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The impact of IPO pricing model on the issuing price: Evidence from China

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I hereby declare that this DBA dissertation is my original work and it has been written by me in its entirety.
I have duly acknowledged all the sources of information which have been used in this dissertation.

This DBA dissertation has also not been submitted for any degree in any university previously.

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Abstract

IPO pricing effectiveness refers to the deviation between the IPO price in the primary market and the actual trading price in the secondary market at the initial stage of listing. IPO underpricing ratio is the main research index used to investigate the effectiveness of IPO pricing in capital market. The phenomenon of excessive IPO underpricing brings many problems to the development of Chinese capital market. The GEM from the establishment of the initial audit system to the registration system, to the inquiry of the implementation of the new rules, IPO underpricing rate has been gradually controlled. This paper mainly studies the influence of underwriters with different reputations on IPO underpricing rate after the registration system and before and after the implementation of the new inquiry regulation, hoping that the research results will be helpful to the formulation of government policies and the selection of underwriters by issuers.

Keywords: IPO underpricing ratio, underwriters' reputation

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As the thesis is about to be completed, the 5-year DBA study also comes to an end. However, looking back the last five years full of sweet and bitter, the tension and busyness in countless learning times becomes an indelible page in my memory and challenges me a lot in learning and thinking.

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Chapter 1 Introduction

Initial Public of offerings (IPO), also known as new issue listing, refers to the activity of raising funds by issuing additional shares in the capital market for the first time to non-specific public investors. After the IPO company passes the issuance process of the China Securities Regulatory Commission (CSRC) and obtains the issuance approval, the shares to be issued will be underwritten in the primary market by the investment banking department of the securities company according to the terms in the prospectus. Under normal circumstances, after the issuance of new shares is completed and the funds are in place, the issuer submits the listing application to its stock exchange according to regulations. On the listing day, its initial shares will be publicly traded in the secondary market through the exchange platform.

The effectiveness of IPO pricing refers to the deviation between the IPO price in the primary market and the actual trading price in the secondary market at the initial stage of listing. The smaller the deviation, the higher the pricing effectiveness. Meanwhile, the greater the deviation, the lower the pricing effectiveness. IPO underpricing (that is, the listing price of a stock in the secondary market is significantly higher than the issuing price in the primary market) widely exists in the stock markets all over the world, due to the different maturity of the capital markets in different countries, the degree of IPO underpricing varies differently. Therefore, IPO underpricing rate has become the

main index to examine the effectiveness of IPO pricing in the capital market. In general speaking, the lower the IPO underpricing rate, the higher the IPO pricing efficiency of the capital market, and the more perfect the market development. In recent years, the IPO underpricing rate of developed countries such as the UK and the US has remained stable at below 20 percent, while the IPO underpricing rate of France and Canada is controlled within 10 percent, which fully reflects the highly mature security market and the effectiveness of IPO pricing.

The excessive IPO underpricing also brings many problems to the development of Chinese capital market. On one hand, there is almost no risk in the domestic IPO market, which greatly reduces the resource allocation and value judgment of IPO in the primary market, and the IPO becomes a scarce resource in the stock market and brings the money-circle effect to the issuer. On the other hand, due to the high underpricing of IPO issuance, the subscription of new shares generates high returns with low risks, triggering a large number of social capital crazy influx, which intensifies the formation of valuation bubbles in the market, spawning serious speculation and reducing the efficient allocation of social resources. In the development of China's capital market, underwriters, who are supposed to fairly reflect the fair value of IPO companies through transparent disclosure and thus reduce the phenomenon of excessive IPO price suppression, have not only failed to play their proper role, but also exacerbated the increase in the IPO price suppression rate.

In order to effectively control IPO underpricing, since the establishment of the stock exchange, the domestic regulatory authorities have continuously introduced new IPO pricing policies and laws and regulations to standardize and guide the stock pricing behavior in the securities market, so as to reduce IPO underpricing, improve the value discovery of investment institutions for enterprises, and optimize the resource allocation in the capital market. However, has the introduction of these regulatory policies achieved the desired effect? Especially with the introduction of the registration system in recent years, from the Shanghai Science and Technology Innovation Board to the Shenzhen Growth Enterprise Market (GEM) Board, and then the full implementation of the registration system, has the IPO underpricing rate been effectively controlled? Is the IPO underpricing rate higher or lower than before the implementation of the registration system?

Reviewing the evolution of Chinese IPO pricing model, since the 1990s, Chinese securities market has developed so far. In order to meet the needs of the market, a variety of different methods of issuing new shares have been used. It can be roughly divided into the eight types as follows (Table 1-1).

Table 1-1 New Share Issuance Method of China A-share Market

	Issuance Method	Introduction
1	Subscription Certificate Issuance	Securities subscription certificate is the right to subscribe for a certain number of securities at a specified price. Before the issuance of securities, the issuing company or the relevant department will issue them to qualified investors. However, the uncertainty of investors in the process of subscription increases the risk of the stock market, and may cause a waste of resources and increase the cost of subscription.
2	Certificates of Deposit (CDs) Issuance	The method of issuing certificates of deposit is to draw lots to determine subscribers by issuing special fixed certificates of deposit. During the recruitment period, the underwriter determines the winning rate according to the number of certificates of deposit issued and the number of stocks issued, and finally determines the winning candidate through the open lottery. This issuance method reduces the cost of the primary market, but the sudden expansion of subscription does not suit the capital market, which is still in its infancy. In addition, it encourages speculation, so it is soon cancelled.
3	Online Auction Issuance	Online auction issuance is a way in which the issuing company entrusts the lead underwriter to use the trading system of the stock exchange to determine the issue price of the stock and issue the stock. However, it has not been implemented since it was put on trial in 1994.
4	Full Advance Issuance	This approach is an extension of deposit-linked issuance, combining online pricing. Investors deposit the subscription funds into the special bank account of the lead underwriter in the irregular subscription interval, and settle the allocation ratio according to the issuance amount and the total amount of subscription after valid subscription. Compared with the simple issue of savings deposits, the funds paid in full have a shorter occupation time and higher issuance efficiency.
5	Online Pricing Issuance	It refers to the use of the advanced trading system of the stock exchange by the lead underwriter to publish the price negotiated between the underwriter and the listed company to inform the investors to subscribe to the stock within a limited time. It is also known as direct pricing issue. Direct pricing issue requires higher pricing ability of underwriters, but greatly reduces labor cost. Its short issuance cycle effectively avoids the speculation of stock option and completely eliminates the first half market hidden between

		the primary market and the secondary market. It has been on trial and accepted by the capital market since 1996.
6	Online Issuance and Allotment	There is an allotment of new shares in 1998. After 2006, the initial public offering shares in the securities market of our country has been placed for sale to strategic investors, investment participating in online issuance and the inquiry object online. The development of multiple allotments is the leap of new issues.
7	Offline Issuance	For institutional investment, our country has offline issue model. Through the trading network of the Shanghai Stock Exchange or the Shenzhen Stock Exchange, the lead underwriter of a new issue lists on the stock exchange for sale, and investors applies for the purchase through the easy system of the securities sales department. In March 2008, our country launched the electronic distribution online.
8	Inquiry Issuance	On December 10, 2004, the China Securities Regulatory Commission (CSRC) issued the *Circular concerning Several Issues on Trial Implementation of IPO Pricing Inquiry System* and the accompanying document *Memorandum of Stock Offering Review Standards No. 18 -- Regulatory Requirements on the Conditions and Behaviors of the Objects of IPO Inquiry*. The company offering shares to the public for the initial period (referred to as the issuer) and its sponsor shall determine the issue price of shares by making inquiry to the subject of inquiry.

However, in the process of formulating the pricing which suits our national conditions, we should refer to the international pricing method. At present, the most commonly used pricing methods of stock IPO around the world include fixed price, bidding (auction issue pricing), cumulative bidding (inquiry pricing), and the combination of these three pricing methods.

Fixed Price Pricing

Fixed price pricing refers to that before an IPO, underwriters and issuers work out a unified fixed issue price based on the IPO stock value estimated by the stock valuation model, and then promote the stock to the market with this issue price. Investors can only apply for shares at this price.

The advantages of fixed price pricing are as follows, firstly, at the beginning of the establishment of the capital market, the operating mechanism is not perfect, so the fixed price pricing is considered. Secondly, the quota control limits the control of large-scale subscription, and small and medium-sized investors could also purchase a considerable number of new shares, which is beneficial to small and medium-sized investors, finally reduce the cost of issuance. The disadvantage is that it is easy to cause the issue failure and high underpricing after listing, so only a few countries later adopt this pricing.

Bidding Pricing (Auction Issue Pricing)

Bidding pricing means that underwriters and issuers do not set a unified issue price. First, the issuer announces the relevant information of IPO shares to investors, and the investors declare the purchase price and quantity within the prescribed time for bidding. After the purchase is completed, the lead underwriter will accumulate all valid applications in order of purchase price from highest to lowest. The effective price is when the cumulative subscription reaches the number of shares to be financed. Once

the effective price is determined, it is divided into unified auction pricing and differential auction pricing according to the final transaction price. If the market has strong demands for new shares, investors often blindly raise the bidding price. It is easy to lead to the overvaluation of the issue price and the large price gap between investors' applications for shares, which results in unfair.

Cumulative Bidding Pricing (Inquiry Pricing)

At present, the most commonly used IPO pricing method in mature securities markets of foreign developed countries is cumulative bidding pricing, which has the highest degree of marketization and protects the interests of investors. Its pricing process starts with the lead underwriter determining the inquiry range of new shares, then carries out roadshow inquiry, and finally determines the issue price of shares and distributes to investors.

The first step is to determine the inquiry range. The lead underwriter first investigates the company to be listed, and according to the subscription demand of institutional investors, uses reasonable estimation method to work out the initial stock issue inquiry range, which provides reference for investors to declare.

The second step is roadshow inquiry. In the initial inquiry range, the underwriters accept the investor's application, and add up the number of applications, and calculate

the total amount of applications at different prices. They record all relevant information about the IPO stock issue, investor subscription price and quantity information into a book.

The third step is to determine the final issue price. After the roadshow inquiry, the underwriters will collect the purchase quotation and purchase quantity after analysis. They determine the final issue price in accordance with a certain multiple of the amount of funds raised by the issue.

Hybrid Pricing (Combination of the above three pricing methods)

Hybrid pricing means a pricing method that combines the three basic pricing methods mentioned above. The specific operation method is basically to adopt different pricing methods for different shares. This method narrows the initial offering price range through bidding or cumulative bidding among investors, and finally determines the IPO offering price. The combination of cumulative bidding inquiry/fixed price pricing is most widely used in various countries, which combines the advantages of the two basic pricing, market-based pricing and fair treatment of investors. It not only makes the IPO pricing reflect the real demand of the market, but also gives play to the influence of institutional investors on the final issue pricing while protecting the interests of small and medium investors. However, the issue pricing method has a high issue cost and underpricing degree.

In the process of implementing different issuance methods in China, the CSRC also follows international practice and adopts different pricing systems, in order to explore a new issuance mechanism suitable for Chinese characteristics and improve the efficiency of capital allocation (Table 1-2).

Table 1-2 Pricing and Issuance System of New Shares in China's A-share Market

Time Period	Initial Public Offering System	
	Verification System	Pricing System
1993.08 before	Examination and Approval System	Fixed Price
1993.08-1996.12	Quota Management	Fixed Price
1996.12-1999.07	Index Management	Relative Fixed Price/Earnings Ratio
1999.07-2001.03	Index Management	Cumulative Bidding Pricing
2001.03-2005.05	Channel System	Capped P/E Ratio
2005.05-2009.06	Sponsor System	Issue P/E Ratio Invisible Control
2009.06-2012.04		Decide the P/E Ratio at Its Own Discretion
2012.04-2014.01		No more than 25 percent of the industry average P/E
2014.01-2019.04		Not higher than the industry average P/E
2019.04-2020.04	Sponsor system and registration system (Sci-Tech innovation board (STAR Market)) parallel	Issue P/E ratio invisible control (sponsor system) Not higher than the industry average P/E ratio (registration-based pricing) Issue P/E ratio at discretion (registration system - inquiry)
2020.04 afterwards	Sponsor system and registration system (Sci-Tech innovation board (STAR Market), Growth Enterprise Market (GEM) parallel	Issue P/E ratio invisible control (sponsor system) Not higher than the industry average P/E ratio (registration-based pricing) Issue P/E ratio at discretion (registration system - inquiry)

At present, there are three pricing methods in parallel, namely the implicit control of the price/earnings ratio of issuance, the pricing method (not higher than the average price/earnings ratio of the same industry), and the inquiry method (the price/earnings

ratio of issuance is determined by itself). In the first two methods, the issuer and the underwriter cannot subjectively control and adjust due to the policy. Only the third method, the inquiry pricing, can be adjusted and selected through the subjective will of the issuer and the underwriter. Therefore, it is particularly important to understand the inquiry mechanism in depth.

Over the past decade, the US-style Book-building system has become increasingly popular for pricing new shares worldwide, while the auction system has been abandoned by national markets (Sherman, 2005). The general process of issuance pricing of listed companies in the United States is, the issuer and underwriter determine the issuance price range -- collect the demand information of new shares from institutional investors through roadshows -- determine the final issuance price. Compared with the American-style inquiry system, the Chinese-style inquiry system has stricter control over the issue price of new shares. Since China implemented the inquiry system in 2004, the primary market pricing of new shares has gone through four stages: regulation - marketization - regulation - marketization and regulation. At the beginning of the implementation of the inquiry system, although the CSRC did not set a ceiling on the issuance price in the official documents, few companies in the A-share main board market issued stocks with a price-earnings ratio of more than 30 times. The government has implemented “Window Guidance” (a mild, exhortatory and non-mandatory regulatory method) on the pricing of new shares (Wang Binghui, 2013). The

first phase of the reform of the inquiry system (June 2009) desalinated administrative guidance and realized the marketization of new share pricing in a real sense. However, due to the large area of "breaking" of new shares (falling below the issue price) and the prominent problem of "three high" (high issue price, high price-earnings ratio and high super-raising) of the GEM, under the pressure of market public opinion, the CSRC strengthened the pricing control in the third phase of the reform of the inquiry system (April 2012). After March 2014, the pricing of new shares completely returned to the era of regulation. The regulatory level stipulates that the P/E ratio of new shares should not exceed 23 times. Most companies choose to issue on the "regulatory red line" of 23 times. Since then, China's inquiry system is essentially a fixed price-earnings ratio pricing. After July 2019, the registration system has been implemented on the Science and Technology Innovation Board and the Growth Enterprise Board, and the pricing of new shares entered the era of marketization and regulation. In addition, in recent years, the regulators have begun to strengthen the supervision of the first-day trading price of new shares. Especially the "first-day limit" system of new shares, which began in December 2013, has had an important impact on the pricing of new shares after listing. The system stipulates that the effective declaration price of new shares on the first day shall not be higher than 144 percent of the issue price, which leads to the bleak trading of new shares on the first day. After the new shares are listed, they continuously rise to the limit (the market calls it the continuous market).

To sum up, it is seen that the degree of IPO underpricing in China's capital market has remained at a high level for a long time. According to relevant statistics, in the 20 years from the establishment of the capital market in 1990 to 2010, the average value of the IPO underpricing level of A-shares reached has 140 percent. In the *Opinions on Further Promoting the IPO System Reform*, which was officially released by the CSRC in December 2013, the rise and fall of the IPO on the first day of the listing is restricted by policy. In theory, the IPO underpricing rate of A-share market will be reduced to a certain extent. However, the reality is that this has triggered the unique phenomenon of closing the price limit of new shares in the domestic stock market for several consecutive days after the listing of new shares, which has not fundamentally solved the IPO underpricing problem in the A-share market.

At the same time, a decision on "*Major Issues Concerning Comprehensively Deepening Reforms*" approved in 2013 clearly pointed out that China would promote the reform of the stock issuance registration system. In 2014, The State Council proposed in "*Several Opinions on Further Promoting the Healthy Development of the Capital Market*" that the reform of the registration system of stock issuance should be combined with the specific conditions of the market. However, due to the relative lack of theories and different opinions on the reform system, the reform of registration system did not make great progress until five years later. On November 15, 2018, the State Council announced that the Shanghai Stock Exchange would pilot the issuance of a register-

based science and technology innovation board. With the implementation of this decision, the first batch of 25 companies listed under the registration system appeared on the Science and Technology Innovation Board on July 22, 2019, and the registration system reform was officially implemented. April 27, 2020, “GEM Reform and Pilot Registration System Overall Implementation Plan” was passed, which opened the curtain of a new round of GEM registration system reform.

The growth enterprise market, also known as the “second board market”, mainly provides suitable financing channels and growth space for innovative and entrepreneurial enterprises that cannot meet the listing conditions of the main board market, and occupies an important position in the securities market. Although the entry threshold of the GEM is lower than that of the main board market, considering the late establishment, small scale and outstanding performance of entrepreneurial enterprises or small and medium-sized enterprises, the GEM also has the characteristics of high risk and strict operation requirements. Even if the above enterprises operate well, have large growth space and good prospects for development, they also face a complicated and rigorous approval process in the GEM market. The probability of successful listing is lower than that of the main board market and the small and medium-sized board market, and the listing experience cycle is longer.

The reform of the GEM registration system is divided into two parts. First of all, the Shenzhen Stock Exchange has relaxed the limit on the rise and fall of stocks and the limit on investor qualification. Secondly, the Shenzhen Stock Exchange has simplified the conditions for the listing of GEM enterprises. The previous provisions on the examination of listed companies by the CSRC are changed to the examination by the exchange, and the focus of the examination is changed from the conditions for the issuance and listing of enterprises to the information disclosure as the core. The regulatory authorities attach great importance to the improvement of the new share issuance system in the capital market. The research on the IPO system has also been widely concerned, but the impact of the registration system reform on the IPO pricing efficiency of the GEM has been less studied in academic circles.

Since August 2020, the GEM has officially implemented the reform of registration system, and both pricing and inquiry methods have been implemented in the pricing and issuance of new shares. The new share price determined by the pricing issuance method is based on the average P/E ratio of the same industry of the issuer in the month before the pricing date. For inquiry issuance, the issuer and the recommendation broker need to determine the issue price of the shares by way of road show and inquiry to the inquiry object. In theory, the way of inquiry issuance is closer to the market behavior. In this way, the buyer and seller communicate and bargain directly, and finally choose a win-win price for IPO issuance.

However, in September 2020, a company named Swancor Advanced Materials Co., Ltd. (688585.SH) was listed on the board at 2.49 yuan per share, raising 107 million yuan, breaking the minimum amount of funds raised on the board. Its IPO price corresponds to a market capitalization of 1.076 billion yuan, just meeting the listing standards of Science and Technology Innovation Board, the market value is not less than 1 billion yuan, while Swancor Advanced Materials rose 557 percent on its first day of trading.

This IPO attracted a lot of attention at the time. For a time, skyrocketing and group offering of new shares have become hot discussion in the industry. In the following year, there were a series of typical cases in which the listing of Zhengyuan Geomatics Group Co., Ltd. (688509. SH), Everdisplay Optronics (Shanghai) Co., Ltd. (EDO) (688538. SH), DookBook Co., Ltd. (301025. SZ) and other low-priced issues rose sharply.

The reason is that the IPO inquiry pricing at this stage is mainly limited by the “four-value constraint” in the IPO pricing link. The so-called “four-value constraint” refers to that if the issuing price determined by the issuer and the lead underwriter after inquiry exceeds the median and weighted average of the offline investors’ quotations after excluding the highest quotation, and the lower value of the median and weighted average of the quotations of public funds, social security funds, pension funds,

enterprise annuity funds and insurance funds after excluding the highest quotation, the risk warning announcement of different times shall be issued according to the extent of exceeding. The so-called "four-value constraint" is when the issuer and the lead underwriter ask for an issue price that exceeds the highest bid excluding. Then, the median and weighted average of offline investors' quotations, excluding the highest quotation. If the median price of public offering fund, social security fund, pension fund, enterprise annuity fund and insurance fund is lower than the weighted average price, different times of risk warning announcements shall be issued according to the exceeded range. In order to prevent the independent quotation from being too high or too low to be finalized, the pricing inertia of "the lower of the four values" is superimposed on the issue price of new shares, and offline investment institutions often choose the quotation method of "collectively forming the price center and reducing the position cost". Therefore, most of the registered companies in this stage are issued at a price slightly lower than the "four values". In this circumstance, the priority of many institutions is not to explore the value of enterprises, but how to ensure the placement. It is against this background that the agency problem of underwriters has led to the high IPO underpricing rate at this stage.

On September 18, 2021, CSRC appropriately amended the *Relevant Provisions on the Issuance and Underwriting of Initial Public Offerings on the GEM*, focusing on solving the situation of "Group Offering" among some offline investors in practice. Meanwhile,

Shanghai Stock Exchange and Shenzhen Stock Exchange and the Securities Association of China (SAC) would simultaneously improve the business rules and regulatory systems related to IPO pricing on the Science and Technology Innovation Board and the Growth Enterprise Board.

The newly implemented inquiry rules adjusted the high price elimination ratio from “no less than 10 percent” to “no more than 3 percent and no less than 1 percent”. At the same time, it also cancels the need to delay the issuance when the new share pricing breaks through the “lower of the four values”. After the clarification of the new inquiry rules, if the issuance price exceeds the average level of offline investors’ quotations, only one special announcement of investment risk needs to be issued before the subscription, without delaying the subscription. The reduction of the proportion of high-price elimination will give rise to breaking through the “lower of the four values” and encourage all parties to fully play. According to Wind data, from January 1, 2021 to September 17, 2021 (before the inquiry of the new rules), there were 385 A-share new shares listed, of which 207 were not fully raised, and only 41 were over-raised. After the implementation of the new inquiry rules (September 18, 2021 to July 4, 2022), there were 313 new shares listed in A-shares, of which 161 were over-raised, and only 72 were not fully raised. The market has changed from insufficient to too much. After the implementation of the new inquiry rules, the most direct and most interesting thing in the market is the arrival of “breaking the tide”. In 2021, more than nine months before

the implementation of the new inquiry rules, only six individual shares broke on the first day of listing, with a maximum breaking rate of 15 percent. After the implementation of the new inquiry rules, 57 shares broke on the first day. Among them, 23 of them have the highest breaking rate of more than 15 percent on the first day, including Vanchip (Tianjin) Technology Co., Ltd (688153. SH), RIGOL Technologies Co., Ltd (688337. SH) and ASR Microelectronics Co., Ltd. (688220. SH), all of which are more than 30 percent. As of July 5, only the closing price of RIGOL was slightly higher than the issue price (60.88 yuan) with 61.05 yuan, and the other two shares still haven't recovered the issue price. Up to now, Vanchip and ASR still break 29.94 percent and 59.66 percent respectively.

The reason is that the underwriting fee is linked to the total amount of funds raised. The higher the price, the more funds raised, the more underwriting fee the underwriters charge. According to Wind data, in 2021, in more than 9 months before the implementation of the new regulation of inquiry, the average IPO underwriting fee is 47.16 million yuan. After the implementation of the new regulation, the average underwriting sponsor fee has risen to 77.02 million yuan on July 4 this year, an increase of 63.32 percent. In this context, the priority of many institutions is not to explore the value of enterprises, but to set the issuing price of enterprises at a higher level, and then charge higher sponsorship fees. The agency problem of underwriters makes IPO issuance move from underpricing to premium, the other extreme.

Before and after the introduction of the new inquiry rules, the same pricing method and different pricing rules have completely different effects on the underpricing degree of the new share issuance. Studying the reasonable, effective, objective and fair IPO pricing model in China's capital market, IPO underpricing phenomenon and its influencing factors, especially the IPO pricing for innovative and entrepreneurial small enterprises, will improve the current IPO pricing mechanism of A-shares, improve the effectiveness of IPO pricing, and have great significance in promoting the reform of IPO system and enhancing the efficiency of capital market resource allocation.

Chapter 2 Literature Review

2.1 IPO Underpricing Abroad

There are three classic topics on IPO pricing in the literature, short-term underpricing of new shares, long-term underperformance of new shares and hot market. Among them, IPO underpricing is the most concerned issue, because the degree of IPO underpricing can be used to visually verify whether the IPO pricing is effective. The early scholars who paid attention to the IPO underpricing include Stoll, Curle, Logue, Ibbotson, and so on. Ibbotson (1975) proposes many possible explanations for IPO underpricing, and then scholars establish many formal models to explain IPO underpricing. Because there are many related theories, misuse is inevitable in use, especially in the context of China's system. For this reason, we have systematically sorted out the important theories explaining IPO underpricing (Table 2-1). We believe that these theories can be divided into information asymmetry theory and behavioral finance theory according to whether the participants are rational or not. The research mainly focuses on the independent or cross-combination influence of the issuer, underwriter and investor. According to the source of information asymmetry, information asymmetry theory is further divided into "winner curse" theory, signal transmission theory, information display theory and agency theory. According to the source of incomplete rationality, behavioral finance theory is further divided into prospect theory, incomplete adjustment theory and heterogeneous belief theory. Among them, the theories involving the

underwriters include: information display theory in rational theory, agency theory, price stability hypothesis, trade-off hypothesis and incomplete adjustment theory in incomplete theory.

Table 2-1 Studies on IPO Underpricing Abroad

	Assumption	Research on	Theory	Representatives	Core Ideas
1	Information Asymmetry Theory	Between Investors	The "Winner's Curse" Theory	Rock (1986)	There is information asymmetry among investors. In order to make up for the information risk of uninformed investors, new shares need to underprice issuance.
2		Between Issuers and Investors	Signal Transmission Theory	Booth & Smith (1986)	Issuers have more information about the value of the business than investors. In order to send high-quality signals, they need to hire reputable underwriters.
3		Between Underwriters and Investors	Information Display Theory	Benveniste & Spindt (1989)	Investors have more information about share demand than issuers do, and underpricing is needed to attract investors to display that information.
4		Issuer and Underwriter	Agency Theory	Baron (1982)	Underwriters have more information about the market demand for new shares than issuers and need to authorize them to handle pricing and underprice the offering.
5	Other Rational Theories	Underwriter	Price Stability Hypothesis	Ruud (1993)	IPO underpricing is not necessarily a deliberate underpricing, but may also be the result of underwriter prices stabilized.
6		Underwriters and Issuers	Tradeoff Hypothesis	Tinic (1988)	Underpriced issuance has many other benefits, such as attracting the attention of the capital market and reducing the risk of litigation.
7	Behavioral Finance Theory	Issuer	Prospect Theory	Loughran & Ritter (2002)	Issuers take the gains into account from the first-day price rise and are not unhappy with the IPO underpricing.
8		Underwriter	Incomplete Adjustment Theory	Hanley (1993)	Because the underwriter is not completely rational, the inquiry stage to adjust the new information is often not sufficient.
9		Investor	Heterogeneous Belief theory	Miller (1977)	Under the heterogeneous belief and short-selling restriction, the share price of new shares can reflect the opinions of optimistic investors better.
10		Investor	Betting Preference Theory	Green & Hwang (2012)	Betting preferences have led investors to overprice new issues.

11		Investor	Finite Attention Theory	Da (2011)	New shares attract investors' short-term attention, leading to short-term overpricing and long-term price reversals.

1) Theories based on the assumption of perfect rationality: Information Asymmetry Theory and Others

The main parties involved in a new share issue include issuers, underwriters and investors. The theory of information asymmetry assumes that one party has more information than the other, or that one type of investor has more information than another type of investor. Information friction caused by information asymmetry makes underpricing issue necessary in equilibrium state, and may lead to underpricing issue of new shares on purpose.

Information Asymmetry among Investors: The "Winner's Curse" Theory

The model of Rock (1986) assumes that informed investors have more information advantages than uninformed investors. When the issue price of new shares is low, informed investors actively subscribe, while uninformed investors can subscribe to fewer new shares. When the issue price of new shares is high, informed investors choose not to participate in the subscription, and uninformed investors subscribe to more new shares, which is the phenomenon of "winner curse". The uninformed investors face additional risks due to their information disadvantages. In order to make up for their information risks, the issuer must give a certain discount to the new shares

to attract them to apply for new shares. Beatty and Ritter (1986), based on the same logic of Rock (1986) model, demonstrate that the value uncertainty of new shares is positively related to IPO underpricing.

Information Asymmetry between Issuers and Investors: Signal Transmission Theory

Since the issuer has a better understanding of its own operating conditions and development prospects, and thus has a better understanding of the company's intrinsic value than investors, investors are faced with the classic "lemon problem". One way to solve the "lemon problem" is to reduce the uncertainty of the company's value or the information asymmetry among investors by employing reputable underwriters or auditors to transmit signals (Booth & Spindt, 1986; Cater & Manaster, 1990; Titman & Trueman, 1986). The other way is that the issuer sends high-quality signals through underpricing when it goes public, and recovers the cost of signal transmission through refinancing and other means after it goes public (Welch, 1989; Allen & Faulhaber, 1989).

Information Asymmetry between Underwriters and Investors: Information Display Theory

This theory assumes that investors know more information about stock price or demand than underwriters (Benveniste & Spindt, 1989). The underwriter induces investors to display information about stock demand through independent distribution rights. In

order to induce investors to tell the truth, the underwriters need to underpin the issuance to a certain extent, otherwise investors will be unprofitable if they tell the truth.

Information Asymmetry between Issuers and Underwriters: Agency Theory

Baron (1982) believes that there is a conflict of interest between the issuer and the underwriter. As a risk-averse underwriter, the underwriter is motivated to reduce its efforts and use its information advantage to underpricing the issuance. In the case of information disadvantage, the optimal strategy of the issuer is still to authorize the underwriter to price and accept a certain degree of underpricing. The agency problem of underwriters may also be manifested in the distribution of highly underpriced new shares to affiliated institutional investors or executives of affiliated listed companies to obtain commission business income or potential investment banking business income (Loughran & Ritter, 2002).

Others

In addition to the information asymmetry theory, other rational-based theories include:

Price Stability Hypothesis. According to this hypothesis, because underwriters are legally allowed to take price stabilization measures after the IPO listing, we actually observe fewer cases of new shares falling below the issue price, which is represented by IPO underpricing (Ruud, 1993).

Tradeoff Hypothesis. According to this hypothesis, the underwriter or issuer intends to reduce the IPO underpricing in order to avoid potential litigation risks (Tinie, 1988; Hughes & Thakor, 1992), save marketing expenses (Habib & Ljungyvist, 2001), increase the freedom to distribute new shares to gain control or supervision benefits (Brennan & Franks, 1997; Stoughton & Zechner, 1998), and attract the attention of investors in the capital market and consumers in the product market (Chemmanur, 1993; Demers & Lewellen, 2003) and so on.

2) Theories based on the assumption of imperfect rationality: Behavioral Finance Theory

The first-day return of an IPO may not necessarily represent the underpricing of the primary market (IPO underpricing), but also the overvaluation of the secondary market (IPO premium). For example, Purnanandam & Swaminathan (2004) show that IPO companies are overpriced on average by 14 percent to 50 percent (depending on different matching criteria). According to Behavioral Finance Theory, issuers, underwriters and investors may not be completely rational. The imperfect rationality of issuers or underwriters leads to their acceptance of underpriced issuance, while the imperfect rationality of investors leads to the overpricing of new shares in the short term after listing.

Imperfect Issuer Rationality: Prospect Theory

According to the prospect theory, the negative utility brought by losses of the same range is greater than the positive utility brought by profits (Kahneman & Tversky, 1979). Loughran & Ritter (2002) believe that in the case of IPO, profit or loss depends on the reference point anchored by the issuer, and the reference point of an incomplete rational issuer should be the median of the initial offering price range. The issuer tends to sum up the losses (relative to the issue price) and earnings (relative to the reference point) caused by the rise of the first day. Since the total earnings are positive, the issuer will not be dissatisfied with the IPO underpricing.

Underwriters are not entirely rational: Incomplete Adjustment Theory

According to the incomplete adjustment theory, because underwriters are not completely rational, the price adjustment in the inquiry stage does not fully reflect the new information (such as the public information of the overall market), resulting in IPO underpricing. Moreover, the price adjustment range in the inquiry stage is often significantly positively correlated with the first-day return rate of IPO (Hanley, 1993; Bradley, 2001).

Investors are not entirely rational: Investor Behavior Theory

Differences of investors' belief: investor sentiment or speculation. Miller (1977) explained IPO underpricing earlier by using heterogeneous belief theory. The theory is

that investors are more divided about new issues. Under short-selling restrictions, the share prices of new shares tend to better reflect the opinions or sentiments of optimistic investors, making them overvalued. Recent studies have shown that investor sentiment may be an important factor affecting IPO premiums in the secondary market (Ritter & Welch, 2002; Dorn, 2009; Cornelli, 2006). Further, Ljungqvistf (2006) and Derrie (2005) set up models respectively to explain the influence mechanism of investor sentiment on IPO pricing in the primary market. In addition to investor sentiment, investor belief differences also affect the pricing of new shares by acting on speculation. The theoretical model of Scheinkman & Xiong (2003) is used to explain why investors prefer to speculate on new shares. The value of new shares is uncertain, investors tend to be more divided on new shares, and speculators have a better chance to sell new shares at a higher price to more stupid investors.

Preference Differences of investors: gambling preference. Gambling bias, in which investors prefer stocks with a gambling nature, overvalues those with a lower probability of high returns. Barberis & Huang (2008) use gaming theory to explain stock price phenomenon. Their analysis suggests that in a market with betting investors, IPO may come to market overvalued and yield low long-term returns. The reason is that IPO companies are usually new companies, and a large part of their market pricing is based on expectations of high future growth.

Bounded rationality: investor attention theory. This theory holds that investors' attention is a scarce resource that can affect the price of a stock. Da (2011) uses the search volume index to measure the attention of investors, and finds that the search volume index can be used to explain the short-term underpricing and long-term low performance of new shares.

2.2 IPO Underpricing in China

There have been some literatures on the related research of IPO underpricing in China, especially the A-share IPO underpricing research combining Chinese characteristics and foreign IPO pricing theories. After sorting out, Table 2-2 demonstrates the literature consistent with the information asymmetry and behavioral finance theory.

Table 2-2 Studies on IPO Underpricing in China

	Assumption	Research on	Theory	Core Ideas
1	Information Asymmetry Theory	Auditor	Signaling Role of auditors	1. Price controls and state ownership reduce the auditor's reputation. 2. Reputable auditors would boost IPO underpricing.
2		Underwriter	Signaling Role of underwriters' reputation	1. The reputation of underwriters has no significant influence on IPO pricing, which does not support the signaling hypothesis of underwriters. 2. In the market-based pricing stage, the reputation of the underwriter lowers rather than increases the IPO underpricing. 3. Underpricing of IPOs underwritten by foreign underwriters is significantly lower than that of domestic underwriters.
3		VC Institution	Signaling Role of Venture Capital	1. Venture capital raises IPO underpricing. 2. The IPO underpricing rate of companies backed by foreign capital and venture capital with mixed background is low.
4		Media	Information Discovery and Emotional Transmission of Media	1. Media reports reduce the information asymmetry between issuers and investors through the function of information transmission, thus reducing IPO underpricing. 2. Media reports increase IPO underpricing by affecting investor sentiment and the trading price of new shares in the secondary marke.
5	Behavioral Finance Theory	Investor	Investor Belief Difference: Investor Sentiment or Speculation	Based on the theory of disagreement, the first day returns of Chinese IPOs are explained from the perspective of investor sentiment or speculation.
6		Investor	Investor Preference Difference: Gambling Preference	1. The stronger the betting characteristics, the worse the long-term performance. 2. Loss aversion has an important effect on IPO pricing.
7		Investor	Bounded Rationality: Investor Attention Theory	Investors in the primary market focus on raising the offering price, while those in the secondary market focus on raising the first-day price.

1) Information Asymmetry Theory and Underpricing of New Shares

This part of the study mainly draws on foreign theories of information asymmetry to analyze the role of Chinese intermediaries in reducing information asymmetry and transmitting positive signals. Earlier studies have focused on the signaling role of auditors and underwriters. Some recent studies focus on the signaling role of venture capital and the mediating role of media.

Signaling Role of Auditors

According to the theory of information asymmetry, reputable auditors lower IPO underpricing by signaling to outside investors that the company is a high-quality issuer. However, some Chinese studies have found that price controls and state ownership reduce auditor reputation (Chen Jun and Chen Hanwen, 2011; Wang Chengfang and Liu Huilong, 2014). Moreover, based on the data from 2009 to 2011 after the marketization reform of the inquiry system, Hu Dan and Feng Qiaogen (2013) find that auditors with high reputation actually increased IPO underpricing.

Signaling Role of Underwriters' Reputation

According to the signaling hypothesis of underwriters' reputation, high-profile underwriters send signals of high-quality issuing companies to external investors, thus reducing IPO underpricing (Beatty & Ritter, 1986). However, evidence from China finds that underwriters' reputation has no significant impact on IPO pricing and does not support underwriters' signaling hypothesis (Guo Hong and Zhao Zhenyu, 2006;

Guo Haixing, et al., 2011). In addition, Shao Xinjian et al. (2013) find that in the market-oriented pricing stage, underwriters' reputation decreases rather than increased IPO underpricing. Recently, Zheng Jianming et al. (2018) find that the underpricing rate of IPO underwritten by foreign participating underwriters is significantly lower than that of domestic underwriters.

Signaling Role of Venture Capital

According to the signal hypothesis of venture capital, venture capital conveys the signal of the quality of the issuing company and helps to reduce the IPO underpricing. Some Chinese scholars have studied the signaling function of venture capital, but most studies have not found evidence that venture capital reduces IPO underpricing, or even increases IPO underpricing (Yang Qijing et al., 2015; Chen Gongmeng et al., 2011; Jiang Jian et al., 2011). However, Zhang Xueyong and Liao Li (2011) find that the IPO underpricing rate of companies backed by foreign capital and mixed background venture capital is lower.

Information Discovery and Emotional Transmission of Media

Media reports may affect the return on the first day of IPO in two ways: first, media reports reduce the information asymmetry between issuers and investors through the information transmission function, thus reducing IPO underpricing. The second is that media reports affect the trading price of the secondary market of new shares by

influencing investor sentiment, thus increasing IPO underpricing. Wang Changyun et al. (2015), Wang Changyun and Wu Jiawei (2015) find that media reports or negative media reports have reduced IPO underpricing. However, the research of Huang Jun and Chen Xinyuan (2013) and Quan Xiaofeng (2015) finds that media reports significantly improve the short-term IPO underpricing, but reduce the long-term performance of IPO. Xiong Yan et al. (2014) find that media reports improve the pricing efficiency of the primary market (reducing IPO underpricing), but reduce the pricing efficiency of the secondary market (first-day turnover).

2) Investors' Behavior and IPO Pricing Efficiency

In recent years, many studies refer to foreign behavioral finance theories to explain the excessively high IPO underpricing in China. This paper presents the theories in the order in which they are used to explain the IPO phenomenon.

Differences of Investors' Beliefs: Investor Sentiment or Speculation

First of all, some studies explain the first-day return of China's IPO from the perspective of investor sentiment or speculation based on the Diverge of Opinion theory. Zhu et al. (2015), Yu Honghai et al. (2015), Song Shunlin and Wang Yanchao (2016) all find that investor sentiment or speculation has a significant impact on IPO first-day return (or IPO premium), and the greater the uncertainty of new shares' value, the stronger the impact of investor sentiment on IPO first-day return. However, Yu

Honghai et al. (2015), Song Shunlin and Wang Yanchao (2016) believe that differences of opinion represent the uncertainty of the company's value, while Zhu et al. (2015) believe that differences of opinion represent the company's information environment. Secondly, Song Shunlin and Tang Siyuan (2016) use the unique data of institutional investors' quotations to study the impact of investor sentiment on the pricing of new shares in the primary market. The study finds that investor sentiment is significantly positively correlated with IPO premium and IPO first-day return, consistent with previous studies. However, the higher the investor sentiment is, the higher the institutional investors' quotation at the inquiry stage is. Investor sentiment is significantly negatively correlated with IPO underpricing. It shows that investor sentiment cannot only affect the pricing of the secondary market, but also affect the quotation behavior of institutional investors in the primary market. Finally, some recent studies have studied the impact of institutional investors' disagreement on the pricing of new shares during the inquiry process with the help of China-specific quotation data. Li Dongxin et al. (2014) find that there are large differences in the quotations of Chinese inquiry institutions, indicating that the differences of opinions were serious during the quotation process. Further research shows that the greater the difference in the quoted prices of inquiry institutions and the more serious the differences of opinions, the more prominent the problem of IPO pricing in the primary market is. However, the difference in the quoted prices of institutions is significantly negatively correlated with the first-day earnings of IPO, indicating that the differences of opinions of investors have been

reflected in the IPO pricing in advance through the quotation of inquiry institutions. However, Cao et al. (2015) find completely the opposite conclusion with similar samples, that is, the greater the divergence in the quotation of institutional investors at the inquiry stage, the higher the first-day return. The reason may be that differences of opinion have a greater impact on the price of new shares after listing.

Preference Differences of Investors: Gambling Preference

Some recent studies have used gaming theory to explain the IPO pricing puzzle in China. Tang Wei and Xu Liheng (2016) find that for every standard deviation increase in betting characteristics, the first-day gains significantly increased by 5.5 percent. But over the long term, the stronger the betting characteristics, the worse the long-term performance. Wang et al. (2018) also consider the gambling characteristics of investors (right-skewed distribution of expected returns) and loss aversion (left-skewed distribution of expected returns). It is found that both left and right skew distribution of expected returns can affect IPO first-day returns, and the influence of left skew distribution is even greater, indicating that loss avoidance behavior has an important impact on IPO pricing.

Bounded Rationality: Investors' Attention Theory

Recent studies have also used investor attention theory to explain the IPO pricing puzzle in China. Song Shuangjie et al. (2011) find that the Internet search volume of individual

stocks before IPO has a good explanatory and predictive power for the market popularity, first-day excess return and long-term performance, which can explain 23 percent of the first-day excess return and more than 10 percent of the long-term cumulative return. Qi Luo and Jingdong Wu (2017) find that investors in the primary market focus on raising the issue price, while investors in the secondary market focus on raising the first-day trading price. In addition to learning from foreign behavioral finance theories to study IPO pricing, there are many literatures evaluating the importance of investor behavior in explaining the phenomenon of IPO pricing in China. Even in mature markets, first-day prices can be overvalued (Purnanandam & Swaminathan, 2004; Ritter & Welch, 2002). In China, where speculation is rife and individual investors dominate, the explanatory power of investor behavior should be stronger. Earlier studies have realized the importance of behavioral explanation to the first-day return of China's IPO (Han Liyan and Wu Yanran, 2007; Jiang Hongbo, 2007). Recently, some studies have adopted the stochastic frontier analysis method to try to evaluate whether the composition of China's IPO first-day return rate is caused by the low issuance price in the primary market (IPO underpricing) or the high pricing in the secondary market (IPO premium). Their findings consistently show that in China, the IPO premium accounts for the main part of the first-day return of IPO (Liu Yuhui and Shen Keting, 2011; Zou Gaofeng et al., 2012; Huang Shunwu et al., 2017). Song et al. (2014) use comparable company law and analysts' predicted prices to measure intrinsic value, and also find that IPO premium accounts for a major part of China's IPO first-

day return. The above results show that to explain China's ultra-high IPO first-day return, we need to start with the theory of investor behavior based on incomplete rationality. Although behavioral theory is very important to explain the mystery of China's IPO first-day return rate, few studies have explored how to constrain investors' irrational behavior. Song et al. (2014) use comparable company law and analysts' predicted prices to measure intrinsic value, and also find that IPO premium accounts for a major part of China's IPO first-day return. Specifically, during the sample period, when the first-day return is 66 percent, IPO underpricing and IPO premium account for 14 percent to 22 percent and 44 percent to 53 percent respectively. The above results show that to explain China's ultra-high IPO first-day return, we need to start with the investor behavior theory based on incomplete rationality. Although behavioral theory is very important to explain the mystery of China's IPO first-day return rate, few studies have explored how to constrain investors' irrational behavior. An exception is that Song Shunlin and Xiao Tusheng (2014) find that the price of new shares after listing is often much higher than the analysts' forecast price of new shares. The higher the IPO premium estimated by the analyst forecast price method, the worse the long-term market performance after IPO, which means that investors do not follow the analyst's valuation suggestions. There is no evidence that analysts' pricing forecasts can limit investors' irrational emotions.

2.3 Theories about Underwriters

From the above literature review, it is seen that domestic and international studies on information asymmetry theory have examined not only issuer and investor behavior but also the role of underwriters. All of them mention that the role of underwriters in the IPO pricing process has different degrees of influence on the IPO price suppression. The role of underwriters is not only studied in information asymmetry theory, but also includes the underwriter agency problem mentioned in agency theory.

1) Underwriters' Agency Problem

The separation of ownership and control in modern corporation provides a stage for the development of agency theory. Traditional Agency Theory examines the conflict of interest between owner and agent, which is mainly proposed by Jensen & Meckling (1976). They believe that the principal entrusts the agent with some decision-making rights and requires the agent to provide beneficial services for the agent, and assuming the existence of moral hazard, self-benefit maximization and other issues. In this way, it is believed that the agent would not always take actions aimed at the interests of the principal. So, in the context of traditional agency theory to understand IPO discount, this conflict of interest exists between the issuer and the underwriter. Baron (1982) argues that from the agency theory model of discount, a new IPO company should go through the stage of "information asymmetry" about stock value and underwriter behavior. As a result, new IPO accepts different levels of discount variation according

to the strengths and weaknesses of certain defense mechanisms. At the same time, the greater information asymmetry between it and the underwriters makes the underwriters focus on raising the fees of the IPO companies so as to gain more self-interests.

Different from traditional agency theory, multiple agency theory tests the conflicts of interest between different stakeholders and agents. Different from one-to-one relationships, multiple agents emphasize the results of many-to-many relationships (Arthurs et al., 2008). Hoskisson, Hitt, Johnson & Grossman (2002) argue that such multiple relationships created potential "conflicts of interest" among different interest groups. Each agent is faced with conflicting choices about which party's interests to retain, making the system more complicated. Compared with traditional agency theory, multiple agency theory extends its theoretical perspective and model complexity.

The underwriter has multiple agents. Arthur et al. (2008) find that the underwriter acted as the agent of both IPO companies and investors (including institutional investors). IPO companies hire underwriters to help them list their shares, and act as the principals of underwriters. However, IPO investors are also the principals of underwriters, that is, the stocks they buy are underwritten by these underwriters. Investors seeking to buy shares at low offering prices (and high discounts) hurt IPO companies. Chuang & Lin (2008) emphasize that as agents of two principals, underwriters may pay more attention to the interests of investors rather than the IPO company. Because investors, especially

institutional investors, will repeatedly invest in IPO and rights issue, while IPO companies are not often active in the capital market after listing. In other words, the underwriters have more business opportunities with investors in the future than the IPO companies, so they will benefit the investors through the discount. The study finds that many institutional investors are interested in short-term gains associated with IPO investment discounts.

2) Moderating Effect of Underwriters' Reputation

At the same time, in theory, Akerlof (1970) believes that there is a huge information asymmetry between the investors who are the providers of funds and the issuing companies who are the demanders of funds, which makes investors have to constantly lower their valuation of certain assets. If there is no mechanism to alleviate this information asymmetry problem, the market will gradually shrink or even disappear. In the theoretical model of Booth & Smith (1986), underwriter reputation is regarded as a safeguard mechanism to solve or alleviate the problem of information asymmetry between investors and issuing companies. Their model emphasizes the authentication function of intermediaries in the problem of information asymmetry. In the theoretical model proposed by Chemanur & Fulghieri (1994), the reputation of underwriters is gradually established by adopting stricter valuation standards. The result of the equilibrium is that the investment banks with high reputation choose to underwrite those companies with low risk and thus get higher returns as compensation. The issuing

company will also be able to obtain higher issuing price because of the underwriters with high reputation. One of the common points of these theoretical models is that they all believe that there should be a positive correlation between the reputation of underwriters and the price of securities. This means that the underpricing of new shares should decrease with the improvement of the reputation of underwriters. Because the underpricing of new shares is understood as the cost paid by the issuing company due to the existence of information asymmetry, and the reputation of the underwriter alleviates this problem.

Fernando et al. (2015) study the value of reputation from two perspectives, taking equity underwriting as an example. First, from the perspective of potential investors, the reputation of underwriters helps them distinguish between high-quality and low-quality IPO companies. Second, from the perspective of the issuing company, the issuing company needs to determine which underwriter or underwriters to choose in order to obtain the largest financing scale with the minimum dilution of equity. OzmelU (2013) believes that investment banks have a reputation, which is a comprehensive record and summary of the past behavior of investment banks. Investors could judge the professionalism and ethics of an investment bank by its reputation. He Pingzheng (2014) concludes that investment banks with a good reputation would pay attention to their good reputation and make reasonable pricing for IPO for their own long-term interests. Corwin (2005) finds that the reputation of investment banks was negatively

correlated with the degree of IPO underpricing. Sometimes, however, the relationship changes, and investment banks may be linked to individual institutional investors. Part of the profits that individual investors get from the IPO shares at a low price can be channelized to the underwriting investment banks, which have an incentive to collude with some institutional investors to deliberately drive down the price of the shares. Of course, due to the restrictions of laws and regulations, this situation only exists in some capital markets, in most capital markets is rare.

Logue (1973), Beatty & Ritter (1986) first propose the concept of underwriter reputation. Many subsequent studies use different variables to measure underwriter reputation. Empirical results show that different underwriter reputation indicators have different influences on the underpricing degree of new shares. Carter & Manaster (1990) measure the reputation of underwriters according to their ranking in the tombstone announcement of new stock offerings (abbreviated as CM method). The investment banks with the top ranking enjoy a higher reputation in the industry. Johnson & Miller (1988), based on a certain cut point, simply distinguishes reputable and non-reputable underwriters in the form of duality (JM Method for short). Megginson & Weiss (1991) use the relative share of each underwriter in the securities underwriting market (MW Method for short) as the index to measure the reputation of investment banks. The larger the market share, the higher the reputation of investment banks.

Many studies in the literature take Chinese new shares as a sample, and find that the relationship between underwriter reputation and new share underpricing is not always negative. This result is similar to the research based on new shares in other countries. The analysis results of Tian Jia and Zhan Weihua (2000) show that the excess return rate of stocks underwritten by famous investment banks is not significantly different from that of stocks underwritten by ordinary investment banks. Jin Yunhui and Yang Wen (2003) examine the relationship between the first-day yield of new shares and the reputation of underwriters in three stages, using the new shares listed from 1996 to 2001. They find that the relationship between the two was not significant in the two subsamples from 1996 to 2000, but significant in the subsamples in 2001. Jiang Shuncai et al. (2006) study 1230 new shares listed from 1991 to 2005. Their research results show that there is no significant relationship between underwriter reputation and first-day return of new shares. Guo Hong and Zhao Zhenyu (2006) study the new shares issued from 2000 to 2003. Their research finds that the underwriters' reputation seems to have no significant impact on the issue price or initial return of new shares, whether in the case of free pricing or regulated price-earnings ratio.

In the theoretical research taking China's new shares as a sample, the measure of underwriters' reputation has also been adjusted in combination with international theories. Liu Zhiyi (2011) believes that in the mature securities issuance market, the reputation of underwriters is formed in the market competition. The underwriters with

higher reputation should also account for a larger proportion of the issuance volume in the IPO market, and the underwriters with a larger proportion of the issuance volume tend to pay more attention to maintaining and improving their reputation. Li Yan (2010) measures the reputation of underwriters by adding the market share and the share of underwriting times to adjust the deviation caused by the excessive issuance scale of some listed companies. Zhang Qiang and Zhang Bao (2012) set the top 10 underwriters as high reputation, otherwise it is low reputation, according to the *Annual Ranking of Main Underwriters of Securities and Stocks issued by the China Securities Association*.

Chapter 3 Hypothesis Development

The capital markets of Western countries in Europe and the United States have a much longer history of development. The capital market supporting laws and regulations, such as issuance system and regulatory policies, are more abundant and diverse. The theoretical research on IPO price suppression in Western countries is also more comprehensive and perfect. On the contrary, China's capital market has been developed for a relatively short period of time, only 30-40 years. In addition, in the process of development, it has been constantly adjusting the IPO issuance methods and establishing a sound issuance system and regulatory policies. As for the theoretical research of western countries, we cannot copy them completely and directly apply them to China's capital market. Instead, we need to consider how to adjust the theoretical research model under the influence of the development history of the A-share market, China's political system, market regulation system and other factors with unique Chinese characteristics. Summarize the theoretical results which are more suitable for China's capital market and promote the reform of new share issuance system and enhance the efficiency of capital market resource allocation.

Therefore, some scholars have also made studies on how formal and informal institutions affect the IPO price suppression rate by combining the characteristics of China's unique political and cultural environment (e.g., Table 3-1), in order to better explain the phenomenon of IPO price suppression rate fluctuations in the Chinese capital market.

Table 3-1 Studies on IPO Underpricing Rate with Chinese Characteristics

	Assumption	Research on	Theory	Core Ideas
1	China's Formal System Influence	Government	Regulatory Role of Government	Government control measures (mainly price controls) increase first-day returns and reduce the efficiency of IPO pricing, while relaxing pricing controls reduce first-day returns and improve the efficiency of IPO issuance.
2	The Influence of Informal Institutions in China	Underwriter	The Political or Social Connections of the Underwriter	1. Politically connected underwriters improve the approval rate of the issuance committee, but they hurt the company's long-term market performance and have no effect on short-term IPO underpricing. 2. Underwriters at the center of the network attract more institutional investors and tend to undersell new issues. 3. Analysts close to the underwriters increase underpricing by choosing to issue high valuation reports.
3		Underwriters and Institutional Investors	Social Relationships between Underwriters and Institutional Investors	Underwriters may use their networks to raise the price of an offering
4		Underwriter	Inquire about Social Relations among Institutional Investors	The higher the overall correlation degree of the inquiry object, the lower the IPO pricing.
5		Issuer	The Political or Social Connections of the Issuer	1. The political connection of the issuer helps private enterprises raise the issue price. 2. If the sponsor representative has a social relationship with the IPO company's executives, the underpricing rate of the company is significantly lower.
6		Auditor	The Social Connections of the Auditor	There is a significant correlation between having a social relationship with the audit committee and IPO short-term underpricing.

3.1 Government Regulation and IPO Pricing Efficiency

Pricing controls have a direct impact on IPO pricing. Earlier studies all find that government controls (mainly price controls) increased IPO first-day returns and reduced IPO pricing efficiency (Liu Yuhui and Xiong Peng, 2005; Cheung et al., 2009; Tian, 2011), while deregulation of pricing reduces IPO first-day returns and improves IPO issuance efficiency (Liu Zhiyuan et al., 2011; Zhang Zheng and Ouyang Shan, 2012; Tian Lihui et al., 2013). Moreover, the correlation between IPO issue price and financial characteristics variables reflecting firm quality is enhanced after pricing market reform (Liu Zhiyuan et al., 2011). However, recent studies suggest that deregulation also raises some new problems. Yu Honghai et al. (2013) find that after the reform of the RFQ system, the unreasonable institutional arrangements lead to excessive competition among institutional investors participating in the RFQ, resulting in overpricing of IPOs and generating the problem of "three highs" (high P/E ratio, high issue price, and high oversubscription) of IPOs. Moreover, under the institutional arrangement that underwriters do not have the right to place new shares and underwriters' underwriting fees are linked to the proceeds, underwriters have a strong incentive to increase the issue price. They may raise the issue price at the final pricing stage, resulting in an issue price significantly higher than the institutional offer level at the inquiry stage and overpricing of new shares (Shao Xinjian et al. 2013; Song Shunlin and Tang Siyuan, 2016; Song Shunlin, 2019). In addition, existing studies find that controls on issue pricing also lead to ineffective release of uncertainty about the value

of IPOs, which encourages investors' speculation on IPOs (Song Shunlin and Tang Siyuan, 2017). In particular, IPO speculation is very serious in the context of both issue pricing controls and first-day trading price controls, as evidenced by ultra-high first-day returns and significantly higher turnover and volatility in the short term after listing (Wei Zhihua et al., 2019; Song Shunlin and Tang Siyuan, 2019; Tang Siyuan and Song Shunlin, 2020). In addition, the stock price bubble caused by IPO speculation also affects the market reaction when IPO shares are released, which in turn increases the risk of market volatility (Zhang Jingfan et al., 2020).

3.2 Relationship between Culture and IPO Pricing Efficiency

China is a relationship-based society, and stakeholder relationships have an important impact on IPO pricing, especially in the context of market-based pricing. In the IPO pricing process, not only the social relationships of underwriters have an impact on pricing, but also the social relationships of issuers, as well as the social relationships of intermediaries and even among investors.

The Political or Social Connections of the Underwriter

Chen et al. (2017) find that politically connected underwriters increase the approval rate of the issuance committee, but harm the long-term market performance of the firm and have no effect on short-term IPO price suppression. Rumokoy et al. (2017) find that underwriters in the center of the network attract more institutional investors to

participate and tend to suppress the price of the IPO. This result suggests that network hubs may represent underwriter reputation rather than political connections. Shao, Xinjian et al. (2018) investigate how the relationship between underwriters and other underwriters analysis affects the pricing of IPOs. They find that analysts with close ties to underwriters are able to effectively incite excessive optimism among individual investors by choosing to issue high valuation reports, allowing emotional bubbles to enter the IPO price.

Social Relationships between Underwriters and Institutional Investors

Luo et al. (2015) find that institutional investors with close ties to underwriters are more likely to participate in RFQs and offer more optimistic prices, raising the level of IPO pricing, suggesting that underwriters may use their network of connections to increase IPO prices. On one hand, underwriters can leak sensitive information about issue pricing to institutional investors to help them focus on participating in IPO projects with higher yields (Sun, Shuwei et al., 2015). Chen, Xinyuan et al. (2016), on the other hand, explain the relationship between underwriters and institutional investors in a more positive light, arguing that their social ties are reciprocal and facilitate the transmission of information during a company's IPO. Institutional investors are able to invest in quality firms, and underwriters earn high underwriting revenues as a result.

Inquire about Social Relations among Institutional Investors

Yu Haihai et al. (2013) find that excessive competition among inquiry institutions lead to excessively high issue prices. Zheng Kai et al. (2017) find that the higher the overall correlation degree of the inquiry object, the lower the IPO price, indicating that the inquiry object may also use their own relationship network to unite to lower the IPO price.

The Political or Social Connections of the Issuer

Both Francis et al. (2009) and Li and Zhou (2015) find that issuers' political connections (connections of executives or their investors) help private firms to increase their offering prices. However, Chen et al. (2015) find that SOEs (State Owned Enterprises) have higher IPO price suppression than private firms, especially for centrally controlled firms. In contrast, Fusheng Yu and Chengfang Wang (2012) find that the relationship between the nature of property rights and IPO price suppression is affected by pricing controls. Under pricing controls, firms with higher state ownership are more likely to break through pricing controls through political connections and issue at higher prices. In addition, Sun et al. (2018) study the impact of social ties between executives and sponsor representatives. The empirical results show that if a sponsor representative has a social relationship with an IPO firm's executives, the firm has significantly lower price suppression and performs better in the market within three years after the IPO. The relationship between executives and underwriters seems to play a positive forensic role.

The Social Connections of the Auditor

Yunsen Chen et al. (2014) find that having auditor-issuer social connections is significantly and positively associated with short-term IPO price suppression. They argue that this is due to the fact that the auditor-issuer relationship deceives investors in the secondary market, leading to overvaluation of IPOs after listing. In contrast, Du and Lai (2017) find that the relationship between intermediaries (auditors or lawyers) and the issuance committee is significantly and negatively related to IPO price suppression. They interpret this result as a result of investors in the primary market disapproving of the issuance committee relationship, which they perceive as sending a poor signal of firm quality.

With the development of China's capital market for more than thirty years since its establishment, the issuance system and pricing mechanism have become more and more mature, and gradually conform to international practices. The implementation of the registration system is a landmark milestone in the marketization of IPO pricing. After all, the implicit control of the IPO P/E ratio under the recommendation system will only provide policy arbitrage opportunities, resulting in the continuous increase and limit phenomenon after the listing of new shares, and lead to high IPO underpricing. At the same time, after the registration system, due to the restriction of the inquiry rules, the implementation of the new inquiry rules has been delayed. Under the registration

system, the performance of IPO underpricing is also significantly different from that of inquiry.

Based on theoretical studies of the Chinese government's control system, it is found that government controls on issue prices increase the first-day return of IPOs, which in turn increases the IPO price suppression rate (Liu Yuhui and Xiong Peng, 2005; Cheung et al., 2009; Tian, 2011), while deregulation of pricing reduces the first-day return of IPOs, i.e., reduces the IPO price suppression rate. (Liu et al., 2011; Zhang Zheng and Ouyang Shan, 2012; Tian Lihui et al., 2013). When the registration system is implemented, the price depression rate of IPOs is expected to decrease with the deregulation of issue prices.

Meanwhile, according to the theory of underwriter's multiple agency problem, underwriters are agents of multiple interests, including IPO companies, investors and underwriters themselves. Therefore, under the institutional arrangement with the allocation rights and underwriting fees tied to the funds raised, the underwriters will choose the most favorable way to push the company to set the IPO price.

It is found that when the theory of Chinese government control system and underwriter's multiple agency theory exist at the same time in a period, underwriters will eventually influence the IPO price of enterprises in a way that maximizes their own

interests. Therefore, after the implementation of registration system and before the introduction of new inquiry rules, the IPO underpricing rate in China does not decline as it did after the introduction of foreign registration system. Instead, it further increases the IPO underpricing rate.

According to the time of the implementation of the registration system and the implementation of the new inquiry rules, this paper divides the research into three stages. The first stage is before the implementation of the registration system, which is from November 28, 2019 to August 23, 2020. The second stage is from August 24, 2020 to September 17, 2021, after the implementation of the registration system and before the introduction of the new inquiry rules. The third stage is after the implementation of the registration system, and the new inquiry rules are launched, from September 18, 2021 to January 28, 2022. According to the theoretical research of Chinese government regulation system, it is proposed that IPO underpricing rate will decrease after the launch of registration system. At the same time, according to the theory of multiple agents of underwriters, the behavior of underwriters will affect the fluctuation of IPO underpricing rate. Then, the hypotheses are put forward as follows:

H1a: *After the launch of the registration system to the launch of new inquiry rules, IPO underpricing rate is higher than the launch of the registration system.*

H1b： *After the introduction of new inquiry rules, IPO underpricing rate is lower than before the launch of registration system.*

In the second stage of inquiry, according to China's Securities Law, the IPO must be organized by qualified securities companies for roadshows, promotion, pricing and sales. In theory, the process of underwriters determining the issuing price through inquiry is similar to "beauty contest". Based on the price agreed by the majority, that is, the distribution of the number of quotations and the number of subscriptions of the inquiry objects is the main reference basis. The offering price is selected within the quotation dense range. According to the industry practice, the underwriters shall submit the IPO pricing report to the CSRC after the inquiry. The pricing of the underwriter must carefully consider the price intensity of the inquiry, so the issuing price determined by the underwriter will not deviate from the intensive range generally. At the same time, due to the large number of inquiry objects, the price-intensive areas are actually relatively concentrated, and the pricing difference between the upper and lower limits of the range will not be too large. This actually limits the impact of underwriters' selection of different positions in the price-intensive range on the issue price, which is mainly determined by the distribution of quotations of inquiry objects.

The Guiding Opinions on Further Reform and Improvement of the IPO System stipulates that institutional investors who participate in the inquiry, namely the inquiry

objects, can only obtain new shares offline. Once the offline subscription price is lower than the issue price, new shares will not be obtained. The object of inquiry shall offer a true price, and the lead underwriter shall take measures to put an end to high quotation without concluding a transaction and low quotation without concluding a transaction. Therefore, subject to the constraints of the system, the profit of the inquiry object participating in the inquiry mainly depends on its quotation strategy.

In this stage of the inquiry rule, the underwriter's quotation strategy should consider the "four-value constraint". The so-called "four-value constraint" means that the offering price set by the issuer and the lead underwriter exceeds the median and weighted average of the price offered by investors below the net, excluding the highest bid. If the median price of public offering fund, social security fund, pension fund, enterprise annuity fund and insurance fund is lower than the weighted average price after excluding the highest offer, different times of risk warning announcements shall be issued according to the exceeding range.

According to the agency theory, the underwriters will consider not the market value of the issuer's enterprise, but the interests of the underwriters themselves, in order to be successfully listed in the offering offer and obtain the allotment. At this time, the interests of the underwriters will no longer be the underwriting expenses of the raised funds, but will come from the acquisition of low-priced new shares. The excess earnings

from the sale of new shares after listing for several trading limits. At the same time, the underwriters use their advantage of asymmetric information with the issuer to concentrate on holding down prices. Then, the hypothesis is put forward as follows:

H2a: *After the introduction of the registration system and before the introduction of the new inquiry rules, the IPO underpricing rate of inquiry pricing model is higher than that of fixed price pricing model.*

According to the research on underwriter reputation theory, there is no unified research conclusion on the impact of underwriter reputation on IPO underpricing. There are some studies that put forward positive correlation conclusions, and there are also some studies drawing negative correlation conclusions. There are even some empirical studies that suggest there is no significant correlation. The main reason is that different empirical studies are in different policy backgrounds. That is, the issuing system and pricing method are different, so the conclusions are different. The background of this paper is the impact of underwriter reputation on IPO underpricing in the period before and after the new rules of inquiry under the GEM registration system. Then, the hypothesis is put forward as follows:

H2b: *After the introduction of the registration system and before the introduction of the new inquiry rules, the IPO companies dominated by underwriters with higher reputation (i.e. the role of sponsors) have higher underpricing degree, that is, the lower the price earnings ratio.*

The CSRC has also paid high attention to the behavior of the underwriters to hold down the price in a group, and timely introduced the new inquiry rules for policy guidance and revision. The newly implemented new inquiry rules have adjusted the high price elimination ratio from “no less than 10 percent” to “no more than 3 percent and no less than 1 percent”. At the same time, it also canceled the need to delay the issuance when the new share pricing breaks through the “lower of the four values”. After the clarification of the new inquiry rules, if the issuance price exceeds the average level of offline investors’ quotations, only one special announcement of investment risk needs to be issued before the subscription, and there is no need to delay the subscription. The reduction of the proportion of high-price elimination will help to break through the “lower of the four values” and encourage all parties to fully play.

According to the agency theory, the underwriter’s main consideration at this stage is not the market value of the issuer, but how to participate in the issuer’s new share issuance smoothly and charge high underwriting fees. Therefore, the quotation strategy of the underwriters at this stage is not to obtain the new shares at a low price, because the low price may lead to a low price and exit. Therefore, the underwriters will try to quote higher prices and then charge higher underwriting fees. The underwriter earns the underwriting service fee instead of the excess earnings from the market. Then, the hypothesis is put forward as follows,

H3a: *After the introduction of the new rules for inquiry, the IPO underpricing rate of inquiry pricing model is lower than that of fixed price pricing model.*

Similarly, according to the theoretical research on the reputation of underwriters, the underwriters with a high reputation influence the behaviors of issuers and other underwriters and promote the realization of their interests through their status in the market. Therefore, the the hypothesis is put forward as follows,

H3b: *After the introduction of the new rules for inquiry, the IPO company dominated by underwriters with higher reputation (i.e. the role of sponsor) will have lower underpricing degree, that is, the higher the issuing price earnings ratio will be.*

Chapter 4 Data and Method

There are two main research ideas on the effectiveness of IPO pricing in the capital market: first, the degree of IPO underpricing is generally used to measure the effectiveness of IPO pricing at home and abroad. Second, based on the basic assumption that the secondary market is not completely efficient, the effectiveness of IPO pricing is analyzed from the perspective of behavioral finance and investor rationality. Based on the above two ideas, combined with the actual situation of China's capital market, this paper takes the relevant influencing factors of the primary market and the secondary market into account, and carries out an empirical study on the effectiveness of the issuance of new shares. The research design is as follows.

4.1 Dependent Variable

The degree of IPO price suppression is usually used as its measure when examining the effectiveness of IPO pricing, and the Unadjusted Initial Returns (IR) is used as the IPO price suppression rate to quantify the degree of IPO price suppression.

The formula for calculating IR is as follows:

$IR = (P_1 - P_0) / P_0$;

P_1: the closing price of the new shares on the first day of listing;

P_0: the issue price of new shares;

At present, the maturity of China's capital market, the level of legal regulation, investor quality, investment rationality, etc. are compared with the mature market economy in Europe and the United States there are large differences. Considering that since December 2013, the securities trading market in China introduced a 44 percent halt rule on the first day of IPO, and this led to the phenomenon of continuous multi-day halt until the opening day of the IPO. Because of the existence of this phenomenon, the sample is taken on the first day will be distorted by the policy restrictions. This paper argues that the simple application of IPO first-day return indicators in developed countries cannot objectively reflect the effectiveness of IPO pricing in China's securities market. Therefore, the IR indicators and the related variables in the model are adjusted as follows - adjust the first-day closing price of the new shares P_1 to the closing price of the trading week following its listing.

4.2 Sample

This paper selects 326 enterprises successfully listed before and after the Growth Enterprise Market (GEM) registration system, including 50 enterprises issued before the implementation of the registration system (2019.11.28 - 2020.8.23), 197 enterprises (2020.8.24 - 2021.9.17) after the implementation of the registration system until the implementation of the new rules of inquiry, and 79 enterprises after the inquiry of new regulations issued (2021.9.18-2022.1.28). The data for listed companies comes from the Straight Flush trading software and the CSMAR database (Research database on

initial public offerings of Chinese listed companies). The corresponding descriptive analysis of the three stage samples is shown in Table 4-1.

Table 4-1 Descriptive analysis of sample issue indicators at each stage

Time	Indicators	Sample Size	Max	Min	Mean	Median	Standard Deviation
First Stage	Issuing Share (10K shares)	50	30,000.00	1,231.39	3,636.73	2,500.00	4,181.14
	Issuing PE	50	22.99	15.28	21.63	22.95	1.96
	Issuing Value (10K Yuan)	50	207,000.00	16,850.00	53,031.45	41,932.74	32,163.77
	Operating Revenue (10K Yuan)	50	359,500.00	18,100.00	71,418.00	52,150.00	60,648.72
	Profit (10K Yuan)	50	77,300.00	3,440.64	12,116.92	8,549.47	12,268.53
Second Stage	Issuing Share (10K shares)	197	54,215.92	933.35	3,676.66	2,668.00	4,447.23
	Issuing PE	197	115.56	7.98	27.67	25.28	14.48
	Issuing Value (10K Yuan)	197	1,393,349.03	6,201.55	75,434.77	48,216.00	116,360.62
	Opeating Revenue (10K Yuan)	197	17,074,300.00	10,400.00	199,146.07	61,200.00	1,230,016.01
	Profit (10K Yuan)	197	540,800.00	1,800.00	17,442.63	9,163.81	45,545.08
Third Stage	Issuing Share (10K shares)	79	22,191.25	1,177.80	3,790.70	3,000.00	3,393.43
	Issuing PE	79	249.03	11.16	46.52	39.23	33.63
	Issuing Value (10K Yuan)	79	467,636.88	17,624.38	106,500.95	64,979.52	88,081.08
	Operating Revenue (10K Yuan)	79	1,439,200.00	12,100.00	116,440.51	54,000.00	225,737.13
	Profit (10K Yuan)	79	62,900.00	3,506.60	12,666.22	8,140.88	11,990.88

Table 4-2 illustrates the statistical descriptive analysis of IR in three stages.

Table 4-2 Descriptive analysis of IPO underpricing rate of full sample

Time	Index	Sample Size	Max	Min	Mean	Median	Standard Deviation
First Stage	IR	50	208.799%	27.383%	124.212%	131.903%	25.718%
Second Stage	IR	197	1158.710%	-13.742%	199.548%	166.184%	166.895%
Third Stage	IR	79	885.209%	-21.954%	87.846%	51.621%	128.915%

From the above table, it is seen that the IPO price suppression has been the first to rise and then to decrease over the three phases, and the GEM has significantly improved the effectiveness of IPO pricing after the introduction of the new RFQ regulation. However, comparing the IR of the pricing approach and the RFQ approach under the second and third stages, it is seen that the different trends of price suppression under the two different IPO pricing approaches are shown in Table 4-3.

Table 4-3 Descriptive analysis of two different IPO pricing approaches

Time	Pricing Approach	Sample Size	Max	Min	Mean	Median	Standard Deviation
Second Stage	Fixed Pricing	49	455.265%	-13.742%	65.443%	40.315%	74.564%
	Inquiry Pricing	148	1158.710%	13.302%	243.947%	202.585%	164.686%
Third Stage	Fixed Pricing	21	885.209%	-13.222%	95.943%	43.239%	185.071%
	Inquiry Pricing	58	513.346%	-21.954%	84.914%	56.214%	99.580%

As is seen from Table 4-3, in the second stage, IPO underpricing rate of inquiry is higher than that of pricing, while in the third stage, IPO underpricing rate of inquiry is lower than that of pricing. The only change that took place between the second and third stages is the introduction of new rules on inquiry, which changes the underwriters' entry requirements. Based on the changes of underwriters' behavior around this time when the new rules of inquiry change, the agency theory explains that underwriters have conflicts of interest with issuers and make use of their advantages of information

asymmetry to determine the IPO pricing price in their own favor, which leads to different trends of IPO underpricing rate.

Chapter 5 Regression Analysis

In order to further analyze the influence of underwriter reputation on IPO underpricing rate and verify the above theoretical assumptions, this paper uses multiple linear regression method to build an analysis model of the factors influencing IPO underpricing rate.

5.1 Variables

On the basis of fully considering the actual development of Chinese securities market, referring to the existing literature and relevant theories and comprehensively examining various indicators in the IPO process, the following indicators are selected as the model variables (shown in Table 5-1).

Table 5-1 Definition of Variables

Variables	**Variable Name**	**Description**
Dependent Variable	IPO-IR	IR = （P_1－P_0） / P_0
Dummy Variables	PRE-REG	D_i is a time dummy variable (D_1=0 and D_2=0 for the first stage until August 24, 2020; D_1=1 and D_2=0 for the second stage from August 24, 2020 to September 17, 2021; and D_1=0 and D_2=1 for the third stage from September 18, 2021 to January 28, 2022).
	PRE-NIR	
	POST-NIR	
	FP (Fixed Price)	FP method is to confirm the issue price with reference to the average P/E ratio of listed companies in the same industry in the past month. IP approach is that the issuer and its sponsor shall determine the issue price of the stock by way of inquiry from the inquiry recipients. T_i is a dummy variable for IPO issue price determination method (for fixed pricing issue method, T_i=1; for inquiry issue method, T_i=0)
	IP (Inquiry Price)	
Control Variables	PS (Profit Size)	Take the net profit of an enterprise in the year before its IPO
	# Directer	Take the number of board members in the year prior to the IPO
	TA (Total Asset)	Take the total assets of the enterprise in the year before the IPO
	NCFOPS (Net Cash Flow from Operating activities Per Share)	Take the net cash flow generated per share from operating activities in the year prior to the IPO
	Leverage	Take the asset-liability ratio of the enterprise one year before the IPO
Fixed Effects	IE (Industry Effect)	According to the CSRC enterprise industry directory classification
	RE (Region Effect)	Enterprises are classified according to their registered addresses
Moderator	REP	The underwriters are ranked by the number of shares underwritten in the previous year as a percentage of the total number of shares issued in the year

According to the study, the larger the PS, the more room for future growth and the ability of the firm to maintain its current strong growth rate will be a concern for new investment institutions. This is because the regression coefficient of this control variable with the explanatory variable is expected to be negative. Similarly, the higher the NCFOPS and Leverage, the more rationally the NIIs will judge whether the firm has the ability to continuously improve these indicators in the future and thus give a more rational offer, so the regression coefficients of these control variables can be expected to be negative. According to the information asymmetry theory, the larger the total asset value and the larger the number of board members, the more inaccurate the information conveyed may be, which in turn increases the IPO price suppression rate, so the regression coefficients of these control variables can be expected to be positive.

Descriptive analysis statistics are done for the control variables in the samples of the three aforementioned stages (Table 5-2). The samples with missing data are removed due to incomplete data in some of the samples, and all of the samples with this removed data are from the first stage. Since the pricing method of IPO issuance of enterprises in this stage is restricted by the invisible price-earnings ratio (PE=22.96) of the regulator and is not influenced by underwriters. Therefore, the missing samples in this section do not affect the results of the regression analysis, and the descriptive analysis is as follows.

Table 5-2 Descriptive Analysis of Control Variables

Variable Names	Sample Size	Mean	Standard Deviation	Min	Median	Max
PS	312	15679.235	37017.404	1800.000	8717.315	5.41e+05
#Directer	312	8.003	1.501	5.000	9.000	13.000
TA	312	1.62e+09	9.71e+09	2.20e+08	7.13e+08	1.71e+11
NCFOPS	310	1.251	1.967	-6.380	0.980	21.760
Leverage	257	35.453	14.987	5.260	35.080	72.420

5.2 Model

Based on the research hypothesis, the dependent variable and independent variables, the formula is proposed as follows:

$$IR=\beta_0+\beta_1\cdot D_1+\beta_2\cdot D_2+\beta_3\cdot T_i+\beta_4\cdot(D_1\times T_i)+\beta_5\cdot(D_2\times T_i)+\beta_6\cdot REP_i+\beta_7(REP_i\times T_i)+\beta_8\cdot(REP_i\times D_1)+\beta_9(REP_i\times D_2)+\beta_{10}\cdot(D_1\times T_i\times REP_i)+\beta_{11}\cdot(D_2\times T_i\times REP_i)+r\cdot\boldsymbol{Controls}+\theta\cdot\boldsymbol{FEs}+\varepsilon_i$$

In the formula, *IR* is the dependent variable, namely IPO underpricing rate. D_i is a time dummy variable (the first stage is before August 24, 2020, $D_1=0$, $D_2=0$; the second stage is from August 24, 2020 to September 17, 2021, with $D_1=1$ and $D_2=0$; the third stage is from September 18, 2021 to January 28, 2022, $D_1=0$, $D_2=1$). T_i is the dummy variable of IPO issuing price determination method (fixed pricing issuing method, $T_i=1$; inquiry issue mode, $T_i=0$). *REP* is a moderator, representing the reputation of the underwriter. *Controls* is the control variable. *FEs* is a fixed effect. εi is the residual term. $(D_i\times T_i)$ is the interactive dummy variable of the dependent variable, representing the influence of different stages and different issuing price confirmation methods on IPO

underpricing rate. ($D_1 \times T_i \times REP_i$) represents the impact of different issue price recognition methods on IPO price suppression rate at different stages for underwriters with different reputation. ($REP_i \times T_i$) represents the impact of reputation at different issuance methods. ($REP_i \times D_1$) represents the impact of reputation at the second stage. ($REP_i \times D_2$) represents the impact of reputation at the third stage. r represents the vector of coefficients of control variables; θ represents the vector of coefficients of variables with fixed effects; β_i represents the coefficients corresponding to different explanatory variables and their cross-products.

5.3 Data Analysis

By using stata statistical analysis software, samples from the three stages are used in the model for calculation and to test the proposed hypotheses above.

1) Hypothesis Testing of H1a and H1b

As shown in Table 5-3, Column (1) indicates the effect of intermediate stage D_1 (i.e., second stage, after the introduction of the registration system and before the introduction of the new RFQ regulation) and post- RFQ regulation D_2 (i.e., third stage, after the introduction of the registration system and after the introduction of the new RFQ regulation) on IR (i.e., IPO price suppression rate). The table shows that the regression coefficient of D_1 in the intermediate stage is positive, i.e. It increases the price suppression rate, and the regression coefficient of D_2 after the new RFQ regulation

is negative, i.e. It decreases the price suppression rate. Column (2) is based on column (1) with the addition of variables for the issue price determination method. The regression results are still positive for the regression coefficient of D_1 in the intermediate stage, i.e. It raises the price suppression rate. The regression coefficient of D_2 is negative after the new regulation of quotation, i.e. It decreases the price suppression rate. Meanwhile, the effect of the issue price determination method T on IR is significantly correlated. Column (3) is based on Column (2) with the addition of the variable of underwriter reputation REP. Column (4) is based on Column (3) with the addition of control variables. Column (5) is based on Column (4) with the addition of fixed effects.

Table 5-3 Regression Results of H1a and H1b

Variables	(1)	(2)	(3)	(4)	(5)
D_1	0.674***	0.992***	1.007***	1.170***	0.947***
	(3.642)	(5.143)	(5.244)	(6.968)	(4.681)
D_2	-0.488**	-0.173	-0.195	-0.047	-0.035
	(-2.446)	(-0.854)	(-0.960)	(-0.263)	(-0.151)
T		-1.272***	-1.282***	-0.956***	-0.746***
		(-6.487)	(-6.512)	(-3.925)	(-3.233)
REP			-1.059*	-0.467	-0.750
			(-1.776)	(-0.706)	(-0.835)
log_PS				-0.519**	-0.501*
				(-2.183)	(-1.971)
#Directer				0.036	0.076
				(0.475)	(1.254)
log_ TA				0.437**	0.410*
				(2.101)	(1.698)
NCFOPS				-0.063	-0.041
				(-1.228)	(-0.678)
Leverage				-0.024***	-0.018**
				(-3.179)	(-2.174)
Industry FE	No	No	No	No	Yes
Region FE	No	No	No	No	Yes
N	312	312	312	257	253

Note: "", "**"and "***" represents the significant level of 10%, 5% and 1%.*

In summary, the regression coefficients of columns (1) to (5), D_1 and D_2, both show a positive correlation between D_1 and IR. In the D_1 stage, the coefficient shows a 94.7 percent increase, as well as a negative correlation between D_2 and IR. In the D_2 stage, the coefficient shows a 3.5 percent decrease, which indicating that the **H1a** and **H1b** are supported. After the launch of the registration system to the launch of new inquiry rules, IPO underpricing rate is higher than the launch of the registration system. IPO price suppression is lower after the introduction of the new RFQ regulation than before

the introduction of the registration system.

2) Hypothesis Testing of H2a and H3a

As shown in Table 5-4, Column (1) indicates the effect of different issue price determination methods (T_i) on the IPO depression rate (IR) at different stages (D_i). Column (2) is based on Column (1) with the addition of the cross product of reputation REP with D_i and T_i. Column (3) adds control variables to Column (2). Column (4) adds fixed effects to Column (3).

Table 5-4 Regression Results of H2a and H3a

Variables	(1)	(2)	(3)	(4)
REP	-1.413**	-6.330	-3.443	-8.377
	(-2.305)	(0.081)	(2.319)	(3.149)
D_1	1.214***	1.176***	1.371***	1.002***
	(6.141)	(4.948)	(7.035)	(4.408)
T	0.083	0.098	0.124	0.653
	(0.564)	(0.425)	(0.382)	(0.975)
D_1*T	-2.028***	-2.059***	-1.890***	-2.079***
	(-8.449)	(-9.007)	(-6.025)	(-3.513)
D_2	-0.554***	-0.578**	-0.341*	-0.411
	(-2.863)	(-2.555)	(-1.917)	(-1.619)
D_2*T	0.048	0.023	0.178	-0.325
	(0.109)	(0.053)	(0.377)	(-0.479)
T*REP		0.411	1.242	0.722
		(0.351)	(0.811)	(0.332)
D_1*REP		0.784	0.408	1.858
		(0.565)	(0.313)	(0.583)
D_2*REP		0.306	-1.977	0.240
		(0.132)	(-0.976)	(0.061)
log_PS			-0.446*	-0.437*
			(-1.955)	(-1.728)
#Directer			0.037	0.071
			(0.502)	(1.211)
log_ TA			0.419**	0.416*
			(2.072)	(1.793)
NCFOPS			-0.070	-0.039
			(-1.347)	(-0.582)
Leverage			-0.026***	-0.022***
			(-3.513)	(-2.699)
Industry FE	No	No	No	Yes
Region FE	No	No	No	Yes
N	312	312	257	253

Note: "", "**"and "***" represents the significant level of 10%, 5% and 1%.*

In summary, the regression results of the second-order cross product term "D_1*T" in column (1) to column (4) above show that the regression coefficient is negative in the

middle stage D_1 (i.e., the second stage), and the IPO price suppression rate decreases by 207.9 percent for companies that choose pricing as the issuance price determination method, and the correlation is significant. Before the registration system, there was a policy control ceiling of PE 23 times, and the valuation was artificially depressed. The pricing method after the registration system referred to the average price-earnings ratio of listed companies in the same industry in the past month, which was closer to the fair valuation of the market for the industry, so the IPO underpricing rate decreased. At the same time, under the registration system, the IPO issue price of enterprises is only determined in the way of pricing and inquiry, one of two choices. Therefore, the **H2a** is supported, that is, the IPO price suppression rate of the inquiry method is higher than that of the pricing method in the second stage.

In columns (1) to (4), the "D_2*T" second-order cross product term does not yield significant results and the regression coefficients are small. Meanwhile, according to the statistical results in Table 4-3, the mean and median IRs of the pricing and RFQ methods are relatively similar. The data regression conclusions are consistent with the results of the descriptive analysis.

There is no result to significantly support the **H3a**. On one hand, it is because the sample number is too small, and the difference between pricing/inquiry and premium rate is not obvious. That is to say, there are 79 samples of companies after the new rule of

inquiry, among which 58 companies are for inquiry and 21 companies are for pricing. Another reason is the influence of the underwriter's multiple agency theory at this stage. The underwriters sacrifice underwriting commissions in the second stage of the IPO offering price has gained the right to place the new shares and could benefit by working together with other underwriters to press the price. This helps underwriters, who are also institutional investors, to participate in each other's projects and form long-term cooperative relationships. After the new shares are issued, they can be cashed out in the secondary market to obtain higher investment income.

In the third stage, the underwriters raise the IPO price by giving up their rights to sell shares in return for hefty underwriting fees. If you cooperate with other institutional investors, new shares will be broken to the detriment of the interests of the other party, not conducive to the long-term cooperation relationship between institutions. As a result, the third phase of higher IPO offerings are mainly targeted at individual investors. Individual investors need a frame of reference to choose whether to participate or not. The best benchmark is the recent average P/E ratio of listed companies in the same industry, which is the basis for pricing. Beyond this average P/E ratio, individual investors will feel that the price is too high and choose to participate cautiously, which may lead to a low fund raising, so the underwriters will try to choose a price range that individual investors are willing to pay and at the same time can maximize their own

interests to promote the IPO. Therefore, in the third stage, the IPO underpricing rates of inquiry mode and pricing mode are relatively close, with no significant difference.

3) Hypothesis Testing of H2b and H3b

As shown in Table 5-5, Column (1) shows the influence (IR) of different pricing methods (T_i) on IPO underpricing rate of underwriters (REPs) with different reputations in different stages (D_i). On the basis of Column (1), control variables are added in Column (2). On the basis of Column (2), the fixed effect is added in Column (3).

Table 5-5 Regression Results of H2b and H3b

Variables	(1)	(2)	(3)
REP	-4.220	-2.287	-5.331
	(-1.939)	(-0.449)	(0.178)
T	0.623	0.504	1.780**
	(1.212)	(0.808)	(1.983)
T*REP	-2.724	-0.973	-6.078
	(-0.914)	(-0.289)	(-1.487)
D_1	1.184***	1.377***	1.044***
	(4.964)	(7.049)	(4.563)
D_1*REP	0.652	0.305	1.498
	(0.465)	(0.231)	(0.471)
T*D_1	-2.618***	-2.301***	-3.280***
	(-4.719)	(-3.469)	(-3.808)
T*D_1*REP	3.833	2.815	8.554*
	(1.205)	(0.738)	(1.917)
D_2	-0.610***	-0.372**	-0.441*
	(-2.639)	(-1.975)	(-1.719)
D_2*REP	1.757	-0.924	2.534
	(0.782)	(-0.444)	(0.681)
T*D_2	-0.407	-0.130	-1.228*
	(-1.086)	(-0.333)	(-1.797)
log_PS		-0.442*	-0.442*
		(-1.921)	(-1.747)
#Directer		0.036	0.074
		(0.485)	(1.251)
log_ TA		0.415**	0.414*
		(2.045)	(1.799)
NCFOPS		-0.073	-0.047
		(-1.385)	(-0.682)
Leverage		-0.026***	-0.021**
		(-3.361)	(-2.506)
Industry FE	No	No	Yes
Region FE	No	No	Yes
N	312	257	253

Note: "", "**"and "***" represents the significant level of 10%, 5% and 1%.*

To sum up, in Column (3), the regression result of the third-order cross-multiplication term of "T*D_1*REP" shows that it is significant and the coefficient is positive, indicating that every 1 percent increase in underwriter's reputation has an impact on the underpricing rate difference of 8.55 percent. Therefore, after the introduction of the registration system and before the introduction of the new regulation of inquiry, the reputation of the lead underwriter increases the difference of IPO underpricing rate under the two modes of inquiry and pricing, that is, the **H2b** is supported. The third order cross multiplication item "T*D_2*REP" is not displayed because the reference variable is before the introduction of the registration system, that is, the first stage. However, in this stage, there is no inquiry mechanism, so "T*D_1" is relative to the first stage and has no meaning. In addition, it is seen from Table 5-4 that the cross-multiplication terms of reputation and other variables are not significant, so the regression results of H3b need to refer to the second-order cross-multiplication terms of "T*D_2". The results show that it is significant and the coefficient is negative. It indicates that after the introduction of the new regulation of inquiry, the reputation of the lead underwriter reduces the difference of IPO underpricing rate under the two modes of inquiry and pricing, that is, the **H3b** is supported.

5.4 Robustness Check

In the above regression calculation, IR is selected one week after the IPO, mainly because of the following considerations: On the one hand, the Chinese IPO issuance

system has restrictions on the trading day halt, so the data of too short a period is not accurate enough. On the other hand, the data of one month, three months or six months, because of the longer period, are prone to other factors affecting the trading price, which in turn affects IR. However, from the robustness perspective, still one-month, three-month or six-month data are selected for robustness testing. The results are shown in Tables 5-6, where Column (1) is listed as one-week post-IPO trading day closing price data, Column (2) is listed as one-month post-IPO trading day closing price data, Column (3) is listed as three-month post-IPO trading day closing price data, and Column (4) is listed as six-month post-IPO trading day closing price data.

Table 5-6 Robustness Check of Regression Results

Variables	(1)	(2)	(3)	(4)
REP	-5.331	-11.355	-12.875	-9.194
	(0.178)	(-0.975)	(-1.695)	(-0.890)
T	1.780**	1.138	1.160	0.190
	(1.983)	(0.873)	(0.919)	(0.168)
T*REP	-6.078	-1.127	-1.091	-1.360
	(-1.487)	(-0.167)	(-0.161)	(-0.233)
D_1	1.044***	0.333	0.040	0.222
	(4.563)	(0.749)	(0.098)	(0.559)
D_1*REP	1.498	5.690	7.174*	4.479
	(0.471)	(1.402)	(1.927)	(1.339)
T*D_1	-3.280***	-2.500*	-2.355*	-1.315
	(-3.808)	(-1.929)	(-1.883)	(-1.183)
T*D_1*REP	8.554*	2.203	1.251	2.071
	(1.917)	(0.311)	(0.176)	(0.335)
D_2	-0.441*	-0.974**	-1.163***	-1.226***
	(-1.719)	(-2.235)	(-2.613)	(-2.653)
D_2*REP	2.534	2.506	3.812	2.575
	(0.681)	(0.505)	(0.777)	(0.602)
T*D_2	-1.228*	-0.687	-0.674	0.523
	(-1.797)	(-0.752)	(-0.762)	(0.649)
T*D_2*REP	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
log_PS	-0.442*	-0.361	-0.275	-0.234
	(-1.747)	(-1.031)	(-0.820)	(-0.734)
#Directer	0.074	0.058	0.065	0.030
	(1.251)	(0.700)	(0.832)	(0.331)
log_ TA	0.414*	0.354	0.385	0.413
	(1.799)	(1.199)	(1.356)	(1.458)
NCFOPS	-0.047	-0.102	-0.118*	-0.099*
	(-0.682)	(-1.621)	(-1.922)	(-1.670)
Leverage	-0.021**	-0.019**	-0.019*	-0.018
	(-2.506)	(-2.022)	(-1.796)	(-1.379)
Industry FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes
N	253	253	253	253

Note: "", "**"and "***" represents the significant level of 10%, 5% and 1%.*

In summary, from column (1) to column (4), the regression results of "$T*D_1*REP$" and "$T*D_2$" are more significant for the IR calculated with the closing price data of the trading day one week after the listing, and less significant for the IR calculated with the closing price data of the trading day more than one week after the time period. The regression results are not significant for the IR calculated with the closing price data of the trading day after one week of listing. Because of the longer time period, the share price performance of firms in the secondary market is also more susceptible to different factors, which makes the correlation weaker.

Chapter 6 Discussion and Conclusion

This paper analyzes and studies the IPO pricing efficiency by selecting a sample of 326 companies with IPO offerings on Shenzhen GEM from November 28, 2019 to January 28, 2022, constructing a multiple linear regression model, especially the impact of underwriters with different reputations on IPO pricing efficiency before and after the new inquiry regulation, and conducting robustness tests by IPO price suppression rates in different cycles.

The regression analysis finds that the IPO price suppression rate increases after the introduction of the registration system, but it decreases and is effectively suppressed after the introduction of the new inquiry regulation (the H1a and the H1b are supported). Further analysis of the changes in IPO price suppression rate reveals that during the period before the introduction of the new RFQ regulation (i.e., the second stage) after the introduction of the registration system, the IPO price suppression rate of enterprises issued by the RFQ method is higher than that of enterprises issued by the pricing method (the H2a is supported) and the reputation of the lead underwriter increases the difference in IPO price suppression rate between the two modes of RFQ and pricing (the H2b is supported). After the introduction of the new regulation of inquiry, the behavior of underwriters under the method of inquiry changed due to the policy, and

the reputation of the lead underwriter reduced the difference of IPO underpricing rate under the two modes of inquiry and pricing (the H3b is supported).

From the results of the regression analysis, this paper argues that in the multiple agency theory of underwriters, underwriters not only act as agents of IPO companies and investors (investment institutions), but also as agents of their own interests. Underwriters first consider maximizing their own interests when the policy allows it. Before the new RFQ regulation, underwriters depress the issue price of companies, obtain new shares at a low price, and then sell them to the market to cash out after the share price rises, to the detriment of both issuers and investors (investment institutions). After the new RFQ regulation, they raise the issue price of companies to obtain over-raising funds and high underwriting returns, and then later the share price of companies breaks down, to the detriment of investors (investment institutions). This finding can be used as a supplement to the multiple agency theory to explain the fluctuation of IPO firms' price suppression rate before and after the implementation of the new regulations on RFQ after the launch of Shenzhen GEM.

Based on the above findings, the following recommendations are made: First, the government should strengthen the supervision of underwriters to prevent and control the underwriter agency problem. On the one hand, the current pricing mechanism that underwriting fees are proportional to the total amount of underwriting can be reformed

to reduce this “incentive distortion” at the root and “derail” the interests of underwriters and issuers; on the other hand, a more reasonable underwriters’ reputation ranking mechanism should be established to form a healthy competition through the “invisible hand” of the market, to promote underwriters from focusing on earnings to social reputation, and to promote the transparency of the underwriting and sponsorship process. Secondly, the market-oriented reform of the inquiry system should be insisted on to reduce administrative intervention and bring into play the pricing function of the inquiry mechanism. The quotation agency should exclude the interference of many factors such as the number of issues in the issue of listed companies, with the purpose of reasonably assessing the intrinsic value of the issuing company and avoiding homogeneous quotations.

Of course, there are some shortcomings in this paper such as the limited sample collected in this study and the few influencing factors selected due to the short time of the implementation of the registration system of Shenzhen GEM, which will also facilitate the development of further research. It is hoped that through the study of GEM IPO price suppression, some factors influencing the high price suppression of GEM will be found, which will provide some useful reference for the pricing of GEM issuance under the registration system in China, so as to facilitate the long-term development of GEM market under the registration system in China.

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Appendix

The Regional Distribution of the Sample

Area	2019.11.28-2020.8.23	2020.8.24-2021.9.17	2021.9.18-2022.1.28	Total Amount
Guangdong	10	50	12	72
Jiangsu	8	30	19	57
Zhejiang	7	32	13	52
Shanghai		17	4	21
Shandong	5	10	6	21
Beijing	5	10	4	19
Anhui	3	7	3	13
Henan	4	3	3	10
Fujian		8	2	10
Hubei		5	4	9
Sichuan	2	4	2	8
Jiangxi	1	3	1	5
Hunan		1	4	5
Hebei	1	4		5
Tianjin	2	2		4
Shaanxi	1	2		3
Xizang		1	1	2
Liaoning		1	1	2
Jilin		2		2
Yunnan		1		1
Xinjiang	1			1
Ningxia		1		1
Heilongjiang		1		1
Guizhou		1		1
Guangxi		1		1
Total Amount	50	197	79	326