

AN EMPIRICAL STUDY OF IPO UNDERPRICING: EVIDENCE FROM CHINESE STOCK MARKET

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Abstract

Initial public offerings, as one of the most important activities for firms, have raising massive amount of researches. Regarding China, the stock markets are experiencing a massive level of IPO underpricing, which leads to trillions of dollars leaved on the table. This study is conducted for the question why Chinese IPO are so heavily underpriced and the determinants of IPO underpricing, also the possibility of IPO be underpriced in China. We confirm again that Chinese IPOs are heavily underpriced and the average underpricing level is about 110%. Further, Chinese IPO will experience a negative short term return starting from 10 days after listing, and there are significantly different characteristics for state owned IPOs and private IPOs. This study finds that information asymmetry, proportion of state owned share and risk are the mainly determinants of IPO underpricing in China. Additionally, one of the biggest reason that Chinese initial public offering is underpriced so much is because of government participation, since we find that firms with larger proportion of government state owned shares will be more underpriced.

Keywords: IPO, Underpricing, State-Owned, Aftermarket Performance

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1. Introduction

ShaHe Ltd, a reputable wine company established in 19th October 1991, went public on 21st April 1992 with an opening price of ¥ 14 and a closing price of ¥ 25 (underpriced by 78.57%), which leaves value of ¥ 121 million capital on the table for investors. Furthermore, another famous example of Chinese firms underpricing is GeLi electronic, a leader company in electronic industry, went public on 18th of November 1996, with an opening price of ¥ 17.5 and a closing price of ¥ 50 (underpriced by 185.71%). Comparing with ShaHe Ltd, GeLi Electronic is more serials in underpricing, which leaves ¥ 682.5 million worth of capital on the table for investors. This leads to further concern: why these Chinese IPOs are so heavily underpriced? Since the objectives of firm is maximize its capital instant of leaving such a huge amount of money for investors, and Chinese IPO firms show significantly different real life story with the normal firms' objective. An IPO puzzle is existing.

Reviewing IPO literature in Chinese case indicates the high level of IPO underpricing is very common in this country. For instance, Su (2004) reports the underpricing level in China is 128.20 %, and Li (2006) finds similar result that the price

premium in Chinese stock market is 134.62 %, Datar and Mao (1997) even discover the underpricing level is 388.00%. Although IPOs are normally underpriced worldwide (Ritter, 1998), (see as Table 1 for worldwide IPO underpricing phenomenon), however, this situation in other countries is not as noticeable as in China. This highly underpriced phenomenon could raise a series attention: what is happening in Chinese stock market and why these IPOs are underpriced so much.

Regarding China, it has becoming the second largest economy in the world and attracting more and more international capital and investments. A health financial market will benefit for not just Chinese investors, but also the worlds'. Therefore, conducting a research about Chinese stock market and why this country's IPO market is so outstanding and noticeable from worldwide will be crucial and necessarily. Further, current research in Chinese stock market normally use smaller sample size, none of them covers the entire history of Chinese stock market development. Therefore, the results might be misleading and out of date. We aim to provide a comprehensive analysis about why Chinese IPO underpriced so much and the possibility of IPO underpriced.

Table 1. IPO underpricing level of main countries in the world

This table present the IPO underpricing phenomenon for the main counties in the world

Country	Studies conducted by	IPO underpricing level
Australia	Lee, Taylor and Walter	11.9%
Canada	Jog and Srivastava	5.4%
China	Datar and Mao	338.0%
Germany	Ljungqvist	10.9%
India	Krishnamurti and Kumar	35.3%
United Kingdom	Dimson	12.0%
United States	Ibbotson	15.8%

This study discovers a very high level of IPO underpricing, which is 110.33 %, and the results are consistent with other researches have done in Chinese case, such as *Su and Fleisher (1999)*. Another findings is that, IPOs are heavily underpriced and issuers leave large amount of money on the table for investors on the first trading day, firms in China normally experience a negative short term return. Further, we also get supporting evidence to prove that there are several significant difference between state owned IPOs and private IPOs, for instance, private IPOs are normally smaller and older than state owned IPOs. Regarding determinations of IPO underpricing in China, results indicate that larger firms will be less underpriced; older firms are less underpriced; firms with larger time gap will be more underpriced; firms with larger proportion of state owned shares will be more underpriced. The possibility of firms being underpriced analysis also provides similar results. Furthermore, this study shows that there is no difference for the determinations of IPO underpricing between states owned IPOs and private IPOs. More interesting findings is that larger firms will experience less short term return when we focusing on 10 day, 20 day and 30 day period.

2. Literature reviews

Western scholars have begun to explore the reason why IPO is under-priced during the 1970s, and then they have developed a number of related theories and hypotheses about IPO under-pricing. So far there are six theories are widely recognized as following:

“Winner Curse” hypothesis

There has been a lot of research conducted on IPOs, documenting short-run underpricing and long run underperformance. *Capen, Clappand Campbell (1971)* first proposed “Winner Curse” hypothesis, they stated that in any kind of auction, because the value of auction is uncertain, the winner is usually overvalue it, therefore the benefits are regular low or even returns are negative. *Rock (1986)* developed the winner’s Curse model and stated that

underpricing is necessary because of asymmetric information between investors and issuers. He reported that there are two kinds of investors in the market, one is better informed investors and another one is less informed investors. Regarding these better informed investors, since they held more information about value of the firms they are going to invest, they will normally subscript these underpriced IPO shares. While for these investors uninformed, they subscribe new shares of every IPO. If the IPO is overvalued, uninformed investors will receive only a part of the attractive IPOs. Therefore these investors with limited information about IPOs gets unexpected lower return or even a negative income (*Ritter and Welch, 2002*). With negative return and unexpected low profit, the demand of new issuing shares from these uninformed investor will decrease, also the successful chance of IPO issuing will be dramatically cut down. *Ljungqvist (2007)* argues that the only way to make uninformed investors to subscript new issuing shares is give them positive investment returns (or at least break even). From underwriters or issuers perspectives, they cater to the demand of uninformed investors, set a relatively lower price in order to attract uninformed investors, and this will increase the successful chance of issuing.

In fact, Rock’s model has limited empirical proof. *Beatty and Ritter (1986)* developed Rock’s model. They bring in the concept of ex-ante uncertainty to show the level of underpricing increases. Firms with more ex-ante uncertainty, will have higher level of underpricing (*Ritter, 1984*). *Betty and Ritter (1986)* select some variables like issuing scale, firms’ age, retained interest to test the relationship with uncertainty, and the results confirm Rock’s hypothesis. It is now widely accepted in the literature that ex-ante uncertainty is at the heart of the IPO process and that higher uncertainty leads to higher underpricing (*Ljungqvist, 2007*).

The Investment Banker Monopsony-Power Hypothesis

Baron(1982) assumed that Investment Banker as underwriter possess more information on the

demand of security and the true value of firms than issuers, therefore issuers will ask underwriter to evaluate the market information and set price for new issuing shares. However, since the issuers cannot effectively monitor underwriters, these underwriters may underprice new issuing shares to increase the possibility of success issuing. Further, underwriters will allocate these underpriced shares to their own clients (such as funding companies, investment group) to enhance business relationship with them. Therefore, this theory argue that reason of IPO underpricing is mainly decided by underwriters instant of issuers. *Baron's (1982)* model illustrates the more uncertainty on market demand.

Signalling hypothesis

This theory began to 1980s. *Allen and Faulhaber (1989)*, *Grinblatt and Hang(1989)* and *Welch (1989)* interpreted a signalling hypothesis in which they claimed that there are two kinds of firms in investment market -- "high-quality" firms and "low-quality" firms. For investors' perspectives, it is difficult to distinguish these two types of firms, which leads to the asymmetric information produce. The better performance firms under-price their IPOs to credibly separate themselves from relative poor performance firms and then recoup benefits from seasoned equity offerings (SEOs) thereafter. While the "low-quality" firm cannot issue a higher price in the future because of their poor performance, thus they will lose their compensation. *Welch (1989)* model listed the important underlying assumptions, which means that issuing firms have superior information to investors and/or underwriters. These firms are so wealth-constrained that they explicitly consider the possibility of future equity offerings in deciding on the prices of their IPOs. Therefore, firms are low-quality, generally have less under-priced. In the signalling hypothesis, high quality firms will underprice their IPOs on purpose, and recoup these lost during IPO underpricing through issuing SEOs (Seasonal Equity Offers) with higher price and larger total proceeds. Therefore, the signalling hypothesis assumes that a SEO issuing will be followed for these underpriced IPO firms.

In China, the signaling theory may not suitable and the explanation power is also limited. As signaling theory stated, firms will underpriced their IPO in order to promote their future equity share issuing. However, the case in China is that the share price is mainly decided by Chinese government instant of firms themselves. The underpricing phenomenon is forced by political regulations. A statistic example would be that 76.52% of Chinese IPOs are underpriced, but only 29.83% firms did future seasonal equity offering till 2011. These

numbers show how limited explaining power would be for signaling theory in Chinese stock market.

Costly information acquisition hypothesis, Dynamic Information Acquisition Hypothesis et. al. are also used to explain IPO underpricing.

3. Characteristics of the Chinese IPO market

After the economic reforms which began in 1978, these are still several difficulties faced by Chinese government. One of the most noticeable one is lack of capital support for state owned firms. Also government and banks can support certain amount of capital for state owned firms, the bad debt ratio is very high due to the un-experienced management. Therefore, in order to overcome these difficulties and provide fresh capital resource for state owned enterprises, the Chinese stock market was finally established in the early 1990s. The reason of establishment of stock exchange market makes this market is unavoidably from government participation and intervention. One unique character of Chinese IPO market is its "five types" of shares.

(1) Government shares. These shares are not able to be traded in secondary stock market since Chinese government want still keep controls of these firms even after they going public. However, since 2005, Chinese government remove the restrictions that government shares cannot be traded in order to improve the liquid of shares.

(2) Legal entity shares, also called C shares. This kind of shares are held by other state-owned enterprises. Also, Legal entity shares are not allowed to be traded in secondary stock market.

(3) Employee shares, which are held by managers and employees;

(4) Ordinary domestic individual shares, also called A shares. Only Chinese citizens of the PRC can purchase A shares on the Shanghai Securities or the Shenzhen Stock Exchange. This is also the kind of shares this study focus on.

(5) Foreign shares, which include B share, H shares (for these firms listed on Hong Kong stock exchange market), or N share (for these firms listed on the New York stock exchange market).

The unique shareholding system of China shows that government is not willing to give up their political control over enterprises (*Su and Fleisher, 1999*). The retention of equity by the government has two opposing implications for IPO underpricing. In international market, a high percentage of equity retention by original owners indicates a signal that owner's faith in the business, which reduce the investors' uncertainty and marketability (*Keasey and Short, 1992*). In China, domestic investors believe that the state-owned shares because the ex- ante uncertainty will be controlled by government. A high percentage of shares which hold by the state may be equated with

inefficiency and low productivity, so fewer investors buying the new shares on the first day of trading and the IPO underpricing would be lower. This point is also be proved in our study since we find that investors would ask for a higher rate of return for firms with higher proportion of state owned shares. *Beatty and Ritter (1986)* postulate that lower ex-ante uncertainty and relative lower IPO underpricing.

4. Research Methodology

4.1 Data selection

This research collected all the firms listed in Shanghai and Shenzhen Stock exchange market from 1990 till 2010. The data range almost covers the entire history of Chinese stock market development, since China just officially established its stock exchange market in 1990. These Chinese firms listed in Hong Kong (which called H share), New York (which called N share) and B shares (for international investors) are excluded in this study. The data is collected from Data Stream and GTA (Guo Tai An) database which is always used by researches about Chinese stock market, such as *Cheung, Ouyang and Tan (2009)*, *Su and Brookfield (2013)*. The final sample is comprised of 2031 IPOs, with 1305 state owned IPOs and 726 private IPOs. In order to prevent influence from outliers, following *Golubov, Petmezas and Travlos (2012)*, this study changes the top 5% and bottom 5% of each variable into their mean value.

4.2 Descriptive analysis

We discover that the average underpricing level of Chinese IPO from 1990 to 2010 is 110.33% (see as Panel A of Table 2), which is very high level when comparing with other countries, such as Australia (*Lee et al, 1993*, report the average IPO underpricing in Australia is 11.9%), Canada (underpricing level is 10.1% reported by *Jog and Riding, 1987*; and *Jog and Srivastava, 1993*), France (underpricing level is 4.2% reported by *Palliard and Belletante, 1992*; and *Leleux and Muzyka, 1993*), Germany (underpricing level is 10.9% report by *Ljungqvist, 1993*), United Kingdoms (underpricing level is 12.0% reported by *Dimson, 1979*) and United States (underpricing level is 15.3% reported by *Ibbotson et al, 1994*). However, underpricing level in China reported in this study is similar with other researches did by *Su (2004)* which finds the underpricing in China is 128.20% during the period 1994 to 1999, and *Li (2006)* which presents the price premium is 134.62% from 1999 to 2001. Another interesting finding is that IPO return is significantly reduced to 1.98% after 5 days and then become negative return for 10 day, 20 day and 30 day term. This presents a

fact that the Chinese IPO normally experiences a relatively high level of return on IPO day, and then the return dramatically reduced with time going.

The average capitalization raised from IPO market is 428.05 million RMB with a minimal value of 49.5 million RMB and a maximal value of 1990.6 million RMB. Chinese firms experienced an average 0.052 of ROA, which is profitable. Another important information Panel A reported is the proportion of state owned shares, which the average value is 28.24% with a minimal value of 0% and a maximal of 100%. The existed of state-owned shares is one unique characteristics in Chinese stock market. The government want still keep control for the most important firms (such as emerging industry firms, telecommunication firms and logistic firms) after them going public. Some firms ever got 100% state owned shares, for the firms with 100% state owned shares, the shares are subscribed by government or government controlled organizations.

Panel A of table 2 also indicates that average history of firms when going public is 1476.10 days in China. The time gap in China need to be paid attention to since the average value is 115.66 days, which is very high when comparing with other developed countries, such as United States only has an average time gap of 10.63 days. The longer time gap stands for larger risk, and this is also the main reason that why Chinese IPOs are underpriced so much. 29.1% of IPOs going public in China are through top five underwriters and the average sale growth rate before going public is 27.9%.

Panel B and Panel C in Table 2 further divided the sample into two group, Panel B is about statistic descriptive about state owned IPOs and Panel C is about statistic descriptive about private IPOs. The reason for doing this is because many researchers argue that there are differences between state owned IPOs and private IPOs, our results further confirm that there are do existed significantly differences between state owned IPOs and private IPOs. A noticeable finding is that state owned IPOs having an average of 109.52% underpricing and private IPOs having an average of 117.78% underpricing. The return will be significantly reduced with time development for both state owned IPOs and private IPOs, this can be seem from the fact that the initial return is 109.52% (117.78%) at the first day and then the return significantly reduced to 2.34% (1.34%) on the 5 day for state owned IPOs (private IPOs). Average size of state owned IPOs is 511.50 million RMB, this number is larger than private IPOs, which having an average value of 429.12 million RMB. The reason for that is state owned firms can enjoy policy benefit, such as tax, place for manufactory, priority of getting financial support from banks or financial institutions, this makes state owned firms easier to expand their business. Another reason is

that state owned firms are normally manufacturing firms, oil firms, electronic firms, telecommunication firms et all which require large total assets, this is also the reason why the average capitalization size is much bigger for state owned IPOs. However, state owned firms are less

profitable than private firms, this can be seen from the point that the average return on asset (ROA) is 0.049 for state owned IPOs and 0.058 for private IPOs.. Also, private firms having higher sale growth rate (0.337) than state owned enterprises (0.246).

Table 2. Descriptive Analysis

This table provides descriptive results of Chinese IPO between the time periods 1990-2010. The data is collected from Data Stream and GTA database. The data is further divided into three group. In Panel A, it presents the descriptive for the entire sample. Panel B and Panel C further divided

the sample into state-owned IPO, which are these IPOs has government untradeable shares, and private IPOs, which are these IPOs without government shares involved. See appendix for the definition of each variable

Panel A: Descriptive analysis for entire sample					
Variable	Mean	Std. Dev	Min	Max	Obs
Underpricing	110.33%	87.28%	-78%	469%	2031
5 day return	1.98%	41.16%	-92.93%	941.49%	2031
10 day return	-11.99%	52.61%	-94.48%	590.85%	2031
20 day return	-27.40%	50.20%	-98.38%	513.85%	2031
30 day return	-18.61%	53.48%	-98.50%	545.00%	2031
Size (Million)	482.05	370.71	49.5	1990.6	2031
P State share	28.24%	27.59%	0	100%	2031
ROA	0.052	0.040	-0.032	0.558	2031
EXC	0.433	0.496	0	1	2031
History (days)	1476.10	1370.77	199	9604	2031
Time gap(days)	115.66	423.76	6	4046	2031
Underwriter	0.291	0.495	0	1	2031
Growth	0.279	0.198	-0.985	1.89	2031
Panel B: Descriptive for State-owned IPOs					
Variable	Mean	Std. Dev	Min	Max	Obs
Underpricing	109.52%	97.07%	-78%	460%	1305
5 day return	2.34%	45.11%	90.15%	941.49%	1305
10 day return	-12.43%	52.14%	-94.48%	532.66%	1305
20 day return	-27.72%	51.90%	-97.61%	513.85%	1305
30 day return	-19.19%	53.50%	-92.76%	469.94%	1305
Size (Million)	511.50	394.42	49.50	1990.6	1305
ROA	0.049	0.037	-0.032	0.558	1305
EXC	0.527	0.499	0	1	1305
History (days)	1233.11	1241.27	199	9604	1305
Time gap(days)	127.79	435.99	6	3561	1305
Underwriter	0.401	0.158	0	1	1305
Growth	0.246	0.631	-0.985	1.89	1305
Panel C: Descriptive for private owned IPOs					
Variable	Mean	Std. Dev	Min	Max	Obs
Underpricing	117.78%	66.2%	-0.68	469%	726
5 day return	1.34%	33.03%	-92.93%	733.66%	726
10 day return	-11.21%	53.46%	-94.37%	590.85%	726
20 day return	-26.84%	47.06%	-98.38%	253.53%	726
30 day return	-17.59%	53.47%	-98.50%	545.00%	726
Size (Million)	429.12	317.73	49.74	1980.00	726
ROA	0.058	0.046	-0.015	0.373	726
EXC	0.247	0.431	0	1	726
History (days)	1912.88	1480.77	200	7406	726
Time gap(days)	93.87	93.87	8	4046	726
Underwriter	0.094	0.381	0	1	726
Growth	0.337	0.96	-0.938	1.801	726

To sum it up, there are significantly different characteristics between states-owned firms and private firms when going public. This leads further

concern: will the determinants of underpricing also different between states-owned enterprises and private enterprises? Therefore, we conduct further

research on the determination difference of IPO underpricing for state owned IPOs.

4.3 Hypotheses development

Information asymmetry theory argue that the reason firms underprice their initial public offerings is because there is unbalanced information for investors and issuers. In order to compensate uninformed investors, firms will underprice their IPO. This means, the underpricing level will be less if information asymmetry level is low. For these firms with larger total capitalization, they are normally well known and reputable in their belonging industry. Therefore, investors is able to obtain more information about these larger firms, thus, reducing the level of information asymmetry (see as *Su and Fleisher, 1999; Ma and Faff, 2007*). Also, there will be professional institution evaluation of larger, well-known and reputable firms, some institution even predict performance of well-known firms, such as Moody, Fitch, S&P. This further reduce information asymmetry level. Additionally, larger firms are normally less risky, therefore, investors would ask small price premium for IPO shares. This leads to the first hypothesis:

H1: Firms with larger size are less underpricing in the process of initial public offering.

Old firms can provides better chance for public to get information about them than youths, therefore, this can reduce level of information asymmetry significantly (See as *Wu, 2004; Ma, 2007*). Additionally, older firms are expected to have more knowledge and advantage in the industry they operating, thus, less risky for them. *Su and Fleisher (1999)* get a negative relationship between history of firm and IPO underpricing. Following *Wu (2004)* and *Ma (2007)*, our next hypothesis is:

H2: Older firms are less underpricing in the process of initial public offering.

The time gap between IPO announcement and IPO listing means for uncertainty and risk. The larger the time gap, the higher the possibility that market condition will deteriorate and the initial public offering will fail (see as *Ritter, 2003*). *Ma (2007)* uses the time gap as a control variable and gets a positive relationship with IPO underpricing. Therefore, our third hypothesis is:

H3: Firms with larger time gap during initial public offering are more underpriced.

State owned share is one unique situation in Chinese stock market. Majority of state owned

shares are converted from assets owned by government before conducting initial public offerings, which can be represented as retained ownership (see as *Ma, 2007*). *Keasey and Short (1992)* argue that the high proportion of equity retention by original owner can be traded as a sign of high level of ex-ante uncertainty and low marketability of shares. However, a different point stated by *Beatty (1989)* shows that the level of equity retention can also indicates the original owner has faith of the enterprises and future development. Consequently, higher proportion of state-owned share could stands for better development in the future, and the uncertainty of firm will be lower. Following *Beatty (1989)* and *Ma (2007)*, this study argue that higher proportion of state owned shares imply less ex-ante information asymmetry and uncertainty. Therefore, the next hypothesis is:

H4: Firms with higher proportion of state owned shares are less underpriced.

Firms with higher sale growth rate are normally traded as less risky in IPO studies (see as *Hahn, Ligon and Rhodes, 2013*). Investors will ask less price premium for less risky firm in initial public offering since the risk is always associating with return. Therefore, the next hypothesis this study presents is:

H5: Firms with higher ratio of sale growth rate will be less underpriced.

Underwriter, a crucial player in IPO market, is believed to have significantly influence on initial return. As *Chua (2014)* argued, top underwriters have more professional knowledge about firms' value and market condition, therefore, the price of new issuing shares will be more reasonable and closer to true value. Further, investors would concern firms going public through reputable underwriter as less risky, therefore, investors will require less initial return. The final hypothesis this study present is:

H6: Firms going public though top underwriters would experience less initial return.

4.4 Methodology

There are several ways to measure underpricing level, the two ways that most commonly used are IPO underpricing without market adjusted return, and IPO underpricing with market adjusted return. For the first method, it calculated as the opening price minus opening price, and then divided by opening price. This is showed as following:

$$\text{Model (1) IPO underpricing} = \frac{(\text{IPO Closing price} - \text{IPO Opening price})}{\text{IPO Opening price}} * 100\%$$

However, this method does not concern about market influence and has been Criticism by many other scholars, such as *Aggarwal, Leal and*

Hernandes (1993). For the other measure of IPO underpricing, the market adjusted initial return, is showed as:

Model (2) IPO underpricing

$$= \frac{(\text{IPO Closing price} - \text{IPO Open price})}{\text{IPO Opening price}} * \frac{(\text{Closing price of market index on IPO day} - \text{Open price of market index on IPO day})}{\text{Opening price of market index on IPO day}} * 100\%$$

This method is more commonly used comparing with the first method, such as Aggarwal, Leal and Hernandes (1993), Lin and Tian (2012), Su and Brookfield (2013), et al. Following above literatures, this research also used market adjusted method to show IPO underpricing.

Following Su and Fleisher (1999) Cheung, Ouyang and Tan (2009), classical OLS regression will be adopted in this study. The regression model is shown as:

$$\text{IPO underpricing} = a + \beta_1 \text{Ln Size} + \beta_2 P \text{ state share} + \beta_3 \text{ROA} + \beta_4 \text{EXC} + \beta_5 \text{Time Gap} + \beta_6 \text{History} + \beta_7 \text{Time Gap} + \beta_8 \text{Growth} + \varepsilon_i$$

Model (3)

Where a is constant value and ε_i is the error term. IPO underpricing is the level of underpriced for issuing firms, which calculated as $(\text{Closing price} - \text{Opening price}) / \text{Opening Price} * (\text{Market Closing price on IPO day} - \text{Market Opening price on IPO day}) / \text{Market Opening price on IPO day}$; Ln size is Natural logarithm of total IPO proceeds, which calculated as $\text{Ln}(\text{IPO opening price} * \text{Total shares outstanding})$; P state is the Percentage of state-owned shares, which calculated as $\text{total shares holding by government} / \text{total shares outstanding}$; ROA is Return on Asset; EXC is a dummy variable, which takes value of 1 if IPO is listed on Shanghai stock market, otherwise, 0; Ln History is Natural logarithm of the day between firm established and going public; Time gap is the day between IPO announcement day and listing day; Underwriter is Dummy variable, takes value of 1 if firm going public through top 5 underwriters, otherwise, 0; Growth is Past sales growth, which calculated as $(\text{Sales}_1 - \text{Sales}_0) / \text{Sales}_0$.

Further, this study also evaluate the possibility of firm be underpriced. Based on the nature of research question, Logit or Probit analysis is suitable. In our paper, Probit analysis is adopted. The dependent variable will be Underpricedummy, where takes value of 1 if firm underpriced, otherwise, 0. The regression model is similar with model 3, shown as:

$$\text{Underpricingdummy} = a + \beta_1 \text{Ln Size} + \beta_2 P \text{ state share} + \beta_3 \text{ROA} + \beta_4 \text{EXC} + \beta_5 \text{Time Gap} + \beta_6 \text{History} + \beta_7 \text{Time Gap} + \beta_8 \text{Growth} + \varepsilon_i$$

Model (4)

Where a is constant value and ε_i is the error term. Underpricing is a dummy variable, which takes value of 1 if firm underpriced, otherwise, 0;

To the best of my knowledge, this is the very first study conduct analysis about possibility of firm be underpriced, and for this point, it can be concerned as contribution for literature.

Table 3 is about correlation matrix for all variables used in this study. One can see that underpricing is significantly related with our independent variables, such as size, proportion of state owned shares, ROA, history, and time gap. Some significant relationships between certain independent variables used in this research are existed. In order to prevent the multicollinearity issue that may misleading our regression results, this research conduct VIF test to evaluate whether multicollinearity existed in each regression test. Luckily, no VIF value is bigger than 10 (actually, maximal value of VIF in all OLS regression is 8.31).

Table 3. Correlation matrix

This table provides correlation between each variables used in this research. The data is collected from Data stream and GTA database for Chinese firms listing in Shanghai and Shenzhen stock exchange market from 1990 to 2010. *** means the statistic significant level of 1%, ** means the statistic significant level of 5%, and * means the statistic significant level of 10%

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Underpricingrate (1)	1.000													
Underpricingdummy (2)	0.302***	1.000												
5 day return (3)	0.001	-0.002	1.000											
10 day return (4)	-0.113***	0.013	0.126***	1.000										
20 day return (5)	-0.012	0.040*	0.090***	0.525***	1.000									
30 day return (6)	-0.129***	-0.014	0.012	0.364***	0.590***	1.000								
Ln Size (7)	-0.414***	-0.155***	0.025	-0.059**	-0.202***	-0.182***	1.000							
P stateshare (8)	-0.099***	-0.188***	0.040*	0.002	-0.010	-0.008	0.102	1.000						
ROA (9)	0.056**	0.001	0.013	-0.027	0.027	-0.029	0.011	-0.086**	1.000					
EXC (10)	-0.736***	-0.227***	0.007	0.072**	-0.023	0.100***	0.384	0.337***	-0.099***	1.000				
Ln history (11)	-0.071**	-0.064**	-0.021	0.020	-0.024	-0.007	-0.045**	-0.313***	-0.103***	-0.165***	1.000			
Time gap (12)	0.049**	0.047**	0.017	-0.005	-0.022	-0.029	0.021	-0.014	-0.027	0.062**	0.111***	1.000		
Underwriter (13)	0.114***	0.320***	0.004	0.012	0.020	0.019	-0.051	-0.058**	0.021	-0.037	-0.056**	0.035	1.000	
Growth (14)	-0.078**	-0.003	0.082	-0.004	-0.002	-0.006	0.043*	-0.043*	0.022	0.067**	-0.025	-0.047**	0.003	1.000

5. Results and Findings

5.1 Determination of IPO underpricing

The regression results in table 4 indicate very significant and interesting results. Underpricing in China is largely decided by total proceeds raised from IPO process. Firms with large proceeds (Lnsize) will experience significantly lower level of underpricing comparing with firms with small proceeds raised in IPO process. This result is same as this study expected and is also consistent with information asymmetry theory (see as Beatty and Ritter, 1986; Rock, 1986; and Zhang, 2012), since large firms are more reputable and better known, therefore, the information asymmetry level will be lower and investors would ask less return for these kind of firms. Further, larger firms are concerned as less risky than small firms, this is also the reason

why firms with larger capitalization are less underpriced. We should accept the first hypothesis. In addition to that, another interesting findings is that firms with larger proportion of state-owned shares will be significantly more underpriced, which is the same with Chen, Firth and Kim (2004) and Chi and Padgett (2005), but different from our hypothesis. This results is surprising and presenting the fact that Chinese investors do concern that firms with government background are more risky and, thus, require higher level of initial return. One noticeable characteristic of state-owned enterprises is un-effective producing and wasting of money on some personal benefit, this may also be the reason that investors ask higher price premium on firms with government background. The results is consistent with Cheung, Ouyang and Tan (2009).

Table 4. The Determinations of IPO underpricing (OLS)

This table provides classical OLS regression analysis results for the determinations of IPO underpricing for all firms listed in Shanghai and Shenzhen Stock Exchange market using data from 1990 to 2010 in China. The data is collected from Data stream and GTA Database. Standard errors in parentheses. *** means the statistic significant level is 1%, ** means the statistic significant level is 5%, and * means the statistic significant level is at 10%.

VARIABLES	
Ln Size	-0.151*** (0.0157)
P state share	0.375*** (0.0478)
ROA	-0.499* (0.299)
EXC	-1.333*** (0.0276)
Ln History	-0.0834*** (0.00688)
Time Gap	0.000239*** (2.82e-05)
Underwriter	0.450*** (0.0845)
Growth	-0.0143 (0.0136)
Constant	3.602*** (0.225)
Observations	2,031
F	430.22***
Adj R-squared	0.629

Furthermore, results from regression analysis present a fact that more profitable firms (ROA) experience less underpricing in their IPO processes. This is because these profitable firms are considered as less risky by both investors and market (see as Chen, Firth and Kim 2004). Cheung et al. (2009)'s results also support this findings. Besides, firms listing in Shanghai stock market are statistically less underpriced than these listing in Shenzhen stock market, the explanation for this result is firms listed in Shenzhen stock market are normally high technology firms and these firms are concerned as unstable and more risky (see as Ti,

2002). Other finding this research would like to report is that history has a significantly negative relationship with level of underpricing, the older the firm, the less underpriced will be. This results is also consistent with information asymmetry theory that older firms are better known, and investors can get more information about older firms to reduce level of information asymmetry, and leads to lower level of underpricing (see as Hahn, Ligon and Rhodes, 2013). Furthermore, Time gap also can influences IPO underpricing significantly. Time gap is related with risk level as uncertainty increasing with the waiting time becoming longer (see as Yu

and Tse, 2006). Therefore, and investors would require higher price premium which leads to higher IPO underpricing level. Luckily, the results support conjunction as regression results present a significant positive relationship between time gap and IPO underpricing. Also, we should accept the hypothesis 3. Finally, the results indicate that firm going public through reputable underwriters would experience more underpricing, this finding is the same with Hanley (1993). The F value is significantly at 1% level, and Adjusted R squared is 0.629, which shows the model is jointly significant, and the explanation power is acceptable.

5.2 The Determinations of IPO underpricing for State owned IPOs and Private IPOs

Since there are still debates about state-owned IPOs and private IPOs in academic area (see as Chen, Firth and Kim 2004), researchers argue that the characteristics of state owned IPOs and private IPOs are significantly different. For example, state owned IPOs are normally larger, which means they are less risky than private IPOs. Therefore, this study conducts analysis for the determinants of IPO underpricing for state owned IPOs and private IPOs separately to evaluate whether there is any difference for this two groups. The Table below (Table 5) shows the determinants of IPO underpricing with further classification of state owned IPOs and private IPOs. The results are

similar with before when this study conduct analysis for entire sample. This table proves that total proceeds (Ln Size) is negatively related with IPO underpricing level for both models (model 1 and model 2), which means that more total proceeds firms raised from IPO, the less price premium firms will experience (both state-owned IPOs and private IPOs). Interestingly, the influence from ROA disappear when we conduct analysis for state-owned IPOs and private IPOs (although its significantly level is only 90% in Table 4). The results for variables "EXC" and "Ln History" stay the same with Table 4 which presents a statistic significant negative relationship with IPO underpricing level, which indicates that firms listed on Shanghai stock exchange market will be less underpriced, and older firms will experience smaller price premium no matter the firm is state owned or private owned. "Time Gap" and "Underwriter" shows positive relationship with dependent variable for model 1 and model 2 in Table 5, this result is the same as we expected. Finally, F value and Adj R square value indicate a good fitted and acceptable explaining power of the model. To sum up, although there is debate between state-owned IPOs and private IPOs, there are seems no differences for the determinants of IPO underpricing for the two groups. Further, information asymmetry theory and risk level is associated with level of underpriced are confirmed again here.

Table 5. The Determinations of IPO underpricing for State owned IPOs and Private IPOs (OLS)

This table provides classical OLS regression analysis results for the determinations of IPO underpricing for all firms listed in Shanghai and Shenzhen Stock Exchange market using data from 1990 to 2010 in China. The data is collected from Data stream and GTA Database. Standard errors in parentheses. Model 1 is about firms with state owned untradeable share; Model 2 is about private firms' IPO. *** means the statistic significant level is 1%, ** means the statistic significant level is 5%, and * means the statistic significant level is at 10%.

VARIABLES	State Owned IPOs	Private IPOs
	(1)	(2)
Ln Size	-0.148*** (0.0191)	-0.131*** (0.0248)
ROA	-0.250 (0.410)	-0.385 (0.388)
EXC	-1.480*** (0.0327)	-1.041*** (0.0451)
Ln History	-0.0684*** (0.00779)	-0.108*** (0.0123)
Time Gap	0.000179*** (3.44e-05)	0.000257*** (4.44e-05)
Underwriter	0.435*** (0.0995)	0.302** (0.143)
Growth	-0.0263 (0.0236)	-0.0112 (0.0147)
Constant	3.785*** (0.273)	3.496*** (0.345)
Observations	1,305	726
F	431.72 ***	103.45 ***
Adj R-squared	0.698	0.469

5.3 The possibility of IPO underpricing

Being different from Table 4 and Table 5 using OLS regression analyse the level of IPO underpricing, Table 6 conducts a more robustness analysis and applies Probit analysis to evaluate the possibility of firm being underpricing for Chinese firms. This is also an important contribution for literature since there is no research conducted research about the possibility of IPO underpricing before. The dependent variable is Underpricing Dummy, which takes value of 1 if firm underpriced, otherwise, 0. Table 6 shows that firms with larger total proceeds from IPOs are less likely underpriced, and the statistic level is very significant, which is at 1%. This result is consistent with information asymmetry theory as well, since firm with larger proceeds are normally well known and less risk, and investors are easier to obtain information about larger firms, therefore, the

possibility of larger firm being underpriced will be reduced significantly. The most concerned variable “P state shares” shows a quite interesting and concerned result, firms with higher proportion of state owned shares are less like to be underpriced. Furthermore, older firms are less likely to be underpriced, which is the same as this study expected at the beginning since public has more chances and sources to obtain information about older firms and this will reduce level of information asymmetry significantly, thus, less likely to be underpriced for them. The sign of “Time gap” prove the conjunction once again that time gap is related with risk and uncertainty, firms with longer time gap are more likely to be underpriced. Finally, Table 6 shows that firms going public through top five underwriters are more likely to be underpriced. Pseudo R2 proves a good fit of the model used in Table 6.

Table 6. The possibility of IPO underpricing (Probit)

This table provides Probit regression analysis results for possibility of IPO underpricing for all firms listed in Shanghai and Shenzhen Stock Exchange market using data from 1990 to 2010 in China. The data is collected from Data stream and GTA Database. Standard errors in parentheses. *** means the statistic significant level is 1%, ** means the statistic significant level is 5%, and * means the statistic significant level is at 10%.

VARIABLES	
Ln Size	-0.437***
	(0.0864)
P state share	-1.789***
	(0.245)
ROA	-1.206
	(1.385)
EXC	Omitted
Ln History	-0.163***
	(0.0519)
Time Gap	0.0134***
	(0.00465)
Underwriter	1.485***
	(0.243)
Growth	-0.0225
	(0.0649)
Constant	7.607***
	(1.233)
Observations	2,031
LR chi2	211.16
Pseudo R2	0.322

5.4. Short term performance of IPOs

In Table 7, this study conducts analysis for IPO short term performance in China with classification of 5 day (model 1), 10 day (model 2), 20 day (model 3) and 30 day return (model 4). The results indicate that firms with higher proportion of state owned shares will experience higher five day return at 10% significant level. In addition to that, another factor can influence firms' five day short term performance would be the growth, and firm with higher growth rate would enjoy higher five day return, this is because firms with higher sale growth

are normally more profitable, therefore, higher short term return. Other variables seem have no influence on dependent variable in model 1. When this paper focusing on 10 day short term performance, model 2 indicates that firms raised larger proceeds during IPOs will have less 10 day short term return. This situation remain the same when we extend the time period for 20 days (model 3) and 30 days (model 4) and the result is consistent with *Chi and Padgett (2005)* who conduct analysis about IPO short term performance and discover a negative relationship between total capitalization and short term return. Another common factor can

influence both short term returns for 10 day, 20 day and 30 day would be *EXC*, model 2, model 3 and model 3 all shows that firms listed in Shanghai stock market experience higher return. In model 4, this study finds that firms with higher proportion of state owned shares will have less short term return (the same result with *Chi and Padgett, 2005*), which is opposite with model 1, and this result is quite interesting since the relationship between

proportion of state owned and short term performance is significantly positive when we focusing on 5 day return and changing to significantly negative when this study concentrate on 30 day return. Other noticeable finding needs to report in model 4 is that firm with long time gap during IPO processes are less likely to have higher 30 day short term return.

Table 7. Short term performance of IPOs (OLS)

This table provides classical OLS regression analysis results for short term performance for all firms listed in Shanghai and Shenzhen Stock Exchange market using data from 1990 to 2010 in China. Model 1 is for 5 day short term performance, model 2 is for 10 day short term performance, model 3 is for 20 day short term performance, and model 4 is for 30 day short term performance. The data is collected from Data stream and GTA Database. Standard errors in parentheses. *** means the statistic significant level is 1%, ** means the statistic significant level is 5%, and * means the statistic significant level is at 10%.

	5 day Short term return	10 day Short term return	20 day Short term return	30 day Short term return
VARIABLES	(1)	(2)	(3)	(4)
Ln Size	0.0129 (0.0125)	-0.0665*** (0.0159)	-0.142*** (0.0149)	-0.172*** (0.0157)
P state share	0.0735* (0.0376)	-0.0399 (0.0479)	-0.0235 (0.0450)	-0.109** (0.0473)
ROA	0.119 (0.233)	-0.172 (0.296)	0.399 (0.278)	-0.130 (0.292)
EXC	-0.0222 (0.0217)	0.132*** (0.0277)	0.0718*** (0.0260)	0.241*** (0.0273)
Ln History	-0.00169 (0.00544)	0.00920 (0.00693)	-0.00517 (0.00651)	0.00211 (0.00684)
Time Gap	2.32e-05 (2.20e-05)	-1.88e-05 (2.81e-05)	-2.20e-05 (2.64e-05)	-5.01e-05* (2.77e-05)
Underwriter	0.0135 (0.0668)	0.0479 (0.0851)	0.0362 (0.0800)	0.0508 (0.0840)
Growth	0.0396*** (0.0105)	-0.00501 (0.0134)	0.000190 (0.0126)	-0.00827 (0.0132)
Constant	-0.178 (0.177)	0.590*** (0.226)	1.496*** (0.212)	1.893*** (0.223)
Observations	2,031	2,031	2,031	2,031
F	2.94**	14.03***	21.94***	38.96***
Adj R-squared	0.010	0.016	0.047	0.072

6. Conclusion

6.1. Findings

This study conducts analysis about IPO underpricing in Chinese stock market and presents the average underpricing is 110.33%, which is really high when comparing with other developed countries in the world. The results is consistent with other studies about Chinese case, such as *Su and Fleisher (2007)*. Additionally, the time gap between IPO announcement and IPO listing days is very long. Longer time gap means higher level of uncertainty, this can be explained as one main reason that why Chinese initial public offering is underpriced so much. Further, we report that there are significantly different between state owned IPOs and private IPOs, for instance, state owned IPOs are normally have larger size, and they are normally youth.

Further, this study prove that firms with larger total capitalization will experience less underpricing in Chinese stock market, which is the same with our expectation and the information asymmetry theory. Additionally, proportion of state owned share has negative relationship with IPO underpricing. This present the fact that investors does not concern government participation can reduce the risk level, also the higher proportion of original ownership does not necessarily stands for faith in business operation and future development. Regarding the time gap, the results is the same with our expected that larger time gap will increase uncertainly and leads to higher underpricing level. Also, the older firms will enjoy less price premium in IPO market. Profitable firms, as we expected, are less underpriced.

Although there are many debates about the difference between state owned IPOs and private IPOs, and how government may benefit from these

state owned firms through initial public offering, this study did not find any evidence that there are any difference in the determinations of IPO underpricing. Further, we proves that although IPOs experiencing a dramatically level of initial return, however, the return will be significantly reduced with time development and became negative.

Additionally, this research also evaluates the possibility of firm be underpriced, and there are several noticeable findings. We report that firms with larger total proceeds are less likely to be underpriced. Also, the proportion of state owned shares can influence the possibility of underpricing significantly. Firms with higher proportion of state owned shares are less likely to be underpriced. One possible explanation would be that government does not allow leave too much money on the table because that will leads to loss of capital sources. Further, old firms are less likely to be underpriced, which is consistent with information asymmetry theory. Other finds are firms going public through top underwriters have higher possibility to be underpriced.

Regarding IPO short term performance, we report that proportion of state owned shares and growth are the only two factors can influence 5 day short term return. When this study extend the time period to 10 day, 20 day and 30 day return, one noticeable finding is that firms with larger size will be have less short term return. This effect is opposite with the one when we just focusing on IPO day. Additionally, firms listed in Shanghai stock exchange market will experience higher short term return (such as 10 day, 20 day and 30 day). Overall, majority of hypotheses are confirmed, and there are several noticeable findings in this study.

6.2 Suggestions and Application of results

The findings in this research have important means in real life. First of all, investors should know that even underpricing in initial public offering are commonly existed, but investing in IPO shares are not easy money since the return will be dramatically reduced with time development and return will become negative starting after 10 days of initial public offering. Secondly, government should know that investors do not concern government participation as low risk, instant, investors will ask higher price premium for IPOs with higher proportion of state owned shares. Therefore, government should reduce the level of intervention and participation in stock market. What government need to do is just effectively supervising stock market activities. Thirdly, firms can go for reputable underwriters when they want maximize total proceeds from IPO activities. Since reputable underwriters have more knowledge of

what is true value of the firm and how market would react for new shares issuing. Fourthly, investors requiring higher level of return could choose smaller firms since there are more risky but will have higher level of price premium. Finally, government should be more effective in reducing time gap between IPO announcement day and IPO listing day, because longer time gap leads massive loss in capital market for issuers.

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