

The Chinese Initial Public Offering Market: Underpricing, Duration to Listing and Hot Issue Cycles

This Thesis Submitted for the Degree of Doctor of Philosophy

Haifeng Guo

Department of Econometrics and Business Statistics

Faculty of Business and Economics

Monash University

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Abstract

This thesis conducts three empirical studies on the Chinese A-share initial public offering (IPO) market, specifically, underpricing and short-run underperformance, duration from offering to listing and hot and cold issuing cycles. Before the empirical analysis, the literature is reviewed associated with these three topics. In addition, this thesis presents an overview of the Chinese IPO market which is found to undergo an experiment period from 1984 to 1990, a transition period from 1991 to 1993 and finally steps into a relatively mature stage from 1994. The issuing systems, allocation mechanisms, pricing methods, structure of shareholders are also discussed. The first empirical study analyses underpricing and short-run underperformance of the Chinese A-share IPOs from Mar, 2001 to 2005 when the Approval System is adopted. We find the market adjusted first-day returns average at 93.49% during this period. Then we explore why Chinese IPOs are underpriced so much. The influences of inequality of IPO demand and supply, allocation mechanisms, structure of shareholders, duration to listing and underwriters are discussed respectively. Based on the discussion, we construct an ordinary least squares regression model and find that the underpricing is positively related to this IPO's turnover ratio and state-owned shares and negatively related to its offering price, issuing size, etc. Meanwhile, this study extends the estimation and compares these IPOs' short-run underperformance on their 10th, 20th, 30th trading day. We find that the levels of short-run underpricing shrink. Both allocation mechanisms and underwriters can impact the degree of shrinking.

The second empirical study estimates the duration from offering to listing of Chinese A-share IPOs issued from 1994 to 2005. We firstly explain the different IPO issuing

procedures under the Administrative Authorizing System and the Approval System respectively and then compare the effects of these two issuing systems on the length of this duration. The findings indicate that the waiting time to listing has been shortened greatly after the Approval System is adopted. Secondly, this study emphasizes on exploring endogenous factors related to an issuer itself, such as this issuer's quality, market sentiment, allocation mechanism, and underwriter, etc. Then a Cox proportional hazard model is employed to examine these factors' influences on this issuer's final listing. Further, this study extends the analysis to explore the role of the issuing system and issuing year respectively. Most endogenous factors are found to still be functioning when we take into account the effect of the issuing system, but the effects of underwriter, allocation mechanism, offering price and floatation size diminish in favour of the effect of issuing year.

The third empirical study focuses on detecting hot and cold IPO cycles in the Chinese A-share market during 1994-2005 using a Markov regime switching model. We introduce a set of observations to measure IPO monthly activities, which include the number of IPOs, underpricing, market conditions and duration to listing, and thus establish a model to estimate these activities' average performance in hot and cold periods respectively. It is found that a hot period is related with an abundant supply of IPOs, high levels of underpricing, positive market conditions and short waiting time to listing. This study presents the turning points of hot and cold periods for each observation. The cycles detected by the number of IPOs are the benchmark and then these cycles' robustness is tested by the other observations.

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Declaration for thesis based or partially based on conjointly published or unpublished work

General Declaration

In accordance with Monash University Doctorate Regulation 17 / Doctor of Philosophy and Master of Philosophy (MPhil) regulations the following declarations are made:

I hereby declare that this thesis contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

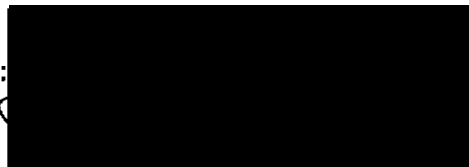
This thesis includes one original papers published in peer reviewed journals and one unpublished publications. The core theme of the thesis is to analyze the Chinese IPO market. The ideas, development and writing up of all the papers in the thesis were the principal responsibility of myself, Haifeng Guo, working within the Department of Econometrics, Monash University under the supervision of Professor Robert Brooks and Dr. Roland Shami.

The inclusion of co-authors reflects the fact that the work came from active collaboration between researchers and acknowledges input into team-based research.

My contribution to the work involved the following:

Thesis chapter	Publication title	Publication status*	Nature and extent of candidate's contribution
4	Underpricing of Chinese A-share IPOs and Short-run Underperformance under the Approval System from 2001 to 2005	Published	Literature review, modeling and drafting
6	Detecting Hot and Cold Cycles Using Markov Regime Switching Models—Evidence from the Chinese A-share IPO Market	Accepted	Literature review, modeling and drafting

Signed:



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Chapter 1 Introduction

1.1 Background and Motivations

An initial public offering (IPO) occurs when a security is sold to the general public for the first time, with the expectation that a liquid market will develop (Ritter, 1998). The IPO process involves many units, such as an issuer, investors, underwriters, and many other intermediaries; therefore, a large number of questions are raised and need to be addressed associated with IPO markets.

Specifically, the Chinese IPO market attracts increasing interest in recent years. Firstly, the Chinese IPO market is very impressive for its extremely high levels of initial-day returns, although underpricing exists widely in every nation's IPO market. According to Loughran et al (1994, updated in 2008)'s summary, the level of underpricing in the Chinese IPO market ranks the first among the 45 countries. The average underpricing of Chinese IPOs reaches 164.5% from 1990 to 2005, which is almost 10 times that of some developed nations, such as Australian, U.K, U.S, etc. Even among the emerging markets, the Chinese IPO underpricing still differentiates itself for its high magnitude. For example, the levels of underpricing are 92.7% for the Indian market during 1990-2007 and 69.6% for the Malaysia IPOs during 1980-2006 respectively, which are only a half of the magnitude of the Chinese IPO's. In short, the extremely high levels of underpricing makes the Chinese IPO market very unique and promising to investigate.

Secondly, the Chinese IPO market has always been surrounded by a large number of optimistic investors who are fascinated by high initial-day returns. Especially in the

early years, the China Stock Regulatory Commission (CSRC) restricted supplies of IPOs which resulted in extraordinary inequality of supply and demand for an IPO. Although this inequality has been reduced greatly, the Chinese IPOs are still thought to be highly profitable.

Thirdly, the Chinese IPO market has developed greatly during the last decades. For example, there are more than 1300 A-share IPOs issued and listed which raised at least 544 billion (RMB) during 1990-2005. During this period, the Chinese IPO market has witnessed many changes associated with IPO issuing. An instance is that the Approval System has substituted the Administrative Authorising System since 2001 which is thought to be a substantial change in IPO issuing. Moreover, pricing methods and allocation mechanisms have been renovated as well. These changes bring about many interesting topics which deserve investigation. In general, the Chinese IPO market attracts focus for its complex and unique characteristics.

1.2 Research Questions

There are many interesting topics associated with the Chinese A-share IPO market. This thesis, specifically, pays attention to addressing the following three questions.

Research question 1:

What is the underpricing after the Approval System is adopted in the Chinese IPO market?

Many studies address the underpricing of Chinese IPOs (Su and Fleisher, 1999; Mok and Hui, 1998; Chi and Padgett, 2005; Chen et al, 2004; Chan et al, 2004; Wang,

2005, Cai, 2006, Yu and Tse, 2006, Cheung et al, 2009); however, no one focuses on the period when the Approval System is adopted in China.

Since Mar, 2001, the Approval System has substituted the Administrative Authorizing System in new share issuing. Under the Administrative Authorizing System, the CSRC is in charge of checking and supervising a company's credit, business risk, issuing size and price, etc. This system is necessary in an undeveloped IPO market for the benefits of investors and stability of the stock market; however, it becomes more complicated with the development of the Chinese stock market. Under the Approval System, the issuing procedure is more efficient and the issuer and underwriter have more authority in pricing, allocating, etc. Therefore, we assume that the mispricing would be minimized and thus the underpricing will be lower than before. Meanwhile, the issuing procedure becomes less complicated than before, which means an IPO may get issued and listed quicker than before. Therefore, the first research topic of this thesis focuses on the Chinese A-share IPOs' underpricing particularly for the period between 2001 and 2005 when the Approval System is adopted. We discuss some fundamental factors and then employ an ordinary least squares (OLS) regression model to measure these factors' effects on the underpricing.

Research question 2:

What influenced the length of an IPO's duration time from offering to listing?

The duration elapsed between offering and listing is accompanied by uncertainty and risk for both issuers and subscribers (Chen et al., 2004) and the longer the time lasts,

the more risk they encounter. The primary focus of IPO research is on underpricing, hot issues, corporate governance, etc. However, few studies analyse the length or duration from the offering date to eventual listing, a significant period to both issuers and investors alike. The longer time to listing will increase risk and information asymmetry (Mok and Hui, 1998; Chan et al., 2004). Many empirical studies find there exists a strong positive relationship between underpricing of IPOs and this duration in many countries (Lee et al., 1996; Chen et al., 2004), which motivates the need to understand the factors that impact the timing of the final listing of an IPO.

The Chinese IPO market has witnessed a great change for this duration time from more than two months in 1994 to a half month when the market steps into 2002 and the Approval System takes function. An interesting question is whether the Approval System shortens this waiting time? Further and more important, assuming that all exogenous factors such as issuing procedures, electronic subscription instruments, etc. are the same, are there any endogenous factors which are under the issuer's control and endow this IPO with more chances to list faster?

Therefore, the second research topic reveals how the Chinese issuing procedures can affect an issuer's waiting time from offering to listing and how the issuer-related factors can assist this listing speed.

Research question 3:

Are there “hot issues” phenomena in China? If yes, when are the turning points for the hot and cold issuing cycles?

The phenomenon of “hot issues” has been recognized for many years around the world. The number of IPO issuers will be increasing greatly after companies observe

IPOs over-subscribed and underpriced by the largest amounts. This phenomenon repeats in a time series and thus hot/cold issuing cycles come into being. A hot IPO market is characterized by the combination of a large volume of IPOs, high initial returns and positive market condition (Ibbotson and Jaffe, 1975; Ritter, 1984; Brailsford, *et al.*, 2004; Lowry and Schwert, 2002).

However, there is a lack of attention investigating this phenomenon in the Chinese market. Recognizing a hot period will not only assist IPO issuers raise more money but also help investors benefit more from the initial returns. Therefore, the third topic endeavours to detect the hot and cold issuing cycles and their turning points in the Chinese IPO market via measuring a set of IPO activities.

Therefore, this thesis intends to make a contribution to the Chinese IPO research in three points. Firstly, it addresses the new change of underpricing when the Approval System is adopted. Secondly, it investigates the hazard and listing speed of an issuer. Finally, the Chinese IPO issuing cycles will be thoroughly discussed.

1.3 Outline of the Thesis

Chapter 1 provides an introduction for the thesis. It firstly presents the background and research motivations. Then this chapter explains the three research topics and outlines the following chapters.

Chapter 2 reviews the literature on underpricing, time to listing and hot issues respectively. For the underpricing part, it firstly presents a general review on rationales and empirical studies, and then puts more specific focus on the literature on the Chinese IPO market. The literature on duration to listing is not as much as underpricing. This part mainly comprises the impact of the duration on underpricing

and the factors concerned with the length of the duration. For the hot issues section, the international literature is reviewed and then a brief discussion is presented as regards the Chinese hot issues.

Chapter 3 presents an overview of the Chinese IPO market to provide a basis for the following empirical studies. The first two sections depict the three developing stages of the Chinese IPO market and the bull and bear periods of the Chinese stock market. Then this chapter explains two issuing systems: the Administrative Authorizing System and the Approval System. Further, this chapter describes the main allocation mechanisms and pricing methods in China. Finally, the characteristics of the Chinese unique shareholder structure are discussed in this chapter.

Chapter 4 conducts the empirical study on the underpricing of the Chinese A-share IPOs issued between 2001 and 2005 when the Approval System is adopted. It firstly presents a brief overview of the Chinese IPOs' initial-day return and duration to listing from 1984 to 2005. Then this chapter describes the data. The emphasis is put on the explanation of why the Chinese IPOs are underpriced so much. The results of the estimation are discussed along with some concluding remarks. Further, a short-run underperformance analysis is also conducted.

Chapter 5 employs Cox proportional hazard models to estimate the Chinese A-share IPOs' duration to listing from 1994 to 2005. This chapter explains the two issuing systems and then compares the difference of the duration between these two systems. The following section puts more focus on the endogenous factors concerned with this duration. The models and their estimation results are presented in section 5.4. Finally, this chapter further conducts an extended analysis which examines the influence of issuing system and issuing year.

Chapter 6 focuses on detecting hot and cold IPO cycles in the Chinese A-share market using a Markov regime switching model. This chapter firstly introduces a set of measures of IPO activities and thus establishes a model to estimate these activities' average performance in hot and cold periods respectively. These measures include IPO volume, underpricing, stock market condition and duration to listing. Further, this chapter depicts the turning points of hot and cold periods across the period from 1994 to 2005 for each measure, with the number of IPOs per month as the benchmark.

Chapter 7 makes a conclusion for this thesis. It also discusses the limitation of this research and proposes the further research areas in the Chinese IPO market.

The next chapter reviews the literature associated with the research topics in this thesis.

Chapter 2 Literature Review

Initial public offerings have been the research focus for many years and an abundance of studies are devoted to address and investigate related issues about IPO activity. These studies comprise both theoretical and empirical research involving underpricing, short and long-term performance, money left, time to listing, hot/cold issues and corporate governance etc (Rock, 1986; Ibbotson and Ritter, 1995; Ritter, 1998; Mok and Hui, 1998; Su and Fleisher, 1999; Loughran and Ritter, 2002; Lowry and Schwert, 2002; Brailsford *et al.*, 2004 Ritter and Welch, 2002; Sherman and Titman, 2002). The relationship with these issues are also thoroughly discussed in terms of regulations, pre-and post-structure of shares, allocation mechanisms, underwriters, institutions process, market effect, economic conditions, etc (Ritter and Welch, 2002; Ljungqvist and Wilhelm, 2005; Yong, 2007; Chi and Padgett, 2005; Chen et al, 2004; Chan et al, 2004; Wang, 2005; Alavi et al, 2008; Cheung et al, 2009). This chapter reviews the literature on three topics, specifically, underpricing, time to listing and hot issues in order to serve as a basis for the following studies in this thesis. The review is arranged in three parts and for each part, the international studies are generally discussed and then more specific focus is put on the literature on the Chinese IPOs.

2.1 Literature Review on Underpricing

2.1.1 International Studies on Underpricing

A. Rationales for underpricing

A number of studies endeavour to explain why new shares are intended to be underpriced and the related elements which may affect the magnitudes of underpricing (Rock, 1986; Ritter, 1998; Ibbotson and Ritter, 1995; Ritter and Welch, 2002; Sherman and Titman, 2002). The relative importance of these different rationales has also changed over time. In the 1980s, Rock's (1986) winner's curse and the Benveniste and Spindt (1989) dynamic information acquisition models were widely accepted in explaining much of the underpricing. In the 1990s, however, when the average initial returns are much higher, ownership and agency explanations of under-pricing can better explain the under-pricing (Yong, 2007). A variety of reasons are adopted to explain an IPO's underpricing and the following lists the most popular viewpoints.

a. information asymmetry

Information asymmetry is a very popular hypothesis for explaining underpricing of IPOs (Brau and Fawcett, 2006). Information asymmetry could exist between the underwriter and the issuer (Holmstrom, 1980; Baron, 1982), between issuers and potential investors (Beatty and Ritter, 1986; Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990; Spatt and Srivastava, 1991) and between informed and uninformed investors (Rock, 1986; Ritter, 1998), among which the last one is well known for the winner's curse hypothesis. The winner's curse is initially

suggested by Rock (1986) who argues that issuers underprice their shares to compensate the uninformed investors for the adverse selection problem they face in the allocation of shares. Generally a strong demand will result in rationing when a more or less fixed number of shares are sold at a fixed offering price. In the new issuing market, there are some superior investors who obtain much more information about the new share in all kinds of ways, and then they have informational advantages compared with the other potential investors. In this situation of informational asymmetry and high demand of offerings, a winner's curse will occur. If the informationally inferior investors can buy the desirable shares very easily, it suggests that those superior investors don't value the shares worth buying (Ritter, 1998). So the issuers must make sure the new shares are underpriced enough to encourage those uninformed investors purchasing the order.

Some studies further take the underpricing as a cost of information disclosure when an IPO goes public. Sherman and Titman (2002) argue that when there is little need for accurate pricing, the expected gain from underpricing exactly offsets the investors' costs of acquiring information. Jain (1997) extends this hypothesis and raises the adverse selection problem which results from information asymmetry between various market participants.

b. ex ante uncertainty

Ex ante uncertainty is related with information asymmetry but emphasizes on investing risk faced by potential investors. Goergen et al.(2009) argue that large underpricing is caused by the high degree of riskiness of the issuing firms and by the partial adjustment phenomenon of offer prices to compensate institutional investors for the truthful revelation of their demand for the shares. Chowdhry and Sherman

(1996) propose that if all investors realize ex ante uncertainty that the offering price is “too low”, then there will be a large oversubscription for the firms. Therefore, they suggest issuers would like to underprice shares in order to reduce the likelihood that the issue will fail. The similar argument is made by Brau and Fawcett (2006) that underpricing compensates investors for taking risk. The ex ante uncertainty is tested by a large number of studies, among which researchers have used the variance of the after-market returns of IPOs (Clarkson and Merkley, 1994; Ritter, 1984), the age of the firm at the time of offering (Ritter, 1984, 1991; Megginson and Weiss, 1991), the offer size (Beatty & Ritter, 1986; McGuinness, 1992) and the underwriter’s reputation (Carter and Manaster, 1990; James and Wier, 1990; Johnson and Miller, 1988) as proxies for measuring the ex ante uncertainty of the IPOs.

c. signalling hypothesis

Allen and Faulhaber (1989), Grinblatt and Hwang (1989), Ritter (1998) and Welch (1989) propose that underpricing an IPO is a strategy of an issuer who wants to “leave a good taste” with investors issues in order to issue SEO in the future, because the issuer knows the true value of its own firm and signals their intrinsic value by underpricing the IPO (Ritter, 1998). High-quality firms underprice their IPOs to differentiate themselves from low-quality firms and, thus, receive a more favourable market response to subsequent equity offerings. Welch (1996) finds that signalling high-quality issuers are worth 2-3 times more than non-signalling low-quality firms.

However, empirical studies don’t reveal too much strong relationship between IPO underpricing and subsequent SEO issuing, such as the Jegadeesh et al (1993)’s study on the US IPO market. Spiess and Pettway (1997) also find no evidence that firms

recover the cost of an underpriced IPO in either higher issue proceeds or in greater wealth for the firm's initial owners either.

d. ownership dispersion hypothesis

The ownership dispersion hypothesis is recently popular in explaining underpricing (Booth and Chua, 1996; Brennan and Franks, 1997; Smart and Zutter, 2003; Field and Sheehan, 2004; Brau and Fawcett, 2006; Alavi, et al, 2008; Zheng and Li, 2008). Booth and Chua (1996) hypothesize that IPOs are underpriced to promote ownership dispersion, which in turn increases aftermarket liquidity of IPO stocks. Ritter (1998) also argues that issuing firms may intentionally underprice their shares in order to generate excess demand and so be able to have a large number of small shareholders. This dispersed ownership will both increase the liquidity of the market for the stock, and make it more difficult for outsiders to challenge management.

Some studies apply this hypothesis to explain the underpricing of new offerings and dispersion of ownership. Brennan and Franks (1997) show that underpricing is used to ensure oversubscription and rationing in the share allocation process so as to allow owners to discriminate between applicants for shares and to reduce the block size of new shareholdings. The liquidity after IPOs is also tested in some evidence studies. Zheng and Li (2008) propose that underpricing also has direct effects on secondary market liquidity after controlling for ownership structure and other factors. A similar argument is provided by Pham et al (2003).

However, there are some doubts on this hypothesis in the view of corporate finance. Stoughton and Zechner (1998) propose that managers underprice their offerings in order to encourage investment by blockholders who, as a feedback, are wanted to provide monitoring services. Field and Sheehan (2004) further discuss that the link

between underpricing and ownership structure is weak because they find most firms who have outside blocks in place at the IPO retain them afterwards. In terms of acquiring new blockholders, there is no difference between firms that underprice and those that do not.

e. agency conflict hypothesis

Ritter (1984) argues that the positive empirical relation between firm value and insider holdings may be due to agency rather than signalling explanations. A recent study by Ritter and Welch (2002) further argues that asymmetric information may not be the primary driver of many IPO phenomena, however, they believe that non-rational and agency conflict may explain more about IPO issues. The similar conflicts are also explained by Loughran and Ritter (2002). They argue that underwriters may prefer to underprice IPOs and intentionally leave more money on the table than necessary and then allocate these shares to favoured buy-side clients. Meanwhile, they can underprice IPOs to minimize the risk of the issuing failing. Ruud (1993) also indicates that underwriters have incentives to recommend a lower offering price to make sure of a successful issuing.

f. market feedback hypothesis

The market feedback hypothesis is raised to explain the behaviour of investment banks. Investment bankers may underprice IPOs to induce regular investors to reveal information during the pre-selling period, which can then be used to assist in pricing the issue (Ibbotson and Ritter, 1995). In order to induce regular investors to truthfully reveal their valuations, the investment banker compensates investors through underpricing (Ritter, 1998).

There are still a few further hypotheses which address a new issue's underpricing from different viewpoints, such as the investment banker's monopsony power hypothesis, lawsuit avoidance hypothesis, bandwagon hypothesis, etc (Rock, 1986; Ibbotson and Ritter, 1995; Ritter, 1998; Loughran and Ritter, 2002; Lowry and Schwert, 2002; Ritter and Welch, 2002; Sherman and Titman, 2002). These rationales may be not independent of each other; however, some of them are often combined to explain underpricing of IPO in empirical studies.

B. Empirical studies of underpricing

The underpricing phenomena of IPOs exist in every nation's stock market, although the levels of underpricing vary across different countries. A comprehensive review of underpricing of IPOs can be gauged from Ibbotson and Ritter (1995), Ritter (2003) and Loughran, et al (1994). A detailed review of IPO studies on Asian countries can be found in Yong (2007). As recently summarized by Loughran, et al (Updated in 2008, See details on Jay Ritter's home website), among the 45 countries of their summary, the levels of first day returns are much higher in emerging markets especially in the Asian countries, such as China, India, Malaysia, Japan, Korea, Sri Lanka, etc. For these emerging markets, most average first-day returns are around 40%-50%, while the levels of Indian and Chinese IPOs are more incredibly higher. In empirical studies, quite a variety of proxies are adopted to reveal why IPOs are underpriced. The following review sorts the most frequent-used proxies into firm-specific characteristics and systematic factors.

a. firm-specific characteristics

The offer price is argued to be incorporated as firm-specific risk information (Beneda and Zhang, 2009) that can reveal the quality of this firm. Investment bankers may underprice IPOs to induce regular investors to reveal information during the pre-selling period, which can then be used to assist in pricing the issue. This argument has been developed by Benveniste and Spindt (1989). Those IPOs for which the offer price is revised upwards will be more underpriced than those for which the offer price is revised downwards (Ibbotson and Ritter, 1995). The positive relationship between offering price and magnitude of underpricing is demonstrated by a large number of empirical studies, such as Hanley (1993); Chowdhry and Sherman (1996) and Loughran and Ritter (2002).

Many empirical studies find issuing size of an IPO impacts on underpricing as well (Lee, et al, 1996; Sharpe and Woo, 2005) and the underperformance would be very modest if issuing size and book-to-market ratio match well (Ritter and Welch, 2002). The same result is found by many studies such as Fama and French (1992), Loughran and Ritter (1995), Brav and Gompers (1997), Davis et al (2000) and Moshirian et al (2009).

Many empirical studies find that there is a link between the level of underpricing and the firm's ownership structure (Brennan and Franks, 1997; Sharpe and Woo, 2005). For example, Sharpe and Woo (2005) find the underpricing and ownership retention decisions are interrelated in the Australian IPO market. Brennan and Franks (1997) analyse the data from a sample of 69 IPOs in the UK and find that underpricing is used to ensure oversubscription and rationing in the share allocation process so as to allow owners to discriminate between applicants for shares and to reduce the block

size of new shareholdings. Zheng and Li (2008) find in the Nasdaq IPOs that underpricing is positively correlated with the number of non-block institutional shareholders after an IPO but negatively correlated with the changes in the total number of shareholders, which suggests that IPOs are underpriced to promote ownership dispersion, which in turn increases aftermarket liquidity of IPO stocks. Smart and Zutter (2003) further test the relationship between underpricing and ownership in the US market specifically via comparing single-class and dual-class issuers. For the dual-class companies, insiders issue ordinary common shares to the public while retaining ownership of a class of shares with superior voting rights. They find that dual-class companies with higher post-IPO institutional ownership are less underpriced compared with the single-class companies, which suggests that dual-class ownership structures protect private control benefits.

Alavi et al (2008) also indicate that differences in pre-IPO owners' incentives and bargaining power as implied by their pre-IPO shareholdings can significantly influence the IPO process. Chahine (2007) use a sample of 172 French IPOs and empirically find initial owners' decisions on dispersion can reduce underpricing at the time of initial public offerings (IPOs). However, Field and Sheehan (2004) find that the link between underpricing and ownership structure is weak.

Besides, many other terms are discussed in explaining underpricing, including the firm's age, history, industry, accounting information, firm size, time to listing, investor's interest, demand-to-offer ratio, etc (Lee, et al, 1996, Sharpe and Woo, 2005; Chahine, 2007).

b. effects of systematic characteristics

The underwriter is thought to affect the level of underpricing because some studies argue that underwriters would like to underprice offerings and benefit from this underpricing via allocating more underpriced IPOs to favoured clients, to hedge funds and other related investors (Loughran and Ritter, 2002; Ritter and Welch, 2002). Some believe that underwriters are compensated for analyst coverage via greater underpricing because the underwriter fees are usually uninformed (Cliff and Denis, 2004). As regards underwriters, many studies argue that a more prestigious underwriters can assist IPOs issuing and thus the magnitude of underpricing can be minimized by a prestigious underwriter (Benveniste and Wilhelm, 1997; Sherman and Titman, 2002; Kirkulak and Davis, 2005; Mantecon and Poon, 2009). However, evidence from Japanese IPOs is interesting in this regards (Beckman et al, 2001; Kirkulak and Davis, 2005). Beckman et al (2001) find no evidence that underwriter reputation influences the level of mispricing. Kirkulak and Davis (2005) find that the relationship between underwriter reputation and underpricing depends on where the IPO is priced, reflecting the level of demand for the issue. When there is high (low) demand there is a positive (negative) and significant relationship between underwriter reputation and the level of underpricing.

Market sentiment also attracts much focus in IPO underpricing studies which involves the environment both prior to IPO offering and prior to IPO listing. Leite (2007) find underpricing being positively related to market returns observed prior to the IPO. Bradley et al (2009) also support the view that higher secondary market returns accrue to IPOs with more information asymmetries and levels of underpricing, which are possibly due to price and aggregate demand uncertainty.

Derrien and Womack (2003) apply pre-offering market return and volatility to test the effect on underpricing; while Ma and Faff (2007) adopt prelisting market conditions in their study to discuss the underpricing, because they argue underpricing is likely to be influenced much more by market conditions before listing than before offering.

The allocation mechanism accounts for a large portion in explaining the level of underpricing. Many studies argue that the allocation mechanism is highly related with mispricing and information asymmetry minimizing (Derrien and Womack, 2003; Sherman and Titman, 2002; Sherman, 2005). Fixed pricing, bookbuilding and auction methods are among the most discussed mechanisms (Kaneko and Pettway, 2003; Vandemaele, 2003; Derrien and Womack, 2003; Ma and Faff, 2007; Pettway et al, 2008). Ma and Faff (2007) find that the fixed price procedure of the secondary market proportional offering is optimal in minimising the underpricing and cross-sectional variation of the first day returns in the Chinese IPO market, although they propose that the bookbuilding procedure is optimal in counteracting adverse conditions created by low market profitability, high market volatility and uncertainty induced by the time 'gap' from offering to listing. While Derrien and Womack (2003) use the French IPOs to find that the auction mechanism (compared with bookbuilding and fixed price) is associated with less underpricing and a lower variance of underpricing. Similar findings are provided by Kaneko and Pettway (2003) and Pettway et al (2008) in the Japanese IPO market. A thorough discussion about bookbuilding and underpricing is presented in Sherman and Titman (2002).

2.1.2. Underpricing Studies on Chinese IPOs

A. Evidence of underpricing

The Chinese IPO market has attracted increasing interest for its extremely high level of underpricing which is highlighted in many studies (Loughran et al, 1994; Ritter and Welch, 2002; Yong, 2007). A large number of studies are devoted to addressing Chinese IPOs and discussing why Chinese IPOs are underpriced so much (Su and Fleisher, 1999; Mok and Hui, 1998; Chi and Padgett, 2005; Chen et al, 2004; Chan et al, 2004; Wang, 2005, Cai, 2006, Yu and Tse, 2006, Cheung et al, 2009).

Table 2-1 lists the main selected studies on underpricing evidenced from Chinese IPOs. They describe the levels of underpricing using the first-day return as the proxy based on different data. The magnitudes of underpricing are extremely high in the early period of the Chinese IPO market. As provided by Su and Fleisher (1999), the first-day returns average at 948.59% during Jan. 1987 to Dec, 1995, which absolutely differentiates the Chinese market from the other nations' IPO markets during the same period, from the viewpoint of underpricing (Loughran, et al, 1994). Further, as delineated by Mok and Hui (1998), Datar and Mao (1997), Chen et al (2004), Chan et al (2004) and Wang (2005), the levels of underpricing during the 1990s are still very high which can be gauged from their findings ranging from 178% to 338%. Comparatively, the Chinese underpricing becomes less severe since the late 1990s and reaches around 100% (Kimbrow, 2005; Chi and Padgett, 2005; Yu, 2005; Chen and Li, 2006; Cheung et al, 2009).

In table 2-1, it can be found there is a decreasing trend in the initial return from the beginning of the Chinese stock market to nowadays. To some extent, this might be attributed to the developing and maturing of the Chinese IPO market, according to Yu and Tse (2006). They propose that a new IPO is often highly underpriced in undeveloped stock market and then reaches a reasonable level as the stock market develops. There has been overwhelming evidence that underpricing is higher in buoyant stock markets [Davis and Yeomans, 1976 (UK); Reilly, 1977 (USA); and McGuinness, 1992 (Hong Kong)]. Huang and Levich (2003) also demonstrate there exists greater IPO underpricing in developing capital markets because of more severe information asymmetry and higher uncertainty regarding the intrinsic value of a firm.

B. Hypotheses tested in the Chinese IPO market

Many explanations are provided for underpricing in the Chinese IPO market. Information asymmetry and ex ante uncertainty are argued to address Chinese IPO underpricing reasonably. Su (2004) finds that the degree of IPO underpricing is correlated with ex ante uncertainties and information asymmetry and he specifically indicates that IPO underpricing is negatively related to stock market returns around an IPO and positively related to the stock-market risk. The ex ante uncertainty hypothesis is also tested by Yu and Tse (2006) and Mok and Hui (1998).

Meanwhile, Chi and Padgett (2005) also state that information asymmetry can result in high underpricing. They adopt the percentage of shares owned by government and state-owned companies and the floatation size of offering as a proxy of information asymmetry and find that both are negatively related with IPO returns. Chen et al

(2004) take foreign shares issued by an issuer as a proxy of information asymmetry. They find issuers who issued foreign shares are likely to have lower information asymmetry because of the additional firm-specific disclosures they make. Reduced information asymmetry implies a reduced need for underpricing and this suggests a negative coefficient on foreign shares. However, interestingly, Gannon and Zhou (2007) find that the asymmetric information hypothesis does not apply in the Chinese IPO market during the year 2003.

The winner's curse is specifically favoured by many studies, although it's a subtopic of information asymmetry. Yu and Tse (2006) argue that the winner's curse hypothesis is the main reason of Chinese underpricing of IPOs. Su (2004) also finds that the winner's curse affects the Chinese market which he investigates using the data of 587 firms between 1994 and 1999.

The signalling hypothesis also generates some controversial findings in the Chinese IPO market. On the one hand, Chen et al (2004) identifies firms are willing to set a lower price for IPOs if they are going to make SEOs in the first 2 years after the initial listing. Su and Fleisher (1999) also find that the Chinese IPO underpricing is a strategy for firms to signal their value to investors. However, on the other hand, Yu and Tse (2006) argue that the signalling hypothesis is not empirically supported in the Chinese market during their sample period from 1995 to 1998. Meanwhile, Su (2004) indicates that the market feedback hypothesis accounts for the Chinese IPO underpricing more than the signalling hypothesis.

C. Specific reasons related to the Chinese IPO market

The Chinese stock market differs greatly from other developed markets, such as the U.S. and other developed and emerging markets because of governance arrangements and the specific stock system. Many researchers try to explain the extremely high underpricing on Chinese IPOs based on China's specific characteristics of her stock market (Chi and Padgett 2005; Chen et al, 2004; Chan et al, 2004).

a. ownership effect

The ownership effect has always attracted focus in explaining the extremely high levels of underpricing in China. Su (2004) indicates that the larger is the pre-IPO leverage, the larger is the underpricing. Managers and directors in high-quality firms signal their confidence in the IPO by remaining highly committed to the company via sizable retained share ownership. Su (2004) finds that insider ownership and IPO underpricing are two reinforcing signals. Wang (2005) also indicates that ownership concentration has a significant impact on IPO performance in Chinese IPO market. An IPO leads to a dramatic change in a firm's ownership structure, resulting in separation of corporate control and ownership. The portion of shares retained by original owners and ownership concentration are effective ways to reduce agency costs and thus improve performance. Similar findings are provided by Jain and Kini (1994) and Kim et al. (2004) for the US and Thai markets respectively.

Because of the Chinese specific shareholders structure, the ownership effect is assumed to affect IPO process greatly and thus has been discussed thoroughly by many studies. However, the findings are so varied that there isn't an agreement on

the effect of different types of shareholders, especially on the shares owned by government and legal entities. Although these shares are not permitted to be sold in the secondary market, they may affect issuing and underpricing of an IPO greatly because of their huge proportion of vote rights and dividend allocation (Mok and Hui, 1998, Chen et al., 2004, Su and Fleisher, 1999; Su, 2004; Yu and Tse, 2006). Table 2-2 lists their findings about the shareholders' structure on underpricing evidenced from Chinese IPOs.

An argument is raised by Chen et al (2004), Su and Fleisher (1999), Su (2004) and Wang and Zhang (2007) that the level of IPOs underpricing could be positively related with the structure of shares held by government and quasi-government entities along with shares held by legal entities, because the larger these kinds of shares, the smaller portion of shares that can be issued publicly to ordinary investors.

Chen et al. (2004) argues when state or quasi-state share ownership is high, agency costs increase and liquidity decreases. Therefore, greater underpricing is required to compensate investors for their increased risk exposure. Wang and Zhang (2007) argue that state owners strategically underprice the IPO, because they care less about the IPO proceeds but more about the wealth gain after IPO. They empirically find a positive relationship between IPO underpricing and state ownership in the Chinese stock market which is consistent with the wealth maximization hypothesis of IPO pricing. Su and Fleisher (1999) also find IPO underpricing is positive with shares held by government, legal entities and employee. They interpret it using an issuer's signalling of its intrinsic value and intention to issue an SEO in the future.

However, another argument is proposed by Mok and Hui (1998), Chan et al. (2004), Chi and Padgett (2005) and Yu and Tse (2006) that underpricing is negatively

related with shares owned by government and legal entities. Yu and Tse (2006) argue that legal entity retention can serve as a government support and business guarantee, which means, in other words, investors' confidence in the government guarantee dominates their worry over the agency cost. Therefore, these shares are found to be negatively related with underpricing significantly. Thus high equity retention lowers the ex ante uncertainty about firm value, and thereby lowers the required level of underpricing. Mok and Hui (1998) think that smaller government and legal shares imply greater ex ante uncertainty and so lead to higher IPO underpricing. Chan, et al (2004) and Chi and Padgett (2005) also find similar results in their study: a negative relationship of government and legal entities' share size with IPO market return.

b. regulatory interference

The Chinese IPO market has been impacted by government regulatory interference especially in the early stages; therefore some studies are devoted to reveal how the Chinese IPOs underpricing can be effected by the Chinese government and its regulations.

Huyghebaert and Quan (2009) find that government commitment to privatization significantly affects the levels of underpricing in China. Francis et al (2009) also provide some evidence which reveals that political connections play a very important role in the going-public process, including the offering pricing, degree of underpricing and the other costs associated with going public. Tian (2003) argues that the listing quota and pricing caps imposed by the government are major determinants of IPO underpricing.

Kao et al (2009) also examine the effect of government regulatory initiatives in China involving IPOs. Their studies focus on two sets of IPO regulations issued between January 1, 1996 and February 11, 1999: pricing regulations, which stipulate that IPO prices be a function of accounting performance, and penalty regulations, which penalize IPO firms for overly optimistic forecasts. They find that IPO firms that report better pricing-period accounting performance have larger declines in post-IPO profitability, lower first-day stock returns and worse long-run post-IPO stock performance. Pricing regulations may have induced IPO firms to inflate pricing-period earnings and affect the post-IPO performance negatively. On the other hand, penalty regulations have deterred IPO firms from making overoptimistic earnings forecast and therefore have a positive impact on the behaviour of IPO firms. Gannon and Zhou (2007) also argue that overpricing by the secondary market and the trading activity on the first trading day are the main functions of the A-share underpricing. Cheung et al (2009) indicate that regulatory changes affect Chinese IPOs underpricing as well.

The Chinese IPO underpricing has been decreased greatly which may have resulted from the reduced regulatory interference in the setting of offering prices, as recently addressed by Loughran et al (1994, updated on 2008 on Jay Ritter's home page).

c. inequality of demand and supply of IPO

The extreme inequality of demand and supply of IPOs is thought to be one of the major reasons which results in the high level of underpricing in China. Chi and Padgett (2005) conduct an empirical study on the IPOs issued from 1996 to 2000 and propose that the high first-day return can be accounted by inequality of demand and supply of IPOs. They argue that there was a very large supply of capital but only a

few investing chances in the 1990s. Therefore, the demand in the initial public offering market was very huge; however the Chinese government controlled IPO numbers to make sure of the success of IPOs for enterprises raising money. This extreme inequality might push the trading prices on the first trading day even higher and thus increase the degree of the first-day return. Some studies take IPO size as the proxy for supply of offerings and find a negative relationship with underpricing (Su and Fleisher, 1999; Chen et al, 2004).

d. other factors

Besides the above topics around underpricing, the Chinese issuing mechanisms are thought to affect the underpricing of Chinese IPO market as well (Su and Fleisher, 1999; Mok and Hui, 1998; Chi and Padgett, 2005; Su, 2004; Chen et al, 2004; Chan et al, 2004). For example, Su (2004) finds that when a lottery mechanism is used in allocating shares, IPO underpricing is significantly higher. Specifically, IPO underpricing is the largest under the lottery with a fixed number of application forms, is the second largest under the lottery with an unlimited number of application forms, and is the smallest under the auction mechanism (Su and Fleisher, 1999). Similar findings are made by Mok and Hui (1998).

The underwriter is also a popular proxy to explain Chinese IPOs. Gannon and Zhou (2007) find a contract with a high underwriter's fee leads to less A-share underpricing. Chen et al. (2004) and Wu (2001) also suggest that underwriters' reputation is insignificant in explaining the Chinese IPO underpricing.

To summarize, the underpricing studies evidenced from Chinese IPOs involve a variety of interesting topics which comprise the testing of general rationales and

specific reasons related with the Chinese unique characteristics, including an ownership effect, regulatory interference, inequality between demand and supply of IPOs, allocation mechanisms, underwriters' effect, etc(Su and Fleisher, 1999; Mok and Hui, 1998; Chi and Padgett, 2005; Chen et al, 2004; Chan et al, 2004; Su, 2004; Su, 2004; Wang, 2005, Cai, 2006, Yu and Tse, 2006, Cheung et al, 2009).

2.2 Duration between Prospectus and Listing

2.2.1 The Impact of the Duration on Underpricing

Lee et al. (1996) provides a detailed explanation of the duration time between prospectus and trading using Australian IPOs. They suggest that this period reflects three distinct components comprising the period between the official registration of the prospectus and the opening of the issue to subscribers, the period between the opening of the issue and closing and the period between the issue closing and the commencement of exchange trading. They further indicate that the variation in the total time which elapses between prospectus registration and the commencement of exchange trading will primarily reflect the time it takes for the issue to sell. It is likely that issues experiencing long delays have had difficulty attracting interest from 'informed' investors, reflecting the winners' curse faced by the uninformed (Lee et al, 1996).

Therefore, many studies employ this time to proxy the demand of potential investors, especially for informed investors (Lee et al, 1996; Brooks et al, 2009) and reveal its impact on an IPO's underpricing (Lee et al, 1996; Mok and Hui, 1998, Chen et al, 2004) Yu and Tse, 2006). According to Lee et al (1996)'s results, they find a

negative relationship between this listing delay and underpricing because they argue this time captures the extent to which uninformed investors face a winner's curse via the presence or absence of informed investor demand, i.e. the longer the delay time, the less informed investor demand and the less underpricing are respectively. However, based on Chinese evidence, the empirical results are opposite to this negative relationship. Mok and Hui (1998), Su and Fleisher (1999) and Chen et al (2004) find that this duration and the level of underpricing are positively related, which means that the longer the time, the higher the underpricing is. This is because the days elapsed between offering and listing is highly related with risk and information asymmetry, i.e. the longer the time, the more risk for the investors (Mok and Hui, 1998).

The length between prospectus registration to listing is quite different across countries. How et al (2007) document the average time to listing is 27 days between 1989 and 2000 in Malaysia. For Australian IPOs, the average is 59 days between 1994 and 2004 (Brooks et al, 2009). However, in China, this time is quite longer than that in other countries. In the early years, the average time even reaches more than 200 days (Mok and Hui, 1998; Su and Fleisher, 1999).

Therefore, many Chinese empirical studies pay more attention to the impact of this duration on the level of underpricing (Mok and Hui. 1998, Chan et al. 2004, Chen et al., 2004). Chen et al (2004), using the data from 1992–1997, find that: for the total data, the average underpricing is 298%, however, for the data with duration less than 2 months, the average underpricing is 110%; while for duration greater than 2 months, the average underpricing is 631%. The authors explain this finding with the rationale that a long delay between the issue of IPO shares and the subsequent listing

substantially increases the risk to the subscribers of the shares. Therefore, this risk is compensated by the heavy underpricing of the new issue. Mok and Hui (1998) and Chan et al (2004) still find a significant positive relationship and they propose that the reason is due to information asymmetry among the issuers, underwriters and investors and the fact that the longer time will increase risk and thus larger underpricing is required.

However, Yu and Tse (2006) provide a different finding in their empirical study. The time lag is insignificant in explaining IPO underpricing during 1995-1998. They argue that is because the time lag in their sample has been dramatically shortened, which removes many uncertain factors caused by the long time lags.

2.2.2 The Factors Affecting the Duration

By reviewing the literature related to duration, it is found that less attention has been paid to addressing what factors can affect this duration time. It is believed that the length of this duration can be affected by both the administrative regulation and the endogenous firm-related factors (Lee et al., 1996; Brooks et al., 2009). Lee et al (1996) explain that the administrative and standardised regulations can affect the whole length of this duration. Brooks et al (2009) find time to listing is significantly influenced by similar independent variables associated with underpricing. In their findings, a shorter time to listing is associated with a higher issue price, and the use of an underwriter or reputable independent accountant. Meanwhile, the duration tends to be shorter if an IPO issues a small size of offerings since a smaller floatation can be subscribed relatively easily and quickly. The level of informed demand is thought to be related to the duration as well (Lee et al., 1996). Further, Aggarwal

(2002) indicates that IPOs can conduct offering after register sooner than others when underwritten by famous underwriters. Mok and Hui (1998) attribute the extremely long waiting time to listing to the premature Chinese market at the beginning years.

To summarise, the studies on duration are not as many as those in underpricing, but the impact of the duration on the level of an IPO's underpricing has been thoroughly discussed. This duration time is thought to be related with the risk, uncertainty and the investors' demand. Both the administrative regulations and the endogenous firm-related factors can determine the length of this duration.

2.3 Hot Issue

2.3.1 Literature Review on International Studies

The phenomena of hot issues have been recognized for many years. Evidence manifests the significant correlation between high levels of average initial returns and the following large volume of IPOs (Ibbotson and Jaffe, 1975; Ritter, 1984; Lowry and Schwert, 2002; Yung et al., 2008; Hoffmann-Burchardi, 2001; Goergen, et al, 2009). Meanwhile, the IPO volume is argued to coincide with stock market conditions and business cycles as well; Specifically, a hot issue market is often found to be related with positive investor sentiment, bull stock markets and expansionary business cycles (Lowry and Schwert, 2002; Brailsford et al., 2004, Yu and Tse, 2006). In general, these studies mainly focus on addressing why hot issues occur and then identifying the hot and cold periods (Ibbotson et al., 1994; Lowry and Schwert, 2002; Brailsford et al., 2004).

A. Why hot issue comes into being?

a. information asymmetry viewpoint

Some researchers explain the cyclical behaviour of IPOs issuing from an information asymmetry perspective. When the decision is made to go public, the available information set includes the current level of underpricing, the number of IPOs currently on issue, and the current economic and market conditions. This information set is used in forming predictions about the future condition of the IPO market (Choe et al., 1993; Loughran et al., 1994). Ibbotson et al. (1994) manifest that both the level of underpricing and the IPO volume as persistent processes where the current period level of underpricing and IPO volume appear to be good predictors of the future level of underpricing and IPO volume, respectively.

It is well discussed that the behaviour of issuing cycles can be explained by the time-varying adverse selection cost, which claims that investors demand large price discounts in periods when asymmetric information is high (Choe et al., 1993). Ivanov and Lewis (2008) indicate that since managers realize that information quality is mean-reverting, private firms postpone new investment opportunities until they can obtain funds at cheaper rates and thus a cyclical pattern in the new issues market emerges. Hoffmann-Burchardi (2001) argues that the cost of information revelation could be minimised if the offerings go public in a hot period, and thus investors do not have to be compensated for information acquisition through a smaller issue price. Alti (2005) further conducts a detailed analysis about information spillovers on IPO timing. He indicates that the IPO timing decision of a firm is driven by its concern to minimize the offer mispricing, which results because

of the asymmetric distribution of information among investors. Information spillovers from pioneers' IPOs help reduce uncertainty on common valuation factors and make going public less costly for the followers. He suggests that high offer price realizations for pioneers better reflect investors' information, facilitate a stronger spillover effect, and hence trigger a larger number of subsequent IPOs.

b. opportunity being overvalued

Loughran et al. (1994) find IPOs appear to cluster during periods in which the firms can be valued relatively highly. Lowry and Schwert (2002) argue that most issuers prefer to go public immediately after a period of high initial returns because they can raise more money than they previously thought (Ritter, 1984), i.e. the offering price can be set comparatively higher and the floatation can be filled more easily. This speculation is assisted by Derrien (2005) and Purnanandam and Swaminathan (2004) who find that IPOs issued in hot periods may be overpriced more than in cold periods so that issuers rush to earn this “window of opportunity” of a hot market. Loughran and Ritter (2002) also indicate that issuers care more about their total money raised and then relatively less about specific underpricing. Some further support is provided by the Helwege and Liang (2004)’s findings that firms have higher market valuations in hot IPO markets no matter the quality of the firms. Benninga et al (2005) even find that firms issue shares in hot markets because the cash flows of their firms can be relatively higher than in cold markets.

c. investor sentiment

The effect of investor sentiment on the issue cycles has been well documented in the literature. Ritter (1984) finds a hot IPO market would be coming when the market

begins experiencing an unusual oversubscription as well as extremely high initial returns, which could be thought as the first explanation of investor sentiment on hot issues. Rajan and Servaes (1997) argue that investors will assume that initial returns are likely to remain high if they observe the recent issues' prices have risen. Ivanov and Lewis (2008) further indicate that if investors become overly enthusiastic about the potential of private companies, the fundamental factors that cause IPO volume could create a positive feedback loop, as optimistic investors supply funds at below market rates, exacerbating and prolonging the duration of IPO waves.

The detailed explanation of investor sentiment is conducted by Lowry (2003) who attributes the overpricing of IPOs in hot markets to investor sentiment. During the periods when the market is clustered by IPOs with high initial returns, the overoptimistic investor sentiment is accumulated and investors are willing to pay more for firms than they are worth. During these periods, the costs of going public are especially low. Consequently, a large number of firms find it optimal to go public. In contrast, during periods of low sentiment, investors may undervalue firms, causing IPO volume to be low. In other words, the more favourable investor sentiments at the time of the offering, the more IPO shares are overpriced (Lowry, 2003). This argument is supported by many empirical studies (Brailsford et al., 2004; Helwege and Liang, 2004; Derrien, 2005; Benninga et al, 2005; Ivanov and Lewis, 2008). Helwege and Liang (2004) suggest that hot markets are not driven primarily by changes in adverse selection costs, managerial opportunism, or technological innovations, but more likely reflect greater investor optimism. Further, Cornelli et al. (2006) provide some evidence about small investors in hot markets. They propose that the small investors are vulnerable to be overoptimistic and to pay a price

exceeding fundamental value; therefore, the issuers have more opportunity to issue at a relatively high price during hot markets.

d. stock market and economic conditions

As regards the sentiment effects, Derrien (2005) further indicates the varied individual investor sentiment is strongly related to market conditions prevailing at the time of the offering. There is a positive link between the “market conditions” prevailing at the time of an offering and its subsequent initial return (Derrien, 2005). Pastor and Veronesi (2005) argue that the number of firms going public changes over time in response to time variation in market conditions. Their results reveal that IPO waves tend to be preceded by high market returns and followed by low market returns. When market conditions worsen, stock prices drop and IPO volumes decline because private firms choose to wait for more favourable market conditions before going public. Derrien and Womack (2003) even propose that the initial returns on IPOs in France during 1992–1998 are predictable using market returns in the 3-month period preceding the offerings. This argument about the effect of stock market condition on IPO cycles is not in the minority. Similar findings are provided by Loughran et al (1994) and Brailsford et al (2000) for U.S. market and Rees (1997) for U.K. market. They indicate that there is a strong positive relationship between stock market conditions and the value and the volume of IPOs. Further, evidence across the world supports that some hot issue markets are coincided with a major bull run in the stock market (Ibbotson and Ritter, 1995; Brailsford et al., 2004). In general, the stock market condition can be used to detect hot or cold IPO issuing cycles.

It is also argued that the existence of hot and cold IPO markets is a kind of economic phenomenon (Brailsford et al., 2004). Benninga et al (2005) report that changes in macroeconomic conditions simultaneously affect firms' behaviour. Lowry (2003) indicates that changes in aggregate demand for capital over time influence the supply of IPOs; that is, economic forces change a firm's demand for capital and there are periods when the aggregated demand across firms can become concentrated. The consequent response is a variation in the supply of capital through the new issue market. Brailsford et al. (2004) also believe that the changing trend of demand and supply of IPOs results in switching cycles. They find that the cyclical IPO issuing behaviour could be detected and explained more precisely accompanied with the specific economic situations.

The empirical studies are conducted by Helwege and Liang (2004) with an industry-based analysis and Pastor and Veronesi (2005) with an expanded market-wide analysis. Ivanov and Lewis (2008) assert that IPO volume reflects current conditions in the economy and will therefore be positively correlated with various measures of business activities. It reflects the observation that when economic conditions are favourable, firms are able to obtain capital at attractive rates.

B. Lead-lag period

Another discussion of IPO cycles focuses on the lag period between the real hot issue period and the current period's underpricing. Ibbotson et al. (1988) find there are about 6-12 months between the high levels of underpricing and the following hot market. Lowry and Schwert (2002) argue that this lag time is due to the institutional lags induced through regulatory requirements and book-building activities. Brailsford et al (2004) find that the number of new issues can be led by past IPO

volume, levels of underpricing and the past condition of the stock market. They further propose that this lag period is about 5 months, which assists the view that institutional features delay the actual issuing date and thus the rush period of IPO volumes.

2.3.2 Studies Evidenced on Chinese IPOs

Only limited literature studies hot issues in the Chinese IPO market. Zhou (2008) tests the monthly IPO volume and average initial returns for 1,380 Chinese IPOs over the period 1991 to 2005. His results manifest that periods with higher initial returns tend to be followed by spurts of IPO volume. He also argues that there exists a strong correlation between these two series. His results show that higher initial returns lead more IPOs in the Chinese IPO market, with a 6-9 months leading period. He attributes this lag-period to the time between when a firm files for an IPO and it gets approval from the CSRC. Yu and Tse (2006) conduct their study from the viewpoint of underpricing and indicate that the IPOs are more underpriced in a hot market.

Interestingly, the government intervention and political policies are paid much more attention in Chinese IPO cycle studies (Zhou, 2008; Shen and Li, 2009). The rationale comes from the argument that the cycles of economic activities are not only the sum of micro-behavior of individual firms, but substantially affected by macro-political factors. Shen and Li (2009) argue that the business cycle and investor sentiment hypotheses provide no explanation for the cyclical fluctuations in the Chinese IPO market, however the political policy primarily accounts for these cycles. They conduct an empirical analysis and find that changes of IPO quotas from

political hot seasons to cold seasons lead to the cycles of hot issue markets in the Chinese market.

To summarize, a hot issue market is characterized by a large volume of IPOs, high levels of underpricing and positive investor sentiment. It is discussed that a hot IPO market is coincided with a positive stock market and business conditions as well. Some studies on Chinese IPOs reveal some relationships between Chinese government policies and issuing cycles.

2.4 Conclusion

This chapter firstly overviews the literature on the rationales and empirical studies associated with underpricing. Some unique characteristics of the Chinese market can explain the high levels of Chinese IPOs' underpricing. By reviewing the studies in the Chinese IPO market, the levels of underpricing decrease from Chinese IPO market's beginning years to recent years. This thesis intends to conduct an empirical analysis in chapter 4 to address this change in Chinese IPOs' underpricing, specifically on the period between 2001 and 2005.

By reviewing the studies on duration from offering to listing, the risk and uncertainty are argued to relate to this duration. However, most literature emphasizes on the relationship between this duration and underpricing. This thesis intends to conduct a deeper study on this duration and reveal what factors can affect this duration in chapter 5.

For the literature on hot issues, most studies explain the phenomena of "hot issues" from information asymmetry viewpoint, opportunity being overvalued, investor

sentiment and business conditions, etc. However, there is a lack of studies on Chinese hot issues. Therefore, in chapter 6, a study is conducted to explore the hot issues period in China.

Table 2-1 Selected Studies Evidenced on Chinese A-share IPOs' Underpricing

Authors	Sample Size	Time Period	Average Initial-day Return (%)
Su and Fleisher(1999)	308	1987 - 1995	948
Mok and Hui (1998)	87	1990 - 1993	289
Datar and Mao (1997)	226	1990 - 1996	338
Chen et al (2004)	701	1992 - 1997	298
Chan et al (2004)	570	1993 - 1998	178
Wang (2005)	747	1994 - 1999	271
Kimbro (2005)	691	1995 - 2002	132
Chi and Padgett(2005)	668	1996 - 2000	129
Yu (2005)	439	2000 - 2004	116
Chen and Li (2006)	320	2000 - 2004	117
Cheung et al (2009)	1191	1992 - 2006	114

Table 2-2 Relations between IPO's Underpricing and Shareholder Structure

Authors	Data period	IPO number	Average initial-day return	Relation with shareholder structure					Reasons
				IPO shares	State shares	Legal entity shares	Employee shares	Foreign shares	
Su and Fleisher(1999)	1987–1995	308	948%	negative	positive	positive	positive	N/A	Issuer's signalling of its intrinsic value and intension to issue SEO in the future.
Chen <i>et al.</i> (2004)	1992–1997	701	298%	N/A	positive	N/A	N/A	negative	IPOs who have high state-owned shares are intended to offer at a lower price to attract investors which results in high underpricing
Wang and Zhang (2007)	1998-2002	408	114%	N/A	positive	N/A	N/A	N/A	State owners care less about the IPO proceeds but more about the wealth gain after IPO.
Mok and Hui (1998)	1990–1993	87	289%	N/A	negative	negative	N/A	N/A	Smaller government and legal shares imply greater ex ante uncertainty and so lead to more IPO underpricing
Chan <i>et al.</i> (2004)	1993–1998	570	178%	N/A	negative	negative	N/A	N/A	Few investors would pay more price for IPOs in which there is high non-negotiable shares that indicate more bureaucratic control and operating inefficiency.
Chi and Padgett (2005)	1996–2000	668	129%	N/A	negative	N/A	N/A	N/A	Government underprice IPOs to attract other investors because it knows more information than these investors
Yu and Tse (2006)	1996-1998	343	123%	N/A	negative	negative	N/A	N/A	Legal entity retention can be served as government support and business guaranty. Investors' confidence in the government guaranty dominates their worry over the agency cost.
Gannon and Zhou (2007)	2003	47	76.14%	positive	N/A	N/A	N/A	N/A	The greater the percentage of tradable shares indicates less information asymmetry, stronger after-listing corporate governance and thus less underpriced. But they found a converse result.

Chapter 3 An Overview of the Chinese IPO Market

3.1 Introduction

The Chinese IPO market has undergone many changes during the last 20 years; therefore, this chapter presents an overview of the Chinese IPO market to provide a basis for the following studies. Firstly, this chapter depicts the three developing stages of the Chinese IPO market as well as the bull and bear periods of the Chinese stock market. Then this chapter pays more attention to explaining the issuing systems, allocation mechanisms and pricing methods in China. Finally, the Chinese unique characteristics of shareholder structure are discussed in this chapter.

3.2 Development Stages of the Chinese IPO Market

The Chinese IPO market has emerged since the mid 1980s and taken about one decade to step into a relatively mature market. For the period up to 2005, the Chinese IPO market can be segmented into the following three developing stages.

A. 1984-1990: an experiment period

The Chinese stock history can be traced back to the middle of 1980s when the first Chinese IPO was issued as a part of an experimental joint stock system in 1984. After that, there is a large scale of enterprises joining in the pilot joint stock system and issue offerings to employers, employees and some local public in order to raise capital. However, only 90 of them are recognized by the Chinese State Reform Commission as having listing qualifications and 59 formally list from 1990 to 1998 after the Shanghai Stock Exchange (SHSE) and the Shenzhen Stock Exchange

(SZSE) established. Table 3-1 shows the listing statistics of IPOs issued from 1984 to 1990. During this period, 1,406 million shares are issued and RMB 1,586 million are raised by these 59 IPOs. Among these IPOs, 33 of them are listed on the SHSE while the other 26 list on the SZSE during the next following 9 years.

During this period, there is a lack of regulation on stock issuing and trading, so most issuers circulate their stocks by their own which results in disorder in the stock market. This period can be determined as an experiment stage which is characterized by non-standardization of stock issuing and trading. Firstly, face values of stocks are not uniform during this period and can be different across different enterprises, such as RMB100, RMB200, etc. and more interestingly, the stock offering prices are the same as the face values. However an offering price should be determined according to an individual enterprise's situation other than the single face value. So this phenomenon excludes this experiment period from an ordinary stock market because the offering price is supposed to be a trade-off value which represents an IPO's quality, uncertainty, information asymmetry, etc. Secondly, the offering mechanism is typically self-insured which means most issuers seldom employ underwriters or other intermediate institutions to assist their offering. A final but an important character is the scope of subscribers which is limited to employers or employees and some members of the local public. This limitation makes stock issuing and trading during this period as semi-public offerings.

B.1991-1993: the transition period

The experiment period of Chinese stock trading is terminated by the establishment of the SHSE and the SZSE in late 1990, and this announces that China steps into a real stock market. The SHSE is established in Nov, 1990 and begins to operate in Dec

1990. There is some trial stock trading business in Shenzhen stock trading counters in late 1990 and finally the SZSE is established on Jul, 1991.

Table 3-2 lists the total number of shares and gross proceeds issued during 1991-1993. From the results in table 3-2, compared with the experiment periods, more and more firms rush to issue their offerings especially in 1992- 1993 and correspondingly, the total number of shares and gross proceeds increase greatly. There are a total of 272 companies going public, where 157 IPOs are listed on the SHSE and the other 115 are listed on the SZSE.

During these three years, a large number of stocks are issued, which relieves the inequality of demand and supply of stocks in the early 1990s. However this period is still believed as a transition period and an immature stage of development compared with the next following years, so this period is excluded in many IPO studies. For example, the CSRC restricts pricing of new shares strictly to minimize the Chinese stock risk and all issuers sell their offerings with a fixed price/earning (P/E) ratio. The allocation mechanism is also developing and a variety of allocation methods are experimented with including limited subscription warrants, unlimited subscription warrants with lot drawing, or saving linkage offerings, etc. Therefore, there are many problems for IPOs issued before 1994, such as unusual and different rules on issuing, listing and trading, some obsolete allocation mechanisms, non-standardised booking value of IPOs, etc (Ma and Faff, 2007). However this transition period provides a good basis for the next following years. Meanwhile, the CSRC releases a couple of regulations and laws related to stock issuing, trading and information disclosure of listing companies including prospectus, listing announcement, instant important issues report, etc.

C. 1994 and after: the relatively mature period

The Chinese stock market has been developed into a relatively mature stage since from the promulgation of the Company Law in 1994. Since 1994, the Chinese stock market is thought to become stable because of the decreasing uncertainty and information asymmetry in IPO issuing (Chen et al, 2004; Ma and Faff, 2007). From table 3-3, there are a total of 1062 IPOs issued during these 12 years, where 3-fifths of them are listed on the SHSE. The Chinese IPO market flourishes during 1996 to 2000 with a huge number of IPOs issued boosting shares and gross proceeds.

During this period, the Chinese IPO market has been developed greatly, including pricing methods, allocation mechanisms, issuing systems, and reforms on non-tradable shares. For pricing methods of new shares, fixed P/E ratio pricing and bookbuilding are both used in these years. There have been a variety of allocation mechanisms adopted, including online offering, secondary market proportional offering, placement to strategic investors, etc. Meanwhile, the administrative authorizing system has been replaced by the approval system on 2001 which makes the IPO issuing more efficient and effective.

3.3 Bull and Bear Cycles of the Chinese Stock Market

During the period from 1990 to 2005, the Chinese stock market has undergone many fluctuations and some bull and bear cycles have been detected. The following lists the main bull and bear markets from 1990 to 2005 according to the SHSE's composite indexes.³⁻¹

³⁻¹ The cycles of the SHSE and the SZSE are highly correlated, so the indexes of the SZSE are not provided here.

A. The 1st Cycle

a. bull market: Dec.1990-May.1992

The first bull market starts from Dec.1990 at 96.5 points and finally stops at 1429 points on May. 1992. This bull market lasts for two and a half years.

b. bear market: Jun. 1992-Nov.1992

However, the composite index suddenly descends on Jun. 1992 and drops to 386 points on Nov. at the same year. The index declines up to 73% within a half year.

B. The 2nd Cycle

a. bull market: Nov.1992-Feb.1993

The second bull market follows very closely to the first bull and the index is pushed high to 1558 points within 3 months. This bull period is very famous in the Chinese stock history for its extraordinary speed and extremely high increase.

b. bear market: Feb.1993-Jul.1994

During 1993, a huge number of issuers go public to raise money while the supply of capital doesn't increase, which means the stock market may be diluted and trading prices of stocks might be affected. As a result, the Chinese stock composite index starts declining again. This declining trend keeps continuous and drops to its lowest at 325 points on Jul. 1994, the same level of two years ago.

C. The 3rd Cycle

a. bull market: Aug.1994-Sep.1994

The 3rd bull market lasts for less than 2 months which is stirred by the CSRC to encourage the issuers and investors' confidence, because the current stock market is surrounded by an overwhelming pessimistic sentiment. As a result, the stock market

undergoes the 3rd short bull period but with a very high increasing range from 325 points to 1052 points.

b. bear market: Sep.1994- Jan. 1996

From Sep. 1994, the Chinese stock market turns to be a long bear market for more than one and a half years. The composite index drops to 577 points on May, 17, 1995 and finally this descending stops at this point. Then the market witnesses an extremely sudden and sharp rise from 582 points on 18th, May, 1995 to 926 points on 22nd, May, 1995. This abnormal rise is thought to be triggered by the news that Chinese government decides to close the national debt and futures market which is understood to inspire the stock market. After this short increase, the composite index turns to drop again but not so sharply. The stock market takes a half year to return to the lowest point at 512 points.

D. The 4th Cycle

a. bull market: Jan.1996-May.1997

The new bull market starts on Jan. 1996 which is led by those stocks with good business performance and finally reaches 1510 points in May, 1997.

b. bear market: May. 1997-May.1999

Since 1996, a large number of issuers detect the hot market and rush to issue offerings. The stock market is thus expanded rapidly by an excessive supply of IPOs which overloads the capital supply; as a result, the bear market comes again. The composite stock index turns to decline slowly from May. 1997 and drops to 1047 points on May. 1999. This bear market lasts for two years.

E. The 5th Cycle:

a. bull market: May.1999- Jun.2001

The new bull market is triggered by internet stocks and the composite stock index climbs to 2245 points. This bull market is of great importance because it is the first time for the Chinese stock market to reach over 2000 points. Meanwhile, all kinds of funds flourish during these two years.

b. bear market: Jun. 2001- Jun. 2005

The following bear market lasts for 4 years which is a result of the combination of internet bubbles collapsing and Chinese state-owned shares reforms. During 2000-2001, a mass of internet stocks are dashed to the ground which were extremely over-valued in late 1990s. Besides these worldwide internet bubbles collapsing, the policy named “State-owned Shares Reducing” is a more important reason which triggers this long-term bear market in China. The Chinese stock market declines from 2245 points to 998 points.

To summarise, the Chinese stock market fluctuates more along with high uncertainty and is very sensitive to the Chinese government’s policies during the early years. After 1995, the Chinese stock market becomes relatively stable and fluctuates less. The bull and bear market are thought to be related to IPO cycles; potentially the stability of the stock market assists the developing of its IPO market.

3.4 Issuing System

3.4.1 Administrative Authorizing System

From 1994 to 2005, the Chinese IPO market has witnessed two kinds of IPO issuing systems. The first is called the Administrative Authorizing System which terminates around 2000. There are in total 776 IPOs administratively authorized to go public in this period. For this system, the CSRC has to control the overall IPOs quantity and limit the number of applications for each year in order to make the market stable. The CSRC even allocates quotas to each province in the period of 1994-1996. The procedures for a firm going public are listed in the flow chart in Figure 3-1.

A firm has to undergo two stages which comprise preliminary examination and the authorizing process to get the permission to issue public offerings. In the first stage, the firm needs to submit the pre-examination files to its corresponding province or industrial committee to get the permission since the province or committee's quota for each year is limited, and if permitted, this firm's application will be sent to the CSRC for pre-examining. Only those firms who passed the pre-examination can step into the second stage to obtain administrative authorizations. Like in the first stage, the firm needs to send the final application files which consist of all the necessary formal and supplementary materials to both its corresponding province/committee and sequentially the CSRC as well. But the difference is that the CSRC emphasizes on the firm's eligibility for economic development and quality in management, finance, operation, etc. in stage 1, but in step 2, the CSRC's focus is switched on checking whether the firm meets the requirement according to the regulations and laws relevant to stock issuing. After obtaining the authorization from the CSRC, the

firm must further submit the authorization to the SHSE or the SZSE and request for acceptance. Then, the issuer can publish its prospectus and begin to offer. When the issuer and underwriter finish offering, the issuer can apply for listing in its corresponding stock exchange after it submits the reports about the underwriting and offering to the CSRC. Finally, the stock exchange can arrange this IPO's listing. Under this system, it can be quite a long time for a firm to fulfil the entire procedures, especially in stage 1 and stage 2.

3.4.2 Approval System

An important change in the Chinese IPO market is the adoption of the Approval System. This system is introduced Dec, 1998 but begins to operate from Mar, 2001 which stopped the history of the Administrative Authorizing System in new share issuing. During Mar, 2001-2005 there are in total 286 IPOs issued under the Approval System.

In Figure 3-2, the IPO issuing procedures become less complicated under this system. First of all, a firm needs to hire an underwriter and this underwriter provides training and assistance about stock issuing. Meanwhile, this firm has to pass the examination concerning the laws and regulations about IPO issuing. Then, the firm along with its main underwriter send applications for offering to the CSRC for initial examining and second checking. If approved, the firm can begin to offer. After finishing offering, the issuer needs to send an application for listing to the CSRC and then submit approved files to its corresponding stock exchange for listing. Finally, the stock exchange will arrange this IPO's listing.

The significant differences between these two systems are embodied by the procedures and their efficiency. Under the Administrative Authorizing System, a

company who intends to go public needs to get the permission from the CSRC-the organisation in charge of checking and supervising company's credit, business risk, issuing size and price, etc. This system is necessary in an undeveloped IPO market for the benefits of investors and stability of the stock market; however, it becomes more complicated with the development of the Chinese stock market. The approval system shows more advantages in procedure simplification and offering efficiency. Meanwhile, in the approval system, the underwriter's supervision responsibility is highly accentuated, i.e. the underwriter has to evaluate the issuer's credit and risk completely and recommend those qualified companies to the CSRC. Further, the underwriter is in charge of training firms around offering and listing. This change is thought to be a great reform for the Chinese stock market. The underwriter is granted more freedom and responsibility, which may assist IPOs offering and listing because of underwriter experience and reputation.

Table 3-4 lists the number of shares and gross proceeds under these two issuing systems. Under the Administrative Authorizing System, there are 776 IPOs issued which raise almost a total of RMB 300,000 million during 1994-Feb.2001. Under the Approval System, there are RMB178,564 million money raised by these 286 IPOs during Feb. 2001-2005. Comparatively, the average shares and gross proceeds of an IPO under the Approval System are larger than those of an IPO under the Administrative Authorizing System.

3.5 Allocation Mechanism

A variety of allocation mechanisms have been adopted in the Chinese stock market across these 20 years. Most of them are used in a specific time and then evolved with

the development of the IPO market. From 1984 to 2005, the Chinese IPO market has witnessed the following allocation mechanisms.

A. Private Placement

Before the establishment of the SHSE and the SZSE, IPO offerings and trading are very limited and undeveloped. Most issuers sell or allocate their offerings privately to their employees or local public in the beginning years of stock trading. There are no uniform allocation mechanisms during this period. Therefore, the initial allocation mechanism could be defined as private placement offerings.

B. Selling Subscription Warrants

The allocation methods of IPOs begin to become uniform after the establishment of the SHSE and the SZSE. During 1991 and 1992, most issuers sell a limited number of subscriptions warrants to intended investors. Only those investors who obtain warrants are eligible to buy IPO shares on a pro rata basis (Ma and Faff, 2007). However, this allocation system brings about a number of problems, such as imbalance between extremely huge demand and limited supply of warrants, corruption in offering, non-transparency, etc. Therefore, from mid 1992, some issuers sell an unlimited number of warrants and then the subscription rights are allocated via lottery. This new method avoids those problems related with limited warrants selling and then is adopted widely until 1994.

C. Saving Linkage Offering (SL)

There are many trials of allocation mechanisms in 1994. During 1994-1998, an allocation method named “Saving Linkage Offering (SL)” is employed by many issuers. For SL offering, subscribers need to buy deposit certificates or deposit the

money in the specific banks which the issuers designate. The successful subscribers are determined according to lot drawing. The SL offering embodies the specific importance of deposit in Chinese stock market and the relative under-development of the stock market before 1998.

D. Full Prepayment and Proportionally Offering (FPPO)

The method was very popular before the Online Offering is adopted. First of all, the investors need to put the full prepayment to the designated accounts via counters. The offerings are allocated proportionally according to their prepayment. There are two types of forms of this allocation method, “prepayment in full, proportional subscription and balance refunded immediately” and “prepayment in full, proportional subscription, and balance deposited to another account”.

E. Online Offering (OL)

Since 1994, the electronic trading system has been adopted all over the counters and thus Online Offering (OL) is widely used in the Chinese IPO market. For OL Offering, shares are sold to all potential investors through the electronic trading system of the SZSE and the SHSE with a fixed price or a consulting price. Subscribers deposit prepayment in the electronic trading system as a reserve and the money will be transferred to issuers if subscription is successful or the prepayment are refunded to the unsuccessful subscribers. The OL offering is also based on lottery drawing. This offering is a widely used offering mechanism in the world and has functioned in the Chinese IPO market for many years.

F. Secondary Market Proportional Offering (SMPO)

During late 1990s, there was a problem that the secondary market is often influenced greatly by new shares issuing due to some investors' withdrawing their investment to subscribe. In order to solve the problem and encourage investors in the secondary market, the CSRC introduces the adoption of a new offering mechanism from the early 2000s called Secondary Market Proportional Offering (SMPO), whose significant difference is that new shares are sold to those subscribers who have already held stocks in the secondary market proportionally on the basis of the market value of securities held by these investors. This means the more stocks a subscriber has, the more opportunity to buy new IPOs. In addition, no prepayment deposit is required for this mechanism.

The SMPO offering may be divided into two kinds of situations according to using counters or not, which is usually named as "offline": either the issuers can allocate all the offerings to the existing investors with the proportion of their stock value via electronic trading system, or they can allocate a part of offerings proportionally to institutions, strategic investors or funds according to their subscription via the counters (Ma and Faff, 2007).

G. Bookbuilding Offering

Bookbuilding offering is firstly introduced in 1999 and often combined with other types of offering mechanisms together. Bookbuilding offering is basically aimed to determine a proper offering price. For bookbuilding offering, an issuer and its underwriter make a price range and then consult this price range to institutional investors offline or ordinary investors online. A predetermined proportion of shares are sold to the institutional investors and the remaining shares are allocated (via an

online process) to individuals with the fixed price similar to the price which applied to institutional investors (Ma and Faff, 2007).

H. Portfolio of allocation mechanisms

However, during the period from 1994 to 2005 many issuers combined some kinds of allocation mechanisms together. For example, many issuers sell their shares with the portfolio of online offering and proportional offerings, i.e. a part of offerings (for example, 50%) is issued to new investors using electronic trading system and the other is allocated to investors (including ordinary investors, institutions, strategic investors, funds, etc.) according to their proportion rights via the electronic trading system or counters. Another portfolio of allocation mechanisms is bookbuilding plus SMPO. For example, issuers pre-sell a small part of shares to strategic investors and funds to consult the offering price and then offer the other shares to investors using SMPO with the consulting price.

3.6 Pricing Methods

The Chinese IPO market has adopted a variety of pricing methods, including pricing according to a fixed P/E ratio, bookbuilding pricing, etc. Generally, the following methods have been used in determining prices of IPOs.

A. Offering with face value

Before the establishment of the Chinese stock exchanges, there is a lack of uniform issuing of new offerings and most of stocks are issued on their face values. During these years, the face values of shares are not uniform either; therefore, the offering pricing varies a lot among different firms.

B. Pricing with a fixed P/E ratio

After the establishment of the SHSE and the SZSE, the CSRC regulates the pricing methods of new offerings and requires firms to issue their shares with a fixed ratio of price on earning (P/E). Although there are some trials of IPOs issued with a bidding price in 1994, most of IPOs are issued based on a fixed P/E ratio. The pricing of an IPO is formulated as following:

$$\text{Offering pricing} = \text{earning per share after tax (EPS)} * \text{fixed P/E ratio} \quad (3-1)$$

For this pricing method, the offering price is more determined by EPS because the P/E ratio is fixed and promulgated by the CSRC. However, the computation of the EPS has varied across different periods. Before 1995, it is the value of the EPS in the year before the offering. From late 1995 to Feb, 1997, the EPS is the average of the values of EPS of both the last year and the current year of the offering. This computation is replaced by the average of the last 3 years' EPS values during the period between Mar, 1997-Feb, 1998. Then the EPS is calculated according to the forecasted earnings and the weighted shares. The IPO pricing adopts the following computations about the EPS in Table 3-5.

These pricing experiments are adopted during the period between 1995 and 1999, but all of them have some limitations, such as embellishing earnings, exaggerated forecasting on earning, etc. Meanwhile, the fixed P/E ratio restricts the self-determination of issuers and underwriters, so the CSRC gives some right of pricing to issuers and underwriters in the following years.

C. Self-determined Pricing

Issuers have been granted with the right of pricing independently since 1999 which is thought to be a milestone for IPOs pricing. The following conditions should be taken into account for an issuer and its underwriter to determine the offering price. Firstly, the firm's business performance should be analysed as well as its industrial perspectives. Secondly, the recent average P/E ratios of the secondary market should be referenced and compared when an issuer determines its own P/E ratio. This method provides the issuer and its underwriter more freedom in pricing and more responsibility in convincing its offering price to both the CSRC and subscribers.

This method stops the history of pricing with a strictly restricted fixed P/E ratio and grants more importance on an issuer's business performance and current secondary stock market, which suggests that offering price is more determined by the individual issuer and its industry as well as the latest performance of the stock market.

D. Pricing by bookbuilding

Bookbuilding is well known for its efficiency in determining a final offering price (Ma and Faff, 2007). There are two optional procedures after an issuer and its underwriter set a price range. The issuer and underwriter can consult this price range to institutional investors offline and then determine the final offering price. Otherwise, they can go through a road show online prior to the issuing date and then determine a final offering price based on the result of the road show. The final offering price is determined according to cumulative subscriptions, preferred price or the negotiated price range.

In comparison to the other pricing methods, the bookbuilding procedure places greater focus on the demand of potential investors and the final offering price is more able to reflect the balance of the demand and supply of new shares. Meanwhile, bookbuilding pricing is argued to be more efficient to minimize market return and market volatility than fixed pricing (Benveniste and Busaba, 1997; Derrien and Womack, 2003).

3.7 Structure of Shareholders

The structure of shareholders in Chinese issuers is well known for its specific Chinese characteristics which are unique and quite complex. In China, for a company who is permitted to go public, there may be six types of shares in the company: state-owned shares, legal entity shares, employee shares, natural person shares, ordinary A-shares and ordinary foreign shares. Not every listing company has all of these six types of shares; most of the companies have two to four types, such as state-owned shares, legal entity shares and ordinary A-shares.

For all types of shares, ordinary A-shares and ordinary foreign shares are known as tradable shares. Ordinary A-shares are traded on the domestic stock exchanges (SHSE or SZSE) which were initially designated to domestic investors and traded using the currency of RMB. Comparatively, ordinary foreign shares are traded using foreign currencies which are designated to foreigners or list on foreign stock exchanges. Many Chinese firms decide to go public in foreign countries and thus the foreign shares can be segmented according to their listing exchanges. A first type is called B-shares which are traded on the SHSE or SZSE but in foreign currency and initially designated to foreign investors; a second type is named H-shares in which a company lists on the Hong Kong Exchange (HKEX); a third type is called N-shares

which are listed on the New York Stock Exchange (NYSE) and a fourth is S-shares (Singapore Exchange). In China, a firm may have both ordinary A-shares and ordinary foreign shares (B-shares, H-shares, N-shares or S-shares).

State-owned shares are the shares which are held by Chinese government and state-owned legal entities; Legal entity shares are the shares which are owned by ordinary legal entities (these legal entities are not state-owned); Employee shares are those shares which are purchased by people who are working in this enterprise; Natural person shares refer to the shares which are purchased by the individuals who have a significant relationship with the IPO issuer. These types of shares are non-tradable shares, i.e. these shares were not permitted to be sold in the SHSE or SZSE but can only be transferred to others by private negotiations. This characteristic is a typical Chinese style with historical reasons. In the beginning years of the Chinese stock market, stock trading was thought being part of capitalism which betrayed the socialism theory of China; therefore, in order to make sure of the main authority of enterprises, the Chinese government lets enterprises to issue some parts of their stocks publicly and leaves the remaining parts as non-tradable, especially for those shares labelled as state-owned shares.

These non-tradable shares account for approximately two thirds of total shares for listed companies in China. However, with the Chinese stock market's development, these non-tradable shares become problematic and bring many troubles for their non-trading characteristics. China has conducted several trials to assist these shares trading on the stock exchanges but most of them have failed. Since late 2004, the CSRC has set off a significant and thorough reform in the Chinese stock market with the primary objective of trying to push these non-tradable shares on stock exchanges

after compensating the current tradable shareholders. This reform fulfils its primary goal and is of great importance on the trading of all types of stocks. The first non-tradable share was released on the stock exchanges on Jun, 2006 which announced that the history of non-tradable shares is terminated.

3.8 Conclusion

By overview of the Chinese IPO market, we can notice that the Chinese IPO market has become relatively mature since 1994. Since 2001, the Approval System has substituted the Administrative Authorizing System and the issuing procedure has become more efficient than before. A number of allocation mechanisms are adopted in China, such as online offering, secondary market proportional offering, etc and many issuers combine some mechanisms together to allocate their shares. The pricing methods are varied from fixed pricing to bookbuilding which are adopted during some specific periods. Finally, the six types of shareholder structures are discussed.

Table 3-1 IPOs Issued from 1984 to 1990

Issuing Year	Number of IPOs	Total number of shares (million)	Total gross proceeds (RMB million)	listing year of IPOs								
				1990	1991	1992	1993	1994	1995	1996	1997	1998
1984	1	0.0065	0.0065	1								
1985	3	9.66	9.66	2				1				
1986	2	76.00	76.00					1		1		
1987	6	119.99	119.99	2					2	1*		1*
1988	22	820.30	841.30		1*	1*	4	1	3	3 (2*)	3	6 (3*)
1989	17	240.00	376.65	2	3*	2	5 (4*)			3*	1*	1*
1990	8	140.50	162.55	1*			1		1*	4 (3*)	1*	
1984-1990	59 (26*)	1406.457	1586.157	8 (1*)	4 (3*)	3 (1*)	10 (4*)	3	6 (1*)	12 (9*)	5 (2*)	8 (5*)

*This indicates the number of IPOs which list on the Shenzhen Stock Exchange. There are a total of 59 IPOs issued from 1984-1990. Among them, 26 IPOs are listed on the SZSE and the others are listed on the SHSE.

Table 3-2 IPOs issued from 1991 to 1993

Issuing Year	Number of IPOs	Where: listed on the SHSE	listed on the SZSE	Total number of shares (Million)	Total gross proceeds (RMB, Million)
1991	18	4	14	602.53	2172.32
1992	112	79	33	2367.42	42719.71
1993	142	74	68	7192.43	29979.32
1991- 1993	272	157	115	10162.38	74871.35

Table 3-3 IPOs issued from 1994 to 2005

Year	Number of IPOs	Where: listed on the SHSE	listed on the SZSE	Total number of shares(Million)	Total gross proceeds (RMB, Million)
1994	39	20	19	988.96	5405.81
1995	13	8	5	555.55	2191.55
1996	172	84	88	3829.81	22435.16
1997	188	82	106	10563.24	65513.94
1998	102	51	51	7294.60	40908.52
1999	93	46	47	8518.26	50956.99
2000	139	95	44	11288.30	84370.21
2001	67	67		7945.82	56318.19
2002	70	69	1	12095.00	55192.29
2003	66	66		8363.70	45350.81
2004	98	59	39	5488.09	35345.86
2005	15	3	12	1391.50	5763.07
1994-2005	1062	650	412	78322.84	469752.40

Table 3-4 Descriptive Statistics of IPOs under Two Issuing Systems

Period	Issuing system		Number of IPOs		
1994-Feb.2001	Administrative Authorizing System		776		
	Minimum	Maximum	Mean	Std. deviation	Sum
Number of shares (million)	10.00	1877.00	58.29	84.99	45235.72
Gross proceeds (RMB, Million)	33.00	7845.86	375.24	468.32	291187.95
Mar.2001-2005	Approval System		286		
	Minimum	Maximum	Mean	Std. deviation	Sum
Number of shares(million)	13.40	5000.00	115.68	386.93	33087.12
Gross proceeds (RMB, million)	100.00	11816.00	624.35	1363.55	178564.45
1994-2005	Both		1062		
	Minimum	Maximum	Mean	Std. deviation	Sum
Number of shares(million)	10.00	5000.00	73.75	214.80	78322.84
Gross proceeds (RMB, million)	33.00	11816.00	442.32	819.67	469752.40

Table 3-5 Computations of EPS in the pricing with a fixed P/E ratio

Period	Computation of EPS	Characteristics
1993- mid.1995	the value of the EPS of the year before offering	The EPS is affected by the business performance in the last year before the offering
Late 1995- Feb. 1997	(EPS of the last year + forecasted EPS of the current year) /2	The EPS is affected by the business performance in both the last year and the current year.
Mar. 1997- Feb. 1998	\sum (EPS of the last 3 years)/3	The EPS is affected by the business performance in the last 3 years. Not influenced by earnings in the current year.
Mar.1998- Mar.1999	The forecasted total earnings after tax in the current year/the weighted total shares in the current year	<p>a. the weighted total shares in the current year=the total shares before offering+ [the shares of new offerings*(12-the offering month)/12]</p> <p>b. The firms whose forecasted earnings is less than the real earning by more than 20% are required to explain and apology and may be punished by the CSRC.</p> <p>C. The AE/Share is affected by the forecasted earnings of the current year. No influence of the last years' performance.</p>

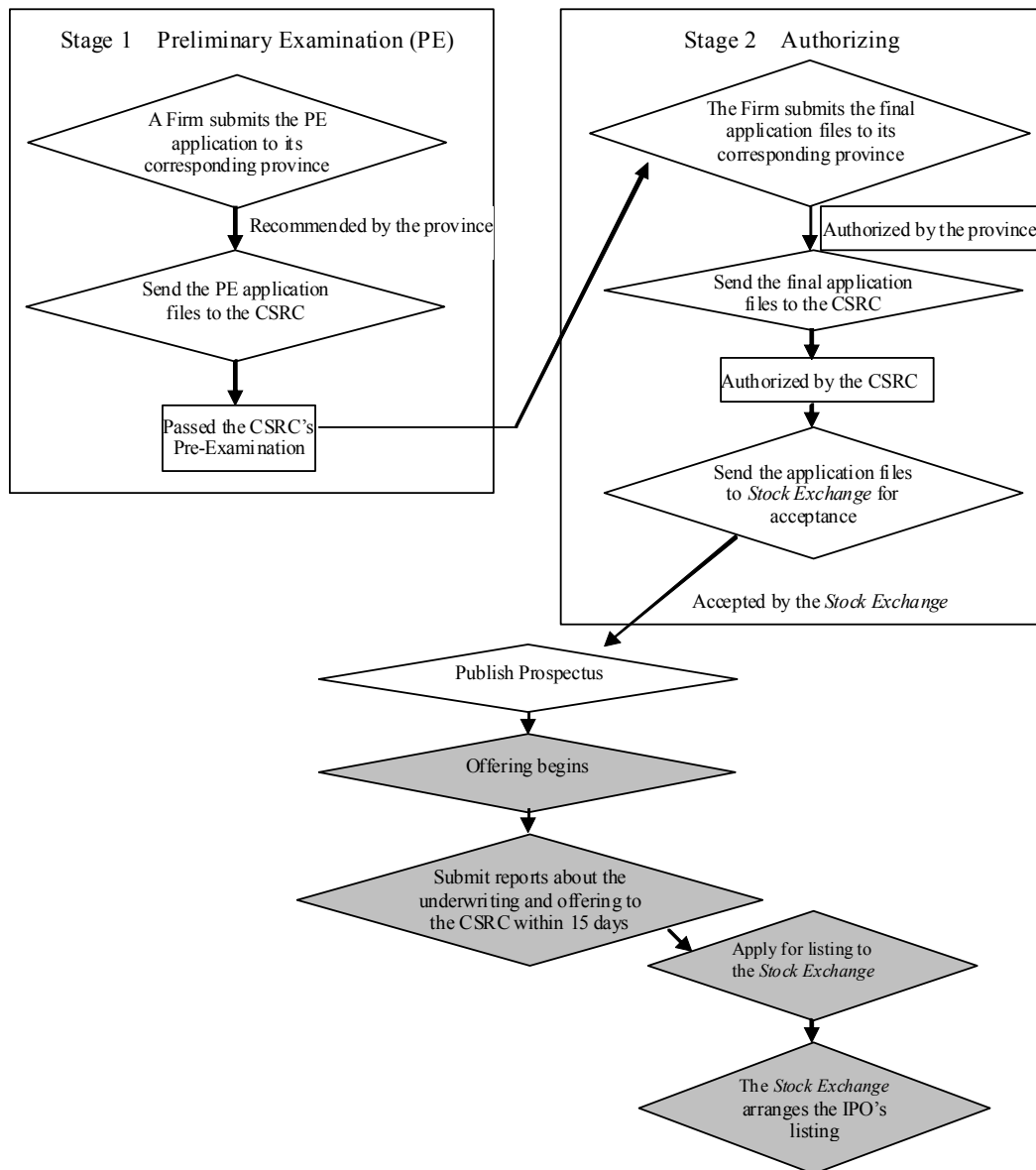


Figure 3-1. IPO Issuing Process under the Administrative Authorizing System (1994-2000)

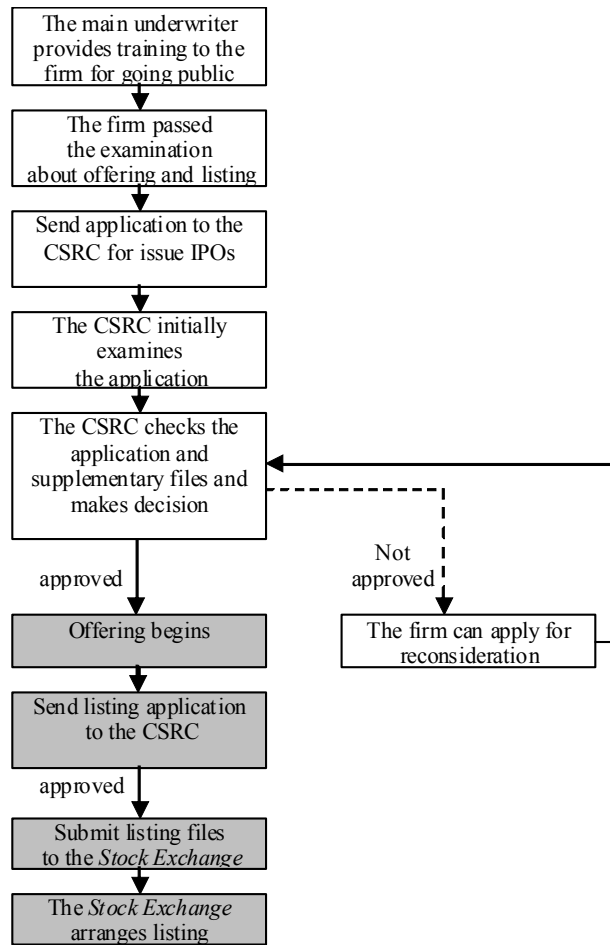


Figure 3-2. IPO Issuing Process under the Approval System (2001- 2005)

Chapter 4 Underpricing and Short-run Underperformance under the Approval System from 2001 to 2005

4.1 Introduction

This chapter analyses the underpricing of the Chinese A-shares IPOs and thus reveals the factors which affect the level of the underpricing. Further, this chapter studies the short-run underperformance in a 30 trading-day period. The data specifically focuses on the period from 2001 to 2005 when the Approval System is adopted.

An important change in the Chinese IPO market is the adoption of the Approval System that begins to operate from Mar, 2001 and stops the history of the Administrative Authorizing System in new share issuing. Thus the issuing procedures become less complicated. Meanwhile, under this new Approval System, the underwriters' responsibility is paid more focus that underwriters have to evaluate issuers' credit and risk completely and recommend those qualified companies to get approval from the CSRC. This change is thought to be a great reform in the Chinese stock market and issuers and underwriters are granted with more freedom and responsibility in pricing and issuing.

This chapter, besides presenting an overview of the underpricing and duration to listing of Chinese A-share IPOs from its beginning to 2005, emphasizes on the new change of A-share IPOs' underpricing and its short-run underperformance under the Approval System from Mar, 2001 to 2005. The recent paper by Gannon and Zhou (2007) explores underpricing between 2000 and 2003, and finds evidence of a

possible structural break in 2003. This chapter extends the analysis in Gannon and Zhou (2007) by considering a longer sample after the introduction of the new Approval System.

Section 4.2 provides the overview of the underpricing and duration to listing in the Chinese A-share IPO market. Section 4.3 describes the data and the proxy for underpricing of IPOs. Section 4.4 explains the factors which affect the extremely high levels of underpricing in Chinese IPOs. Therefore, based on the reasons above, an ordinary least squares regression model is used to analyse the level of underpricing in section 4.5. Further, section 4.6 analyses the short-run underperformance of IPOs in a 30 trading-day period. Section 4.7 contains some concluding remarks.

4.2 The underpricing and Duration to Listing from 1984 to 2005

Many papers study the underpricing of Chinese A-share IPOs using the first-day return as the proxy based on different data (Su and Fleisher, 1999; Mok and Hui, 1998; Chi and Padgett, 2005; Chen et al, 2004; Chan et al, 2004; Wang, 2005, Cai, 2006, Yu and Tse, 2006, Cheung et al, 2009). By reviewing the literature on Chinese A-share IPO underpricing, we notice the phenomenon of a significant decreasing trend in the initial-day returns from 1984 to nowadays. Another similar phenomenon strongly related with this underpricing change is the trend in duration to listing.

In order to show these trends, table 4-1 and figure 4-1 list the average initial-day returns (IR) and duration to listing classified by the year of offering date from 1984-2005. Until 31st Dec. 2005, there have been 1393 IPOs issued and listed on the SHSE and the SZSE. From Jun, 2005 till Jun 2006, the CSRC stops IPO issuing because of

the Chinese stock reform to convert all of the non-tradeable shares to become tradeable shares. As a consequence there are only 15 IPOs in 2005. In addition, any sentiment effects associated with this major reform are now outside of our data period. Further sentiment effects are well spread across the sample period as illustrated by the range of bull and bear periods in the Chinese stock markets found by Yan et al (2007).

From table 4-1 and figure 4-1, both IPO underpricing and duration to listing undergo three stages. Both of them are very high between 1984 and 1990. In this special period, the stock exchanges aren't established yet and thus the initial-day returns and duration time are much higher: the average initial-day returns range from 622% to 17533%, among which the highest individual IPO's initial-day return reaches 38300% in 1989 and even the lowest one is still 302% before 1988; duration to listing ranges from 1567 to 3030 days, among which the longest extends to 4046 days in 1987. The second stage, from 1991 to 1993, can be defined as a transition period which means both IPO underpricing and duration time decline greatly compared with the averages in the first stage. In this period, average underpricing ranges from 358.43% to 805.26% and duration period ranges from 270 to 643 days. Since 1994, the Chinese IPO market has come into a fairly reasonable and mature stage. The level of underpricing has reached quite stable figures, from 41.53% to 154.38%; and the duration time ranges from 15 to 75 days. Significantly, the gaps between maximums and minimums have become shorter and shorter, which indicates that the Chinese A-share IPO market has become more mature. Table 4-2 presents a linear regression of the relationship between the initial-day return and the duration time and the result shows a significant positive relationship between them in these twenty years. This positive relationship is shown in Figure 4-1.

In table 4-1, the levels of underpricing of IPOs issued after 2001 (especially for the years 2003 to 2005) are much lower than those issued in previous years, and the distributions are less dispersed. In addition, the new offerings are listed within a reasonable and much shorter time period. Thus the risk to investors has been reduced to a great extent. These changes arising under the new Approval System indicate the improvement in the efficiency of IPO issuing in Chinese A-shares⁴⁻¹. In addition as Chi and Padgett (2005) identify 2000 marks the date at which the CSRC changed the formula for calculating offering prices based on the earnings per share and price earnings ratio. All these changes attract our interest to investigate the underpricing specifically for the data period from 2001 to 2005 when the Approval System is adopted.

4.3 Data

The primary data sources are the *China Stock Market IPO Research Database (A-Share)* plus the *China Stock Closing Prices Database* provided by the *GTA Information Technology Company Ltd.* These datasets include the main information in IPOs' issuing process and each IPO's prices on the listing date, the 10th trading day, the 20th trading day and the 30th trading day. Meanwhile, some supplementary data are added into our research database gained from prospectus and listing documents and the SHSE and the SZSE indexes. Our research sample is the Chinese A-share IPO data classified from Mar, 2001 to 31st Dec, 2005, which includes 286 IPOs' data issued and listed in this period. The year of the offering date published in

⁴⁻¹ The average level of underpricing when the approval system is adopted is lower than that under the administration authorizing system in general, although the period from 2001 to 2002 is exceptional. But the magnitude of underpricing is influenced by many factors, such as stock market conditions, economic conditions, etc. Therefore, this period should not affect the hypothesis about the approval system.

the prospectus is the year that an IPO has been classified, even though this IPO may be listed in the next following year.

We use *stock market adjusted initial-day return (MIR)* (Carter *et al*, 1998) in the following research as the proxy of underpricing of IPOs in the first trading day. *MIR* is computed as the following:

a. The *initial-day return of the stock i (IR_i)*

$$IR_i = (P_{i,1st} / P_{i,0}) - 1 \quad (4-1)$$

where $P_{i,1st}$ is the closing price of stock i on the first trading day and $P_{i,0}$ is the offering price of stock i .

b. *Stock market return at the first trading day (SMR_{i,1st})*

$$SMR_{i,1st} = (M_{i,1st} / M_{i,0}) - 1 \quad (4-2)$$

Where $M_{i,1st}$ is the stock i 's corresponding SHSE or SZSE A-share composite index on the first trading day and $M_{i,0}$ is the SHSE or SZSE A-share composite index on the stock i 's offering day.

c. *Stock market adjusted initial-day return of the stock i (MIR_i)*

$$MIR_i = (P_{i,1st} / P_{i,0}) - (M_{i,1st} / M_{i,0}) \quad (4-3)$$

The stock market return is the change of the corresponding SHSE or SZSE A-share composite indexes on the 1st listing date of an IPO compared with that on the issuing date. It indicates market sentiment of the total stock market in the duration period. Therefore, *MIR* can value underpricing more accurately because it extracts the impact of the overall stock market on an individual IPO's price.

4.4 Why are Chinese A-share IPOs Underpriced So Extremely?

The Chinese stock market differs greatly from other developed and emerging markets because of difference in the market structure and governance arrangement

(Chan *et al.*, 2004, Chen *et al.*, 2004, Chi and Padgett 2005). Based on the literature review and specific characteristics of the Chinese IPO market, the following factors are assumed to affect Chinese A-share IPOs' underpricing.

4.4.1 Inequality of Demand and Supply of IPOs

The supply of IPOs has been under the control of the CSRC since the IPO market's inception in order to ensure the quality of listing companies and minimise risk. Prior to 2001, the CSRC determines an annual quota for new shares to be issued each year and this quota is allocated among provinces and state-industrial commissions according to the criteria that support regional or industrial development goals. After the adoption of the approval system in 2001, the CSRC still makes the decision even though investment banks and underwriters can recommend enterprises to go public (Chi and Padgett, 2005). Therefore, there is still a large shortage in the supply of IPOs compared with the demand (Chen et al, 2004; Chan et al, 2004; Wang, 2005; Yu and Tse, 2006). For example, Chi and Padgett (2005) conduct an empirical study on the data of 668 Chinese IPOs and demonstrate that underpricing can in part be accounted for by high inequality of demand and supply of IPOs.

In China, apart from stocks, the main investment instruments available to investors are bank deposits and Treasury Bonds. In order to stimulate consumption, the Chinese government reduced deposit interest rates repeatedly, which provides added incentives for investors to buy stocks rather than hold bank deposits. Meanwhile, the average earning in the IPO market is thought to be higher than that in the secondary stock market (Chi and Padgett, 2005). The Chinese IPO market is also less risky than the secondary stock market. Take the average P/E ratio as an example; the P/E ratio averages at around 20 in the IPO market, only one third of that in the secondary

stock exchanges. The relatively higher earnings and lower risk lead to a huge demand for IPOs (Su and Fleisher, 1999; Chen et al, 2004; Chi and Padgett, 2005).

Issuing size is a main proxy for the supply of IPO and is expected to have a negative relationship with underpricing, which is demonstrated by many studies in other countries' IPO markets (Lee *et al.*, 1996). The empirical studies in the Chinese IPO market are consistent with this result (Su and Fleisher, 1999, Chan *et al.*, 2004). Chan *et al* (2004) explains this relationship as follows: the investors don't need to buy the shares urgently on the first trading day if there are more public shares offered. Furthermore, Mok and Hui (1998) think that the larger IPO is less risky than a smaller one and this usually leads to less underpricing. Another explanation is that the more shares offered, there will be less information asymmetry and thus lower IPO underpricing (Lee *et al.* 1996, Chen *et al.*, 2004).

Hanley and Weiss (1993) and Carter *et al* (1998) investigate whether there exists a strong positive preoffer demand and the level of underpricing using the fraction of the total issue offered by existing preissue shareholders. This study furthers this point and adopts two ratios which can reflect to what extent the strong demand is over the supply of offerings. One is the *winning lottery ratio* (Chi and Padgett, 2005). This ratio is computed using the number of successful subscribers on the number of total valid subscribers. The lower ratio indicates greater demand for an IPO compared with flotation size. It reflects the degree of inequality of demand and supply of offerings in the preoffer stage. Further discussion about the winning lottery ratio follows in section 4.4.2. Meanwhile, the *turnover ratio* also indicates the inequality of demand and supply when the offerings begin to list on exchanges, which is computed by trade volume on the first trading day on the number of tradable A-shares and refers to the trading frequency of a stock on its first trading

day. The more shares are traded on the first listing day, the more interest and demand investors have on this particular IPO. A low winning lottery ratio and a high turnover ratio are assumed to be related with a relatively high level of underpricing.

4.4.2 Allocation Mechanisms

There are three main offering mechanisms adopted in the period from Mar, 2001 to 2005, with the strong imprimatur by the CSRC. Before May, 2002, most issuers sell shares to all potential investors through the electronic trading system of the SZSE and SHSE with a fixed price or consulting price, which is called *Online Offering (OL)*. This is a widely used offering mechanism in the world. The CSRC forces the adoption of a new offering mechanism from May 2002 called *Secondary Market Proportional Offering (SMPO)*, whose significant difference is that new shares are proportionally sold to those subscribers who have already held stocks in the secondary market on the basis of the market value of securities held by these investors. No IPO is issued in late 2004 by requirement of the CSRC. From the beginning of 2005, most issuers prefer to pre-sell a small part of shares to strategic investors and funds to consult on the offering price and then offer the other shares to investors using *SMPO*. We name it *Bookbuilding plus Secondary Market Proportional Offering (BSMPO)*. Compared with *OL*, the latter two have similar characters that the right to buy IPOs depends on how many stocks subscribers already have held in the secondary market.

The *winning lottery ratio* is the ratio of successful subscribers on total valid subscribers, which reflects how much interest and desire the potential investors have for a particular IPO. Figure 4-2 shows winning lottery ratios of IPOs categorized by allocation mechanism. The winning lottery ratio appears to be affected by allocation

types, if we assume that investors' sentiment about IPOs don't change greatly in these five years. For *OL*, the winning lottery ratios mainly range from 0.056% to 5.03%, with the mean of 0.362%, much higher than those of the other two types. The winning lottery ratios in the latter two figures have a similar range, from 0.02% to 2.75%, with the average 0.098%. This means *SMPO* may make the distribution of offerings more scattered to potential investors.

Table 4-3 shows the corresponding average *MIRs* of IPOs categorized by these three offering types. Meanwhile, those outliers of winning lottery ratio in each category are removed and thus the revised *MIRs* are also shown in the table. From this table, it can be found that the levels of underpricing of IPOs are significantly different across these three offering types. For *Online Offering*, there are 57 IPOs and the average *MIR* is 141.08% which is the highest in these three types. In our sample, most issuers go public with *SMPO* and its average *MIR* is in the middle, with the figure of 84.52%. For *BSMPO*, there are only 15 IPOs and the average underpricing, with the figure of 48.95%, is the lowest in these categories.

Rationing in itself does not lead to underpricing, but to keep uninformed investors in the market requires an additional premium-the average underpricing of all IPOs (Rock, 1986). Many empirical studies prove that the offering mechanism can affect the levels of IPOs underpricing (Leleux and Paliard, 1996, Derrien and Womack, 2003, Ljungqvist *et al.*, 2003). Ma and Faff (2007) find that a bookbuilding mechanism shows relatively good efficiency and secondary market proportional offering is able to minimise the IPO underpricing and cross-sectional variation of the first day returns. From table 4-3, the findings proved Ma and Faff's result. Further, beyond Ma and Faff's research, we find that the combination of bookbuliding and *SMPO* can make issuers more informed about investors' expectation about their

offerings and thus the offering prices can be determined more efficiently. Therefore, the money left on the table can be minimized to the benefit of the issuers. But according to Gannon and Zhou's (2007) study, offering mechanism is found not to affect underpricing of IPOs significantly both for the data of 2000-2002 and the data of 2003. However, based on our above discussion and findings, we still assume the offering mechanism can make some influences on underpricing. The regression analysis in section 4.5 will explore the effect of each offering mechanism on the magnitude of underpricing of IPOs.

4.4.3 Structure of Shareholders

For a company who is permitted to go public in China, there may be six types of shares in the company: state-owned shares (including shares held by the state and state-owned legal entities), legal entity shares, employee shares, natural person shares, ordinary A-shares and ordinary foreign shares. Among these, the last two types are known as tradable shares. The other types of shares, which account for approximately two thirds of total shares for listed companies in China, are not permitted to be sold in the SHSE or SZSE but can only be transferred to others by private negotiations. This restriction was not changed until Jun, 2006 when the Chinese stock market reform brought new changes for these non-tradable shares. Our research sample is the IPOs issued from Mar, 2001 to Dec, 2005; therefore, the non-tradable shares have no opportunity to list on the SHSE or SZSE in this period.

Table 4-4 reports the average structures of shareholders after A-share IPO issuing in our research sample. The ratios are computed using the proportions of each type of shares divided by total shares after A-share IPO issuing. All the shares are categorized into five types, where: *Tradable shares* include ordinary A-shares listed

on the SHSE or SZSE and ordinary foreign shares; *State shares* comprise shares held by the state and state-owned legal entities; *Legal entity shares* refer to shares held by legal entities except those held by state-owned entities; *Natural person shares* refer to shares held by individual persons, such as initiatives; *Employee shares* are owned by employees who have employment with the issuer. All the data are listed as their averages of each variable in each IPO year.

From table 4-4, we can notice that shares owned by state and legal entities totally account for over 60%. As noted in the literature review, the structure of shareholders is proved to affect underpricing of an IPO greatly. However, the findings of different studies are quite controversial (See table 2-2). These conflicting results may be affected by the data period and different variables included in the analysis. The Chinese stock market has undergone different stages in its development and has been strongly affected by the CSRC, so this chapter will use the data from 2001 to 2005 to examine how and to what extent the shareholder structure affects IPO underpricing. In our analysis, the roles of natural person shares and employee shares are not considered because of their small proportion in the total shares on offer.

4.4.4 Duration from Offering to Listing

The time elapsed between prospectus and listing in the Chinese IPO market is often longer than that in developed markets (Su and Fleisher, 1999). Many empirical studies find the result that there exists a significant relationship between duration time and IPO underpricing (Lee et al, 1996). This phenomenon exists in the Chinese IPO market as well (Mok and Hui. 1998, Chan *et al.* 2004, Chen *et al.*2004). It is argued that a long delay between offering and listing will increase the risk for subscribers (Chen *et al.*, 2004) and information asymmetry among the issuers,

underwriters and investors (Mok and Hui, 1998; Chan et al., 2004); therefore, a larger underpricing will be expected if the duration time is longer.

4.4.5 Underwriter's Reputation

Underwriters play a significant role in underpricing because they are in charge of advising a price range for the new issue and decision for the last offering price. Loughran and Ritter (2004) indicate that underwriters would like to recommend a lower offering price if underwriters can be compensated by both the issuer (the gross spread) and investors; otherwise, the compensation is merely the gross spread. They believe that underwriter discretion can eliminate the winner's curse problem if underwriters allocate shares in hot issues only to those investors who are willing to buy other IPOs. However, Gannon and Zhou (2007) argue that a higher issue price is more likely to have prolonged issue period and a greater chance of the underwriter suffering from capital loss in the event of undersubscription. As a result, underwriters are more likely to set high fees for the high issue price. Anyhow, Benveniste and Wilhelm (1997) and Sherman and Titman (2002) indicate that underwriter discretion can be used to the benefit of issuing firms.

Obviously, a good underwriter has better capability to evaluate a new IPO, estimate total stock market demand and then advise a more reasonable price for an issuer, who is willing to collect more money and hopefully leave less money on the table. Many studies are conducted to examine the effect of underwriter's reputation in an IPO's underpricing and find negative relationships between underwriter's reputation and underpricing of IPO (Beatty and Ritter 1986, Carter *et al.* 1998, Gannon and Zhou, 2007). Carter *et al.* (1998), using American IPO data from 1979-1984, also

find that underperformance of IPO stocks relative to market over a three-year holding period is less severe for IPOs underwritten by more prestigious underwriters. In our sample, all the issuers appoint underwriters to issue their new shares. From Mar, 2001 to 2005, there are a total of 60 underwriters that are designated as the lead underwriters, which help issuers to make a total of more than 170 billion (RMB) gross proceeds. These underwriters are classified into three ranks according to the average market share (Megginson and Weiss, 1991). Similar with Megginson and Weiss, if the issuing firm has more than one lead underwriter, the average of the lead underwriters' market share is used as the measure of quality. The underwriters with 1st rank are assumed to have more experience, skill and premium service in underwriting, and are expected to be more capable to minimize underpricing of IPOs. Table 4-5 shows the average market shares and the corresponding underpricing levels of IPOs across these three ranks of underwriters. There are 12 underwriters with 1st rank that help 120 issuers to go public, accounting for 69.2% of the total underwriting market. The average underpricing of IPOs for this group is the lowest level in these three groups which shows that IPOs issued by more prestigious underwriters are more probable to be less underpriced.

4.5 The OLS Model and Analysis Results

Our study uses an OLS regression model, which is estimated using White heteroskedasticity consistent standard errors, to analyse underpricing of IPOs. The approach is consistent with Ritter (1991) and How (2000). The total data include 286 Chinese A-share IPOs which are issued and listed from Mar, 2001 to 2005. Based on the above reasons, the following variables are included in our model:

Market Adjusted Initial-day Return (MIR): the dependant variable, which is adopted to explain the level of underpricing consistent with previous studies on the Chinese IPO market

Offering Price: the issue price when an IPO goes to public. This variable is included because it is demonstrated to affect underpricing of IPOs significantly according to others' research and is expected to be negatively related with underpricing (Ritter, 1984, Su and Fleisher, 1999, Ibbotson *et al.*, 1994).

Log (issuing size): the natural logarithm of total newly issued shares' number of an IPO. These shares comprise shares issued to strategic investors, ordinary legal entities, funds investors and individual investors. This variable is expected to be negatively related with *MIR*.

Winning Lottery Ratio (%): the ratio of successful subscribers on total valid subscribers in issuing process, which is expected to have a negative relationship with the level of underpricing.

Turnover Ratio (%): refers to the trading frequency of a stock on its first trading day, which is the ratio of the trade volume of an IPO on its first trading day on the number of tradable shares. The higher this ratio is, the more should an IPO be underpriced.

Ratio of Tradable Shares on Total Shares (Ratio tradable share): the proportion of tradable share on total shares after IPO. The tradable shares include previous tradable shares, such as B-shares, H-shares, etc and the shares permitted to be traded in this IPO issuing.

$$\text{Ratio (tradable share)} = \frac{\text{(previous tradable shares+ tradable shares in this IPO)}}{\text{/total shares after IPO}} \quad (4-4)$$

Ratio of State-owned Shares on Total Shares (Ratio state share): the proportion of shares owned by the Chinese government and state-owned legal entities divided by total shares after IPO issuing. The shares are not permitted to list in the secondary stock market until June, 2006. It is computed as:

$$\begin{aligned} \text{Ratio (state share)} &= (\text{state-owned shares} + \text{state-owned legal entity shares}) \\ &\quad / \text{total shares after IPO} \end{aligned} \quad (4-5)$$

Ratio of Legal Entities-Owned Shares on Total Shares (Ratio legal entity share): the proportion of shares owned by ordinary legal entities on total shares after IPO issuing. These shares are non-tradable as well.

$$\begin{aligned} \text{Ratio (legal entity share)} &= \text{shares owned by ordinary legal entities} \\ &\quad / \text{total shares after IPO} \end{aligned} \quad (4-6)$$

Duration Time: the days elapsed between issuing and listing of IPO and is expected to positively affect the underpricing.

Dummy Variable of Underwriter with 1st Rank (DummyUnderwriter1st): this dummy variable equals 1 if the lead underwriter of an IPO is among the 1st rank list. An IPO is expected to have a lower underpricing level if it is underwritten by a 1st rank underwriter.

Dummy Variable of Secondary Market Proportional Offering (DummySMPO): a dummy variable which equals 1 if an issuer offers its shares with *Secondary Market Proportional Offering (SMPO)*.

Dummy Variable of Bookbuilding plus Secondary Market Proportional Offering (DummyBSMPO): a dummy variable which equals 1 if an issuer offers its shares with *Bookbuilding plus Secondary Market Proportional Offering (BSMPO)*.

The model is:

$$\begin{aligned}
 MIR_i = & C + \beta_1 * Offering\ price_i + \beta_2 * Log(issuing\ size)_i + \beta_3 * Winning\ Lottery \\
 & Ratio_i + \beta_4 * Turnover\ Ratio_i + \beta_5 * Ratio\ (tradable\ share)_i + \beta_6 * Ratio(state \\
 & share)_i + \beta_7 * Ratio\ (legal\ entity\ share)_i + \beta_8 * Duration_i + \beta_9 * \\
 & DummyUnderwriter1st_i + \beta_{10} * DummySMPO_i + \beta_{11} * DummyBSMPO_i + \\
 & error_i
 \end{aligned}
 \tag{4-7}$$

Table 4-6 presents the descriptive statistics of the variables in the model including the skewness and excess kurtosis measures. Table 4-7 lists the correlation matrix of variables. Table 4-8 shows the model is reasonably well specified with the significance level of 1% ($F = 22.9974$) and *adjusted R*² of 47%. As we predict, the offering price of an IPO is negatively related with its underpricing level since the higher the offering price for a particular IPO, the less scope for the price on the 1st listing day increasing because of the increasing risk probability, and therefore, a lower underpricing level.

From the estimation result, our assumption that the inequality of demand and supply of offerings does affect underpricing of IPOs is proved significantly via *Log(issuing size)*, *winning lottery ratio* and *turnover ratio*. When more offerings are issued to the public, the extreme inequality will be lowered and investors will have more chances to purchase the offerings when IPOs are listed on the exchanges, as such the level of underpricing will be minimized. Meanwhile, this negative relationship between the underpricing and issuing size can be explained given that there is less uncertainty and information asymmetry when more offerings go public (Beatty and Ritter, 1986, Rock, 1986, Mok and Hui, 1998). The *winning lottery ratio* shows how much interest investors have on a particular IPO and indicates to what extent the

inequality of purchasing demand compared with offerings issued. This ratio is negatively related to underpricing of IPOs with a significance level of 10%, which means the lower the ratio, the stronger the inequality of demand and supply of offerings, and therefore, the higher the prices will need to be when the offerings are exchanged on the first listing day. The *turnover ratio*, which is the trading frequency of new shares on the first listing day and reflects the potential investors' interest on a particular IPO, has a significant positive relationship with level of underpricing (significance level is 1%) and shows that if the offerings are traded more frequently, the listing prices might be pushed much higher and as a result, the underpricing level will be higher compared with the offering price. This result is consistent with Gannon and Zhou's (2007) finding. Briefly, the extremely high underpricing of Chinese A-share IPOs can be triggered by the large quantity of investors and relatively small supply of offerings to some extent.

In our model, the impact of shareholders' structures are found to have positive relationships with the level of underpricing, but only *Ratio(state share)* is statistically significant. Chen *et al* (2004) explain that if the state share for a company accounts for a large part of the total shares, the government control usually influences the business management to a great extent and thus the operating efficiency is lower than other companies. In addition, due to the large component of state shares, the voting rights and dividend allocation proportions will be minimized for the investors who hold the tradable shares, thus decreasing tradable shares investors' interest and enthusiasm on this IPO. The issuers take into account and would like to issue a relatively low offering price to attract investors to make sure of the success of its IPO issuing. Therefore, the structure of state-owned and state legal entity-owned shares will increase the level of underpricing of IPOs. Unfortunately,

the role of tradable shares and shares owned by ordinary legal entities are not estimated significantly in our model.

As we predict, the duration to listing has a positive relationship with the *MIR* although the *t-value* doesn't exceed conventional significance. This result can be explained combined with the figures in table 4-1 and figure 4-1, which indicate that the underpricing of IPOs is related with the change of days elapsed from prospectus to listing significantly and both underpricing and duration time undergo three very similar stages. The model uses IPOs from 2001 to 2005, and for this period, the duration time isn't as unreasonably long as in previous periods: the average is 16 days and the period ranges from 10 to 39 days. Therefore, the relationship between *MIR* and duration time doesn't show much significance because of the lack of difference of days in duration period among each IPO. It further tells that if issuers can successfully list their offerings within a reasonable duration period (in our sample, around a half and up to one month), the underpricing of their offerings is not impacted much by how many days elapsed.

As we assume, the level of underpricing can also be minimized by the experiences and skills of more prestigious underwriters because they are better in advising offering prices, controlling issuing risk, etc (Beatty and Ritter 1986, Carter et al. 1998). Meanwhile, there exists a win-win relationship between underwriters and issuers, i.e., low dispersion firms attempt to reveal their low risk characteristics to the market by selecting more prestigious underwriters, and good underwriters only market IPOs with low dispersion firms in order to maintain their good reputation (Carter and Manaster, 1990). However, the *t-statistics* of this variable is not significant in our results.

As we discussed in section 4.4.2, our results suggest that offering mechanism does influence the degree of underpricing. Compared with *Online offering*, an IPO will be less underpriced if it chooses *Secondary Market Proportional Offering* or *Bidding plus*. Because of the absence of a prepayment requirement, the *SMPO* (including bidding plus) shows its advantage in collecting subscribers and the allocations are more scattered to the potential investors. This is also demonstrated by the relatively lower average winning lottery ratios for *SMPO* and *BSMPO* (see figure 4-2). Thus the extremely high market return in the IPO market is minimized to some extent since speculators who play fewer roles in short-term profiteering find it more difficult to bid up listing prices in comparison with before. Meanwhile, the relationship between the IPO market and the secondary market becomes closer because the allocation proportion is determined according to the value of securities which subscribers already have in the secondary market. Therefore, the average IPO market returns become less when issuers adopt *SMPO* and *BSMPO*. In addition, the level of underpricing will be further decreased if issuers pre-sell some shares to strategic investors and funds to consolidate the offering price using bookbuilding (coefficient estimate of -0.70 with significance level of 1%). Bookbuilding is found to be not only efficient in lower underpricing and cross-sectional variation of the first day returns, but also optimal in the sense that it has the ability to counteract the influence of adverse market conditions and the uncertainty during the offer/listing gap (Benveniste and Spindt, 1989, Ma and Faff, 2007). The combination of bookbuilding and *SMPO* provides issuers more benefits not only from avoiding too much money left on the table but also from constructing a good basis for an IPO's performance in the future.

4.6 Short-run Underperformance of Chinese A-share IPOs

In addition to the analysis of the market adjusted initial-day returns, we also analyse how Chinese A-share IPOs perform within their first 30 trading days. We collect closing prices of all IPOs on their 10th trading day, the 20th trading day and the 30th trading day and compute market adjusted 10th, 20th and 30th trading day returns. The formula is listed as below:

$$MIR_{i,xth} = (P_{i,xth} / P_{i,0}) - (M_{i,xth} / M_{i,0}) \quad (x=10, 20, 30) \quad (4-8)$$

where $P_{i,xth}$ is the closing price of stock i on the xth trading day, $P_{i,0}$ is the offering price of stock i , $M_{i,xth}$ is its corresponding SHSE or SZSE A-share composite index on the xth trading day and $M_{i,0}$ is the SHSE or SZSE A-share composite index on the offering day.

In addition, we also compute the *cumulative return* from MIR to MIR_{30th} to measure both the direction and the degree of IPOs performance during these 30 trading days. This rate indicates the trend and speed of short-run underpricing in a 10-day pace. The cumulative return is computed as follows:

$$Cumulative\ return_i = (MIR_{i,30th} / MIR_i)^{(1/3)} - 1 \quad (4-9)$$

Table 4-9 presents the average market adjusted stock short-run returns categorized by the offering mechanisms and underwriter ranks, which include IPOs' underpricing on their 10th, 20th, 30th trading day. Generally, most IPOs' underpricing shows a decreasing trend from the first listing day to the 30th but to a small degree, with the average figure declining from 93.49% to 87.92% and a cumulative return rate of -2.03%. This shrinking trend is most evident for IPOs which go public using

SMPO, with the average rate at -4.87%. For IPOs with *OL* Offering, the average levels of underpricing change from 141.08% to 137.41%, a slight decrease. However, for *BSMPO*, more than a half of IPOs show an increasing trend from *MIR* to *MIR*_{30th}, especially for the IPOs underwritten by Rank 2nd underwriters (the cumulative return reaches 13.27%). Even with this increasing trend, we still notice that the overall underpricing levels of IPOs using *BSMPO* are much less than those of IPOs using *OL* and *SMPO*. It assists the conclusion that the combination of bookbuilding and *SMPO* can make IPO issuing more efficient and keep the levels of underpricing to a reasonable range. At this point, the *BSMPO* appears to be the optimal offering mechanism for Chinese A-share IPOs.

Ritter and Loughran (1998) and Carter *et al* (1998) find that less short-run and long-run underperformance of underpricing is associated with more reputable underwriters. Our research on Chinese A-shares is consistent with this result. In table 4-9, the levels of underpricing of IPOs who are underwritten by 1st rank underwriters are comparatively lower within the first 30 trading days⁴⁻². Meanwhile, the underperformance shrinks at a relatively mild rate (see the figures of *CR*) for the categories of IPOs issued by the 1st rank underwriters. These findings may be explained by the win-win rule between underwriters and issuers as well. The good companies definitely want to select more prestigious underwriters who, naturally, would like to underwrite more profitable and less risky issuers. Market expectation of efficient advice by reputable underwriters implies that the stock prices of these companies usually change in a reasonable and gentle range after listed, avoiding

⁴⁻² The exception is that the figures in the category of 1st rank using *BSMP* are much higher than those of IPOs with 2nd and 3rd rank underwriters before the 20th trading day, but till the 30th trading day, the figure decreases to a lower level than those figures of other IPOs' *MIR*_{30th}.

sharp changes. Therefore, the changing trends of the *MIRs* of IPOs issued by 1st rank underwriters are comparatively smoother.

4.7 Conclusion

This chapter outlines significant changes of both underpricing and the duration time of the Chinese A-share IPOs from 1984 to 2005. Both the first-day return and the duration time undergo three main stages from extremely high average levels to more reasonable levels, which indicates that the Chinese IPO market has stepped into a stable developing stage. The significant positive relationship is included in our findings.

From Mar, 2001, an important change has occurred in the Chinese IPO market in that the Approval System substitutes for the Administration Authorizing System. Therefore, we collect the data of 286 IPOs issued and listed from Mar, 2001 to 2005 to analyse underpricing in this period and find the average market adjusted initial-day return is 93.49%.

It is demonstrated that the high level of the Chinese A-share IPOs' underpricing can be explained by the inequality of demand and supply of IPOs with the proxies of *issuing size*, *winning lottery ratio* and *turnover ratio*. An IPO's *MIR* might be lower if there are more shares issued or its winning lottery ratio is higher. Further, the turnover ratio is found to be positively related to underpricing because a higher trading frequency in the first day reflects a good expectation about a particular IPO and as such the trading price will be pushed higher. The influence of shareholder structure is tested in the model and the results indicate a significantly positive relationship between the structure of state-owned shares and underpricing. Meanwhile, our findings show that underpricing is significantly affected by offering

mechanisms, i.e., *MIR* tends to be more underpriced when an IPO is issued using *Online Offering*, in contrast, *Secondary Market Proportional Offering* can minimize the level of underpricing. The combination of bookbuilding and *SMPO* seems the optimal offering mechanism because it makes IPO issuing more efficient in terms of lower underpricing and consolidating offering price.

Finally, this chapter analyses the short-run underperformance of IPOs on their 10th, 20th, 30th trading days. We find that most IPOs underpricing shrinks in this short-run period to a small degree. These shrinking trends are most evident for IPOs which go public using *SMPO* and slight for IPOs using *OL*. The levels of underpricing for IPOs using *BSMPO* increase in this short-run, but in general, the values for this type are much less than those of IPOs using *OL* and *SMPO*. Meanwhile, underpricing of IPOs which are underwritten by more prestigious underwriters shows a comparatively lower range and shrinks at a relatively mild rate in the short-run.

Table 4-1 Descriptive Statistics of Chinese A-share IPOs' Underpricing and Duration Time

Sample period	Sample number	Variable names	Mean	Median	Maximum	Minimum	Std. dev.
1984-1985	4	IR	17533%	18815%	31930%	573%	128.9
		Duration(days)	2390	2200	3289	1874	618
1986	2	IR	622%	622%	668%	577%	0.64
		Duration(days)	3030	3030	3422	2638	554
1987	6	IR	11695%	1442%	32690%	1125%	160.94
		Duration(days)	2724	3240	4046	1205	1157
1988	22	IR	1537.86%	1397.5%	3550%	302%	8.03
		Duration(days)	2634	2773	3561	762	834
1989	17	IR	4368.98%	874%	38300%	-82.4%	106.79
		Duration(days)	1567	1455	2987	387	891
1990	8	IR	1340.94%	1332%	2180%	-8.5%	7.7852
		Duration(days)	1966	2281	2615	282	801
1991	18	IR	805.26%	616.67%	257%	-21%	7.4947
		Duration(days)	477	255	2119	11	612
1992	112	IR	654.17%	306.94%	4900%	-73.33%	9.4973
		Duration(days)	643	353	3385	10	650
1993	142	IR	358.43%	156.92%	3590%	10.99%	5.4317
		Duration(days)	270	80	3081	24	522
1994	39	IR	83.27%	54.62%	249.75%	-10%	0.6549
		Duration(days)	75	59	179	25	42
1995	13	IR	113.66%	70%	542.86%	-18.58%	1.5879
		Duration(days)	66	46	292	14	72
1996	172	IR	115.36%	107.85%	357.61%	-6.17%	0.7073
		Duration(days)	20	19	64	7	8.79
1997	188	IR	147.75%	129.83%	469.09%	5.47%	0.7752
		Duration(days)	23	20	80	9	12
1998	102	IR	131.50%	108.59%	830.21%	2.08%	1.0928
		Duration(days)	56	42	382	12	44
1999	93	IR	116.13%	106.22%	341.87%	7.14%	0.7418
		Duration(days)	57	51	133	16	29
2000	139	IR	154.38%	141.94%	476.77%	0.28%	0.8612
		Duration(days)	26	20	194	10	23
2001	67	IR	136.49%	118.99%	413.79%	0.74%	0.9089
		Duration(days)	27	24	87	12	13

2002	70	IR	123.37%	109.20%	428.25%	-32.72%	0.8001
		Duration(days)	15	15	31	10	3
2003	66	IR	71.84%	64%	228%	10.73%	0.4364
		Duration(days)	15	15	25	13	2
2004	98	IR	70.17%	58.77%	324.89%	-9%	0.5497
		Duration(days)	16	15	28	13	2
2005	15	IR	41.53%	43.17%	133.86%	2.79%	0.3399
		Duration(days)	16	15	24	10	4
1984-2005	1393	IR	378.41%	119.37%	38300%	-82.4%	20.986
		Duration(days)	203	26	4046	7	567

The year of offering date published in the prospectus is the year that an IPO has been classified, even though this IPO may be listed in the next following year. We use stock's initial-day return as a proxy of underpricing which is computed with the formula: *Stock Initial-day Return* (IR_i) = $(P_{i,1st}/P_{i,0}) - 1$, where $P_{i,1st}$ is the closing price of stock i on the first trading day, and $P_{i,0}$ is the offering price of stock i .

Table 4-2 Regression Result of Duration Time on Initial-day Return

Variables	Coefficient	Std. error	t-Statistic	<i>P</i> -value
C	1.645598	0.257767	6.384054	0.0000
Duration Time	0.010466	0.002239	4.675174	0.0000
R^2	0.079920			

Table 4-3 Offering Mechanisms and Corresponding Average Underpricing of IPOs

Offering Mechanism	Period	Number of IPOs	Average <i>MIR</i> (%)	Standard deviation (%)	Number of outliers according to winning lottery ratio	Average <i>MIR</i> with outliers revised (%)	Note: exceptions
<i>OL</i>	Mar, 2001- May, 2002	57	141.08	92.25	1	142.10	
<i>SMPO</i>	May, 2002 - Aug, 2004	212	84.52	62.83	1	84.78	2 IPOs using other offering types in this period
<i>BSMPO</i>	Jan, 2005 - Jun, 2005	15	48.95	33.02	0	48.95	

There is no IPO issued from Sep, 2004 to Dec, 2004 and Jul, 2005 to Dec, 2005 as required by the CSRC because of Chinese stock market reform.

Table 4-4 Structure of Shareholder of Chinese Listed Companies

Year	Number of IPOs	Tradable Shares		Non-tradable Shares			
		Average Ratio of Tradable Shares (%)	Where: average ratio of A-shares (%)	Average Ratio of State Shares (%)	Average Ratio of Legal Entity Shares (%)	Average Ratio of Natural Person Shares (%)	Average Ratio of Employee Shares (%)
2001	37	32.23	29.46	39.25	27.67	0.97	0.40
2002	70	34.81	31.49	39.05	20.57	2.25	1.79
2003	66	33.21	33.10	36.92	26.99	2.13	0.27
2004	98	32.77	32.70	24.56	29.18	12.47	0.98
2005	15	30.29	24.15	30.01	35.74	4.27	1.20
Total	286	33.17	31.63	33.96	26.71	4.418	0.928

Table 4-5 The 1st Rank underwriters and the underpricing of IPOs

Rank of underwriter	Range of relative market share	Total relative market share	Number of underwriters	Numbers of IPOs underwritten	Average underpricing (<i>MIR</i>)		
					Mean	Median	Standard Deviation
1st rank	2.0 % - 23.6 %	69.2 %	12	120	87.9%	73.8%	69.5%
2nd rank	1.0% - 1.8%	18.5 %	13	89	105.7%	90.5%	85.8%
3rd rank	0.09% - 0.8%	12.3 %	35	77	88.2%	77.4%	60.2%
Total	0.09% - 23.6 %	100%	60	286	93.9%	80.6%	71.8%

Table 4-6 Descriptive Statistics of the Variables

Variables	Mean	Median	Minimum	Maximum	Std. deviation	Skewness	Excess kurtosis
<i>MIR (%)</i>	93.49	79.33	-29.64	430.15	72.94	0.35	0.13
<i>Offering price</i>	7.98	7.03	2.20	36.68	4.29	0.11	0.21
<i>Log(issuing size)</i>	8.67	8.41	7.20	13.12	0.89	0.07	6.11
<i>Winning Lottery Ratio(%)</i>	0.16	0.68	0.03	5.03	0.39	0.91	0.95
<i>Turnover Ratio(%)</i>	57.28	56.79	4.53	88.44	12.68	0.32	-1.73
<i>Ratio (tradable share) (%)</i>	33.17	33.20	2.44	78.78	7.62	-0.12	-1.16
<i>Ratio (state share) (%)</i>	33.96	34.62	0.00	84.99	29.03	-0.43	-1.57
<i>Ratio (legal entity share) (%)</i>	26.71	15.34	0.00	77.72	27.47	0.52	-1.13
<i>Duration Time(days)</i>	16.92	15.00	10.00	39.00	4.14	0.88	5.26

Table 4-7 Correlation Matrix of the Variables

Variables	<i>MIR</i>	<i>Offering price</i>	<i>Log(issuing size)</i>	<i>Winning Lottery Ratio</i>	<i>Turnover Ratio</i>	<i>Ratio (tradable share)</i>	<i>Ratio (state share)</i>	<i>Ratio (legal entity share)</i>	<i>Duration Time</i>
<i>MIR</i>	1.00								
<i>Offering price</i>	-0.20	1.00							
<i>Log(issuing size)</i>	-0.08	-0.10	1.00						
<i>Winning Lottery Ratio</i>	-0.24	0.26	-0.27	1.00					
<i>Turnover Ratio</i>	0.11	0.07	-0.36	0.35	1.00				
<i>Ratio (tradable share)</i>	0.37	0.45	0.30	0.07	0.19	1.00			
<i>Ratio (state share)</i>	0.26	-0.28	0.42	0.14	-0.53	0.22	1.00		
<i>Ratio (legal entity share)</i>	0.19	0.33	0.07	0.26	0.14	0.25	0.46	1.00	
<i>Duration Time</i>	0.48	0.05	0.59	0.22	0.18	0.12	0.48	-0.29	1.00

Table 4-8 Regression Results of the Market Adjusted Initial-day Return (*MIR*)

Variables	Coefficient	Standard error	t-value
<i>C</i>	1.5766	0.8268	(1.9069)**
<i>Offering price</i>	-0.0432	0.0109	(-3.9318)***
<i>Log(issuing size)</i>	-0.2440	0.0800	(-3.0489)***
<i>Winning Lottery Ratio(%)</i>	-0.5790	0.5281	(-1.0962)*
<i>Turnover Ratio(%)</i>	2.6263	0.3507	(7.4887)***
<i>Ratio (tradable share) (%)</i>	0.5314	0.4608	1.1532
<i>Ratio (state share) (%)</i>	0.2822	0.1251	(2.2555)**
<i>Ratio (legal entity share) (%)</i>	0.1812	0.1265	1.4328
<i>Duration Time(days)</i>	0.0121	0.0078	1.5457
<i>DummyUnderwriter_{1st}</i>	-0.0022	0.0599	-0.0382
<i>DummySMPO</i>	-0.2224	0.1498	(-1.4843)*
<i>DummyBSMPO</i>	-0.6959	0.1713	(-4.0619)***
<i>R²</i>		0.4922	
<i>Adjusted R²</i>		0.4708	
<i>F statistics</i>		(22.9974)***	

* Significance level of 10%, ** Significance level of 5%, ***Significance level of 1%.

Table 4-9 Short-run Underpricing of Chinese A-share IPOs

Offering mechanism	<i>OL</i>				<i>SMPO</i>				<i>BSMPO</i>				
Underwriters reputation	1 st Rank	2 nd Rank	3 rd Rank	Total	1 st Rank	2 nd Rank	3 rd Rank	Total	1 st Rank	2 nd Rank	3 rd Rank	Total	All sample
IPO Number	38	15	4	57	73	69	70	212	7	5	3	15	286
<i>MIR</i> (%)	129.81	152.52	205.27	141.08	70.69	100.52	83.17	84.52	58.37	36.09	48.41	48.95	93.49
<i>MIR</i> _{10th} (%)	125.79	146.91	199.46	136.51	66.19	93.67	76.20	78.44	56.57	43.66	44.98	51.21	90.11
<i>MIR</i> _{20th} (%)	127.37	142.16	204.01	136.64	62.76	90.99	73.81	75.59	50.84	44.14	53.62	52.50	88.88
<i>MIR</i> _{30th} (%)	133.62	134.50	184.37	137.41	60.90	89.93	68.23	72.77	43.09	52.45	60.69	54.25	87.92
Cumulative return (%)	0.97	-4.10	-3.52	-0.88	-4.85	-3.64	-6.39	-4.87	-9.62	13.27	7.83	3.47	-2.03

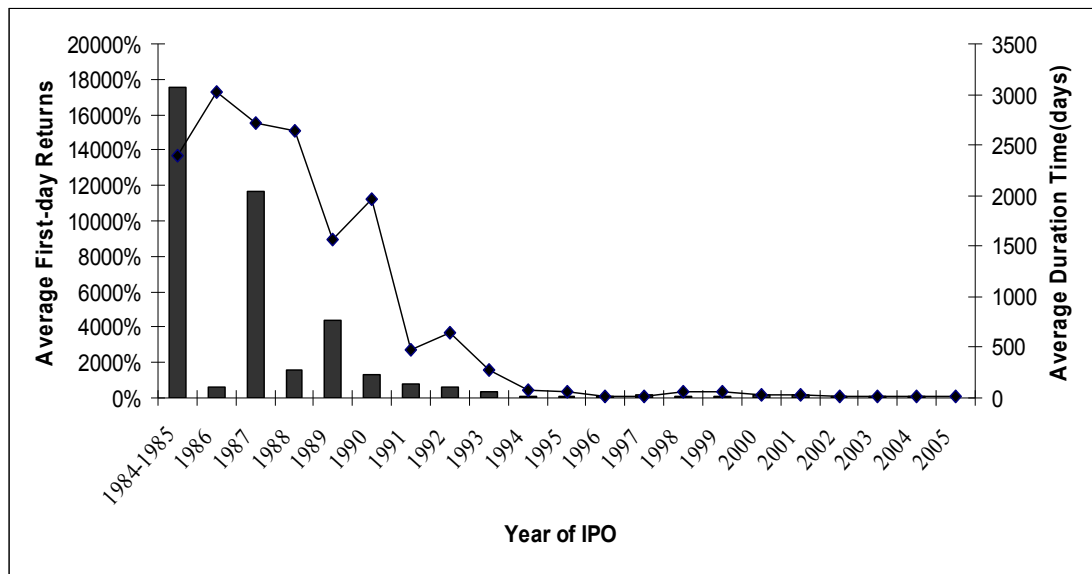


Figure 4-1 Average Initial-day Return and Duration of Chinese A-share IPOs

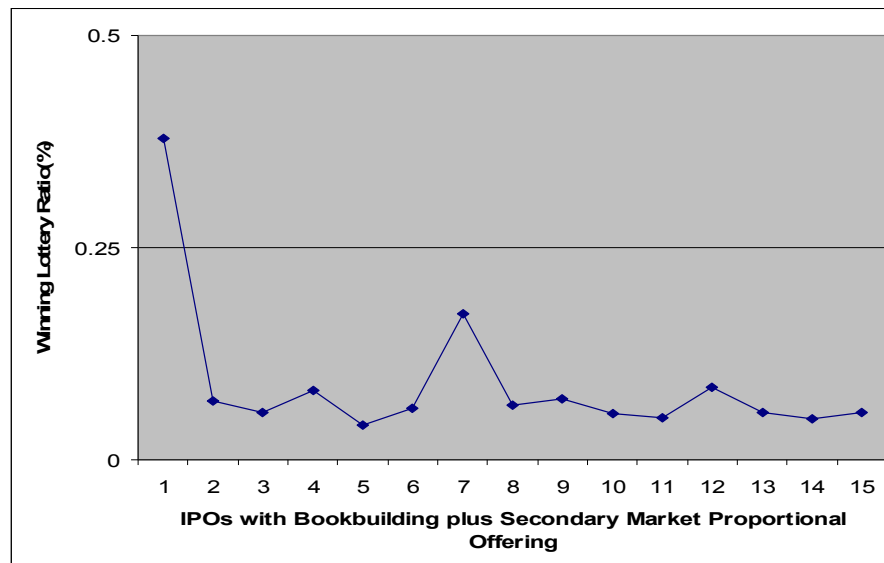
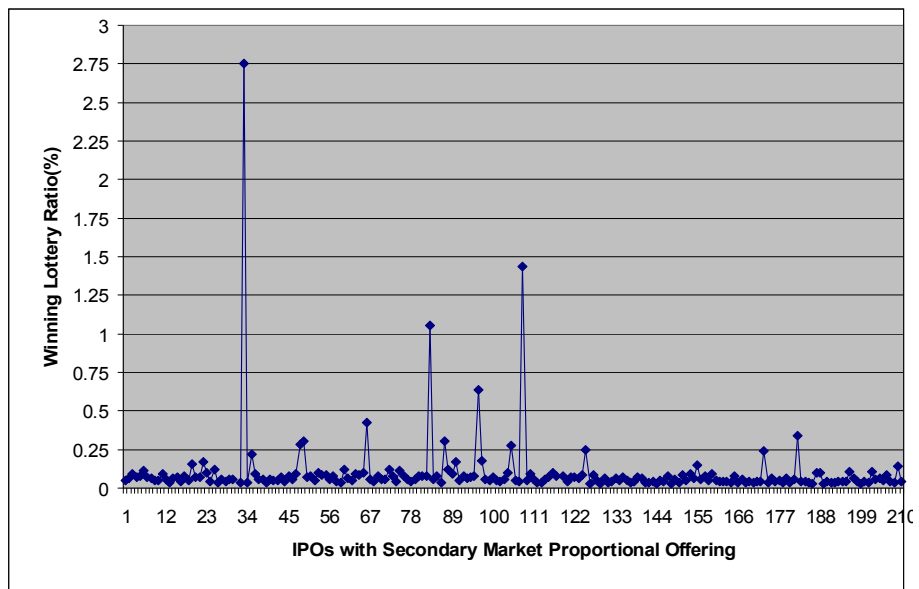
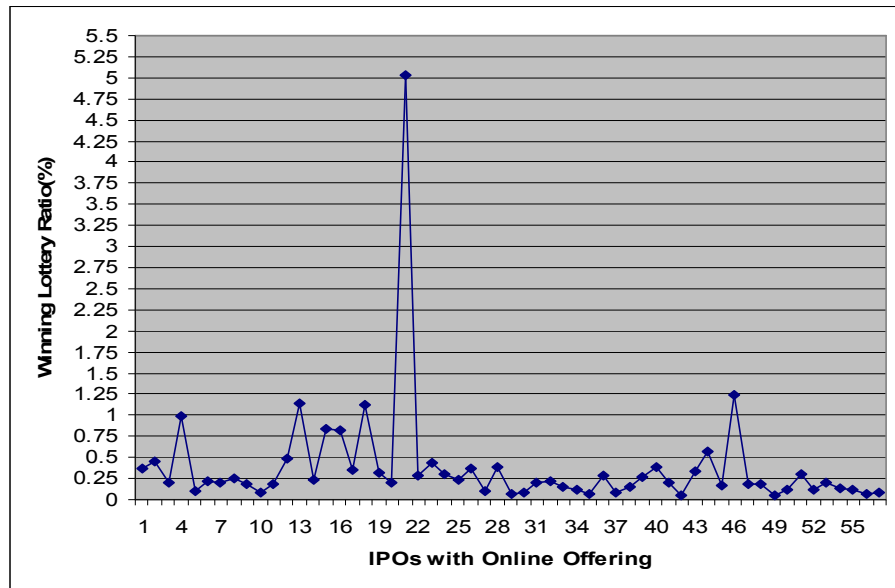


Figure 4-2 Winning Lottery Ratio Categorized by Offering Mechanism

Chapter 5 Duration from Offering to Listing: Cox Proportional Hazard Models

5.1 Introduction

This chapter employs Cox proportional hazard models to estimate the Chinese A-share IPOs' duration to listing from 1994 to 2005. The exogenous effect of issuing systems is discussed first. Then the focus is on exploring endogenous factors which are related to an issuer itself and examining influences of these factors on the issuer's final listing. Finally, this chapter further conducts an extended analysis which explores the role of issuing system and issuing year respectively.

Many empirical studies find that the level of underpricing will be more severe if an IPO takes a longer time to listing (Mok and Hui, 1998; Chan *et al.*, 2004; Chen *et al.*, 2004). However, based on our empirical results in chapter 4, the underpricing won't be affected too much if an issuer can successfully list their offerings within a relatively short time; for example, during 2001-2005, this time is about from a half month up to one month. Thus we can control the level of the underpricing if we know how to control the length of this duration. Therefore, this chapter intends to explore how an issuer can control this duration and explore the factors that lead to its offering listing quickly.

The questions may include the following: whether and to what extent do issuing procedures influence the length of this time? Further and more important, besides the effect of issuing procedures, are there some endogenous factors which can assist IPO's listing and are under the issuer's control, such as employing a more

prestigious underwriter? Whether the time can be shortened by a certain type of allocation method? Whether the market sentiment can influence the speed of listing for an IPO? These questions are not only of concern to issuers but also to investors, who may assess the investment risk and thus choose an IPO with a shorter waiting time to listing to minimize the financial cost, especially for those subscribers who are intended to benefit from the underpricing.

This chapter adopts Cox proportional hazard models to analyse the duration from offering to listing using the data of Chinese A-share IPOs from 1994 to 2005, which extends the data period used in chapter 4 (the reason is explained in section 5.4). Section 5.2 explains the two IPO issuing systems and procedures and compares the difference of duration to listing in these two systems. Section 5.3 will discuss the main endogenous factors which may influence the time to listing for an IPO; Section 5.4 describes the database and employs Cox proportional hazard models to estimate the coefficients and hazards for each independent variable addressed. A further discussion on underwriters' influence is presented in this section; Section 5.5 extends the Cox model with the frailty shared by IPO issuing systems and years; Section 5.6 draws some conclusions.

5.2. Difference under Two Issuing Systems

There are some explanations about the length of this duration (Lee et al, 1996; Brooks et al., 2009) that both the administrative regulations and the endogenous firm-related factors can determine the length of this duration. The issuing process undoubtedly affects IPOs' listing speed since the issuers have to accomplish all necessary procedures and qualifications and then can list, i.e. listing of IPOs is under the regulation of procedures and the supervision of a stock regulatory commission.

This may be plausible to account for the significant difference in duration days across different countries.

In the sample period of our data, the Chinese IPO market has witnessed two kinds of IPO issuing systems: the Administrative Authorizing System during 1994 to 2000 and the Approval System during 2001 and 2005 (See more details in section 3.4).

Table 5-1 presents the average duration to listing as well as underpricing during 1984-2005. We find that the waiting time for listing for the IPOs in the Administrative Authoring System is on average 35 days with a wide variation from a minimum of 7 days to a maximum of 382 days. In contrast, the same average is 16 days with a range from 10 to 39 days in the Approval System. Under the first system, it can be quite a long time for a firm to fulfil the entire procedures and finally get listed. Comparatively, the IPO issuing procedures become less complicated under the second system. This finding indicates that these two issuing systems affect the length of the duration. A further discussion of the issuing system is provided in the section 5.5.

After addressing the IPO issuing procedures and their average duration time, an interesting discussion has to be raised as to whether there are any factors related to an issuer itself which affect the length between offering and listing besides the influence of the different systems' efficiency, although an IPO's final listing date seems to be arranged by the stock exchange. That is to say, assuming that all exogenous factors such as issuing procedures, electronic subscription instruments, etc. are the same, are there any endogenous factors which are under the issuer's control and endow this IPO with more chances to list faster?

5.3 Endogenous Factors

It is believed that there exist some endogenous factors related with an issuer itself that could endow this issuer more superiority to list faster, assuming the same exogenous conditions (Lee *et al.*, 1996; Brooks *et al.*, 2009).

5.3.1 Quality of IPOs

The duration elapsed between offering and listing is accompanied by uncertainty and risk for both issuers and subscribers (Chen *et al.*, 2004) and the longer the time lasts, the more risk they encounter. Usually, an IPO's quality plays a most important role in affecting uncertainty and risk, i.e. the uncertainty is comparatively lower for those issuers in a good business situation, such as strong profit earning capability, efficient management structure, etc. In this chapter, the following proxies are employed to examine the quality of an IPO.

A. Offering price

The offering price is thought to be able to represent the quality of an IPO to a reasonable extent, because it is usually recommended by the underwriter after the overall assessment of the issuer and investigation of the demand for the offerings. The offering price is demonstrated by Brooks *et al.* (2009) to have a significant relationship with underpricing and time to listing of an IPO in the Australian context. The representing capability is more strongly identified when an issuer employs the online/offline price consulting from institutions and/or individual investors (Ma and Faff, 2007). There are about 5% of issuers adopting this price advising method from 1994 to 2005 in the Chinese A-share IPO market. This mechanism is found to be effective to minimize the level of underpricing comparatively (Ma and Faff, 2007) in

the analysis in chapter 4 and it is expected to have similar performance in accelerating the timing of an IPO's listing.

B. Structure of shareholders

The relationship between ownership structure and company's performance has been examined by numerous studies (Kutsuna *et al.*, 2002; Gunasekarage *et al.*, 2007), although the arguments are quite controversial about whether concentrated ownership is positively or negatively related to performance. In the process of IPO issuing, the structure of shareholders is given much significance to explain underpricing and the aftermarket performance of IPOs (Kutsuna *et al.*, 2002; Yeh and Shu, 2004; Alavi *et al.*, 2008). However, few references focus on the relationship between structure of shareholders and the time to listing. Large shareholders may have a strong financial incentive and ability to monitor the company and earn more if the company is listed quickly. Therefore, the role of existing large shareholders may have a great influence on the hazard and speed of listing of IPOs.

The distinguishing characteristics of shareholder structure of most issuers in China is that the two major parts of shares, besides the tradable shares, are state-owned shares and legal-entity-owned shares, which account for more than a half of the total shares for listed companies. The portion of state-owned shares represents the degree of influence by the state as well as the corresponding right to enjoy state and public resources, and a large portion of state-owned shares may bring more advantages and priorities for listing especially in a hot listing period. Further, a higher portion of state-owned and legal-entity-owned shares may imply lower uncertainty (Mok and Hui, 1998) and thus the subscriptions of this IPO may be filled more quickly. However, a large component of state-owned and legal-entity-owned shares may

influence the management efficiency of the company (Chan *et al.*, 2004) and cause a reluctance on the part of investors, which inevitably reduces the speed to list. The contradictory character of these shares is of great interest and motivates us to investigate whether a larger portion of these two types of shares can increase or decrease the speed and hazard for an IPO to listing within a specified period.

C. Issuing size

We take into account the issuing size in our model in that the issuing size affects the success of listing directly. A larger floatation size usually takes a longer time to be subscribed and increases the uncertainty for an issuer and the hazard for investors (Mok and Hui, 1998; Chan *et al.*, 2004). We assume the larger the floatation size, the more hazards the listing encounters.

D. Whether issuing foreign shares previously?

The level of information asymmetry is thought to be related to uncertainty significantly (Lee *et al.*, 1996; Brooks *et al.*, 2009). Our database is Chinese A-shares which are initially publicly offered from 1994 to 2005, of which some companies issued ordinary foreign shares (B/H/N/S shares) before this A-share offering. The companies who have issued and listed foreign shares may have more approaches to minimize information asymmetry because the potential A-share investors can obtain more information via their foreign listing (Chen *et al.*, 2004). Meanwhile, these companies are under the dual-supervision by the corresponding foreign monitoring commissions, such as Hong Kong Securities and Futures Commission (H.K.SFC), the U.S. Securities and Exchange Commission (U.S.SEC), etc. and the domestic monitoring commission (CSRC) as well. This may decrease the uncertainty and risk to list A-shares in the domestic market. Further, the listing of

foreign shares creates some kind of signalling effect to potential investors that may produce the appearance of good quality on these companies.

There are a total of 1062 A-share IPOs issued from 1994 to 2005 in our database, including 30 companies that have issued foreign shares publicly before this A-share offering. This study will test whether the listing of foreign shares can assist these 30 companies to list their A-share IPOs faster or not.

E. Whether publishing a possible listing date in prospectus?

Interestingly, although a majority of issuers declare they will ask the stock exchange to arrange their listing as soon as possible, there are a few issuers that publish a possible listing date in their prospectus. These phenomena of providing the possible listing date mainly happen during the period from 1994 to 1996. In our data, there are a total of 35 IPOs indicating this possible date, where 33 IPOs are issued during 1994-1996 and another 2 are in the other period; however, only 19 of them finally list on a date close to that they published. This may indicate the real listing date is dynamically set after the offering is successfully finished. The issuer must meet the entire necessary requirements, while the speed and success of offering are definitely related to this issuer's characteristics.

However, the information asymmetry might be minimized if an issuer provides this published date; therefore, this paper estimates the effect of this signal and analyses its impact on the real listing. We create a dummy variable *DummyT* to distinguish those issuers who publish this information, where:

DummyT=0, if an issuer doesn't provide the possible listing date in its prospectus;

DummyT=1, if an issuer provides the possible listing date in its prospectus.

5.3.2 Market Sentiment

Market sentiment plays a significant role in IPO studies. It is argued that financial managers can observe a hot issue period and ascertain when the market conditions are changing and thus they can decide within a reasonable amount of time to bring their offering public within favourable market conditions (Blondell *et al.*, 2006). When the market sentiment stays positive, financial managers would like to issue offerings in this positive market environment to make sure of the success of issuing; meanwhile, the potential investors are willing to subscribe to new offerings in this period to earn higher initial returns. Therefore, the uncertainty and risk are situated at comparatively lower levels when the stock market encounters positive market sentiment, i.e. the hazard of non-listing of an IPO decreases. We use $SMR_{(offering\ /-30\ days)}$ to measure the market sentiment and assume new offerings can list faster in a positive than in a negative market sentiment.

$SMR_{(offering\ /-30\ days)}$ is the stock market return on an IPO's offering day compared with the 30 working days before this offering:

$$SMR_{(i,\ offering\ /-30\ days)} = (M_{i,0} / M_{i,-30days}) - 1 \quad (5-1)$$

Where $M_{i,0}$ is the stock i 's corresponding SHSE or SZSE A-share composite index on the offering day and $M_{i,-30days}$ is the SHSE or SZSE A-share composite index on the 30 working days before the offering day of the stock i .

This variable represents the change in market sentiment across 30 working days before the offering date and a positive figure indicates a short term positive stock market condition.

5.3.3 Allocation mechanism

An increasing number of studies focus on allocation mechanisms in IPO issuing and there exists an agreement that IPO allocation mechanisms manifest different levels of efficiency in the offering process (Benveniste and Spindt, 1989; Welch, 1992) and relate to different magnitudes and variation of underpricing (Leleux and Paliard, 1996; Ljungqvist *et al.*, 2003; Derrien and Womack, 2003; Ma and Faff, 2007).

During the period of 1994 to 2005, a great portion of issuers employ the online offering (OL) mechanism. For OL offering, the new offerings are allocated directly to the successful subscribers through the electronic trading system with a fixed price or consulting price. Proportional Offering (PO) is also the major allocation system employed by issuers. The PO offering comprises two kinds of situations including “full prepayment and proportional offering” and “secondary market proportional offering”. During the period from 1999 to 2005 many issuers combined OL and PO allocation systems together, i.e. a part of their offerings (for example, 50%) are issued to new investors using the electronic trading system and the others are allocated to investors (including ordinary investors, institutions, strategic investors, funds, etc.) according to their proportion rights via the electronic trading system or counters.

During the period of 1994 to 2005, there are a few companies employing other allocation systems, such as privately allocating offerings to employees or related persons or institutions, selling subscription warrants to investors via counters, saving linkage offering (SL), etc. These allocation mechanisms are only employed in some individual cases and account for a very small part of the total.

In this chapter, we classify the allocation systems into four types: OL offering, PO offering, OL plus PO and the others which includes saving linkage offering, private placement, and selling subscription warrants, etc. We create three dummy variables *Dummy (OL offering)*, *Dummy (PO offering)* and *Dummy (OL plus PO)* for the first three and compare these with the fourth type of allocation systems which is assigned as the base case.

5.3.4 Underwriter

A number of studies discuss the underwriters' role in IPO issuing and many agree that the IPO issuing process can be assisted by hiring a more reputable underwriter (Beatty and Ritter, 1986; Benveniste and Wilhelm, 1997; Carter *et al.*, 1998; Sherman and Titman, 2002; Loughran and Ritter, 2004; Kirkulak and Davis, 2005). According to Aggarwal's (2002) finding, the time to offering from the register date is shorter for IPOs employing the nine big underwriters and available institutional allocation compared with the others, which indicates the efficiency of the more reputable underwriters in IPO issuing. Further, a good underwriter has better capability in evaluating issuers, demand investigation, price advising and effective allocation; therefore, we assume IPOs who hire a more reputable underwriter tend to list faster than others. In our sample, all the issuers appoint underwriters to issue their new shares. The underwriters with 1st rank are assumed to have more experience, skill and premium service in underwriting, and are expected to be more capable to assist IPOs listing.

5.4 Data and Cox Proportional Hazard Models

Our data period is from 1st, Jan, 1994 to 31st Dec, 2005 which is determined because of three reasons. Firstly, we extend the sample period in chapter 4 in order to take

into account more changes in the Chinese IPO market. Secondly, we exclude the IPOs of pre-1994 following the considerations proposed by Ma and Faff (2007) about the main problems of IPOs issued before 1994, such as unusual and different rules on issuing, listing and trading, some obsolete allocation mechanisms, non-standardised booking value of IPOs, etc. Thirdly, as regards the duration to listing, a number of IPOs with extremely long duration to listing are probably misleading in that the SHSE or SZSE haven't been established until Dec, 1990 but IPOs emerged in the mid 1980s. Therefore, the final sample comprises 1062⁵⁻¹ Chinese A-share IPOs issued and listed during 1994-2005.

In our sample, all the IPOs get listed on the SHSE or SZSE within a certain period. Figure 5-1 depicts the scatter plot of time to listing of these total 1062 IPOs in an issuing date order. In table 5-2, we allocate these IPOs according to their time to listing into five categories: within 15 days, 16 to 30 days, 31 to 60 days, 61 to 100 days and more and summarize them across these 12 years. The durations to listing of the IPOs are quite different and comparatively longer in the period of 1994 to 1996 and then develop in regular and steady ranges around 15 to 60 days. However, this situation is broken by the period from 1998 to 1999 when the market witnesses that only two IPOs managed to list within 15 days and most IPOs have to wait for up to from half a month to 3 months, even longer to listing. However when the market steps into 2000, this appearance has been changed and recovered to the situation before 1998, where most points centralise around half a month to two months, and after 2002, the days to listing decreased greatly to a stable range around half of a month. This phenomenon that most IPOs can list within a short time is one of the symbols of the market development which has two primary merits: the uncertainty

⁵⁻¹ Our database doesn't include "HANGZHOU FUTONG SHOWA OPTICAL COMMUNICATION CO., LTD." (code:600349) who published its prospectus but hasn't conducted the real offering.

and risk are minimized to some extent and the accumulated money can be released to float sooner to promote the secondary market flourishing. In general, for the total sample, more than two-thirds of IPOs are listed within one month and the other one-fifth within two months. The remaining issuers who account for about 10% in total, however, haven't seen their offerings listed until three months or even longer. The huge difference of duration to listing divides issuers into different hierarchies of uncertainty and hazard and requires issuers and investors to pay more attention to assessing their IPO's probability to list within an expected period.

In order to address this issue, this chapter estimates a Cox proportional hazard model to undertake hazard analysis about the period to listing of IPOs, which is also referred to as survival analysis. The primary benefits of hazard analysis over regression analysis or qualitative response models lies in their ability to explicitly account for time and handle censored observations and time varying covariates (LeClere, 2000; Shumway, 2001; Jain and Kini, 2008). The hazard analysis can incorporate information both from censored and uncensored observations to provide consistent parameter estimates (Allison, 1995; Jain and Kini, 2008), and thus the results can be more accurate to forecast and assess the listing hazard for a new offering. The semi-parametric Cox proportional hazard model, which employs maximum partial likelihood estimation procedure (Cox, 1972), is extensively used in hazard analysis for several attributes⁵⁻². The principal advantage lies in that the baseline hazard function is not required to be pre-specified and can take any functional form which enlarges the flexibility of application (Allison, 1995; Jain and Kini, 2008). Further, the Cox model proposes both discrete and continuous

⁵⁻² see the detailed discussion attached to Cox (1972).

measurement of event times and makes it relatively easier to incorporate the time dependent variables (Allison, 1995; Jain and Kini, 2008).

Denote by T a random variable representing failure time, which tells the duration of an IPO to get listed after offering. The survival function (denoted as $S(t)$) and the hazard failure rate (denoted as $\lambda(t)$) are:

$$S(t) = \Pr(T \geq t) \quad (5-2)$$

$$\lambda(t) = f(t) / S(t) \quad (5-3)$$

The survival function in equation (5-2) describes the likelihood that a randomly selected IPO will “survive” longer than a specified period of time t , which means that this offering hasn’t been listed on the SHSE or SZSE till time t . The hazard function in equation (5-3) indicates the conditional probability that this issuer will fail in the future given that it has survived up to the current time t , i.e. the probability that this offering can get listed in the future.

In order to explore the influences by variables discussed previously, the semi-parametric Cox proportional hazard function (5-4) and its corresponding survival function (5-5) are employed:

$$\lambda_i(t) = \lambda_o(t) \exp(\beta' x_i) \quad (5-4)$$

$$S_i(t) = S_o(t)^{\exp(\beta' x_i)} \quad (5-5)$$

Where x_i denotes a vector of explanatory covariates for IPO i with unknown coefficients β , $\lambda_o(t)$ denotes the baseline hazard function and $S_o(t)$ is the baseline survival function which represent the risk and survival probability of listing for an IPO with $x_i=0$ (Cox, 1972; Brooks *et al*, 2009). In our sample, the dependent time variable is the durations of IPOs from offering to listing and each observation will be

marked by “failure” if listed. A positive coefficient for each covariate x_i indicates that an IPO is more likely to list within a certain period t influenced by this factor. The corresponding hazard ratio for x_i which is defined as the risk of instantaneous exit rate, representing listing of this IPO, is larger than 1 if the coefficient is positive and the larger the ratio, the higher probability the listing of an IPO will occur.

In our models, there are 11 independent variables included and descriptive statistics for these variables are reported in table 5-3, where:

Offering Price: the issue price when an IPO is offered.

Ratio of State-owned Shares on Total Shares (Ratio state share): the proportion of shares owned by Chinese government and state-owned legal entities divided by total shares after IPO issuing.

Ratio of Legal-entity-owned Shares on Total Shares (Ratio legal entity share): the proportion of shares owned by ordinary legal entities on total shares after IPO issuing.

Log (issuing size): the natural logarithm of total newly issued shares' number of an IPO. These shares comprise shares issued to strategic investors, ordinary legal entities, funds investors and individual investors.

SMR (offering /-30 days): the stock market return on an issuer's offering day compared with 30 working days before the offering.

Dummy Variable of Issuing Foreign Shares (Dummy issuing foreign shares): this variable equals 1 if the issuer has offered foreign shares before this A-share offering.

Dummy Variable of Online Offering (Dummy OL offering): a dummy variable which equals 1 if an issuer offers its shares with online offering.

Dummy Variable of Proportional Offering (Dummy PO offering): a dummy variable which equals 1 if an issuer offers its shares with proportional offering.

Dummy Variable of OL plus PO Offering (Dummy OL plus PO): a dummy variable which equals 1 if an issuer offers its shares using a combination of online offering and proportional offering.

Dummy Variable of Underwriter with 1st Rank (DummyUnderwriter1st): this dummy variable equals 1 if the lead underwriter of an IPO is among the 1st rank list.

Dummy Variable of Telling Possible Listing Date (DummyT): this dummy variable equals 1 if the issuer provides the possible listing date in its prospectus.

The results including both coefficients and hazard ratios are shown in table 5-4. For the covariate “offering price”, the positive coefficients (with the values around 0.02) accompanied with hazard ratios larger than 1 are found to be significant at the 5% level in the model, which suggests the offering price can increase the probability for an IPO to list and this finding is consistent with Brooks *et al.*’s (2009) investigation using the Australian IPOs data. This finding also demonstrates our assumption that IPOs with good quality tend to be subscribed and listed faster than others.

Issuing size is the only covariate whose coefficient is negative significantly and has a hazard ratio less than 1. A larger size of floatation needs a longer time to be subscribed and more preparation for listing. Therefore, an issuer with a relatively large issuing size may go to final listing slower than the others. Moreover, the floatation size serves as a proxy of uncertainty (Su and Fleisher, 1999; Chan *et al.*, 2004) and uncertainty will increase the risk for listing which results in a relatively long period to list as well.

A valuable exploration is found in the influence of the structure of shareholders on the hazard of listing of IPOs. Despite the contradictory influences by state-owned

and legal-entity-owned shares on IPOs issuing, the coefficients of both the ratio of state-owned shares (around 0.57) and the ratio of legal entity-owned shares (around 0.41) are significantly positive with the correspondingly high magnitudes of the hazard ratios in the model, which indicates the portions of state-owned shares and legal-entity-owned shares may increase the probability to listing. This demonstrates that uncertainty and risk can be decreased by the portion of state-owned and legal-entity-owned shares when new offerings are going to public (Mok and Hui, 1998) and the subscription can be fulfilled sooner than others. Moreover, the hazard ratios of state-owned shares are comparatively larger than those of legal-entity-owned shares overall, which also manifests our prediction about the priority and advantages about the structure of state-owned shares to assist an IPO to list. If forecasting, the structure of state-owned and legal-entity-owned shares compose two significant predictors for investors and issuers to assess the listing hazard within an expected period.

Another finding lies in the positive effect of the variable *SMR* (*offering* /-30 days) on IPOs' listing. It indicates that, as we assumed, the market sentiment does influence the final listing time and risk, i.e. a positive market sentiment can impress confidence on both issuers and subscribers and accelerate an IPO to list quicker. Therefore, issuers and underwriters need to detect whether the current market is in a positive sentiment or not and thus determine an accurate time to offering.

In our models, the coefficients of *Dummy (OL offering)*, *Dummy (PO offering)* and *Dummy (OL plus PO)* are all significantly positive with "the other offering methods" as a base case. This supports our discussion about the efficiency difference if issuers employ different offering methods in IPO issuing and, as regards time to listing, the efficiency of offering methods is in a descending order: the proportional offering, the

online plus PO offering, the online offering and then the other methods, such as saving linkage offering, private placement, selling subscription warrants, etc. Compared with the other mechanisms, the proportional offering shows its distinguishing advantage in assisting offerings to list quicker which is consistent with Ma and Faff's (2007) argument and our findings in chapter 4 that secondary market proportional offering ranks as the most efficient offering mechanism in the view of "underpricing".

However, surprisingly, the signals of "foreign shares issued before" and "providing the possible listing date in prospectus" don't impact on the duration to listing significantly. This implies that issuing foreign shares does not affect this issuer's A-shares to go to final listing quicker or slower. Although there exist some plausible arguments that information asymmetry can be decreased because subscribers can obtain additional firm-specific disclosures from foreign stock markets (Chen *et al.*, 2004), as regards the time to listing, we don't find any support for this signalling impact on new A-shares. Further, the effect of providing the possible listing date don't function greatly either, which may be the result of the low probability that IPOs can successfully list on the date that they published in the prospectus.

Interestingly, the prediction about underwriter reputation is not supported since the coefficient is not significant despite the values being positive. However, many empirical studies find significantly better capability in issuing by more reputable underwriters, including in price recommendation, allocation and aftermarket performance, etc (Carter *et al.*, 1998; Carter and Manaster, 1990). Further, some evidence indicates that IPOs can conduct offering after register sooner than others when underwritten by famous underwriters (Aggarwal, 2002). Why do the more reputable underwriters not perform better in assisting offerings to the eventual listing?

In order to reveal the underlying fact about the underwriters' effect on time to listing, we strata the total data by underwriters' rank and compare the difference of failure hazards in two groups. Table 5-5 depicts the average durations and figure 5-2 shows the failure proportions of IPOs grouped by 1st rank underwriters and non 1st rank underwriters.

In table 5-5, the average time to listing for the IPOs with 1st rank underwriters is shorter (29 days) than the average for the others with non-1st rank underwriters (32 days). From Figure 5-2, the hazard to failure doesn't show much difference between two groups when the failure proportion is below 0.82 (the corresponding time to listing is around 47 days); however, the advantage of the 1st rank underwriters becomes obvious when the failure hazard increases, i.e. IPOs which employ a more famous underwriter have higher probability to list soon after when this IPO hasn't listed until around 47 days. In general, we may conclude that the average time to listing is shorter when employing a reputable underwriter and, for those issuers who may encounter a high listing failure risk, the more reputable underwriters can assist them to list quicker.

5.5 The Effect of Issuing System and Issuing Year

The following studies extend the above Cox proportional hazard model and focus on the effect of heterogeneity on the dependent variable. We notice that from table 5-1, table 5-2 and figure 5-1, the durations to listing for IPOs show a strong endogenous effect of issuing system and time-related characteristics and thus we assume there may exist issuing system and time-period heterogeneity. Therefore, we conduct analysis with frailty shared by the IPO issuing system and the time-period heterogeneity respectively. The Cox frailty shared model is as follows:

$$\lambda_{ij}(t|x_{ij}) = \lambda_o(t) \alpha_j \exp(\beta' x_{ij}) \quad (5-6)$$

$$S_{ij}(t|x_{ij}) = S_o(t)^{\alpha_j \exp(\beta' x_{ij})} \quad (5-7)$$

The $\lambda_{ij}(t|x_{ij})$ in equation (5-6) and $S_{ij}(t|x_{ij})$ in equation (5-7) represent the hazard and survival probability of an IPO i issued in group j , where α_j is the frailty accompanied with the heterogeneity and is analogous to random effects in the regression model (Brooks *et al.*, 2009). We assume frailties are gamma distributed with a mean of 1 and a variance θ (Hougaard, 1995, 2000). The conventional $\exp(\beta' x_{ij})$ is consistent with the previous discussion that stands for the unconditional effect of the independent covariates x_{ij} , but it provides more implications when employed in this frailty shared model given that the effect of covariates diminishes in a particular group by the effect of the frailty. This extended model eliminates the heterogeneity effect on the listing hazard and the estimates are expected to be more meaningful.

Firstly, we estimate the model with the frailty shared by the heterogeneity of the issuing system, where the 1062 IPOs can be categorized into two groups: 776 IPOs with the Administrative Authorizing System and 286 IPOs with the Approval System respectively. This model assumes the exogenous effect related to issuing system on duration to listing is shared equally, i.e. the opportunities of IPOs for listing are same if they are issued under the same issuing system.

By comparing the results across table 5-4 and 5-6, although the effects of offering price and ratio of legal-entity-owned shares become insignificant, the other influences including issuing size, ratio of state-owned shares, $SMR_{(offering/-30\text{ days})}$ and the three allocation mechanisms still operate in assisting IPOs listing. The findings

indicate that, assuming each IPO has the same exogenous effect related to issuing system, the duration to listing is affected by its floatation size, level of state-owned shares, magnitude of market sentiment and which allocation mechanism it employs. This further manifests our assumption that an issuer could control some endogenous factors and make some actions to assist its offering listing although the specific final listing date seems to be arranged by the stock exchange.

Secondly, we conduct the analysis on the time-period heterogeneity. We separate all the 1062 IPOs into 12 groups according to their IPO year. In table 5-7, only *SMR (offering /-30 days)*, the ratio of state-owned and the ratio of legal-entity-owned shares remain significant with the positive coefficients, which indicates these three independent variables can assist IPOs listing faster even taking into account the effect of issuing year. However, for the other variables like offering price, issuing size and allocation mechanisms, these influences on listing diminish in favour of the frailty effect, i.e., the importance is decreasing for an IPO to choose what kind of allocation mechanism or employing a 1st rank underwriter, etc. compared with the choice to go public in a particular year. Take the period between 1998 and 1999 as an example, the average time to listing are much longer than the others, and an IPO tends to list slower if it decides to go public in this period, but another IPO with identical characteristics may list quicker if issued beyond this period. This also demonstrates the argument that offerings seem to list quicker in a positive market sentiment or with a high ratio of state-owned or legal-entity-owned shares.

5.6 Conclusion

This chapter analyses IPO's listing speed and hazard using the data of Chinese A-shares across 1994 to 2005. We firstly explain the two IPO issuing systems and their

effect on IPO's duration to listing. The Approval System is found to be more efficient than the Administrative Authorizing System since the IPO issuing procedure is simplified under the Approval System and most IPOs go to final listing within a half month.

Besides the exogenous effect from issuing systems, this chapter demonstrates there exist some endogenous factors which are related with an issuer itself and can improve the issuer listing faster. The findings include that: the listing probability is positively related to the offering price and negatively related to the floatation size; the portion of state-owned and legal-entity-owned shares can significantly assist the listing probability which supports our discussion about the advantage and priority of the state-owned and legal-entity-owned issuers in listing above others. We also find a positive market sentiment can accelerate the listing speed for an IPO. As regards the allocation mechanism, we divide the total IPOs into four types: online offering, proportional offering, online plus proportional offering and others. By generating three dummy variables with the last one as a base case, the findings indicate that the first three allocation mechanisms can assist IPOs list faster than using the other allocation methods, where the efficiency of allocation methods are in a decreasing order: PO, online plus PO, online offering and then the other offering types.

Further, the more reputable underwriters are found to be able to help IPOs listing faster when an IPO hasn't been listed until 47 days after offering and on an average, the time to listing of IPOs underwritten by more reputable underwriters are comparatively shorter than that of the others. However, we find that the signalling effects of issuing foreign shares previously and providing a possible listing date in prospectus don't impact on the timing of A-shares listing.

Finally, our modelling is extended to consider the impacts of IPO issuing systems and issuing years via frailty effects. We find that most endogenous factors still function assuming the opportunities of IPOs for listing are the same when issued under the same issuing system. However, the effect of underwriters, allocation mechanisms, offering price and floatation size diminish in favour of the effect of issuing year, which supplements the view that IPOs can list faster when offered in a positive market sentiment or with a high ratio of state-owned or legal-entity-owned shares.

Table 5-1 Descriptive Statistics of IPOs' Underpricing and Duration

Sample period	Sample number	Variable names	Mean	Maximum	Minimum	Std. dev.
1984-1993	331	Duration (days)	759.92	4046	10	974.54
		Initial-day return	1205%	38300%	-82.40%	4201%
1994 -2005	1062	Duration (days)	30.58	382	7	28.31
		Initial-day return	120.61%	830.21%	-32.72%	83.97%
Where:						
1994 – Feb, 2001	776	Duration (days)	35.61	382	7	31.55
		Initial-day return	131.11%	830.21%	-19.00%	85.25%
Mar, 2001- 2005	286	Duration (days)	16.92	39	10	4.14
		Initial-day return	93.49%	430%	-30.00%	71.94%

Table 5-2 Duration to Listing from 1994 to 2005

Duration to listing(days)	Number of IPOs												
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	total
Within 15	0	1	58	46	2	0	14	9	55	52	60	10	307
16 to 30	4	3	91	110	23	19	99	40	14	14	38	5	460
31 to 60	17	5	21	27	43	37	22	16	1	0	0	0	189
61 to 100	6	3	2	5	23	28	0	2	0	0	0	0	69
More than 100	12	1	0	0	11	9	4	0	0	0	0	0	37
Total	39	13	172	188	102	93	139	67	70	66	98	15	1062

Table 5-3 Descriptive Statistics for Independent Variables

Variable	Std.				
	Mean	Min	Max	deviation	Skewness
<i>Offer price</i>	6.961	1.400	36.680	3.140	2.731
<i>Ratio (state share) (%)</i>	25.765	0.000	95.429	29.755	0.506
<i>Ratio (legal entity share) (%)</i>	18.816	0.000	88.667	24.757	1.084
<i>Log(issuing size)</i>	8.401	6.908	13.122	0.797	1.048
<i>SMR (offering +/-30 days) (%)</i>	2.226	-26.181	58.900	11.343	0.738
<i>Dummy variables</i>	Count				
<i>Dummy(issuing foreign shares)</i>	30				
<i>Dummy(OL offering)</i>	597				
<i>Dummy(PO offering)</i>	325				
<i>Dummy(OL plus PO)</i>	90				
<i>DummyUnderwriter1st</i>	592				
<i>DummyT</i>	35				

Table 5-4 Estimation of Cox Proportional Hazard Models for IPOs' Duration to Listing

Variable	Std error of			
	Coefficient	coefficient	Hazard ratio	P-value
<i>Offer price</i>	0.022	0.009	1.023	0.022
<i>Ratio (state share) (%)</i>	0.574	0.121	1.776	0.000
<i>Ratio (legal entity share) (%)</i>	0.415	0.149	1.514	0.005
<i>Log(issuing size)</i>	-0.118	0.049	0.889	0.016
<i>SMR (offering +/-30 days)</i>	0.851	0.327	2.342	0.005
<i>Dummy(issuing foreign shares)</i>	-0.029	0.222	0.972	0.898
<i>Dummy(OL offering)</i>	0.673	0.189	1.961	0.000
<i>Dummy(PO offering)</i>	1.537	0.192	4.651	0.000
<i>Dummy(OL plus PO)</i>	0.858	0.218	2.358	0.000
<i>DummyUnderwriter1st</i>	0.102	0.067	1.108	0.127
<i>DummyT</i>	-0.292	0.198	0.749	0.141
<i>Log likelihood</i>	-5767.77			
<i>LR χ^2 (11)</i>	201.00			0.000

Table 5-5 Duration of IPOs Grouped by Underwriters

Duration(days)	Number of IPOs	Std.				
		Mean	Min	Max	deviation	Skewness
With 1 st rank underwriter	592	29.14	9	149	21.54	2.43
With the non-1 st rank underwriter	470	32.39	7	382	34.94	4.41
Total	1062	30.58	7	382	28.31	4.33

Table 5-6 Estimate of Cox Model with Frailty Shared by Issuing System

Variable	Std error of			
	Coefficient	coefficient	Hazard ratio	P-value
<i>Offer price</i>	-0.008	0.009	0.992	0.392
<i>Ratio (state share) (%)</i>	0.311	0.127	1.365	0.014
<i>Ratio (legal entity share) (%)</i>	0.121	0.153	1.132	0.419
<i>Log(issuing size)</i>	0.229	0.049	0.795	0.000
<i>SMR (offering +/-30 days)</i>	1.951	0.347	7.033	0.000
<i>Dummy(issuing foreign shares)</i>	0.219	0.225	1.246	0.328
<i>Dummy(OL offering)</i>	0.688	0.192	0.989	0.000
<i>Dummy(PO offering)</i>	1.132	0.199	3.102	0.000
<i>Dummy(OL plus PO)</i>	0.939	0.219	2.558	0.000
<i>DummyUnderwriter1st</i>	0.185	0.068	1.203	0.006
<i>DummyT</i>	-0.123	0.201	0.884	0.539
<i>Wald χ^2 (11)</i>	130.11			0.000
<i>Log likelihood</i>	-5709.75			
<i>θ</i>	0.317	0.306		
<i>group=2</i>				

Note: Standard errors of regression parameters are conditional on theta.

Table 5-7 Estimate of Cox Model with Frailty Shared by IPO Issuing Year

Variable	Std error of			
	Coefficient	coefficient	Hazard ratio	P-value
<i>Offer price</i>	-0.001	0.011	0.999	0.990
<i>Ratio (state share) (%)</i>	0.415	0.131	1.515	0.002
<i>Ratio (legal entity share) (%)</i>	0.354	0.157	1.425	0.024
<i>Log(issuing size)</i>	-0.034	0.053	0.966	0.521
<i>SMR (offering +/-30 days)</i>	1.668	0.346	5.303	0.000
<i>Dummy(issuing foreign shares)</i>	0.118	0.225	1.124	0.601
<i>Dummy(OL offering)</i>	0.447	0.289	1.563	0.123
<i>Dummy(PO offering)</i>	0.411	0.292	1.509	0.158
<i>Dummy(OL plus PO)</i>	0.132	0.327	1.141	0.687
<i>DummyUnderwriter1st</i>	0.053	0.069	1.053	0.453
<i>DummyT</i>	0.077	0.223	1.080	0.730
<i>Wald χ^2 (11)</i>	43.72			0.000
<i>Log likelihood</i>	-5627.90			
<i>θ</i>	0.789	0.307		
<i>group=12</i>				

Note: Standard errors of regression parameters are conditional on theta.

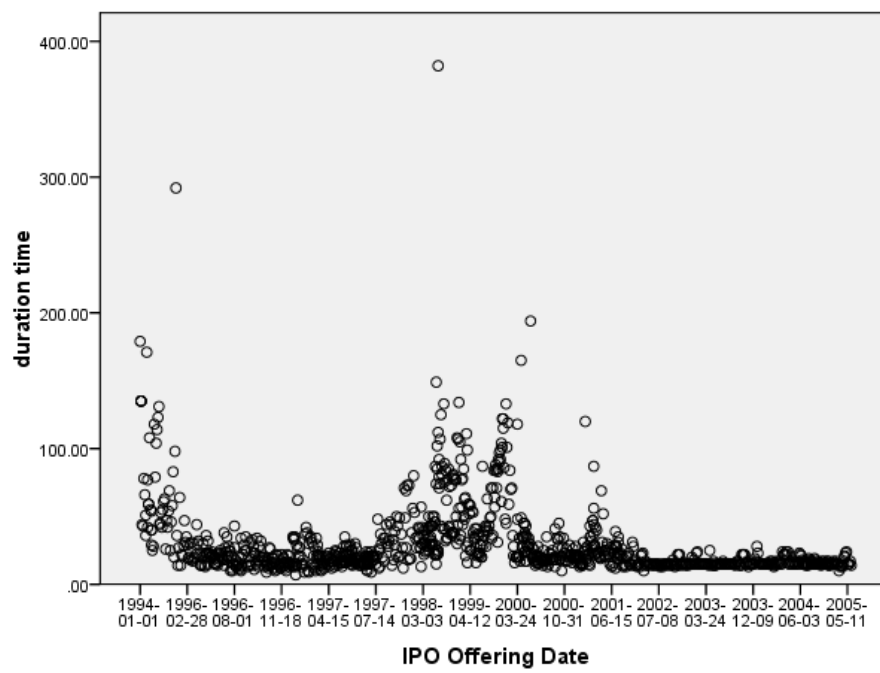


Figure 5-1 The Distribution of Time to Listing

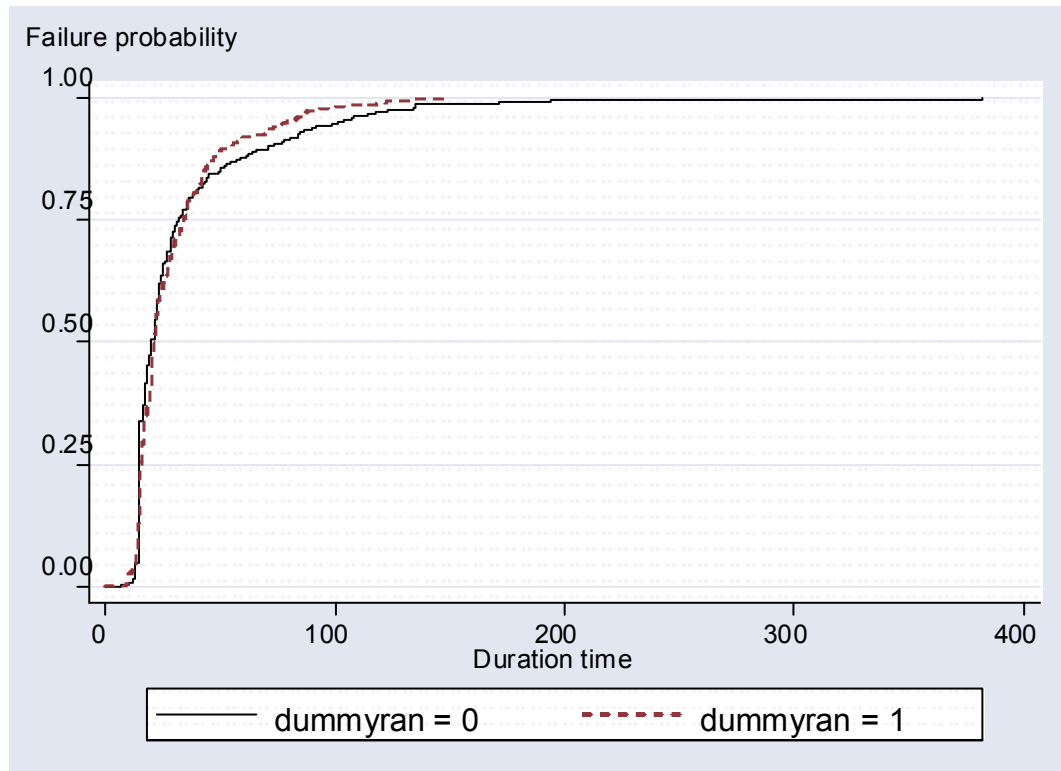


Figure 5-2 The Failure of IPOs Grouped by the 1st Rank Underwriters

Note: The cross point of two failure proportion lines is 0.82 where the corresponding time to listing is around 47 day.

Chapter 6 Detecting Hot and Cold Issuing Cycles Using A Markov Regime Switching Model

6.1 Introduction

This chapter focuses on detecting hot and cold IPO cycles in the Chinese A-share market using a Markov regime switching model. We introduce a set of observations to measure IPO activities, which include the numbers of IPOs issued, the levels of underpricing, the market conditions and the duration time from prospectus and listing, and thus establish a model to estimate these activities' average performance in hot and cold periods respectively. Further, this chapter depicts the turning points of hot and cold periods across the period from 1994 to 2005 for each observation. The cycles detected by the number of IPOs per month are the benchmark and then these cycles' robustness is tested by the other observations.

The phenomenon of “Hot IPO Markets” has been recognized for many years around the world. By reviewing the Chinese IPO market, we notice that IPO issuing clusters during some years, such as the period of 1992-1993, 1996-1998 and 2000 (See table 4-1). These phenomena indicate there may exist some hot issuing markets in China. Most literature on Chinese IPOs focuses on measuring underpricing but little attention has been paid to investigating IPO issuing cycles. Therefore, this chapter intends to detect hot/cold issuing periods in the Chinese IPO market.

The plan of this chapter is as follows. Section 6.2 describes our data, discusses the application of the Markov regime switching method in hot and cold issuing cycles and then further proposes the specific model in this chapter. Section 6.3 introduces four types of IPO activity observations to capture the hot/cold periods. Section 6.4 presents the results from the regime switching models and further lists the hot and cold IPO issuing periods and their turning points across 1994 to 2005. This section also exhibits the overlay of hot periods detected by each IPO activity. Section 6.5 draws some conclusions.

6.2 Data and Methodology

6.2.1 Data

The sample data comprise all the ordinary Chinese A-share IPOs issued from Jan, 1994 to Dec, 2005. The following four periods “Aug.-Nov., 1994, Feb.-May, 1995, Sep.-Dec., 2004 and Jun.-Dec., 2005” are removed from the final research sample because no IPO is permitted to go public during these periods under the CSRC’s restriction, therefore, there are in total 1061 ordinary A-share IPOs issued in 124⁶⁻¹ months included in our paper, with all B-shares, foreign shares, mutual funds and REITs excluded.

6.2.2 Methodology

To detect turning points of a continuous series Y_t , we need to define what a turning point is, i.e. how does one recognize a peak and a trough (Harding and Pagan, 2002).

⁶⁻¹ The outlier month "Aug. 1995" is deleted in the analysis. In this month, there is one IPO issued whose initial return is too high (548.26%) to be included in the analysis.

The problems come from the fact that some points might not be a real turning point because a hot or cold period has to persist for some time and therefore some turning points need to be eliminated if the phase is too short. In other words, the final turning points need to be checked by smoothing and filtering rules. Further, if we designate IPO activity as a binary random variable s_t taking the value of one in cold periods and zero in hot periods, we can segment the total time into such a binary series. Then we can apply a Markov-based Regime Switching model to solve this binary process problem.

The Markov-based regime switching model is proposed by Hamilton (1989) to analyse business cycles which views the parameters of an autoregression as the outcome of a discrete-state Markov process and assumes the density distribution of the current state ($s_t=0$ or $s_t=1$) is only based on the most recent turning point in a time series. Hamilton (1989) presents the algorithm for drawing probabilistic inference about whether and when the shifts may have occurred based on the observed behaviour in the form of a nonlinear interactive filter. By using the maximum likelihood method, the population parameters can be estimated and thus the econometrician can use this approach to forecast in the future.

The Markov-based regime switching model is widely used in economic fields, especially in detecting business cycles. Recently, this approach is used by many researchers to identify hot and cold issue periods in the IPO market. For example, Brailsford *et al.* (2000) apply this method in the US IPO market for 20 years of data. They employ a variety of variables to measure IPO activities that capture different

aspects of IPOs, including new issue volume, proceeds and underpricing. Based on this method, they finally mark off the turning points of hot and cold periods for this 20-year period.

To start the model, we need to assume an IPO market (s_t) may undergo two states $s_t=0$ or $s_t=1$ that represent whether the IPO market is in a hot period or in a cold period. This chapter is consistent with other studies not concerning interim parts between hot and cold periods (Hamilton, 1989; Brailsford *et al.*, 2000). We also assume IPO activities are independent and their transitions of states follow a first order Markov process, which means that the probability of the current state, hot or cold, is only based on the most recent state. The activity Y_t can be denoted by the following equation (6-1):

$$Y_t = \alpha_1 S_t + \alpha_2 (1-S_t) + [\sigma_1 S_t + \sigma_2 (1-S_t)] \varepsilon_t \quad (6-1)$$

where y_t is the measure of IPO activity. s_t is a binary state variable that denotes the unobserved state of system. The transitions of states are governed by a first-order Markov process, $P(s_t | Y_{t-1}, S_{t-1}) = P(s_t | s_{t-1})$. Where:

$$\text{Prob}(s_t=1 | s_{t-1}=1)=p$$

$$\text{Prob}(s_t=0 | s_{t-1}=1)=1-p$$

$$\text{Prob}(s_t=0 | s_{t-1}=0)=q$$

$$\text{Prob}(s_t=1 | s_{t-1}=0)=1-q$$

$$\text{and } \varepsilon_t \sim N(0, 1)$$

The probability of the current state being in a cold period ($s_t=1$) is decided by the last period state s_{t-1} . If last period is a cold period, the transition probability is p ,

otherwise it is $1-p$ for a transition from a cold period to a hot period. The switching probability from the last hot period to a current hot period is denoted as q , therefore, the probability from hot to cold is $1-q$. The probability of state observation follows a normal density function with means α_1 and variance σ_1 in a cold period or with means α_2 and variance σ_2 in a hot period. The object of the computation is to obtain the unknown parameter vector $\{\alpha_1, \alpha_2, p, q, \sigma_1, \sigma_2\}$ based on observations of IPO activity in each month.

6.3 IPO Activity Measures

We use eight observations that measure IPO activities to detect the IPO issuing cycles across the 124-month period. These observations reflect the IPO activities in four aspects, including the volume of IPOs, underpricing, market conditions and the duration from offering to listing.

First, consistent with other studies, we use the number of IPOs offered in each month to measure the volume fluctuation (Ibbotson *et al.*, 1994; Lowry, 2003; Loughran and Ritter, 2004; Brailsford *et al.*, 2000, 2004) and denote N_t as the number of IPOs issued in the month t . This is the most direct and immediate index to reflect the cycle of IPOs offering. The robustness of the detected cycles will be explored using the other observations.

The second type of observations employed is the average initial returns of all IPOs issued each month. We use two calculations of initial returns, IR_t and MIR_t , where IR_t represents the average initial return in month t while MIR_t is revised by stock

market return. Both take each IPO equally weighted, i.e. IPOs of small firms have the same influence as IPOs of large firms on the overall result (Lowry and Schwert, 2002).

$$IR_t = \sum (P_{t,i,1st} / P_{t,i,0}) / N_t \quad (6-2)$$

$$MIR_t = \sum [(P_{t,i,1st} / P_{t,i,0}) - (M_{t,i,1st} / M_{t,i,offering})] / N_t \quad (6-3)$$

where IR_t is the average initial return in the month t . $P_{t,i,1st}$ is the closing price of stock i issued in the month t on the first trading day and $P_{t,i,0}$ is the offer price of stock i . MIR_t is the average stock market adjusted initial return in the month t . $M_{t,i,1st}$ is the corresponding SHSE or SZSE A-share composite index of stock i issued in the month t on the first trading day and $M_{t,i,offering}$ is the SHSE or SZSE A-share composite index on stock i 's the offering day. N_t is the number of IPOs in the month t .

Market condition has been given great attention in detecting hot IPO markets and has been found to impact on IPO issuing significantly (Brailsford *et al.*, 2000; Chen *et al.*, 1986; Harvey, 1988). However, researchers have to select some certain parts to measure sentiment because market condition refers to all kinds of economic aspects concerning IPOs. Some studies even separate market conditions in two categories and investigate their influences on IPO issuing separately: market return and investors sentiment (Lowry, 2003). Thus proxies are employed to measure market condition, such as average composite stock market index, secondary market trading volume, term premium, fund return, market to book ratio, EW market return, etc (Lowry, 2003; Chen *et al.*, 1986; Harvey, 1988; Brailsford *et al.*, 2000; Loughran

and Ritter, 2000). These variables reflect market condition in different aspects according to different research purposes.

In chapter 5, we only use $SMR_{(offering \text{ } \pm 30 \text{ days})}$ to observe the market sentiment. But the issuing cycles are assumed to be affected by market conditions greatly, which deserves much more attention. Therefore, in order to reflect market conditions clearly, we employ four variables in this chapter and measure the changes of the market condition: $(Tradingvolume)^{6-2}$, $SMR_{t(1st)}$, $SMR_{t(offering \text{ } \pm 30 \text{ days})}$ and $SMR_{t(offering \text{ } \pm 60 \text{ days})}$ to detect the market sentiment.

Tradingvolume is the trading volume of the secondary stock market:

$$Tradingvolume_t = (\sum Tradingvolume_m) / M_t \quad (6-4)$$

where $Tradingvolume_m$ is the ordinary A-shares trading volume in the SHSE for the m th day of the month t ($m=1, 2, 3, \dots, 31$). M_t is the number of days of the month t .

$SMR_{t(1st)}$ is the month t 's average stock market return on stock i 's first trading day compared with offering day.

$$SMR_{t(1st)} = \sum [(M_{t,i,1st} / M_{t,i,offering}) - 1] / N_t, \quad (6-5)$$

where $M_{t,i,1st}$ is stock i 's corresponding SHSE or SZSE A-share composite index on the 1st trading day in the month t and $M_{t,i,offering}$ is the stock i 's corresponding composite index on the offering day.

$SMR_{t(offering \text{ } \pm 30 \text{ days})}$ is the month t 's average stock market return on the stock i 's offering day compared with 30 working days before the offering:

⁶⁻² We use the stock market trading volume on the SHSE. The SHSE and SZSE are highly correlated with each other, so we don't add SZSE's indices.

$$SMR_{t(offering / -30days)} = \sum [(M_{t,i, offering} / M_{t,i, -30 days}) - 1] / N_t, \quad (6-6)$$

where $M_{t,i, -30 days}$ is stock i 's corresponding SHSE or SZSE A-share composite indexes on the 30th working day before the offering day.

$SMR_{t(offering / -60 days)}$ is the month t 's average stock market return on the stock i 's offering day compared with 60 working days before the offering:

$$SMR_{t(offering / -60days)} = \sum [(M_{t,i, offering} / M_{t,i, -60 days}) - 1] / N_t, \quad (6-6)$$

where $M_{t,i, -60days}$ is stock i 's corresponding SHSE or SZSE A-share composite indexes on the 60th working day before the offering day.

These four variables reflect the stock market condition and trends in different aspects.

$Tradingvolume_t$ tracks the overall stock market and describes market condition in a month interval. The other three measures differ from a recent period to a longer period compared with an IPO's offering and listing, where $SMR_{t(1st)}$ represents the average market change between offering and listing which is consistent with explaining stock market sentiment after offering. The other two variables measure market changes across 30 and 60 working days before the offering date respectively.

One of the advantages of these measures is that we can detect how closely the stock market's change is correlated with the date of a new offering in both the short and long-term. Specifically, when offering, more positive market condition leads to higher initial returns and more companies are willing to go public soon thereafter.

The last observation is the duration time from offering to listing. We find that IPOs can list faster during positive market sentiment especially in hot periods in chapter 5.

The findings indicate that offerings can be filled and listed within a shorter time and

more easily in a positive market. This chapter continues to check the relationship between this duration and the hot/cold issue period and we assume that the waiting time from prospectus to listing will be shorter if issuers and investors detect a hot market.

$$D_t = (\sum D_{t,i}) / N_t, \quad (6-8)$$

where D_t is the average duration days of all IPOs issued in the month t . $D_{t,i}$ is the duration days between prospectus and listing of stock i which is offered in the month t .

All the IPOs are clustered according to their offering month and the monthly data is generated. There are 124 months included in our final database. Table 6-1 and Figure 6-1 depict the descriptive statistics and trends of each issuing month for each variable, which measures IPO activity in different respects. From table 6-1, the number varies from zero to 40 IPOs going public in a month with an average number of 8.50 IPOs per month. For underpricing, the means of the initial return IR_t (109%) and the market adjusted initial return MIR_t (107%) don't show much difference. As regards market conditions, $Tradingvolume_t$ averages at 13.64 billion with the minimum 0.63 billion and the maximum 53.54 billion. The average $SMR_{t(1st)}$ is around -0.25% and ranges from -27.15% to 28.81%. For the other two variables $SMR_{t(offering \text{ } \pm 30 \text{ days})}$ and $SMR_{t(offering \text{ } \pm 60 \text{ days})}$, it can be found that the means increase in an ascending order as do the ranges of these three variables, which reflect the stock returns as well as the uncertainty and risk may increase when the time horizon

becomes longer. For the last variable, the average duration time between offering and listing is 31.52 days and ranges from 7 to 110 days⁶⁻³.

In figure 6-1a, it is very obvious that the issuing of IPOs fluctuate greatly across these 12 years. Generally, there are three periods that the IPO market witnesses contraction: Apr. 1994-Dec. 1995, Oct. 1999-Feb. 2000 and Sep. 2001-Feb.2002. While, we also find that there are some booming periods specifically: May. 1996-Jun. 1997, Apr. 2000-Jan. 2001 and Feb. to Aug. 2004. These alternating issuing changes between large and small quantities make it very promising for us to continue exploring hot and cold issue periods.

In figures 6-1b and 6-1c, the time series trend of IR_t and MIR_t are similar across these 12 years. Generally, the levels of underpricing (both IR_t and MIR_t) are comparatively higher after 1997 and before 2003 with the other years in a lower stage. They both underwent contraction periods between 1994 and 1995 and then began booming from the middle of 1996. These expansion periods ended at around the middle of 1997, followed by another booming period from the second quarter of 2000 and ended at 2001. These trends indicate there exists a relationship between underpricing and numbers of IPOs across these 12 years. Promisingly, the fluctuations of underpricing and number of IPOs show some similar changes in the time series.

⁶⁻³ Because there is no IPO issued in some months, the corresponding days of that month will be recorded as zero days. From 1994 to 2005, the minimum time for an issuer to wait is 7 days.

With respect to the market conditions, $Tradingvolume_t$ might be found to undergo a slight increase in an overview which runs through the whole period. This suggests the Chinese stock market has been developing during these 12 years. However, this increasing trend is accompanied by many fluctuations. Generally speaking, the stock trading volume is in a lower stage from 1994 to 1995 and then it steps into the first flourish period between mid. 1996 and mid. 1997. The second thriving of trading can be found in mid. 1999-mid.2000. Then the levels of trading volume fall to a relatively lower range and this situation lasts for more than one year and stops at early 2002. Since 2002, the secondary stock market witnesses a few severe fluctuations that are accompanied with some booming periods simultaneously. The Chinese stock market undergoes the most flourishing period between Nov. 2003 and Apr. 2004.

For the other three market condition observations, $SMR_{t(1st)}$ measures the changes of the stock market between the offering date and the listing date. In figure 6-1e, most figures of $SMR_{t(1st)}$ ranges between -20% and 20% and fluctuate closely around the mean -0.25%. Generally speaking, the extent of fluctuations after the year 2000 becomes less than in previous years. In figures 6-1f and 6-1g, both returns of $SMR_{t(offering \pm 30 \text{ days})}$ and $SMR_{t(offering \pm 60 \text{ days})}$ are very low and stay below zero before the middle of 1995. Since the middle of 1996 the figures of both measures turn to be increasing. Since 1998 the fluctuations of these two measures are closely around their means and don't show too much bias to either the positive or negative side.

For the last variable duration time from prospectus to listing, there are two periods that IPOs have to wait for a comparatively longer time to see their offerings listing: Jan. 1994~Jul. 1995 and Jun.1998~Dec.1999. In these two periods, the monthly average waiting time may exceed 50 days and some are even up to 100 days. For the other periods, the monthly average time is comparatively lower at around 30 days and this figure decreases to 15 days after 2002.

6.4 Regime Switching Results and Hot and Cold Issuing Cycles

Table 6-2 depicts the optimal estimates and their standard errors for each IPO activity measure from the regime switching analysis. It can be found that in general the means (α_1) in cold periods of most activities (except duration) are lower than those in hot periods (α_2). In addition, most of the standard errors are lower in cold periods⁶⁻⁴.

From table 6-1, we know the average number of IPOs issued per month is 8.50 for the entire period from 1994 to 2005. However from table 6-2, the average IPO quantities are found to be of great difference between cold and hot periods. During cold periods, there are on average 4.93 IPOs going public in a month with a standard error of 0.53 IPO. However, during hot periods the average number of issued IPOs is

⁶⁻⁴ 1. For all IPO activity measures, the estimate in cold periods α_1 is generally smaller than the estimate in hot periods α_2 ($\alpha_1 < \alpha_2$) except the variable “duration”. The observation “ D_t ” is just a reverse. In hot periods, it is assumed that duration time will be shorter than that in cold periods, therefore, for average duration α_1 in cold is bigger than α_2 in hot ($\alpha_1 > \alpha_2$). 2. Meanwhile, the sample for the observation “ D_t ” is from 1994 to 2001 with 87 months. There is no regime switches for “ D_t ” in the sample from 2002 to 2005.

15.91, which is almost triple the issued IPOs in cold periods although the variation (with the standard error of 2.58 IPOs) is much higher than in cold periods. This difference demonstrates that the Chinese IPO market does experience contractions and expansions over the 12 years in the point of average IPO numbers. Further, the estimated probability of “staying in a hot period” is 0.86 while “staying in cold period” has a higher probability of 0.93.

The levels of underpricing during hot periods are much higher than those in cold periods, averaging 159% compared to 66% for IR_t (or similarly 136% compared to 67% for MIR_t). For both observations of underpricing, the average levels in hot periods are almost double than those in cold periods. The transition probabilities for p and q are both around 0.92-0.95 for IR_t and MIR_t . IR_t and MIR_t don't exhibit significant differences in descriptive statistics, but there is some difference in the estimated values from the regime switching analysis.

For the stock market conditions, the average trading volume ($Tradingvolume_t$) of the secondary stock market for a single month in hot periods is 23.15 billion, but in cold periods, 8.58 billion stocks are exchanged on average in a single month. The trading activities are usually found to be more active when traders detect a hot stock market; meanwhile, the IPO market tends to be more active as well. During the period of 1994-2005, the trading volume in hot periods is almost three times that in cold periods, which may influence IPO cycles greatly. The probability for “staying in a cold period” (0.95) is a little larger than the probability for “staying in a hot period” (0.90), which is alike with the situation of the observation “number of IPOs”.

$SMR_{t(1st)}$, $SMR_{t(offering / -30 \text{ days})}$ and $SMR_{t(offering / -60 \text{ days})}$ indicate significant differences of the stock market returns between hot periods and cold periods. These three measures show the average means 0.28%, 1.00% and 4.99% in hot periods but much lower means of -0.49%, -0.46% and -1.68% in cold periods. In hot periods, the stock market's indices in offering date increase compared with months ago, which indicates an optimistic market sentiment in hot periods. However, in cold periods, the stock market undergoes a decreasing trend, so the stock market returns are negative figures. These three variables measure stock market sentiment across different durations in an order of "short to long" and "near to far" and thus their corresponding parameters can exhibit the trend of market sentiment very clearly.

For the duration (D_t), we find there is a structural break between 1994-2001 and 2002-2005. Since 2002, the average duration days for most offerings are not as variable as in previous years and decrease to around 15 days which doesn't change till the end of our data. It has been proved that duration between offering and listing influences the level of underpricing significantly in many papers (Chan *et al.*, 2004; Chen *et al.*, 2004), but we find in chapter 4 that duration won't affect underpricing anymore if this duration time is shortened to a half month. Therefore, we break the total 124 months into two parts and conduct the analysis respectively.

The first part comprises 87 months from 1994 to 2001. During these years, the average duration time for offerings listing is only 23 days in hot periods but 61 days in cold periods. Meanwhile, the standard error of the duration in hot periods (5 days)

is much lower than that in cold periods (41 days). The probabilities are both 0.96 for a month “staying in cold period” or “staying in hot period”.

There are 37 months in the second part for the period 2001-2005 and no regime switching is detected for this period because most values are around 15 days and not applicable for regime switching.

Figures 6-2(a~h) graph each variable's smoothing probability $P(s_t = 0 | Y_{t-1})$ across these 124 months and those durations are highlighted if the probability exceeds 0.5, which means that the corresponding periods may follow a hot issuing period. At the end of each graph, it also lists the corresponding hot and cold periods and their turning points across these 12 years detected using the Markov regime switching analysis. We take the observation of IPO numbers as the benchmark and use the other observations to test the robustness of the cycles. There may be some lag periods between the cycles detected by the IPO numbers and those by the other observations according to others' research findings (Ibbotson *et al.*, 1994; Lowry and Schwert, 2002; Brailsford *et al.*, 2004).

As regards to cycles, the segmentation method is of great value. Normally the average duration for a cold (hot) period is determined by the rule $1/(1-p)$ ($1/(1-q)$) (Hamilton, 1989; Harding and Pagan, 2002). If we take p or q as 0.9, the segmentation period for a hot or cold period is 10 months. However, Brailsford *et al.* (2004) argue that six months would be optimal segmentation duration for a hot or cold period because of economic factors or investor sentiment's effect on the stock market. Moreover, Lipman (1997) puts forward that institutional and regulatory

features induce lags between the corporate manager's decision to issue and the listing date. These lags have been estimated to be somewhere between three to six months. Therefore, this paper follows Brailsford *et al.* (2000) 's segmentation duration and takes six months as the minimum phase for a real hot or cold period. However, there are only 124 months in our data and some important phases and fluctuations may be ignored if we take six months as the minimum criterion. Therefore, as a supplement, this paper still extracts those periods which are less than six months but longer than three months ($3\text{months} \leq 6\text{months}$) and names them as "quasi-hot" or "quasi-cold" periods. Although the duration of these quasi-periods does not seem long enough, they make a contribution to explain IPO issuing cycles.

In figure 6-2a, the smoothing probability $P(s_t = 0 | Y_{t-1})$ for the number of IPOs fluctuates greatly between hot and cold periods. There are five cold issue periods that are detected according to its smoothing probability $P(s_t = 0 | Y_{t-1})$: Jan.1994~Apr.1996, Jul.1998~Jun.1999, Oct.1999~Mar.2000, Mar.2001~Mar.2004 and Sep.2004~May.2005, where the first and fourth periods are extremely long which last for almost more than 2 years. There is one quasi-cold period Nov.1997~Mar.1998 identified as well. The hot periods are relatively less apparent: May.1996~Oct.1997 and Apr.2000~Feb.2001 last for around one year and the other three seem much shorter which could be only named as quasi-hot periods. In general, the Chinese IPO market has a higher probability for staying in a cold period for 85 months with a $P(s_t = 0 | Y_{t-1})$ less than 0.5. In comparison, the probability for encountering a hot issue market is lower because there are only 39 months with a

$P(s_t=0|Y_{t-1})$ larger than 0.5. Meanwhile, the stability for the hot issue market seem not as robust as that for the cold issue market which could be gauged from that most hot periods are only quasi ones which are longer than 3 months but less than 6 months.

The underpricing of new issues has been adopted to detect and explain the hot issues widely (Ritter, 1984; Brailsford *et al.*, 2000). Figure 6-2b and 6-2c list the regime switching results for IR_t and MIR_t . In comparison with the cycles detected by the “number of IPOs”, the changes of underpricing seem less variable and much clearer in terms of the identification of periods. The two observations of underpricing undergo great similarity for switching tracks, where two long periods with $P(s_t=0|Y_{t-1})$ larger than 0.5 can be observed: Oct.1996~Oct.1998 and May.1999~Jan.2003; while the cold periods are relatively short: Jan.1994~Jun.1995, Nov.1995~Sep.1996 and Feb.2003~May.2005. Generally, for IR_t , the probability of “staying in hot periods” is larger than that of “staying in cold periods” with 71 months to 53 months. Similar interpretations are for MIR_t (74 months to 50 months).

It is interesting that the cycles detected by underpricing don't exactly overlap those found by the number of IPOs. This is not unusual because there have been many arguments about the existence of a lag period between the current high initial returns and the future large volume of issuers (Ritter, 1984; Brailsford *et al.*, 2000). Ritter (1984) proposes that hot issue market (monthly average initial returns) periods are usually followed by a large and prolonged increase in the volume of initial public offerings. In our sample, the high IR_t period of 1995-1996 is followed by the hot IPO

volume N_t period of 1996-1997; the hot IR_t period of 1997-1998 is overlapped and followed by the hot N_t period of 1997-1998 and beginning-mid, 1998; and the hot IR_t period of “1999 afterwards” is overlapped and followed by Jul.1999~Sep.1999 and 2000-2001 in N_t . However, we don’t find similar relationship between the two kinds of activities for the period of 2001-2004.

Ritter (1984) argues that the relationship between high levels of underpricing and large volume of IPOs can be explained by monopsony exploitation. He says issuers in a market segment, which is subject to monopsony exploitation, get the best deal by going public immediately after a hot issue market period of high average initial returns: they receive large sums for comparatively little equity (Ritter, 1984). The current underpricing can serve as a signal for issuers, which results in the expectation that their offerings could be valued more than in cold periods.

Figures 6-2(d~g) show the regime switching results for the four observations of market conditions. For the *tradingvolume_t*, it experiences an extremely long cold period from Jan.1994 to May.1999, although there is a spark around 1997. The first quasi-hot period is very short which lasts for only 4 months and then it steps into a quasi-cold period afterwards. The first real hot period begins from Feb.2000 and ends on Sep.2000. These two hot periods are parallel with the same time detected by the number of IPOs. After 2002, the *tradingvolume_t* still witnesses two hot periods.

The other three observations' results are quite promising and valuable as well, in comparison to the number of IPOs, these three observations generate less fluctuations. Meanwhile, these three measures show high similarity in regime

switching, especially in the first several years. From 1994 to mid. 1997, all these three measures are more probable staying in hot, where the period from 1996 to 1997 is parallel with the hot period by N_t . Since 1999, the cycles detected by these market condition observations become coincident with the cycles done by N_t greatly, especially for $SMR_{t (offering \pm 60 \text{ days})}$ which can be gauged from the accordance of the cycles listed in graph 2g and graph 2a.

Market condition is thought to be very informative to address why most issuers would like to go public in hot periods. Although the pricing of offerings is fundamentally based on the natural value of a firm and its development in the future, the market conditions can strongly influence an IPO to be over-valued. In a hot period, capital supply increases in comparison to in a cold period, so investors would like to show higher expectations and are willing to subscribe. Therefore, offerings can be sold at a higher price or with a larger floatation size without an increasing risk of failure. This is plausible to explain why most issuers prefer to go public in a hot period. A second argument probably comes from the underwriters' suggestion about the optimal time of offering (Brailsford *et al*, 2000). An underwriter would prefer to advise issuers to go public and thus they can benefit more from the higher profit related with the final proceeds the issuers gained. Lowry (2003) indicates if individual investors are occasionally overoptimistic and willing to pay more for firms than they are worth, then value-maximizing managers will issue equity during these periods of high investor sentiment.

In order to explain the relationship between market condition and IPO cycles, we take the period of 1999-2002 as an instance. The CSRC takes some actions to motivate the stock market sentiment in 1999 via justifying insurance capital to trade in the stock market, permitting securities companies to mortgage stocks to banks, etc. Thus the stock market becomes booming from mid.1999. Accordingly, the IPO market makes an instant reflection simultaneously (in figure 6-2a) and then a hot period (Jul.1999~Sep.1999) comes into being. A second positive market sentiment continues from Feb. 2000 and closely is followed by a lagged and prolonged hot issue period of new offerings (Apr.2000~Feb.2001, in figure 6-2a). However, the secondary market condition turns to be negative from late 2000 and then five months later, the N_t follows up to cold from Mar.2001.

Figure 6-2h draws the smoothing probability $P(s_t = 0 | Y_{t-1})$ of observation “duration time between prospectus and listing” across 87 months from 1994 to 2001. This variable's regime switches of hot and cold periods are quite clear and come up alternately. Compared with other measures, the cycles of D_t are the least fluctuated and seem stay in hot and cold periods evenly, where on average 45 months are in cold periods with another 42 months in hot periods. As regards to the activity D_t , almost two regimes can be determined according to its smoothing probability $P(s_t = 0 | Y_{t-1})$. The two hot periods Dec.1995~Oct.1997 and Jun.1999~Dec.2001 overlay the hot issue periods detected by N_t , which demonstrates there exists a coincidence between the average short waiting time to listing and a hot IPO issue market. Since

2002, the average time to listing is around 15 days and lack of variability, so no regime switches.

The duration to listing is thought to be informative in addressing IPO hot issues (Lee *et al.*, 1996; Mok and Hui, 1998; Chen *et al.*, 2004; How *et al.*, 2007; Brooks *et al.*, 2009). The time to listing is related to risk and information asymmetry (Mok and Hui, 1998; Chan *et al.*, 2004). We also assume that potential investors are willing to subscribe to new offerings in hot periods to earn higher initial returns; therefore, the uncertainty and risk are situated at comparatively lower levels. The finding in chapter 5 demonstrates that the probability of listing increases when an IPO is issued in a positive market. The results in this regime switching analysis further supplement the argument about the combination of the average short duration to listing and large volume of new offerings in some periods.

For most observations, more than 3 cycles (where a cycle represents one full hot period and one full cold period) are detected. If we take into account quasi-periods, we could even detect more than six cycles spanning these 12 years and this aggravates fluctuations and uncertainty for IPO issuing, as well as investing risk for investors.

Figure 3 graphs the overlays of hot periods across these 124 months with each IPO activity measure respectively. We take the cycles recognized by the number of IPOs as the benchmark and check their robustness using the results detected by the other observations.

There are two hot periods are detected by observation N_t , where the first period May.1996~Oct.1997 is parallel with the hot periods done by all the other observations except the $tradingvolume_t$; and Apr.2000~Feb.2001 is overlapped by the periods detected by most variables except $SMR_{t(1st)}$. Therefore, these two hot periods are of great robustness. Meanwhile, the quasi-hot periods Jul.1999~Sep.1999* is also robust to some extent because it is recognized as hot by most observations as well (except D_t). Similarly, the cold periods Jan.1994~Apr.1996, Jul.1998~Jun.1999, Mar.2001~Mar.2004 are robust to some extent as well.

The cycles may not overlap exactly when detected by the different variables. This is consistent with others' studies (Ritter, 1984; Brailsford *et al*, 2000), because there may exist some lagged time between the high levels of underpricing or positive market sentiment and the real flourishing of IPOs. It is argued the reason may come from the IPO issuing process in that institutional regulations and legal requirements delay the real offering day although issuers would like to take advantage of the perceived improvement in valuations as soon as possible (Lipman, 1997; Brailsford *et al.*, 2000).

It is important to raise the discussion that the IPO cycles don't come into being independently and is influenced by numerous factors, such as economic conditions, capital supply, political regulations and other uncertainty, etc. For example, the Chinese central bank declares reducing interest several times continuously in 1996. Immediately, the secondary stock market becomes booming and soon after the IPO

market begins to flourish. However, the Chinese macro economy steps into contraction from mid.1997 and the stock market makes an instant reflection to turning into “cold period” which can be gauged from the trends of $SMR_{t(1st)}$, SMR_t (*offering +/-30 days*) and SMR_t (*offering +/-60 days*). The N_t follows up to be cold too in a couple of months. Similarly, the hot issue period Apr.2000~Feb.2001 is influenced by economic conditions and stock regulations as well. This hot period is triggered by encouraging regulations concerned in stock market. During this period, we notice that almost all the observations experience flourishing, including the IPO numbers, the levels of underpricing, the market sentiment and the listing speed. However, the reform of state-owned shares through the trading gate leads the stock market to a long bear market since 2001. As a result, the IPO market steps into cold in the same time. Therefore, we have to say the cycles of IPO market are not independent and may be influenced by many factors.

6.5 Conclusion

This chapter employs four types of IPO activity measures (monthly data) to detect hot and cold cycles and their turning points for the Chinese A-share IPO market across 1994 to 2005 by using Markov regime switching models. These observations measure the number of IPOs issued, the levels of underpricing, the trading volume of each month, the three stock market returns across different periods ($SMR_{t(1st)}$, SMR_t (*offering +/-30 days*) and SMR_t (*offering +/-60 days*)) and the listing speed. Our findings

demonstrate that the features of a hot period include a large volume of new offerings, high underpricing, strong market conditions and quick subscribing and listing speed. The hot and cold periods (including quasi-periods) and their turning points are detected clearly by each IPO activity measure and mostly more than three cycles are recognized. For the benchmark observation N_t , we recognize 2 hot periods, 3 quasi-hot periods, 5 cold periods and 1 quasi-cold periods. The following periods are tested to be robust by using the other measures as comparison: the two hot periods May.1996~Oct.1997, Apr.2000~Feb.2001, one quasi-hot Jul.1999~Sep.1999 and three cold periods Jan.1994~Apr.1996, Jul.1998~Jun.1999, Mar.2001~Mar.2004.

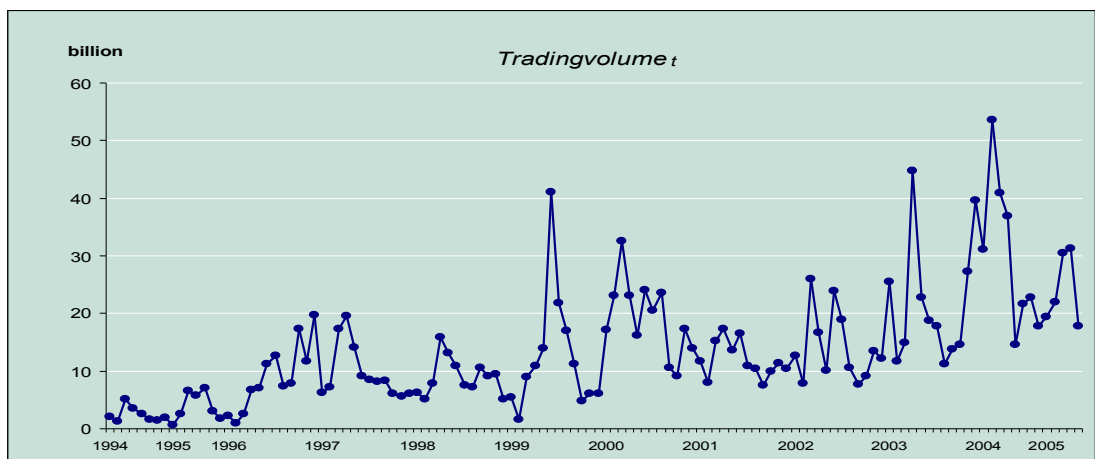
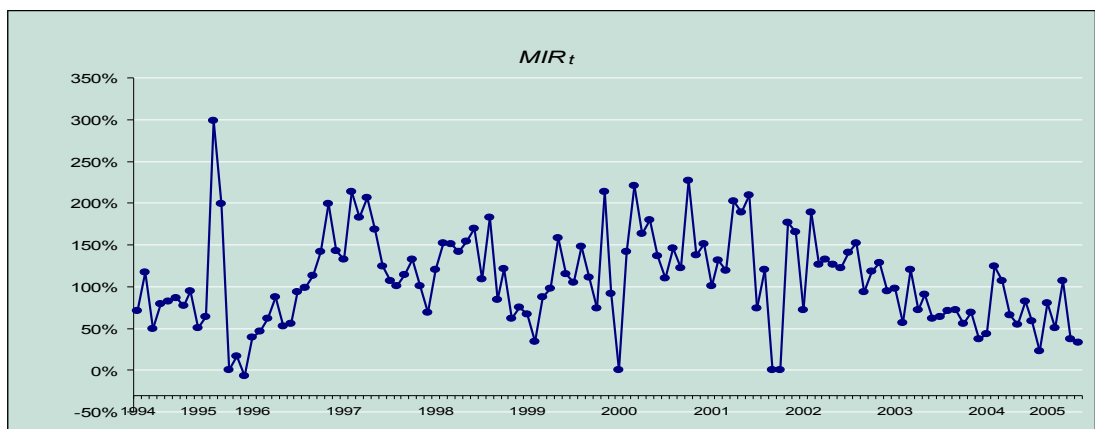
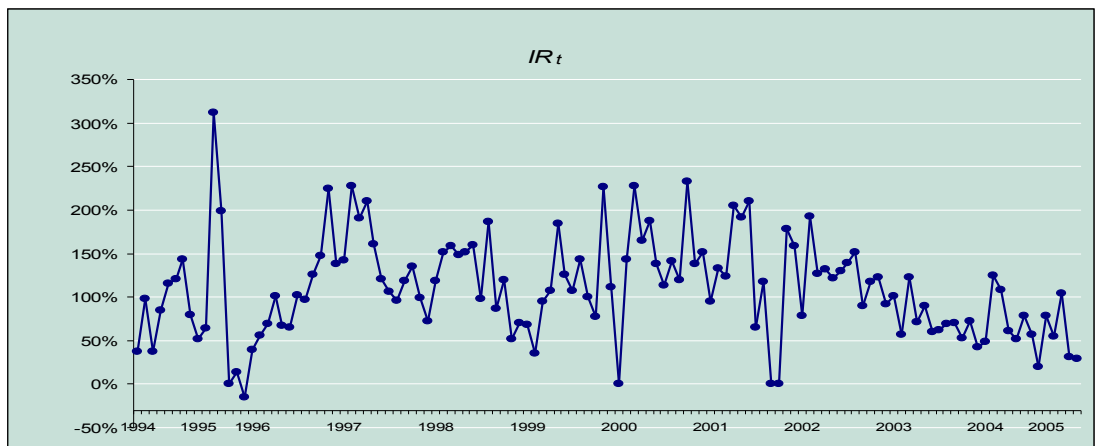
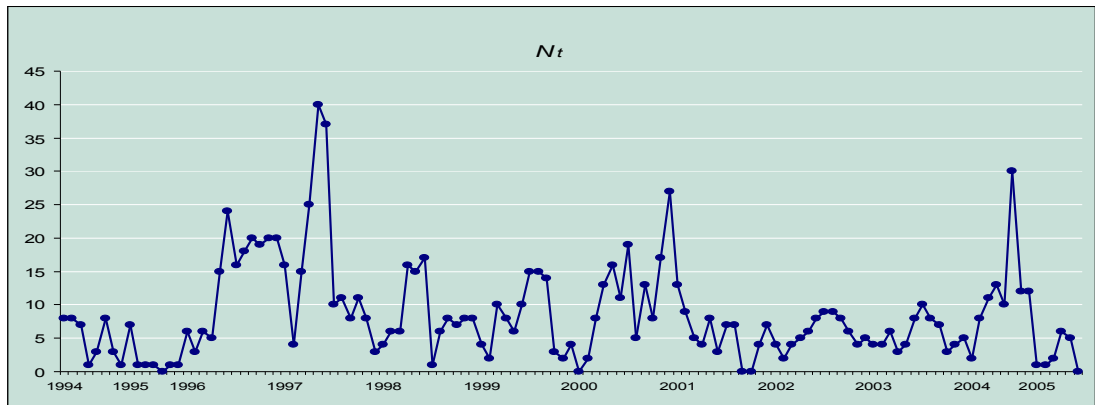
Table 6-1 Descriptive Statistics of all IPO Activity Measures

Variable	N	Mean	Std. Deviation	Minimum	Maximum
N_t	124	8.50	0.64	0.00	40.00
$IR_t(\%)$	124	109.56	5.18	-15.31	312.44
$MIR_t(\%)$	124	107.58	4.97	-6.71	298.26
$Tradingvolume_t$	124	13.64	0.88	0.63	53.50
$SMR_{t(1st)}(\%)$	124	-0.25	0.07	-27.15	28.81
$SMR_{t(offering \text{ } \pm 30 \text{ days})}(\%)$	124	0.07	0.08	-24.00	31.00
$SMR_{t(offering \text{ } \pm 60 \text{ days})}(\%)$	124	1.12	1.31	-33.00	45.00
$D_t(\text{days})$	124	31.52	2.04	0.00	110.00

Note: The $tradingvolume_t$ is degraded by 1,000,000,000.

Table 6-2 The Regime Switch Estimates for Each IPO Activity Measure

IPO activity Measure	Parameter	α_1	α_2	σ_1	σ_2	p	q
N_t	Estimate	4.93	15.91	2.86	6.61	0.93	0.86
	Standard Error	0.53	2.58	0.38	1.76	0.04	0.09
	Likelihood: 161.32						
IR_t	Estimate	0.66	1.59	0.33	0.50	0.93	0.92
	Standard Error	0.09	0.27	0.07	0.21	0.08	0.07
	Likelihood: 43.48						
MIR_t	Estimate	0.67	1.36	0.29	0.52	0.94	0.95
	Standard Error	0.07	0.20	0.05	0.15	0.06	0.04
	Likelihood: 35.03						
$Tradingvolume_t$	Estimate	8.58	23.15	4.70	9.89	0.95	0.90
	Standard Error	0.92	3.63	0.64	2.38	0.04	0.12
	Likelihood: 182.38						
$SMR_{t(1st)}$	Estimate	-0.49%	0.28%	0.05%	0.12%	0.97	0.93
	Standard Error	0.01%	0.03%	0.01%	0.02%	0.04	0.09
	Likelihood: -62.14						
$SMR_{t(offering \text{ } \pm 30 \text{ days})}$	Estimate	-0.46%	1.00%	0.06%	0.13%	0.97	0.94
	Standard Error	0.01%	0.04%	0.01%	0.03%	0.04	0.08
	Likelihood: -53.17						
$SMR_{t(offering \text{ } \pm 60 \text{ days})}$	Estimate	-1.68%	4.99%	0.07%	0.19%	0.95	0.93
	Standard Error	0.01%	0.06%	0.01%	0.04%	0.04	0.07
	Likelihood: -34.10						
$D_t \text{ (days)}$	Estimate	61.09	23.47	42.28	5.89	0.96	0.96
	Standard Error	11.72	1.69	8.33	1.36	0.05	0.05
	Likelihood: 160.93						



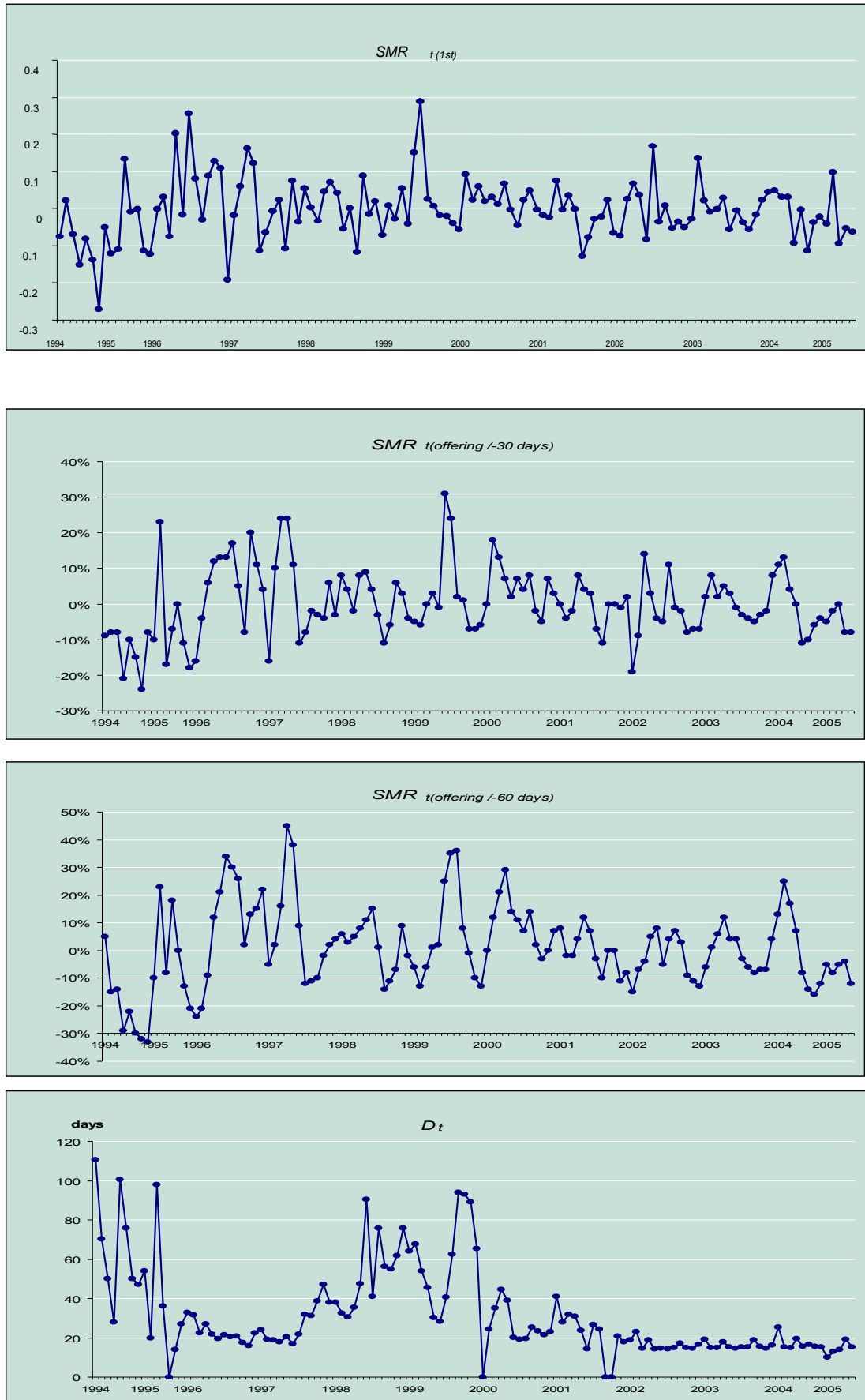
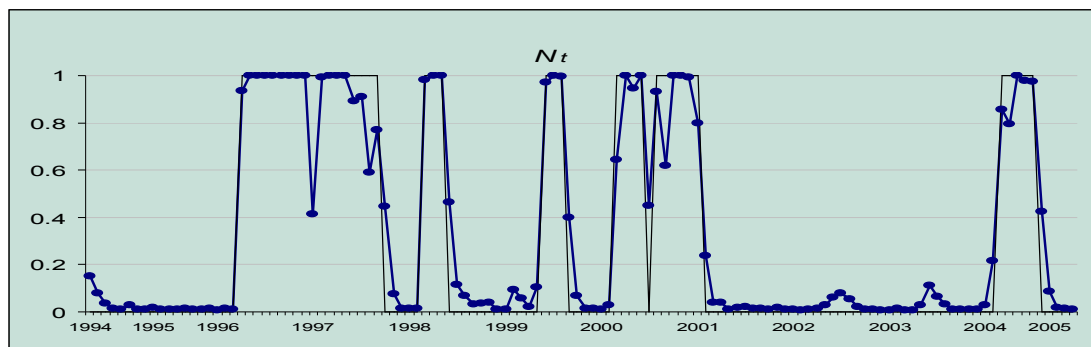
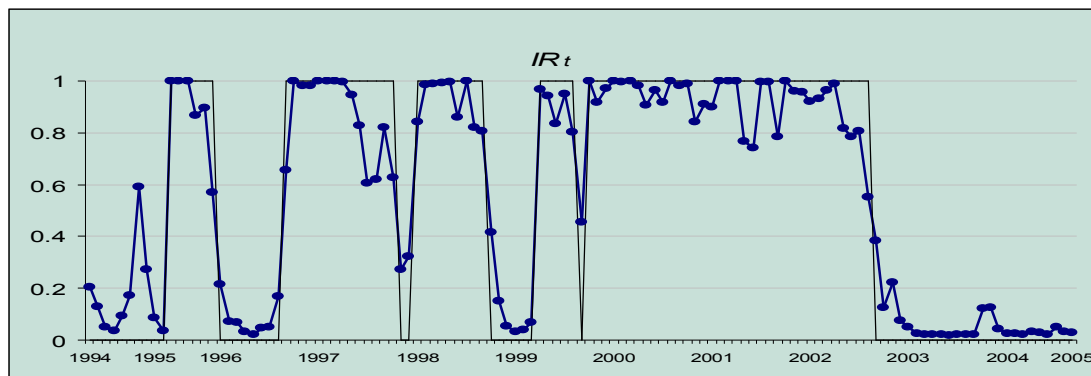


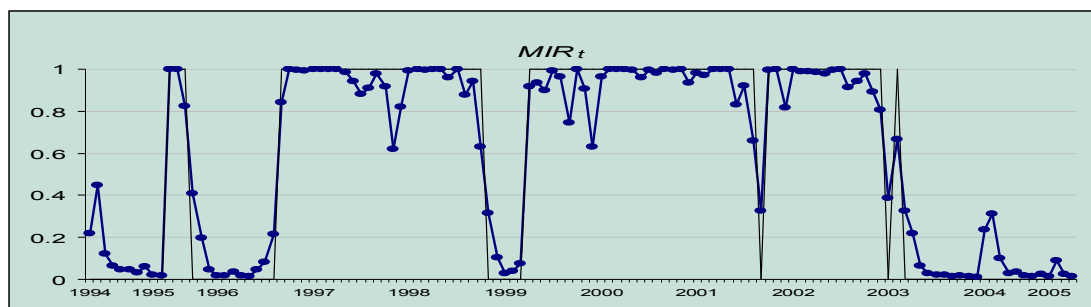
Figure 6-1(a~h) The Distribution of Each IPO Activity Measure from 1994 to 2005



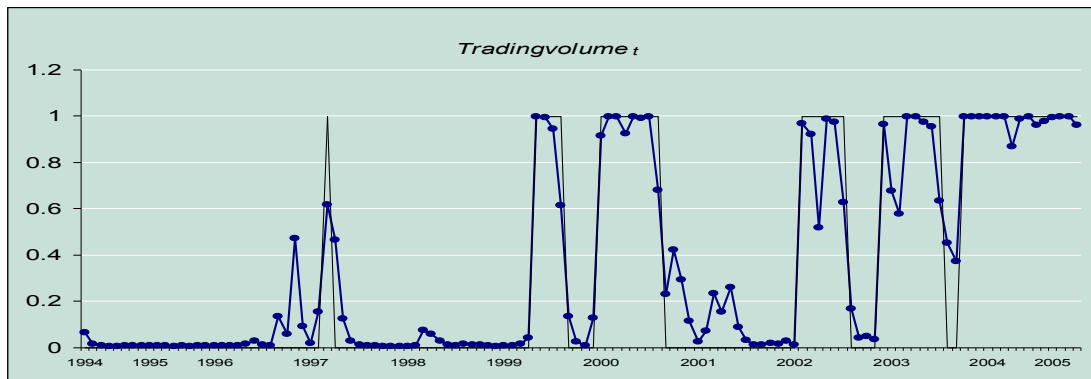
Cold periods	Jan.1994~Apr.1996 Mar.2001~Mar.2004	Nov.1997~Mar.1998* Sep.2004~May.2005	Jul.1998~Jun.1999	Oct.1999~Mar.2000
Hot Periods	May.1996~Oct.1997 Apr.2004~Aug.2004*	Apr.1998~Jun.1998*	Jul.1999~Sep.1999*	Apr.2000~Feb.2001



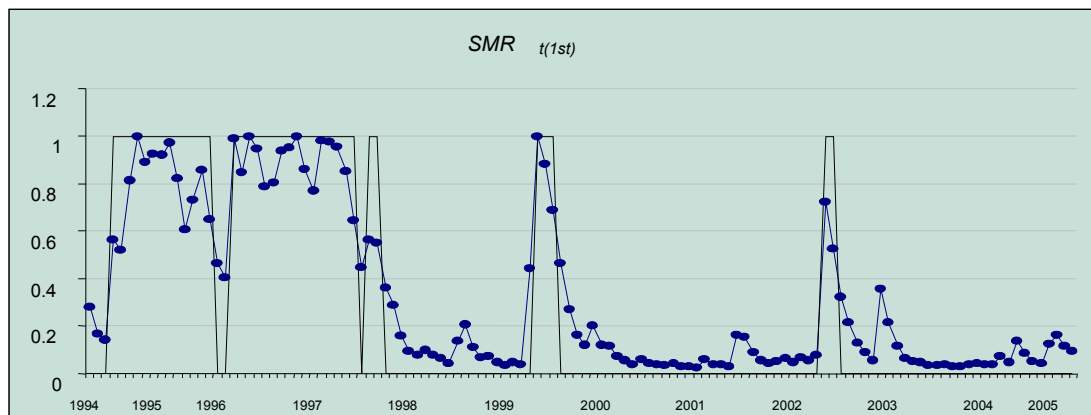
Cold periods	Jan.1994~Jun.1995	Nov.1995~Sep.1996	Nov.1998~Apr.1999*	Feb.2003~May.2005
Hot Periods	Jul.1995~Oct.1995*	Oct.1996~Oct.1998	May.1999~Jan.2003	



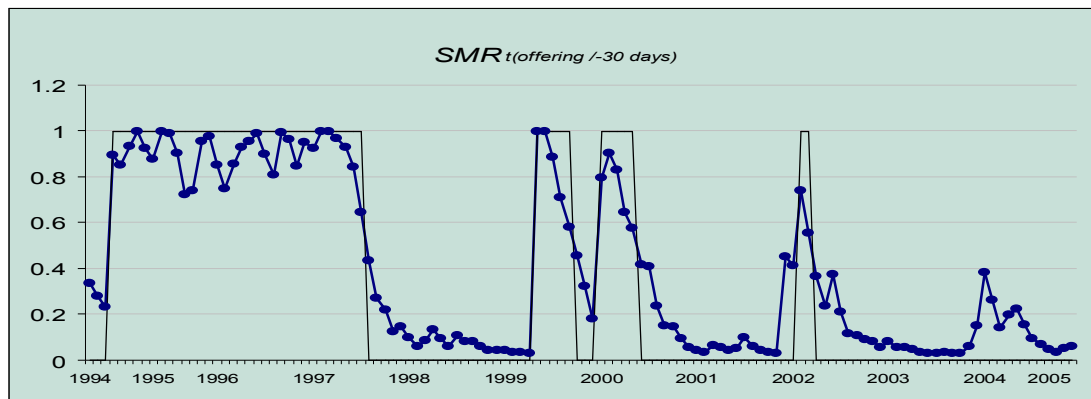
Cold periods	Jan.1994~Jun.1995	Nov.1995~Sep.1996	Dec.1998~Apr.1999*	Feb.2003~May.2005
Hot Periods	Jul.1995~Oct.1995*	Oct.1996~Nov.1998	May.1999~Jan.2003	



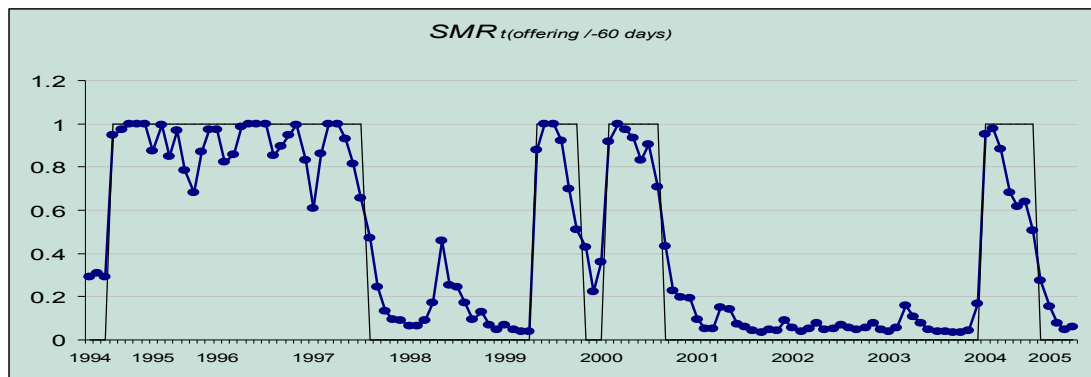
Cold periods	Jan.1994~May.1999	Oct.1999~Jan.2000*	Oct.2000~Feb.2002	Sep.2002~Dec.2002*
Hot Periods	Jun.1999~Sep.1999*	Feb.2000~Sep.2000	Mar.2002~Aug.2002	Jan.2003~May.2005



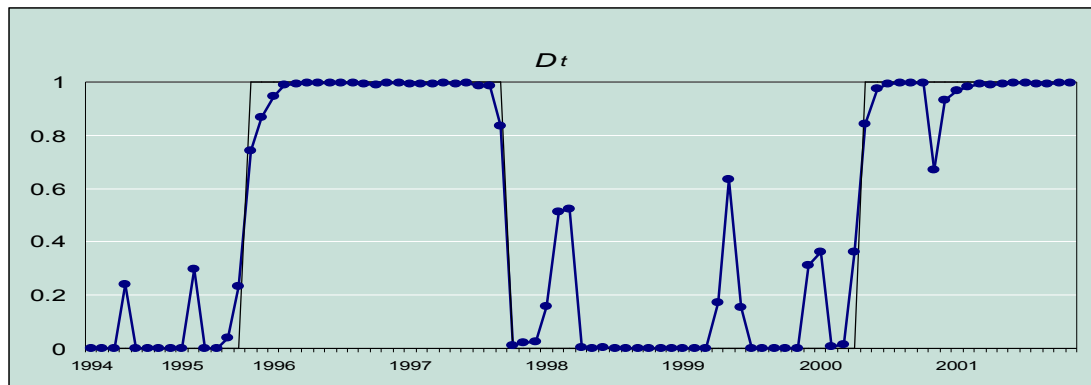
Cold periods	Jan.1994~Mar.1994*	Nov.1997~May.1999	Oct.1999~May.2005
Hot Periods	Apr.1994~Otc.1997	Jun.1999~Aug.1999*	



Cold periods	Jan.1994~Mar.1994*	Sep.1997~May.1999	Nov.1999~Jan.2000*	Jul.2000~ May.2005
Hot Periods	Apr.1994~Aug.1997	Jun.1999~Oct.1999*	Feb.2000~Jun.2000*	



Cold periods	Jan.1994~Mar.1994*	Sep.1997~May.1999	Dec.1999~Feb.2000*	Jul.2000~Jan.2004
	Sep.2004~ May.2005			
Hot Periods	Apr.1994~Aug.1997	Jun.1999~Nov.1999	Mar.2000~Sep.2000	Feb.2004~Aug.2004



Cold periods	Jan.1994~Nov.1995	Nov.1997~May.1999
Hot Periods	Dec.1995~Oct.1997	Jun.1999~Dec.2001

Note: The quasi-periods are marked with *.

Figure 6-2(a-h) The Switching Regimes and Hot and Cold Periods

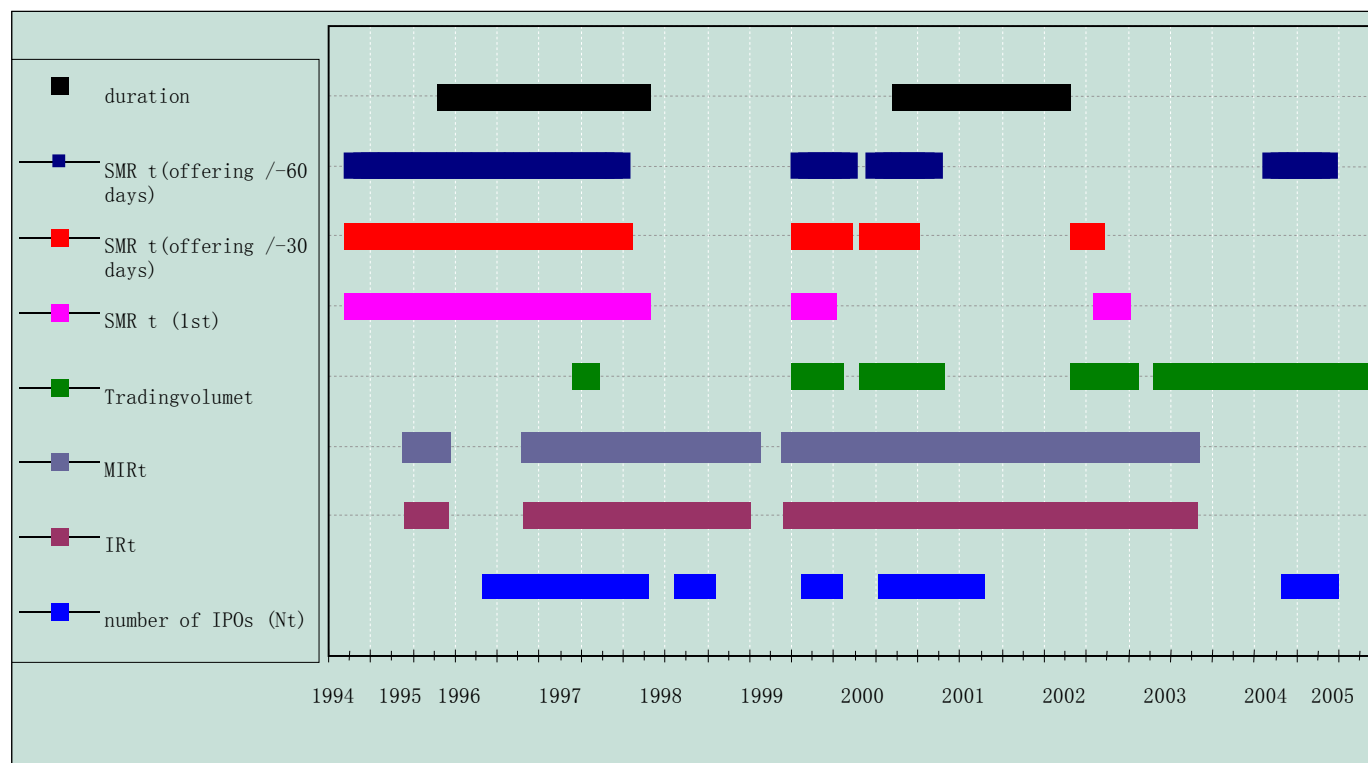


Figure 6-3 The Overlay of Hot Periods of the Chinese A-share IPO Market

Chapter 7 Conclusion

This chapter summarizes the key findings of this thesis and provides the answers for the three questions introduced in the beginning of this thesis. Further, some limitations of this research are discussed and some future research topics are presented associated with the Chinese IPO market.

7.1 Key findings

This thesis has conducted three empirical studies on the Chinese A-share IPO market. The first study is to analyse the underpricing of IPOs issued during Mar, 2001-2005 when the Approval System is adopted. The second study analyses what factors affect the length of an issuer's duration time from offering to listing. The last study focuses on the hot and cold issuing cycles in China.

The underpricing of the Chinese IPO market is comparatively higher than other countries as noted by many studies (Loughran et al, 1994; Yong et al, 2007). After the Approval System is adopted, the levels of underpricing have decreased to a significant extent. For example, the initial returns average at 93.49% during 2001-2005, which, however, is still higher than most nations. Our findings indicate that this high magnitude can be attributed to the inequality of IPO demand and supply with the proxies of issuing size, winning lottery ratio and turnover ratio. An IPO's shareholder structure affects its underpricing as well; in particular, we find that the ratio of state-owned shares may push up the level of underpricing. Further, the decision of allocation mechanism may affect this IPO's underpricing level. In the period 2001-2005, an IPO is less underpriced offered with secondary market

proportional offering or combined with bookbuilding, compared with the online offering.

The duration to listing is shown to be influenced by both issuing procedures and the issuer-related endogenous factors. In China, the Approval System is found to be more efficient than the Administrative Authorizing System since the IPO issuing procedures are simplified under the Approval System and most IPOs go to final listing within a half month. Although the issuing procedure is an exogenous factor and beyond an issuer's management, the issuer can still assist its final listing via controlling the floatation size, hiring a more reputable underwriter or deciding to go public in positive market conditions. Meanwhile, we find that a state-owned company may have priority in listing compared with a non-stated owned company, if they are identical in other elements. The allocation mechanism is also found to affect the length of this duration; in particular, the efficiency of allocation methods is in a decreasing order: proportional offering, online plus proportional offering, online offering and then the other offering types.

Finally, we employ different measures of IPO activities and thus detect some issuing cycles in the Chinese IPO market. Our findings demonstrate that the features of a hot period include a large volume of new offerings, high underpricing, positive market conditions and quick subscribing and listing speed. The two hot periods May.1996~Oct.1997, Apr.2000~Feb.2001 and one quasi-hot period Jul.1999~Sep.1999 are found to be robust.

7.2 Answers for the research questions

Based on the empirical studies, we find the answers for the three questions proposed in the introduction.

Research question 1: what is the underpricing after the Approval System is adopted in the Chinese IPO market?

Answer: i) we find that the underpricing has decreased after the Approval System is adopted. During the period Mar, 2001-2005, the average stock market adjusted initial-day return is 93.49%, a lower level than in previous years. ii) Further, the levels of underpricing shrink in a 30-day period. These shrinking trends are different across allocation mechanisms and underwriters. In particular, the underpricing shrinks slightly for IPOs allocated using online offering and underwritten by more reputable underwriters.

Research question 2: what influenced the length of an IPO's duration from offering to listing?

Answer: Both issuing procedures and the issuer-related factors are found to influence the length of an IPO's listing speed: i) in the Chinese IPO market, the Approval System is found to be more efficient than the Administrative Authorizing System. On average, the waiting time to listing has been shortened from 35.61 days to 16.92 days. ii) Some endogenous factors are found to be positively related to the listing speed, such as the offering price, the portions of state-owned and legal-entity-owned shares, positive market sentiment and a small floatation size. iii) The four types of allocation mechanisms are found to affect the length of this duration. iv)

The more reputable underwriter is found to be able to help an IPO listing faster when it hasn't listed until 47 days after offering and on an average, the time to listing of IPOs underwritten by more reputable underwriters are comparatively shorter than that of the others.

Research question 3: are there “hot issues” phenomena in China? If yes, when are the turning points for the hot and cold issuing cycles?

Answer: The “hot issues” phenomena are found in the Chinese market. For the benchmark observation “the number of IPOs”, we recognize 2 hot periods, 3 quasi-hot periods, 5 cold periods and 1 quasi-cold period. The following periods are found to be robust by using the other measures as comparison: the two hot periods May.1996~Oct.1997, Apr.2000~Feb.2001, one quasi-hot Jul.1999~Sep.1999 and three cold periods Jan.1994~Apr.1996, Jul.1998~Jun.1999, Mar.2001~Mar.2004.

7.3 Limitations

The following limitations are considered in my studies:

- a. In the empirical study in Chapter 5, the allocation mechanisms for IPOs are quite varied across these 12 years. Therefore, we categorise them into four main types, like proportional offering, online plus proportional offering, online offering and the other offering types. This might ignore some details and thus differences of individual IPO, although a finer classification would require more data in each category.
- b. In the empirical study in Chapter 6, the economic effects are discussed when we interpret the cycles detected by the observations. However, this might not be enough to indicate the impact of economic conditions on issuing cycles. A further study could also consider the modelling of macroeconomic data.

c. The Chinese IPO market is argued to be interfered with by the regulations of the CSRC greatly. This study notices some major regulations, such as changes in allocation mechanisms, pricing methods etc, but some minor interference hasn't been explicitly taken into account, such as the regulations on offerings to funds and ordinary legal entities, etc. Again, a finer classification would require more detailed data.

7.4 Future research topics

The following topics could extend the analysis in the thesis:

- a. ownership structure and corporate governance: this topic extends the influence of shareholder structure in IPO issuing and then tests its effect on corporate management.
- b. political interference on the Chinese IPO market: this topic subtracts the main regulations in the Chinese IPO market and measures its interference on the underpricing and issuing cycles.
- c. the relationship between IPO cycles and the behaviour of the monetary market: the IPO cycles are argued to be related with the monetary market and this topic studies these two markets' behaviour.

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