 to 56 percent on average and by the nation in a sample of 49 countries [7]. Ritter proves that the most common rationale for underpricing is that asymmetric information generates a moral hazard because of a principal-agent or principal-principal conflict [8]. This classic line of thought, on the other hand, has received only sporadic empirical support [9].

Different from other countries, the aggregate amount of new shares issued every year in the Chinese IPO market is determined by the central government. Chan, Wei, and Wang’s research conclude that IPO underpricing is much higher than the average level in other countries around the world because of the willingness of CSRC to announce an underpriced offering price to guarantee full subscription and the excess demand of investors following by a general state-owned situation in China [10]. Previous literature explores many possible reasons that cause the underpricing phenomenon, for example, as argued by Gao and Zhao, information asymmetry through region and industry [11], CEO background [12], taxation policy [13], etcetera. Based on the sample IPO data from the Chinese SME board from 2006 to 2016, Zou et al. introduce pricing factors and mis-valuation factors to explain the underpricing in China [4]. In the area of exploring reasons for IPO underpricing in China, previous literature either focuses on one specific factor which may affect the offering price or explores in a comprehensive view with outdated or limited sample data.

3 Methodology and Model Specification

This article aims to provide a detailed explanation of reasons that may cause China’s IPO underpricing, and then use the OLS regression method based on the sample data from China Securities Market and Accounting Research Database (CSMAR) to evaluate proposed arguments and evaluate whether China stock market policy changes affect IPO underpricing detriments.

3.1 Method

This article adopts regression analysis using the OLS method to analyse determinants of China's A-share market. As proposed by Yuan, the current method of measuring the degree of IPO underpricing is generally uniform and can be roughly divided into two indicators according to whether the stock market has a first-day price constraint policy: before 2014, when the stock price increase limitation policy was not introduced, the IPO underpricing can be measured by the first-day yield which is used as a proxy variable to measure the degree of IPO underpricing in some existing literature [13–16]. In 2014 and afterwards, the closing price of the first non-up or down stop after listing is used instead of the first-day yield rate (except for stock markets that implement the registration system). This is because after the first-day increase limit is set, the maximum first-day increase of new stocks is limited to 44%. On the surface, it seems that this has restricted China's IPO price underpricing phenomenon, but if observing continuously time-series data, it could be found that the stock market has seen an abnormal phenomenon that several or even dozens of ups and downs for many consecutive days since the date of the listing of new stocks. Therefore, in periods with first-day increase limitation, first-day yields are no longer suitable for measurement. In addition, since the listing of stocks is generally reflected behind the issuance date of about 10 working days, during which the fluctuations in the stock market may affect the price of new shares, a more accurate method which excludes the impact of stock market fluctuations is introduced. Excluding market influence, the adjusted IPO underpricing rate can be expressed as:

$$Adjr = \frac{P_i - P_{ie}}{P_{ie}} - \frac{M_1 - M_0}{M_0} \quad (1)$$

In this formula, *Adjr* measures the degree of IPO underpricing, P_i refers to the closing price of the new stock i on the first trading date after IPO based on A-share market index, P_{ie} represents the offering price of the new stock i based on A-share market index, M_1 refers to the market average return on the first trading day of stock i , M_0 represents the market average return on the offering date of stock i .

3.2 Sample Selection and Model Construction

Sample data is consisted of 3,068 IPO observations in Chinese A-share market during the period from 01/01/2006 to 31/12/2021. IPO information comes from CSMAR database. Based on Koop and Li's research, this article separates explanatory variables into several different sources: 'Information Asymmetry Factor' which measures the impact of asymmetric information possessed by investors, 'Corporate Governance Factor' which tests the influence of different IPO firms' director structure, 'CEO Background Factor' which evaluates the effect of different CEO personal backgrounds, and 'Corporations' Profitability Factor' which assesses IPO firms' operation and financial performance [17]. This article first uses single variable regression to test the correlation between variables and adjusted underpricing rate. Subsequently, multivariable regression of these four variables is deployed to obtain a comprehensive image of how dependent and explanatory variables interact. After this, this article divides the full sample into three sub-samples in terms of 2006–2009, 2009–2014, 2014–2021 to examine the influence of Chinese IPO policy changes.

3.2.1 Information Asymmetry Factor

In accordance with the research proposed by Gao and Zhao, information asymmetry theory is a factor of China stock market IPO underpricing, mainly in terms of geographical distribution [11]. This article divides Chinese provinces into eight economic areas, which are Northeast Region (i.e., Province Liaoning, Jilin and Heilongjiang), Northern Coastal Region (i.e., City Beijing, Tianjin and Province Hebei, Shandong), Eastern Coastal Region (i.e., City Shanghai, and Province Jiangsu, Zhejiang), Southern Coastal Region (i.e., Province Fujian, Guangdong and Hainan), Yellow River Middle Reach Region (i.e., Province Shaanxi, Shanxi, Henan and Neimeng), Changjiang River Middle Reach Region (i.e., Province Hunan, Hubei, Jiangxi and Anhui), Southwest Region (i.e., Province Yunnan, Guizhou, Sichuan, Guangxi and City Chongqing), Northwest Region (i.e., Province Gansu, Qinghai, Ningxia, Xizang, Xinjiang).

3.2.2 Corporate Governance Factor

The experimental survey conducted by Burton et al. indicates that different level of corporate governance will contribute to different level of different IPO underpricing rate, which is a problem deemed to agency theory [18]. Agency theory assumes asymmetric information between managers and principals creates moral hazards due to conflicts between principal and principal or agent. This article treats the number of independent directors of companies' managers and the proportions of independent directors sitting in Audit Committee, and Remuneration and Appraisal Committee as a detriment of IPO underpricing rate.

3.2.3 CEO Background Factor

As discussed by Blankespoor, Hendricks, and Miller, when investors make their valuations, companies' CEO personal characteristics have important impact in investors' decision-making process, which affects investors' judgements when they value the firms, and will consequently change the performance of share prices in both primary and Secondary stock market [19]. This article assumes CEO background is constructed with respect to their education level and gender.

3.2.4 Corporations' Profitability Factor

As proved in Zou, Cheng, Chen and Meng's research [4], which uses the method of stochastic frontier approach, a company's profitability ability does have influence on its IPO performance. Following Kim and Ritter [20] and Kim et al. [21], this article introduces earnings per share (EPS) which is collected twelve months prior to the announced IPO date as a proxy to evaluate the firms' ability to produce wealth for the shareholders.

Table 1. IPO Underpricing Situation in Different Regions of China

Region	Mean IPO Underpricing Rate	Standard Deviation
Changjiang River Middle Reach Region	71.52%	88.01%
Eastern Coastal Region	56.69%	67.33%
Northeast Region	81.09%	131.36%
Northern Coastal Region	58.86%	93.06%
Southern Coastal Region	63.90%	77.38%
Southwest Region	68.38%	103.32%
Northwest Region	77.89%	108.91%
Yellow River Middle Reach Region	71.88%	90.89%

4 Result and Discussion

4.1 Single Variable Regression

This section uses single variable regression using OLS method to investigate the relationship between information asymmetry factor, corporate governance factor, CEO background factor, company's profitability factor and the adjusted IPO underpricing rate. By running the regression, correlation between explanatory variables and explained variables is proved. Finally, these figures will provide empirical evidence to this article's discussions of the intuitions behind China stock market underpricing phenomenon.

4.1.1 Information Asymmetry Factor

This paper sets the information asymmetry variable as a dummy variable which identifies well-developed region (i.e., eastern coastal, northern coastal and southern coastal region) as '0' and less-developed region (i.e., other regions) as '1'. As shown in Table 1, it can be observed that some less-developed regions have a higher degree of underpricing and variation level, while other economically prosperous regions have a lower degree of underpricing level and variation level. For instance, mean IPO underpricing rate in northeast and northwest is high, respectively achieving the level of 81.09% and 77.89%, and this rate is unstable with a relatively high standard deviation. While in eastern coastal, southern coastal and northern coastal regions, the level of underpricing rate is relatively low and stable. This result is consistent with research made by Gao and Zhao that well-developed regions have advantages of more rapid information-spreading, cheaper information research cost and agency cost, and easier risk-controllability, which together reduce the information gap between investors in financial market, and thereby form a relatively reasonable IPO price [11].

Table 2 presents OLS regression result of adjusted IPO underpricing rate and information asymmetry factor. The formula is determined as:

$$Adj_r = \beta_{Info} * Info + Constant \quad (2)$$

Table 2. Information Asymmetry OLS Result

Variable	Coefficient	T-statistics	P-value
Constant	0.7589	34.5480	
β_{Info}	-0.1991	-2.6705	0.0076
Sample Size	3068 Observations		

Table 3. Corporate Governance OLS Result

Variable	Coefficient	T-statistics	P-value
Constant	0.7212	20.5192	
β_{Corp}	-0.0857	-2.1773	0.0295
Sample Size	3068 Observations		

The coefficient is negative, which provides empirical support to above inference that information is easier to be obtained in well-developed regions than those relatively less-developed regions and thereby information asymmetry will affect IPO underpricing rate. Constant means the intercept term, which refers to other exogenous variables that affect the adjusted IPO underpricing rate. The P-value is 0.0076, which means result is statistically significant at 1% significance level, hence there is a negative relationship that more information leads to lower IPO underpricing rate.

4.1.2 Corporate Governance Factor

Corporate governance has a negative relationship with IPO underpricing rate because IPO issuers are willing to generate excess return through their underpricing behaviours, which will then lead to greater ownership dispersion and less incentives for outsiders to monitor corporate insiders' behaviour [7]. Their research shows that companies with a better control in terms of majority ownerships and dual-class structure were underpriced at a normal level. To prevent corporate insiders from obtaining private ownership benefit, independent directors' supervision is vital and necessary. In this article, it is assumed '1' for better corporate governance when there exist at least three independent directors in board of directors and at least one independent directors in both audit committee and remuneration and appraisal committee. The regression could be expressed as:

$$Adj_r = \beta_{Corp} * Corp + Constant \quad (3)$$

The OLS result further provides empirical evidence that negative relationship exists, which means a better corporate governance will reduce IPO underpricing rate. Constant here refers to the intercept, which represents other exogenous variables that affect the adjusted IPO underpricing rate. P-value is 0.0295, which is smaller than 0.05 but greater than 0.01, therefore the result is significant at 5% level (Table 3).

4.1.3 CEO Background Factor

Previous research proposed by Judge et al. shows that CEO background will affect share price in IPO [22]. In IPO process, board members will have most influence on eventual outcomes as they are the key decision-makers. Pollock, Porac, and Wade argue that it is the board's responsibility to communicate and support the work of external advisors, understand the information presented, objectively and critically challenge the underlying assumption, coordinate, and direct the overall process, and ultimately decide the offering price and detailed timing of the IPO [23]. This article assumes gender and education background as two explanatory variables. For gender, female discrimination generally appears in workspace around the world such as the 'glass ceiling' phenomenon. Hence, it is assumed that underpricing rate will become higher when managers of the firm are female derived by an inside underpriced offering price following managers' inaccurate estimates of the company's intrinsic value and an outside psychologically acceptable price by prospective investors based on their lower expectations of generated cash flow by the female directors. For education background, more knowledgeable boards are more likely to skillfully manage IPO process and therefore enhance companies' absorptive capacity. According to Zahra and George absorptive capacity refers to a set of knowledge creation routines by which firm acquire, assimilate, transform, and apply knowledge to obtain a more dynamic organisation capacity [24]. Hence, it is reasonably expected that collective knowledge assembled within the board members will improve the efficiency of IPO and will likely contribute to a successful and a minimal or eliminated underpricing issue. This article assumes the gender variable '1' for male director, '2' for female director; and the education background variable '1' for technical secondary school and below, '2' for associate degree, '3' for bachelor's degree, '4' for master's degree, '5' for doctor's degree, and '6' for other advanced level business-specific educations. The regression function can be derived as:

$$Adjr = \beta_{Gend} * Gend + \beta_{Edu} * Edu + Constant \quad (4)$$

As shown in Table 4, gender issue has a positive relationship of a coefficient of 0.0554 with IPO underpricing rate, however, the result is statistically insignificant. This result is consistent with the conclusion that male managers are more capable to maintain a low underpricing rate, while the statistical insignificance may be a result of the traditional virtue of Chinese culture that the society will not discriminate against female workers to a severe extent. For education, it is presented that a higher level of education will reduce the underpricing rate, and the regression result is statistically significant at the 10% level, which further supports the above discussion.

4.1.4 Corporations' Profitability Factor

Following previous research by Kim and Ritter and Kim et al, this article uses 12-month EPS before the announcement date as a proxy for measuring a company's profitability ability [20, 21]. The regression formula can be expressed as:

$$Adjr = \beta_{EPS} * EPS + Constant \quad (5)$$

Table 4. CEO Background OLS Result

Variable	Coefficient	T-statistics	P-value
Constant	0.4713	3.3284	
β_{Gend}	0.0554	0.9862	0.3242
β_{Edu}	-0.0612	1.7264	0.0845
Sample Size	3068 Observations		

Table 5. Companies' Profitability OLS Result

Variable	Coefficient	T-statistics	P-value
Constant	0.7434		
β_{ESP}	-0.0323	-0.9447	0.3450
Sample Size	3068 Observations		

By conducting OLS regression method, a negative relationship is identified that a higher earnings per share twelve months prior to IPO is likely to reduce the underprice rate whereas the result is statistically insignificant. One possible reason for the statistical insignificance is that China stock market usually prices a company inaccurately (Table 5).

4.2 Multi Variable Regression

By using multiple variable regression method, this article investigates how the five explanatory variables and the explained variable interact with each other. The formula can be derived as:

$$Adj_r = \beta_{Inf0} * Info + \beta_{Corp} * Corp + \beta_{Gend} * Gend + \beta_{Edu} * Edu + \beta_{EPS} * EPS + Constant \quad (6)$$

Besides, the importance of each explanatory variable is also identified by comparing the coefficients. At last, by comparing multi variable regression result within different time periods, this article examines the effect of China stock market policy regime.

4.2.1 Result and Descriptive Statistics

As shown in Table 6, the result is mainly consistent with that of the single variable regressions. Gender variable and EPS are still statistically insignificant regarding their coefficient with the adjusted underpricing return, which further supports the argument that the gender discrimination phenomenon is unpopular, and EPS does not always reflect the correct information for investors in China. Furthermore, comparatively less information and worse corporate governance will cause a high level of underpricing percentage while the corporate governance factor has a larger influence. Besides, education

Table 6. Multi Variable OLS Result

Variable	Coefficient	T-Statistics	P-value
Constant	0.3895		
β_{Inf0}	-0.0664	-0.5574	0.0058
β_{Corp}	-0.1068	-1.2371	0.0216
β_{Gend}	0.0864	1.1416	0.1571
β_{Edu}	-0.0465	1.1951	0.0232
β_{EPS}	-0.0265	-0.7721	0.4402

has a positive relationship with IPO underpricing rate, which indicates higher education degree will reduce the IPO underpricing rate.

4.2.2 Regression Result in Different Time Periods

Regression result is similar between the three-period figure and full sample summary statistics. From 2006 to 2009, the adjusted underpricing rate is negatively and significantly correlated with information variable whereas positively and significantly correlated with education and corporate governance factors. However, the data of the coefficient during the period 2009–2014 and 2014–2021 continues to display a weak relation between explanatory factors and explained factor. However, significance level keeps being statistically significant for education background, information asymmetry, and corporate factors, which are referred to as mis-valuation factors [4].

After considering the foregoing findings, it may be concluded that mis-valuation factors are the primary source of IPO underpricing. The fact that most IPOs launched 2014 afterwards were temporarily suspended for several days, as their trading prices were higher than the limitation of trading halts system. In terms of statistics, an implication occurs that individual investor demand exceeds the quantity of new shares offered because the fact of 713.15 and 78.34 percent with respect to average online over-subscription multiple and adjusted first-day turnover ratio. In line with the findings of research conducted by Ginger Meng, Zhang, and Zou, these figures suggest that secondary market investors include a sizable number of irrational people, whose excessive desires will drive up aftermarket IPO prices in the short run [25]. As a result, misvaluation factors will affect investors' judgement, and then irrational investors' emotion together with their behaviours in the secondary market, will cause IPO underpricing phenomenon (Table 7).

Table 7. OLS Result in Different Time Period

Variable	Coefficient (2006/2009)	Coefficient (2009/2014)	Coefficient (2014/2021)
constant	0.4587** (3.1306)	0.2994** (2.3746)	0.3491*** (9.7087)
β_{Inf0}	-0.1701** (1.1347)	-0.1692* (1.6813)	-0.0241** (-1.1633)
β_{Corp}	-0.0582** (0.8710)	-0.0428** (0.7561)	-0.0161** (1.1302)
β_{Gend}	-0.0357 (0.6178)	0.0035 (0.0786)	0.0082 (0.6225)
β_{Edu}	-0.0505** (-1.5307)	-0.0183* (-0.6608)	-0.0079** (3.0397)
β_{EPS}	-0.0104 (-0.4232)	-0.0109 (-0.4856)	0.0074 (0.0242)

Note: t statistics in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 Conclusion

This article investigates the factors which cause Chinese IPO underpricing issue. It is concluded that information asymmetry between different regions, the Chief Executive Officers' background with respect to education and gender, the extent of IPO firms' corporate governance, and IPO companies' profitability capability have an influence on the adjusted underpricing rate. This article deploys the OLS regression method to estimate the correlation between them and test whether these factors are empirically established in China's financial market. It is observed that education background, information asymmetry, and corporate governance have a negative relationship with underpricing proportion that higher of them leads to lower underpricing. However, gender has a negative relationship with underpricing that female manager usually cause a higher underpricing rate whereas the result is statistically insignificant. The EPS has an ambiguous relationship with underpricing rate since inefficient pricing mechanism in the financial market. Besides, it is also presented the China's policy changes which have not made a huge impact on factors causing underpricing.

In this article, the four factors can be expanded, and the econometric method can be improved. For the information asymmetry factor, there are also some other variables that can be considered such as industry distribution. For the company profitability factor, EPS is too simple to be a proxy for a company's profitability ability. In future research, more factors can be considered, and for each factor, the different econometric methods can be considered, for example, the stochastic frontier method or fixed-effect model can be considered when exploring the relationship between adjusted underpricing rare and company profitability capability.

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